# Sample Building

**Project #: 1111**


Prepared by:

**Nova Commissioning Service Ltd.**

1439 Youville Dr. Unit 18A

Orleans, ON

(613) 830-6656, Fax (613) 824-1070


for

**Sample Owner Name**

1111 Sample Road

Ottawa, Ontario, K1K 1R1,

Tel: +1 (613) 222-2222

Fax: (613) 222-3333

| Job Name: | Sample Building | Date: | 23-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Mechanical Specifications | Spec. #: | 20 05 01 | Nova Project #: | N1120 |

## Commissioning Activity Matrix

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| **20 05 17 pipe welding** | **3.3 Inspection and Tests - General Requirements:** ***Per Entire Section.*** **3.4 Specialist Examinations and Tests:** ***Per Entire Section.*** | | | | |
| **20 05 20 Seismic Restraints** | **3.2 Certification** .1 At the completion of the installation the seismic specialist shall visit the site and review that the installation of restraint for system is in accordance with their design. The specialist shall provide written certification that the systems have been correctly restrained. | | | | |
| **20 07 13 Thermal Insulation for Ducting** | **1.6 Samples** .1 Provide sample installation of round and rectangular ductwork 1.8m (6ft) sections for approval. Samples shall be reviewed by Engineer prior to start of installations. | | | | |
| **20 07 20 Thermal Insulation for piping** | **1.6 Samples** .1 Provide sample installation of round and rectangular ductwork 1.8m (6ft) sections for approval. Samples shall be reviewed by Engineer prior to start of installations. | | | | |
| **20 07 53 Acoustic Duct Lining** | **1.3 Samples** .1 Provide sample mockup of rectangular duct section with acoustic insulation installed. Mockup shall be reviewed prior to start of installations. | | | | |
| **21 13 13 Wet Pipe Sprinkler Systems** | **1.8 Training** .1 Provide four (4) hours of training to the Owners representative on site. This is a requirement for substantial completion. **3.2 Disinfection** .1 Disinfect new piping and existing piping | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| | where renovations are being completed.<br>.2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.<br>.3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.<br>.4 Obtain at least two consecutive satisfactory bacteriological samples form piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.<br>**3.3 Field Quality Control**<br>.1 Site Test, Inspection:<br>.1 Perform test to determine compliance with specified requirements in presence of Authority having jurisdiction.<br>.2 Test, inspect, and approve piping before covering or concealing.<br>.3 Preliminary Tests:<br>.1 Hydrostatically test each system at for a 2 hour period with no leakage or reduction in pressure.<br>.2 Flush piping with potable water in accordance with NFPA 13R.<br>.3 Preliminary Tests:(Cont'd)<br>(Cont'd) .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.<br>.4 Test alarms and other devices.<br>.5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and correction made, submit signed and dated certificate in accordance with NFPA 13R.<br>.4 Formal Tests and Inspections:<br>.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.<br>.2 Submit written request for formal inspection at least 15 days prior to | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| | inspection date.<br>.3 Repeat required tests as directed.<br>.4 Correct defects and make additional tests until systems comply with contract requirements.<br>.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.<br>.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted. | | | | |
| **22 05 00 Plumbing Pumps** | **3.2 Field Quality Control**<br>.1 Check power supply.<br>.2 Check starter protective devices.<br>.3 Start up, check for proper and safe operation.<br>.4 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls,audible and visual alarms, over-temperature and other protective devices.<br>.5 Adjust flow from water-cooled bearings.<br>.6 Adjust impeller shaft stuffing boxes, packing glands. | | | | |
| **22 11 18 Domestic Water Piping** | **3.3 Pressure Tests**<br>.1 Conform to requirements of Section 20 05 01 -General Requirements.<br>.2 Test pressure: greater of 1½ times maximum system operating pressure or 860 kPa (125 psi).<br>.3 Test in accordance with Ontario Building Code.<br>**3.4 Disinfection**<br>.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.<br>.2 Upon completion, provide laboratory test reports on water quality for Consultant approval.<br>.3 Provide necessary chemicals and equipment and disinfect system to requirements of the Ontario Building Code. Disinfection shall be in accordance with the procedures outlined in Appendix item A-7.6.2.2. Flushing and Disinfecting Water Services Pipes, in the 2006 | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| | Ontario Building Code and supplemented as follows:<br>.1 All lines shall be disinfected, including distribution lines within building and including lines smaller than 100mm in diameter.<br>.2 Free chlorine residual at ends of lines after disinfection to be greater than 0.05mg/L.<br>.3 The Contractor shall carry out three consecutive tests of water samples (24 hours apart or greater) at all remote points of system for E-coli, total coliform, and heterotrophic plate count. Results shall show zero presence, and results shall be reviewed and accepted by Consultants.<br>.4 Contractor shall repeat the above disinfection procedures until satisfactory test results are received and approved. | | | | |
| **22 11 23 Facility Natural Gas Piping** | **3.3 Testing**<br>.1 Test system in accordance with CAN1-B149.1.<br>**3.7 Inspection**<br>.1 Contractor shall apply and have the Technical Standards and Safety Authority or local gas utility authority inspect gas system installation. Contractor shall pay all fees for inspections by T.S.S.A. or local utility. Contractor shall provide T.S.S.A. or local utility inspection report to Engineer and include in O & M Manual. | | | | |
| **22 13 17 Drainage Waste and Vent Piping - Cast Iron and Copper Above Ground** | **3.1 Installation**<br>.3 Test the plumbing system in accordance with the O.B.C. Part 7. | | | | |
| **22 13 18 Drainage Waste and Vent Piping - Plastic Buried** | **3.1 Installation**<br>.1 Install and test in accordance with Ontario Building Code Part 7 Plumbing and local authority having jurisdiction. | | | | |
| **22 30 05 Domestic Water Heaters** | **3.1 Installation**<br>.4 Manufacturer's factory trained, certified Engineer to start up and commission DHW heaters and provide written confirmation that the hot water system is installed properly and operating correctly. | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| **22 42 01 Plumbing Specialties and Accessories** | **3.1 Installation**<br>.3 Install and test in accordance with Ontario Building Code Part 7 Plumbing and local authority having jurisdiction.<br>**3.7 Commissioning**<br>.1 After start-up, test, adjust and provide operation as indicated, to suit site conditions such as:<br>.1 Clean out strainers periodically until clear.<br>.2 Clean out and prime all floor drain traps using trap seal primers or other means acceptable to the Plumbing Code.<br>.3 Prove freedom of movement of cleanouts.<br>.4 Backflow preventors and vacuum breakers: confirm operation of backflow preventors and vacuum breakers and provide test certificate from qualified testing agency. Testing agency to verify installation of correct type of backflow preventor or vacuum breaker to suit application. | | | | |
| **23 05 93 Testing, Adjusting and Balancing for HVAC** | **1.2 General**<br>.4 Submit 6 copies of TAB reports, each in "D" ring binders, complete with index tabs for verification and approval of Engineer.<br>**.15 Verification:**<br>.1 Reported measurements shall be subject to verification by Engineer. Provide instrumentation and manpower to verify results of up to 30 % of all reported measurements. Number and location of verified measurements to be at discretion of Engineer. | | | | |
| **23 05 94 Pressure Testing of Ducted Air Systems** | **1.2 Timing**<br>.1 Ducts to be tested before installation of insulation or any other form of concealments.<br>**1.4 Test Procedures**<br>.1 Maximum lengths of ducts to be tested to be consistent with capacity of test equipment.<br>.2 Section of duct to be tested is noted in Section 23 31 14.<br>.3 Repeat tests until specified pressures are attained. Bear costs for repairs and repetition to tests.<br>.4 Base partial system leakage calculations on | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| | Reference Standard.<br>.5 Seal leaks that can be heard or felt, regardless of their contribution to total leakage.<br>**1.6 Verification**<br>.1 Consultant to witness tests and to verify reported results.<br>1.9 Report Forms<br>.1 Submit proposed report form and test report format to Consultant for approval at least three weeks before proposed date of first series of tests. Do not start tests until approval received in writing from Consultant.<br>1.10 Pressure Test Reports: Per Entire Section | | | | |
| **23 05 95 HVAC Commissioning** | **Per Entire Section** | **Nova** | | | |
| **23 09 36 Energy Monitoring and Control Systems (EMCS) General Requirements** | **1.17 Testing**<br>.4 Notify the Consultant in writing at least 14 working days before testing is to take place.<br>.6 Perform tests in presence of Consultant.<br>**1.18 Commissioning: *Per Entire Section.***<br>**1.20 Training: *Per Entire Section.***<br>**3.5 EMCS: Start-up and Check-out: *Per Entire Section.***<br>**3.6 Commissioning, Testing and Acceptance: *Per Entire Section.*** | | | | |
| **23 21 13.01 Hydronic Systems: Copper** | **3.4 Flushing and Cleaning: *Per Entire Section*.**<br>**3.6 Testing**<br>.1 Test system in accordance with Section 20 05 01 - Mechanical General Requirements:<br>.1 General: maintain test pressure without loss for 4h unless otherwise specified.<br>.2 Hydraulically test hydronic piping systems at 1½ times system operating pressure or minimum 860 kPa, whichever is greater. | | | | |
| **23 21 13.02 Hydronic Systems: Steel** | **3.4 Flushing and Cleaning: *Per Entire Section*.**<br>**3.6 Testing**<br>.1 Test system in accordance with Section 20 05 01 - Mechanical General Requirements:<br>.1 General: maintain test pressure without loss for 4h unless otherwise specified. | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| | .2 Hydraulically test hydronic piping systems at 1½ times system operating pressure or minimum 860 kPa, whichever is greater. | | | | |
| **23 21 24 Variable Frequency Drive** | **3.1 Installation**<br>.3 Coordinate the installation, test and commissioning of drives with Division 23. Obtain written acceptance from these individuals for each drive.<br>**3.2 Field Quality Control**<br>.1 Perform tests in accordance with Division 26, Electrical General Requirements section.<br>.2 Submit test record to Consultant for review and acceptance.<br>.3 Submit configuration reports for all of the drives as generated card by the software application. Submit a complete OPC database printout from the Drive OPC Server.<br>.4 A ½ **day training** shall be provided to operators. It will include alarm configurations and manual control of motor/VFD. | | | | |
| **23 23 00 Copper Tubing & Fittings Refrigerant** | **3.4 Pressure and Leak Testing**<br>.2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides (Cont'd) respectively.<br>.3 Test Procedure: Build pressure up to 5 psig (35 kPa) with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.<br>**3.5 Dehydration Charging and Charging:** ***Per Entire Section.***<br>.2 Record and report all measurements to Consultant.<br>**3.7 Registration**<br>.1 Register refrigeration system with Technical and Inspection Standards and Safety Authority when required by CSA B52 and Technical Standard and Safety Act 2000. Apply, pay for and have T.S.S.A. inspect refrigeration system when required by CSA B52 or Technical | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| | Standards and Safety Act 2000. | | | | |
| **23 25 00 HVAC Water Treatment Systems** | **3.3 Cleaning of Mechanical System:**<br>.1 Provide copy of recommended cleaning Mechanical System procedures and chemicals for approval byConsultant.<br>**3.4 Water Treatment:**<br>.3 Operating staff training.<br>**3.6 Commissioning:** ***Per Entire Section.*** | | | | |
| **23 31 14 Duct - Low Pressure - to 500 Pa (2 in)** | **3.5 Leakage Tests**<br>.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.<br>**3.6 Duct Cleaning**<br>.1 All ducts shall be thoroughly vacuumed. | | | | |
| **23 33 16 Dampers - Fire** | **3.1 Installation**<br>.3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.<br>.8 Do random drop test on six fire dampers to ensure proper installation. Reset damper upon completion of test. | | | | |
| **23 34 00 HVAC Fans** | **Inspection** | **Nova** | | | |
| **23 37 20 Louvres, Intakes and Vents** | **1.4 Test Reports**<br>.1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90. | | | | |
| **23 52 00 Low Pressure packaged Boiler System** | **2.7 Tests**<br>.1 Boiler inspection shall include hydrostatic test in the presence of an Authorized Inspector. He/she shall certify a data report which shall be delivered with the boiler as evidence of A.S.M.E. compliance. In addition to A.S.M.E. symbol, the boilers shall bear a Canadian Registration Number.<br>.2 A factory electrical cabinet test shall be performed. An operational check shall be evidenced on adjustment of controls and check of all safety devices.<br>**3.3 Commissioning**<br>.1 Manufacturer to:<br>.1 Start up and commission installation.<br>.2 Provide 8 hrs. on site to demonstrate operation and maintenance.<br>.3 Certify installation. | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| | .2 Provide Consultant at least 24 h notice prior to inspections, tests, and demonstrations. Submit written report of inspections and test results. | | | | |
| **23 73 11 Packaged Air Handling Units RTU-1** | **Inspection** | **Nova** | | | |
| **23 81 24 Ductless Split Air Conditioning Units** | **Inspection** | **Nova** | | | |
| **23 82 22 Force Flows** | **Inspection** | **Nova** | | | |
| **23 82 36 Convectors and Finned Tube Radiation** | **Inspection** | **Nova** | | | |
| **26 05 00 Common Work Results Electrical** | **1.8 SYSTEM STARTUP**<br>.1 Instruct Engineer and operating personnel in operation, care and maintenance of systems, system equipment and components.<br>. 2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.<br>**1.9 OPERATING INSTRUCTIONS**<br>.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.<br>**3.6 FIELD QUALITY CONTROL**<br>**.1 Load Balance:**<br>. 3 Provide upon completion of work, load balance report as directed in PART 1 – SUBMITTALS…<br>**. 2 Conduct following tests:** ***All per spec including:***<br>. 6 Insulation resistance testing:<br>.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.<br>. 2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.<br>. 3 Check resistance to ground before energizing.<br>**.3 Carry out tests in presence of Engineer.** | | | | |
| **26 05 28 Grounding - Secondary** | **3.3 FIELD QUALITY CONTROL**<br>.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.<br>.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.<br>. 3 Perform tests before energizing electrical system. | | | | |

| Spec | Description | Action By | Date Scheduled | Done (Y/N) | Comments |
|---|---|---|---|---|---|
| **26 12 13 Liquid Filled, Medium Voltage Transformers** | **1.3 Source Quality**<br>.1 Control Submit type production test certificates to Engineer.<br>**3.2 Field Quality Control**<br>.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.<br>.2 Carry out following **insulation tests** using megger with 20,000megohm scale and resulting insulation resistance corrected to base of 20°C.<br>. 1 High voltage to ground with secondary grounded for duration of test.<br>. 2 Low voltage to ground with primary grounded for duration of test.<br>. 3 High to low voltage.<br>.11 Carry out visual mechanical and electrical tests in accordance with Section 01 91 00 Commissioning.<br>.12 Operate 2500 / 3333 kVA transformers without load for period of 3 days prior to connecting the secondary load. | | | | |
| **26 29 03 Control Devices** | **1.5 QUALITY ASSURANCE**<br>. 1 Submit to Engineer one copy of test results.<br>**2.2 FIELD QUALITY CONTROL**<br>.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.<br>. 4 Check out complete system for op sequencing. | | | | |
| **28 31 03 Multiplex Fire Alarm and voice Communication Systems** | **1.3 Quality Assurance**<br>.1 Inspection tests to conform to: CAN/ULC-S536.<br>.2 Submit inspection report to Engineer.<br>**3.2 Field Quality Control**<br>. 1 Perform tests in accordance with Section 26 05 00 - Common Work Results – Electrical and to CAN/ULC-S537.<br>. 2 Fire alarm system:<br>.1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel.<br>. 2 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation.<br>of system. | | | | |

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Pipe welding | Spec. #: | 20 05 17 | Nova Project #: | N1120 |

**Insert pipe welding reports here.**

3.3 Inspection and Tests - General Requirements
.2 Formulate "Inspection and Test Plan" in co-operation with Engineer.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Seismic Restraints | Spec. #: | 20 05 20 | Nova Project #: | N1120 |

**Insert Seismic Restraints reports here.**

**3.2 Certification**

.1 At the completion of the installation the seismic specialist shall visit the site and review that the installation of restraint for system is in accordance with their design. The specialist shall provide written certification that the systems have been correctly restrained.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Thermal Insulation for Ducting | Spec. #: | 20 07 13 | Nova Project #: | N1120 |

**Insert Thermal Insulation for Ducting reports here.**

**1.6 Samples**

.1 Provide sample installation of round and rectangular ductwork 1.8m (6ft) sections for approval. Samples shall be reviewed by Engineer prior to start of installations.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Thermal Insulation for Ducting | Spec. #: | 20 07 13 | Nova Project #: | N1120 |

**Insert Thermal Insulation for Ducting reports here.**

**1.6 Samples**

.1 Provide sample installation of round and rectangular ductwork 1.8m (6ft) sections for approval. Samples shall be reviewed by Engineer prior to start of installations.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Acoustic Duct Lining | Spec. #: | 20 07 53 | Nova Project #: | N1120 |

**Insert Thermal Insulation for Ducting reports here.**

**1.3 Samples**

.1 Provide sample mockup of rectangular duct section with acoustic insulation installed. Mockup shall be reviewed prior to start of installations.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Wet Pipe Sprinkler Systems | Spec. #: | 21 13 13 | Nova Project #: | N1120 |

**Insert Wet Pipe Sprinkler Systems Disinfection reports here.**

**3.2 Disinfection**

.1 Disinfect new piping and existing piping where renovations are being completed.

.2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.

.3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.

.4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Wet Pipe Sprinkler Systems | Spec. #: | 21 13 13 | Nova Project #: | N1120 |

**Insert Wet Pipe Sprinkler Systems Flushing and Alarms reports here.**

**3.3 Field Quality Control**

.1 Site Test, Inspection:
.2 Flush piping with potable water in accordance with NFPA 13R.
.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 correction made, submit signed and dated certificate in accordance with NFPA 13R.
.4 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.
.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.
.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Wet Pipe Sprinkler Systems | Spec. #: | 21 13 13 | Nova Project #: | N1120 |

| | |
|---|---|
| Date of test: | |
| Project: | |
| Location of test: | |
| System Tested: | |
| Duration: | |
| Pressure: | |
| Witnessed by: | |
| Date: | |
| Title: | |
| Signature: | |
| Comments: | |

| Start: 22:48 | Finish 00:08 |
|---|---|
|  |  |

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Wet Pipe Sprinkler Systems | Spec. #: | 21 13 13 | Nova Project #: | N1120 |

# Customer Training Attendance

**Date:** _____

**Training on: Wet Pipe Sprinkler Systems**

**Demonstrated By:** _____ **Firm:**_____

**In accordance with specifications (section(s) and brief description).**

**Provide four (4) hours of training to the Owners representative on site.**

**ATTENDEES**

| Name | Signature | Representing |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**Comments:**

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Plumbing Pumps | Spec. #: | 22 05 00 | Nova Project #: | N1120 |

| # | Tag | Location | Service | Type | Commissioned per checklist below (Y/N) | Notes |
|---|---|---|---|---|---|---|
| 1 | RCP-1 | Mech. Room | Domestic Water | | | |
| 2 | CP-1 | Mech. Room | Boiler Pump | | | |
| 3 | CP-2 | Mech. Room | Boiler Pump | | | |
| 4 | HP-1A | Mech. Room | HW Sec. Water | | | |
| 5 | HP-1B | Mech. Room | HW Sec. Water | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |

| Requested documentation submitted | Rec'd | Comments |
|---|---|---|
| Manufacturer's cut sheets | ☐ | |
| Performance data (pump curves, coil data, etc.) | ☐ | |
| Installation and startup manual and plan | ☐ | |
| O&M manuals | ☐ | |
| Factory test results | ☐ | |
| Sequences and control strategies | ☐ | |
| Warranty Certificate | ☐ | |
| Pump alignment report | ☐ | |
| Vibration testing report | ☐ | |
| | | |
| **Comments:** | | |

1439 Youville Drive, Unit 18A, Orleans, Ontario, K1C 4M8
Ph: (613)830-6656 Fax: (613)824-1070 E-mail: info@novacommissioning.ca

| Installation Checks | | | |
|---|---|---|---|
| **Check if Acceptable; Provide comment if unacceptable** | | **NA** | **Comment** |
| **General** | | | |
| Installation is per manufacturer's instructions | ☐ | ☐ | |
| Manufacturers recommended spare parts are provided | ☐ | ☐ | |
| Permanent label affixed | ☐ | ☐ | |
| Pump lubricated | ☐ | ☐ | |
| Pump drive properly aligned | ☐ | ☐ | |
| Pump turns freely | ☐ | ☐ | |
| Drive guard or shield is properly installed | ☐ | ☐ | |
| Pumps in place and properly anchored | ☐ | ☐ | |
| Pipes are supported independently of the pump | ☐ | ☐ | |
| Vibration isolation devices installed and functional | ☐ | ☐ | |
| Seismic anchoring installed and functional where applicable | ☐ | ☐ | |
| Isolation valves and piping specialties installed | ☐ | ☐ | |
| No leaks apparent | ☐ | ☐ | |
| Pump detail checked against the drawings and all devices, gages and appurtenances are in place | ☐ | ☐ | |
| Insulation installed per requirements; pumps for cold water insulated to avoid condensation yet allow for service | ☐ | ☐ | |
| | | | |
| **Electrical and Controls** | | | |
| Power disconnect is located within site of the unit it controls and labeled | ☐ | ☐ | |
| All electric connections tight | ☐ | ☐ | |
| Grounding installed for components and unit | ☐ | ☐ | |
| Safeties installed and operational | ☐ | ☐ | |
| Starter overload breakers installed and correct size | ☐ | ☐ | |
| All control devices and wiring complete | ☐ | ☐ | |
| Control system interlocks connected and functional | ☐ | ☐ | |
| Operation of HOA switch checked in all positions | ☐ | ☐ | |
| Proper safeties in control when HOA switch in hand position | ☐ | ☐ | |
| Installation per manufacturer's instructions | ☐ | ☐ | |
| Rotates in the correct direction (for VFD, check Inverter and Bypass modes) | ☐ | ☐ | |
| | | | |
| **VFD** | | | |
| Installation per manufacturer's requirements and start up instructions completed | ☐ | ☐ | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if Acceptable; Provide comment if unacceptable** | | **NA** | **Comment** |
| Drive location not subject to excessive moisture or dirt | ☐ | ☐ | |
| Drive location not subject to excessive temperatures | ☐ | ☐ | |
| Appropriate Volts vs. Hz curve is being used | ☐ | ☐ | |
| Drive size matches motor size | ☐ | ☐ | |
| Drive mounted on house keeping pad (if applicable) | ☐ | ☐ | |
| Cooling air flow path clean and unobstructed | ☐ | ☐ | |
| Permanent label affixed and UL stamp approved | ☐ | ☐ | |
| VFD interlocked to control system | ☐ | ☐ | |
| Unit is programmed with full written programming record on site | ☐ | ☐ | |
| Minimum and maximum speed set | ☐ | ☐ | |
| Accel time set to _____ and Decel time set to _____ | ☐ | ☐ | |
| Operation checked in HAND, OFF, and AUTO. As applicable operation also checked in BYPASS | ☐ | ☐ | |
| Where applicable, ensure safeties are active in all modes | ☐ | ☐ | |
| Coordinated with BAS for all interface ranges and signal isolation | ☐ | ☐ | |
| Restart on Power Failure parameter set to auto | ☐ | ☐ | |
| VFD powered (wired to controlled equipment) | ☐ | ☐ | |
| Grounding installed for components and unit | ☐ | ☐ | |
| Drive min and max speed set to _____ Hz min and 60 Hz max | ☐ | ☐ | |
| Security settings set per Owner direction and Password documented for Owner | ☐ | ☐ | |
| Drive response to loss of signal set to _____ | ☐ | ☐ | |
| Output pulse resolution set to _____ MHz. (This is coordinated with the application to minimize audible noise and coordinated with driven bearing allowances.) | ☐ | ☐ | |
| Checked the input voltage with drive disconnected | ☐ | ☐ | |
| Input of motor FLA represents 100% to 105% of motor FLA rating | ☐ | ☐ | |
| Upper frequency limit set at 100%, unless explained otherwise | ☐ | ☐ | |
| | | | |
| **Sensors and Gages** | | | |
| Temperature, pressure and flow gages and sensors installed | ☐ | ☐ | |
| Piping gages, BAS and associated panel temperature and pressure readouts match | ☐ | ☐ | |
| **TAB** | | | |
| Installation of system and balancing devices allowed balancing to be completed following specified NEBB or AABC procedures and contract documents | ☐ | ☐ | |

**Summary of issues:**

| System | Description |
|---|---|
| | |

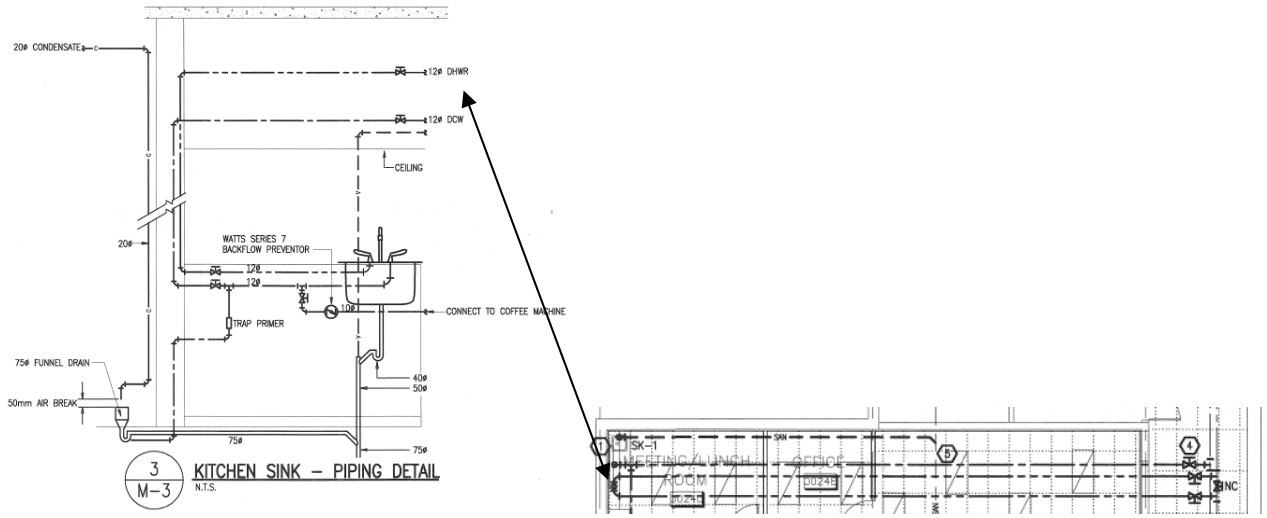
**Recommendations:**

| System | Description |
|---|---|
| | |

| | Name | Company | Date |
|---|---|---|---|
| **Witnessed by:** | | | |

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Domestic Water Piping | Spec. #: | 22 11 18 | Nova Project #: | N1120 |

| | |
|---|---|
| Date of test: | |
| Project: | |
| Location of test: | |
| System Tested: | |
| Duration: | |
| Pressure: | |
| Witnessed by: | |
| Date: | |
| Title: | |
| Signature: | |
| Comments: | |

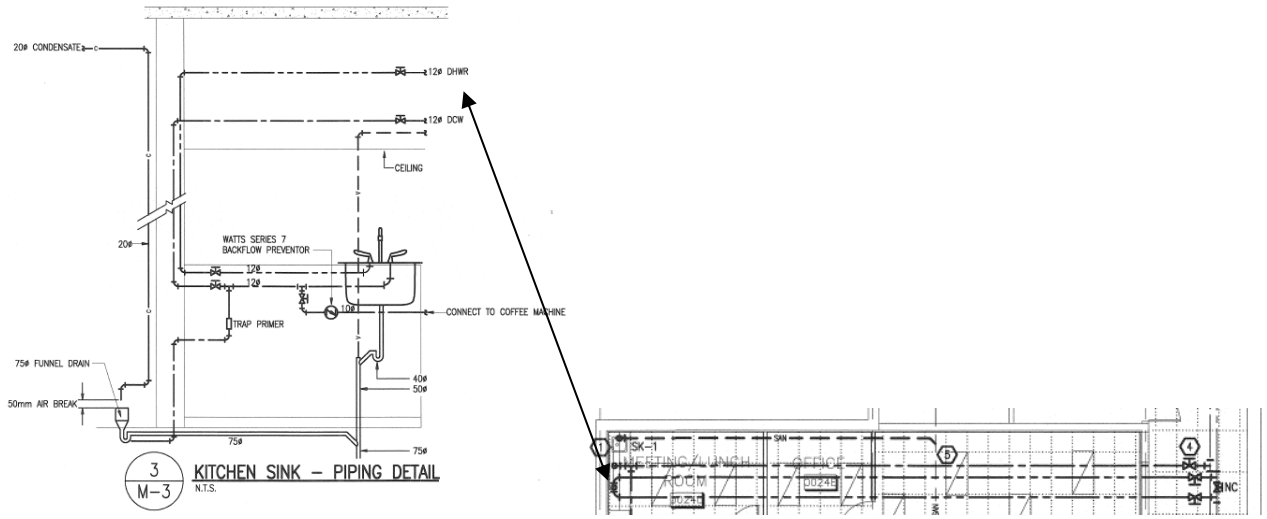


| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Domestic Water Piping | Spec. #: | 22 11 18 | Nova Project #: | N1120 |

**Insert Domestic Water Piping Disinfection reports here.**

**3.4 Disinfection**

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.
.2 Upon completion, provide laboratory test reports on water quality for Consultant approval.
.3 Provide necessary chemicals and equipment and disinfect system to requirements of the Ontario Building Code. Disinfection shall be in accordance with the procedures outlined in Appendix item A-7.6.2.2. Flushing and Disinfecting Water Services Pipes, in the 2006 Ontario Building Code and supplemented as follows:
.1 All lines shall be disinfected, including distribution lines within building and including lines smaller than 100mm in diameter.
.2 Free chlorine residual at ends of lines after disinfection to be greater than 0.05mg/L.
.3 The Contractor shall carry out three consecutive tests of water samples (24 hours apart or greater) at all remote points of system for E-coli, total coliform, and heterotrophic plate count. Results shall show zero presence, and results shall be reviewed and accepted by Consultants.
.4 Contractor shall repeat the above disinfection procedures until satisfactory test results are received and approved.



| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Facility Natural Gas Piping | Spec. #: | 22 11 23 | Nova Project #: | N1120 |

**Insert Natural Gas Piping reports here.**

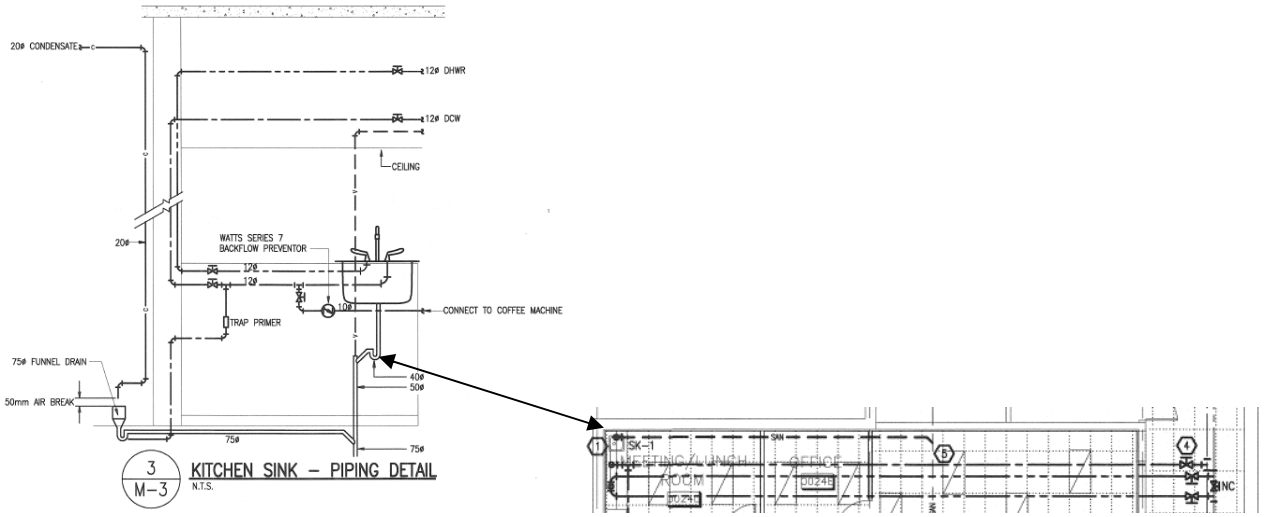
**3.3 Testing**
.1 Test system in accordance with CAN1-B149.1.
**3.7 Inspection**
.1 Contractor shall apply and have the Technical Standards and Safety Authority or local gas utility authority inspect gas system installation. Contractor shall pay all fees for inspections by T.S.S.A. or local utility. Contractor shall provide T.S.S.A. or local utility inspection report to Engineer and include in O & M Manual.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Drainage Waste and Vent Piping - Plastic Buried | Spec. #: | 22 13 18 | Nova Project #: | N1120 |

**Insert Drainage Waste and Vent Piping - Plastic Buried reports here.**

### 3.1 Installation

.1 Install and test in accordance with Ontario Building Code Part 7 Plumbing and local authority having jurisdiction.



| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Domestic Water Heaters | Spec. #: | 22 30 05 | Nova Project #: | N1120 |

**Insert Domestic Water Heaters start-up report here.**

**3.1 Installation**

.4 Manufacturer's factory trained, certified Engineer to start up and commission DHW heaters and provide written confirmation that the hot water system is installed properly and operating correctly.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Plumbing Specialties and Accessories | Spec. #: | 22 42 01 | Nova Project #: | N1120 |

**Insert Plumbing Specialties and Accessories report here.**

**3.1 Installation**
.3 Install and test in accordance with Ontario Building Code Part 7 Plumbing and local authority having jurisdiction.
**3.7 Commissioning**
.1 After start-up, test, adjust and provide operation as indicated, to suit site conditions such as:
.1 Clean out strainers periodically until clear.
.2 Clean out and prime all floor drain traps using trap seal primers or other means acceptable to the Plumbing Code.
.3 Prove freedom of movement of cleanouts.
.4 Backflow preventors and vacuum breakers: confirm operation of backflow preventors and vacuum breakers and provide test certificate
from qualified testing agency. Testing agency to verify installation of correct type of backflow preventor or vacuum breaker to suit application.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Testing, Adjusting and Balancing for HVAC | Spec. #: | 23 05 93 | Nova Project #: | N1120 |

**Insert Testing, Adjusting and Balancing for HVAC report here.**

**1.2 General**
.4 Submit 6 copies of TAB reports, each in "D" ring binders, complete with index tabs for verification and approval of Engineer.
**.15 Verification:**
.1 Reported measurements shall be subject to verification by Engineer. Provide instrumentation and manpower to verify results of up to 30 % of all reported measurements.
Number and location of verified measurements to be at discretion of Engineer.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Pressure Testing of Ducted Air Systems | Spec. #: | 23 05 94 | Nova Project #: | N1120 |

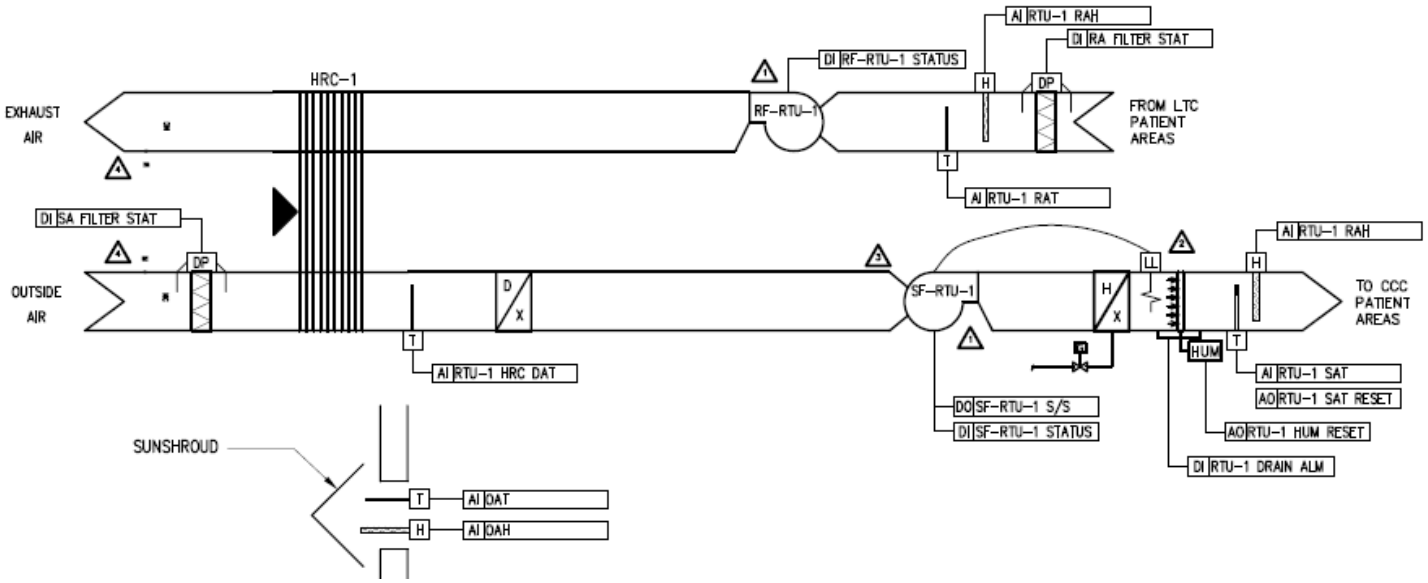
**Insert Pressure Testing of Ducted Air Systems report here.**

**1.2 Timing**
.1 Ducts to be tested before installation of insulation or any other form of concealments.
**1.4 Test Procedures**
.1 Maximum lengths of ducts to be tested to be consistent with capacity of test equipment.
.2 Section of duct to be tested is noted in Section 23 31 14.
.3 Repeat tests until specified pressures are attained. Bear costs for repairs and repetition to tests.
.4 Base partial system leakage calculations on
Reference Standard.
.5 Seal leaks that can be heard or felt, regardless of their contribution to total leakage.
**1.6 Verification**
.1 Consultant to witness tests and to verify reported results.
1.9 Report Forms
.1 Submit proposed report form and test report format to Consultant for approval at least three weeks before proposed date of first series of tests. Do not start tests until approval received in writing from Consultant.

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Energy Monitoring and Control Systems (EMCS) | Spec. #: | 23 09 36 | Nova Project #: | N1120 |

# Air Handling Unit #1 Controls Checklist

| I/O Type | Point Name | Point Description | Operation Verified | Point on OWS | Notes |
|---|---|---|---|---|---|
| AI | AHU1_SAT | AHU-1 Supply Air Temperature | | | |
| AI | AHU1_MAT | AHU-1 Mixed Air Temperature | | | |
| AI | AHU1_RAT | AHU-1 Return Air Temperature | | | |
| AI | AHU1_SF_STAT | AHU-1 Supply Fan Status | | | |
| AI | AHU1_RF_STAT | AHU-1 Return Fan Status | | | |
| DI | AHU1_FIL_STAT | AHU-1 Filter Status | | | |
| DO | AHU1_ SS | AHU-1 Start Stop | | | |
| AO | AHU1_DMP | AHU-1 Dampers | | | |
| AO | AHU1_CC_V | AHU-1 Cooling Coil Valve | | | |
| AO | AHU1_HC_V | AHU-1 Heating Coil Valve | | | |
| AO | AHU1_M_DMP | AHU-1 Mixing Damper | | | |



## Sequence of Operations Verification

| Sequence of Operation | (Y/N) | Comments |
|---|---|---|
| **AHU1 SEQUENCE OF OPERATION**<br>THE AHU CONTROLS SEQUENCE SHALL BE STARTED BY AN OCCUPANCY TIME SCHEDULE AT THE EMCS OR A LOCAL OVERRIDE PUSH BUTTON IN THE GYM OFFICE. | | |
| **UNOCCUPIED MODE – SUMMER**<br>THE AHU SYSTEM IS IN THE UNOCCUPIED MODE WHEN THE OCCUPANCY SCHEDULE IF “OFF” AND THE OVERRIDE PUSH BUTTONS ARE “OFF”. | | |
| DURING THE UNOCCUPIED SUMMER MODE SF-AHU1 AND RF-AHU1 SHALL BE NIGHT CYCLED WHEN GYM 1, 2 SPACE TEMPERATURE HAS RISEN ABOVE 27 DEGC(80'F) DURING THE SUMMER. FANS EF-5, TF-1 AND TF-2 SHALL BE…… | | |
| | | |
| | | |
| | | |
| | | |

**Summary of issues:**

| System | Description |
|---|---|
| | |

**Recommendations:**

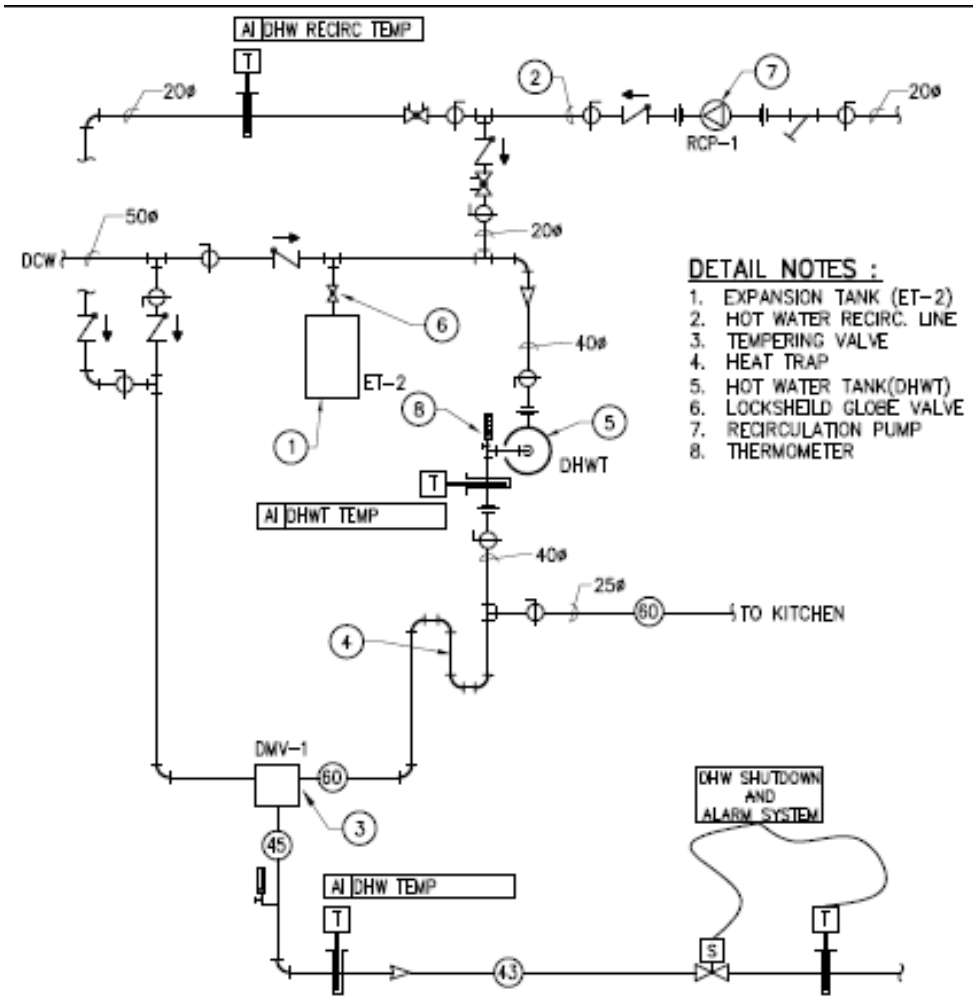
| System | Description |
|---|---|
| | |

| | Name | Company | Date |
|---|---|---|---|
| **Witnessed by:** | | | |
| | | | |
| | | | |

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Energy Monitoring and Control Systems (EMCS) | Spec. #: | 23 09 36 | Nova Project #: | N1120 |

# Domestic Hot Water Controls Checklist

| I/O Type | Point Name | Point Description | Operation Verified | Point on OWS | Notes |
|---|---|---|---|---|---|
| AI | DHW RECIRC TEMP | | | | |
| AI | DWH TEMP | | | | |
| AI | DWH TEMP | | | | |




NOTES:
1. INSTALL BUILDING DOMESTIC HOT WATER TEMPERING VALVE IN MECHANICAL ROOM. SET TEMPERATURE: 43°C.
2. CONTRACTOR IS TO PROVIDE 100mm HIGH HOUSEKEEPING PAD FOR ALL HOT WATER TANK AND BOILERS. PADS ARE TO EXTEND 100mm PAST THE EDGES OF THE EQUIPMENT AND BE SEISMICALLY RATED.
3. PROVIDE TANK DRAINAGE AS PER OBC AND MANUFACTURER'S RECOMMENDATIONS.

## Sequence of Operations Verification

| Sequence of Operation | (Y/N) | Comments |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Comments:

**Summary of issues:**

| System | Description |
|---|---|
| | |

**Recommendations:**

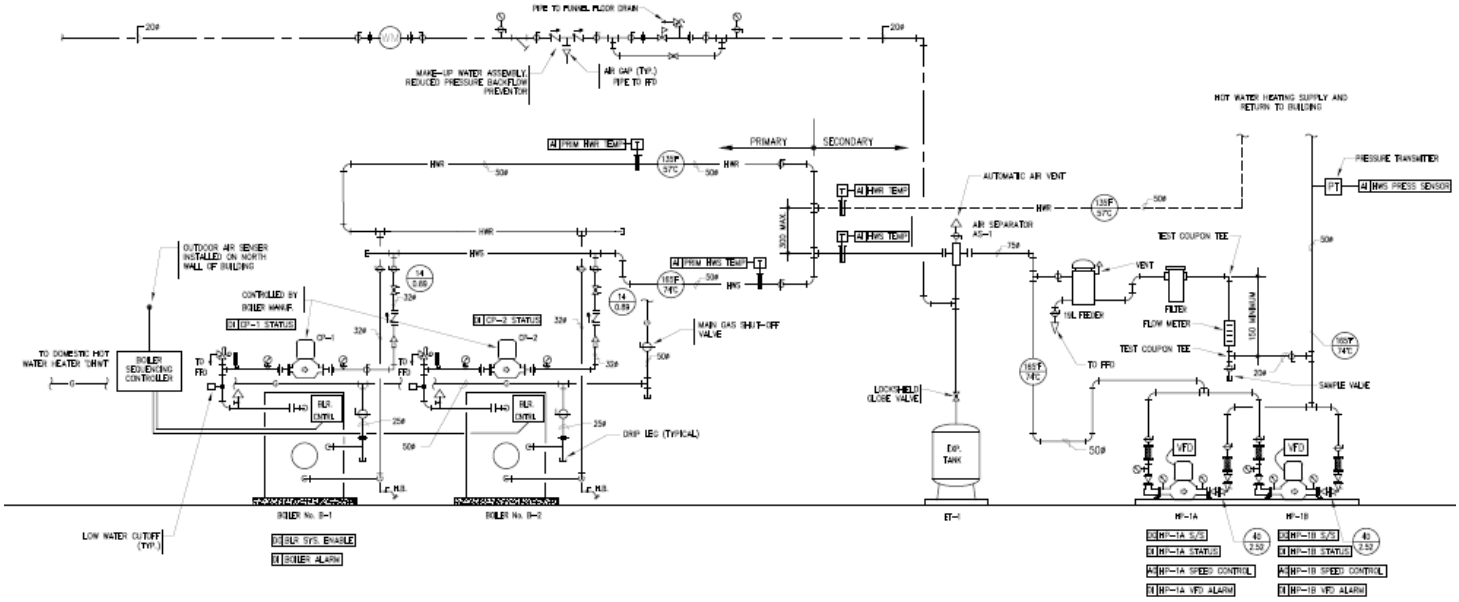
| System | Description |
|---|---|
| | |

| | Name | Company | Date |
|---|---|---|---|
| **Witnessed by:** | | | |
| | | | |
| | | | |

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Energy Monitoring and Control Systems (EMCS) Gener | Spec. #: | 23 09 36 | Nova Project #: | N1120 |

# Hot Water Controls Checklist

| I/O Type | Point Name | Point Description | Operation Verified | Point on OWS | Notes |
|---|---|---|---|---|---|
| AI | PRIM_HWS_TEMP | Primary Hot Water Supply Temperature | | | |
| AI | PRIM_HWR_TEMP | Primary Hot Water Return Temperature | | | |
| AI | SEC_HWS_TEMP | SECary Hot Water Supply Temperature | | | |
| AI | SEC_HWR_TEMP | SECary Hot Water Return Temperature | | | |
| DI | B1-REC_P_STAT | Boiler B-1 Recerc-Pump Status | | | |
| DI | B2_REC_P_STAT | Boiler B-2 Recerc-Pump Status | | | |
| AI | B1_SWT | Boiler B-1 Supply Water Temperature | | | |
| AI | B1_RWT | Boiler B-1 Return Water Temperature | | | |
| DO | B1_SS | Boiler B-1 Start Stop | | | |
| DO | B2_SS | Boiler B-2 Start Stop | | | |
| DO | HP5_SS | Heating Pump HP-5 Start Stop | | | |
| DO | HP5A_SS | Heating Pump HP-5A Start Stop | | | |
| AO | B1_TEMP_RESET | Boiler B-1 Temperature Reset | | | |
| AO | B2_TEMP_RESET | Boiler B-2 Temperature Reset | | | |
| AI | AHU_GLS_TEMP | Glycol AHU Supply Temperature | | | |



**Sequence of Operations Verification**

| Sequence of Operation | (Y/N) | Comments |
|---|---|---|
| THE BOILER, BOILER PUMP AND 100% RETURN VALVE PROTECTION PACKAGE CONTROLS SHALL BE PROVIDED BY THE BOILER MANUFACTURER AND SHALL BE EQUIPPED WITH INPUT AND OUTPUT TERMINALS FOR CONNECTION BY THE CONTROLS CONTRACTOR. | | |
| .1 THE INPUT AND OUTPUT TERMINALS AVAILABLE FOR EACH BOILER SHALL BE AS FOLLOWS: BOILER ENABLE/DISABLE, 0-10V BOILER OUTPUT CONTROL, AND… | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| Comments: | | |

**Summary of issues:**

| System | Description |
|---|---|
| | |

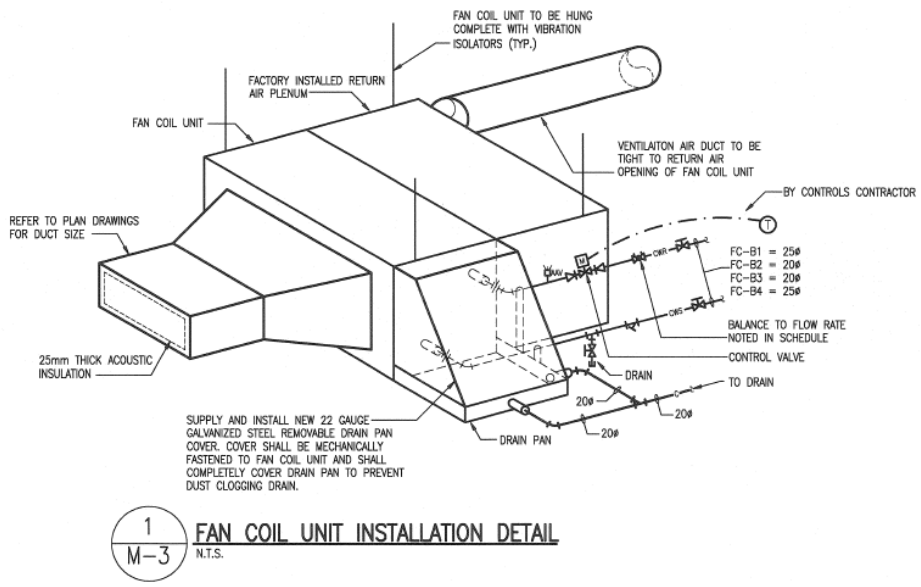
**Recommendations:**

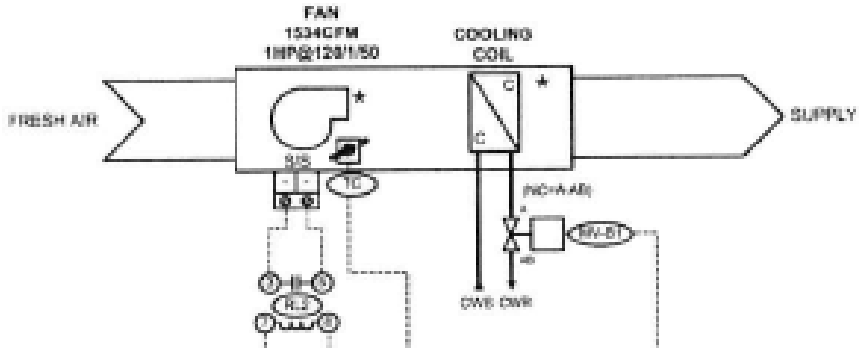
| System | Description |
|---|---|
| | |

| | Name | Company | Date |
|---|---|---|---|
| **Witnessed by:** | | | |
| | | | |
| | | | |

| Job Name: | Sample Building | Date: | 23-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Mechanical Specifications | Spec. #: | DWG-M-4 | Nova Project #: | N1120 |

| # | Type | Tag | Room # | Design (LPS) | Actual (LPS) | Room Temp | | Cooling | Heating | CO2 | Motion | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Reading | Actual | | | | | |
| 1 | Fan Coil | FC-B1 | 0024C North | 120 | | | | | | n/a | n/a | |
| 2 | Fan Coil | FC-B2 | 0024 North | 120 | | | | | | n/a | n/a | |
| 3 | Fan Coil | FC-B3 | 0024 South | 240 | | | | | | n/a | n/a | |
| 4 | Fan Coil | FC-B4 | 0024C South | 240 | | | | | | n/a | n/a | |
| 5 | VAV | VAV B1 | | 150 | | | | | | n/a | n/a | |
| 6 | VAV | VAV B2 | | 265 | | | | | | n/a | n/a | |




**Witnessed by:**

| Name | Company | Date |
|---|---|---|
| | | |
| | | |
| | | |

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Energy Monitoring and Control Systems (EMCS) | Spec. #: | 23 09 36 | Nova Project #: | N1120 |

# Customer Training Attendance

**Date: _____**

**Training on: EMCS**

**Demonstrated By: _____ Firm:_____**

**In accordance with specifications (section(s) and brief description).**

**Per 1.20 – Phase 1**

**ATTENDEES**

| Name | Signature | Representing |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**Comments:**

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Energy Monitoring and Control Systems (EMCS) | Spec. #: | 23 09 36 | Nova Project #: | N1120 |

# Customer Training Attendance

**Date: _____**

**Training on: EMCS**

**Demonstrated By: _____ Firm:_____**

**In accordance with specifications (section(s) and brief description).**

**Per 1.20 – Phase 2**

**ATTENDEES**

| Name | Signature | Representing |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**Comments:**

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Variable Frequency Drive | Spec. #: | 23 21 24 | Nova Project #: | N1120 |

**Insert Variable Frequency Drive report here.**

**3.1 Installation**
.3 Coordinate the installation, test and commissioning of drives with Division 23.
Obtain written acceptance from these individuals for each drive.
**3.2 Field Quality Control**
.1 Perform tests in accordance with Division 26, Electrical General Requirements section.
.2 Submit test record to Consultant for review and acceptance.
.3 Submit configuration reports for all of the drives as generated card by the software application. Submit a complete OPC database printout from the Drive OPC Server.

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Variable Frequency Drive | Spec. #: | 23 21 24 | Nova Project #: | N1120 |

# Customer Training Attendance

**Date:** _____

**Training on: Variable Frequency Drives**

**Demonstrated By:** _____ **Firm:**_____

**In accordance with specifications (section(s) and brief description).**

A ½ **day training** shall be provided to operators. It will include alarm configurations and manual control of motor/VFD.

**ATTENDEES**

| Name | Signature | Representing |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**Comments:**

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Copper Tubing & Fittings Refrigerant | Spec. #: | 23 23 00 | Nova Project #: | N1120 |

**Insert Copper Tubing & Fittings Refrigerant reports here.**

**3.4 Pressure and Leak Testing**
.2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides respectively.
.3 Test Procedure: Build pressure up to 5 psig (35 kPa) with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.
**3.5 Dehydration Charging and Charging:**
***Per Entire Section.***
.2 Record and report all measurements to Consultant.
**3.7 Registration**
.1 Register refrigeration system with Technical and Inspection Standards and Safety Authority when required by CSA B52 and Technical Standard and Safety Act 2000. Apply, pay for and have T.S.S.A. inspect refrigeration system when required by CSA B52 or Technical Standards and Safety Act 2000.

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | HVAC Water Treatment Systems | Spec. #: | 23 25 00 | Nova Project #: | N1120 |

**Insert HVAC Water Treatment Systems reports here.**

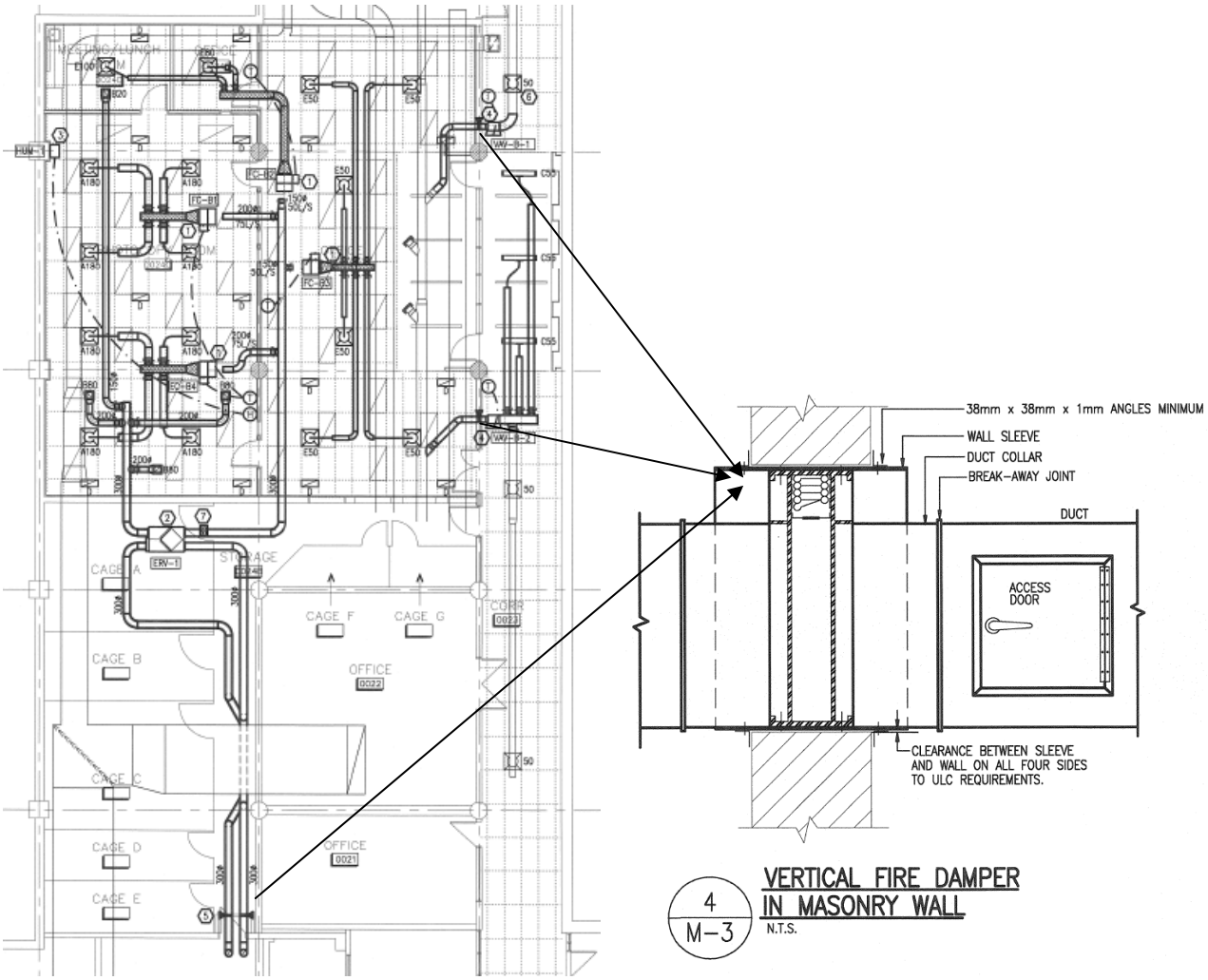
**3.3 Cleaning of Mechanical System:**
.1 Provide copy of recommended cleaning Mechanical System procedures and chemicals for approval by Consultant.

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Duct - Low Pressure - to 500 Pa (2 in) | Spec. #: | 23 31 14 | Nova Project #: | N1120 |

| | |
|---|---|
| Date of test: | |
| Project: | |
| Location of test: | |
| System Tested: | |
| Duration: | |
| Pressure: | |
| Witnessed by: | |
| Date: | |
| Title: | |
| Signature: | |
| Comments: | |

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Dampers - Fire | Spec. #: | 23 33 16 | Nova Project #: | N1120 |

| Floor | Room # | To Room # | Location Name | Side | System | Access | Comments |
|---|---|---|---|---|---|---|---|
| 1st | 168 | --- | Office | North | Supply | Acceptable | Screwed type access door |
| 1st | 122 | --- | Office | North | Return | Acceptable | |
| 1st | 148 | --- | Office | South | Return | Acceptable | |




**Claude Goulet**
**Nova Commissioning Manager**

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | HVAC Fans | Spec. #: | 23 34 00 | Nova Project #: | N1120 |

# Exhaust Fan #1 Checklist

| Associated Checklists | | | | | |
|---|---|---|---|---|---|
| **AHU** | ☐ | **Ductwork** | ☐ | **BAS** | ☐ |
| **Other** | ☐ | **Other** | ☐ | **Other** | ☐ |
| **Comments:** | | | | | |

| Requested documentation submitted | Rec'd | Comments |
|---|---|---|
| Manufacturer's cut sheets | ☐ | |
| Performance data (pump curves, coil data, etc.) | ☐ | |
| Installation and startup manual and plan | ☐ | |
| O&M manuals | ☐ | |
| Factory test results | ☐ | |
| Sequences and control strategies | ☐ | |
| Warranty Certificate | ☐ | |
| | | |
| **Comments:** | | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| **General** | | | |
| Cabinet and general installation | ☐ | ☐ | |
| Permanent labels affixed | ☐ | ☐ | |
| Casing condition good: no dents, leaks, door gaskets installed | ☐ | ☐ | |
| Access doors close tightly – no leaks | ☐ | ☐ | |
| Mountings checked and shipping bolts removed | ☐ | ☐ | |
| Connection between duct and unit tight and in good condition | ☐ | ☐ | |
| Vibration isolation equipment installed & released from shipping locks | ☐ | ☐ | |
| Maintenance access acceptable | ☐ | ☐ | |
| Sound attenuation installed | ☐ | ☐ | |
| Thermal insulation properly installed and according to specification | ☐ | ☐ | |
| Instrumentation installed according to specification (thermometers, pressure gages, flow meters, etc.) | ☐ | ☐ | |
| Clean up of equipment completed per contract documents | ☐ | ☐ | |
| Filters installed and replacement type and efficiency permanently affixed to housing--construction filters removed | ☐ | ☐ | |
| | | | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| **Fans and Dampers** | | | |
| Exhaust fan and motor aligned | ☐ | ☐ | |
| Exhaust fan belt tension & condition good | ☐ | ☐ | |
| Exhaust fan protective shrouds for belts in place and secure | ☐ | ☐ | |
| Exhaust fan area clean | ☐ | ☐ | |
| Exhaust fan and motor lube lines installed and lubed | ☐ | ☐ | |
| Filters clean and tight fitting | ☐ | ☐ | |
| Filter pressure differential measuring device installed and functional (magnahelic, inclined manometer, etc.) | ☐ | ☐ | |
| Smoke and fire dampers installed properly per contract docs (proper location, access doors, appropriate ratings verified) | ☐ | ☐ | |
| All dampers close tightly | ☐ | ☐ | |
| All damper actuators installed | ☐ | ☐ | |
| | | | |
| **Ducts** | | | |
| Sound attenuators installed | ☐ | ☐ | |
| Duct joint sealant properly installed | ☐ | ☐ | |
| No apparent severe duct restrictions | ☐ | ☐ | |
| Turning vanes in square elbows as per drawings | ☐ | ☐ | |
| Pressure leakage tests completed | ☐ | ☐ | |
| Branch duct control dampers operable | ☐ | ☐ | |
| Ducts cleaned as per specifications | ☐ | ☐ | |
| Balancing dampers installed as per drawings and TAB's site visit | ☐ | ☐ | |
| | | | |
| **Electrical and Controls** | | | |
| Power disconnects located within site of the unit it controls and labeled | ☐ | ☐ | |
| All electric connections tight | ☐ | ☐ | |
| Grounding installed for components and unit | ☐ | ☐ | |
| Safeties installed and operational | ☐ | ☐ | |
| Starter overload breakers installed and correct size | ☐ | ☐ | |
| All control devices and wiring complete | ☐ | ☐ | |
| Control system interlocks connected and functional | ☐ | ☐ | |
| Smoke detectors in place | ☐ | ☐ | |
| | | | |
| **VFD** | | | |
| Installation per manufacturer's requirements and start up instructions completed | ☐ | ☐ | |
| Drive location not subject to excessive moisture or dirt | ☐ | ☐ | |
| Drive location not subject to excessive temperatures | ☐ | ☐ | |
| Appropriate Volts vs. Hz curve is being used | ☐ | ☐ | |
| Drive size matches motor size | ☐ | ☐ | |
| Drive mounted on house keeping pad (if applicable) | ☐ | ☐ | |
| Cooling air flow path clean and unobstructed | ☐ | ☐ | |
| Permanent label affixed and UL stamp approved | ☐ | ☐ | |
| VFD interlocked to control system | ☐ | ☐ | |
| Unit is programmed with full written programming record on site | ☐ | ☐ | |
| Accel time set to _____ and Decel time set to _____ | ☐ | ☐ | |
| Operation checked in HAND, OFF, and AUTO. As applicable operation also checked in BYPASS | ☐ | ☐ | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| Where applicable, ensure safeties are active in all modes | ☐ | ☐ | |
| Coordinated with BAS for all interface ranges and signal isolation | ☐ | ☐ | |
| Restart on Power Failure parameter set to auto | ☐ | ☐ | |
| VFD powered (wired to controlled equipment) | ☐ | ☐ | |
| Grounding installed for components and unit | ☐ | ☐ | |
| Drive min and max speed set to _____ Hz min and 60 Hz max | ☐ | ☐ | |
| Security settings set per Owner direction and Password documented for Owner | ☐ | ☐ | |
| Drive response to loss of signal set to _____ | ☐ | ☐ | |
| Output pulse resolution set to _____ MHz. (This is coordinated with the application to minimize audible noise and coordinated with driven bearing allowances.) | ☐ | ☐ | |
| Checked the input voltage with drive disconnected | ☐ | ☐ | |
| Input of motor FLA represents 100% to 105% of motor FLA rating | ☐ | ☐ | |
| Upper frequency limit set at 100%, unless explained otherwise | ☐ | ☐ | |
| | | | |
| **Sensors and Gages** | | | |
| Temperature, pressure and flow gages and sensors installed | ☐ | ☐ | |
| Piping gages, BAS and associated panel temperature and pressure readouts match. | ☐ | ☐ | |
| | | | |
| **TAB** | | | |
| Installation of system and balancing devices allowed balancing to be completed following specified NEBB or AABC procedures and contract documents | ☐ | ☐ | |

| Operational Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comments** |
| Fan rotation correct (If VFD, check rotation in bypass and VFD Inverter mode) | ☐ | ☐ | |
| Fan has no unusual noise or vibration | ☐ | ☐ | |
| All dampers (OSA, RA, EA, etc.) stroke fully without binding and spans calibrated and BAS reading site verified | ☐ | ☐ | |
| Specified point-to-point checks have been completed and documentation record submitted for this system | ☐ | ☐ | |

**Summary of issues:**

| System | Description |
|---|---|
| | |

**Recommendations:**

| System | Description |
|---|---|
| | |

| | Name | Company | Date |
|---|---|---|---|
| **Witnessed by:** | | | |
| | | | |

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Louvres, Intakes and Vents | Spec. #: | 23 37 20 | Nova Project #: | N1120 |

**Insert Louvres, Intakes and Vents reports here.**

**1.4 Test Reports**

.1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Low Pressure packaged Boiler System | Spec. #: | 23 52 00 | Nova Project #: | N1120 |

# Boiler1 Checklist

| Associated Checklists | | | | | |
|---|---|---|---|---|---|
| Heating Hot Water Pump | ☐ | Heating Hot Water Piping | ☐ | BAS | ☐ |
| Other | ☐ | Other | ☐ | Other | ☐ |
| Comments: | | | | | |

| Requested documentation submitted | Rec'd | Comments |
|---|---|---|
| Manufacturer's cut sheets | ☐ | |
| Performance data (pump curves, coil data, etc.) | ☐ | |
| Installation and startup manual and plan | ☐ | |
| O&M manuals | ☐ | |
| Factory test results | ☐ | |
| Sequences and control strategies | ☐ | |
| Warranty Certificate | ☐ | |
| | | |
| **Comments:** | | |

| Installation Checks | | | |
|---|---|---|---|
| Check if acceptable, provide comment if unacceptable | | NA | Comment |
| **General** | | | |
| General appearance good, no apparent damage | ☐ | ☐ | |
| Installation is per manufacturer's instructions | ☐ | ☐ | |
| Seismic restraints in place | ☐ | ☐ | |
| Pipe fittings and accessories complete | ☐ | ☐ | |
| Hydronic system flushing complete and strainers cleaned | ☐ | ☐ | |
| Test plugs (P/T) installed near all control sensors and as per spec | ☐ | ☐ | |
| Flow switch installed as required | ☐ | ☐ | |
| Equipment labels affixed | ☐ | ☐ | |
| Tube pull and access door space adequate and to code | ☐ | ☐ | |
| Combustion air supply installed | ☐ | ☐ | |
| No leaking apparent | ☐ | ☐ | |
| | | | |
| | | | |
| | | | |
| | | | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| **Draft Fan (if applicable)** | | | |
| Fan is installed per manufacturer's instructions | ☐ | ☐ | |
| Casing in good condition; no dents | ☐ | ☐ | |
| Mountings checked and shipping bolts removed | ☐ | ☐ | |
| Vibration isolators installed | ☐ | ☐ | |
| Plenums free of debris | ☐ | ☐ | |
| Fan rotates freely and in correct direction | ☐ | ☐ | |
| Bearings lubricated | ☐ | ☐ | |
| Equipment guards and safety devices installed | ☐ | ☐ | |
| Starter installed and size coordinated with motor | ☐ | ☐ | |
| Motor correctly aligned | ☐ | ☐ | |
| | | | |
| **Gas Train** | | | |
| Gas train Installed in accordance with NFPA, FM and IRI | ☐ | ☐ | |
| Gas train checked for leaks | ☐ | ☐ | |
| Gas piping installed and tested | ☐ | ☐ | |
| Gas train vents are terminated per code | ☐ | ☐ | |
| Gas train safety devices are operational | ☐ | ☐ | |
| Drip leg provided in gas main | ☐ | ☐ | |
| Gas cock valve orientation per manufacturers recommendations | ☐ | ☐ | |
| Gas cock valve accessible and travels freely | ☐ | ☐ | |
| Gas cock checked for leaks in closed position with the other gas train valves open | ☐ | ☐ | |
| Gas meter installed per manufacturer's instructions | ☐ | ☐ | |
| Gas meter properly located in non-turbulent section of pipe | ☐ | ☐ | |
| Gas meter is properly oriented | ☐ | ☐ | |
| Gas meter is wired correctly | ☐ | ☐ | |
| Gas meter is accessible for test and service | ☐ | ☐ | |
| Gas pressure adjusted and verified within acceptable range | ☐ | ☐ | |
| Confirmed gas PRV operation | ☐ | ☐ | |
| Gas pressure sensor limits are appropriate for application | ☐ | ☐ | |
| Hi gas pressure switch installed per manufacturer's instructions | ☐ | ☐ | |
| Hi gas pressure switch is properly wired | ☐ | ☐ | |
| Low gas pressure switch installed per manufacturer's instructions | ☐ | ☐ | |
| Low gas pressure switch is properly wired | ☐ | ☐ | |
| Gas control valve installed per manufacturer's instructions | ☐ | ☐ | |
| Gas control valve installed vertical with direction of flow confirmed | ☐ | ☐ | |
| Gas control valve accessible and travels freely | ☐ | ☐ | |
| Gas control valve checked for leaks in closed position with the other gas train valves open | ☐ | ☐ | |
| Gas control valve had no visible damage | ☐ | ☐ | |
| Gas control valve nameplate readings checked against application and is applied correctly | ☐ | ☐ | |
| Drum relief valve setting adequate for application | ☐ | ☐ | |
| Drum relief valve discharge properly piped | ☐ | ☐ | |
| Stop-Check valve pressure rating applicable for duty | ☐ | ☐ | |
| Stop-Check valve installed per manufacturers instructions | ☐ | ☐ | |
| | | | |
| | | | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| **Piping** | | | |
| Hydronic piping complete, including blowdown system, makeup water piping and safety reliefs | ☐ | ☐ | |
| Piping supported independently of the Boiler | ☐ | ☐ | |
| Hydronic system flushing complete and strainers cleaned | ☐ | ☐ | |
| Isolation valves and balancing valves installed | ☐ | ☐ | |
| Piping type and flow direction labeled on piping | ☐ | ☐ | |
| Chemical treatment system or plan installed | ☐ | ☐ | |
| Unions installed to allow for easy removal of control valves | ☐ | ☐ | |
| | | | |
| **Electrical and Controls** | | | |
| Power disconnect is located within site of the unit it controls and labeled | ☐ | ☐ | |
| All electric connections tight | ☐ | ☐ | |
| Grounding installed for components and unit | ☐ | ☐ | |
| Safeties installed and operational | ☐ | ☐ | |
| Starter overload breakers installed and correct size | ☐ | ☐ | |
| All control devices and wiring complete | ☐ | ☐ | |
| Control system interlocks connected and functional | ☐ | ☐ | |
| Smoke detectors in place | ☐ | ☐ | |
| Multiple boiler interlocks completed | ☐ | ☐ | |
| | | | |
| **Flue** | | | |
| Installed per manufacturers instructions | ☐ | ☐ | |
| Sloped toward boiler | ☐ | ☐ | |
| Clearance to combustibles per code | ☐ | ☐ | |
| Protection in place to prevent burning hazard | ☐ | ☐ | |
| Discharge is protected from rain and blockage | ☐ | ☐ | |
| Provisions in place for expansion compensation | ☐ | ☐ | |
| Discharge is located to preclude re-entrainment back into the building | ☐ | ☐ | |
| Draft checked and meets minimum requirements of boiler manufacturer | ☐ | ☐ | |
| | | | |
| **Low Water Cutoff** | | | |
| Installed per manufacturer’s instructions | ☐ | ☐ | |
| Wire terminations checked and correct | ☐ | ☐ | |
| | | | |
| **Sensors and Gages** | | | |
| Temperature, pressure and flow gages and sensors installed | ☐ | ☐ | |
| Piping gages, BAS and associated panel temperature and pressure readouts match. | ☐ | ☐ | |
| | | | |
| **TAB** | | | |
| Installation of system and balancing devices allowed balancing to be completed following specified NEBB or AABC procedures and contract documents | ☐ | ☐ | |

**Summary of issues:**

| System | Description |
|---|---|
| | |

**Recommendations:**

| System | Description |
|---|---|
| | |

**Witnessed by:**

| Name | Company | Date |
|---|---|---|
| | | |
| | | |
| | | |

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Low Pressure packaged Boiler System | Spec. #: | 23 52 00 | Nova Project #: | N1120 |

# Customer Training Attendance

**Date: _____**

**Training on: Low Pressure packaged Boiler System**

**Demonstrated By: _____ Firm:_____**

**In accordance with specifications (section(s) and brief description).**

**Provide 8 hrs. on site to demonstrate operation and maintenance.**

**ATTENDEES**

| Name | Signature | Representing |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**Comments:**

| Job Name: | Sample Building | Date: | 1-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | HVAC Fans | Spec. #: | 23 34 00 | Nova Project #: | N1120 |

# Air Handling Unit #1 Checklist

| Components Included | | | | | |
|---|---|---|---|---|---|
| Supply Fan | ☐ | Economizer | ☐ | Cooling Coil | ☐ |
| Return Fan | ☐ | Air Blender | ☐ | Pre-Heat Coil | ☐ |
| Exhaust / Relief Fan | ☐ | Filter(s) | ☐ | Heating Coil | ☐ |
| VFD(s) | ☐ | Humidifier | ☐ | Other | ☐ |
| | | | | | |
| **Associated Checklists** | | | | | |
| Chilled Water Pump | ☐ | Heating Hot Water Pump | ☐ | BAS | ☐ |
| Chilled Water Piping | ☐ | Heating Hot Water Piping | ☐ | Other | ☐ |
| Steam Piping | ☐ | Condensate Piping | ☐ | Other | ☐ |

**Comments:**

| Requested documentation submitted | Rec'd | Comments |
|---|---|---|
| Manufacturer's cut sheets | ☐ | |
| Performance data (fan curves, coil data, etc.) | ☐ | |
| Installation and startup manual and plan | ☐ | |
| O&M manuals | ☐ | |
| Factory test results | ☐ | |
| Sequences and control strategies | ☐ | |
| Warranty Certificate | ☐ | |

**Comments:**

1439 Youville Drive, Unit 18A, Orleans, Ontario, K1C 4M8
Ph: (613)830-6656 Fax: (613)824-1070 E-mail: info@novacommissioning.ca

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| **General** | | | |
| Cabinet and general installation | ☐ | ☐ | |
| Permanent labels affixed, including for fans | ☐ | ☐ | |
| Casing condition good: no dents, leaks, door gaskets installed | ☐ | ☐ | |
| Access doors close tightly - no leaks | ☐ | ☐ | |
| Connection between duct and unit tight and in good condition | ☐ | ☐ | |
| Vibration isolation equipment installed & released from shipping locks | ☐ | ☐ | |
| Maintenance access acceptable for unit and components | ☐ | ☐ | |
| Sound attenuation installed | ☐ | ☐ | |
| Thermal insulation properly installed and according to specification | ☐ | ☐ | |
| Instrumentation installed according to specification (thermometers, pressure gages, flow meters, etc.) | ☐ | ☐ | |
| Clean up of equipment completed per contract documents | ☐ | ☐ | |
| Filters installed and replacement type and efficiency permanently affixed to housing--construction filters removed | ☐ | ☐ | |
| | | | |
| **Valves, Piping and Coils** | | | |
| Pipe fittings complete and pipes properly supported | ☐ | ☐ | |
| Pipes properly labeled | ☐ | ☐ | |
| Pipes properly insulated | ☐ | ☐ | |
| Strainers in place and clean, blowdown installed | ☐ | ☐ | |
| Piping system properly flushed | ☐ | ☐ | |
| No leaking apparent around fittings | ☐ | ☐ | |
| All coils are clean and fins are in good condition | ☐ | ☐ | |
| All condensate drain pans clean and slope to drain, per spec | ☐ | ☐ | |
| Valves properly labeled | ☐ | ☐ | |
| Valves installed in proper direction | ☐ | ☐ | |
| OSAT, MAT, SAT, RAT, chilled water supply sensors properly located and secure (related OSAT sensor shielded) | ☐ | ☐ | |
| Test plugs (P/T) and isolation valves installed per drawings | ☐ | ☐ | |
| | | | |
| **Fans and Dampers** | | | |
| Supply fan and motor alignment correct | ☐ | ☐ | |
| Supply fan belt tension and condition good | ☐ | ☐ | |
| Supply fan protective shrouds for belts in place and secure | ☐ | ☐ | |
| Supply fan area clean | ☐ | ☐ | |
| Supply fan and motor properly lubricated | ☐ | ☐ | |
| Return/exhaust fan and motor aligned | ☐ | ☐ | |
| Return/exhaust fan belt tension & condition good | ☐ | ☐ | |
| Return/exhaust fan protective shrouds for belts in place and secure | ☐ | ☐ | |
| Return/exhaust fan area clean | ☐ | ☐ | |
| Return/exhaust fan and motor lube lines installed and lubed | ☐ | ☐ | |
| Filters clean and tight fitting | ☐ | ☐ | |
| Filter pressure differential measuring device installed and functional (magnehelic, inclined manometer, etc.) | ☐ | ☐ | |
| Smoke and fire dampers installed properly per contract docs (proper location, access doors, appropriate ratings verified) | ☐ | ☐ | |
| All dampers close tightly | ☐ | ☐ | |
| All damper actuators installed | ☐ | ☐ | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| | | | |
| **Ducts** | | | |
| Sound attenuators installed | ☐ | ☐ | |
| Duct joint sealant properly installed | ☐ | ☐ | |
| No apparent severe duct restrictions | ☐ | ☐ | |
| Turning vanes in square elbows as per drawings | ☐ | ☐ | |
| OSA intakes located away from pollutant sources & exhaust outlets | ☐ | ☐ | |
| Pressure leakage tests completed | ☐ | ☐ | |
| Branch duct control dampers operable | ☐ | ☐ | |
| Ducts cleaned as per specifications | ☐ | ☐ | |
| Balancing dampers installed as per drawings and TAB's site visit | ☐ | ☐ | |
| **Electrical and Controls** | | | |
| Power disconnects located within site of the unit it controls and labeled | ☐ | ☐ | |
| All electric connections tight | ☐ | ☐ | |
| Grounding installed for components and unit | ☐ | ☐ | |
| Safeties installed and operational | ☐ | ☐ | |
| Starter overload breakers installed and correct size | ☐ | ☐ | |
| All control devices and wiring complete | ☐ | ☐ | |
| Control system interlocks connected and functional | ☐ | ☐ | |
| Smoke detectors in place | ☐ | ☐ | |
| | | | |
| **VFD** | | | |
| Installation per manufacturer's requirements and start up instructions completed | ☐ | ☐ | |
| Drive location not subject to excessive moisture or dirt | ☐ | ☐ | |
| Drive location not subject to excessive temperatures | ☐ | ☐ | |
| Appropriate Volts vs. Hz curve is being used | ☐ | ☐ | |
| Drive size matches motor size | ☐ | ☐ | |
| Drive mounted on house keeping pad (if applicable) | ☐ | ☐ | |
| Cooling air flow path clean and unobstructed | ☐ | ☐ | |
| Permanent label affixed and UL stamp approved | ☐ | ☐ | |
| VFD interlocked to control system | ☐ | ☐ | |
| Unit is programmed with full written programming record on site | ☐ | ☐ | |
| Accel time set to _____ and Decel time set to _____ | ☐ | ☐ | |
| Operation checked in HAND, OFF, and AUTO. As applicable operation also checked in BYPASS | ☐ | ☐ | |
| Where applicable, ensure safeties are active in all modes | ☐ | ☐ | |
| Coordinated with BAS for all interface ranges and signal isolation | ☐ | ☐ | |
| Restart on Power Failure parameter set to auto | ☐ | ☐ | |
| VFD powered (wired to controlled equipment) | ☐ | ☐ | |
| Grounding installed for components and unit | ☐ | ☐ | |
| Drive min and max speed set to _____ Hz min and 60 Hz max | ☐ | ☐ | |
| Security settings set per Owner direction and Password documented for Owner | ☐ | ☐ | |
| Drive response to loss of signal set to _____ | ☐ | ☐ | |
| Output pulse resolution set to _____ MHz. (This is coordinated with the application to minimize audible noise and coordinated with driven bearing allowances.) | ☐ | ☐ | |
| Checked the input voltage with drive disconnected | ☐ | ☐ | |
| Input of motor FLA represents 100% to 105% of motor FLA rating | ☐ | ☐ | |

| Installation Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comment** |
| Upper frequency limit set at 100%, unless explained otherwise | ☐ | ☐ | |
| **Sensors and Gages** | | | |
| Temperature, pressure and flow gages and sensors installed | ☐ | ☐ | |
| Piping gages, BAS and associated panel temperature and pressure readouts match. | ☐ | ☐ | |
| | | | |
| **TAB** | | | |
| Installation of system and balancing devices allowed balancing to be completed following specified NEBB or AABC procedures and contract documents | ☐ | ☐ | |

| Operational Checks | | | |
|---|---|---|---|
| **Check if acceptable, provide comment if unacceptable** | | **NA** | **Comments** |
| Supply fan rotation correct (If VFD, check rotation in bypass and VFD Inverter mode) | ☐ | ☐ | |
| Return/exhaust fan rotation correct | ☐ | ☐ | |
| Return /exhaust fan acceptable noise & vibration | ☐ | ☐ | |
| Supply fan has no unusual noise or vibration | ☐ | ☐ | |
| Inlet vanes aligned in housing, actuator spanned, modulate smoothly and proportional to input signal and EMS readout | ☐ | ☐ | |
| All dampers (OSA, RA, EA, etc.) stroke fully without binding and spans calibrated and BAS reading site verified | ☐ | ☐ | |
| Valves stroke fully and easily and spanning is calibrated | ☐ | ☐ | |
| Valves verified to not be leaking through coils when closed at normal operating pressure | ☐ | ☐ | |
| Specified point-to-point checks have been completed and documentation record submitted for this system | ☐ | ☐ | |
| **Comments:** | | | |

**Summary of issues:**

| System | Description |
|---|---|
| | |

**Recommendations:**

| System | Description |
|---|---|
| | |

**Witnessed by:**

| Name | Company | Date |
|---|---|---|
| | | |
| | | |
| | | |

| Job Name: | Sample Building | Date: | 30-Mar-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | 23 81 24 Ductless Split Air Conditioning Units | Spec. #: | 23 37 20 | Nova Project #: | N1120 |

**Insert Ductless Split Air Conditioning Unit manufacturer start-up reports here.**

| Job Name: | Sample Building | Date: | 2-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Common Work Results Electrical | Spec. #: | 26 05 00 | Nova Project #: | N1120 |

## Insert Reports Here

**3.6 FIELD QUALITY CONTROL**
**.1 Load Balance:**
. 3 Provide upon completion of work, load balance report as directed in PART 1 – SUBMITTALS…
**. 2 Conduct following tests:** ***All per spec including:***
. 6 Insulation resistance testing:
.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
. 2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
. 3 Check resistance to ground before energizing.
**.3 Carry out tests in presence of Engineer.**

| Job Name: | Sample Building | Date: | 2-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Grounding - Secondary | Spec. #: | 26 05 28 | Nova Project #: | N1121 |

## Insert Reports Here

**3.3 FIELD QUALITY CONTROL**

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

. 3 Perform tests before energizing electrical system.

| Job Name: | Sample Building | Date: | 2-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Liquid Filled, Medium Voltage Transformers | Spec. #: | 26 12 13 | Nova Project #: | N1120 |

## Insert Reports Here

**1.3 Source Quality**
.1 Control Submit type production test certificates to Engineer.
**3.2 Field Quality Control**
.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
.2 Carry out following **insulation tests** using megger with 20,000megohm scale and resulting insulation resistance corrected to base of 20°C.
. 1 High voltage to ground with secondary grounded for duration of test.
. 2 Low voltage to ground with primary grounded for duration of test.
. 3 High to low voltage.
.11 Carry out visual mechanical and electrical tests in accordance with Section 01 91 00 Commissioning.
.12 Operate 2500 / 3333 kVA transformers without load for period of 3 days prior to connecting the secondary load.

| Job Name: | Sample Building | Date: | 2-Apr-09 | Project #: | 1111 |
|---|---|---|---|---|---|
| Spec. Name: | Control Devices | Spec. #: | 26 29 03 | Nova Project #: | N1120 |

# EF # Controls Checklist

## Sequence of Operations Verification

| 3.3 Sequence of Operation | EF-34 | EF-35 | EF-36 | Comments |
|---|---|---|---|---|
| .1 High temperature reached<br>.1 Supply damper opens.<br>.2 Exhaust damper opens.<br>.3 Exhaust fan starts. | | | | |
| .2 Set point reached<br>.1 Exhaust fan stops.<br>.2 Exhaust damper closes.<br>.3 Supply damper closes. | | | | |
| 3 Sprinkler head actuated.<br>.1 Pneumatic pressure lost shutting off the fan and closing dampers. | | | | |

**Summary of issues:**

| System | Description |
|---|---|
| | |

**Recommendations:**

| System | Description |
|---|---|
| | |

**Witnessed by:**

| Name | Company | Date |
|---|---|---|
| | | |
| | | |
| | | |

| Job Name: | L'esplanade Laurier Transformer Replacement | Date: | 2-Apr-09 | Project #: | 476751 |
|---|---|---|---|---|---|
| Spec. Name: | Multiplex Fire Alarm and voice Communication Syste | Spec. #: | 28 31 03 | Nova Project #: | N1121 |

## Insert Reports Here

**1.3 Quality Assurance**
.1 Inspection tests to conform to: CAN/ULC-S536.
.2 Submit inspection report to Engineer.
**3.2 Field Quality Control**
. 1 Perform tests in accordance with Section 26 05 00 - Common Work Results – Electrical and to CAN/ULC-S537.
. 2 Fire alarm system:
.1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel.
. 2 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation.
of system.