

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Contract Administrator submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .4 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .5 Verify field measurements and affected adjacent Work are co-ordinated.
- .6 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review.
- .8 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 14 days for Contract Administrator's review of each submission.
- .5 Adjustments made on shop drawings by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

- .6 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Contract Administrator's review, distribute copies.
- .10 Submit electronic (PDF format) copy of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.
- .11 Submit electronic (PDF format) copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Contract

- Administrator where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Contract Administrator.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Contract Administrator.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic (PDF format) copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Contract Administrator.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Contract Administrator.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit 3 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Contract Administrator.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Contract Administrator's business address.
- .3 Notify Contract Administrator in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .6 Make changes in samples which Contract Administrator may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

- .1 Not Used

1.5 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution as directed by Contract Administrator.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: As required to provide adequate visual record.
- .4 Frequency of photographic documentation: As required to document works.
 - .1 Upon completion of: framing and services before concealment, of Work, as directed by Contract Administrator.

1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit required documentation in accordance with Bid Opportunity.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Contract Administrator. The Contractor will not be responsible for asbestos abatement which will be the responsibility of the City.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Contract Administrator.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Contract Administrator.

1.3 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Not Used

1.2 INSPECTION

- .1 Allow Contract Administrator access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Contract Administrator instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Contract Administrator will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, the City shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Contract Administrator for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the City.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Contract Administrator at no cost to the City. Pay costs for retesting and reinspection.

1.4 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

- .1 Notify appropriate agency and Contract Administrator in advance of requirement for tests, in order that attendance arrangements can be made.

- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

- .1 Not Used
- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Contract Administrator as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the City will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Contract Administrator.

1.7 REPORTS

- .1 Submit electronic copies of inspection and test reports to Contract Administrator.
- .2 Provide copies to subcontractor of work being inspected or tested.

1.8 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.

1.9 MOCK-UPS

- .1 Not Used

1.10 MILL TESTS

- .1 Submit mill test certificates as required of specification Sections.

1.11 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 REFERENCES

- .1 Not Used

1.3 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 WATER SUPPLY

- .1 Provide continuous supply of potable water for construction use. Shut-off of the main water supply is not anticipated to be required during this work.
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal if required.

1.5 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures within normal indoor temperature range (18°C to 21°C) in building areas where construction is in progress. Maintain a minimum of 10°C in entirety of building unless otherwise approved in writing by Contract Administrator.
- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building to be used when available. General Contractor will be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, clean as required to return to pre-use condition..
- .8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Contract Administrator.
- .9 The City will pay utility charges when temporary heat source is existing building equipment.
- .10 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .11 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6 TEMPORARY POWER AND LIGHT

- .1 The General Contractor shall provide and pay for temporary power during construction for temporary lighting and operating of power tools as required.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

1.7 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction, governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the City or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Contract Administrator.
- .3 Clear snow and ice from access to building.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by the City or other Contractors.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

- .6 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .10 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .15 Sweep and wash clean paved areas.
- .16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Clean roofs, downspouts, and drainage systems.
- .18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .19 Remove snow and ice from access to building.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned with Contract Administrator's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, three final copies of operating and maintenance manuals in English.
- .6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7 Furnish evidence, if requested, for type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

1.2 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project; Date of submission; names.
 - .1 Addresses, and telephone numbers of Contract Administrator and Contractor with name of responsible parties.
 - .2 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.4 AS-BUILTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Contract Administrator one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples. Field test records.
 - .6 Inspection certificates.
 - .7 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Contract Administrator.

1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings provided by Contract Administrator.

- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.6 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.

- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Additional requirements: as specified in individual specification sections.

1.7 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.8 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.9 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.

- .4 Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.10 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site; place and store. Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

1.11 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Contract Administrator.

1.12 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Contract Administrator approval.
- .3 Warranty management plan to include required actions and documents to assure that Contract Administrator receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Contract Administrator for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Contract Administrator's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .3 Procedure and status of tagging of equipment covered by extended warranties.
 - .4 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .9 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .10 Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

1.13 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Contract Administrator.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Contract Administrator's personnel two weeks prior to date of final inspection.
- .2 Contract Administrator will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.2 QUALITY CONTROL

- .1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Contract Administrator's personnel, and provide written report that demonstration and instructions have been completed.

1.3 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Contract Administrator's approval. Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation.
- .2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.

- .4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.7 TIME ALLOCATED FOR INSTRUCTIONS

- .1 Allow full 8 hour day for instruction and training.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Acronyms:
 - .1 Cx - Commissioning.
 - .2 O&M - Operation and Maintenance.
 - .3 PI - Product Information.
 - .4 PV - Performance Verification.
 - .5 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

- .1 CX is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
 - .2 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

1.3 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Contract Administrator, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.4 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review contract documents, confirm by writing to Contract Administrator.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent and special features.
 - .6 Submit complete start-up documentation to Contract Administrator.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete TAB procedures on systems, submit TAB reports to Contract Administrator for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Contract Administrator in writing of discrepancies and deficiencies on finished works.

1.5 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

1.6 COMMISSIONING DOCUMENTATION

- .1 Contract Administrator to review and approve Cx documentation.
- .2 Provide completed and approved Cx documentation to Contract Administrator.

1.7 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.8 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
- .2 Contract Administrator representative to witness of start-up and testing.

1.9 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Contract Administrator.
 - .3 Obtain written approval of test results and documentation from Contract Administrator before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Contract Administrator.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.10 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Contract Administrator after distinct phases have been completed and before commencing next phase.

- .4 Document required tests on approved PV forms.

1.11 START-UP DOCUMENTATION

- .1 Assemble start-up documentation and submit to Contract Administrator for approval before commencement of commissioning.
- .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit Contract Administrator to repeat start-up at any time.

1.12 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Contract Administrator for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.13 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.14 START OF COMMISSIONING

- .1 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.15 INSTRUMENTS / EQUIPMENT

- .1 Provide the following equipment as required:
 - .1 2-way radios.
 - .2 Ladders.
 - .3 Equipment as required to complete work.

1.16 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 Under accepted simulated operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

1.17 WITNESSING COMMISSIONING

- .1 Contract Administrator representative to witness activities and verify results.

1.18 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Contract Administrator within 5 days of test and with Cx report.

1.19 REPEAT VERIFICATIONS

- .1 Assume costs incurred by Contract Administrator for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Contract Administrator's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 Contract Administrator deems Contractor's request for second verification was premature.

1.20 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Contract Administrator.

- .2 Report problems, faults or defects affecting Cx to Contract Administrator in writing. Stop Cx until problems are rectified. Proceed with written approval from Contract Administrator.

1.21 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Contract Administrator.

1.22 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.23 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.24 OCCUPANCY

- .1 Cooperate fully with Contract Administrator during stages of acceptance and occupancy of facility.

1.25 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with Contract Administrator.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.26 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10 of specified values.

- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.27 CONTRACT ADMINISTRATOR'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Contract Administrator will not relieve Contractor from compliance with specified start-up and testing procedures.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Commissioning forms to be completed for equipment, system and integrated system.

1.2 INSTALLATION/START-UP CHECK LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Contract Administrator supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Contract Administrator.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 SAMPLES OF COMMISSIONING FORMS

- .1 Contract Administrator will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.
- .3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

1.4 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

- .1 When additional forms are required, but are not available from Contract Administrator develop appropriate verification forms and submit to Contract Administrator for approval prior to use.

1.5 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:

- .1 Contract Administrator provides Contractor project-specific Commissioning forms with Specification data included.
- .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
- .3 Confirm operation as per design criteria and intent.
- .4 Identify variances between design and operation and reasons for variances.
- .5 Verify operation in specified normal and emergency modes and under specified load conditions.
- .6 Record analytical and substantiating data.
- .7 Verify reported results.
- .8 Form to bear signatures of recording technician and reviewed and signed off by Contract Administrator.
- .9 Submit immediately after tests are performed.
- .10 Reported results in true measured SI unit values.
- .11 Provide Contract Administrator with originals of completed forms.
- .12 Maintain copy on site during start-up, testing and commissioning period.

1.6 LANGUAGE

- .1 To suit the language profile of the awarded contract.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

AIR HANDLING UNIT			
AHU NUMBER	AHU-1	SPEC REFERENCE	23 73 11
AREA SERVED			
LOCATION			
AIR UNIT DATA	Specified	Shop Drawings	Installed
MANUFACTURER			
MODEL NUMBER			
CAPACITY L/S (CFM)			
STATIC PRESSURE KPA (IN.)			
FAN TYPE (Supply)			
FAN TYPE (Return)			
COMMENTS:			

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-1		SPEC REFERENCE		23 73 11	
<u>Supply Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating			Type		
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-1		SPEC REFERENCE		23 73 11	
<u>Outdoor Air Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating			Type		
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT			
AHU NUMBER	AHU-2	SPEC REFERENCE	23 73 11
AREA SERVED			
LOCATION			
AIR UNIT DATA	Specified	Shop Drawings	Installed
MANUFACTURER			
MODEL NUMBER			
CAPACITY L/S (CFM)			
STATIC PRESSURE KPA (IN.)			
FAN TYPE (Supply)			
FAN TYPE (Return)			
COMMENTS:			

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-2		SPEC REFERENCE		23 73 11	
<u>Supply Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating			Type		
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-2		SPEC REFERENCE		23 73 11	
<u>Return Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating		Type			
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT			
AHU NUMBER	AHU-3	SPEC REFERENCE	23 73 11
AREA SERVED			
LOCATION			
AIR UNIT DATA	Specified	Shop Drawings	Installed
MANUFACTURER			
MODEL NUMBER			
CAPACITY L/S (CFM)			
STATIC PRESSURE KPA (IN.)			
FAN TYPE (Supply)			
FAN TYPE (Return)			
COMMENTS:			

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-3		SPEC REFERENCE		23 73 11	
<u>Supply Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating			Type		
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-3		SPEC REFERENCE		23 73 11	
<u>Return Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating			Type		
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT			
AHU NUMBER	AHU-3	SPEC REFERENCE	23 73 11
AREA SERVED			
LOCATION			
AIR UNIT DATA	Specified	Shop Drawings	Installed
MANUFACTURER			
MODEL NUMBER			
CAPACITY L/S (CFM)			
STATIC PRESSURE KPA (IN.)			
FAN TYPE (Supply)			
FAN TYPE (Return)			

COMMENTS: _____

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-3		SPEC REFERENCE		23 73 11	
<u>Supply Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating			Type		
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

AIR HANDLING UNIT							
AIR UNIT NUMBER		AHU-3		SPEC REFERENCE		23 73 11	
<u>Return Fan</u>							
FAN MANUFACTURER				DRAWING REF.			
FAN MODEL NUMBER				LOCATION			
FAN SERIAL NUMBER				FAN TYPE			
MOTOR MANUFACTURER				MODEL			
MOTOR SERIAL NUMBER				FRAME			
Volts/Phase		HP/KW		RPM		Amps	
Panel No		Fuse Rating		Type			
Thermal Protection							
AIR UNIT DATA		Design		Measured		Remarks	
Air Flow L/S (CFM)							
Outlet Velocity m/s (FPM)							
Ext. Static Pressure Pa (IN)							
Fan RPM							
Fan BHP							
Voltage		A-B					
		A-C					
		B-C					
Amperage		A-B					
		A-C					
		B-C					
COMMENTS:							

Contractor			
Name (Print)			
Signature		Date	

Integrated Systems Review

Date:

System to be Reviewed:

Components of Systems:

Heating Boilers B-1 and B-2	

Visual Review

Item	Pass/Fail	Comments
Equipment installed, operational, accessible for maintenance, free of defect.		
All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final setpoints and schedules and with debugging, loop tuning and sensor and device calibrations completed.		
Test and balance (TAB) complete and approved for the hydronic system.		
All start-up deficiency items for this equipment corrected.		
Safeties and operating ranges reviewed.		
Equipment clean inside and out		

Systems Verification

Test to be Performed	Heating loop temperature control: Test the boiler plant operation (Turn off existing electric boilers)
Desired Result	Boilers operate to maintain loop temperature at set point.
Pass Fail	
Comments	

Systems Verification

Test to be Performed	<u>Loss of power.</u> With boilers ON, shut OFF power to them.
Desired Result	Boiler burners shut OFF and an alarm is generated in the BAS.
Pass Fail	
Comments	

Test to be Performed	<u>Low water.</u> Unhook the wire to the low water sensor to initiate an alarm.
Desired Result	Boiler burners shut OFF and an alarm is generated in the BAS.
Pass Fail	
Comments	

Test to be Performed	<u>High limit.</u> Lower the high limit setting to the current water temperature to initiate an alarm and shutdown.
Desired Result	Boiler burners shut OFF and an alarm is generated in the BAS.
Pass Fail	
Comments	

CIRCULATING PUMP			
PUMP NUMBER	PU-1	SPEC REFERENCE	23 21 23
SYSTEM SERVED			
LOCATION			
PUMP DATA	Specified	Shop Drawings	Installed
MANUFACTURER			
LIQUID			
MODEL NUMBER			
SIZE (suction x discharge)			
CAPACITY L/S (GPM)			
HEAD PRESSURE KPA (PSI)			
TYPE			
RPM			
BHP			
MOTOR KW (HP)			
IMPELLER SIZE			
VOLTS/PHASE			
AMPS			
COMMENTS: _____			

Contractor			
Name (Print)			
Signature		Date	

CIRCULATING PUMP			
PUMP NUMBER	PU-1	SPEC REFERENCE	23 21 23
MOTOR MANUFACTURER		MODEL	
Volts/Phase	HP/KW	RMP	
Amps	Panel No	Fuse Rating	
Thermal Protection			
MOTOR DATA	Design	Measured	Remarks
Motor RPM			
Voltage	A-B		
	A-C		
	B-C		
Amperage	A-B		
	A-C		
	B-C		
PUMP DATA			
Flow L/S (GPM)			
Head kPa (Feet)			
Efficiency			
Pump RPM			
Outlet Velocity m/s (FPM)			
COMMENTS: _____			

Contractor			
Name (Print)			
Signature		Date	

CIRCULATING PUMP			
PUMP NUMBER	PU-2	SPEC REFERENCE	23 21 23
SYSTEM SERVED			
LOCATION			
PUMP DATA	Specified	Shop Drawings	Installed
MANUFACTURER			
LIQUID			
MODEL NUMBER			
SIZE (suction x discharge)			
CAPACITY L/S (GPM)			
HEAD PRESSURE KPA (PSI)			
TYPE			
RPM			
BHP			
MOTOR KW (HP)			
IMPELLER SIZE			
VOLTS/PHASE			
AMPS			
COMMENTS: _____ _____ _____ _____ _____ _____ _____			

Contractor			
Name (Print)			
Signature		Date	

CIRCULATING PUMP			
PUMP NUMBER	PU-2	SPEC REFERENCE	23 21 23
MOTOR MANUFACTURER		MODEL	
Volts/Phase	HP/KW	RMP	
Amps	Panel No	Fuse Rating	
Thermal Protection			
MOTOR DATA	Design	Measured	Remarks
Motor RPM			
Voltage	A-B		
	A-C		
	B-C		
Amperage	A-B		
	A-C		
	B-C		
PUMP DATA			
Flow L/S (GPM)			
Head kPa (Feet)			
Efficiency			
Pump RPM			
Outlet Velocity m/s (FPM)			
COMMENTS: _____			

Contractor			
Name (Print)			
Signature		Date	

REHEAT COIL			
REHEAT COIL NUMBER		SPEC REFERENCE	
SYSTEM SERVED			
LOCATION			
COIL DATA	Specified	Shop Drawings	Installed
MANUFACTURER			
HEATING SOURCE			
AIR FLOW L/s (CFM)			
SIZE MM (INCHES)			
AIR VELOCITY MPM(FPM)			
AIR P.D. kPa (PSI)			
NO. OF ROWS			
CAPACITY L/s (GPM)			
WATER P. D. kPa (PSI)			
COMMENTS: _____			

Contractor			
Name (Print)			
Signature		Date	

UNIT HEATER			
UNIT HEATER NUMBER		SPEC REFERENCE	
SYSTEM SERVED			
LOCATION			
	Specified	Shop Drawings	Installed
Manufacturer			
Model			
Heating Source			
Air Flow L/S (Cfm)			
Size Mm (Inches)			
Weight			
Water Flow L/S (Gpm)			
Water P. D. kPa (Feet)			
Heating Output kW (BTUH)			
Fan Hp			
Voltage			
Amps			
COMMENTS: _____			

Contractor			
Name (Print)			
Signature		Date	

UNIT HEATER							
UNIT HEATER NUMBER				SPEC REFERENCE			
	YES	NO	N/A		YES	NO	N/A
Unit heater In Place				Unit Cleaned			
Clearance Provided				Mounted Properly			
Piping Installed				Piping Correct			
Valves In Place				Valves Tagged			
Water Flow Available				Insulation Complete			
Drain In Place				Vent Provided			
Controls Complete				Controls Functional			
Fan wired				Thermostat installed			
Abnormal vibrations				Fan guard in place			
Outlet dampers directed				Unions In Place			
Identification Tag present				Unit Label Correct			
Unit Cycles On Tstat				Disconnect Wired			

COMMENTS: _____

Contractor			
Name (Print)			
Signature		Date	

