

DIVISION 1 - GENERAL REQUIREMENTS

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| <u>1 WORK COVERED BY
CONTRACT DOCUMENTS</u> | .1 | Work of this Contract comprises of design and construction of concrete slab replacement and rehabilitation for the CFIA General Services Building and related site redevelopment at Lethbridge, Alberta. |
| <u>2 CONTRACT METHOD</u> | .1 | Construct Work under design-build contract. |
| <u>3 WORK SEQUENCE</u> | .1 | Construct Work to accommodate Departmental Representative's continued use of the site and existing surrounding premises during construction. |
| | .2 | Maintain fire access/control. |
| <u>4 DESIGN BUILDER USE
OF PREMISES</u> | .1 | Restricted use of site and premises as directed by Departmental Representative until Substantial Performance. |
| | .2 | Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work as directed by Departmental Representative. |
| | .3 | At completion of operations condition of existing work: equal to or better than that which existed before new work started. |
| <u>5 EXISTING
SERVICES</u> | .1 | Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission. |
| | .2 | Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic and Departmental Representative's operations. |
| | .3 | Provide alternative routes for personnel, |

pedestrian and vehicular traffic.

- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services to maintain existing buildings' systems.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.
- .11 Construct barriers in accordance with Section 01 56 00.

6 DOCUMENTS
REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and Other Safety

Related Documents.

- .11 Material and Safety Data Sheets.
- .12 Labour conditions and Wage Schedules.
- .13 Material and Labour Bonds.
- .14 Manufacturers' applicable instructions.
- .15 Municipal and Provincial Permits.
- .16 Other documents as specified.

END OF SECTION

1 ACCESS AND
EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

2 SPECIAL
REQUIREMENTS

- .1 Submit schedule in accordance with Section 01 32 15.
- .2 Ensure that Design Builder personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.
- .4 Ingress and egress of Design Builder vehicles at site is limited to xxxxxx.
- .5 Deliver materials from 07:30 hours to 20:00 hours unless otherwise approved by Departmental Representative.

3 SECURITY
CLEARANCES

- .1 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

4 COMMISSIONAIRE

- .1 Provide a Commissionaire to be present on site at all times while conducting activities associated with Work.

5 BUILDING
SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not allowed.

END OF SECTION

1 Applications
for Progress
Payment

- .1 Submit to Department Representative, at least 14 days before first application for payment, Cost Breakdown, in detail as directed by Department Representative, for parts of Work, aggregating total amount of Contract Price, so as to facilitate evaluation of applications for payment. After approval by Department Representative, Cost Breakdown will be used as basis for progress payments.
- .2 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Department Representative may reasonably require to establish value and delivery of products.

END OF SECTION

1 APPOINTMENT AND
PAYMENT

- .1 Obtain and pay for services of inspection/testing laboratory for:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Design Builder's convenience.
 - .3 Testing, adjustment and balancing of mechanical and electrical equipment and systems.
 - .4 Commissioning performance testing and verification.
 - .5 Mill tests and certificates of compliance.
 - .6 Tests specified to be carried out by Design Builder.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.
- .3 Inspection/testing agencies engaged by Design Builder shall be reviewed by and be acceptable to Departmental Representative.
- .4 Departmental Representative, at Departmental Representative's expense, may also engage inspection/testing agencies as may be deemed required.

2 DESIGN BUILDER'S
RESPONSIBILITIES

- .1 Provide, for Design Builder's and Departmental Representative's inspection/testing agencies, labour, equipment and facilities to:
 - .1 Provide access to Work to be inspected and tested.
 - .2 Facilitate inspections and tests.
- .2 Make good Work disturbed by inspection and test.
- .3 Provide storage on site for laboratory's exclusive use to store equipment and cure test

samples.

- .4 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .5 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .6 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

END OF SECTION

1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4 Provide physical space (construction phase only) and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance and Departmental Representative.
- .8 Representative of Contractor, Subcontractor, Consultant and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

2 PRECONSTRUCTION
MEETING

- .1 Within 7 days after each Contract award, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Design Builder, major Subcontractors, Consultants, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 15.
 - .3 Schedule of submission of shop drawings, samples, colour chips, product data. Submit submittals in accordance with Section 01 33 00.
 - .4 Commissioning
 - .5 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
 - .6 Delivery schedule of specified equipment in accordance with Section.
 - .7 Site security in accordance with Section 01 56 00.
 - .8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .9 Engineer provided products.
 - .10 Record drawings in accordance with Section 01 33 00.
 - .11 Maintenance manuals in accordance with Section 01 78 00.
 - .12 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.
 - .13 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .14 Appointment of inspection and testing agencies or firms.
 - .15 Insurances, transcript of policies.

3 PROGRESS
MEETINGS

- .1 During course of Work schedule progress meetings every two weeks.
- .2 Design Builder, major Subcontractors, Consultants involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.

- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Commissioning.
 - .11 Maintenance of quality standards.
 - .12 Review proposed changes for affect on construction schedule and on completion date.
 - .13 Other business.

END OF SECTION

1 GENERAL

- .1 Use a project management control system based on Critical Path Method (CPM) and Bar (GANTT) Chart techniques as may be required and agreed upon by Departmental Representative to achieve Contract project demands specified here in and also specified in Project Brief and PWGSC Documentation and Submission Standards.
- .2 Schedule reviews by Departmental Representative shall not mean approval of detail inherent in schedule, responsibility for which lies with Design Builder.

2 DEFINITIONS

- .1 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .2 Project Plan: formal, approved document used to guide both Project execution and Project control. Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines. Project plan may be summary or detailed.
- .3 Project Schedule: planned dates for performing activities and planned dates for meeting milestones.
- .4 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.
- .5 Work Breakdown Structure (WBS): deliverable-oriented grouping of project elements that organizes and defines total Work scope of Project. Each descending level represents increasingly detailed definition of Project Work.

3 SYSTEM
DESCRIPTION

- .1 Construction Progress Schedule (Project Time Management): describes processes required to ensure timely completion of Project. These processes ensure that various elements of Project are properly coordinated. It

consists of planning, time estimating, scheduling, progress monitoring and control.

- .2 Project monitoring and reporting: as Project progresses, keep team aware of changes to schedule, and possible consequences. In addition to Bar Charts and CPM networks, use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.

.1 Narrative reporting begins with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.

4 SCHEDULE REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.
- .2 Acceptance of Master Plan and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract. Duration of Contract may only be changed through bilateral Agreement.
- .3 Consider Master Plan and Detail Schedule showing Work completed in less than specified Contract duration, to have float.
- .4 Calculate dates for completion milestones from Plan and Schedule.
- .5 Delays to non-critical activities, those with float may not be basis for time extension.
- .6 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated. Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.
- .7 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration. Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.

- .8 Arrange participation on and off site of Design Builder's Contractors, Own Forces and suppliers, as required by Departmental Representative for purpose of network planning, scheduling, updating and progress monitoring. Approvals by Departmental Representative of original networks and revisions do not relieve Design Builder from duties and responsibilities required by Contract.
- .9 Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative Project Control System for planning, scheduling, monitoring and reporting of project progress.
- .3 Submit Project Control System to Departmental Representative for approval; failure to comply with each required submission, may result in progress payment being withheld in accordance with Federal Government's Terms of Payment.
- .4 Refer to article "Progress monitoring and reporting" of this specification Section for frequency of Project control system submittals.
- .5 Submit Project planning, monitoring and control system data as required by Departmental Representative in following form.
 - .1 CD files in original scheduling software specified in Project Brief and PWGSC Documentation and Submissions Standards containing schedule and cash flow information, labeled with data date, specific update, and person responsible for update.
 - .2 Master Plan Bar Chart.
 - .3 Construction Detail schedule Bar Chart.
 - .4 Listing of project activities and tender

packages including milestones and logical connectors, networks from Project start to end. Sort activities by activity identifier and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.

.5 Criticality report listing activities and milestones with days total float.

.6 Progress report in early start sequence, listing for each trade or tender package, activities due to start, underway, or finished within two months from monthly update date. List activity identifiers, description and duration.

6 QUALITY
ASSURANCE

- .1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including Commissioning.

7 PROJECT MEETING

- .1 Meet with Departmental Representative within 5 working days of each Award of Sub-Contract or Own Forces date, to establish Work requirements and approach to project construction operations.

8 WORK BREAKDOWN
STRUCTURE (WBS)

- .1 Prepare construction Work Breakdown Structure (WBS) within 5 working days of Award of Sub-Contract or Own Forces date.

9 PROJECT
MILESTONES

- .1 Project milestones include:
 - .1 Structural Slab Design.
 - .2 66% Construction Document Review.
 - .3 99% Construction Document Review.
 - .1 Tender Packages/Own Forces Work
 - .2 Slab on Grade Demolition (Substantial Completion), GL 1-6.
 - .3 Foundations (Substantial Completion), GL 1-6.
 - .4 Services (Substantial Completion), GL 1-6.
 - .5 Slab Replacement (Substantial Completion), GL 1-6.
 - .6 Re-installation of CFIA Equipment (Substantial Completion), GL 1-6.
 - .7 Excavation (Substantial Completion), GL

7-12.

- .8 Foundation and Underpinning (Substantial Completion), GL 7-12.
- .9 Services (Substantial Completion), GL 7-12.
- .10 Slab Rehabilitation (Substantial Completion), GL 7-12.
- .11 Backfilling and Site Grading (Substantial Completion).
- .12 Final Commissioning and Document Submission.
- .13 Warranty Review.
- .14 Final Certificate Completion and Project Closeout.

10 MASTER PLAN

- .1 Structure and base construction progress/networks system on WBS coding.
- .2 Prepare comprehensive construction Master Plan and dependent Cash Flow Projection within 5 working days of finalizing agreement proceed with construction.
 - .1 Master Plan will be used as baseline.
 - .1 Departmental Representative will review and return revised baseline within 10 working days.
- .3 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
- .4 Initial and subsequent Master Plans will include:
 - .1 CD containing schedule and cash flow information, clearly labeled with data date, specific update, and Design Builder's person responsible for update.
 - .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
 - .3 Network diagram showing, activity sequencing (logic), total float, early/late dates, current status and durations.
 - .4 Actual/projected monthly cash flow: expressed annually and monthly and shown in both graphical and numerical form.

11 DETAIL
SCHEDULE

- .1 Provide detailed project schedules within 5 working days of agreement to proceed with construction, showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Shop drawings.
 - .2 Samples.
 - .3 Approvals.
 - .4 Procurement.
 - .5 Construction.
 - .6 Installation.
 - .7 Site works.
 - .8 Testing.
 - .9 Commissioning and acceptance.
- .2 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Plan.
- .3 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Departmental Representative for review effects created by insertion of new Change Order.

12 REVIEW OF THE
CONSTRUCTION DETAIL
SCHEDULE

- .1 Allow 10 workdays for review by Departmental Representative of proposed construction Detail Schedule.
- .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within 5 workdays.
- .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.
- .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

13 COMPLIANCE
WITH DETAIL
SCHEDULE

- .1 Comply with reviewed Detail Schedule.
- .2 Proceed with significant changes and

deviations from scheduled sequence of activities that cause delay, when agreed by Departmental Representative.

- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.

- .1 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

- .4 In the event of a request for Contract extension, submit as per a pre-agreed upon scheduled review periods to Departmental Representative, justification, project schedule data and supporting evidence for extension to Design Builder's Contract or Design Builder's Contractors' completion date, or partial or interim acceptance milestone date when required. Include as part of supporting evidence:

- .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.

- .2 Prepared schedule indicating how change will be incorporated. Demonstrate perceived impact based on date of occurrence of change and include status of construction at that time.

- .3 Other supporting evidence requested by Departmental Representative.

14 PROGRESS
MONITORING AND
REPORTING

- .1 On ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of Design Builder's Own Forces, Contractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.

- .2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.

- .3 Perform Detail Schedule update monthly with status dated (Data Date) on last working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Submit to Departmental Representative copies of updated Detail Schedule.
- .5 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .6 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
 - .1 Description of progress made.
 - .2 Pending items and status of: permits, shop drawings, Change Orders, possible time extensions.
 - .3 Status of Construction Manager's Contract and Design Builder's Contractors' completion date and milestones.
 - .4 Risk review including current and anticipated problem areas, potential areas of delays and gains and corrective measures and opportunities with gains in time.
 - .5 Review of progress and status of critical activities.

END OF SECTION

1 ADMINISTRATIVE

- .1 Submit to Departmental Representative 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 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated 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.
- .6 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are coordinated.
- .8 Design Builder's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Design Builder's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on

site.

- .11 Notwithstanding requirement for hard copy submissions, also post on Buzzsaw.

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 Design Builder to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional registered or licensed in Province of Alberta, 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 10 working days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Design Builder'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 Design Builder.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Respective Design Professional's stamp, signed by Consultant of record.
 - .5 Design Builder's stamp, signed by Design Builder's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .6 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 Departmental Representative's review, distribute copies.
- .10 Submit 6 prints of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit 6 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit 6 copies of test reports for

- requirements requested in specification Sections and as Departmental Representative may reasonably request.
- .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 6 copies of certificates for requirements requested in specification Sections and as Departmental Representative may reasonably request.
- .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 6 copies of manufacturers instructions for requirements requested in specification Sections and as Departmental Representative may reasonably request.
- .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 6 copies of Manufacturer's Field Reports for requirements requested in specification Sections and as Departmental Representative may reasonably request.
- .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit 6 copies of Operation and Maintenance Data for requirements requested in specification Sections and as Departmental Representative may reasonably request.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide

details applicable to project.

- .19 If upon review by Departmental Representative, 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.
- .20 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Design Builder submitting same, and such review shall not relieve Design Builder of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Design Builder is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

3 SAMPLES

- .1 Submit for review samples in triplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's site office.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is

criterion, submit manufacturer's full range of samples.

- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative 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.

4 MOCK-UPS

- .1 Erect mock-ups in accordance with 01 45 00.

5 PROGRESS
PHOTOGRAPHS

- .1 Submit labeled progress photographs.
- .2 Each submission
 - .1 Prints sizes from electronic format, 200 x 300 mm.
 - .2 Electronic format on CD.
- .3 Print Type: semi-matt colour with binding margin at one end.
- .4 Paper: single weight, not mounted.
- .5 Number of prints required: 3 sets.
- .6 Identification, print copy and electronic format: name and project number, viewpoint and date of photograph.
- .7 Viewpoints: interior and exterior locations: viewpoints determined by Departmental Representative.
- .8 Frequency: monthly with progress statement.

END OF SECTION

1 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Environmental protection plan: include:
 - .1 Name of person responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.
 - .3 Name and qualifications of person responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.

.5 Erosion control plan which identifies type and location of erosion controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction

activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan: to be included and updated, as required.

3 FIRES

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

4 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

5 DRAINAGE

- .1 Provide erosion and sediment control plan that identifies type and location of erosion and sediment controls to be provided. Plan: include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sedimentations control plan.
- .3 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .4 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local

authority requirements.

6 SITE CLEARING
AND PLANT
PROTECTION

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Departmental Representative.

7 POLLUTION
CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

8 HISTORICAL/
ARCHAEOLOGICAL
CONTROL

- .1 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area

are discovered during construction.

- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Design Builder and Departmental Representative.

9 NOTIFICATION

- .1 Departmental Representative will notify Design Builder in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Design Builder's Environmental Protection plan.
- .2 Design Builder: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Design Builder for such suspensions.

END OF SECTION

1 REFERENCES AND
CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC, 2010) 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.

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 Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

3 BUILDING
SMOKING ENVIRONMENT

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

END OF SECTION

1 INSPECTION

- .1 Allow Departmental Representative 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 Departmental Representative instructions, or law of Place of Work.
- .3 If Design Builder 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 Departmental Representative 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, Departmental Representative shall pay cost of examination and replacement.

2 INDEPENDENT
INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .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 Departmental Representative at no cost to

Departmental Representative. Pay costs for re-testing and re-inspection.

3 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.

4 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative 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.

5 REJECTED WORK

- .1 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 Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner 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 Departmental Representative.

6 REPORTS

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

7 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested by Departmental Representative.
- .2 Include for tests and mix designs as specified.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications.
- .2 Construct in locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups 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.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Mock-ups may remain as part of Work.

9 MILL TESTS

- .1 Submit mill test certificates as requested by Departmental Representative.

10 EQUIPMENT AND
SYSTEMS

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

END OF SECTION

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- | | |
|--|---|
| <u>1 INSTALLATION
AND REMOVAL</u> | <ul style="list-style-type: none">.1 Provide temporary utilities controls in order to execute work expeditiously..2 Remove from site all such work after use. |
|
 | |
| <u>2 DEWATERING</u> | <ul style="list-style-type: none">.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water. |
|
 | |
| <u>3 WATER SUPPLY</u> | <ul style="list-style-type: none">.1 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal. |
|
 | |
| <u>4 TEMPORARY
HEATING AND
VENTILATION</u> | <ul style="list-style-type: none">.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:<ul style="list-style-type: none">.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 of minimum 10 degrees C in areas where construction is in progress..5 Ventilating:<ul style="list-style-type: none">.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, not to be used when available. Be responsible for damage to heating system if use is permitted.

.7 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.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

5 TEMPORARY POWER
AND LIGHT

.1 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.2 Provide temporary power for electric cranes and other equipment as required.

.3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lux.

.4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected.

Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

6 TEMPORARY
COMMUNICATION
FACILITIES

- .1 Provide and pay for temporary telephone, fax, data, e-mail, internet access hook up, lines, equipment necessary for own use.

7 FIRE
PROTECTION

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

END OF SECTION

1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.
- .2 Master Painters Institute (MPI)

2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.

3 INSTALLATION
AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Design Builder, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be graveled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

4 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs.

5 HOISTING

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial

arrangements with Subcontractors for their use of hoists.

- .2 Hoists cranes to be operated by qualified operator.

6 SITE
STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

7 CONSTRUCTION
PARKING

- .1 Parking will be permitted on site.
- .2 Provide and maintain adequate access to project site.
- .3 Clean site access areas/routes where used by Design Builder's equipment.

8 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

9 OFFICES

- .1 Provide office heated to 22 degrees C, lighted 750 lux and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

10 EQUIPMENT,
TOOL AND MATERIALS
STORAGE

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work

activities.

11 SANITARY
FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Permanent facilities may not be used by Contractor. Design Builder to provide own facilities.

12 CONSTRUCTION
SIGNAGE

- .1 No construction advertisement signs, other than health and safety, warning and instructional signs, are permitted on site.
- .2 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

13 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

END OF SECTION

1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-0121-M1978(R2003), Douglas Fir Plywood.
- .2 Master Painters Institute (MPI).

2 INSTALLATION
AND REMOVAL

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

3 HOARDING

- .1 Erect temporary site enclosures using lumber framing and exterior grade plywood to CSA 0121.
- .2 Apply plywood panels vertically flush and butt jointed.
- .3 Provide lockable truck entrance gate(s) and pedestrian door(s) as required and conforming to applicable traffic restrictions on adjacent streets and sites roadways. Equip gates with locks and keys.
- .4 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law and directed by Departmental Representative.
- .5 Paint public side of site enclosure in Departmental Representative selected colours with one coat primer and one coat exterior paint to applicable MPI formula. Maintain public side of enclosure in clean condition.
- .6 Erect temporary site enclosure using new chain link fencing 2.4 m high. Provide lockable truck gates. Maintain fence in good repair.
- .7 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

<u>4 GUARD RAILS AND BARRICADES</u>	.1	Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
	.2	Provide as required by governing authorities.
<u>5 WEATHER ENCLOSURES</u>	.1	Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
	.2	Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
	.3	Design enclosures to withstand wind pressure and snow loading.
<u>6 DUST TIGHT SCREENS</u>	.1	Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
	.2	Maintain and relocate protection until such work is complete.
<u>7 ACCESS TO SITE</u>	.1	Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
<u>8 PUBLIC TRAFFIC FLOW</u>	.1	Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.
<u>9 FIRE ROUTES</u>	.1	Maintain access to property including overhead clearances for use by emergency response vehicles.
<u>10 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY</u>	.1	Protect surrounding private and public property from damage during performance of Work.

- .2 Be responsible for damage incurred.

11 PROTECTION OF
BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

1 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

2 AVAILABILITY

- .1 Immediately upon signing Contract(s), review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

3 STORAGE,
HANDLING AND
PROTECTION

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

4 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Departmental Representative will pay for transportation cost of products supplied by Departmental Representative. Unload, handle and store such products.

5 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, to allow for Departmental Representative's review of the next course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

6 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative whose decision is final.

7 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

8 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

9 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

10 LOCATION OF
FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

11 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

12 FASTENINGS -
EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

13 PROTECTION OF
WORK IN PROGRESS

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

14 EXISTING
UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having

jurisdiction. Stake and record location of
capped service.

END OF SECTION

<u>1 QUALIFICATIONS OF SURVEYOR</u>	.1	Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.
<u>2 SURVEY REFERENCE POINTS</u>	.1	Existing base horizontal and vertical control points are designated on drawings.
	.2	Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
	.3	Make no changes or relocations without prior written notice to Departmental Representative.
	.4	Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
	.5	Require surveyor to replace control points in accordance with original survey control.
<u>3 SURVEY REQUIREMENTS</u>	.1	Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
	.2	Establish lines and levels, locate and lay out, by instrumentation.
	.3	Stake for grading, fill, topsoil placement and landscaping features.
	.4	Stake slopes and berms.
	.5	Establish pipe invert elevations.
	.6	Stake batter boards for foundations.
	.7	Establish foundation column locations and floor elevations.
	.8	Establish lines and levels for mechanical and electrical work.

4 EXISTING
SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
- .2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

5 LOCATION OF
EQUIPMENT AND
FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

6 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

7 SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

- .3 Submit certificate signed by surveyor
certifying those elevations and locations of
completed Work that conform and do not conform
with Contract Documents.

END OF SECTION

1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Departmental Representative or separate Design Builder.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate Design Builder.
 - .7 Written permission of affected separate Design Builder.
 - .8 Date and time work will be executed.

2 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00.

3 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

4 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids

with fire-stopping material, full thickness of the construction element.

- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

END OF SECTION

1 PROJECT
CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Design Builders.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .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. Refer to Section 01 74 21.
- .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.

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 Departmental Representative or other Design Builders.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 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.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .16 Sweep and wash clean paved areas.
- .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .18 Clean roofs, downspouts, and drainage systems.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .20 Remove snow and ice from access to building.
- .21 Complete cleaning prior to start-up and commissioning of systems and integrated systems.

END OF SECTION

1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's waste management goals.
- .2 PWGSC's waste management goal 75 percent of total project waste to be diverted from landfill sites. Provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Accomplish maximum control of solid construction waste.
- .4 Preserve environment and prevent pollution and environment damage.

2 DEFINITIONS

- .1 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .2 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .3 Inert Fill: inert waste - exclusively asphalt and concrete.
- .4 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .7 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of

using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

- .8 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .9 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .10 Separate Condition: refers to waste sorted into individual types.
- .11 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .12 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.
- .13 Waste Management Co-ordinator (WMC): Design Builder representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .14 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

3 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:

- .1 Waste Audit.
- .2 Waste Reduction Workplan.
- .3 Material Source Separation Plan.
- .4 Schedules completed for project.

4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Prepare and submit following prior to project start-up:
 - .1 Submit 2 copies of completed Waste Audit (WA): Schedule A.
 - .2 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.
 - .3 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.
 - .4 Submit 2 copies of Cost/Revenue Analysis Workplan (CRAW): Schedule D.
 - .5 Submit 2 copies of Materials Source Separation Program (MSSP) description.
- .3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
 - .1 Failure to submit could result in hold back of final payment.
 - .2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled or disposed of.
 - .3 For each material reused, sold or recycled from project, include amount in tones or quantities by number, type and size of items and the destination.
 - .4 For each material land filled or incinerated from project, include amount of material and identity of landfill, incinerator or transfer station.

5 WASTE AUDIT (WA)

- .1 Conduct WA prior to project start-up.
- .2 Prepare WA: Schedule A.
- .3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

6 WASTE REDUCTION
WORKPLAN (WRW)

- .1 Prepare WRW prior to project start-up.
- .2 WRW should include but not limited to:
 - .1 Destination of materials listed.
 - .2 Deconstruction/disassembly techniques and sequencing.
 - .3 Schedule for deconstruction/disassembly.
 - .4 Location.
 - .5 Security.
 - .6 Protection.
 - .7 Clear labeling of storage areas.
 - .8 Details on materials handling and removal procedures.
 - .9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.
- .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Describe management of waste.
- .5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.
- .6 Post WRW or summary where workers at site are able to review content.
- .7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

7 DEMOLITION
WASTE AUDIT (DWA)

- .1 Prepare DWA prior to project start-up.
- .2 Complete DWA: Schedule C.
- .3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

8 COST/REVENUE
ANALYSIS WORKPLAN
(CRAW)

- .1 Prepare CRAW: Schedule D.

9 MATERIALS
SOURCE SEPARATION
PROGRAM (MSSP)

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
- .1 Transport to approved and authorized recycling facility or to users of material for recycling.

10 WASTE
PROCESSING SITES

- .1 Contact Alberta Environment.

11 STORAGE,
HANDLING AND
PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Design Builder's property.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal

facility.

- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Provide waybills for separated materials.

12 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

- | | | |
|--|----|---|
| <u>13 USE OF SITE
AND FACILITIES</u> | .1 | Execute work with least possible interference or disturbance to normal use of premises. |
| <u>14 SCHEDULING</u> | .1 | Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work. |
| <u>15 APPLICATION</u> | .1 | Do Work in compliance with WRW. |
| | .2 | Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes. |
| <u>16 CLEANING</u> | .1 | Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition. |
| | .2 | Clean-up work area as work progresses. |
| | .3 | Source separate materials to be reused/recycled into specified sort areas. |
| <u>17 DIVERSION OF
MATERIALS</u> | .1 | From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative and consistent with applicable fire regulations.
.1 Mark containers or stockpile areas.
.2 Provide instruction on disposal practices. |
| | .2 | On-site sale of salvaged, recovered, reusable, recyclable materials is not permitted. |
| | .3 | Demolition Waste: |

Material Type	Recommended Diversion %	Actual Diversion %
Electrical Equipment	80	[_____]
Mechanical Equipment	100	[_____]
Metals	100	[_____]
Rubble	100	[_____]

Wood (uncontaminated)	100	[_____]
Other		

.4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	[_____]
Plastic Packaging	100	[_____]
Rubble	100	[_____]
Steel	100	[_____]
Wood (uncontaminated)	100	[_____]
Other		[_____]

18 WASTE AUDIT
(WA)

.1 Schedule A - Waste Audit (WA):

(1) Material Category	(2) Material Quantity Unit	(3) Estimated Waste %	(4) Total Quantity of Waste (unit)	(5) Generation on Point	(6) % Recycled	(7) % Reused
Wood and Plastics Material Description Off-cuts Warped Pallet Forms Plastic Packaging Cardboard Packaging Other						
Material Description Glass Wood Metal Other						

19 WASTE REDUCTION
WORKPLAN (WRW)

.1

Schedule B:

(1) Material Category	(2) Person(s) Quantity Responsible	(3) Total Amount of Waste (unit)	(4) Actual Reused Amount (units) Projected	(5) Actual Recycled Destination (unit) Projected	(6) Material(s)
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Wood and
Plastics
Material
Description
Chutes
Warped
Pallet
Forms
Plastic
Packaging
Cardboard
Packaging
Other

Glass
Wood
Metal
Other

20 DEMOLITION
WASTE AUDIT (DWA)

.1

Schedule C - Demolition Waste Audit (DWA):

(1) Material Description	(2) Quantity	(3) Unit	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks and Assumptions
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Wood
Wood Stud
Plywood
Regular Slab
Regular Wood

21 COST/REVENUE ANALYSIS WORKPLAN (CRAW)	.1	Schedule D - Cost/Revenue Analysis Workplan (CRAW):
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(1) Material Description	(2) Total Quantity (unit)	(3) Volume (cum)	(4) Weight (cum)	(5) Disposal Cost/Credit = \$(+/-)	(6) Category Sub-Total \$(+/-)	(7) Cost (-) + Revenue \$(+)
Wood						
Wood Stud						
Plywood						
Regular Slab						
Regular Wood						

END OF SECTION

1 INSPECTION AND
DECLARATION

- .1 Design Builder's Inspection: Design Builder and SubContractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Design Builder's Inspection and that corrections have been made.
 - .2 Request Departmental Representative Inspection.
- .2 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Authorities Having Jurisdiction have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for final inspection.
- .3 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Design Builder. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

2 WARRANTY INSPECTION

- .1 In the case of one year warranty, conduct joint inspections six (6) and ten (10) months after Interim Certificate of Completion. In the case of each extended warranty, conduct joint inspections in four (4) periods as agreed by Departmental Representative.
- .6 Immediately prior to end of warranty period(s) Departmental Representative and Design Builder shall make a joint final inspection of the remedial Work noted two (2) months prior to end of warranty(s) and reported within the two (2) during remedial

work.

END OF SECTION

1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final inspection, with Departmental Representative'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 Departmental Representative;
 - .1 Six final copies of operating and maintenance manuals in English.
 - .2 Six copies of final Commissioning Report
 - .3 Six copies plus one electronic copy of final Building Management Manual.
- .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.

2 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: extension type catalogue binders bound with heavy duty green fabric, hot stamped gold lettering on front and spine.
- .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 components, systems, integrated systems, process flow, 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.
- .9 Provide as-built 1:1 scaled CAD files in dwg format on CD.

3 CONTENTS - EACH
VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Department Representative and Design Builder with name of responsible parties.
 - .3 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, incorporating manufacturer's instructions specified in Section 01 45 00.

.6 Training: refer to Section 01 79 00.

4 AS-BUILTS AND
SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative 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.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 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 Departmental Representative.

5 RECORDING
ACTUAL SITE
CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Specifications Documents.
- .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, guarantees, inspection certifications, field test records, required by individual specifications sections.

6 FINAL SURVEY

- .1 Submit final site survey certificate in accordance with Section 01 71 00 certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

7 EQUIPMENT AND

- .1 Each Item of Equipment and Each System:

SYSTEMS

- 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 Design Builder'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 Include test and balancing reports as specified in Section 01 45 00 and 01 91 13.
- .15 Additional requirements: as specified in individual specification sections and Project Brief.

8 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- .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.

9 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 as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative.

Include approved listings in Maintenance Manual.

- .5 Obtain receipt for delivered products and submit prior to final payment.

10 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 as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

11 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 as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

12 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 Departmental Representative.

13 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 60 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative 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 Departmental Representative 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, manufacturers' guarantees 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 Departmental Representative 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 Design Builders, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems and integrated systems.
 - .3 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.

- .4 Design Builder's plans for attendance of the various required post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 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 Departmental Representative to proceed with action against Design Builder.

14 PRE-WARRANTY
CONFERENCE

- .1 Meet with Departmental Representative, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.
- .2 Departmental Representative will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

15 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.

- .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 Design Builder.

END OF SECTION

1 General

- .1 Commissioning is a planned program of tests, procedures and checks carried out systematically on components, systems and integrated systems verifying that the Work is in accordance with the design intent. Commissioning includes all testing procedures, such as:
 - .1 Field quality testing.
 - .2 Equipment Start up procedures.
 - .3 Manufacturer Representative Start-Up procedures.
 - .4 Specialty testing.
 - .5 Testing and Balancing of HVAC systems.
 - .6 Component Verifications.
 - .7 System and Integrated System testing procedures.
- .2 Commissioning verifies that key deliverables are submitted such as:
 - .1 Commissioning Plan
 - .2 Shop drawings.
 - .3 Commissioning schedule.
 - .4 Commissioning documentation.
 - .5 Training Plan.
 - .6 Training Schedule.
 - .7 Training
 - .8 O/M Manuals.
 - .9 Record drawings.
 - .10 Final Commissioning Report.

2 Independent
Commissioning Agent

- .1 Assign an Independent Commissioning Agent defined as independent of any firm involved in project design or construction. Independent Commissioning Agent to:
 - .1 Cooperate with Departmental Representative's commissioning specialist in all aspects of commissioning process.
 - .2 Define and lead commissioning team.
 - .3 Develop Commissioning Plan.
 - .4 Develop all project specific component forms, system and integrated system test procedures in accordance with commissioning plan and final shop drawings.
 - .5 Provide binders (Master) including all commissioning documents by discipline to Design Builder to be maintained at their site office at all times.

- .6 Manage commissioning process on behalf of Design Builder.
- .7 Coordinate and attend site commissioning meetings:
 - .1 To be contiguous with site project meetings during project commissioning phase
 - .2 Chair, record minutes and distribute minutes of all commissioning meetings
- .8 Participate in Design Builder's design team site observations.
- .9 Issue a fully integrated commissioning schedule which is fully compatible and integrates with Design Builder's construction schedule and:
 - .1 Incorporates Critical Path Methods.
 - .2 Shows all Dependencies.
 - .3 Includes all contractor field testing, start-ups and verifications as prerequisites for each system and Integrated System test procedure.
 - .4 Identifies all commissioning component, system and Integrated System Test Procedures.
 - .5 Identifies deferred commissioning due to seasonal constraints.
- .10 Coordinate commissioning process with sub-contractor coordinators, owner and Departmental Representative.
- .11 Schedule and coordinate training of owner's staff during the commissioning phase.
- .12 Track all Design Builder's submittals related to commissioning process.
- .13 Confirm commissioning prerequisites are complete prior to Systems and Integrated Systems Testing, such as:
 - .1 Field quality testing
 - .2 Equipment Start up procedures
 - .3 Manufacturer Start up procedures
 - .4 Specialty Testing
 - .5 EMCS I/O point, control sequence and graphic verifications
 - .6 Specialty control system I/O point, control sequence and graphic verifications
 - .7 Testing and Balancing
- .14 Track and compile all commissioning results and documents as they are completed.

- .15 Verify all component forms are completed and in accordance with design data and installation prior to systems being commissioned.
- .16 Witness all System and Integrated System Testing and sign off results confirming they are in accordance with design.
- .17 Prepare, submit and track deficiencies identified during commissioning process.
 - .1 Submit to Design Builder and Departmental Representative
 - .2 Document resolutions and incorporate into Final Commissioning Report
- .18 Incorporate all commissioning documentation and results into a final commissioning report and submit to Departmental Representative recommending interim acceptance.
- .19 Participate in warranty period and review.

3 Commissioning
Schedule

- .1 Participate in detailed integrated commissioning schedule.
- .2 Develop and update a detailed commissioning schedule and submit to the Departmental Representative. Include the following milestones:
 - .1 Equipment Start-ups.
 - .2 Manufacturer Start-Ups.
 - .3 Component Verification Forms: Contractor Verification.
 - .4 Component Verification Forms: Design Builder Design Team Approvals.
 - .5 Testing and Balancing.
 - .6 System and Integrated Performance Verification Testing Procedures: Design Builder verification.
 - .7 System and Integrated Performance Verification Testing Procedures: Design Builder Design Team and Departmental Representative verification.
 - .8 Deferred System Performance Verification Testing Procedures: Design Builder Design Team and Departmental Representative verification.

-
- | | | |
|--|----|---|
| <u>4 Commissioning Documents</u> | .1 | Sample component forms, System and Integrated System Performance Verification Test procedures are included in this section. - Team to develop all: <ul style="list-style-type: none">.1 Component Verification Forms, System and Integrated System Performance Verification test procedures for all systems to be commissioned in accordance with the Commissioning Plan..2 System Performance Verification test procedures..3 Submit to Departmental Representative for review..4 Revise or develop Component Forms, System and Integrated System Performance procedures to incorporate revisions as a result of:<ul style="list-style-type: none">.1 Approved shop drawings..2 Approved construction changes. |
| <u>5 Commissioning Meetings</u> | .1 | Conduct Commissioning meetings as per Section 01 31 19. |
| <u>6 Accuracy of <u>Reported</u> Results</u> | .1 | Measured Values: <ul style="list-style-type: none">.1 To be verified with calibrated EMCS sensors and test instruments..2 Within +/- 5% of design criteria. |
| <u>7 Execution</u> | .1 | Commissioning process shall follow a logical sequence of verification, from component verifications through to system and integrated system Performance Verification Testing. <ul style="list-style-type: none">.1 Verification of components:<ul style="list-style-type: none">.1 Sample Component verification Forms are included in this section..2 Independent Commissioning Agent Team shall develop Component Verification Forms one month following shop drawing approval and submit to the Departmental Representative for review..3 Design Builder design team to complete the specified data field of the Component Verification Forms..4 Complete the shop drawing, installed data fields and installation |

- checks. Sign off and submit to Independent Commissioning Agent Team for approval.
- .5 Independent Commissioning Agent Team to approve all completed Component Forms.
- .2 System Performance Verification Testing Procedures:
 - .1 Design Builder Verification:
 - .1 Prior to System Performance Verification confirm all pre-requisites are complete and approved including:
 - .1 Field Testing.
 - .2 Equipment Start-ups.
 - .3 Manufacturer Start-ups.
 - .4 Specialty Testing
 - .5 All component forms for the system to be commissioned.
 - .2 Execute the System Performance Verification Testing procedures.
 - .3 Re-test until results are successful.
 - .4 Final results of testing to be entered and submitted electronically.
 - .5 Certify the results are acceptable.
 - .6 Submit to the Independent Commissioning Agent prior to Independent Commissioning Agent Verification.
- .2 Independent Commissioning Agent and Departmental Representative Verification:
 - .1 Notify Departmental Representative and Independent Commissioning Agent 7 days prior to the final System Performance Testing.
 - .2 Co-ordinate System Performance Verification Testing as agreed by Departmental Representative and Independent Commissioning Agent.
 - .3 Demonstrate System Performance Verification tests in the presence of the Departmental Representative and Independent Commissioning Agent.
 - .4 Departmental Representative and Independent Commissioning Agent certify the results.
 - .5 Resolve deficiencies identified during

- the System Performance Verification test.
- .6 Re-test in the presence of Departmental Representative and Independent Commissioning Agent.
- .7 Final results to be type written.
- .3 Integrated System Performance testing procedures:
 - .1 Independent Commissioning Agent Verification:
 - .1 Prior to Integrated System Performance Verification Testing:
 - .1 Confirm all pre-requisites are complete and approved including:
 - .1 All Systems Performance Verification Testing for systems related to the Integrated System to be verified have been certified by the Departmental Representative and Independent Commissioning Agent Team.
 - .2 Execute the Integrated System Performance Verification Testing procedures.
 - .3 Re-test until results are successful.
 - .4 Final results of testing to be entered and submitted electronically.
 - .5 Certify the results are acceptable.
 - .6 Submit to Independent Commissioning Agent prior to Independent Commissioning Agent Verification.
- .4 Departmental Representative and Independent Commissioning Agent Verification:
 - .1 Notify the Departmental Representative and Independent Commissioning Agent 7 days prior to the final Integrated System Performance Verification Testing.
 - .2 Co-ordinate System Performance Verification Testing as agreed by Departmental Representative and Independent Commissioning Agent.
 - .3 Demonstrate System Performance Verification tests in the presence of the

Departmental Representative and Independent Commissioning Agent team.

.4 Independent Commissioning Agent team and Departmental Representative certify results.

.5 Resolve deficiencies identified during the System Performance Verification test.

.6 Re-test in the presence of the Independent Commissioning Agent Team and Departmental Representative.

.7 Final results of testing to be entered and submitted electronically.

8 Deferred System and .1
Integrated Performance
Testing

Independent Commissioning Agent Team to identify deferred System or Integrated System Performance Verification testing as a result of seasonal constraints or other circumstances agreed on by the Departmental Representative.

.2 Execute Independent Commissioning Agent Verification.

.3 Execute Departmental Representative and Independent Commissioning Agent Verification.

9 Supporting
Documentation

.1 EMCS Trending:

.1 Define trends for all basic process variables such as:

.1 Supply air temperature.

.2 Supply air pressure.

.3 Supply air humidity.

.4 Space temperature.

.5 Space Humidity.

.6 Airflow.

.2 Trends to be run continuously for 14 days and demonstrate systems attain set point and remain stable.

10 Tracking of
Commissioning
Documentation and
Results

.1 Independent Commissioning Agent to utilize a tracking system to confirm:

.1 All submittals related to commissioning pre-requisites are completed and approved by Design Builder's Design Team.

.2 All commissioning documentation and results are complete and accepted by

Independent Commissioning Agent.

- .2 Retain on site, copies of all commissioning documentation organized by discipline.

11 Integrated Systems to be Commissioned

- .1 Life Safety Systems:
 - .1 Verifies the integrated performance of life safety systems such as:
 - .1 Fire Alarm System.
 - .2 Emergency Power System.
 - .3 Fire Pumps.
 - .4 Elevators.
 - .5 HVAC Fan shutdowns.
 - .6 Stairwell pressurization.
 - .7 Emergency Lighting.

12 Sample Commissioning Documents

- .1 Refer to attached Section 01 91 14, 20 pages.

13 General Commissioning

- .1 Sample forms only. All tests and procedures to be developed by Design Builder's Independent Commissioning Agent.

END OF Section

1 Component Verification

DB Design Team:

File No.
 Project Name:
 Project Number:
 Project Location:

EQUIPMENT DATA:

Manufacturer
 Type
 Model Number
 Serial Number

Building
 Area
 Floor
 room

LOCATION DATA:

NAMEPLATE DATA:

GPM
 Head Pressure
 Voltage/Phase
 Amperage
 RPM
 HP

Specified	Shop Drawings	Installed	Verified

250 (10)

SUPPORT DOCUMENTS:

Manufacturer's report	Y / N / NA	Comments:	
Manufacturer's certificates	Y / N / NA	Comments:	
Pump & Fans Curves attached	Y / N / NA	Comments:	
DB start-up report	Y / N / NA	Comments:	

Comments

SIGN-OFFS:

Design Builder Manager: _____ Date: _____

DB Design Team: _____ Date: _____

Department/Representative: _____ Date: _____

Component Verification Sheet		Section: XX XX XX
System: Chilled Water	Equipment: PUMP	Tag: HWP-01
Prepared By: _____		

2 System Performance Verification

Project Name Page X of X
Project No: XXXX

Air Handling AHU-1 Test M-1(note: unique
test ID mechanical test M-1)

1. Test Purpose

- .1 The intent is to test all HVAC and EMCS components through a series of checks and procedures designed to exercise the control system as it would be used in normal and abnormal operating conditions.
- .2 To ensure system operation is as per contract documents.
- .3 Make adjustments to system components as required to suit the design intent and operational requirements.
- .4 "DB" denotes Design Builder's Own Forces sign off.
- .5 "DBCA" denotes Design Builder's Independent Commissioning Agent's verification.

2. System Design and operation narrative

Note: Describes the design philosophy of the system and narrates the operation and operational control parameters.

AHU-1 and its corresponding return air fan RF-1 maintain the pressurization of the second floor at approximately 20 Pa by the modulation of the fans by VSD-1 (supply fan) and VSD-2. (return fan)

3. Test Pre-Requisites

.1 Mechanical:

	DB	DBCA
.1 All component verifications are complete and approved	[]	[]
.2 Air system balancing is complete and approved	[]	[]
.3 Heating is operational and verified	[]	[]
.4 Cooling is operational and verified	[]	[]
.5 Humidification is operational and verified	[]	[]
.6 Hydronic balance is complete and approved	[]	[]

	DB	DBCA
.2 Controls:		
.1 All component verifications are complete and approved	[]	[]
.2 All control device calibrations and physical point verifications are complete and approved.	[]	[]
.3 All manual overrides and jumpers have been removed to allow for automatic / normal operation	[]	[]
.4 Final control program is loaded and operational	[]	[]
.5 All hardwired interlocks and safeties (if any) are operational	[]	[]
.6 All software interlocks and safeties (if any) are operational	[]	[]
.7 All trend logs, if required, are operational for: Physical points, setpoints and performance variables	[]	[]
4. Modes of Operation are Set-Up and Functioning		
.1 System Modes:		
1. Off mode - system shuts down	[]	[]
2. Occupied mode - system starts up	[]	[]
3. Unoccupied mode - system air volumes, go to minimum position	[]	[]
.2 Operating Modes:		
1. Heating mode - heating coils and pumps enabled	[]	[]
2. Evap cooling mode - humidifier valves enabled	[]	[]
3. Cooling mode - cooling coil enabled	[]	[]
4. Humidification mode - humidifier valves enabled	[]	[]

	DB	DBCA
.5 System Start/Stop Sequencing		
.1 System equipment status at shut down		
1. Supply fan is off and variable speed drive is set to minimum position	[]	[]
2. The relief fan is off and variable speed drive is set to minimum position	[]	[]
3. Outside air damper is closed	[]	[]
4. Relief air damper is closed	[]	[]
5. Chilled water cooling coil valve is closed	[]	[]
6. The heat recovery loop 3 way valve shall be closed to the return line from the relief air recovery coil	[]	[]
7. The heating coil exchanger valve is closed	[]	[]
8. The heating coil duty and standby pumps are off	[]	[]
9. The heat recovery pump is off	[]	[]
10. The evap cooler valves are closed Control loops are disabled	[]	[]
11. Exhaust fan EF-41 is disabled	[]	[]
12. Dust collector DC-1 disabled	[]	[]
.2 System equipment start-up sequence		
1. If outdoor temperature is less than the supply air temperature setpoint, the heating coil duty pump shall start and the heating coil heat exchanger valve shall open to 100%	[]	[]
2. If the duty heating coil pump fails to start the standby pump starts	[]	[]
3. After a time delay the relief air damper shall open time delay set at 5 min.	[]	[]
4. The relief air fan shall start when the relief damper is fully open.(Hardwire interlock) on fan start-up ramp the fan to 10% speed	[]	[]
5. When relief fan is proven to be running the outside air damper opens	[]	[]
6. When the outside air damper is fully open the supply fan starts(hardwire interlock) on fan start-up ramp the fan to 10% speed	[]	[]
7. If the outside air temperature is below 13 Deg. C. start the heat recovery loop pump	[]	[]
8. Enable the control loops	[]	[]

DB DBCA

6. Operating Sequences

- | | | | |
|----|--|-----|-----|
| .1 | System to run continuously when commanded through the EMCS | [] | [] |
| .2 | Supply fan speed is varied to satisfy supply duct static pressure of <u>250</u> Pa | [] | [] |
| .3 | Relief fan speed is varied to satisfy relief duct static pressure of <u>250</u> Pa | [] | [] |
| .4 | Heat recovery loop valve, heating coil valve, evaporative cooling and cooling coil valve modulate in sequence to satisfy the supply air temperature setpoint of 12 ⁰ C. | [] | [] |
| .5 | Heating | | |
| 1. | Modulate heat recovery loop valve to satisfy the heat recovery coil leaving air temperature setpoint of <u>12</u> ⁰ C | [] | [] |
| 2. | Modulation of the heat recovery loop valve shall not allow the exhaust air temperature to drop below 5 ⁰ C | [] | [] |
| 3. | Modulate the heating coil heat exchanger valve to satisfy the heating coil leaving air setpoint temperature of <u>12</u> ⁰ C | [] | [] |
| 4. | The heating coil valve and cooling coil valve shall not be open at the same time | [] | [] |
| 5. | Alternative heating coil duty and standby pumps every 200 hours | [] | [] |
| .6 | Cooling | | |
| 1. | First stage of cooling is the evaporative cooler | [] | [] |
| 2. | Open 2 evaporative cooler 2 position valves as required to satisfy the supply air temperature setpoint of <u>12</u> ⁰ C | [] | [] |
| 3. | Humidity limitations override temperature requirements | [] | [] |
| 4. | When the evaporative cooler can no longer satisfy supply air temperature setpoint, close the evaporative cooler valves | [] | [] |
| 5. | Cooling coil valve modulates to satisfy the supply air temperature setpoint with all evaporative cooler valves closed | [] | [] |

		DB	DBCA
.7	Operate the 2 @ 2 position evaporative cooler valves as required to satisfy the relief air humidity setpoint	[]	[]
.8	Setpoint schedule is as follows: OAT> 15 Deg. C.45% RH -20 <OAT <15 Deg. C.25% RH OAT <-20 Deg. C.20%	[] [] []	[] [] []
.9	Supply air temperature setpoint reduces if all reheat coil valves are closed	[]	[]
.10	Supply air temperature setpoint increases if all reheat coil valves are open	[]	[]
.11	Exhaust fan EF-41 is enabled when system is in occupied mode	[]	[]
.12	Exhaust fan EF-41 is disabled when system is in unoccupied mode or off mode	[]	[]
.13	Dust collector DC-1 is enabled when system is in occupied mode	[]	[]
.14	Dust collector DC-1 is disabled when system is in unoccupied mode or off mode	[]	[]
7.	Alarms and Status		
.1	Supply fan failure causes: 1. Alarm at OWS 2. Close supply and relief dampers 3. Relief fan shall stop when relief damper closes 4. Return system to off position	[] [] [] []	[] [] [] []
.2	Relief fan failure causes: 1. Alarm at OWS 2. Close supply and relief dampers 3. Relief fan shall stop when relief damper closes 4. Return system to off position	[] [] [] []	[] [] [] []
.3	Heating coil duty pump failure causes: 1. Alarm at OWS 2. Standby pump starts	[] []	[] []
.4	Heating coil standby pump failure causes: 1. Alarm at OWS	[]	[]
.5	Heat recovery loop pump failure causes: 1. Alarm at OWS	[]	[]

		DB	DBCA
.6	Low supply air temperature causes:		
1.	Hardwire interlock will close dampers and turn off fans	[]	[]
2.	Turn heating coil pump on and drive heating coil heat exchanger valve fully open	[]	[]
3.	Turn heat recovery pump on and drive heat recovery valve fully open	[]	[]
4.	Drive chilled water coil valve fully closed	[]	[]
5.	Setpoint temperature is 5 ⁰ C.	[]	[]
.7	High supply duct static pressure causes:		
1.	Hardwire interlock closes dampers and turns fans off	[]	[]
2.	Return system to off position	[]	[]
3.	Setpoint pressure is <u>1000</u> Pa	[]	[]
.8	High relief air duct static pressures causes:		
1.	Hardwire interlock closes dampers and turns fans off	[]	[]
2.	Return system to off position	[]	[]
3.	Setpoint pressure is <u>1000</u> Pa	[]	[]
.9	Failure of supply air temperature sensor in cooling mode causes:		
1.	Modulate cooling coil valve to maintain return air temperature of 22 ⁰ C	[]	[]
.10	Failure of supply air temperature sensor in heating mode causes:		
1.	Modulate preheat and recovery coil to satisfy heat recovery coil leaving air temperature setpoint	[]	[]
.11	Failure of heating coil leaving air temperature sensor causes:		
1.	Drive heat recovery valve fully open and modulate heating coil heat exchanger valve to satisfy the supply air temperature setpoint	[]	[]
.12	Failure of supply duct static pressure sensor causes:		
1.	If one sensor fails, vary fan speed to satisfy remaining sensor	[]	[]
2.	If both sensors fail keep supply fan speed at last commanded position	[]	[]

DB DBCA

- .13 Failure of relief duct static pressure sensor causes:
 - 1. If one sensor fails, vary fan speed [] []
to satisfy remaining sensor
 - 2. If both sensors fail keep supply fan [] []
speed at last commanded position
- .14 Failure of return air relative humidity sensor causes:
 - 1. Alarm at OWS [] []
 - 2. Evaporative cooler valves remain at [] []
last position
- .15 Failure of supply air relative humidity sensor causes:
 - 1. Alarm at Owners [] []
 - 2. Evaporative cooler valves remain at [] []
last position
- .16 An alarm is generated at the OWS if EF-41 [] []
fails to start 3 min. after start command
- .17 An alarm is generated at the Owners if any [] []
supply or exhaust air terminal unit air
volume is more than 10% above or below
setpoint

8. Test Sign Off:

Testing Personnel: (Sub-Contractor/CM Own Forces)

Firm: _____

Signature : _____

Witnessed By: (Department Representative)

Firm: _____

Signature : _____

Witnessed and approved By: (CM Design Team)

Firm: _____

Signature : _____

COMMENTS:

3 Integrated Systems Performance Verification

Project Name
Project No:XXXX

Page 1 of

Integrated Life Safety System Test: IST1

Note: This is a generic test. It can be used as a guide to develop a project specific test. The project specific test will be developed jointly by the Architectural, Mechanical and Electrical consultants. It is intended to commission and verify the interaction of the building Life Safety Systems including their interactions with other building systems through a sequence of operation in accordance with the design intent. It will include the following modes:

Mode 1: Fire Alarm + Normal Power

A fire alarm is initiated via a pull station. The response of the fire alarm, designed interactions with other life safety systems and interactions with other building systems will be identified in this test procedure as sequences and are to be verified when executing this test.. The fire alarm should not be reset and remain in alarm with the pull station still operated during the transition of normal to emergency power and mode 2.

Mode 2: Fire Alarm + Emergency Power

The utility power is switched off. The transition from normal power to emergency power and the operation and interactions of Life Safety Systems and other building systems when on emergency power will be identified in this test procedure as sequences in accordance with the design. These sequences are to be verified when executing this test. Fire Alarm Audible Levels can be measured and verified at this time.

Mode 3: Emergency Power

The Fire Alarm pull station and fire alarm panel is reset. Verification of designed functionality of the building systems under emergency power would occur in this mode via sequences identified in this test procedure. These sequences are to be verified when executing this test. Emergency Egress lighting levels can be measured and verified at this time.

Mode 4: Building electrical system blackout + Fire Alarm

A fire alarm is initiated via a pull station. The Emergency generator is shut down (preferably by simulated failure) Security system functionality is verified with reference to design intent with respect to egress from the building and access to key areas in the building.

Mode 5: Emergency Power + Fire Alarm

A fire alarm is initiated via a pull station. The response of the fire alarm, designed interactions with other life safety systems and interactions with other building systems will be identified in this test as sequences and be verified during this test.. The fire alarm should not be reset and remain in alarm with the pull station still operated during the transition and restoration of normal power in mode 5.

Mode 6: Revert to Normal Power

The Utility power is restored. Transition from emergency power to normal power occurs and the operation of Life Safety Systems and other building systems through this transition will be identified in this test as sequences and verified according to the design.

1. Test Purpose

- .1 To test the Integrated functionality between Life Safety Systems including interactions with other building systems through a series of checks and procedures and verify it is according to the design intent.
- .2 To ensure system operation is as per contract documents.
- .3 Make adjustments to systems as required to suit the design intent and operational requirements.
- .4 “DB” denotes Design Builder’s Own Forces sign off. “DBCA” denotes Design Builder’s Independent Commissioning Agent’s verification.

2. System Design and operation narrative

Note: Describes briefly the design philosophy of the systems, the operation of Life Safety Systems, their interactions, and their interactions with other building systems.

3. Test Pre-Requisites

- .1 Mechanical (Note: list life safety systems and other systems which interact to provide life support, facilitate emergency egress and maintain the client’s critical operations. Confirm these systems have been commissioned, results approved and deficiencies which would impact this test are resolved)

		DB	DBCA
.1	AHU-1 System Test is complete and approved		
.2	AHU-2 System Test is complete and approved		
.3	AHU-3 System Test is complete and approved		
.4	SEF-1 Atrium exhaust fan System Test is complete and approved		
.5	AC-1 LAN room air conditioning System Test is complete and approved		
.6	SP-1 Stairwell pressurization fan System Test is complete and approved		
.7	SP-2 Stairwell pressurization fan System Test is complete and approved		
.8	Fire Protection System is Tested and verified		
.9	CHE-1 Chiller room Exhaust Fan System Test is complete and approved		
.10			

- .2 Electrical (Note: list life safety systems and other systems which interact to provide life support, facilitate emergency egress and maintain the client's critical operations. Confirm these systems have been commissioned, results approved and deficiencies which would impact this test are resolved)

		DB	DBCA
.1	Fire Alarm System has been verified and approved		
.2	Emergency Power System Test is complete and approved		
.3	Elevator 1 and 2 have been tested and verified		
.4	Security System has been tested and verified		
.5	Lighting control system has been tested and verified		
.6	Motor Control Centers have been tested and verified		
.7	Emergency Generator Day Tank TK-1 has a max of 1 hour of fuel available		

- .3 Controls:

		DB	DBCA
.1	All manual overrides and jumpers have been removed to allow for normal/automatic operation.		
.2	Final control program is loaded and operational		
.3	All hardwired interlocks and safeties are operational		
.4	All software interlocks and safeties are operational		
.5	All Systems are operating in occupied mode		

- .4 EMCS Trends: (Note: Set Up trends in the EMCS as support documentation, provide in hard copy & electronic format)

Set up the following trend logs the day prior to the test

		DB	DBCA
.1	Fire Alarm status		
.2	Emergency Generator Status		
.3	AHU-1 Occupied /Unoccupied status		
.4	AHU-2 Occupied /Unoccupied status		
.5	AHU-3 Occupied /Unoccupied status		
.6	AC-1 LAN room air conditioning unit status		
.7	HP-1 Heating water pump 1 status		
.8	HP-2 Heating water Pump 2 Status		
.9	B-1 Heating Boiler status		
.10	B-2 Heating Boiler Status		
.11	SEF-1 Atrium exhaust fan status		
.12	SP-1 Stairwell pressurization fan status		
.13	SP-2 Stairwell pressurization fan status		
.14	CHE-1 Chiller room Exhaust Fan status		

6. Mode 2: Fire Alarm + Emergency Power

		DB	DBCA
.1	Open the Main Utility Breaker MB-1 Date: Time:		
.2	Fire Alarm continues to operate in stage 2 alarm, audible and strobes continue to operate		
.3	EMCS work station and panels remain powered via central UPS		
.4	Emergency Generator starts, runs up to rated speed & voltage, Transfer switch operates.		
.5	Transition from normal to emergency time was less than 10 seconds: Transfer time: secs		
.6	Generator combustion air damper CA-1 opens		
.7	Generator room Intake and relief damper operate correctly		
.8	AHU-4 modulates to maintain generator room temperature set point of 21 deg C		
.9	Emergency Generator room battery pack emergency lighting operates through power transfer		
.10	Mechanical Penthouse battery pack emergency lighting operates through power transfer		
.11	Main Electrical Switch room battery pack emergency lighting operates through power transfer		
.12	Main Fire Alarm Panel monitor indicates the emergency Generator is running		
.13	SP-1 & 2 Stairwell pressurization fans re-start following the 10 sec power interruption		
.14	CHEF-1 Chiller room Exhaust Fan re-starts following the 10 sec power interruption		
.15	SEF-1 Atrium exhaust fan re-starts following the 10 sec power interruption		
.16	Smoke dampers SD-1,SD-2,SD-3,SD-4 remain closed		
.17	Doors with magnetic hold open devices FD-1, FD-2, FD-3, FD-4, FD-5 remain released		
.18	Elevators 1 & 2 remain homed to main floor		
.19	Verify Emergency Exit signage continues to operate		
.20	Verify by measurement that fire alarm audible levels meet NBC requirements		
.21	Central UPS maintained connected loads throughout the normal to emergency power transfer		
.22			
.23			
.24			
.25			
.26			

7. Mode 3: Emergency Power

		DB	DBCA
.1	Reset Fire Alarm Pull Station and Fire Alarm Panel		
.2	SP-1 & 2 Stairwell pressurization fans stop		
.3	CHEF-1 Chiller room Exhaust Fan continues to run		
.4	SEF-1 Atrium exhaust fan stops		
.5	Smoke dampers SD-1,SD-2,SD-3,SD-4 open		
.6	AC1- LAN room air conditioner starts		
.7	Confirm Elevator 1 is fully operable on emergency power		
.8	Initiate water flow on 3 rd floor stand pipe, packaged fire pump starts and delivers specified flow		
.9	Measure Emergency egress lighting levels and confirm they meet NBC		
.10	HP-1 Heating water pump operates and maintains pressure set point		
.11	HP-2 Heating water Pump, confirm fail over of this pump when HP-1 stops		
.12	B-1 & B-2 Boilers are operational & modulate maintain heating water temperature set point		
.13	Emergency Generator TK1-LL Day Tank low level initiates fuel transfer		
.14	FTP-1 or 2 Fuel Transfer Pumps Transfer fuel to TK-1 day tank until TK1-HL met		
.15	Emergency generator runs for 2 hours within specified operating parameters (attach log)		
	.		

.8 Mode 4: Building electrical system blackout + Fire Alarm

		DB	DBCA
.1	Initiate a Fire Alarm manual pull station: Date Time Loc		
.2	Shutdown Emergency Generator		
.3	Fire Alarm Panel in main lobby indicates the point in alarm and is in first stage alarm		
.4	Fire Alarm Five minute timer is started		
.5	EMCS logs fire alarm in alarm review screen as Fire Alarm first stage Alarm		
.6	All horns are operating at 20 strokes / minute		
.7	Fire Alarm Second Stage general Alarm occurs after five minutes		
.8	EMCS logs fire alarm in alarm review screen as Fire Alarm second stage Alarm		
.9	All Fire Alarm Horns sound at 120 strokes / minute, strobes are flashing		
.10	Security system remains operative for egress from the building		
.11	Security system allows access to penthouse and generator spaces		
.12			
.13			
.14			
.15			
.16			
.17			

9. Mode 5: Emergency Power + Fire Alarm

		DB	DBCA
.1	Send elevator 1 to the 3 rd floor		
.2	Initiate a Fire Alarm manual pull station: Date Time Loc		
.3	Fire Alarm Panel in main lobby indicates the point in alarm and is in first stage alarm		
.4	Fire Alarm Five minute timer is started		
.5	EMCS logs fire alarm in alarm review screen as Fire Alarm first stage Alarm		
.6	All horns are operating at 20 strokes / minute		
.7	AC-1 LAN room shuts down,		
.8	SP-1 & 2 Stairwell pressurization fans start		
.9	CHEF-1 Chiller room Exhaust Fan continues to run		
.10	SEF-1 Atrium exhaust fan starts		
.11	Smoke dampers SD-1,SD-2,SD-3,SD-4 close		
.12	Doors with magnetic hold open devices FD-1, FD-2, FD-3, FD-4, FD-5 close		
.13	Elevator 1 homes to Main floor (no alternative floor sequence)		
.14	Fire Alarm Second Stage general Alarm occurs after five minutes		
.15	EMCS logs fire alarm in alarm review screen as Fire Alarm second stage Alarm		
.16	All Fire Alarm Horns sound at 120 strokes / minute, strobes are flashing		
.17			

10. Mode 6: Revert to Normal Power

		DB	DBCA
.1	Close Main Utility Breaker MB-1		
.2	Emergency Power Transfer switch returns facility to normal power in 5 minutes .		
.3	UPS prevents connected loads from experiencing a power interruption		
.4	Emergency Generator runs (cools) for 5 minutes then shuts down		
.5	Fire alarm remains in stage 2 general alarm and operates normally during the transition from emergency to normal power		
.6	Reset Fire Alarm Pull Station and Fire Alarm Panel		
.7	SP-1 & 2 Stairwell pressurization fans stop		
.8	CHEF-1 Chiller room Exhaust Fan continues to run		
.9	SEF-1 Atrium exhaust fan stops		
.10	Smoke dampers SD-1,SD-2,SD-3,SD-4 open		
.11	AC1- LAN room air conditioner starts		
.12			

11. Test Sign Off:

Testing Personnel: (Sub-Contractor/CM Own Forces)

Firm: _____

Signature : _____

Witnessed By: (Department Representative)

Signature : _____

Witnessed and approved By: (CM Design Team)

Firm: _____

Signature : _____

COMMENTS:
