

The City of Winnipeg
439-2021_NMS_Format Specifications

1.01 ACCESS AND EGRESS

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

1.02 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of adjacent premises. Make arrangements with Contract Administrator to facilitate work as stated.
- .2 Closures: Protect work temporarily until permanent enclosures are completed.
- .3 Facility access shall be provided 24 hours a day, seven days a week.
- .4 Secure facilities at end of each workday.

1.03 SITE SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions.

END OF SECTION

1.01 RELATED REQUIREMENTS

- .1 City of Winnipeg Request For Information (RFI) v1.0, as appended to this Section.

1.02 REQUESTS FOR INFORMATION

- .1 General: Immediately upon discovery of the need for interpretation of the Contract Documents, prepare and submit a Request for Information (RFI) to the Contract Administrator in the form specified herein.
 - .1 Coordinate and submit RFIs in a prompt manner to avoid delays in the Work.
 - .2 Keep each RFI to one specific item only. Do not combine several items requiring interpretation into one RFI.
 - .3 For RFIs submitted by email include project name, RFI reference number and RFI subject in the email heading.
- .2 Contract Administrator will only consider RFIs submitted by the Contractor. Contract Administrator will not accept, review, or reply to RFIs submitted by Subcontractors, Suppliers or other entities under Contract with the Contractor.
- .3 Content of the RFI: Follow input requirements as illustrated the City's Request for Information (RFI) Submittal form.
 - .1 Attachments:
 - .1 Include detail drawings, sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to describe items requiring interpretation.
 - .2 Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached drawings and sketches.

1.03 RFI SUBMITTAL FORM

- .1 Complete the City's Request for Information (RFI) Submittal form, as appended to this Section.
- .2 Submit RFI form and attachments as electronic files in Adobe Acrobat PDF format.

1.04 NUISANCE OR REDUNDANT RFI

- .1 Contract Administrator will not respond to nor reply to the following Contractor-generated nuisance or redundant RFI's.
 - .1 Requests for approval of submittals.
 - .2 Requests for approval of substitutions.
 - .3 Requests for approval of Contractor's means and methods.
 - .4 Requests for approval of corrective actions for deficient Work.
 - .5 Requests for coordination information already indicated in the Contract Documents.
 - .6 Requests for adjustments in the Contract Time or the Contract Price.
 - .7 Requests for interpretation of Contract Administrator's response on submittals.
 - .8 Incomplete or inaccurately prepared RFIs.
- .2 Do not list nuisance and redundant RFI's in the RFI log.

1.05 CONTRACT ADMINISTRATOR'S RESPONSE

- .1 Contract Administrator will review each RFI, determine action (or no action) required, and submit his reply to the Contractor.
- .2 Allow five working days for Contract Administrator's response time for each RFI. RFI's that are received by the Contract Administrator after [1:00 pm] on working days will be considered as have been received on the next working day.
- .3 Contract Administrator's failure to reply to any RFI within the time period specified above or within a reasonable time period, as determine by the Contract Administrator, will not be considered a reason for a delay claim by the Contractor.
- .4 The Contract Administrator may extend the response time for any RFI at his discretion. Reasons may include, but not necessarily be limited to, the following:
 - .1 Too many RFIs submitted on the same day or within a short time period.
 - .2 RFI's which require extensive review and research by the Contract Administrator, which may include requests for additional information from other sources, the timing of which the Contract Administrator has no control.
 - .3 RFIs which, in the Contract Administrator's opinion, will have no significant impact on the construction progress schedule and therefore may be deferred for a reasonable period of time.
- .5 Contract Administrator's action may include a request for additional information, in which case Contract Administrator's response time will be re-adjusted to the date when the additional information is received by the Contract Administrator.
- .6 If Contractor believes the Contract Administrator's RFI response warrants a change in the Contract Time or the Contract Price, notify the Contract Administrator in writing within [five] days of receipt of the Contract Administrator's RFI response.

1.06 CONTRACTOR'S RESPONSE

- .1 On receipt of Contract Administrator's response to an RFI:
 - .1 Update RFI log as specified herein.
 - .2 Review response and, submit a reply to the Contract Administrator, within [five] working days of receipt of Contract Administrator response, stating whether the Contract Administrator's response is either acceptable or not acceptable.
- .2 If Contract Administrator's response is acceptable:
 - .1 Distribute the response to affected parties and proceed accordingly.
- .3 If Contract Administrator's response is considered not acceptable:
 - .1 Resubmit the RFI and include reason(s) for disagreement.
 - .2 Contract Administrator will review and submit a reply to the Contractor within 5 working days of receipt of resubmittal, notwithstanding the Contract Administrators extension of response time as specified herein.

END OF SECTION



Request for Information (RFI)

Date Submitted:

RFI No.:

Project Name:

Date Response Required by:

Submitted To:

Contract Administrator (CA):	<input type="text" value="Click here to enter name of Contact Administrator."/>
Department/Firm:	<input type="text" value="Click here to enter CA's Dept/Firm."/>

Consultant Ref. No.	<input type="text" value="Click here to enter Reference No."/>
Bid Opportunity No.	<input type="text" value="Click here to enter Bid Opp. No."/>

Requested By:

Name:	<input type="text" value="Click here to enter name."/>
Title:	<input type="text" value="Click here to enter Title."/>
Firm:	<input type="text" value="Click here to enter Firm name."/>
Email/Tel:	<input type="text" value="Click here to enter email/tel."/>

For City Office use	City File No.:	<input type="text" value="Click here to enter City File No."/>
	Project ID:	<input type="text" value="Click here to enter Project ID."/>
	Project Record Index No.:	<input type="text" value="Click here to enter PRI No."/>
	Purchase Order No.:	<input type="text" value="Click here to enter PO No."/>

For details and instructions on how to complete this document, click the [1] icon under the Home tab to display the hidden text.

Request/Question: (to be completed by Contractor)

Answer/Response: (to be completed by Contract Administrator)

Attachment(s):

RFI Response Distribution: (to be completed by Contract Administrator)

- Contract Administrator
- Contractor
- City Project Manager
- Consultant
- Other:

1.01 RELATED DOCUMENTS

- .1 Builders' Liens Act (Manitoba).

1.02 SCHEDULE OF VALUES

- .2 Submit to Contract Administrator, Schedule of Values, at least 15 days prior to submitting first Application for Payment.
- .3 Use Schedule of Values as basis for Contractor's Progress Claim.
- .4 Form of Submittal:
 - .1 Submit typewritten Schedule of Values on letter size white paper.
 - .2 Use Table of Contents of this Tender as basis for format for listing costs of work for Sections under all Divisions.
 - .3 Identify each line item with number and title as listed in Table of Contents of this Tender.
- .5 Itemize separate line item cost for work required by each Section of this Tender.
- .6 After review by Contract Administrator, revise and resubmit Schedule as directed.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Start-up meeting, progress meetings and reports.

1.02 MEETING LOCATION

- .1 Project meetings shall be held in site office provided by Contractor as specified in Section 01 52 00 - Construction Facilities.

1.03 CONSTRUCTION START-UP MEETING

- .1 After award of Contract, but before start of Work, Contract Administrator shall convene a start-up meeting to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of the Contract Administrator, Contractor, and major Subcontractors are to attend.
- .3 Contract Administrator shall establish time and location of meeting and notify all concerned parties within five working days of meeting.
- .4 Contract Administrator shall chair meeting, record minutes, and distribute minutes to all attending parties within four working days after meeting.
- .5 Agenda:
 - .1 Appointment of official representatives of participants in the work.
 - .2 Lines of communication.
 - .3 Schedule of work, progress scheduling.
 - .4 Critical work sequencing and long-lead items.
 - .5 Deliveries
 - .6 Access
 - .7 Procedures for RFIs.
 - .8 Submittal procedures
 - .9 Schedule of submission of shop drawings, product data, samples, test reports,
 - .10 Schedule for provision of mock-ups and field samples.
 - .11 Preconstruction photographs
 - .12 Procedures for changes, field decisions, change orders, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .13 City-furnished products
 - .14 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .15 Safety
 - .16 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .17 Requirements for temporary utilities, temporary barriers and controls, construction facilities, site sign and other temporary construction.
 - .18 Record drawings in accordance with Section 01 78 00 - Project Closeout.
 - .19 Maintenance Manuals in accordance with Section 01 78 00 - Project Closeout.

- .20 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Project Closeout.
- .21 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .22 Appointment of inspection and testing agencies or firms in accordance with Section 01 40 00 - Quality Requirements.
- .23 Insurances and transcript of policies.
- .24 Commissioning

1.04 JOB PROGRESS MEETINGS

- .1 After award of Contract and signing of Agreement, Contractor will convene job progress meetings at regularly scheduled intervals to ensure proper coordination of the Work.
- .2 Designate times and locations of meetings, and notify all parties concerned, including Subcontractors, a minimum five days prior to meetings.
- .3 Chair meetings, record minutes, and distribute minutes to all attending parties within four working days after meetings.
- .4 Agenda to generally 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 and comparison to initial Gantt-Chart Schedule.
 - .8 Review schedule progress, during succeeding work period and comparison to initial Gantt-Chart Schedule.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for effect on construction schedule and on completion date.
 - .12 Health and Safety.
 - .13 Other business.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - .1 Startup construction schedule.
 - .2 Contractor's Construction Schedule.
 - .3 Construction schedule updating reports.
 - .4 Daily construction reports.
 - .5 Material location reports.
 - .6 Site condition reports.
 - .7 Unusual event reports.

1.02 DEFINITIONS

- .1 Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - .1 Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - .2 Predecessor Activity: An activity that precedes another activity in the network.
 - .3 Successor Activity: An activity that follows another activity in the network.
- .2 Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- .3 CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- .4 Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- .5 Event: The starting or ending point of an activity.
- .6 Float: The measure of leeway in starting and completing an activity.
 - .1 Float time is not for the exclusive use or benefit of either City or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - .2 Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - .3 Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- .7 Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Format for Submittals: Submit required submittals in the following format:
 - .1 Working electronic copy of schedule file, where indicated.

- .2 Startup construction schedule.
 - .1 Submittal of cost-loaded, start-up construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- .3 Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- .4 Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - .1 Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- .5 CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - .1 Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - .2 Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 - .3 Total Float Report: List of activities sorted in ascending order of total float.
 - .4 Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- .6 Construction Schedule Updating Reports: Submit with Applications for Payment.
- .7 Daily Construction Reports: Submit at weekly intervals.
- .8 Material Location Reports: Submit at weekly or monthly intervals.
- .9 Site Condition Reports: Submit at time of discovery of differing conditions.
- .10 Unusual Event Reports: Submit at time of unusual event.
- .11 Qualification Data: For scheduling consultant.

1.04 QUALITY ASSURANCE

- .1 Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 19 - Project Meetings. Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - .1 Review software limitations and content and format for reports.
 - .2 Verify availability of qualified personnel needed to develop and update schedule.
 - .3 Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy.
 - .4 Review delivery dates for City-furnished products.
 - .5 Review schedule for work of City separate contracts.
 - .6 Review submittal requirements and procedures.
 - .7 Review time required for review of submittals and resubmittals.
 - .8 Review requirements for tests and inspections by independent testing and inspecting agencies.

- .9 Review time required for Project closeout and City start-up procedures, including commissioning activities.
- .10 Review and finalize list of construction activities to be included in schedule.
- .11 Review procedures for updating schedule.

1.05 COORDINATION

- .1 Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - .1 Secure time commitments for performing critical elements of the Work from entities involved.
 - .2 Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.06 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- .1 Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - .1 Use Microsoft Project, Primavera, Meridian Prolog for current Windows operating system.
- .2 Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - .1 Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- .3 Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - .1 Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Consultant.
 - .2 Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - .3 Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - .4 Startup and Testing Time: Include no fewer than 30 days for startup and testing.
 - .5 Commissioning Time: Include no fewer than 30 days for commissioning.
 - .6 Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Consultant's administrative procedures necessary for certification of Substantial Completion.
 - .7 Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- .4 Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
 - .1 Phasing: Arrange list of activities on schedule by phase.
 - .2 Work under More Than One Contract: Include a separate activity for each contract.
 - .3 Work by City: Include a separate activity for each portion of the Work performed by City.

- .4 City-Furnished Products: Include a separate activity for each product. Include delivery date Delivery dates to stipulate the earliest possible delivery date.
- .5 Work Restrictions: Show the effect of the following items on the schedule:
 - .1 Coordination with City site activities.
 - .2 Limitations of continued occupancies.
 - .3 Uninterruptible services.
 - .4 Partial occupancy before Substantial Completion.
 - .5 Use-of-premises restrictions.
 - .6 Seasonal variations.
 - .7 Environmental control.
- .6 Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - .1 Subcontract awards.
 - .2 Submittals.
 - .3 Purchases.
 - .4 Fabrication.
 - .5 Sample testing.
 - .6 Deliveries.
 - .7 Installation.
 - .8 Tests and inspections.
 - .9 Adjusting.
 - .10 Curing.
 - .11 Startup and placement into final use and operation.
 - .12 Commissioning.
- .7 Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - .1 Structural completion.
 - .2 Temporary enclosure and space conditioning.
 - .3 Completion of mechanical installation.
 - .4 Completion of electrical installation.
 - .5 Substantial Completion.
- .8 Other Constraints: Community material resources.
- .5 Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, piling, Substantial Completion, and final completion.
- .6 Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
- .7 Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - .1 Unresolved issues.
 - .2 Unanswered Requests for Information.

- .3 Rejected or unreturned submittals.
- .4 Notations on returned submittals.
- .5 Pending modifications affecting the Work and the Contract Time.
- .8 Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - .1 Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - .2 Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - .3 As the Work progresses, indicate final completion percentage for each activity.
- .9 Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- .10 Distribution: Distribute copies of approved schedule to Consultant, City, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - .1 Post copies in Project meeting rooms and temporary field offices.
 - .2 When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.07 STARTUP CONSTRUCTION SCHEDULE

- .1 Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- .2 Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- .3 Gantt-Chart Schedule to be consistent with the schedule submitted by the Contractor in their Bid.

1.08 CPM SCHEDULE REQUIREMENTS

- .1 General: Prepare network diagrams using AON (activity-on-node) format.
- .2 Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- .3 CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.

- .1 Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - .1 Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
 - .2 Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - .3 Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - .4 Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- .4 CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
- .1 Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - .1 Preparation and processing of submittals.
 - .2 Mobilization and demobilization.
 - .3 Purchase of materials.
 - .4 Delivery
 - .5 Fabrication
 - .6 Utility interruptions
 - .7 Installation
 - .8 Work by City that may affect or be affected by Contractor's activities.
 - .9 Testing and inspection
 - .10 Commissioning
 - .11 Punch list and final completion.
 - .12 Activities occurring following final completion.
 - .2 Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 - .3 Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 - .4 Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - .1 Subnetworks on separate sheets are permissible for activities clearly off the critical path.

- .5 Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Consultant's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, sustainable design documentation, and demonstration and training (if applicable), in the amount of five percent of the Contract Sum.
 - .1 Each activity cost shall reflect an appropriate value subject to approval by Consultant.
 - .2 Total cost assigned to activities shall equal the total Contract Sum.
- .5 Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- .6 Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 - .1 Contractor or subcontractor and the Work or activity.
 - .2 Description of activity.
 - .3 Main events of activity.
 - .4 Immediately preceding and succeeding activities.
 - .5 Early and late start dates.
 - .6 Early and late finish dates.
 - .7 Activity duration in workdays.
 - .8 Total float or slack time.
 - .9 Average size of workforce.
 - .10 Dollar value of activity (coordinated with the schedule of values).
- .7 Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - .1 Identification of activities that have changed.
 - .2 Changes in early and late start dates.
 - .3 Changes in early and late finish dates.
 - .4 Changes in activity durations in workdays.
 - .5 Changes in the critical path.
 - .6 Changes in total float or slack time.
 - .7 Changes in the Contract Time.
- .8 Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
 - .1 In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 - .2 In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 - .3 In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 - .4 Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

- .1 In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
- .2 Submit value summary printouts one week before each regularly scheduled progress meeting.

1.09 REPORTS

- .1 Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - .1 List of subcontractors at Project site.
 - .2 List of separate contractors at Project site.
 - .3 List of Community Resources utilized, labour, equipment and materials
 - .4 Approximate count of personnel at Project site.
 - .5 Equipment at Project site.
 - .6 Material deliveries.
 - .7 High and low temperatures and general weather conditions, including presence of rain or snow.
 - .8 Testing and inspection.
 - .9 Accidents.
 - .10 Meetings and significant decisions.
 - .11 Unusual events.
 - .12 Stoppages, delays, shortages, and losses.
 - .13 Meter readings and similar recordings.
 - .14 Emergency procedures.
 - .15 Orders and requests of authorities having jurisdiction.
 - .16 Change Orders received and implemented.
 - .17 Change Directives received and implemented.
 - .18 Services connected and disconnected.
 - .19 Equipment or system tests and startups.
 - .20 Partial completions and occupancies.
 - .21 Substantial Completions authorized.
- .2 Material Location Reports: At weekly or monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
 - .1 Material stored prior to previous report and remaining in storage.
 - .2 Material stored prior to previous report and since removed from storage and installed.
 - .3 Material stored following previous report and remaining in storage.
- .3 Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

- .4 Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise City in advance when these events are known or predictable.
 - .1 Submit unusual event reports directly to Consultant and City within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Photographic documentation of:
 - .1 Project site and surrounding properties to record existing conditions prior to start of Work.
 - .2 Project site during course of construction to record construction progress.
 - .3 Project site at final completion of the Work to record completed work.
 - .4 Other specific items as may be requested by Contract Administrator.

1.02 DEFINITIONS

- .1 Within the content of this Section the term "photograph" shall mean "digital image".
- .2 Digital image is a still picture taken with a digital camera which can be viewed on a computer with photo editing/viewing software.

1.03 DIGITAL IMAGES

- .1 Use digital camera with capability of producing digital images at minimum 5.0 megapixels, uncompressed, saved in *.jpeg or *.tif format.
- .2 Copy (burn) each set of images onto a flash drive.
- .3 Identification: identify each disc with name and number of project, date of exposure, set number.

1.04 DISTRIBUTION

- .1 Keep one set of photographs on site.
- .2 Provide one set of photographs to Contract Administrator.

1.05 PRE-CONSTRUCTION PHOTOGRAPHS

- .1 Provide photographs of existing site features, and adjacent buildings and surrounding properties to record existing conditions prior to start of construction work, to the satisfaction of the Contract Administrator.
- .2 Allow for minimum 24 images for each set.
- .3 Number of Sets Required: Three.
- .4 Viewpoints: Exterior viewpoints including close ups of specific details in locations as determined by Contract Administrator.

1.06 CONSTRUCTION PROGRESS PHOTOGRAPHS

- .1 Provide photographs of project site during progress of the Work to record construction progress.
- .2 Provide photographs of remedial work for items of work identified by Contract Administrator as deficient, incomplete or otherwise non-conforming to contract documents.
- .3 Allow for minimum 24 images for each set.
- .4 Number of Sets Required: Three.

- .5 Number of Viewpoints: Interior and exterior viewpoints including close ups of specific details, in locations determined by Contract Administrator.
- .6 Frequency: Monthly with progress statement and as requested by Contract Administrator.

1.07 FINAL PHOTOGRAPHS

- .1 Provide photographs of project site at final completion to record completed work.
- .2 Number of Prints Required: Three.
- .3 Allow for minimum 24 images for each set.
- .4 Number of Viewpoints:
 - .1 Each adjacent building and surrounding property photographed as described in Article 1.5, and other exterior features.
 - .2 Close ups of specific details as determined by Contract Administrator.
 - .3 Locations of viewpoints as determined by Contract Administrator.

1.08 PHOTOGRAPH LABELING CONVENTION

- .1 Provide progress digital images to the Contract Administrator monthly and at final completion of work.
- .2 Label each photograph in accordance with the following naming convention example.

Project Descriptor	Element Descriptor (see Legend below)	Month	Year	Numerical Descriptor
wtgb	a-ext	12	2021	00001
Winnipeg Transit Garage Building	Architectural - Exterior			(five digits)

.3 Legend

.1 Element Descriptor

Architectural - Interior	a-int
Architectural - Exterior	a-ext
Structural	s
Mechanical	m
Electrical	e

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Shop drawings
 - .2 Product data, test reports, certificates.
 - .3 Manufacturer's instructions and field reports
 - .4 Samples

1.02 DEFINITIONS

- .1 Action Submittals: Written and graphic information and physical samples that require Contract Administrator's responsive action. Unless specifically noted otherwise in individual section, the following are considered Action Submittals:
 - .1 Product Data
 - .2 Shop Drawings
 - .3 Reports
 - .4 Closeout Submittals
- .2 Informational Submittals: Written and graphic information and physical samples that do not require Contract Administrator's responsive action. Submittals may be rejected for not complying with requirements. Unless specifically noted otherwise in individual section, the following are considered Informational Submittals:
 - .1 Certificates
 - .2 Maintenance Data
 - .3 Material Safety Data Sheets (MSDS)
 - .4 Inspection Reports
 - .5 Manufacturer's Instructions

1.03 ADMINISTRATIVE

- .1 Submit to Contract Administrator submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 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 Contract Administrator. 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 Contract Administrator, 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 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator 's review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Contract Administrator's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - .1 Submittals that are received by the Contract Administrator after 1:00 pm on working days will be considered as have been received on the next working day.
 - .2 Initial Review: Allow five working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Contract Administrator will advise Contractor when a submittal being processed must be delayed for coordination.
 - .3 Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - .4 Resubmittal Review: Allow five working days for review of each resubmittal.

1.04 SUBMITTAL SCHEDULE

- .1 Submittal Schedule: Submit, as an Action Submittal, a list of submittals, arranged in chronological order by dates required by demolition schedule. Include time required for review when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Contract Administrator and additional time for handling and reviewing submittals required by those corrections.
- .2 Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction progress schedule.
 - .1 Initial Submittal: Submit for review concurrently with the Construction Progress Schedule utilizing the Critical Path Method (CPM).
 - .1 Allow five working days for Consultant review of submittal schedule.
 - .2 Format: Arrange the following information in a tabular format:
 - .1 Scheduled date for first submittal.
 - .2 Specification Section number and title.
 - .3 Submittal Category: Action; Informational.
 - .4 Name of Subcontractor.
 - .5 Description of the Work covered.
 - .6 Scheduled date for Contract Administrator's final release or approval scheduled dates.
 - .2 Final (Revised) Submittal: Submit within 14 days of initial submittal.
 - .1 Submit revised submittal schedule to reflect Consultant review comments and changes in current status and timing for submittals.
 - .3 Progress Submittals: Submit updated Submittal Schedule at monthly intervals to coincide with project meetings.

1.05 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings for Contract Administrator's review.
- .2 This review by the Contract Administrator is for the sole purpose of ascertaining conformance with the general concept of the scope of work. This review shall not mean

that the Contract Administrator approves the content inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of their responsibilities for errors or omissions in the shop drawings or of their responsibility for meeting all requirements of the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

- .3 The term “shop drawings” means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .4 Shop drawings that do not include the stamp, date, and signature of the person responsible for reviewing the shop drawings before submittal to the Contract Administrator, will be rejected and returned without being examined.
- .5 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or registered in Province of Manitoba, Canada and who holds a “certificate of authorization” from the EGM, where specifically requested in the specifications. Shop drawings not bearing the required Engineer’s seal will be rejected and returned without being examined.
- .6 Indicate materials, methods of construction and 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .7 Adjustments made on shop drawings by the Contract Administrator are not intended to change the Contract Price. If it is deemed that such adjustments affect the value of Work, state such in writing to the Contract Administrator prior to proceeding with fabrication or the Work.
- .8 Make changes in shop drawings that the Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify the Contract Administrator in writing of any revisions other than those requested.
- .9 Accompany submissions with transmittal letter, containing:
 - .1 date,
 - .2 project title and number,
 - .3 contractor’s name and address,
 - .4 identification and quantity of each shop drawing, product data, and samples, and
 - .5 other pertinent data.
- .10 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and Address of:
 - .1 Subcontractor,
 - .2 Supplier, and
 - .3 Manufacturer.
 - .4 Contractor’s stamp, signed by Contractor’s authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:

- .1 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .2 Setting details
 - .3 Capacities
 - .4 Performance characteristics
 - .5 Standards
 - .6 Operating weight
 - .7 Relationship to adjacent work.
 - .8 Other
- .12 Submit one digital file in Adobe PDF file format of the following submittals:
- .1 Shop drawings for each requirement requested in specification sections and as the Contract Administrator may reasonably request.
 - .2 Product data sheets or brochures for requirements requested in specification Sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.
 - .3 Test reports for requirements requested in specification Sections and as requested by Contract Administrator.
 - .1 Report signed by authorized official of testing laboratory
 - .2 Testing must have been within three years of date of contract award for project.
 - .4 Certificates for requirements requested in specification Sections and as requested by Contract Administrator.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract, complete with project name.
 - .5 Manufacturers' instructions for requirements requested in specification Sections and as requested by Contract Administrator.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and material safety data sheets concerning impedances, hazards and safety precautions.
 - .6 Manufacturer's field reports for requirements requested in specification Sections and as requested by Contract Administrator.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 If upon review by the Contract Administrator, no errors or omissions in compliance with the Contract Documents are discovered or if only minor corrections are made, copies will be returned, and Work may proceed. If, however, shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through the same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

- .14 No extension of Contract Time will be allowed for delays in the Work which may be caused for Contract Administrator's rejection of shop drawings.
- .15 Shop drawings, which contain deviations from the Contract Documents which are not presented to the Contract Administrator in writing will be rejected and returned without being examined.

1.06 TESTING

- .1 Keep one set of photographs on site.
- .2 Provide one set of photographs to Contract Administrator.

1.07 CERTIFICATES AND TRANSCRIPTS

- .1 Prior to commencement of the Work, provide evidence of compliance with worker's compensation legislation at the place of the Work, including payments due thereunder.
- .2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Requirements and limitations for cutting and patching the Work.
 - .2 Selective demolition and removal of existing materials, equipment and finishes; cutting openings in walls, ceiling, floors and roof decks as required to accommodate the new work and finishes.
 - .3 Patching and making good existing work and finishes affected by alteration and renovation work.
 - .4 Salvage of existing materials and equipment where indicated.

1.02 RELATED WORK

- .1 Patching and making good existing construction and finishes as part of the work of the respective Subcontractors whose work is affected.
- .2 Removal, relocation, of existing mechanical and/or electrical services and equipment.

1.03 COORDINATION MEETING

- .1 Prior to start of alteration and renovation work convene a coordination meeting to review construction procedures for alteration and renovation work. Agenda to include:
 - .1 Construction progress schedule.
 - .2 Site security, temporary enclosures, emergency exits.
 - .3 Site access and storage.
 - .4 Start-up and shut down of mechanical and electrical services.
 - .5 Waste management and disposal.
 - .6 Work procedures in occupied spaces.
- .2 Senior representatives of the Contract Administrator, City, Contractor and major Subcontractors are to be in attendance.
- .3 Establish time and location of meeting and notify all concerned parties within [five] working days of meeting.
- .4 Chair meeting and record minutes. Distribute minutes to all attending parties within [four] working days after meeting.

1.04 GENERAL PROCEDURES

- .1 The existing building(s) are to remain occupied and functional during the work of this project. Execute work with least possible interference or disturbance to building occupants and the general public and the normal use of the premises.
- .2 Prior to start of any alteration work, arrange with the City and Contract Administrator a work schedule satisfactory to operational requirements of the existing facility.
- .3 The City shall vacate only those areas designated for alteration work.
- .4 Confine construction activities to designated work areas. Do not store materials, tools or equipment outside of designated work areas.
- .5 Prevent migration of dust and debris into occupied areas.
- .6 Establish access routes to and from the work areas. Use only designated access routes for movement of workers, tools, equipment, materials, and construction debris.

- .7 Where work must proceed in occupied areas clean up at the end of each workday. Place tools, equipment, and materials into secure lock-up.
- .8 Provide temporary protection to cut and partially finished surfaces to building occupants and general public from possible injury.

1.05 WASTE MANAGEMENT AND DISPOSAL

- .1 Comply with [Section 01 74 19 - Construction/Demolition Waste Management and Disposal][, and Waste Reduction Work Plan].
- .2 Except for items indicated for salvage, construction waste, abandoned or demolished materials and equipment are the Contractor's responsibility and shall be promptly removed from site.
- .3 Dispose of construction debris, abandoned equipment and materials off site via designated access routes.
- .4 Do not allow demolition debris to accumulate within the building or on site. Remove debris on a regular basis.
- .5 Do not allow waste and debris to block access routes to and from exits, fire lanes, or impede access to the building.
- .6 Do not burn rubbish or debris on site.
- .7 Do not use City's waste containers for waste removal.
- .8 Provide suitable waste containers. Locate large waste containers on City's property only in areas acceptable to the City.

1.06 TEMPORARY ENCLOSURES

- .1 Construct temporary partitions to isolate work areas from occupied areas of the building(s). Erect partitions to contain construction debris and prevent unauthorized entry to work areas.
- .2 Prior to erection confirm exact location(s) with Contract Administrator.
- .3 Provide doors to prevent unauthorized access.
- .4 Where temporary partitions restrict access to emergency exits review security requirements with Contract Administrator prior to erection.
- .5 Construct partitions of steel studs spaced at maximum 600 mm on centre. Cover finished side with gypsum board.
- .6 Provide continuous dust barrier on inside of 6 mil polyethylene sheet. Seal holes and joints to prevent migration of dust to occupied areas.
- .7 Where overhead structures are more than 2 400 mm above floor provide continuous polyethylene dust barriers at top of partition to seal off space above partition and structure.

1.07 PROTECTIVE COVERS

- .1 Where furniture, furnishings, cabinet work or other finished work is adjacent to or in areas where alteration work is in progress provide covers to protect against construction debris and dust.
- .2 Remove covers and clean up after each work stage as instructed by Contract Administrator.

1.08 EXISTING MECHANICAL AND ELECTRICAL SERVICES

- .1 Prior to start of Work identify and confirm the location of all mechanical and electrical services within or passing through construction areas. Confirm their origin and destination.
- .2 Where services are concealed within walls, floors, or ceilings and cannot be visually identified use electronic scanning devices or other acceptable means to locate and identify concealed services.
- .3 Do not shut off, disconnect, or remove existing mechanical and electrical services without prior notification of Contract Administrator.
- .4 Where existing service must be shut-down or disconnected, notify City in advance of shut-down or disconnection. Provide schedule indicating which services are affected and duration of shut-down.
- .5 Some services within construction areas may serve other areas of the building not affected by construction work and must remain in service during construction period. Take special precautions to protect and maintain continuance of services that are to remain active to service adjacent areas.
- .6 Include for required connections, temporary or permanent, for continuance of existing services.

1.09 EXISTING FIXTURES AND EQUIPMENT

- .1 Where new flooring and finishes are to be installed, remove and replace existing plumbing fixtures and other equipment to allow for installation of new flooring and finishing products under or behind such item. Example: lift water closets to allow installation of finish flooring base.
- .2 In rooms with floor drains, remove and replace clamp rings to allow for installation of finish flooring under clamp ring.

1.10 SALVAGE MATERIAL

- .1 Remove as salvage items as indicated.
- .2 Remove items carefully to prevent damage. Dismantle large items to fit through openings and ease of transport.
- .3 For items indicated for reinstallation store on site until required.
- .4 For items to be turned over to City transport to storage areas [on site] as directed by City.

1.11 EQUIPMENT

- .1 Provide equipment, tools and machinery for proper execution of the Work.

1.12 PREPARATION

- .1 Structural and load-bearing elements:
 - .1 Obtain Contract Administrator's written approval before cutting, boring or sleeving structural or load-bearing members including roof decks, floor assemblies or load bearing walls and columns.
 - .2 Electronically scan structural elements to confirm location of structural steel and reinforcing before starting work. Record locations on record drawings.
 - .3 Mark out exact locations and dimensions prior to inspection.
 - .4 Do not proceed with the work until the Contract Administrator has reviewed and confirmed proposed work.

- .2 Prevent movement, settlement or damage of structures, services, parts of existing building to remain.
 - .1 Provide bracing, shoring and underpinning as required.
 - .2 Repair damage caused by demolition as directed by Contract Administrator.
- .3 Support affected structures and, if safety of structure being demolished appears to be endangered, take preventative measures, stop Work and immediately notify Contract Administrator.

1.13 SELECTIVE DEMOLITION FOR ALTERATION WORK

- .1 Specialists familiar with the materials affected shall perform selective demolition work.
- .2 Perform in a manner to neither damage nor endanger any part of the existing building or work in progress.
- .3 Demolition work indicated on drawings is schematic only. Verify all dimensions and conditions on site.
- .4 Do not damage or deface existing construction, equipment or finishes indicated to remain or items indicated for salvage.
- .5 Keep cutting to no more than 10% larger than outside dimensions of item penetrating another material.
- .6 Make cuts with clean, true, smooth edges to minimize patchwork and to provide suitable surface for integration of new materials.
- .7 Use concrete saw for cutting concrete.
- .8 Use diamond core drill for cutting small diameter openings in concrete.
- .9 Use of pneumatic driven jackhammers inside buildings is not permitted without Contract Administrator approval.
- .10 Marking:
 - .1 Each Subcontractor is responsible for marking out locations of all cutting, boring, and demolition required for installation of their respective work.
 - .2 Extra costs for additional cutting and patching required because of errors in marking out of locations of cutting and demolition work shall be paid by the Subcontractor responsible for the error in marking.
- .11 Openings and Recesses:
 - .1 Cut openings and recesses in foundation walls and floors as required for installation of new work and finishes.
 - .2 Coordinate with Mechanical, Electrical and other Subcontractors.
 - .3 Contractor is responsible for cutting openings larger than 150 x 150 mm or 150 mm in diameter. Openings smaller than these shall be the responsibility of the Subcontractor requiring the opening.
 - .4 Contractor is responsible for cutting recesses larger than 800 x 800 mm in size. Recesses smaller than these sizes shall be the responsibility of the Subcontractor requiring the recess.

1.14 PATCHING AND MAKING GOOD

- .1 Patching and making good of existing materials and finishes is the responsibility of the Subcontractor whose work is affected.

- .2 Patch and make good all damage to existing materials and finishes resulting from work of this Contract.
- .3 Patching, unless otherwise noted, shall match existing adjacent surfaces in all respects. Make patchwork inconspicuous in final assembly.
- .4 Patch and repair to standard of construction of surrounding materials, except where indicated otherwise.
- .5 Fit work air tight to pipes, sleeves, ducts, conduit and other penetrations. Seal all penetrations tight with acceptable materials.
- .6 Patch openings, holes, cuts and around pipes, ductwork, conduit and other work passing through fire separations and fire rated assemblies. Use materials and methods to maintain integrity of fire ratings. Use materials meeting Underwriters' Laboratories Canada (ULC) requirements and authorities having jurisdiction.

END OF SECTION

1.01 DEFINITIONS

- .1 Environmental Pollution and Damage: Presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavorably 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.

1.02 SUBMITTALS

- .1 Submittals: In accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review by Contract Administrator. 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(s) of person(s) responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from site.
 - .3 Name(s) and qualifications of person(s) responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including 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.
 - .6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, 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.

1.03 FIRES

- .1 Fires and burning of rubbish on site not permitted.
- .2 Where fires or burning permitted, prevent staining or smoke damage to structures, materials, or vegetation that is to be preserved. Restore, clean and return to new condition stained or damaged work.
- .3 Provide supervision, attendance and fire protection measures as directed.

1.04 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.

1.05 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer, or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.06 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authority's emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air 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.

1.07 NOTIFICATION

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

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Inspection and testing, administrative, and enforcement requirements.
 - .2 Tests.

1.02 RELATED REQUIREMENTS

- .1 Submission of tests to confirm product quality, Section 01 33 00 - Submittal Procedures.
- .2 Material and workmanship quality, reference standards, Section 01 61 00 - Common Product Requirements.

1.03 REVIEW OF THE WORK

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

1.04 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to the Work, offsite manufacturing, and fabrication plants.
- .2 Cooperate to provide reasonable facilities for such access.

1.05 PROCEDURES

- .1 Notify the appropriate agency and Contract Administrator in advance of the requirement for tests, in order that attendance arrangements can be made.
- .2 Submit test reports requested in Specification sections or as may be requested by Contract Administrator. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide enough space to store and cure test samples.

1.06 DAMAGED OR DEFECTIVE WORK

- .1 Promptly make good the City's property damaged by removals made under this Contract.
- .2 If in opinion of Contract Administrator, it is not expedient to make good damage to property attributable to the course of the Work, the City will deduct from Contract price the difference in value between Work performed and that called for by repair or remediation to damaged buildings or property, amount of which will be determined by Contract Administrator.

1.07 REPORTS

- .1 Submit four copies of inspection and test reports promptly to the Contract Administrator.
- .2 Provide copies to Subcontractor of work being inspected/tested and manufacturer/
 fabricator of Material being inspected/tested.

1.08 TESTS

- .1 Furnish test results as may be requested.
- .2 The cost of tests and mix designs beyond those called for in the Drawings and
 Specifications or beyond those required by the Law of the Place of Work shall be
 appraised by the Contract Administrator.

END OF SECTION

1.01 INSTALLATION AND REMOVAL

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

1.02 WATER SUPPLY

- .1 A limited amount of water from the existing building supply will be made available for construction use.
- .2 Provide, install and maintain temporary lines and connections at own expense.
- .3 The City will pay utility charges.

1.03 TEMPORARY HEATING AND VENTILATION

- .1 Maintain temperatures of minimum 10°C in areas in which construction is in progress.

1.04 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power required during construction for temporary lighting and the operating of power tools.
- .2 Arrange for connection with Manitoba Hydro. Pay all costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of the supply required for temporary lighting and power tools is the responsibility of Contractor.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

1.05 TEMPORARY COMMUNICATIONS FACILITIES

- .1 Provide and pay for temporary telephone fax and internet hook up, lines and equipment necessary for own use and use of Contract Administrator.

1.06 FIRE PROTECTION

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

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Construction aids.
 - .2 Office and sheds.

1.02 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-Z321, Signs and Symbols for the Occupational Environment.
 - .2 CAN/CSA-S269.2-16, Access Scaffolding for Construction Purposes.

1.03 INSTALLATION AND REMOVAL

- .1 For review and approval of the Contract Administrator, prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Indicate use of supplemental or other staging area.
- .3 Provide construction facilities in order to execute work expeditiously.
- .4 Remove from site all such work after use.

1.04 SCAFFOLDING

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

1.05 HOISTING

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
- .2 Hoists and cranes shall be operated by qualified operator.

1.06 SITE STORAGE/LOADING

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

1.07 CONSTRUCTION PARKING

- .1 Parking will be provided on Site subject to the approval of the Contract Administrator and provided it does not disrupt performance of Work. Parking the area is limited.
- .2 Provide and maintain adequate access to project site.

1.08 CONSTRUCTOR'S SITE OFFICE

- .1 Site office location subject to the approval of the Contract Administrator.

- .2 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing lay-down table.
- .3 Provide marked and fully stocked first-aid case in a readily available location.
- .4 Subcontractors to provide their own offices as necessary, subject to the approval of the Contract Administrator. Direct location of these offices.

1.09 EQUIPMENT, TOOL AND MATERIAL STORAGE

- .1 Provide and maintain, in a 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 a manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances. Location subject to approval of the Contract Administrator.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Existing facilities not to be used.

1.11 CONSTRUCTION SIGNAGE

- .1 No signs or advertisements, other than warning signs, are permitted on site.
- .2 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project and dispose of offsite on completion of project or earlier if directed by Contract Administrator.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Contract Administrator.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from Site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: Adequate to ensure safe operation at all times.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Barriers.
 - .2 Environmental Controls.
 - .3 Traffic Controls.
 - .4 Fire Routes.

1.02 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA)
 - .1 CSA-O121, Douglas Fir Plywood
 - .2 CAN/CSA O141 - Softwood Lumber
 - .3 CSA O151 - Canadian Softwood Plywood

1.03 INSTALLATION AND REMOVAL

- .1 Provide temporary controls to execute Work expeditiously.
- .2 Remove from site all such work after use and make good to adjacent surfaces and finishes.

1.04 HOARDING AND SITE FENCING

- .1 Erect temporary site fence around construction laydown and trailer area to prohibit unauthorized access.
- .2 Use minimum 2 100 mm high chain link or wire mesh fencing with posts at no more than 3 000 mm on centre. Provide lockable truck entrance gate(s) and equip gates with locks and keys.

1.05 GUARD RAILS AND BARRICADES

- .1 Provide as recommended by local governing authorities.

1.06 DUST TIGHT SCREENS

- .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Erect temporary sdust tight screens using 38 x 89 mm steel studs at maximum 610 mm centres, polyethylene sheet, and 1 219 x 2 438 x 13 mm exterior grade plywood (CSP or DFP) or 13 mm gypsum wall board. Extend to underside of existing roof and make air tight.
- .3 Provide access to hoarding areas with temporary hollow metal doors and knock down metal frames and hardware.
- .4 Polyethylene Sheet: Reinforced, fire-resistive sheet, 0.25-mm (10-mil) minimum thickness, with flame-spread rating of 15 or less per ASTM E84 and passing NFPA 701 Test Method.
- .5 Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats minimum 914 by 1 524 mm (36 by 60 inches).
- .6 Maintain and relocate protection until such work is complete.
- .7 Confirm locations and installation with Contract Administrator at least three days prior to installation.

- .8 Where screens restrict access to emergency exits review security requirements with Contract Administrator prior to erection.

1.07 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.08 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.09 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.10 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect adjacent private and public property from damage during the performance of work.
- .2 Be responsible for all damage incurred.
- .3 Provide necessary screens, covers and hoardings.
- .4 Confirm locations and installation with Contract Administrator at least five days prior to installation.
- .5 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Product quality, availability, storage, handling, protection, and transportation.
 - .2 Manufacturer's instructions.
 - .3 Substitution procedures.
 - .4 Quality of Work, coordination and fastenings.
 - .5 Prevention of dust and mould contamination of products and materials during delivery, storage and handling.

1.02 REFERENCE STANDARDS

- .1 Within text of each Specification section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in Specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Contract Administrator reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by the City in event of conformance with Drawings and Specifications or by Contractor in event of non-conformance.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

1.03 QUALITY ASSURANCE

- .1 Products, Materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 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.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Contract Administrator based upon requirements of Drawings and Specifications.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout buildings.
- .5 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.

1.04 AVAILABILITY

- .1 Immediately upon receiving Letter of Intent, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of materials, equipment or articles are foreseeable, notify Contract Administrator within two days discovery of such in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

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

1.05 SUBSTITUTIONS

- .1 The Work is based on the materials and methods specified in the Specifications.
- .2 Substitutions are permitted during Bid period only, make application in accordance with B6 Substitutes.

1.06 STORAGE HANDLING AND PROTECTION

- .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 sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .5 Remove and replace damaged products at own expense and to satisfaction of Contract Administrator.
- .6 Touch-up damaged factory finished surfaces to Contract Administrator's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.07 TRANSPORTATION

- .1 Pay the costs of transportation of products required in the performance of Work.
- .2 Transportation costs of products supplied by the City will be paid for by the City unless specified otherwise. Unload, handle and store such products, unless otherwise specified.

1.08 MANUFACTURERS' INSTRUCTIONS

- .1 Unless otherwise indicated in the specifications, install or erect all products in accordance with manufacturer's recommendations. Do not rely on labels or enclosures that are provided with products. Obtain instructions directly from manufacturers.
- .2 Notify Contract Administrator in writing of any conflicts between the Specifications and manufacturer's instructions so that the Contract Administrator may establish the course of action to follow.
- .3 Improper installation or erection of products due to failure in complying with these requirements authorizes the Contract Administrator to require any removal and re-installation that may be considered necessary, at no increases in Contract price or Contract time.

1.09 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 Contract Administrator if required Work is such as to make it impractical to produce required results.
- .2 Enforce discipline and good order among workers.
- .3 Do not employ anyone unskilled in their required duties. Contract Administrator reserves right to require dismissal from site, workers deemed incompetent or careless.

- .4 Decisions as to standard or fitness of quality of Work in cases of dispute rest solely with Contract Administrator, whose decision is final.

1.10 COORDINATION

- .1 Ensure cooperation of workers during the Work. Maintain efficient and continuous supervision.
- .2 Ensure Work of various Subcontractors does not conflict or create interference.
- .3 Be responsible for the proper coordination and placement of openings, sleeves, and accessories.
- .4 Supply all items required to be built in as and when required, together with templates, measurements and shop drawings.
- .5 Ensure all workers examine the drawings and specifications covering the Work of others that may affect the performance of their own Work. Examine the Work of others and report to the Contract Administrator, in writing, any defects, or deficiencies that may affect the Work. In the absence of any report, the Contractor shall be held to have waived all claims for damage to or defects in such Work.
- .6 Ensure that components openings that are required for the installation of Work is coordinated. Furnish the necessary information to the sections concerned in ample time to permit allowance for such items. Failure to comply with this requirement does not relieve the party at fault of the cost of cutting or drilling at a later date and subsequent patching.

1.11 CONCEALMENT

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

1.12 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate 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.

1.13 PROTECTION OF WORK IN PROGRESS

- .1 Protect Work completed or in progress.
- .2 Prevent overloading of any part of the building. Do not cut, drill, or otherwise sleeve any load bearing structural member unless specifically indicated on drawings or in Specifications without written approval of the Contract Administrator.

1.14 EXISTING UTILITIES

- .1 When connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and 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

1.01 MATERIALS

- .1 Required for original installation.
- .2 Change in materials or products not permitted unless previously approved by Contract Administrator during Bid period.

1.02 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.

1.03 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 Restore damaged work with new products in accordance with requirements of Drawings and Specifications.
- .7 Refinish damaged surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

1.04 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse, recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

1.01 REFERENCE STANDARDS

- .1 Canadian Standards Association:
 - .1 CAN/CSA-Z317.2, Special Requirements for Heating, Ventilation and Air Conditioning (HVAC) Systems in Health Care Facilities.
 - .2 CAN/CSA-Z317.10, Handling of Waste Materials in Health Care Facilities and Veterinary Health Care Facilities.
 - .3 CAN/CSA-Z317.13, Infection Control during Construction, Renovation, and Maintenance of Health Care Facilities.

1.02 GENERAL

- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Store volatile waste in covered metal containers and remove from premises at end of each working day.
- .3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .4 Remove waste materials and debris from the site at regularly scheduled times or dispose of as otherwise directed by the Contract Administrator. Do not burn or bury waste materials or debris on site.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

1.03 MATERIALS

- .1 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.04 CLEANING DURATION DEMOLITION

- .1 Provide on-site containers for collection of waste materials, and debris.
- .2 Dispose of waste materials and debris off site at regularly scheduled intervals.
- .3 Maintain the Work in tidy condition, free from accumulation of waste products and debris.
- .4 Clean interior areas prior to start of finish work; maintain areas free of dust and other contaminants during finishing operations.

1.05 FINAL CLEANING

- .1 Refer to General Conditions.
- .2 When the Work is complete, remove surplus products, tools, construction machinery and equipment. Remove waste products and debris and leave the Work clean and suitable for occupancy by the City.
- .3 Leave the work 'broom clean' before the inspection process commences.
- .4 Remove debris and surplus materials from site.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Requirements for waste management goals, waste management plan and waste management plan implementation.

1.02 DEFINITIONS

- .1 Construction Waste: Solid wastes such as building materials, packaging and rubble resulting from construction, paving and infrastructure.
- .2 Dangerous Goods: Product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
- .3 Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- .4 Hazardous Material: Product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .5 Hazardous Waste: Hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .6 Recyclable Waste: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- .7 Recycling Facility: A business that specializes in collecting, handling, processing, distributing, or remanufacturing waste materials generated by new construction projects, into products or materials that can be used for this project or by others.
- .8 Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- .9 Salvage and Reuse: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

1.03 SUSTAINABILITY OBJECTIVES

- .1 The Contractor shall use all means available to divert the greatest extent practical and economically feasible, construction waste from landfills and incinerators. Develop and implement a demolition waste management plan.

1.04 ACTION SUBMITTALS

- .1 Submit draft waste management plan to the Contract Administrator prior to project start up meeting.

1.05 INFORMATIONAL SUBMITTALS

- .1 Waste Reduction Progress Reports: Submit a monthly report to the Contract Coordinator and include the following information:
 - .1 Material category.
 - .2 Generation point of waste.
 - .3 Total quantity of waste in tons (tonnes)
 - .4 Quantity of waste salvaged, both estimated and actual in tons (tonnes).

- .5 Quantity of waste recycled, both estimated and actual in tons (tonnes).
- .6 Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
- .7 Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- .2 Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- .3 Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- .4 Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.06 WASTE MANAGEMENT PLAN

- .1 General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan. Distinguish between demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.
- .2 Goals: Establish waste diversion goals for the project by identifying at least five materials targeted for diversion.
- .3 Waste: Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work.
- .4 Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - .1 Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - .2 Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - .3 Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- .5 Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1.07 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Contract Administrator.
- .2 Unless specified otherwise, materials for removal do not become Contractor's property.
- .3 Use the following paragraph if material is to be turned over to Consultant.
- .4 Protect, stockpile, store and catalogue salvaged items.
- .5 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

- .6 Use the following paragraph for demolition projects.
- .7 Protect structural components not removed for demolition from movement or damage.
- .8 Use the following paragraph for demolition projects.
- .9 Support affected structures. If safety of building is endangered, cease operations and immediately notify Contract Administrator.
- .10 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage.

1.08 SCHEDULING

- .1 Coordinate work with other activities at site to ensure timely and orderly progress of the work.

1.09 PREPARATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

1.10 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of adjacent property owners and public roadways.
- .2 Maintain security measures established by the City.
- .3 Provide temporary security measures as approved by Contract Administrator.

1.11 WASTE MANAGEMENT PLAN IMPLEMENTATION

- .1 Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- .2 Minimize waste disposal to landfills, employ processes that ensure the generation of as little waste as possible, including the prevention of damage due to mishandling, improper storage, contamination, inadequate protection or other factors, as well as minimizing over packaging and poor quantity estimating.
- .3 Of the inevitable waste that is generated, as many of the waste materials as economically feasible are to be salvaged for reuse and or recycled. However, the Contractor is to abide by any direction from Contract Administrator regarding recyclable waste. Use of waste disposal in landfills or incinerators is to be minimized.
- .4 Provide and pay for the proper disposal and salvage of construction materials and waste.
- .5 Provide completely enclosed garbage containers.
- .6 Use only brokerage, storage, transfer and disposal facilities licensed by authorities having jurisdiction for the recycling and disposal of waste material.
- .7 Material Handling Procedures: Prevent contamination of material to be recycled and salvaged, and handle material consistent with requirements for acceptance by designated facilities; where space permits, source separation is recommended; where material must be co-mingled, they must be taken to a processing facility for separation off site.
- .8 Manager: Designate an on-site party responsible for instructing workers and overseeing and documenting results of the waste management plan for Project.
- .9 Distribution: Distribute copies of the waste management plan to the Job Site Foreman, each Subcontractor, and the Contract Administrator.

- .10 Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by parties at appropriate stages of Project.
 - .11 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
 - .12 Hazardous Wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.
 - .13 Application for Progress Payments: Submit with each Application for Progress Payment a Summary of Waste Generated by the Project:
 - .1 Failure to submit information shall render Application for Payment incomplete and delay Progress Payment.
 - .2 Submit summary on a form acceptable to City containing the following information:
 - .1 Amount in tonnes or cubic metres (tons or cubic yards) of material land filled from the Project.
 - .2 Identity of the landfill.
 - .3 Total disposal cost. Include manifests, weight tickets, receipt, and invoices.
 - .4 Each material recycled, reused, or salvaged from the Project.
 - .5 Amount tonnes or cubic metres (tons or cubic yards).
 - .6 Date removed from the job site, the receiving party, and the transportation cost.
 - .7 Amount of any money paid or received for the recycled or salvaged material.
 - .8 Net total cost or savings of salvage or recycling each material.
 - .3 Attach manifests, weight tickets, receipts, and invoices.
 - .4 The City will pay all tipping fees for non-recyclable material disposal at City owned landfill.
- 1.12 DISPOSAL OF WASTE**
- .1 Burying of rubbish and waste materials is prohibited unless approved by the Contract Administrator.
 - .2 Disposal of waste volatile materials, mineral spirits, oil, paint thinner, into waterways, storm, or sanitary sewers is prohibited.
- 1.13 CLEANING**
- .1 Remove tools and waste materials on completion of work, 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.
- 1.14 SPECIAL PROGRAMS**
- .1 Be responsible for final implementation of programs involving tax credits or rebates or similar incentives related to recycling, if applicable to the Project.
 - .2 A current listing of recyclers specializing in specific categories of materials may be obtained from applicable government agencies. Most provinces have an Internet web site which offers information and suggested recycling sites.

- .3 Obtain information packets relevant to all the above listed programs prior to starting work on the Project and confirm facility's ability to accept waste from Project.
- .4 Document work methods, recycled materials, alternate disposal methods that qualify for tax credits, rebates, and other savings under programs listed by authority having jurisdiction.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 As-built, samples, and specifications.
 - .2 Equipment and systems.
 - .3 Product data, materials, and related information.
 - .4 Operation and maintenance data.
 - .5 Warranties and bonds.
 - .6 Warranty Management Plan.

1.02 SUBMISSION

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

1.03 FORMAT

- .1 Three hard copy (binders), one electronic format (PDF). Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf, letter size format with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, 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.

1.04 CONTENTS – EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses and telephone numbers of Contract Administrator and Contractor 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 clearly 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 - Quality Control.

1.05 AS-BUILTS AND SAMPLES

- .1 Conform to D17 - As-Built Drawings and as follows.
- .2 Maintain at the site for Contract Administrator one record copy of:
 - .1 Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .3 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .4 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.
- .5 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .6 Keep record documents and samples available for review by Contract Administrator.

1.06 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on three (3) sets of black line opaque drawings, and within copy of Specifications. Make arrangements of black line opaque copies.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:
 - .1 Measured locations of utilities and appurtenances referenced to visible and accessible features of construction.
 - .2 Field changes of dimension and detail.
 - .3 Changes made by change orders.
 - .4 Details not on original Contract Drawings.
 - .5 References to related shop drawings and modifications.
- .5 Specifications: Legibly mark each item to record actual construction, including:

- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.07 WARRANTIES AND BONDS

- .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 principals.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with the City's permission, leave date of beginning of time of warranty until the Date of Total Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

1.08 WARRANTY MANAGEMENT PLAN

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Contract Administrator for review.
- .3 Warranty management plan to include required actions and documents to assure that the City receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Contract Administrator for review prior to each monthly pay estimate.
- .6 Assemble approved information in binder and submit upon acceptance of work.
- .7 Except for items put into use with The City's permission, leave date of beginning of time of warranty until Date of Total Performance is determined.
- .8 Conduct joint four-month and nine-month warranty inspection, measured from time of acceptance, by Contract Administrator.
- .9 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 Contractor, Subcontractors, manufacturers or suppliers involved.
 - .2 Contractor's plans for attendance at four and nine-month post-construction warranty inspections.
 - .3 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in a timely manner to oral or written notification of required construction warranty repair work.

- .11 Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

1.09 PRE-WARRANTY CONFERENCE

- .1 Meet with Contract Administrator, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Contract Administrator.
- .2 Contract Administrator 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.

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of inground telescopic piston lifts, specifying general requirements to performance verification of components, and equipment.

1.02 RELATED REQUIREMENTS

- .1 Section 01 91 41 – Demonstration and Training
- .2 Section 14 45 29 – Two Post Inground Bus Lift

1.03 ACRONYMS

- .1 Cx - Commissioning
- .2 CxA - Commissioning Authority
- .3 O&M - Operation and Maintenance
- .4 CVF - Component Verification Form
- .5 FCT - Functional Test
- .6 MAI - Manufacturers Authorized Installer
- .7 TAB - Testing, Adjusting and Balancing

1.04 DEFINITIONS

- .1 Commissioning Authority (CxA): Means Stantec Consulting Ltd.

1.05 GENERAL

- .1 Commissioning is a formal, systematic process of ensuring that building systems perform interactively according to the design intent and the City's operational needs.
- .2 Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - .1 Applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted standards and that they receive adequate operational checkout by installing contractors.
 - .2 Proper performance of equipment and systems is documented.
 - .3 O&M documentation left on site is complete.
 - .4 City's operating personnel are adequately trained.
- .3 The Contractor is responsible for demonstrating equipment and systems, troubleshooting and making adjustments as required to the satisfaction of the CxA.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively tested with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

1.06 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, the Contractor shall correct deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by the CxA and/or related design authority, to ensure effective performance.
- .2 Contractor costs for corrective work, additional tests, and inspections to ensure proper performance of such items to be borne by Contractor.
- .3 Contractor shall pay for all CxA expenses associated with excessive retesting of systems.

1.07 COORDINATION

- .1 The following are members of the commissioning team:
 - .1 Commissioning Authority (CxA)
 - .2 Consultant
 - .3 Contractor
 - .4 Manufacturers Authorized Installer
 - .5 Electrical Subcontractor
 - .6 Any other installing Subcontractors or suppliers of equipment.

1.08 CONFLICTS (BETWEEN SPECIFICATION SECTIONS)

- .1 Report conflicts between requirements of this section and other specification sections to the Contractor before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification (through RFI process) will result in application of the design authority's intent on the issue.

1.09 COMMISSIONING SCHEDULE

- .1 The Contractor will provide Cx schedule to CxA for review and comment.
- .2 The Contractor will provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Commissioning site visits
 - .2 Component verification completion
 - .3 Startup and pre-functional activities
 - .4 Performance Verification testing dates
 - .5 City training
- .3 All parties are responsible to address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.10 SYSTEMS TO BE COMMISSIONED

- .1 The commissioning of the inground telescopic piston lifts will be included under the oversight of the CxA. The Contractor is also required to comply with contract requirements for systems not included in this list.
 - .1 Operating Performance Verifications:
 - .1 Hoist:
 - .1 Vertical travel.
 - .2 Clearance to structure.

- .2 Controls:
 - .1 Wall Mounted/Pendant Controls:
 - .1 Disconnect switch.
 - .2 On/Off.
 - .3 Emergency stop
 - .4 Up/down
 - .5 Key operated return override.
 - .6 Other components.
- .2 Functional Performance Verification:
 - .1 Controls:
 - .1 Vertical Travel:
 - .1 Speed up.
 - .2 Speed down.
 - .2 Emergency Stop:
 - .1 Disconnect switch.
 - .2 Key operated return override.
 - .3 Pinch-point safety strips
 - .2 Load Test:
 - .1 Load test hoist.
 - .2 Full vertical travel
 - .3 Emergency stop
 - .4 Park safety latches

1.11 MEETINGS

- .1 Commissioning Kickoff Meeting. The CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance.
- .2 Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA at the discretion of the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subcontractors.

1.12 SUBMITTALS (SHOP DRAWINGS)

- .1 The CxA requires submittal documentation for facilitating the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team.
- .2 These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CxA will review them and provide feedback, where in the opinion of the CxA, correction is required. O&M manuals must be submitted in electronic (pdf) format.

1.13 COMPONENT VERIFICATION FORMS and INITIAL CHECKOUT

- .1 The following procedures apply to all equipment to be commissioned.
- .2 Component Verification Forms (CVF). CVF checklists document that the equipment and systems are installed in accordance with the design intent and good practice. CVFs for a given system must be successfully completed prior to Functional Testing.

- .1 CVFs will be developed in an electronic format (pdf) by the CxA after the award of the construction contract and electronic copies will be provided to the Contractor. The Contractor and Subcontractors are responsible to execute and document the CVF on site, and return to the CxA for inclusion in the final report. The CxA will verify the installation and accuracy of the CVFs using an audit process.
- .2 CVFs are used to track and document that the proper equipment has been specified, submitted and installed. The forms capture typical maintenance information such as tag #, model, service, location, nameplate data, static submittal data, etc.
- .3 Issues identified during commissioning inspections will be documented by the CxA on the issue tracking log.
 - .1 The Contractor shall respond to issues and ensure correction.
- .4 A sample CVF has been included in Section 01 91 33 for bid purposes.

1.14 SYSTEM START-UP

- .1 Start-up Plan. The Contractor will provide a detailed start-up plan for all commissioned equipment for review by the CxA.
- .2 The start-up plan will include blank start-up forms (provided by manufacturer, or otherwise) for commissioned systems.
 - .1 The CxA may attend start-up at their discretion to ensure that start-up documentation and procedures are being followed as required.
 - .2 The Contractor and vendors shall execute start-up.
 - .3 Provide the CxA with a signed and dated copy of the completed start-up report.
- .3 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit Design Consultant to repeat start-up at any time.
- .4 Submit required startup documentation including, but not limited to:
 - .1 Equipment:
 - .1 Inground Telescopic Piston Lift

1.15 FUNCTIONAL TESTING

- .1 Refer to this article for the list of systems to be commissioned.
- .2 Functional Testing (FCT) demonstrates that each system is operating according to the documented design intent and Contract documents. Each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Verifying the sequences of operation is required for all modes. Proper responses to modes and conditions such as power failure, freeze conditions, fire alarm conditions, equipment failure, etc. may also be tested.
- .3 Functional Tests will be developed in an electronic format (pdf) after award of the Construction Contract by the CxA and electronic copies will be provided to Contractors.
- .4 The Component Verification Forms (CVFs) for a given system's equipment must be completed prior to the Functional Test.

- .5 The Contractor and/or vendors shall execute the Functional Tests as a pre-functional test to verify correct system operation and provide the CxA with a signed and dated copy of the completed tests prior to formal Functional Testing with the CxA present.
- .6 Issues identified during Functional Testing will be documented by the CxA on the issue tracking log.
 - .1 The Contractor shall respond to issues and ensure correction.
- .7 A sample functional test has been included in Section 01 91 33 for bid purposes.

1.16 SEVEN DAY INTEGRATED SYSTEM TESTING

- .1 A seven Day Integrated Systems Test will be completed to ensure proper building performance and operation.
- .2 General Acceptance requires that the systems operate as one entity as intended and that documentation is provided indicating such.
- .3 Issues identified during seven-day testing will be documented by the CxA on the issue tracking log.
 - .1 Contractors shall respond to issues and ensure correction.

1.17 ISSUE TRACKING LOG

- .1 Contractors shall respond to issues noted on the issue tracking log within seven calendar days indicating the corrective action taken.
- .2 CxA may request the Contractor demonstrate successful resolution of items noted on the tracking log.

1.18 CITY TRAINING

- .1 Refer to 01 91 41 for requirements.

1.19 SYSTEMS MANUAL

- .1 Contractor to provide the following documentation to the CxA for inclusion in the systems manual:
 - .1 As-built architectural drawings (electronic copy)
 - .2 As-built mechanical drawings (electronic copy)
 - .3 As-built electrical drawings (electronic copy)
 - .4 As-built controls drawings and cut sheets (electronic copy)
 - .5 Operations and Maintenance manuals (electronic copy)

1.20 AUTHORITIES HAVING JURISDICTION (I.E. GOVERNMENT AND UTILITY AUTHORITIES)

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

END OF SECTION

1.01 SUMMARY

- .1 Section Includes:
 - .1 Roles and responsibilities of training.

1.02 RELATED REQUIREMENTS

- .1 Section 01 91 13 - General Commissioning (CX) Requirements
- .2 Section 14 45 29 – Two Post Inground Bus Lift

1.03 ACRONYMS

- .1 Cx - Commissioning
- .2 CxA - Commissioning Authority
- .3 O&M - Operation and Maintenance
- .4 FCT - Functional Test
- .5 MAI - Manufacturers Authorized Installer
- .6 TAB - Testing, Adjusting and Balancing

1.04 DEFINITIONS

- .1 Commissioning Authority (CxA): Means Stantec Consulting Ltd.
- .2 Trainees: Means personnel selected for operating and maintaining this facility, including building operators, maintenance staff, security staff, and technical specialists as required.

1.05 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate operation and maintenance of equipment and systems to City's personnel two weeks prior to date of substantial inspection.
- .2 City: Provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation in accordance with Section 01 91 13 and Section 14 45 29.
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

1.06 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment two weeks prior to designated dates, for CxA approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.07 INSTRUCTORS

- .1 Contractor and certified factory-trained manufacturers' personnel to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Servicing, maintenance and adjustment of systems, equipment and components.

1.08 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.09 TRAINING MATERIALS

- .1 Training Plans:
 - .1 Formal training plans for each system shall be prepared by the Contractor for review by the CxA.
- .2 Training Materials to Include:
 - .1 "As-Built" Contract Documents (as available at time of training)
 - .2 TAB and FCT Reports (as available at time of training)
 - .3 O&M Manuals
- .3 Contractor, City, and CxA will review training plan.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.

- .5 Supplement Training Materials:
 - .1 Multimedia presentations.
 - .2 Manufacturer's training videos.

1.10 SCHEDULING

- .1 Include in Commissioning schedule time for training.
- .2 Deliver training during regular working hours.
- .3 Training to be completed prior to acceptance of facility.

1.11 RESPONSIBILITIES

- .1 Contractor:
 - .1 Providing detailed training plan and schedule.
 - .2 Implementation of training activities.
 - .3 Quality of training, training materials
- .2 CxA will evaluate training and materials. CxA will attend training at their discretion.
- .3 Upon completion of training, provide written report to CxA, signed by instructor.

1.12 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content Includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-action among systems during integrated operation.
 - .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant technical sections of the specifications.

END OF SECTION

Part 1 General

1.01 SUMMARY

- .1 Section Includes:
 - .1 Selective demolition for interior alterations.
 - .2 Salvage existing material, specialties, and equipment and turn over to City or reincorporated into the finished work where indicated.

1.02 RELATED REQUIREMENTS

- .1 Appendix B: For Asbestos Assessment.
- .2 Appendix C:
 - .1 For Excavation Assessment.
 - .2 For Correspondence from Manitoba Conservation and Climate - Review Under the Contaminated Sites Remediation Act.

1.03 DEFINITIONS

- .1 Demolition: Rapid destruction of building or parts of building, following removal of hazardous materials.

1.04 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASSP A10.6-2006 (R2016), Safety and Health Program Requirements for Demolition Operations
- .2 Canadian Standards Association (CSA International)
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures
- .3 Government of Canada
 - .1 Canadian Environmental Protection Act, 1999 (CEPA)
 - .2 Canadian Environmental Assessment Act, 2012 (CEAA)
 - .3 Transportation of Dangerous Goods Act, 1992 (TDGA)
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 241 (2019), Standard for Safeguarding Construction, Alteration, and Demolition Operations

1.05 MATERIALS OWNERSHIP

- .1 Unless otherwise indicated, demolition waste does not property of Contractor.

1.06 ADMINISTRATIVE REQUIREMENTS

- .1 Site Meetings:
 - .1 Convene pre-demolition meeting two weeks prior to beginning work of this Section in accordance with Section 01 31 19 - Project Meetings to:

- .1 Verify project requirements.
- .2 Review site conditions, including requirements for photographic documentation of existing conditions.
- .3 Coordination with other Subcontractors.
- .2 Arrange for site visit with Contract Administrator to examine existing site conditions adjacent to demolition work, prior to start of Work.
- .3 Ensure site demolition is on the meeting agenda of regularly scheduled job meetings specified in Section 01 31 19 - Project Meetings.
- .4 Ensure key personnel attend.
- .5 Provide written report on status of waste diversion activity at each project meeting.
- .2 Scheduling: Meet project timelines without compromising specified minimum rates of material diversion.
 - .1 Notify Contract Administrator in writing when unforeseen delays occur.

1.07 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Certificates:
 - .1 Written authorization from Contract Administrator is required to deviate from haulers, facilities, receiving organizations.

1.08 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, applicable Provincial/Territorial regulations.

1.09 DELIVERY, STORAGE, AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Storage and Protection:
 - .1 Protect in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Contract Administrator and at no cost to Contract.
 - .3 Remove and store materials to be salvaged, in manner to prevent damage.
 - .4 Store and protect in accordance with requirements for maximum preservation of material.
 - .5 Handle salvaged materials as new materials.

1.10 SITE CONDITIONS

- .1 Examine the Asbestos Assessments which describe hazardous materials within the building that may be handled, removed, or otherwise disturbed and disposed of during the Work. The Asbestos Assessments are appended to this project manual as Appendix B. These documents are provided for information.
- .2 Examine the Excavation Assessment and information pertaining to petroleum hydrocarbon (PHC) impact in the soil located at the limits of the required excavation for the new bus lifts. PHC contaminated soils which are required to be handled, removed, or otherwise disturbed, are to be disposed of during the Work in accordance with federal, provincial, and municipal, regulations and by-laws. The Excavation Assessment and other information are

appended to this project manual as Appendix C. These documents are provided for information.

- .3 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Contract Administrator. Hazardous materials will be removed by the City under a separate contract.
 - .1 Do not proceed until written instructions have been received from Contract Administrator.
- .4 On-site storage or sale of removed items or materials is not permitted.
- .5 Notify Contract Administrator before disrupting building access or services.

Part 2 Products

2.01 PERFORMANCE REQUIREMENTS

- .1 Regulatory Requirements:
 - .1 Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
 - .2 Comply with ANSI/ASSE A10.6, CSA S350, and NFPA 241.

2.02 EQUIPMENT

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.01 PREPARATION

- .1 Inspect site with Contract Administrator and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage, and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of Contract Administrator two days before starting demolition.

3.02 PREPARATION

- .1 Inspect site with Contract Administrator Departmental Representative DCC Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage, and items to remain. Record an inventory of items and provide a copy to Contract Administrator.
- .2 Disconnect, cap, plug or divert, as required, existing utilities within the building where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services in the building and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
 - .1 Immediately notify Contract Administrator of damage to any utility or service, designated to remain in place.
 - .2 Immediately notify the Contract Administrator should uncharted utility or service be encountered and await instruction in writing regarding remedial action.

3.03 PROTECTION

- .1 Prevent movement, settlement, or damage to parts of building to remain in place. Provide bracing and shoring required.
- .2 Keep noise, dust, and inconvenience to occupants to minimum.
- .3 Protect building systems, services and equipment.
- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.

3.04 EXISTING EQUIPMENT

- .1 Existing equipment shall be relocated by the City as indicated in Section 01 35 16 - Alteration Project Procedures.

3.05 SALVAGE

- .1 Refer to demolition drawings and specifications for items to be salvaged for reuse and items to be turned over to the City.
- .2 Items salvaged and reinstalled in Contract:
 - .1 Existing steel cover and steel support frame for center draining trench next to drive isle to be reused.
 - .2 Remove items to be reused, store as directed by Contract Administrator.
 - .3 Coordinate with electrical Subcontractor for disconnection of electrical services where applicable.
- .3 Provide all labour and transportation equipment such as carts, dollies, and hand trucks to complete the work.
- .4 Remove items carefully to prevent damage. Transport items to temporary storage areas as directed by Contract Administrator.
- .5 Surplus items remain the property of the City.

3.06 REMOVAL OPERATIONS

- .1 Remove elements of existing building to permit new construction.
- .2 Perform demolition work in a manner to neither damage nor endanger any part of the existing building or work in progress.
- .3 Demolition work indicated on drawings is schematic only. Verify all dimensions and conditions on site.
- .4 Do not damage or deface existing construction, equipment or finishes indicated to remain or items indicated for salvage.
- .5 Keep cutting to no more than 10% larger than outside dimensions of item penetrating another material.
- .6 Trim edges of partially demolished building elements to tolerances as defined by Contract Administrator to suit future use.
- .7 Make cuts with clean, true, smooth edges to minimize patchwork and to provide suitable surface for integration of new materials.
- .8 Use concrete saw for cutting concrete and masonry.
- .9 Use diamond core drill for cutting small diameter openings in concrete and masonry.

- .10 Use of pneumatic driven jackhammers inside buildings with approval of Contract Administrator.

3.07 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

3.8 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
 - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.
- .3 Waste Management: Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

- .1 Repair damage to adjacent materials or property caused by selective demolition.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 03 20 00 - Concrete Reinforcement
- .2 Section 03 30 00 - Cast-In-Place Concrete

1.02 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA)
 - .1 CAN / CSA-A23.1 - 14, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
 - .2 CAN / CSA-O86.1 - M89, Engineering Design in Wood (Limit States Design)
 - .3 CAN3 - O86S1 / O86.1S1 - 87, Supplement No.1 to CSA Standard CAN3-O86-M84 Engineering Design in Wood (Working Stress Design) and CAN3-O86.1-M84 Engineering Design in Wood (Limit States Design)
 - .4 CSA O121 - 17, Douglas Fir Plywood
 - .5 CSA O151 - 17, Canadian Softwood Plywood
 - .6 CSA O153 - 19, Poplar Plywood
 - .7 CAN3 - O188.0 - M78, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard
 - .8 CSA S269.1 - 16, Falsework and Formwork
 - .9 CAN / CSA - S269.3 - M92 (R2013), Concrete Formwork
- .2 Underwriters Laboratory Canada (ULC)
 - .1 CAN/ULC-S701.1: 2017, Standard for Thermal Insulation, Polystyrene, Boards

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
 - .1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 - Submittals.
 - .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.
 - .3 Comply with CAN/CSA-S269.3 for formwork drawings and CSA S269.1 for falsework drawings.
 - .4 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
 - .5 Indicate sequence of erection and removal of formwork/falsework to Contract Administrator.

1.04 WASTE MANAGEMENT AND DISPOSAL

- .1 Comply with Section 01 74 21 - Construction Waste Management and Disposal.

Part 2 Products

2.01 FORMWORK MATERIALS

- .1 Formwork Materials:

- .1 For Concrete Without Special Architectural Features: Plywood and wood formwork materials to CSA-0121, CAN3-O86S1/O86.1S1, and CSA-O153.
- .2 Form Liner:
 - .1 Plywood: High density overlay, Douglas Fir to CSA O121, T & G edge, 16 mm thick. Sound, undamaged sheets with clean, smooth, true edges.
- .3 Steel Forms: Tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.
- .4 Form Ties:
 - .1 For concrete not designated 'Architectural' use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
 - .2 For concrete designated 'Architectural' use snap ties complete with plastic cones and light grey concrete plugs.
- .5 Nails, spikes, lag bolts, through bolts, anchorages: sizes as required, of sufficient strength and character to maintain formwork in place while pouring concrete.
- .6 Falsework Materials: CSA S269.1.

2.02 ACCESSORIES

- .1 Form Release Agent: Chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps.
- .2 Form Stripping Agent: Colourless mineral oil, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal, at 40°C, flashpoint minimum 150°C, open cup.
- .3 Fillets for Chamfered Corners: Unless otherwise indicated 25 x 25 mm. Special sizes, shapes and profiles as indicated on drawings.
- .4 Void Forms:
 - .1 Paper Forms: Corrugated paper forms with cellular core, 200 mm thickness, minimum compressive strength 69 kPa. Protected all four sides by wax coated moisture protection. Shearmat or VF VoidForm or equal.
 - .1 Location: Structural slabs, beams, walls, and elsewhere indicated.
 - .2 Expanded Polystyrene Forms: Expanded polystyrene board insulation to CAN/ULC-S701, Type 1, compressive strength 55 kPa, thickness indicated.
- .5 Board Insulation: Extruded polystyrene to CAN/ULC-S701 minimum compressive strength 690 kPa, 100 psi, thickness indicated.

Part 3 Execution

3.01 FABRICATION AND ERECTION

- .1 Verify lines, levels, and centres before proceeding with formwork and falsework. Ensure dimensions agree with drawings.
- .2 Obtain Contract Administrator's permission for use of earth forms. Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .3 Construct falsework in accordance with CSA S269.1.
- .4 Form release agent: apply on formwork in accordance with manufacturer's specifications. Apply prior to placing reinforcing steel, anchoring devices and embedded parts. Do not apply form release agent where concrete surfaces are to receive special finishes or

- applied coverings, which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete. Take precautions to keep form release agent from contacting reinforcing steel.
- .5 Refer to architectural Drawings for concrete members requiring architectural exposed finishes.
 - .6 Do not place shores and mud sills on frozen ground.
 - .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
 - .8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.
 - .9 Arrange and assemble formwork to permit easy dismantling and stripping, so that concrete is not damaged during its removal.
 - .10 Arrange forms to allow stripping without removal of principle shores, where these are required to remain in place.
 - .11 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close temporary ports or openings with tight-fitting panels, flush with inside face to forms, neatly fitted so those joints will not be apparent in exposed concrete surfaces.
 - .12 Form weep holes and drainage holes in formwork as indicated. If wood forms are used, remove after concrete has set.
 - .13 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated. Obtain Contract Administrator's permission before framing openings not indicated on Structural Drawings.
 - .14 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
 - .15 Camber slabs and beams 6 mm in 3 000 mm of span unless otherwise indicated. Maintain beam depth and slab thickness from cambered surface.
 - .16 Use chamfer strips on external corners of columns, beams, slabs where exposed in final assembly, and elsewhere indicated. Use chamfer strips at interior corners of concrete members, joints, and elsewhere indicated. Form special chamfer or bullnose corners to details indicated on Drawings.
 - .17 Align form joints and make watertight. Keep form joints to minimum.
 - .18 Locate horizontal form joints for exposed columns 2 400 mm above finished floor elevation.
 - .19 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
 - .20 Clean formwork in accordance with CAN/CSA-A23.1 before placing concrete.
 - .21 Slip forming and flying forms may be acceptable, subject to submittal of details of equipment and procedures for Contract Administrator's review and acceptance.
 - .22 Inspect completed formwork, falsework, shoring and bracing to ensure that work is in accordance with formwork and falsework design and that supports, wedges, fastenings, ties and embedded parts are secure.
 - .23 Inform Contract Administrator when formwork is complete and has been cleaned to allow for inspection. Obtain approval prior to placing concrete.

3.02 VOID FORM INSTALLATION

- .1 Install void forms where indicated, level, and to proper elevation.
- .2 Use paper type void forms under beams, slabs, areaway walls.
- .3 Use expanded polystyrene insulation void forms under walls.
- .4 Where void form is to be placed in areas that will be above existing grade elevations the placement, leveling and compaction of backfill materials to be completed before void form is placed.
- .5 Wrap paper type forms with polyethylene film to protect from moisture. Cover paper type void form with 6 mm thick hardboard.
- .6 Provide minimum 300 x 300 mm sections of hardboard at bolster and chair locations.
- .7 Protect from damage until concrete placement. Replace crushed, damaged, or wet void form before placing concrete.

3.03 REMOVAL AND RESHORING

- .1 Notify Contract Administrator 48 hours in advance prior to removing formwork.
- .2 Do not remove forms and bracing until concrete has gained sufficient strength to carry its own weight, construction loads, design loads that are liable to be imposed upon it. Verify strength of concrete by compressive test results.
- .3 Leave formwork in place for following minimum periods of time after placing concrete:

LOCATION	TEMPERATURE IN °C		
	21-35	15-21	10-15
Wall Side Forms	2 days	3 days	4 days
Beams and Columns Side Forms	2 days	3 days	4 days
All Other Side Forms	2 days	3 days	4 days
Slabs Lower Forms	14 days	17 days	21 days
Beams Lower Forms	14 days	17 days	21 days
Structural Shoring	14 days	17 days	21 days

- .4 Reshore structural members where required due to design requirements or construction conditions and as required to permit progressive construction. Remove forms supporting loads only when concrete has attained 75% of required 28-day compressive strength, provided construction is reshored.
- .5 Remove formwork progressively and in accordance with building and safety code requirements and so that no shock loads or unbalanced loads are imposed on structure.
- .6 Loosen forms carefully. Do not wedge pry bars, hammers, or tools against concrete surfaces.
- .7 Store removed forms, for exposed concrete, so surfaces in contact with fresh concrete will not be damaged. Marked or scored forms will be rejected.
- .8 Tubular Column Forms:
 - .1 For concrete columns strip off laminated fibre from tubular column forms to expose concrete.
- .9 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 03 10 00 - Concrete formwork
- .2 Section 03 30 00 - Cast-In-Place Concrete

1.02 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 ACI 315R 2018 Edition, January 2018, Guide to Presenting Reinforcing Steel Design Details
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
 - .1 ANSI / ACI 315, 1999 - Details and Detailing of Concrete Reinforcement.
- .3 ASTM
 - .1 ASTM A185 / A185M, Welded Steel Wire Fabric for Concrete Reinforcement
 - .2 ASTM A775 / A775M - 19, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 Canadian Standards Association (CSA)
 - .1 CSA - A23.1 - 14 /A23.2 - 14, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices For Concrete
 - .2 CAN3-A23.3 - M84, Design of Concrete Structures for Buildings
 - .3 CSA G30.3 Revision 83M, 1998, Cold - Drawn Steel Wire for Concrete Reinforcement
 - .4 CAN / CSA-G30.18 - M92 (R2007), Billet-Steel Bars for Concrete Reinforcement
 - .5 CAN / CSA-G40.21 - M92, Structural Quality Steels
 - .6 CAN / CSA G164 - M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles
 - .7 CSA W186 - M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction
- .5 Reinforcing Steel Institute of Canada (RSIC)
 - .1 Manual of Standard Practice

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittals Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings consisting of bar bending details, lists, and placing of reinforcement.
 - .2 Indicate bar bending details, lists, quantities of reinforcement, sizes, spacing, locations of reinforcement and mechanical splices if approved by Contract Administrator, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacing and location of chairs, spacers and hangers.
 - .3 Prepare reinforcement drawings in accordance with RISC Manual of Standard Practice, and ANSI/ACI 315, ACI 315R
 - .4 Design and detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated. Provide type B tension lap splices where indicated unless otherwise indicated.

1.04 DELIVERY, STORAGE, HANDLING

- .1 Store materials carefully, clear from ground and protect from rust, soiling, distortion and other damage.

1.05 WASTE MANAGEMENT AND DISPOSAL

- .1 Comply with Section 01 74 21 - Construction Waste Management and Disposal.

Part 2 Products

2.01 MATERIALS

- .1 Substitution Limitations:
 - .1 Substitute different size bars only if permitted in writing by Contract Administrator.
- .2 Reinforcing Steel: Billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing Steel: Weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-Drawn Annealed Steel Wire Ties: CSA G30.3.
- .5 Welded Steel Wire Fabric: ASTM A185 / A185M. Provide in flat sheets only.
- .6 Epoxy Coating of Non-Prestressed Reinforcement: ASTM A 775 / A775M.
- .7 Galvanizing of Non-Prestressed Reinforcement: CAN / CSA G164, minimum zinc coating 600 g/m².
- .8 Chairs, Bolsters, Bar Supports, Spacers: CSA - A23.1. Use corrosion resistant at architectural concrete locations.
- .9 Mechanical Splices: Subject to approval of Contract Administrator.
- .10 Plain Round Bars: CAN / CSA-G40.21.

2.02 FABRICATION

- .1 Fabricate reinforcing in accordance with CSA-A23.1, ANSI / ACI 315 and RISC Manual of Standard Practice, ACI 315R, unless indicated otherwise.
- .2 Obtain Contract Administrator's approval for locations of reinforcement splices other than shown on placing drawings.
- .3 Upon approval of Contract Administrator, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.

2.03 SOURCE QUALITY CONTROL

- .1 Upon request provide Contract Administrator with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum four weeks prior to commencing reinforcing work.
- .2 Upon request inform Contract Administrator of proposed source of material to be supplied.

Part 3 Execution

3.01 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Contract Administrator.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars that develop cracks or splits.

3.02 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN / CSA-A23.1.
- .2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of lead or asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
- .3 Keep reinforcing steel 65 mm back from construction joints and non-doweled joints.
- .4 Use chairs, bolsters, bar supports, spacers acceptable to Contract Administrator.
- .5 Use continuous 3 legged high chairs to support top bars in slabs.
- .6 Use corrosion resistant chairs, bolsters, bar support, spacers, in areas where concrete is to be left exposed and where directed by Contract Administrator.
- .7 Protect epoxy and paint coated portions of bars with covering during transportation and handling.
- .8 Securely tie reinforcing in place with No.16 gauge wire.
- .9 Do not use reinforcement having kinks or bends not indicated or detailed on drawings.
- .10 Obtain Contract Administrator's approval before welding or cutting reinforcing bars.
- .11 Splice reinforcement where indicated on drawings.
- .12 Prior to placing concrete, obtain Contract Administrator's acceptance of reinforcing steel and position.
- .13 Ensure cover to reinforcement is maintained during concrete pour.

3.03 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated and galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 03 10 00 - Concrete Forms and Accessories
- .2 Section 03 20 00 - Concrete Reinforcement
- .3 Work specified in respective trade sections requiring inserts and openings in concrete.

1.02 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 ANSI/ACI 117 2010 Edition, June 2010, Specification for Tolerances for Concrete Construction and Materials (ACI 117-10) and Commentary (ACI 117R-10)
- .2 ASTM
 - .1 ASTM C109 / C109M - 20b, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens)
 - .2 ASTM C260 / C260M - 10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete
 - .3 ASTM C309 - 19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
 - .4 ASTM C494 / C494M - 19, Standard Specification for Chemical Admixtures for Concrete
 - .5 ASTM C939 / C939M - 16a, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
 - .6 ASTM C1017 / C1017M - 13, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .7 ASTM D1751 - 18, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - .8 ASTM D1752 -18, Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
 - .9 ASTM E1155 - 20, Standard Test Method for Determining FF and FL Floor Levelness Numbers
- .3 Canadian Standards Association (CSA)
 - .1 CSA - A23.1 - 14 / A23.2 - 14, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
 - .2 CSA - A3000 - 03, Cementitious Materials Compendium
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34 - M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Samples:
 - .1 At least four weeks prior to commencing work inform Contract Administrator of proposed source of aggregates and provide access for sampling.
- .3 At least four weeks prior to commencing work, submit to Contract Administrator samples of following materials proposed for use:
 - .1 1 kg of each type of Portland Cement.
 - .2 1 kg of each type of Supplementary Cementing Material.
 - .3 1 kg of each type of Blended Hydraulic Cement.
 - .4 1 L of each admixture.
 - .5 1 L of curing compound.
 - .6 1 metre length of joint filler.
 - .7 Waterstops
- .4 Certificates:
 - .1 Minimum four weeks prior to starting concrete work submit to Contract Administrator manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials
 - .4 Grout
 - .5 Admixtures
 - .6 Aggregates
 - .7 Water
 - .8 Joint filler
 - .2 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CSA-A23.1, and that mix design is adjusted to prevent alkali aggregate reactivity problems. Provide test reports on the Alkali-Silica reactivity test.
 - .3 Provide certification that plant, equipment, and all materials to be used in concrete to comply with CSA-A23.1/A23.2.

1.04 QUALITY ASSURANCE

- .1 Minimum four weeks prior to starting concrete work, submit proposed quality control procedures for Contract Administrator's review for following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal
 - .7 Joints.

1.05 WASTE MANAGEMENT AND DISPOSAL

- .1 Comply with Section 01 74 21 - Construction Waste Management and Disposal.

Part 2 Products

2.01 MATERIALS

- .1 Portland Cement: CSA - A3000, normal Type GU or sulfate resistant Type HS where indicated on drawings or in mix design.
- .2 Blended Hydraulic Cement: CSA - A3000.
- .3 Supplementary Cementing Materials: CSA - A3000.
- .4 Water: CSA-A23.1.
- .5 Aggregates: CSA-A23.1. Coarse aggregates to be normal density.
- .6 Air Entraining Admixture: ASTM C260.
- .7 Chemical Admixtures: ASTM C494. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather placing of concrete.
- .8 Shrinkage Compensating Grout: Premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents of pouring consistency, capable of developing compressive strength of 50 MPa after 28 day cure.
- .9 Non-Premixed Dry Pack Grout: Composition of non-metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.
- .10 Curing Compound: CAN/CSA - A23.1 white and to ASTM C309.
- .11 Cushion Pads: Tough, resilient, weather, moisture, and oil resistant material that will not corrode or cause corrosion, consisting of either layers of approved cotton duck saturated and bound together by approved rubber or synthetic compounds, or made from specially compounded synthetic materials.
- .12 Pre-Moulded Joint Fillers:
 - .1 Bituminous impregnated fiber board to ASTM D1751, thickness indicated.
- .13 Weep Hole Tubes: Plastic.
- .14 Dovetail Anchor Slots: Minimum 0.6 mm thick (24 gauge) galvanized steel with insulation filled slots.

2.02 CONCRETE MIXES

- .1 All concrete work shall be in accordance with CSA-A23.1, Alternative 1 Performance Specifications.
- .2 Contractor to provide proprietary mix design performance record as required by Concrete Manitoba
- .3 Refer to structural Drawing S-001, Table D.1 for Concrete mixes information.

Part 3 Execution

3.01 PREPARATION

- .1 Obtain Contract Administrator's approval before placing concrete. Provide Contract Administrator 48 hours of notice prior to concrete placing.
- .2 Pumping of concrete is permitted only after review of equipment and mix by Contract Administrator.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.

- .4 Prior to placing of concrete, obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is doweled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in position.
- .7 Do not place load upon new concrete until authorized by Contract Administrator.

3.02 CONSTRUCTION

- .1 Do cast-in-place concrete works in accordance with CSA - A23.1.
- .2 Maintain concrete cover around reinforcing as indicated.
- .3 Place concrete in its final position as soon as possible after mixing and must be placed within 1.5 hours after the water has been added to the dry materials. Do not use any concrete more than 1.5 hours since mixing cement and water or having a partial set before placing.
- .4 Pour concrete continuously between predetermined construction and control joints. Do not "break" or interrupt successive pours such that "cold" joints occur.
- .5 Sleeves and Inserts:
 - .1 No sleeves, ducts, pipes or other openings shall pass through beams, except where expressly detailed on Structural drawings or approved by Contract Administrator.
 - .2 Where approved by Contract Administrator set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 by 100 mm not indicated on drawings must be approved by Contract Administrator.
 - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as indicated, obtain approval of all modifications from Contract Administrator before placing of concrete.
 - .4 Check locations and sizes of sleeves and openings indicated on structural Drawings with architectural, mechanical, electrical and other Drawings. Report any discrepancies to the Contract Administrator and await remedial measures.
 - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .6 Anchor Bolts:
 - .1 Set anchor bolts to templates under supervision of trade supplying anchors prior to placing concrete.
 - .2 With approval of Contract Administrator grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be at least 100 mm in diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used or to manufacturer's recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-up.
 - .4 Set bolts and fill holes with epoxy grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to temperature at time of erection.
- .7 Drainage Holes and Weep Holes: Form weep holes and drainage holes in accordance with Section 03 10 00. Install weep hole tubes and drains as indicated.

- .8 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .9 Joint Fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Contract Administrator. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .2 Locate and form isolation and expansion joints as indicated. Install joint filler.
 - .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

3.03 COLD WEATHER CONCRETE PLACING

- .1 Maintain following minimum requirements for protecting concrete during and after placement in freezing weather. Except as noted below, concrete curing and protection to be in accordance with CSA - A23.1 / A23.2.
- .2 Before any concrete is placed, remove ice, snow, and frost completely from all formwork, reinforcing and other surfaces. Raise temperature of formwork, reinforcing, and other surfaces above 10°C for 24 hours minimum prior to concrete placing. Where concrete work is to come in contact with the earth, the surfaces of the earth shall be completely free of frost when the concrete is placed thereon.
- .3 Heat concrete aggregates and water to a temperature not over 80°C. Concrete shall not be less than 10°C nor more than 30°C in temperature when deposited. Concrete when placed during freezing weather (or if freezing is anticipated during curing period) shall be fully enclosed and the temperature of the concrete maintained at not less than 20°C for 5 days and not less than 5°C for an additional five days. Provide adequate heating to attain the specified concrete strengths required prior to stripping or provide a concrete mix that will meet the specified stripping strengths under reduced curing temperatures.
- .4 Keep protecting covering clear of concrete and form surfaces to permit full circulation of air. Maintain intact for at least 24 hours after the artificial heat is discontinued.
- .5 Construct heating enclosures/hoarding to be strong and windproof, well ventilated. Locate heating units to prevent local damage to concrete due to local overheating, over drying, or combustion gases.
- .6 Use only indirect fired heat exchange fuel oil type heaters for slabs and flat areas. Vent units to outside the building/hoarding. Direct-fired units are not acceptable.

3.04 FINISHING

- .1 Finish concrete in accordance with CSA - A23.1 / A23.2.
- .2 Use procedures acceptable to Contract Administrator and as noted in CSA - A23.1 / A23.2 to remove excess bleed water. Ensure surface is not damaged.
- .3 Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.
- .4 Saw Cut Crack-Control Joints: CSA - A23.1 / A23.2.
- .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .6 Fill and patch honeycomb areas, rub form joint lines from all exposed concrete.
- .7 Fill and patch form tie holes on exposed concrete.
- .8 Where floor drains occur, finish floor slabs level around walls and pitched to drains minimum 6 mm in 3 metres unless indicated otherwise.

- .9 Provide steel trowelled, smooth, burnished finish where slabs to be left. Burnish to smooth, even finish without ridges, trowel marks, voids, or other imperfections that may transmit through flooring material.
- .10 Provide screed, swirl-trowelled, or scratch finish where is to be applied.

3.05 SURFACE TOLERANCE FOR HORIZONTAL SURFACES

- .1 Concrete tolerance for horizontal surfaces in accordance with CSA - A23.1 / A23.2, Table 21, as follows:

Class	Overall F-number	
	F _F	F _L
A	20	15
B	25	20
C	35	25
D	45	30

- 1. All floor slabs will have a floor flatness of Class B.
- .2 Verification: CSA - A23.1 / A23.2.
 - .1 Floor flatness for Class A flatness can be validated with the straight edge method, but must still meet the Class F-number.
 - .2 Class B floor flatness is to be verified using the ASTM E1155M-96 testing standard through third party testing. Cost of testing by cash allowance.

3.06 CURING AND SEALING

- .1 Cure concrete in accordance with A23.1/A23.2.
- .2 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
- .3 Do not use curing and sealing compounds on surfaces where bond is required for additional concrete, floor finishes or other surface coatings.

3.07 DEFECTIVE CONCRETE

- .1 Modify or replace concrete not conforming to lines, detail and elevations indicated on drawings.
- .2 Repair or replace concrete not properly placed, resulting in excessive honeycombing and other defects in critical areas of stress.
- .3 Do not patch, fill, touch-up, repair or replace exposed architectural concrete except upon expressed direction of the Contract Administrator for each individual area.
- .4 Notify Contract Administrator of proposed methods of repairing or replacing defective concrete. Methods of repairing or replacing defective concrete shall be acceptable to the Contract Administrator.

3.8 FIELD QUALITY CONTROL

- .1 Engage an independent testing laboratory for inspection and testing of concrete and concrete materials.
- .2 Inspection and testing of concrete and concrete materials shall be done in accordance with CSA - A23.1 / A23.2, and as specified below.
 - .1 Take three test cylinders from each 75 cubic metres of each class of concrete placed or for each day of concrete placement if the latter is less than 75 cubic metres. Testing shall be as follows:
 - .1 One 7-day laboratory cured test.
 - .2 Two 28-day laboratory cured tests.

- .2 Take one additional test cylinder during cold weather concreting. Cure cylinder on job site under same conditions as concrete that it represents.
 - .3 Make at least one slump test for each set of test cylinders taken.
 - .4 Cure concrete test cylinders in location designated by testing agency for a minimum of 48 hours prior to transporting to laboratory.
 - .5 Additional testing required due to low, inaccurate or otherwise questionable results shall be paid by the Contractor.
 - .6 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.2.
- .3 Inspection or testing by Contract Administrator will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 03 30 00 - Cast-In-Place Concrete: For Concrete placement, curing and finishing.
- .2 Section 03 35 46 - Concrete Topical Treatments.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Manufacturer's product data sheets identifying material, performance characteristics, surface preparation, installation instructions.

1.03 ENVIRONMENTAL REQUIREMENTS

- .1 Ensure work areas is protected against rain and detrimental weather conditions.
- .2 Maintain ambient temperature of not less than 10 °C from seven days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period. Maintain substrate temperature at 10 °C minimum.
- .3 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .4 Ventilation:
 - .1 Contractor will arrange for ventilation system to be operated during installation of hardeners.
 - .2 Ventilate area of work as directed by Consultant by use of approved portable supply and exhaust fans.
 - .3 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .4 Provide continuous ventilation during and after coating application.

1.04 WASTE MANAGEMENT AND DISPOSAL

- .1 Comply with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.01 MATERIALS

- .1 Non-Metallic Dry Shake Floor Hardener (Plain): Premixed, quartz-silica mixture of finely graded non-metallic aggregates, plasticizer, and cement for maximum wear resistance.
 - .1 Acceptable Products:
 - .1 Euclid Surfex Natural
 - .2 Sika Diamag 7
 - .3 Target Non-Metallic
 - .4 CPD Floor Hardener Pre-Mix (Standard)
 - .5 Master Builders Mastercron

Part 3 Execution

3.01 EXAMINATION

- .1 Verify that slab surfaces are ready to receive work.

3.02 APPLICATION

- .1 Apply hardener in accordance with manufacturer's written instructions.
- .2 Dual Pass Dry Shake Application:
 - .1 Dry shake shall be applied at a rate of 4.88 - 6.1 kg/m²] (1.0 - 1.25 lbs/ft²) for a "medium duty" hardened surface by calibrated mechanical spreader except small areas not accessible to mechanical spreader may be hand applied.
 - .2 Allow slab to dry sufficiently to a point where weight of the finishers and power-trowel equipment do not leave indentation.
 - .3 If any excess bleed water remains on surface, use a rubber hose to drag water from the surface.
 - .4 Using float shoes, break the surface of slab open and apply 2/3 of desired amount of dry shake.
 - .5 Once dry shake has fully darkened due to absorption of moisture, continue floating process to work dry shake into surface.
 - .6 Once first application of dry shake has been worked into the slab, immediately apply remaining 1/3 of dry shake to slab.
 - .7 Pay close attention to area where color may not be prevalent from first application.
 - .8 Continue floating process to work second application into slab.
 - .9 After slab has been given time to further "tighten up" begin final troweling operations.

3.03 PROTECTION

- .1 Protect finished installation until floor treatment has cured.

3.04 SCHEDULE

- .1 Apply floor hardener to concrete floors in following locations:
 - .1 New hoist pit concrete floors.

END OF SECTION

Part 1 General

1.01 SUMMARY

- .1 Section Includes:
 - .1 Concrete water-based sealing compounds.

1.02 RELATED REQUIREMENTS

- .1 Section 03 30 00 – Cast-In-Place Concrete: For concrete floor finishing and surface level tolerance.
- .2 Section 03 35 13 – High-Tolerance Concrete Floor Finishing.

1.03 REFERENCE STANDARDS

- .1 ASTM
 - .1 ASTM C309 - 19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
 - .2 ASTM C979 / C979M – 10, Standard Specification for Pigments for Integrally Colored Concrete
 - .3 ASTM C1315 -19, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20, Surface Sealer for Floors

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Manufacturer's data sheets, including product specifications, test data, preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.
- .3 Manufacturer's Application Data: Indicate special procedures, conditions requiring special attention, and other details.
- .4 Test Reports: Submit substantiating data, test results of previous tests by independent laboratory which purport to meet performance criteria, and other supportive data prior to application of Work.

1.05 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00: Closeout Submittals.
- .2 Maintenance instructions, including precautions for avoiding staining after application.

1.06 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.
- .2 Applicator Qualifications: Company specializing in performing the work of this section with minimum two years documented experience and approved by the manufacturer.
- .3 Materials:

- .1 Minimum five years documented field installations.
- .2 Not to affect bonding capability of other materials applied to substrate.
- .4 Provide materials of this section from single manufacturer.

1.07 MOCK-UPS

- .1 Construction mock-ups in accordance with Section 01 40 00 – Quality Requirements.
- .2 Provide mock-up of concrete topical treatments of approximately 10 m² size, and including wall base inside corner, outside corner, change of material, door threshold.
- .3 Construct mock-up on site where directed.
- .4 Allow 72 hr for review of mock-up by Consultant before proceeding with flooring work.
- .5 Subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00 - Common Product Requirements: For transport, handling, storage, and protection of products.
- .2 Store containers to manufacturer's written instructions.
- .3 Protect materials from freezing.

1.09 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain ambient temperatures above 5 degrees C for twenty-four hours before and during application and until liquid or mastic accessories have cured.
- .2 Temporary lighting:
 - .1 Minimum 1 200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .3 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10°C from seven days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Ventilation:
 - .1 Ventilate area of work as directed by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .3 Provide continuous ventilation during and after coating application.

1.10 WARRANTY

- .1 Manufacturer's Warranty: Five years, materials and installation.

Part 2 Products

2.01 CONCRETES SEALERS

- .1 Surface Sealer: Water-based, acrylic polymer water emulsion type, curing and sealing compound, clear, to CAN/CGSB-25.20, Type 2 or ASTM-C309, Type 1, Class A.

- .1 Acceptable Products:
 - .1 Aqua-Cure VOX, as manufactured by Euclid Chemical.
 - .2 MasterKure CC 160 WB, as manufactured by BASF Corporation.
 - .3 Vocomp-20 as manufactured by W.R. Meadows.

2.02 CONCRETE HARDENERS

2.03 ACCESSORIES

- .1 Water: Clean, potable.

Part 3 Execution

3.01 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Ensure surfaces are clean, dry and free of contaminants.
- .3 Ensure new concrete has cured minimum 28 days.
- .4 Ensure ambient temperature is minimum 10 deg C, and substrate temperature is minimum 4 deg C.
- .5 Notify Consultant if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions are corrected.

3.02 PREPARATION

- .1 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- .2 Ensure surfaces are clean and free of standing water.
- .3 Remove dirt, dust, oil, grease, sealers, and other materials that may prevent adhesion of curing and sealing compound.
- .4 Mechanically abrade existing surface with circular grinder in accordance with ASTM D4259.
- .5 Final remediated surface profile: CSP 2 (0-3 mils profile) in accordance with International Concrete Repair Institute (ICRI) Technical Guideline No.03732
- .6 Perform application on minimum [$<0.85 \text{ sq m} ><<9 \text{ sq ft}>>$] test section; obtain approval of test section from Consultant before proceeding with application.

3.03 INSTALLATION: GENERAL

- .1 Install topical treatments to manufacturer's written instructions.
- .2 Ensure compatibility of topical treatment materials with adhesives of finished flooring materials and other bonded toppings or coatings prior to application.
- .3 Protect adjacent work from spillage and overspray. Remove overspray on adjacent surfaces immediately before dry.
- .4 Apply topical treatments where indicated and allow to cure according to manufacturer's written instructions.
- .5 Do not dilute or mix materials with other products.
- .6 Apply product with brush, roller or low-pressure airless sprayer.

- .7 Apply even coats allowing for and observing adequate penetration. Do not allow surface to dry between coats.
- .8 Do not apply product to surfaces that are restricted by product manufacturer.
- .9 Clean substrate and equipment with potable water.

3.04 INSTALLATION: CHEMICAL HARDENER

- .1 New Concrete: Apply chemical hardener to new concrete as soon as the concrete is firm enough to work on after troweling, except on coloured concrete wait minimum of 30 days.
 - .1 Spray on at rate of 200 square feet per gallon (4.8 sq m/L).
 - .2 Keep surfaces wet with chemical hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather slipperiness may appear before the 30-minute time period has elapsed. If that occurs, apply more chemical hardener as required to keep entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state.
 - .3 After this period, when treated surface becomes slippery lightly mist with water until slipperiness disappears.
 - .4 Wait for surface to become slippery again and then flush entire surface with water removing all residue of chemical hardener.
 - .5 Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
 - .6 Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.

3.05 Existing Concrete: Apply chemical hardener only to clean bare concrete.

- .1 Thoroughly remove previous treatments, laitance, oil, and other contaminants.
- .2 Saturate surface with chemical hardener; respray or broom excess onto dry spots.
- .3 Keep surface wet with cure-seal-hardener for minimum soak-in period of 30 to 40 minutes.
- .4 If, after the 30-minute soak-in period, most of the material has been absorbed, remove all excess material using broom or squeegee, especially from low spots.
- .5 If, after the 30-minute soak-in period, most of the material remains on the surface, wait until it becomes slippery and then flush entire surface with water removing all residue of cure-seal-hardener and squeegee completely dry, flushing any remaining slippery areas until no residue remains.
- .6 If water is not available, remove residue using squeegee

3.06 INSTALLATION: CONCRETE SEALER

- .1 Apply compound at uniform coverage rate in accordance with manufacturer's written instructions.
- .2 Apply as soon as possible after finishing and immediately after disappearance of surface moisture sheen, when used to cure freshly placed concrete.
- .3 Do not apply to concrete to receive toppings, epoxy coatings, urethane coatings, or epoxy adhesives.
- .4 Cure concrete surfaces as specified in Section 03 30 00.

3.07 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

- .2 Protect installed floors until chemical reaction process is complete; at least three months.
 - .1 Comply with precautions listed under PROJECT CONDITIONS.
 - .2 Clean floor regularly in accordance with manufacturer's recommendations; water will accelerate the sealing and scrubbing will impart a shine.
 - .3 Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.
- .3 Precautions and cleaning are the responsibility of the Contractor until substantial completion.

END OF SECTION

Part 1 General

1.01 SUMMARY

- .1 Section Includes:
 - .1 Paint all new work as indicated and as specified.
 - .2 Refer to all drawing and coordinate with work of other trades. Claims for extras to the Contract will not be accepted due to the failure of the Contractor to become fully aware of all work that is required.

1.02 RELATED REQUIREMENTS

- .1 Sections with Items Requiring Site Finishing:
 - .1 Section 14 45 29 – Two Post Inground Bus Hoist

1.03 REFERENCE STANDARDS

- .1 ASTM
 - .1 ASTM D4541-17, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
 - .2 ASTM D4752 – 10(2015), Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
 - .3 ASTM D7091 – 13, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
- .2 Master Painters Institute (MPI)
 - .1 Architectural Painting Specifications Manual (2014)
- .3 Environmental Protection Agency (EPA)
 - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA)
 - .2 SW-846, Test Method for Evaluating Solid Waste, Physical/Chemical Methods

1.04 ACTION / INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be used on project.
- .3 Samples:
 - .1 Indicate where colour availability is restricted.
 - .2 Submit duplicate 200 by 300 mm sample panels of each paint, stain, clear coating, and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .3 When approved, sample panels shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

1.05 CLOSEOUT SUBMITTALS

- .1 Upon completion, submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets (MSDS).

1.06 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Conform to latest MPI requirements for painting work including preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Consultant.
- .7 Standard of Acceptance:
 - .1 Walls, doors and other vertical surfaces: no defects visible from a distance of 1 m at 90° to surface.
 - .2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area and shall be acceptable to Consultant.

1.07 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 Provide paint products meeting MPI "Environmentally Friendly" E1, ratings based on VOC (EPA Method 24) content levels.
- .2 Where indoor air quality (odour) is a problem, use only MPI listed materials having a minimum E2 rating.

1.08 SCHEDULING OF WORK

- .1 Submit work schedule for various stages of painting to Consultant for review. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Consultant for any changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about the building.

1.09 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Labels shall clearly indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Provide and maintain dry, temperature controlled, secure storage.
- .5 Observe manufacturer's recommendations for storage and handling.
- .6 Store materials and supplies away from heat generating devices.
- .7 Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C.
- .8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return areas to clean condition to approval of Consultant.
- .10 Remove paint materials from storage only in quantities required for same day use.
- .11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .12 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and Waste Reduction Work Plan.
- .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:

- .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
- .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by, individuals, or organizations for verifiable re-use or re-manufacturing.
- .8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

1.11 SITE CONDITIONS

- .1 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by the Consultant and the applied product manufacturer, perform no painting work when:
 - .1 Ambient air and substrate temperatures are below 10°C.
 - .2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is above 85% or when the dew point is less than 3°C variance between the air/surface temperature.
 - .5 Rain or snow is forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .2 Perform no painting work when the maximum moisture content of the substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .13 Surface and Environmental Conditions:
 - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
 - .3 Apply paint only when previous coat of paint is dry or adequately cured.

- .14 Additional Interior Application Requirements:
- .1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

Part 2 Products

2.01 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems shall be products of a single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.

2.02 COLOURS

- .1 Consultant will provide Colour Schedule after receipt of product data and samples.
- .2 Selection of colours may be from several different manufacturers. Match colour samples exactly regardless of manufacturer.
- .3 Second coat in a three-coat system to be tinted slightly lighter colour than topcoat to show visible difference between coats.

2.03 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Consultant's written permission.
- .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.04 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint.
- .2 Gloss levels in accordance with MPI Architectural Painting Specifications Manual, defined as follows:

Gloss Level	Description	Gloss @ 60°	Sheen @ 85°
G1	traditional matte finish - flat	Max. 5 units	Max. 10 units
G2	high hide sheet flat - 'velvet-like'	Max. 10 units	10 - 35 units
G3	traditional 'eggshell-like'	10 - 25 units	10 - 35 units
G4	'satin-like'	20 - 35 units	Min. 35 units
G5	traditional semi-gloss	35 - 70 units	
G6	traditional gloss	70 - 85 units	

Gloss Level	Description	Gloss @ 60°	Sheen @ 85°
G7	high gloss	< 85 units	

- .3 Gloss level ratings of interior painted surfaces as follows, except where specified otherwise:

Interior Surfaces	Gloss
Structural steel and metal fabrications	G5

2.05 INTERIOR PAINTING SYSTEMS

- .1 Paint interior surfaces in accordance with the following MPI Painting Specification Manual requirements.
- .2 All paint systems specified herein are premium grade unless otherwise indicated.
- .3 Structural Steel and Metal Fabrications: Columns, beams, joists, etc.
- .1 INT 5.1F - Polyurethane, Pigmented (over epoxy primer).

Part 3 Execution

3.01 GENERAL

- .1 Perform preparation and operations for painting in accordance with MPI Painting Specifications Manual requirements, except where indicated otherwise.
- .2 Apply paint materials in accordance with paint manufacturers' written application instructions.
- .3 Paint all new work, except prefinished items or where indicated otherwise.

3.02 EXISTING CONDITIONS

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Consultant.
- .3 Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.03 PROTECTION

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Consultant.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Remove electrical cover plates, light fixtures, surface hardware on doors, signs and signage, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking any painting operations. Store items and re-installed after painting is completed.

- .5 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .6 As painting operations progress, place "WET PAINT" signs in occupied areas to approval of Consultant.

3.04 CLEANING AND PREPARATION

- .1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent, and bleach where applicable, and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.
- .2 New exposed and unexposed wood surfaces to receive shop applied primer before installation. Use same primers as specified for exposed surfaces and as follows:
 - .1 Apply solvent based sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove visible defects.
- .4 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air, or vacuum cleaning.
- .5 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.
- .6 Do not apply paint until prepared surfaces have been reviewed by Consultant.

3.05 APPLICATION

- .1 Method of application shall be acceptable to Consultant.
- .2 Apply paint by air sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .3 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant.
- .5 Remove runs, sags and brush marks from finished work and repaint.
- .4 Spray Application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
 - .4 Brush out immediately all runs and sags.
 - .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .5 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Consultant.
- .6 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .7 Painting coats specified are intended to cover surface completely. If necessary apply additional coats until satisfactory coverage is obtained. Provide additional coats at not additional cost to Contract.
- .8 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .9 Sand and dust between coats to remove visible defects.
- .10 Doors and Frames:
 - .1 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
 - .2 Finish exposed edges of laminated plastic covered wood doors. Apply wood stain and clear sealer as specified for stained wood surfaces.
 - .3 Finish surfaces of doors and frames that will be concealed behind protective plates and coverings, door frame guards. Use same finish formula specified for visible portion of door.
 - .4 For exterior doors and frames indicated for painting/staining, use exterior quality paint/stain on both interior and exterior sides of door and frame.
 - .5 For doors and frames to receive epoxy coatings, finish both sides of doors and frames with same finish formula.
- .11 Do not paint door and miscellaneous hardware, unless indicated otherwise.
- .12 Do not paint nameplates, signage, fire labels, or other markers or signs indicated to remain.
- .13 Do not paint copper, bronze, chromium plate, nickel, stainless steel, aluminum, lead and other bright metals, unless specified otherwise.

- .14 Clean shop applied paint surfaces that become marked. Touch up with primer and paint as required.

3.06 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Interior painting:
 - .1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
 - .2 Paint exposed electrical panelboards in finished areas with colour and finish to match adjacent surfaces.
 - .3 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
 - .4 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
 - .5 Do not paint interior transformers and substation equipment.
- .2 Exterior painting:
 - .1 Paint exposed conduits, piping, hangers, ductwork, and other mechanical and electrical equipment unless indicated otherwise. Colour and texture to match adjacent surfaces except where indicated otherwise.
 - .2 Paint Following exterior equipment/surfaces:
 - .1 []
 - .3 Do not paint outdoor transformers and substation equipment.
- .3 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .4 Do not paint over nameplates.
- .5 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .6 Paint natural gas piping yellow.
- .7 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.07 RESTORATION

- .1 Clean and re-install all hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust [with methods acceptable to Consultant]. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition [acceptable to Consultant].

END OF SECTION

Part 1 General

1.01 SUMMARY

- .1 Section Includes:
 - .1 Inground, two piston hoist lifts.

1.02 RELATED REQUIREMENTS

- .1 Section 01 91 13 – General Commissioning (Cx) Requirements: For commissioning of inground bus hoists.
- .2 Section 01 91 41 - Demonstration and Training: For inground bus hoist training and demonstration.
- .3 Section 09 91 00 - Painting

1.03 COORDINATION OF RELATED WORK

- .1 Provide templates for installation of equipment and anchor bolts.
- .2 Grading of floor slab to suit hoist installation.
- .3 Service conduit in floor from power units to hoists.
- .4 Electrical power requirements for power unit and control circuits by Division 26 up to control panel disconnect.
- .5 Power wiring after control panel disconnect by this Section, to requirements of Division 26.
- .6 Control wiring and conduit by this Section, to requirements of Division 26.
- .7 Refer to Mechanical, Industrial Contract Drawings for hoist configuration, design and details read in conjunction with Structural Contract Drawings for hoist pit details and coordination requirements for concrete and formwork.

1.04 DEFINITIONS

- .1 Rise: Means the distance platform rises up, measured from finished floor to upper most position.
- .2 Safe Zone: Means location where operator must stand while lifting bus, in accordance with OHSA.

1.05 REFERENCE STANDARDS

- .1 American Society of Civil Engineers (ASCE)
 - .1 ANSI/ALI ALCTV - 2011, Standard for Automotive Lifts - Safety Requirements for Construction, Testing and Validation
 - .2 ANSI/ALI ALOIM - 2020, Standard for Automotive Lifts - Safety Requirements for Operation, Inspection and Maintenance.
 - .3 ANSI/ASME B31.1 - 2020, Power Piping.
- .2 Canadian Standards Group (CSA)
 - .1 CAN/CSA B167 (R2007), Safety Standard for Maintenance and Inspection of Overhead Cranes, Gantry Cranes, Monorails, Hoists and Trolleys
 - .2 CSA C22.1 - 2021, Canadian Electrical Code
 - .3 CSA W47.1;19, Certification of Companies for Fusion Welding of Steel
 - .4 CSA W59 - 2018, Welded Steel Construction (Metal Arc Welding).

- .3 SAE J343 Revised 2017-12-20, Test and Test Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies.

1.06 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittals Procedures.
- .2 Product Data:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations and trouble-shooting protocol.
 - .2 Product transportation, storage, handling and installation requirements.
 - .3 Provide hydraulic pump curves and sound rating data, showing point of operation, bhp and efficiency.
 - .4 Provide hydraulic unit and control component product data, including but not limited to, relief valves, flow valves, solenoid valves, hoses, pistons, compressed air devices, control panels, switches, PLC and motors.
- .3 Shop Drawings:
 - .1 Elevations, sections, details and operating components, dimensions, gauges, finishes of hoists, hydraulic power units, framing, cover plates and accessories and relationship of operating components to adjacent construction.
 - .2 Complete electrical wiring diagrams including electrical schematics and complete written sequence of operation.
 - .3 Coordination drawings indicating clearances to building structure and building services, including but not limited to walls, roof structure, heaters, light fixtures and duct work.
 - .4 Complete hydraulic schematics.
 - .5 Submit details of disassembly for maintainable components.
- .4 Submit Pre-Start Health and Safety Certification letters.
- .5 Training Plan:
 - .1 Submit Training Course Material and Training Schedule in accordance with Section 01 91 41.
- .6 Commissioning:
 - .1 Submit Commissioning Plan, Commissioning Procedures, Certificate of Readiness, Deficiency Report and Commissioning Closeout Report, in accordance with Section 01 91 13.
 - .2 Submit shop and field inspection reports.

1.07 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals. Maintenance Data: For inground hoist lifts to include in maintenance manuals.
- .2 Identification: Manufacturing name, type, year, serial number, number of units, capacity and identification of related systems.
 - .1 Functional description detailing operation and control of components.
 - .2 Performance criteria and maintenance data.
 - .3 Operating instructions and precautions.
 - .4 Safety precautions.
 - .5 Component parts availability including names and addresses of spare part suppliers.
 - .6 Consumables.
 - .7 Lubrication schedule indicating lubrication points and type of lubricant recommended.

- .8 Maintenance and troubleshooting guidelines/protocol and recommended equipment to conduct analysis and repair.
 - .9 Start-up and test reports.
 - .10 Inspection and test reports as required by authority having jurisdiction.
 - .11 Final commissioning report.
 - .12 Pre-Start Health and Safety Conformance Letter.
 - .13 Extended Warranty.
 - .14 Electrical Testing Laboratories (ETL) certification of hoist assembly.
 - .15 Manufacturer's Instructions:
 - .1 Installation instructions for all hoist components.
 - .2 Delivery and storage instructions for all hoist components.
 - .16 Spare parts list.
- .3 As-built drawings.

1.08 QUALITY ASSURANCE

- .1 Hoist Manufacturer:
- .1 Have minimum of ten years experience in design, supply and installation of inground piston hoist lifts with minimum of ten units operating in the field.
 - .2 Manufacturers agent (Supplier) to be resident in the City of Winnipeg and capable of servicing Winnipeg Transit.
 - .3 Be responsible for overall compatibility and co-ordination of bus hoist product and its associated parts, including but not limited to, special fabrications, pre-assembled parts supplied by other companies, hydraulic pumps, hydraulic cylinders, etc.
 - .4 Adhere to written system of policies and procedures in accordance with ANSI/ALI ALCTV.
 - .5 Ensure hoist equipment certified to meet or exceed requirements of ANSI/ALI ALCTV.
- .2 Installer's Qualifications:
- .1 Hoist Manufacturer to approve installer. Installer to be resident in the City of Winnipeg and to be capable of servicing Winnipeg Transit for related future needs.
 - .2 Hoist Manufacturer to provide oversight to installer during installation. Certification to provided at completion by Hoist Manufacturer.
- .3 Designer's Qualifications:
- .1 Equipment, hoist and all appurtenances licensed and approved for use in Manitoba.
 - .2 Review, stamp and sign fabrication and erection shop drawings and design calculations.
 - .3 Conduct shop and site inspections, prepare and submit inspection reports verifying this part of Work is in accordance with Contract Documents and reviewed shop drawings.
 - .4 Monitor and be able to report on supplier's and fabricator's quality control tests and reports for compliance with Contract Documents.
- .4 Installation Records:
- .1 Hoist supplier to maintain up to date record of hoist installation including fabrication drawings for all custom fabricated parts, specifications for all third party components such as hydraulic cylinders, and all methods for finishing components to suit hoist installation.
 - .2 Hoist supplier to maintain records for one year following completion of warranty period.
- .5 Replacement Parts and Parts Supply Chain Inventory:
- .1 Hoist supplier to provide listing and costs of custom fabricated parts most subject to wear and anticipated early replacement, which should be kept in inventory by supplier.

Minimum inventory levels 1 for each unique part, unless more required, to ensure specified maintenance intervals and down time achieved.

- .6 Pre-installation meetings:
 - .1 Following shop drawing and product data submissions, supplier or manufacturer to review final shop drawing and product data submissions with Contract Administrator and Winnipeg Transit officials.

1.09 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

1.10 SITE CONDITIONS (OPERATING CONDITIONS)

- .1 In general, all devices to withstand harsh environmental conditions, with exposure to water, sand and salt in large quantities for extended periods of time.
- .2 Garage and hoists in operation 24 hours per day, 365 days per year. Each hoist to be capable to operate through 10 up/down cycles each day.
- .3 Design hoist equipment to withstand likely encountered conditions, but not limited to:
 - .1 Humid summer conditions: Condensation may form on equipment located at or below grade level.
 - .2 Floor washing: Water and debris may enter hoist equipment and pit openings.
 - .3 Drainage failure: Hoist pits may occasionally become water logged.
 - .4 Loose parts: Repair activities often result in small parts being dropped to floor. Protect hoist equipment from such parts becoming lodged in hoist mechanisms, especially safety devices.

1.11 SAFETY

- .1 In general, provide safety features in accordance with ANSI/ALI ACTV and OSHA.
- .2 Provide secondary safety locking devices in event main electrical power and/or hydraulics fail, while hoisting is occurring or as a result of any additional failure while buses are in a hoisted position
- .3 Design equipment and select products for fail safe failure mode.
- .4 Protect critical safety devices and hoist components from fouling due to water spray, dropped parts, and debris.
- .5 Limit unintentional desynchronization of platforms to maintain level plane of hoisted vehicle.
- .6 Provide key switch overrides for functions not required for normal use or could result in dangerous conditions.
- .7 Limit up and down motion speeds to ANSI/ALI ACTV.
- .8 Protect personnel from all pinch points, shear points, and rotating parts.
- .9 Install warning labels at all potential sources of danger.
- .10 Provide stops to prevent travel beyond normal range of motion. Protect hoisted buses from contacting building structure and any other equipment within proximity of hoist area.
- .11 Provide mechanisms and procedures to safely lower hoisted vehicles after failure has occurred.
- .12 Provide mechanisms and procedures to lock out hoist equipment not safe for use.

- .13 Locate controls so operators cannot operate them from beneath vehicles and only when standing in safe position.
- .14 Design and select equipment within hoist pits for Class 1 Division 2 environments.
- .15 Limit noise from operating equipment to 80 dBA at 1 metre.
- .16 Quick release fittings: Designed to prevent injury to maintainers.

1.12 WARRANTY

- .1 Subject to warranty provided under the General Conditions, provide optional pricing for additional warranty on hoist equipment as described below.
- .2 Five year optional performance warranty from date of Substantial Performance:
 - .1 Warrant against failure all parts subject to normal use.
 - .2 Warrant any deficiency to meet design criteria and requirements of this specification.
 - .3 Coverage: Complete replacement of affected work.
- .3 Ten year optional corrosion warranty from date of Substantial Performance:
 - .1 Warrant against failure all corroded parts.
 - .2 Coverage: Complete replacement of affected work.
- .4 Optional recommended warranty, as suggested by Supplier.

1.13 TRAINING

- .1 Provide training as noted below.
- .2 Maintenance Training:
 - .1 Plant Maintenance – Millwrights/Electricians:
 - .1 Allow a minimum of four hours of total in-class time (through remote presentation) to train for repair and maintenance aspects unique to the newly installed equipment and which is substantially different from the existing hoist equipment.
 - .2 Training tailored to maintenance staff.
 - .2 Training to be provided by Rotary-certified technical staff.

1.14 SPARE PARTS

- .1 Supplier to provide list of recommended spare parts as necessary for one year of operation, post warranty period.

Part 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

- .1 General:
 - .1 Hoist equipment to meet or exceed requirements of ANSI/ALI ALCTV.
 - .2 Consider hoist installation as heavy industrial application and design equipment accordingly.
 - .3 Design hoist system with minimum of simple, rugged components.
 - .4 Design equipment for minimum operating life of 25 years.
 - .5 Two post style, pit mounted.

- .6 Hydraulically powered lifting mechanisms.
- .7 Factors of safety: Load bearing elements including hoist pit structure to meet or exceed factors of safety described in ANSI/ALI ALCTV.
- .8 All material welded to CSA-W47.1 and CSA-W59.
- .9 Drive on, back off arrangement.
- .10 To suit Winnipeg Transit modified bunk spacing and configurations required for Excelsior and older model buses. Bidder to coordinate with City/bus manufacturer to obtain required bunk details in order to ensure all adapters and saddles are appropriate and required for Winnipeg Transit fleet. Unsuitable or unnecessary items will not be accepted.
- .11 Use high pressure, low volume hydraulic power system to minimize hydraulic oil inventory.
- .12 Hoist and associated services to withstand wet environment typical of region.
- .2 Performance: Two post inground lifts that shall meet at least the following specifications
 - .1 Each Two post inground lift shall consist of two lifting units in line with the longitudinal axis of the vehicle, each lifting assembly equipped as to engage the axle and/or suspension as specified. One of the two lifting units is moveable fore and aft to affect variable spacing between lifting units and generally located for the front axle. The other lifting unit is fixed and generally located under the rear axle.
 - .2 Total lift capacity: 50,000 lbs (22,680 kg).
 - .3 Loading: 25,000 lbs. (11,340 kg) front post and 25,000 lbs. (11,340 kg) rear post.
 - .4 Front post shall be movable to provide proper engagement with vehicles ranging in wheelbases from 165 inches (4 190 mm) to 305 inches (7 747 mm)
- .3 Corrosion Control and Protection:
 - .1 Applies to:
 - .1 All materials at or below grade.
 - .2 Materials imbedded in concrete.
 - .3 Materials exposed to moisture, water, salt or condensation.
 - .4 Any other material in electrical contact with above materials.
 - .2 Provide warranty to replace and upgrade to satisfaction of the Commission all components found corroded during warranty period.
 - .3 Design and select components as if subjected to heavy industrial environments.
 - .4 Select and assemble materials to resist or eliminate galvanic corrosion.
 - .5 Materials: stainless steel, chrome plated steel, or hot-dipped galvanized steel and/or cast iron. Rams to be chrome plated.
 - .6 Thickness of plating, dipping, etc. selected to meet minimum 25 years hoist life.
 - .7 Unprotected steel and iron not permitted. Frames and angle brackets shall be hot-dipped galvanized.
 - .8 Metals such as copper, brass, and related alloys not permitted, except where completely and permanently isolated from other less noble metals.
 - .9 Design equipment to withstand and control condensation.
 - .10 Hoist equipment to withstand and control water and debris from such activities, including soaps and detergents, oils and grease.
- .4 Water Proofing Measures:

- .1 Provide mechanisms to remove water trapped within hoist components, such as drainage holes, channels, notches and the like, to control water standing in frames and recesses.
- .2 Prevent water from entering hoist components. Provide watertight construction wherever feasible.
- .5 Hoist Controls:
 - .1 Control system shall conform to all current NEC, UL 201 and OSHA Codes.
 - .2 Main lift controls shall be provided via a remote pendant control hanging from a reel and retractable. It should be easily accessible to the operator and long enough to reach both front and rear of the bus without interfering with any other equipment.
 - .3 Redundant controls shall be provided via a wall mounted control box. The wall control box shall not be deeper than twelve inches and shall be located such that it does not impede on the clear access around each bus required for maintenance personnel, equipment, tools and bus drive-thru exiting.
 - .4 Waterproof-rated.
 - .5 Connection cable to pendant to be provided with an additional five(5) ft length (minimum) from standard length normally provided, to allow for future relocation.
 - .6 Controls to be provided with both audible(buzzer) and visual alarms. Visual alarms to be visible from all required line-of-sight directions.
- .6 Environmental Protection:
 - .1 Provide features to mitigate loss of oil to environment due to leaks, ruptures, etc.
 - .2 Design tanks, hydraulic devices, etc. to minimize total oil capacity.
 - .3 Provide oil level monitoring and indication of leaks, sudden oil loss, etc.
- .7 Coordination of Design:
 - .1 Not all features of hoist and equipment indicated on the Contract Drawings. Requirements of specifications are in addition to features indicated on the Contract Drawings and take precedence.
 - .2 Coordinate revisions of hoist work with other trades impacted by those revisions.
 - .3 Make adjustments to hoist pit layout indicated on Contract Drawings to suit final arrangement of hoist equipment. Submit complete and detailed shop drawings of final hoist and pit design.
 - .4 Locate other appurtenances such as hoist cabinets, control panels and controls to avoid interference with other services while maximizing floor space.
 - .5 Coordinate sloping of floor in hoist area with adjacent work.
- .8 Maintenance:
 - .1 In general, design and select equipment for scheduled maintenance intervals every six months. Select equipment and design hoists to limit down time for maintenance to two days total duration for each year.
 - .2 Locate hydraulic power units within the pit to minimize interference with work and to ensure maintenance access.
 - .3 Provide features to permit repairs and maintenance without use of hoist electrical supply or hydraulic power.
 - .4 Provide mechanism to drain hydraulic oil safely from cylinders into tank, providing means to lower raised buses safely to ground without electric power.
 - .5 Bearings sealed with grease fittings or lubricated for life ball bearing wheels.
 - .6 Design and arrange parts requiring maintenance and/or replacement removable with minimal disassembly or removal of adjacent equipment.

- .7 Select and/or keep inventory of parts to ensure 24 hours availability for maintenance for life of hoist.
- .8 Make and arrange components subject to wear such as lock dogs, axles, wheels, bearings, guides, rails, seals, wipers, etc. easily replaceable.
- .9 Provide list of consumables required for routine and scheduled maintenance.
- .10 Provide list of recommended spare parts, including cost and identifying source of suppliers and long lead items.

2.02 MANUFACTURERS

- .1 Subject to compliance with requirements specified in this section and as established by the basis of design materials, manufacturers offering products that may be incorporated into the work, but not limited to, include the following:
 - .1 Rotary 70Q-ALI
 - .2 Or approved equal through substitution approval request.
- .2 Equipment described herein and as shown on Contract Drawings is representative of typical installation, manufacturer to make revisions to meet all requirements of specifications and site conditions. Provide complete, optimized and fully functional system.

2.03 MATERIALS

- .1 Structural Steel and Metal Fabrications:
 - .1 Galvanizing: CSA G164M to minimum 700 g/m² galvanized coating. Galvanize after fabrication or touch up welds with Galvafruid.
 - .2 Steel Framing, Anchor Bolts, Anchors, etc.: minimum 3 coatings hot-dipped galvanized steel, as required and as indicated on Drawings.
- .2 Hydraulic Hose:
 - .1 Flexible braided hose of size and material compatible with fluid and pressure conditions. Burst pressure minimum four times listed working pressure. In accordance with SAE J517 standard.
 - .2 Quick-release fittings at each end to prevent twisting of hose during installation and 90 degree elbows at each end. In accordance with SAE J516 standard. Observe: MOL advisory on quick release fittings.
- .3 Compressed Air:
 - .1 Hoses: Anaconda Type T1 hose of Teflon with stainless steel wire braid, burst pressure 552 bar, test pressure 276 bar.
 - .2 Filter/Regulator/Lubricator assemblies as per Section 22 15 00.

2.04 INGROUND HOIST LIFT

- .1 General:
 - .1 Heavy duty, two post inground, hoist piston lift installation.
 - .2 Entire lift assembly to consist of electrohydraulic lift, exterior mounted control console and accessories as specified herein.
 - .3 Supply lift with sufficient lengths of hydraulic hose, air hose and electrical cable to permit location to control console in safe position from hoisted vehicle.
 - .4 Use standard hydraulic fittings throughout lift.
 - .5 Dynamic lifting capacity 1.4 times nominal lifting capacity.

- .6 Each 2-post lift shall consist of two lifting units in line with the longitudinal axis of the vehicle, each lifting assembly equipped as to engage the axle and/or suspension as specified. One of the two lifting units is moveable fore and aft to affect variable spacing between lifting units and generally located for the front axle. The other lifting unit is fixed and generally located under the rear axle.
 - .7 Total lift capacity: 50,000 lbs (22,680 kg).
 - .8 Loading: 25,000 lbs. (11,340 kg) front post and 25,000 lbs. (11,340 kg) rear post.
 - .9 Front post shall be movable to provide proper engagement with vehicles ranging in wheelbases from 165 inches (4 190 mm) to 305 inches (7 747 mm)
 - .10 Front Post shall rise 66 inches (1 676 mm) to top of jack assembly.
 - .11 Rear Post shall rise 69 inches (1 753 mm) to top of jack assembly.
 - .12 Front and Rear Diameter: 10-5/8 inches (270 mm).
 - .13 Lifting Rate: 1140 mm per minute, minimum capability
 - .14 Descending Rate: 2400 mm per minimum, maintained
 - .15 Moveable and fixed lifting units synchronization: 2-inches (50 mm).
 - .16 Electrical lift system labeled and listed by Third Party Testing Laboratory such as UL, CE, TUV, ITS or other recognized laboratory.
 - .17 Hydraulic system operates at high pressure and with single acting hydraulic cylinders (power up, gravity down).
 - .18 Provide secondary safety locking devices in event main electrical power and/or hydraulics fail while hoisting is occurring, or as a result of any additional failure while buses are in a hoisted position
- .2 Lift:
- .1 Flush mounted, drive on, back off arrangement.
 - .2 Units shall consist of frames, pumps, lift posts, a common motor assembly complete with relief valves, and check valves mounted on an appropriately sized hydraulic fluid reservoir. The power unit shall be factory assembled and tested.
 - .3 Lifts must be equipped with home pockets for rear saddles to sit flush with floor surface, and for front saddles to sit above floor, creating an unobstructed floor that minimizes tripping hazards
 - .4 Provide front and rear hoist adapters, supplied for each individual lift, capable of lifting all of Winnipeg Transit buses and compatible with existing sets. Provide Ultra Low Profile adapter assembly, part number FD2386YL.
 - .5 Unit floor frames shall be structural and have the option to be installed suspended from a thickened slab or on a load bearing foundation slab.
 - .6 Covers should be shaped to include a full-length interlocking hinge and shall fit together tightly and uniformly to promote smooth travel so as to prevent jamming and twisting. Covers shall be flush to finished floor level.
 - .7 The covers for the moveable lifting unit trench shall be engineered to accept a 7,500 lbs (3,402 kg) point load on a contact area of 2 by 2-inch (50 by 50 mm) as well as a drive-over load 6 by 9-inch (150 by 230 mm tire contact area) of 13,500 lbs./6,124 kg. Cover plates and saddles shall withstand direct and torsional wheel loads from bus traffic without permanent damage or bending. Bus traffic directly onto cover plates will be frequent. Standard cover plates are unacceptable due to proven track record of bending.
 - .8 Front and rear locking legs shall be rated at same capacity as the corresponding jacking units.
 - .9 The locking latches shall be spring loaded to the locked position and shall be released at the control location.
 - .10 Saddles to be Ultra Low profile to provide required clearance.
 - .1 Acceptable Saddle Assembly: FD2386YL as indicated on Drawing Q-001.

- .11 The lift locking leg shall be attached to the saddle to prevent rotation insuring proper location of releases at all times. The locking leg shall prevent rotation of the piston assembly.
- .3 High-Pressure Hydraulic Cylinder:
 - .1 Full hydraulic single acting high pressure with nominal working pressure of 150 bar and integral check valve limits peak pressure to 240 bar.
 - .2 Ram accurately machine polished steel. Outer cylinder casing ST52.2BK steel.
 - .3 Replaceable high pressure seals and packings.
 - .4 Ram protected from external water spray.
- .4 Safety Features:
 - .1 General:
 - .1 "Up" and "Down" push buttons of dead man type, automatically returning to neutral position when released by operator.
 - .2 Contain hydraulic cylinders and locking devices to prevent damage from dirt, grime, contaminants and potentially falling objects.
 - .3 Check valves fitted in each cylinder to prevent lift from collapsing in event hydraulic hose ruptures while lift ascending or descending.
 - .4 Flow regulating valves to maintain maximum speed of 40 mm/s on descent.
 - .2 Safety Locks:
 - .1 Minimum of twelve locking positions throughout its lifting and lowering cycle.
 - .2 Minimum safety factor of not less than three.
 - .3 One set of locks mounted to each lifting cylinder.
 - .4 Locks designed with upper and lower locking jaw to ensure minimum amount of travel in event of hydraulic fluid leak and maintain height of lift.
 - .5 Locks operated by air cylinder requiring shop air of 90 to 125 PSI at control panel.
 - .6 Locks automatically disengaged when lift "lower" control operated, and automatically reengaged when lift "lower" control released.
 - .7 Locks to automatically engage as lift ascends, to ensure positive lock engagement in event of hydraulic failure.
- .5 Manufacturers Name Plates:
 - .1 Product Type S-2 as per Section 20 05 53.
 - .2 Provide "caution" sign 100 by 200 mm, wall mounted at each control unit.
 - .3 Labeling in accordance with ANSI/ALI ALOIM.
 - .4 ETL Certification label.

2.05 HYDRAULIC POWER UNIT AND CONTROLS

- .1 Hydraulic Power Unit:
 - .1 Hydraulic power unit shall be located within the pit to minimize interference with other work and to ensure maintenance access. Hydraulic power unit to consist of one gear pump driven by 600 V, 3 Phase, 60 Hz, or smaller motor mounted on oil reservoir/tank.
 - .2 One pump/motor/tank assembly per hoist.
 - .3 Select and arrange hydraulic distribution block/manifold, control valves, relief valves, pump, motor, filters, tanks, motors and other hydraulic system components to facilitate maintenance access for service, adjustment and replacement of all components.

- .4 Select flow control, solenoid, check and relief valves and filters suited to application in accordance with industry standards, maximum system pressure rating, operating conditions, hydraulic fluid, durability and availability.
- .2 Controls:
 - .1 All components recognized by third party testing laboratory such as UL, CSA, CE, or TUV.
 - .2 Main lift controls shall be provided via a remote pendant control hanging from a reel and retractable. It should be easily accessible to the operator and long enough to reach both front and rear of the bus without interfering with any other equipment.
 - .3 Redundant controls shall be provided via a wall mounted control box. The wall control box shall not be deeper than twelve inches and shall be located such that it does not impede on the clear access around each bus required for maintenance personnel, equipment, tools and bus drive-thru exiting.
 - .4 Control voltage rated to maximum of 24 VAC.
 - .5 Electrical enclosures for control components rated NEMA 4X waterproof and include as minimum:
 - .1 System disconnect.
 - .2 "Power on" pilot lamp.
 - .3 "Up" control and "down" control.
 - .4 "Mechanical lock down button".
 - .6 Connection cable to pendant to be provided with an additional five(5) feet of length from the standard length traditionally provided, to allow for future relocation.
 - .7 Controls to come with audible and visual alarm

2.06 FINISHES

- .1 Steel and Cast-Iron: Galvanized in accordance with CAN/CSA G164-M, all interior and exterior surfaces, 700 g/m².
- .2 Pinch Points and Other Safety Zones: Paint in accordance with Section 09 91 00.
 - .1 Colour: Safety yellow.

Part 3 Execution

3.01 PREPARATION

- .1 Coordinate hoist pit requirements with installer.
- .2 Supply layout drawings of hoist pits, dimensioned to building grid lines.
- .3 Coordinate location of PVC ducts between hoist control panel and pit.

3.02 TESTING AND INSPECTION

- .1 Upon completion of the Work, test and inspect in presence of the Contract Administrator, the Work for compliance with Specifications and manufacturer's drawing.
- .2 Make good work found defective in manner acceptable to the Contract Administrator and reinspected, all at no cost to the City.
- .3 Make any necessary adjustments to satisfaction of the Contract Administrator before hoists put into operation.
- .4 Tests consist of:
 - .1 Performing all functions of hoisting system, including power unit;

- .2 Perform following checks and issue test and inspection certificate for each hoist:
 - .1 Check accessibility and readability of operating and safety labels.
 - .2 Check rated load capacity of hoist with vehicle of suitable weight.
 - .3 Check all structural components including welds.
 - .4 Check all electrical components and wiring.
 - .5 Check all hydraulic and solenoid valves, hoses, piping, tubing, and fittings.
 - .6 Check all controls.
 - .7 Check all fastening devices for tightness including anchor bolts.
 - .8 Check exposed surfaces and edges.
 - .9 Operate hoist and check operation of positive stop and lift locks with representative vehicle.
 - .10 Check raising and lowering speed with representative vehicle.
 - .11 Check all points requiring lubrication.
 - .12 Check operation of synchronization or equalization system with representative vehicle.
 - .13 Operate hoist with representative vehicle; stop at midpoint of travel for period of one hour and measure drop, if any.
- .5 Proof Load Test:
 - .1 Perform load test at certified rated capacity of hoist. Load apparatus to have evenly distributed load to test rated capacity of each cylinder.
 - .2 Operate hoist through full stroke cycle 2 times while loaded.
 - .3 Park hoist on mechanical safety devices for five minutes with power unit de-energized.
 - .4 No visible apparent deformation of any hoist component to result from load test. No impaired function observed during load test.
 - .5 Perform load test after installation and prior to all operational and functional tests.
- .6 Operational and Functional Tests:
 - .1 Other operation tests with representative vehicle provided by the Commission:
 - .1 Operate lift through 5 cycles to demonstrate control functions and safety devices.
 - .2 Lowering speed test.
 - .3 Synchronization devices test.
 - .4 Out of level test.
 - .5 Front post movement test.
 - .6 Hydrostatic pressure test of hydraulic system at 1.5 times maximum operating pressure for one minute.
 - .7 Provide all labour, materials, apparatus and equipment required to perform all proof load, operational and functional tests as specified. To use the City's buses, provide one-week advance notice to the Contract Administrator.

3.03 COMMISSIONING

- .1 Perform Commissioning in accordance with Section 01 91 13

3.04 DEMONSTRATION AND TRAINING

- .1 Engage a factory-authorized service representative to train City's maintenance personnel to operate, adjust, and maintain hoists. Refer to Section 01 94 41.

3.05 MAINTENANCE

- .1 Maintain all equipment and systems installed until Substantial Performance.
- .2 Check operation of each hoist with City's personnel present and before date of Substantial Completion and not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION

Part 1 General

1.01 SUMMARY

- .1 Section Includes:
 - .1 Structure excavation and backfilling and trenching for underground utilities as follows:
 - .1 Removal of surface materials and structures.
 - .2 Excavation of all materials of whatever kind encountered so that pipes and structures can be laid to alignment and depth required.
 - .3 Support of the adjoining ground or structures.
 - .4 Stockpiling and disposal of excess excavated material.
 - .5 Control of surface and subsurface water.
 - .6 Temporary railings, coverings and enclosures to excavations.
 - .7 Removal and replacement of unsuitable material.
 - .8 Backfilling.
 - .9 Restoration of surfaces.

1.02 RELATED REQUIREMENTS

- .1 Section 32 11 16 – Granular Subbase and Base Course.
- .2 Appendix A: For Geotechnical Investigation.
- .3 Appendix C:
 - .1 For Excavation Assessment.
 - .2 For Correspondence from Manitoba Conservation and Climate - Review Under the Contaminated Sites Remediation Act.

1.03 REFERENCE STANDARDS

- .1 ASTM
 - .1 ASTM C136 / C136M - 19, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - .2 ASTM D698
 - .3 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³)
 - .4 ASTM D2167
 - .5 ASTM-D2922
 - .6 ASTM D4318-17e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1- 88, Sieves, Testing, Woven Wire, Inch Series
 - .2 CAN/CGSB-8.2- M88, Sieves, Testing, Woven Wire, Metric
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A3001-08, Cementitious Materials Compendium

- .2 CSA-A23.1/A23.2 2019, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete
- .4 Province of Manitoba
 - .1 The Workplace Safety and Health Act, C.C.S.M. c. W210

1.04 DEFINITIONS

- .1 Excavation Classes: One class of excavation will be recognized; common excavation.
 - .1 Common Excavation: Excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Waste Material: Excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow Material: Material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.
- .5 Recycled Fill Material: Material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .6 Unsuitable Materials:
 - .1 Weak, chemically unstable, or compressible materials or which contains ashes, cinders, organic material, and large pieces of inorganic material or is otherwise unsuitable and which in the judgment of the Contract Administrator, should be removed.
 - .2 Frost Susceptible Materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136: Sieve sizes to CAN/CGSB-8.2.
- .7 Unshrinkable Fill: Very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit to the Contract Administrator written notice at least 14 days prior to excavation work, to ensure cross sections are taken.
 - .2 Submit to the Contract Administrator written notice when bottom of excavation is reached.
 - .3 Moisture density curves to ASTM D698.
 - .4 Sieve analyses to ASTM C136.
 - .5 Field densities to ASTM D2167 or to ASTM D2922.
 - .6 Minimum quality control test frequencies specified as follows are the minimum number required. Perform as many tests as are necessary to ensure that the Work conforms to the requirements of the Contract regardless of the minimum number required.
 - .7 Provide moisture/density curves for each type of material from each source of material to be compacted to a specified density.

- .3 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Inform the Contract Administrator at least four weeks prior to beginning Work, of proposed source of unshrinkable fill materials and laboratory test information.
 - .3 Submit to the Contract Administrator a list of sources of materials including sand, gravel, borrow materials and concrete aggregates.
 - .4 Provide samples, test results, sieve analyses and reports for preliminary approval of materials.
 - .5 Preliminary approval of material does not constitute general acceptance. Acceptance depends upon satisfactory field test results and performance in place.
- .4 Permits:
 - .1 Obtain all permits required for this section of the work, with the exception of those specifically listed as being obtained by the City and abide by the stipulations of the permits.
 - .2 Abide by the stipulation of permits obtained by the City.

1.06 QUALITY ASSURANCE

- .1 Qualification Statement: Submit proof of insurance coverage for professional liability.
- .2 Submit design and supporting data at least two weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the Province of Manitoba, Canada.
- .4 Keep design and supporting data on site.
- .5 Engage services of qualified professional Engineer who is registered or licensed in the Province of Manitoba, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .6 Do not use soil material until written report of soil test results are reviewed by the Contract Administrator.

1.07 REGULATORY REQUIREMENTS

- .1 Abide by the bylaws and regulations of the Province, and/or Municipality in which the work is located and abide by the laws and regulations regarding public safety.
- .2 The regulations of the Workplace Safety and Health Act apply to the work of this section.

1.08 PROTECTION

- .1 Provide construction aids including temporary plant, temporary enclosures, falsework, and temporary construction supports.
- .2 Protect bottom of excavations from freezing.
- .3 Protect bottom of excavations from softening due to moisture.

1.09 WASTE MANAGEMENT AND DISPOSAL

- .1 All materials on site whether stockpiled, stored or excavated are the property of the City, and the City reserves the right to keep any part or all of the material.
- .2 Dispose of debris, waste, unsuitable material, rock or excess material in accordance with the Specifications.

- .3 Dispose of all materials at sites to be located by the City.
- .4 Divert excess aggregate materials from landfill to local facility for reuse as directed by the Contract Administrator.

1.10 SITE CONDITIONS

- .1 Examine the Geotechnical Investigation as appended to this project manual as Appendix A. This document is provided for information.
- .2 Examine the Excavation Assessment and information pertaining to petroleum hydrocarbon (PHC) impact in the soil located at the limits of the required excavation for the new bus lifts. PHC contaminated soils which are required to be handled, removed, or otherwise disturbed, are to be disposed of during the Work, in accordance with applicable federal, provincial, and municipal, environmental regulations and by-laws. The Excavation Assessment and other information are appended to this project manual as Appendix C. These documents are provided for information.
- .3 Buried Services:
 - .1 Before commencing work establish location of buried services on site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify applicable authorities having jurisdiction and the Contract Administrator and establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test excavations.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of the Contract Administrator.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .4 Existing buildings and surface features:
 - .1 Protect existing building and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by the Contract Administrator.
 - .2 Where required for excavation, cut roots or branches the Contract Administrator.

Part 2 Products

2.01 MATERIALS

- .1 A-Base and C-Base Fill: Properties to the following requirements:
 - .1 As stipulated in Section 32 11 16 – Granular Subbase and Base Course.
- .2 Common Fill: Selected material from excavation or other sources, approved by the Contract Administrator for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

- .3 Unshrinkable Fill: Proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum cement content of 25 kg/m³: CSA-A3001, Type SR.
 - .3 Minimum strength of 0.07 MPa at 24 hours.
 - .4 Concrete Aggregates: CSA-A23.1/A23.2.
 - .5 Cement: Type SR.
 - .6 Slump: 160 to 200 mm.

Part 3 Execution

3.01 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.02 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Dispose of refuse in a manner satisfactory to the Contract Administrator.
- .3 Isolate reusable granular and keep it separate from the remainder of the excavated material so that it can be replaced when the backfilling operation has been completed.
- .4 Width of stripping shall be sufficient to permit excavation, pipelaying, backfilling and replacement of topsoil without mixing of materials and without loss of topsoil.

3.03 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Contract Administrator's approval.
- .4 Protect buried services that are required to remain undisturbed.

3.04 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with the Workplace Safety and Health Act.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Temporary protective structures, bracing, shoring and sheeting are the responsibility of the Contractor and shall be designed by a Professional Engineer registered in Manitoba.
- .4 Observe safety regulations of the Workplace Safety and Health Act with regard to protection of the work, property, structures adjacent to the work and maintenance of the trench widths.

- .5 When closed sheeting is required for trenching it shall be installed such that adjacent soil cannot enter the trench either below or through sheeting.
- .6 Increase trench widths as necessary to allow placing of supports, sheeting and bracing, but do not exceed the maximum trench widths shown on the drawings or provide for corrective measures.
- .7 During Backfill Operation:
 - .1 Unless otherwise indicated or directed by the Contract Administrator, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .8 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .9 Upon Completion of Substructure Construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Excess materials may be located and disposed of.

3.05 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in a manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.06 TUNNELLING

- .1 The Contractor shall install pipe by tunneling (coring, pushing or directional boring) opposed to means of open cut trenching at all paved road crossings.
 - .1 For coring or pushing at each end of the proposed tunnel, the Contractor shall excavate pits such that adequate space is allowed around the proposed tunnel opening for the equipment to construct the tunnel at the required elevation and grade.
 - .2 Tunnels shall be straight.
 - .3 The method of tunneling is subject to the prior approval of the Contract Administrator.
 - .4 Excavated pits shall be backfilled in the same manner as required for open trench pipe backfill installation. Where the pit bottom at subgrade is found to be unstable, the unstable material shall be removed and replaced with compacted granular backfill or as required by the Contract Administrator.

3.07 EXCAVATION

- .1 Advise the Contract Administrator at least seven days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated on the drawings.
- .3 Remove obstructions encountered during excavation.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 Trench Excavation:
 - .1 Unless otherwise authorized by the Contract Administrator in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
 - .2 Excavate the trench to a depth sufficient to lay the pipe as shown on the drawings. If any part of the trench bottom is excavated in error below the specified grade, correct with approved materials compacted as specified under Pipe Bedding, at the Contractor's expense.
 - .3 Excavate trench width at the bottom such that the pipe can be laid and jointed as specified and backfill placed and compacted as specified. Trench width dimensions are specified under installation of pipe. Increase trench widths to allow placing of timber supports, sheeting and bracing, but do not exceed the maximum trench width shown on drawings. Make trench walls vertical to 300 mm above the top of the pipe and maintain widths above this level within limits shown on the drawings or in accordance with safety regulations. Pipe design is dependent upon the type of bedding specified and the class of backfilling in the pipe zone, as well as the width of the trench. If the Contractor uses trenching equipment or trenching methods that result in a wider trench than specified under the installation of pipe, then corrective work shall be performed as required by the Contract Administrator, at the Contractor's expense. The corrective work may take the form of either or both of the following:
 - .1 Supply and installation of a higher class of bedding and backfilling in the pipe zone.
 - .2 Supply and installation of a stronger class pipe.
 - .4 Excavate so that the pipe can be laid to the line and grade as shown on drawings, or as established by the Contract Administrator.
 - .5 Stockpile material excavated alongside the trench in authorized working areas in a manner that will not endanger the work, hinder pedestrian or vehicle traffic, block surface drainage or obstruct access to other utilities. Where excavated material cannot be piled along the trench in compliance with the above restrictions, remove it from the site and stockpile at an acceptable location for return to the trench for backfilling. Do not stockpile excavated material over existing pipelines.
 - .6 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Contract Administrator.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material in approved location on site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

- .11 Notify the Contract Administrator when bottom of excavation is reached.
- .12 Payment will be made for removal and replacement of unsuitable material if the work is ordered by the Contract Administrator.
- .13 Material that becomes unstable or unsuitable through the Contractor's failure to divert surface water or control ground water in the trench shall be excavated and removed as waste material and replaced with approved material at the expense of the Contractor.
- .14 Obtain from the Contract Administrator approval of completed excavation.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with fill concrete compacted to not less than 100 % of corrected Standard Proctor maximum dry density.
 - .2 Fill under other areas with C-Base compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .16 Hand trim make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of the Contract Administrator.

3.08 INTERFERING SERVICES

- .1 Provide for the uninterrupted flow of all sewers and drains encountered during the work.
- .2 Repair and make good at the Contractor's expense, any damage which may occur to any watermain, sewer pipe, gas line or other pipe and to any electrical conductor, cable, sidewalk, curb or structure.
- .3 Determine the locations of all structures, pipes, manholes and valves by contact with the Contract Administrator and the examination of drawings. If necessary, explore and excavate for such purposes.

3.09 PIPE BEDDING

- .1 Pipe bedding shall be in accordance with the drawings and with the specifications for installation of the pipe.
- .2 Do not proceed with placing pipe bedding until the Contract Administrator has inspected the trench.

3.10 BACKFILLING IN THE PIPE ZONE

- .1 The pipe zone is defined as that part of the trench from the bottom of the pipe bedding to 100 mm above the top of the pipe or above the top of the highest pipe in a combined trench.
- .2 Backfilling in the pipe zone shall be in accordance with the drawings and with the specifications for installation of the pipe.

3.11 TRENCH BACKFILL

- .1 Trench backfill is defined as backfill above the pipe zone.
- .2 Do not proceed with trench backfill until the Contract Administrator has inspected and approved the bedding and backfill in the pipe zone.
- .3 Place backfill in a dry trench.

- .4 Place backfill by rolling down a slope in the trench or lower by machine. Prevent backfill from dropping vertically.
- .5 Backfill as close as possible to pipe laying operations so that trenches are left open no longer than absolutely necessary.
- .6 Plan the backfilling operation so that exposure of the backfill material to frost is kept to a minimum. Use no large frozen chunks of soil as backfill.

3.12 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D1557 and/or ASTM D698.
 - .1 Within building area use C-Base to underside of base course for floor slabs. Compact to 100 % of corrected maximum dry density.
 - .2 Under concrete slabs: provide 150 mm compacted thickness base course of A-Base to underside of slab. Compact base course to 100%.
 - .3 Retaining walls: use C-Base fill to subgrade level on high side for minimum 500 mm from wall and compact to 95%. For remaining portion, use Common Type fill compacted to 95%.
 - .4 Place unshrinkable fill in areas as indicated.

3.13 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Contract Administrator has inspected and approved installations.
 - .2 Contract Administrator has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling Around Installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or overcast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 1.0 m.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from the Contract Administrator.
 - .2 If approved by the Contract Administrator, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by the Contract Administrator.
- .6 Place unshrinkable fill in areas as indicated.

- .7 Consolidate and level unshrinkable fill with internal vibrators.
- .8 Install drainage system in backfill as indicated on drawings.

3.14 CLEAN UP

- .1 Clean up and dispose of all excess material, trash, rocks, boulders and debris as work progresses.
- .2 Restore all public and private roads, to a condition equal to that in which they were found.

3.15 RESTORATION

- .1 Restore or replace existing concrete or paved surfaces, and other property and surface structures damaged or removed during the course of the work to a condition equal to that before the work began, furnishing all labour and materials at the Contractor's expense.
- .2 Restore other working areas that were affected by the construction operation by concrete or pavement repair as necessary to restore these surfaces to their original level and condition.

3.16 SETTLEMENT DURING GUARANTEE PERIOD

- .1 During the warranty period, the Contractor shall replace materials and rectify all failures that occur as a result of settlement of backfill.
- .2 Replacement of materials and rectification of failures that occur as a result of settlement of backfill, is entirely the responsibility of the Contractor and such repair work shall be done at the Contractor's expense.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 03 20 00 - Concrete Reinforcing.
- .2 Section 03 30 00 - Cast-In-Place Concrete.
- .3 Appendix A: For geotechnical investigation.

1.02 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 ACI 543R, Guide to Design, Manufacture, and Installation of Concrete Piles.
- .2 ASTM
 - .1 ASTM C109, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm Cube Specimens).
 - .2 ASTM C260, Specification for Air-Entrained Admixtures for Concrete.
 - .3 ASTM C1017, Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-A23.2, Methods of Test for Concrete.
 - .3 CAN/CSA-A3000, Cementitious Materials Compendium.

1.03 SITE CONDITIONS

- .1 Inspect site and note characteristics and features affecting the work of this section.
- .2 Allowances will not be made for difficulties encountered due to site conditions visible and known to exist at the time tenders for work are submitted.

1.04 SOILS REPORT

- .1 Refer to geotechnical investigation as appended to this project manual as Appendix A.

1.05 QUALIFICATIONS

- .1 Use fully experienced and qualified workmen for piling work.
- .2 Submit proof of qualifications, and history of successfully completed, similar projects, when so requested.

Part 2 Products

2.01 MATERIALS

- .1 Reinforcing Steel: As specified in Section 03 20 00. Refer to structural Drawings for sizes.
- .2 Cement: CAN/CSA-A5, Type HS sulphate resistant.
- .3 Aggregates: CAN/CSA-A23.1.
- .4 Water: Clean and free of injurious amounts of oil, alkali, organic matter or other deleterious material.

- .5 Air Entraining Admixture: ASTM C 260.

2.02 CONCRETE MIX

- .1 Mix concrete in accordance with Section 03 30 00 to achieve design strengths and mixes as indicated on structural Drawings.

Part 3 Execution

3.01 PREPARATION

- .1 Notify Contract Administrator at least 48 hours prior to piling to arrange for inspection.
- .2 Locate and fix position of piles from established reference points indicated on drawings. Assume responsibility for the accuracy of such positions.

3.02 INSTALLATION

- .1 Install piles in proper locations to diameters and depths indicated on structural Drawings.
- .2 If obstructions are encountered, remove or fill holes with unshrinkable fill approved by the Contract Administrator and place new piles where directed by the Contract Administrator.
- .3 Keep drilled holes free of water and foreign materials.
- .4 Arrange for an allow inspection of pile shafts by the Contract Administrator prior to placing of reinforcing and concrete.
- .5 Install steel reinforcement in accordance with Section 03 20 00 and as indicated on structural Drawings. Extend reinforcing steel above top of piles for anchoring into concrete grade beams and foundation walls as indicated. Provide suitable method of holding reinforcing steel in position for specified concrete coverage.
- .6 Fill pile excavations with concrete to elevations as indicated. Place concrete in one continuous pour in accordance with Section 03 30 00.
- .7 Carefully place concrete by means of vertical chute or elephant trunk or other approved methods to prevent concrete from striking sides of shaft and to prevent foreign material from entering shaft.
- .8 Place concrete by means of tremie should an inflow of water occur that cannot be removed by pumping. Place to a height sufficient to effect a seal. Notify Contract Administrator prior to proceeding with this work.
- .9 Form piles projecting above grade with circular fibre forms to maintain pile diameter to top of pile.
- .10 Mechanically vibrate and compact top 3.5 m of each pile to produce a solid mass, free of honeycomb, air pockets. Do not displace reinforcing steel.
- .11 Use steel protective casings in conditions of non-cohesive soil or water seepage. Ensure penetration of casing to required depths either by self-mass or driving. Withdraw casing in conjunction with concrete placing, keeping bottom of casing 600 mm below level of concrete.

3.03 TOLERANCES

- .1 Install piles vertically, not out of plumb by more than 2% of pile length; nor out of location by more than 50 mm.

3.04 COLD WEATHER CONDITIONS

- .1 When mean daily temperature is below 5°C, heat concrete aggregates and mix water to provide concrete temperature of 10 - 30°C at placing.
- .2 After placing concrete, cover and heat, with approved heating device to prevent freezing of concrete.

3.05 PILE RECORD

- .1 Keep accurate piling records of all installed piles. Record locations, diameters, top and bottom elevations and other pertinent data for each pile installed.
- .2 Submit three copies of piling records to Contract Administrator on completion of piling work.

3.06 DEFECTIVE WORK

- .1 Contract Administrator reserves the right to reject work or materials that do not conform to the Drawings or Specifications and to take any action that he feels necessary to achieve a complete, satisfactory installation as specified.
- .2 Engage an independent Geotechnical Engineer who will approve pile borings, depths and placing of reinforcing steel and submit a report to the Contract Administrator. The Geotechnical Engineer shall be a Professional Engineer registered in Manitoba.
- .3 All concrete shaft piles shall be rejected where:
 - .1 Soil has entered shaft/casing.
 - .2 Water has entered shaft/casing.
 - .3 Shaft/casing is damaged, or out of tolerance, or out of alignment.
- .4 Defective pile, as directed by the Contract Administrator to be cut off at elevation directed by the Contract Administrator and filled with sand and replaced at no cost to the City.

3.07 INSPECTION AND TESTING

- .1 Inspection and testing of concrete and concrete materials shall be in accordance with Section 03 30 00 - Cast-in-Place Concrete.

3.08 CLEAN-UP

- .1 On completion of piling remove all excavated materials and debris from site.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

- .1 Section 31 23 33 – Excavating, Trenching and Backfilling
- .2 Appendix A: For geotechnical investigation.

1.02 REFERENCE STANDARDS

- .1 ASTM
 - .1 ASTM C131 / C131M - 20, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .2 ASTM C535 - 16, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide gradation and LA abrasion test results to Contract Administrator for subbase and base material prior to placement of material.

Part 2 Products

2.01 MATERIALS

- .1 Granular subbase material shall be well graded crushed rock conforming to the following grading requirements.

Sieve Size (mm)	Percent (%) of Total Dry Weight Passing Each Sieve
200	-
150	-
100	97 – 100
50	-
25	30 – 50
5	-
0.08	0-8

- .1 Other properties as follows:
 - Los Angeles degradation maximum loss by mass of 40 % for 100 mm sub-base tested in accordance with grading 1 of ASTM C535.

- .2 Base course material shall be well graded crushed limestone conforming to the following grading requirements.

Sieve Size (mm)	Percent (%) of Total Dry Weight Passing Each Sieve
25	-
20	100
5	40 - 70
2.5	25-60

Sieve Size (mm)	Percent (%) of Total Dry Weight Passing Each Sieve
0.315	8 - 25
0.08	6 - 17

- .1 Other properties as follows:
 - .1 Los Angeles Degradation: Maximum loss by mass of 35% when tested in accordance with grading B of ASTM C131.

Part 3 Execution

3.01 EXAMINATION

- .1 No subbase material is to be placed until the Contract Administrator has approved the subgrade and geotextile installation.
- .2 No base course material is to be placed until the Contract Administrator has approved the granular sub-base construction.

3.02 PLACING

- .1 Ensure no frozen material is placed.
- .2 Place material only on clean unfrozen surface, free from snow or ice.
- .3 Place granular sub-base and base course using methods which minimize segregation and degradation of the material.
- .4 Place granular sub-base in a sufficient thickness to prevent damage to the geotextile prior to equipment traveling over the placed sub-base.
- .5 Construct the granular subbase and base course to the lines and grades shown on the drawings.
- .6 Compact subbase to 98% of Standard Proctor Density.
- .7 Proof roll granular sub-base in the presence of the Contract Administrator with equipment approved by the Contract Administrator.
- .8 Maintain finished subbase condition until succeeding layer of sub-base or base material is constructed.
- .9 Compact base course to 100% of Standard Proctor Density.
- .10 Apply water as required to achieve the required densities.

END OF SECTION

APPENDIX A

Geotechnical Investigation
Winnipeg Transit Garage Hoist Replacement Program
421 Osborne Street, Winnipeg, Manitoba, dated August 201922

Submitted To:



TRANSIT DEPARTMENT

GEOTECHNICAL INVESTIGATION

WINNIPEG TRANSIT GARAGE HOIST REPLACEMENT PROGRAM
421 OSBORNE STREET, WINNIPEG, MANITOBA



AUGUST 2019

FILE NO. 19-217-03



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Attachments

Figure 1 – Test Hole Location Plan for TH1
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Soil Classification Sheet
Test Hole Summary Logs (2)

1.0 INTRODUCTION

ENG-TECH Consulting Limited (ENG-TECH) completed the requested geotechnical investigation for the proposed Winnipeg Transit Garage Hoist Replacement Program at 421 Osborne Street in Winnipeg, Manitoba. ENG-TECH was informed that the Winnipeg Transit Garage had recently been expanded to the west. The hoist replacement program at the Winnipeg Transit Garage would be limited to the pre-expanded Winnipeg Transit Garage, which will include the replacement of 38 in-ground vehicle hoists with the associated in-ground reinforced concrete hoist pits, as well as the concrete floors (structural and slab-on-grade) in the vicinity these 38 hoists. The structures in the pre-expanded portion of the Winnipeg Transit Garage are supported by cast-in-place concrete friction piles, which are reportedly 25 feet in length with diameters of 30 inches, and are being considered for possible re-use. The maximum expected point load of the replacement program will be a factored load of 355 kN. The preferred type of foundation for the new structures would be cast-in-place concrete friction piles. The purpose of the investigation was to assess the soil conditions close to the footprints of the existing 38 hoists to be replaced in the pre-expanded portion of the Winnipeg Transit Garage in order to provide recommendations for the new replacement hoist foundations, concrete garage and hoist pit floors (slab-on-grade and structural), and concrete durability, as well as comments on lateral earth pressures for permanent and temporary below grade walls, and estimate the capacities of the existing cast-in-place concrete friction piles (based on the piles being 25 feet in length with diameters of 30 inches). Verification of depth and diameter of the existing piles was outside the scope of work.

1.1 Scope of Work

ENG-TECH completed the following scope of work:

- Clearance of underground utilities.
- Clearance of limited private services, which included the underground electrical lines of the City of Winnipeg light standards and vehicle plug-ins located south of the southwest corner of the pre-expanded Winnipeg Transit Garage by the east gate of the City of Winnipeg Brandon Street parking lot.
- A test hole drilling and soil sampling program.
- A laboratory testing program.
- An assessment and engineering report outlining the investigation and recommendations as outlined above.

2.0 TEST HOLE DRILLING, SOIL SAMPLING & LABORATORY TESTING

ENG-TECH supervised the drilling of two (2) test holes (TH1 and TH2) on July 17, 2019 at 421 Osborne Street in Winnipeg as shown in Figures 1 and 2. The Winnipeg Transit Garage has been recently expanded to the west, and all the hoists being replaced are located in the pre-expansion transit garage footprint (not including the expansion). Both test holes were drilled close to the locations of the 38 hoists to be replaced and outside the pre-expansion transit garage footprint. The test holes were drilled on the outside of the transit garage to avoid height limitations for the drilling activities associated with the transit garage ceiling.

TH1 was located close to the southeast corner of the pre-expansion transit garage as shown in Figure 1, while TH2 was located close to the southwest corner of the pre-expansion transit garage as shown in Figure 2. TH2 was drilled 15.2 m below existing grade, while TH1 was advanced to 12.2 m below existing grade. The test holes were drilled using a truck mounted Acker MP8 drill rig equipped with 125 mm diameter solid stem continuous flight augers, owned and operated by Paddock Drilling Ltd. All test holes were backfilled using the soil auger cuttings and bentonite upon completion of drilling.

The soil stratigraphy was visually classified at the time of drilling using the modified Unified Soil Classification System (USCS). Soil samples were collected off the auger flights, and by means of Shelby tubes at the depths of 4.6 m and 7.6 m in TH1. All soil samples collected were retained for testing in ENG-TECH's Winnipeg laboratory.

Moisture contents were determined on all collected soil samples (24), while two (2) Atterberg Limits and two (2) unconfined compressive strength tests were completed on selected soil samples. All laboratory results are shown on the test hole summary logs.

3.0 STRATIGRAPHY

The stratigraphy at the test holes consisted of 25 to 150 mm of topsoil over 575 mm to 1.675 m of clay fill followed by approximately 12 m of native clay underlain by silt till to the depth explored, except at the following:

- At TH1, where a 75 mm layer of crushed limestone fill was detected between the topsoil and clay fill.
- At TH1, where an additional 100 mm layer of topsoil was encountered between the clay fill and native clay.
- At TH2, where a 600 mm layer of native silt was detected between the clay fill and native clay.

The topsoil was dark brown, moist, soft and contained organics. The crushed limestone fill was tan, moist, poorly graded, fine to coarse grained, and up to 19 mm in diameter. The clay fill was dark to light brown, moist, firm to stiff, low plastic, and contained silt (trace to some) and gravel (trace to some). The silt was tan, moist to wet and low plastic. The clay was medium brown, moist, stiff to very stiff and contained silt (trace to some), and with depth became grey, soft, and additionally contained gravel (trace). The silt till was tan, moist, stiff, low plastic, and contained sand and gravel.

Seepage and sloughing was detected from the silt layer in TH2, while no seepage or sloughing was encountered at TH1 during the drilling.

Detailed stratigraphy descriptions are outlined on the test hole summary logs.

Since the test holes were outside the pre-expansion transit garage footprint, the upper soils under the present concrete floor in the area of the hoists to be replaced would likely consist of granular fill over native clay, with potentially clay fill between the granular fill and native clay.

4.0 RECOMMENDATIONS

4.1 General

Based on the soil conditions and the magnitude of the expected loads, deep foundations such as the cast-in-place concrete friction piles (the preferred foundation type) would be suitable to limit settlement and differential movements of the proposed replacement hoists, however construction difficulties during the pile installation would include seepage and sloughing from random saturated zones. Seepage and sloughing were detected from a moist to wet silt layer from 1.7 m to 2.3 m below existing grade in TH2 during the drilling program, and random saturated zones should be expected in some of the boreholes for the pile installation.

Other deep foundations, such as driven end bearing piles were not considered since auger refusal was not encountered during the drilling. Suitable foundations could be provided without auger refusal, and determination of auger refusal depth was outside the scope of work for this project.

Shallow foundations would not be practical option due to the size limit constraints associated with the replacement hoist foundations. The existing hoists are supported by cast-in-place concrete friction piles, which may be re-used. Therefore the replacement hoists will require a suitable deep foundation type for support.

Other foundation types could also be used to support the replacement hoists, although they were not considered as practical or economical as the above option. Therefore, only foundation recommendations for cast-in-place concrete friction piles will be presented in this report.

The most current City of Winnipeg grading specifications should be used for the base and sub-base materials specified in this report.

4.2 Foundations

4.2.1 Cast-in-Place Concrete Friction Piles

Cast-in-place concrete friction piles were assessed using a geotechnical resistance factor of 0.4 to obtain the Ultimate Limit State (ULS) and Serviceability Limit State (SLS) values that can be used in design for vertical resistance at the proposed replacement hoists as outlined in Table 1:

Table 1		
ULS and SLS Skin Friction Static Resistances for Cast-In-Place Concrete Piles		
Depth Range (m)	ULS Skin Friction Resistance	SLS Skin Friction Resistance
	kPa	
The greater of: 2.4 m below existing grade or 1.0 m below the underside of the grade beam	0	0
Between the above and 7.6 m below existing grade	18	15
Between 7.6 m and 15.0 m below existing grade	10	8

The following recommendations also apply to the use of cast-in-place concrete friction piles:

- The piles should be spaced at least 2.5 pile diameters apart, as measured from center to center in order to have the piles act individually. For a two (2) pile group, the capacity per pile as outlined above could be used to establish the capacity of the group.
- A minimum embedment depth of 7 m must be used for all piles supporting the replacement hoists located within the Winnipeg Transit Garage, and a minimum embedment depth 8 m must be used for all piles for the replacement hoists located on the perimeter of the Winnipeg Transit Garage and in unheated areas.
- The piles may be treated as supported columns throughout their depth below final grade.
- The weight of the embedded portion of the pile may be neglected in the design, when determining the load on a pile.
- Each pile must be steel reinforced to at least 6 m, with reinforcement to resist up-lift pressures due to structural forces as determined by the structural engineer. The design of piles to resist up-lift from soil swell pressure is not required for all piles since significant differential changes in moisture content are not expected around the piles with depth. Vertical reinforcement may also be required to resist breaking of the upper portion of the piles as a result of up-lift forces due to frost action against perimeter piles and piles in unheated areas. The use of a Sona tube wrapped with a layer of 4 mil poly and inserted in the upper 2.4 m of the bore holes prior to placement of concrete will aid to reduce the potential of uplift pressures on the piles due to frost for all piles supporting replacement hoists on the perimeter of the Winnipeg Transit Garage and in unheated areas.
- The piles should be poured immediately after the completion of drilling to reduce the potential for seepage in the boreholes, and sloughing, swelling and squeezing of the boreholes, and should be poured in accordance with Clause 7.2.7 of the Canadian Standards Association A23.1-14 (Concrete Materials and Methods of Concrete Construction). Seepage and sloughing were detected from a random wet silt layer in TH2 during the drilling program and should be randomly expected in at least some of the boreholes during the installation of the cast-in-place piles. Steel sleeving varying in length (including to full length) may be required for some of the boreholes, while pumping may be required to remove excess water from some of the boreholes prior to pouring the concrete. Sleeving and a pump of adequate capacity should be available on site and used on an as required basis.
- A minimum void space or compressible void form of 150 mm should be maintained under all non-bearing surfaces of the pile caps, grade beams, and structures supported on piles exposed to soil to prevent damage due to uplift pressures and potential swelling of the underlying soils, should it occur.

4.3 Replacement Concrete Slab-on-Grade Garage Floors

ENG-TECH cautions that some movement of the concrete slabs should be expected and is typical for all concrete slab-on-grade floors, and can be minimized with sub-grade preparation, and use of well graded compacted base and sub-base materials. The replacement concrete slab-on-grade floors must not be founded on topsoil or organic soils since there would be the potential of excessive settlement and differential movements. Also, the replacement concrete slab-on-grade floors must not be founded on soft and/or wet soils since there would be the potential for excessive settlement and differential movements, unless there is adequate bridging over the soft and/or wet soils.

Topsoil layers were detected as deep as 900 mm in TH1 and 25 mm in TH2, while a wet soft soil (moist to wet soft silt) layer was encountered between 1.7 m and 2.3 m below existing grade in TH2. Likely any topsoil in the upper 900 mm of the areas of the replacement concrete slab-on-grade floors has been removed previously during the construction present concrete slab-on-grade floors, however a silt layer like detected in TH1 or potentially additional silt layers of random thickness and/depths could be present in the stratigraphy, and should be expected in some areas of the replacement slab-on-grade floors.

Full removal of the soft and/or wet soils would be the best to limit settlement and differential movements, however would likely not be economical or practical across the footprints of the proposed replacement concrete slab-on-grade floors. Partial removal of the soft and/or wet soils encountered with adequate bridging over the remaining soft and wet soils could be used to reduce the potential of excessive movements (settlement and differential movements) to typical movements for the slab-on-grade floors. Adequate bridging of the soft and/or wet soil spots for the replacement garage concrete slab-on-grade floors should consist of at least 300 mm of firm to stiff medium to high plastic clay over a geotextile. Geotextile would provide separation barrier between the soils used for bridging, and the soft and/or wet soils.

If typical movements of a slab in the order of 50 mm are not acceptable to the owner, then a floor structurally supported on piles should be used.

Based on the above and providing the owner is willing to accept the possibility of typical movement of slabs in the order of 50 mm, the replacement concrete floor slabs after the removal of the existing concrete floor slabs could be constructed as follows:

- Removal all soft, wet and/or organic soils (as well as topsoil if encountered) from the surface to their full depth within the footprints of the replacement slab-on-grade floors, continue to excavate as required in order to achieve a minimum depth of 200 mm below the base of the replacement slabs design elevation. The exposed sub-grade soils at the sub-grade design elevation of the slabs should consist of inorganic firm to stiff clay fill and/or medium dense to dense granular fill.

- The exposed sub-grade should be inspected by ENG-TECH (and inspection must include supervising proof rolling with a smooth faced roller in non-vibratory mode), and the upper 300 mm of the exposed sub-grade should be uniformly compacted to 95% of its Maximum Dry Density (MDD) at $\pm 2\%$ of optimum moisture content (ASTM D 698) prior to placement of any base materials. If soft or wet spots are encountered during the proof rolling or compaction activities and partial removal is preferred, these soft and/or wet spots should be sub-excavated an additional 300 mm (partial removal) followed by the placement of a geotextile (non-woven Nilex 4551 or equivalent), and then backfilled using medium to highly plastic inorganic clay in two lifts with each lift compacted to a minimum of 95% of its MDD at $\pm 2\%$ of optimum moisture content. Alternatively if soft and /or wet spots are encountered during the proof rolling or compaction activities and full removal is preferred, these soft and/or wet soils should additionally be fully sub-excavated to their full depth (full removal) and then backfilled using medium to highly plastic inorganic clay in maximum 150 mm thick lifts or crushed sub-base (50 mm max) course in maximum 200 mm thick lifts with lift compacted to a minimum of 95% of its MDD at $\pm 2\%$ of optimum moisture content.
- The excavated soils can be temporarily stockpiled a minimum of 3.0 m away from the excavations. Stockpiled excavated soil must be approved by ENG-TECH for re-use prior to placement.
- As required place medium to highly plastic inorganic clay in maximum 150 mm thick lifts or place crushed sub-base (50 mm max) course in maximum 200 mm lifts to 200 mm below the underside of the design elevation of the slabs, and uniformly compact each lift to 98% MDD at $\pm 2\%$ optimum moisture content.
- Place a 200 mm thick lift of granular or limestone base course and uniformly compact it to 100% of MDD at $\pm 2\%$ optimum moisture content immediately below the base of the slab.
- Place a minimum 6 mil poly layer on top of the granular base under the floor slab prior to pouring the concrete.

The floor slabs should be continuously reinforced and be provided with joints at regular intervals to control and reduce random cracking and to prevent faulting. All partition walls or equipment founded on the slabs must have a minimum 75 mm thick void space at the top to prevent damage if the slab should heave. The slabs should be structurally separated from the grade beams and columns.

4.4 Structurally Supported Replacement Concrete Garage Floor

ENG-TECH understood that the some of the replacement concrete garage floors will be structurally supported on piles over void spaces. With the replacement concrete garage floors supported on piles, compressible void form of 150 mm will suffice below the floors.

4.5 Replacement Concrete Slab-on-Grade Hoist Pit Floors

During the drilling program, topsoil was detected as deep as 900 mm from existing grade in TH1, and a soft and moist to wet silt layer was encountered from 1.7 to 2.3 m below existing grade in TH2. The tops of the replacement concrete pits floors are expected to be located at various depths ranging from approximately 1.5 m (5 feet) to 4.0 m (13 feet) below existing grade. The replacement concrete pit floors must not be founded on topsoil or organic soils since there would be the potential of excessive settlement and differential movements, however this should not be issue since topsoil was only detected to 900 mm in TH2 during the drilling program. Also, the replacement concrete slab-on-grade floors must not be founded on soft and/or wet soils since there would be the potential for excessive settlement and differential movements, unless there is adequate bridging over the soft and/or wet soils.

A soft and moist to wet silt layer was detected in TH2 from 1.7m to 2.3 m below grade during the drilling program and potentially additional silt layers of random thickness and/depths could be present in the stratigraphy, and should be expected in some areas of the replacement pit floors.

Full removal of the soft and/or wet soils would be the best to limit settlement and differential movements, however would likely not be economical or practical across the footprints of the proposed replacement concrete pit floors. Partial removal of the soft and/or wet soils encountered with adequate bridging over the remaining soft and wet soils could be used to reduce the potential of excessive movements (settlement and differential movements) to typical movements for the slab-on-grade floors. Adequate bridging of the soft and/wet soil spots for the replacement concrete slab-on-grade pit floors should consist of at least 300 mm of firm to stiff medium to high plastic clay over a geotextile. Geotextile would provide separation barrier between the soils used for bridging, and the soft and/or wet soils.

Native clay of high plasticity was detected in the both test holes below 900 mm in TH1 and 2.3 m in TH2. If the native clay was to swell in the presence of excess moisture, heave and associated movement of the slab can occur. Movement associated with shrinkage or swelling of the soils due to changing moisture content is expected, however this can be minimized with proper sub-grade preparation and the use of a free draining base material.

If potential typical movement of the replacement concrete pit floors are unacceptable to the owner, then replacement concrete pit floors structurally supported by piles over void spaces should be used.

Based on the above and providing the owner is willing to accept the possibility of typical movements of the concrete pit floor slabs, the replacement pit floor slabs after the removal of the existing floor slabs could be constructed as follows:

- Excavate all silt, and any soft and/or wet soils (as well as topsoil and organic soils if encountered) to their full depth from the surface, and continue as required to at least 150 mm below the underside of the replacement pit floor design elevation (which will vary from approximately between 1.5 m and 4.0 m below existing grade). During the drilling program, soft and moist to wet silt was detected between 1.7 m and 2.3 m below existing grade in TH2. The sub-grade soils should consist of inorganic firm to stiff native clay and/or firm to stiff clay fill and/or medium dense to dense granular fill, should be shaped such that it continuously slopes towards a sump pit(s).

- The excavated soils can be temporarily stockpiled a minimum of 3.0 m away from the excavations. Stockpiled excavated soil must be approved by ENG-TECH for re-use prior to placement.
- Uniformly compact the upper 300 mm of the sub-grade to 95% of its MDD at $\pm 2\%$ of optimum moisture content in order to densify and decrease the voids created during excavating. If soft and/or wet spots are encountered during the compaction activities and partial removal is preferred, these soft and/or wet spots should be sub-excavated an additional 300 mm (partial removal) followed by the placement of a geotextile (non-woven Nilex 4551 or equivalent), and then backfilled using medium to highly plastic inorganic clay in two lifts with each lift compacted to a minimum of 95% of its MDD at $\pm 2\%$ of optimum moisture content. Alternatively if soft and/or wet spots are encountered during the compaction activities and full removal is preferred, these soft and/or wet soils should additionally be fully sub-excavated to their full depth and then backfilled using medium to highly plastic inorganic clay in maximum 150 mm thick lifts or crushed sub-base (50 mm max) course in maximum 200 mm thick lifts with lift compacted to a minimum of 95% of its MDD at $\pm 2\%$ of optimum moisture content. The sub-grade should be inspected by ENG-TECH prior to the placement of any base material.
- Place at least 150 mm of pea gravel and moderately vibrate it to reduce voids and future replacement pit floor movements.
- Place a vapour barrier consisting of a minimum of 10 mil poly directly below the underside of the replacement pit slab prior to pouring the concrete.

The replacement pit floor should be continuously reinforced and should be provided with joints at regular intervals to control and reduce random cracking and to prevent faulting. The replacement pit floor should be structurally separated from the foundation walls and columns.

4.6 Structurally Supported Replacement Concrete Hoist Pit Floors

ENG-TECH understood that the some of the replacement concrete pit floors will be structurally supported on piles over void spaces. With the replacement concrete pit floors supported on piles, compressible void form of 150 mm will suffice below the replacement pit floors. The exposed sub-grade soils of the void space should be shaped such that it continuously slopes towards a sump pit(s).

4.7 Lateral Earth Pressure on Below Grade Walls

ENG-TECH assumes that below grade walls will be rigid, and therefore, the coefficient of earth pressure at rest (K_0) can be used to determine the lateral earth pressure on the walls. The compaction effort of the backfill placed against the walls, backfill type and sub-drainage conditions will have an impact on the magnitude and shape of lateral earth pressures on the walls. Lateral earth pressures induced by compaction, surcharge loading and groundwater will have to be accounted for in the design of below grade walls.

Outlined below are recommendations for lateral earth pressures for lightly to moderately and well compacted backfill against rigid walls.

Lightly to Moderately Compacted Backfill

Backfill lightly to moderately compacted typically corresponds to 90 to 95% of MDD. Settlements under the self-weight of the backfill compacted to the above range usually does not exceed 4% of the fill height. The lateral earth pressures against below grade walls of lightly to moderately compacted backfill with no sub-drainage system installed can be determined as outlined below:

$$\sigma_h = K_o \cdot \gamma \cdot z_w + K_o \gamma'(z - z_w) + \gamma_w(z - z_w)$$

Where:

- σ_h = lateral earth pressure (kN/m²)
- K_o = coefficient of earth pressure at rest
- γ = total unit weight of the soil (kN/m³)
- γ' = buoyant unit weight of the soil (kN/m³)
- γ_w = unit weight of water (kN/m³)
- z = depth of wall below grade (m)
- z_w = depth to the top of the water table (measured from top of final grade, m)

For cases where a sub-drainage system will be installed, the lateral earth pressures acting on the wall may be determined by:

$$\sigma_h = K_o \cdot \gamma \cdot z$$

The recommended values for the lateral earth pressure coefficient and total unit weight of the soil are outlined below:

Earth Pressure Coefficients and Total Unit Weights for Lightly to Moderately Compacted Backfill		
Soil Type	K_o	Total Unit Weight (kN/m ³)
Gravel Fill	0.45	21
Sand Fill	0.50	20
Silt	0.55	19
Clay Fill	0.60	21
Cohesive (Clay)	0.65	18

Well Compacted Backfill

For well compacted backfill against the upper portions of below grade walls, there will be a build-up of lateral compaction stresses acting on the wall. These compressive stresses depend on the force imposed by the compactor, which depends on the dead weight and centrifugal force of the compactor. Typical compactor forces can be provided by the manufacture of the compactor.

Well compacted backfill typically corresponds to 98% (plus) of MDD. Settlements of backfill compacted to at least 98% MDD usually does not exceed 1% of the fill height, providing no surcharge loads are added to the fill after compaction.

When backfill is well compacted against the upper portion of below grade walls, the lateral earth pressures in the upper portion along the walls can be determined as outlined below:

- (1) From: 0 (top of wall) to z_1

$$\sigma_h = K_o \sqrt{(2 \cdot P \cdot \gamma \div \pi)}$$

Where: $z_1 = K_o \sqrt{(2 \cdot P \div (\pi \cdot \gamma))}$

$$P \text{ (Compactor Force, kN/m)} = \frac{\text{Compactor Weight (kN)} + \text{Centrifugal Force (kN)}}{\text{Width of Compactor (m)}}$$

- (2) From: z_1 to z_2

$$\sigma_h = K_o \sqrt{(2 \cdot P \cdot \gamma \div \pi)}$$

Where: $z_2 = (1 \div K_o) \sqrt{(2 \cdot P \div (\pi \cdot \gamma))}$

- (3) From: below z_2

$$\sigma_h = K_o \cdot \gamma \cdot z$$

Soil parameters descriptions have previously been outlined. The recommended values for the lateral earth pressure coefficient and total unit weight of well compacted soils are outlined below.

Earth Pressure Coefficients and Total Unit Weights for Well Compacted Backfill		
Soil Type	K_o	Total Unit Weight (kN/m ³)
Gravel Fill	0.40	22
Sand Fill	0.40	21
Silt	0.45	20
Clay Fill	0.50	22
Cohesive (Clay)	0.55	20

Surcharge Loading

If surcharge loads (other than light vehicle parking within 1.5 m from the pits) will be adjacent the pits, then they will have to be accounted for. We assume busses could park beside the pits, and these busses could generate additional non-uniform surcharge loading against the below grade walls and the order of magnitude dependent on the location of the busses to the below grade walls. Based on Boussinesq method and considering practicality, the horizontal surcharge load generated by the busses on below grade walls could be assumed to be 30 kPa for the upper 2 m of the below grade walls and 8 kPa on the remainder (deeper than 2 m). If other vehicles beside busses will be parked by the pits, we should be informed in order to provide design recommendations.

Lateral Earth Pressure on Temporary Below Grade Walls

Design details of a shoring system can be provided, if required, once more is known about the proposed construction scheduling. For preliminary (and conservative) design purposes the use of a design coefficient (K_d) is recommended rather than the lateral earth pressure coefficient at rest (K_0). For a level grade surface the design lateral earth pressures will increase linearly from zero at the top of grade to a maximum at the base as outlined below.

$$\sigma_h = K_d \cdot \gamma \cdot z$$

Where:

- σ_h = lateral earth pressure for depth z (kN/m^2)
- K_d = design coefficient of earth pressure (0.60)
- γ = unit weight of soil (19 kN/m^3)
- z = depth below soil surface (m)

4.8 Comments on Capacity of Piles Supporting Existing Hoists

There are 38 hoists in the pre-expansion section of the Winnipeg Transit Garage which will be replaced. These hoists are reportedly supported by cast-in-place concrete friction piles which are 25 feet (7.6 m) in length with a diameter of 30 inches (0.76 m). The capacity of each existing reported pile could be estimated by using the skin friction static resistances values provided in Table 1 of section 4.2.1 of this report.

In the case of the top an existing cast-in-place concrete friction pile at underside of garage floor, which was 25 foot in length with a diameter of 30 inches, the capacity based on table 1 would be 223 kN in ULS and 186 kN in SLS, where the estimation based on the following:

- Neglecting greater of upper 2.4 m below existing grade (underside of garage floor) or 1.0 m below the underside of the grade beam.
- A surface area (diameter multiplied by pi) of a 30 inch (0.76 m) diameter cast-in-place concrete friction pile multiplied by a length of 5.2 m (total length of 7.6 m subtracting the neglecting length of 2.4 m), and then multiplied by the ULS value of 18 kPa or the SLS value of 15 kPa. For deeper estimations, note that below 7.6 m from existing grade, the ULS value was 10 kPa and the SLS value was 8 kPa.

The estimated capacity of the existing reported cast-in-place concrete friction piles would be dependent on where the top of the pile was located since all of these piles would have the same length (25 feet) and same diameter (30 inches), however the capacity of all could be calculated using table 1.

The actual top of pile location, length and diameter of the reportedly used cast-in-place concrete friction piles used to support the existing hoists was outside the scope of work.

If requested, ENG-TECH could attempt to use the Echo system to determine the length of the existing piles, which would require removal of any pile caps and grinding the top of the piles relatively flat. The success of Echo system testing is dependent of the integrity of the piles being tested.

4.9 Foundation Concrete

General

All concrete should be designed, specified, and constructed in accordance with CSA standard A23.1-14, Concrete Materials and Methods of Concrete Construction using the Performance Specification Alternative as outlined in Table 5 of CSA A23.1-14.

Under the performance alternative, the concrete supplier shall assume responsibility for the performance of the concrete as delivered and the contractor shall assume responsibility for the concrete in place. The owner shall specify performance requirements including; the required structural criteria and concrete strength at age, the concrete exposure class for durability, and any other properties that may be required to meet the owner's performance requirements such as colour, architectural requirements, and special surface finishes. The owner reserves the right to request the supplier provide satisfactory documentation that the proposed mix design will achieve the strength, durability, and performance requirements specified by the owner, and that the mix design satisfies the requirements of CSA A23.1-14. In addition, the owner may request the contractor to submit documentation demonstrating the owner's performance requirements have been met during construction and placement.

Based on Tables 1, 2, 3, and 4 of CSA A23.1-14, the concrete in contact with the local soils can be classified as a S-2 exposure class (severe sulphate exposure) for the piles and pile caps, a F-2 exposure class (exposure to freezing and thawing without chlorides) for the grade beams, a C-4 exposure class (exposure to chlorides without freezing or thawing) for a garage and pit floor slab areas where potentially buses and vehicles could be parking or being repaired which will be heated to maintain a continuous inside air temperature above freezing, a N-CF exposure class (not exposed to chlorides, freezing or thawing) for floor slab areas with a steel-towel finish which will be heated to maintain a continuous inside air temperature above freezing, and a N exposure class (not exposed to chlorides, freezing or thawing) for floor slab areas which will be heated to maintain a continuous inside air temperature above freezing. The concrete design can be selected as structurally required by design however the concrete should be designed to meet the minimum specifications outlined below for durability.

Piles and Caps (S-2)

56 day minimum compressive strength of 32 MPa
Maximum water/cementing materials ratio of 0.45
Maximum nominal aggregate size of 20 mm
Type HS or HSb cement
Air content of 4-7%

Grade Beams (F-2)

28 day minimum compressive strength of 25 MPa
Maximum water/cementing materials ratio of 0.55
Maximum nominal aggregate size of 20 mm
Type Gu or Gub cement
Air content of 4-7%

Heated Garage and Pit Floors Slab Exposed to Chlorides (C-4)

28 day minimum compressive strength of 25 MPa
Maximum water/cementing materials ratio of 0.55
Maximum nominal aggregate size of 20 mm
Type Gu or Gub cement
Air content of 4-7%
Requirement for air-entrainment should be waived when a steel troweled finish is required

Heated Floor Slabs (Not Exposed to Chlorides) with Steel-Trowel Finish (N-CF)

28 day minimum compressive strength of 25 MPa
Maximum water/cementing materials ratio of 0.55
Maximum nominal aggregate size of 20 mm
Type Gu or Gub cement
Air content – natural

Heated Floor Slabs Not Exposed to Chlorides (N)

Minimum compressive strength for structural design
Maximum water/cementing materials ratio as per the mix design for the strength required
Maximum nominal aggregate size of 20 mm
Type Gu or Gub cement
Air content – natural

4.10 Inspection and Testing

Documentation and inspection during installation cast-in-place concrete friction piles should be conducted by ENG-TECH.

Also, the sub-grades for the concrete slab-on-grade garage and pit floors should be inspected by ENG-TECH prior to the placement of any base and sub-grade materials. Instructions for dealing with sub-grade soft spots will be provided after inspection.

All material testing (both field and laboratory) of the concrete and base materials used at this site should be completed by ENG-TECH, which is certified with Canadian Council of Independent Laboratories (CCIL) for concrete category 2, asphalt type A and B, and aggregates type C.

5.0 CLOSURE

This report was based on the scope of work outlined for the purpose of the investigation, and was prepared in accordance with acceptable professional engineering principles and practices. If you have any questions, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited



Rod Girouard, P.Eng.
Geotechnical Engineer

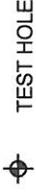
CDH/rig



Clark Hryhoruk, M.Sc., P. Eng.
Principal, Geotechnical Engineer



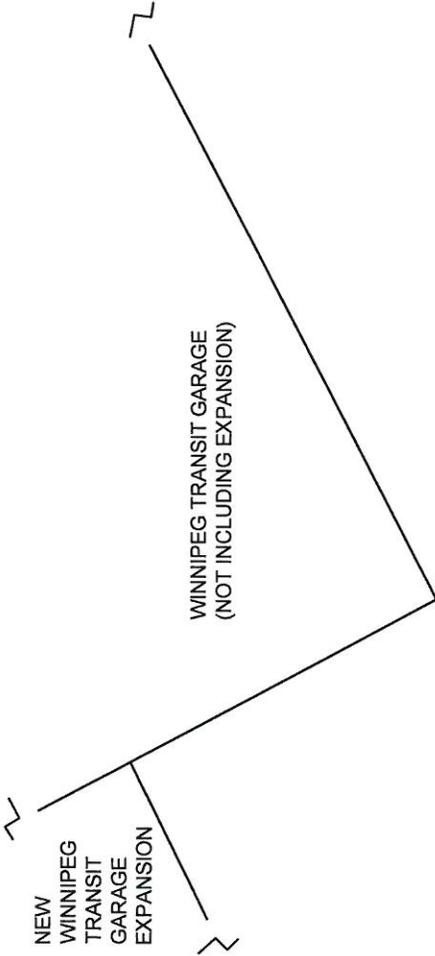
LEGEND



TEST HOLE



TEST HOLE LOCATION TABLE		
GPS COORDINATES OF TEST HOLES July 17, 2019		
HOLE #	UTM	14U
TH1	5525436	0633584



SCALE

NO.	DATE	ISSUE / REVISION
0	AUG. 2019	report

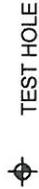


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Fax: (204) 235-1579



CLIENT:	CITY OF WINNIPEG - TRANSIT DEPARTMENT.
PROJECT:	GEOTECHNICAL INVESTIGATION - WINNIPEG TRANSIT GARAGE HOIST REPLACEMENT PROGRAM, 421 OSBORNE STREET, WINNIPEG, MANITOBA
DWG DESCRIPTION:	TEST HOLE LOCATION PLAN FOR TH1
SCALE:	AS SHOWN
DRAWN BY:	RLG
DATE:	AUGUST 2019
FILE NO.:	19-217-03
CLIENT DWG/FIG. NO.:	
ENG-TECH DWG/FIG. NO.:	
NO.:	1

LEGEND



TEST HOLE

NO. | DATE | ISSUE / REVISION

0 | AUG. 2019 | report

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Winnipeg, MB
R2J 3W8
Phone: (204) 233-1694
Fax: (204) 235-1579



ENG. STAMP:



CLIENT:
CITY OF WINNIPEG -
TRANSIT DEPARTMENT.

PROJECT:
GEOTECHNICAL INVESTIGATION -
WINNIPEG TRANSIT GARAGE
HOIST REPLACEMENT PROGRAM,
421 OSBORNE STREET,
WINNIPEG, MANITOBA

DWG DESCRIPTION:
TEST HOLE LOCATION PLAN FOR TH2

SCALE:
AS SHOWN

DRAWN BY:
RLG

DATE:
AUGUST 2019

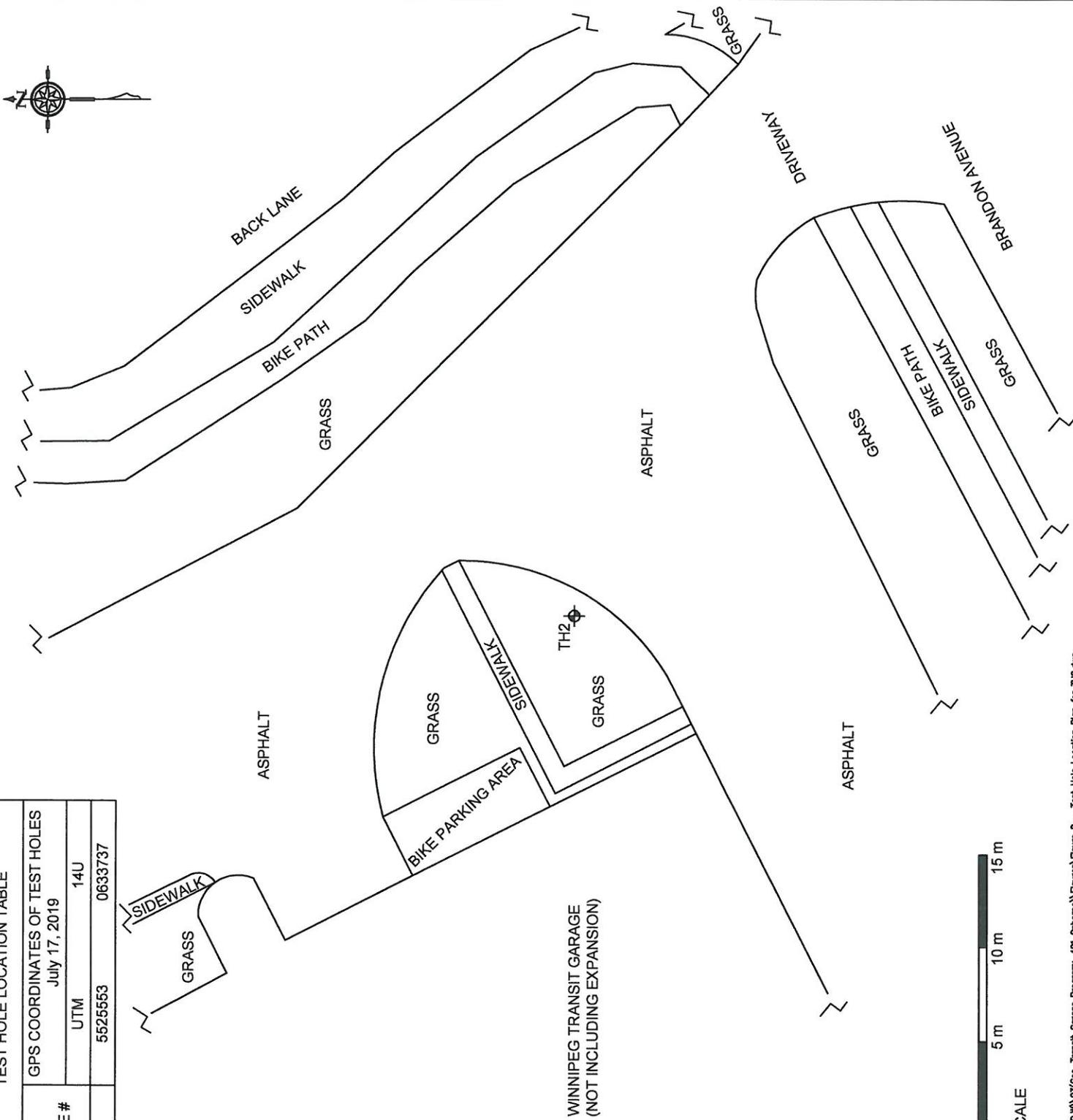
FILE No.:
19-217-03

CLIENT DWG/FIG. No.:

ENG-TECH DWG/FIG. No.:

2

TEST HOLE LOCATION TABLE	
GPS COORDINATES OF TEST HOLES	
July 17, 2019	
HOLE #	UTM
TH2	5525553 14U 0633737



MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS									
MAJOR DIVISION		GROUP SYMBOL	GRAPH SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA				
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75 µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75 mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4			
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7			
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75 mm	CLEAN SANDS (TRACE OR NO FINES)	SW		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
		DIRTY SANDS (WITH SOME OR MORE FINES)	SP		POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
			SM		SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4			
		SC		CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7				
FINE GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75 µm)	SILTS BELOW "A" LINE NEGLECTIBLE ORGANIC CONTENT	LL ≤ 50%	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHTY PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)			
		LL > 50%	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS				
	CLAYS ABOVE "A" LINE NEGLECTIBLE ORGANIC CONTENT	LL ≤ 30%	CL		INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS				
		30% < LL ≤ 50%	CI		INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS				
		LL > 50%	CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS				
	ORGANIC SILTS & CLAYS BELOW "A" LINE	LL < 50%	OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY				
LL > 50%		OH		ORGANIC CLAYS OF HIGH PLASTICITY					
HIGHLY ORGANIC SOILS	PI		PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE					
ADDITIONAL SYMBOLS			PLASTIC SOILS						
TILL		SANDSTONE		MOISTURE	PLASTICITY	INTRUSIONS	CONSISTENCY	POCKET PEN (TSF)	(N)
FILL		GRANITE		DRY	LOW	ROOTLETS	VERY SOFT	< 2	
TOPSOIL				DAMP	MEDIUM	OXIDES	SOFT	0 - 0.5	2 - 4
CONCRETE				MOIST	HIGH	MICA	FIRM	0.5 - 1.0	4 - 8
SHALE				WET		GYPSUM	STIFF	1.0 - 2.0	8 - 15
LIMESTONE						ETC.	VERY STIFF	2.0 - 4.0	15 - 30
							HARD	> 4.0	> 30
				TSF x 95.8 = kPa (q _u) S _u = 1/2 x q _u					
PLASTICITY CHART FOR SOILS PASSING 425 µm SIEVE			SOIL DESCRIPTIONS						
			TRACE: 0 - 10%	BOULDERS: > 200 mm	COARSE SAND: 2 - 4.75 mm				
			SOME: 10 - 20%	COBBLES: 75 - 200 mm	MEDIUM SAND: 0.425 - 2 mm				
			WITH: 20 - 35%	COURSE GRAVEL: 19 - 75 mm	FINE SAND: 0.075 - 0.425 mm				
			AND: 35 - 50%	FINE GRAVEL: 4.75 - 19 mm	FINES: < 0.075 mm				
			GRANULAR SOILS						
			MOISTURE	DENSITY	GRADATION	INTRUSIONS	SPT (N)		
			DRY	VERY LOOSE	POORLY	ROOTLETS	0 - 4		
			DAMP	LOOSE	WELL	OXIDES	4 - 10		
			MOIST	MED. DENSE		MICA	10 - 30		
			WET	DENSE		FINES	30 - 50		
				VERY DENSE		ETC.	> 50		
			DEFINITIONS		C _c = COMPRESSION INDEX				
			LL = LIQUID LIMIT		PL = PLASTIC LIMIT				
			P.I. = PLASTICITY INDEX						
			C _u = COEFFICIENT OF UNIFORMITY						
			q _u = UNCONFINED COMPRESSIVE STRENGTH						
			S _u = UNDRAINED SHEAR STRENGTH						
							420 Turenne Street Winnipeg, MB R2J 3W8 Phone: (204) 233-1694 Fax: (204) 235-1579		



Engineering And Testing
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Test Hole #: TH1

Client: City of Winnipeg - Transit Department

Site: 421 Osborne Street, Winnipeg, Manitoba

Location: Figure 1

Project: Winnipeg Transit Garage Hoist Replacement Program

File No.: 19-217-03

Date Drilled: July 17, 2019

Grade Elevation: ± 100.0 m

Water Elevation: --

SUBSURFACE PROFILE			SAMPLE DATA				SHEAR STRENGTH (kPa)					
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)				
								PL	X	LL	P. Pen	Torvane
0.0		Ground Surface	100.0									
0.0 - 1.0		Topsoil (150 mm) - wood chip covered. - dark brown, moist, soft, organics.		S1	Shelby Tube	28.5				48		
1.0 - 2.0		Crushed Limestone Fill (PG)(75 mm) - tan, moist, poorly graded, fine to coarse grained & up to 19 mm in diameter.		S2	Shelby Tube	27.3				96		
2.0 - 3.0		Clay Fill (CL) - dark to light brown, moist, firm, low plastic, trace to some silt & gravel.		S3	Shelby Tube	43.2				96		
3.0 - 4.0		Topsoil (100 mm) dark brown, moist, soft, organics.		S4	Shelby Tube	50.5				72		
4.0 - 5.0		Clay (CH) - medium brown, moist, stiff, highly plastic, trace to some silt.		S5	Shelby Tube	53.0				72		
5.0 - 6.0		- below 4.9 m, firm to stiff.		S6	Shelby Tube	52.8				48		57
6.0 - 7.0				S7	Shelby Tube	43.7				60		
7.0 - 8.0				S8	Shelby Tube	44.2				48		
8.0 - 9.0		- below 7.9 m, grey & firm.		S9	Shelby Tube	45.8				60		31
9.0 - 10.0				S10	Shelby Tube	48.0				36		
10.0 - 11.0				S11	Shelby Tube	55.0				24		
11.0 - 12.0				S12	Shelby Tube	63.5				24		
12.0 - 13.0		End of Test Hole - end of test hole at 12.2 m below grade. - test hole was dry during drilling. - test hole backfilled with auger cuttings and bentonite upon completion of drilling.								21		
13.0 - 14.0										21		
14.0 - 15.0												

ENG-TECH Consulting Limited

Logged by: Rod G.

Reviewed by: *CA*

Drilled By: Paddock Drilling Ltd.

Drill Rig: Truck Mounted Acker MP8

Auger Size: 125 mm Solid Stem

Completion Depth: 12.2 m

Completion Elevation: ± 87.8 m

Sheet: 1 of 1

Sample Type

Core Barrel

Shelby Tube

Auger Cuttings

Split Spoon



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Test Hole #: TH2

Client: City of Winnipeg - Transit Department

Site: 421 Osborne Street, Winnipeg, Manitoba

Location: Figure 2

Project: Winnipeg Transit Garage Hoist Replacement Program

File No.: 19-217-03

Date Drilled: July 17, 2019

Grade Elevation: ± 100.0 m

Water Elevation: --

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)					
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)			P. Pen	Torvane	UC
								PL	X	LL			
16.0		End of Test Hole - end of test hole at 15.2 m below grade. - seepage and sloughing from silt layer during drilling.	84.0										
17.0		- test hole backfilled with auger cuttings and bentonite upon completion of drilling.	83.0										
18.0			82.0										
19.0			81.0										
20.0			80.0										
21.0			79.0										
22.0			78.0										
23.0			77.0										
24.0			76.0										
25.0			75.0										
26.0			74.0										
27.0			73.0										
28.0			72.0										
29.0			71.0										
30.0			70.0										

ENG-TECH Consulting Limited

Logged by: Rod G.

Reviewed by:

Drilled By: Paddock Drilling Ltd.

Drill Rig: Truck Mounted Acker MP8

Auger Size: 125 mm Solid Stem

Completion Depth: 15.2 m

Completion Elevation: ± 84.8 m

Sheet: 2 of 2

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON

APPENDIX B

Asbestos Assessment - Pipe in Bus Hoist, dated October 7, 20211
Asbestos Assessment - Drain Pipe in Bust Hoist, dated October 16, 2021.....1



Elias Consulting
Occupational Hygiene

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alison@eliasconsulting.ca

October 7, 2019

Project # 15-A-167-82

Trevor Blue
Winnipeg Transit
421 Osborne Street
Winnipeg MB R3L 2A2

Re: Asbestos Assessment – Pipe in Bus Hoist Pit

As part of the bus hoist replacement project, the horizontal pipe connecting the front and rear jack that houses the hydraulic hose was assessed for asbestos. Pipe H34 was sampled and analyzed for asbestos. The cementitious pipes are all considered asbestos containing.

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed
L2358326-1 H34 PIPE						
Sampled By: CLIENT on 02-OCT-19 @ 14:00						
Matrix: BULK						
Bulk Asbestos Content						
Asbestos: Chrysotile (Serpentine)	10-25		1	%		02-OCT-19
Asbestos: Crocidolite (Amphibole)	1-10		1	%		02-OCT-19
Other Non Fibrous: Filler	75-99		1	%		02-OCT-19
Note: Sample contains asbestos						

If each individual cementitious pipe can be removed without being actively damaged (removed intact, no further damage), each would be considered a Type 1 removal. No PPE would be required, and the waste would be treated as asbestos containing and double bagged.

If each individual cementitious pipe cannot be removed intact (no further damage), then each shall be removed under Type 2 abatement procedures. An enclosure would need to be built over the area and enclosing the open pit to some degree. All work that will result in the active damage of the pipe would need to occur inside the enclosure. All workers inside the enclosure would be required to have appropriate asbestos abatement training.

Yours truly,
For Elias Occupational Hygiene Consulting Inc.

Alison Reineke, BHEc, BSc, CIH, ROH, CRSP
Occupational Hygienist



Elias Consulting
Occupational Hygiene

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October 16, 2019

Project # 15-A-167-82a

Trevor Blue
Winnipeg Transit
421 Osborne Street
Winnipeg MB R3L 2A2

Re: Asbestos Assessment – Drain pipe in Bus Hoist Pit

As part of the bus hoist replacement project, the horizontal pipe connecting the front jack to the drain channel was assessed for asbestos. The pipe from hoist H16 was sampled and analyzed for asbestos. The cementitious drain pipes are all considered asbestos containing.

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed
L2364970-1 H16 DRAIN PIPE Sampled By: CLIENT on 15-OCT-19 Matrix:						
Bulk Asbestos Content						
Asbestos: Chrysotile (Serpentine)	10-25		1	%		15-OCT-19
Asbestos: Crocidolite (Amphibole)	10-25		1	%		15-OCT-19
Other Non Fibrous: Filler	50-75		1	%		15-OCT-19
Note: Sample contains asbestos						

After discussions with the Contractor, the cementitious pipes most likely cannot be removed intact (no further damage). All work that will result in the active damage of the pipe would need to occur inside the enclosure. Meaning that the jack hammering that will result in crushing the pipes will need to occur in a Type 2 enclosure in order to contain the silica dust and any asbestos fibers that may be released. An enclosure would need to be built over the area being jack hammered and the open pit. All workers inside the enclosure would be required to have appropriate asbestos abatement training.

Yours truly,
For Elias Occupational Hygiene Consulting Inc.

Alison Reineke, BHEc, BSc, CIH, ROH, CRSP
Occupational Hygienist

APPENDIX C

Excavation Assessment - Winnipeg Transit Garage Building, 421 Osborne Street, Winnipeg, Manitoba, dated February 2020	31
Correspondence from Manitoba Conservation and Climate - Review Under the Contaminated Sites Remediation Act, dated March 4, 2020.....	1

Submitted to:

City of Winnipeg

EXCAVATION ASSESSMENT

WINNIPEG TRANSIT GARAGE BUILDING, 421 OSBORNE STREET
WINNIPEG, MANITOBA



FEBRUARY 2020

FILE NO.: 19-217-03



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EXECUTIVE SUMMARY

ENG-TECH Consulting Limited (ENG-TECH) was retained by the City of Winnipeg (CoW) to assess the petroleum hydrocarbon (PHC) impact at the excavation for the hoist replacement at the Winnipeg Transit Garage Building at 421 Osborne Street in Winnipeg, Manitoba (in this report the property will subsequently be referred to as “the Site”).

The purpose of the current investigation was to assess the residual PHC impact in the soil resulting from the hydraulic hoists that were removed as part of the hoist replacement program. The purpose of the excavation was to facilitate the replacement of the hoists but not to remediate the site impact.

During the excavation/removal of the in-ground hoists and concrete pits, PHC impact in the soil was encountered. Parkwest Projects Ltd., the contractor conducting the hoist replacement, submitted several soil samples for analysis of benzene, toluene, ethylbenzene, xylenes (BTEX) and PHC fractions 1 to 4 (F1-F4). The analytical results indicated that PHC concentrations in the soil, especially PHC F3, were greater than the applicable regulatory guidelines. CoW subsequently decided to have the excavation assessed to determine the residual PHC concentrations at the limits (i.e. the base and walls) of the excavation.

ENG-TECH attended the Site on February 10, 2020 to conduct the excavation assessment. A total of 90 soil samples were collected from the base and walls of the excavation. A total of twelve (12) soil samples were submitted for analysis of BTEX and PHC F1-F4.

Three soil samples had PHC F3 concentrations greater than the applicable guidelines. Two of the samples (S66 and S72) were located on the south wall near the southwest corner (near Hoists 16 and 17); the other sample (S39) was located on the east wall of the excavation (to the east of Hoist 13).

Although only three (3) of the twelve (12) soil samples had PHC concentrations greater than the applicable guidelines, many soil samples from depths of 2 and 3 mbg appeared to be “oily”, indicating that hydraulic oil was present. At several locations, what appeared to be hydraulic oil was seeping from the walls of the excavation typically at the interface between the silt and clay layers.

None of the soils samples from the base of the excavation had PHC concentrations greater than the applicable guidelines. Based on the laboratory results and observations during the soil sampling, PHC impact in the soil did not appear to present at 3.5 metres below grade (i.e., the base of the excavation).

The CCME exposure pathway that governs the site would be “Management Limits”. According to the CCME CWS: “In addition to the chronic toxicity of PHC to human and ecological receptors, various effects of PHC contamination are also considered. These effects include:

- “Free phase formation;
- “Exposure of workers in trenches to PHC vapours;
- “Fire and explosive hazards;
- “Effects on buried infrastructure; and,
- “Aesthetic considerations.”

Since free phase hydraulic oil would not typically be considered an explosive hazard nor would it be expected to produce significant PHC vapours, the primary concerns would be the effects of the hydraulic oil on buried infrastructure and potential exposure of workers to hydraulic oil while working in trenches/excavations.

ENG-TECH concludes that residual concentrations of PHCs were present at the walls of the excavation at concentrations greater than the applicable guidelines.

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1.0 INTRODUCTION

1.1 Terms of Reference

ENG-TECH Consulting Limited (ENG-TECH) was retained by the City of Winnipeg (CoW) to assess the petroleum hydrocarbon (PHC) impact at the excavation for the hoist replacement at the Winnipeg Transit Garage Building at 421 Osborne Street in Winnipeg, Manitoba (in this report the property will subsequently be referred to as “the Site”).

ENG-TECH received authorization to proceed with the current assessment from Mr. Adolfo Laufer of the CoW Transit Department on February 3, 2020.

1.2 Objectives

The purpose of the current investigation was to assess the residual PHC impact in the soil resulting from the hydraulic hoists that were removed as part of the hoist replacement program. The purpose of the excavation was to facilitate the replacement of the hoists and not to remediate the site impact.

1.3 Scope of Work

The scope of work of the current investigation was as follows:

- Collected soil samples at regular intervals and depths representative of the soil layers and where PHC impact was suspected.
- Assess combustible vapour concentrations (CVCs) of the soil samples using an RKI Eagle portable gas detector.
- Submit samples to ALS Laboratories in Winnipeg for laboratory analysis.
- Prepare a report summarizing the field program and analytical results.

1.4 Methodology

The site remediation was conducted using guidelines and criteria outlined in publications from ASTM, the Canadian Council of Ministers of the Environment (CCME), Canadian Standards Association (CSA) and Manitoba Conservation and Climate (MCC). A bibliography/reference list of the publications referred to is attached to this report.

1.5 Background Information

During the excavation/removal of the in-ground hoists and concrete pits, PHC impact in the soil was encountered. Parkwest Projects Ltd., the contractor conducting the hoist replacement, submitted several soil samples for analysis of benzene, toluene, ethylbenzene, xylenes (BTEX) and PHC fractions 1 to 4 (F1-F4). The analytical results indicated that PHC concentrations in the soil, especially PHC F3, were greater than the applicable regulatory guidelines. The CoW subsequently decided to have the excavation assessed to determine the residual PHC concentrations at the limits (i.e. the base and walls) of the excavation.

2.0 SITE ASSESSMENT

2.1 Site Location and Description

The Site is located inside the Winnipeg Transit Garage Building at 421 Osborne Street in the City of Winnipeg, Manitoba. The Site and the majority of the surrounding property are zoned as C3 or “commercial corridor” by the CoW. Industrial property is located to the north and west; residential property is located farther east. The Site is currently used as a bus repair garage.

The site location is presented on Figure 1.

2.2 Field Activities

ENG-TECH attended the Site on February 10, 2020 to conduct the excavation assessment. A total of 90 soil samples were collected from the base and walls of the excavation. Each soil sample collected was analyzed for combustible vapour concentrations (CVCs) using an RKI Eagle calibrated to hexane and operated with methane response enabled. Briefly, the procedures used for CVC testing were as follows:

- Collect a soil sample and remove the perimeter edges. Cut the sample into small pieces and place them into a plastic sealable bag.
- Induce air into the bag such that the bag is taut and seal the bag.
- Allow the soil vapours to release from the soil to accumulate in the headspace of the bag at approximately 20°C.
- Measure the vapour concentration in the headspace of the bag by placing the probe of the RKI Eagle into the bag. Concentrations were recorded in parts per million (ppm) or the percent of the lower explosive limit for hexane (%LEL) and recorded on the test hole logs.

In addition to the above, each soil sample was visually assessed for the presence of obvious odours and/or staining. Soil samples for laboratory analysis were collected from the walls and base of the final excavation limits and were selected based on CVCs and visual observations. These soil samples were placed in laboratory-provided containers, sealed, and placed in a cooler with ice packs. Soil samples collected for analysis of BTEX and PHC F1 were collected using the Terra Core™ sampling device.

Upon completion of fieldwork, coolers were transported to ALS Laboratory Group (ALS) in Winnipeg, Manitoba. ALS is accredited with the Canadian Association for Laboratory Accreditation (CALA).

Table 1 summarizes the excavation soil sample details. Soil sample locations are presented on Figure 1. Photographs taken during the field activities are presented in Appendix A. The locations of the soil samples submitted for laboratory analysis including laboratory results are presented on Figure 2.

2.3 Laboratory Analyses

A total of twelve (12) soil samples were submitted for analysis of BTEX and PHC F1-F4.

The laboratory results are summarized in Table 2. Copies of the reports from ALS are attached in Appendix B.

2.4 Regulatory Guidelines

The results from the soil analyses will be compared to the guidelines outlined in the most recent Canadian Council of the Ministers of the Environment (CCME) publications including:

- CCME Canadian Environmental Quality (CEQ) Guidelines for Protection of Environmental and Human Health (most recent version) with 10^{-5} incremental risk guidelines used for benzene.
- CCME Canada-Wide Standards (CWS) for Petroleum Hydrocarbons (PHC) in Soil (most recent version).

The Site is currently used and zoned for commercial use therefore the commercial guidelines were applied.

The soil types encountered at the Site were primarily fine grained, therefore the fine-grained guidelines were used for comparison.

Groundwater at the Site is not used for drinking water, livestock watering or irrigation therefore guidelines for these pathways do not apply to the Site. Drinking water is provided via water pipeline by the CoW.

The closest body of water is the Red River located approximately 350 m to the east of the site therefore the protection of freshwater aquatic life pathway guidelines do not apply to the Site.

Since the PHC impact is located within a building, the vapour inhalation guidelines were used for comparison.

2.5 Findings

2.5.1 Stratigraphy

The stratigraphy at the Site consisted primarily of a thin layer of granular fill used as a base material for the hoists underlain by silt and clay, with clay being the primary material, especially after a depth of 2.0 metres below grade (mbg).

Groundwater was not observed in the excavation with the exception of a soft wet area in the northwest corner of the excavation where weeping tile was encountered.

2.5.2 CVC Results

The CVCs in the soil samples ranged from 15 to 80 ppm. CVC results are presented on Table 1.

2.5.3 Analytical Results

The PHC concentrations for soil samples were less than the CCME guidelines and/or the detection limits of the test performed, with the following exceptions:

- PHC F3 concentrations for samples 39, 66 and 72 were 7310, 8260 and 18300 mg/kg, respectively and were greater than the PHC F3 criterion of 5000 mg/kg.

2.6 Discussion

Three samples had PHC F3 concentrations greater than the applicable guidelines. Two of the samples (S66 and S72) were located on the south wall near the southwest corner (near Hoists 16 and 17); the other sample (S39) was located on the east wall of the excavation (to the east of Hoist 13).

Although only three (3) of the twelve (12) soil samples had PHC concentrations greater than the applicable guidelines, many soil samples from depths of 2 and 3 mbg appeared to be “oily”, indicating that hydraulic oil was present. At several locations, what appeared to be hydraulic oil was seeping from the walls of the excavation typically at the interface between the silt and clay layers (see Photograph #2).

None of the soils samples from the base of the excavation had PHC concentrations greater than the applicable guidelines. Based on the laboratory results and observations during the soil sampling, PHC impact in the soil did not appear to present at 3.5 mbg (i.e., the base of the excavation).

The CCME exposure pathway that governs the site would be “Management Limits”. According to the CCME CWS, “In addition to the chronic toxicity of PHC to human and ecological receptors, various effects of PHC contamination are also considered. These effects include:

- “Free phase formation;
- “Exposure of workers in trenches to PHC vapours;
- “Fire and explosive hazards;
- “Effects on buried infrastructure; and,
- “Aesthetic considerations.”

Since free phase hydraulic oil would not typically be considered an explosive hazard nor would it be expected to produce significant PHC vapours, the primary concerns would be the effects of the hydraulic oil on buried infrastructure and the potential exposure of workers to hydraulic oil while working in trenches/excavations.

2.7 Conclusions

ENG-TECH concludes that residual concentrations of PHCs were present at the walls of the excavation at concentrations greater than the applicable guidelines.

3.0 THIRD PARTY USE AND STATEMENT OF LIMITATIONS

The content of this document is not intended for the use of, nor is it intended to be relied upon by any person, firm or corporation, other than the Client and ENG-TECH. ENG-TECH denies any liability whatsoever to other parties for damages or injury suffered by such third party arising from the use of this document by them, without the express written authority of ENG-TECH and our client. This document is subject to further restrictions imposed by the contract between the Client and ENG-TECH, and these parties' permission must be sought regarding this document in all other circumstances. ENG-TECH disclaims responsibility for consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

As with any environmental site assessment the intent is to identify and address, not eliminate, potential environmental concerns. The observations made at the Site do not apply to areas which could not be observed. In addition, other materials or compounds not investigated or addressed or beyond the scope of work could be present at the Site. If this occurs, ENG-TECH must be notified to determine whether modification to any part of this report should be conducted.

4.0 CLOSURE

The conclusions and recommendations presented in this report were based on the scope of work outlined for the purpose of the investigation, and were prepared in accordance with accepted professional engineering/geo-science principles and practices. If you have any questions or concerns, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited



Walter Holowka, C.E.T., NCSO
Senior Geoenvironmental Technologist



Clark Hryhoruk, M.Sc., P. Eng.
Principal

CDH/wgh



BIBLIOGRAPHY/REFERENCES

BIBLIOGRAPHY/REFERENCES

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Google Maps, various years, www.google.ca/maps.

Guideline for Designation of Contaminated Sites in Manitoba, Guideline 97-01, published by Manitoba Sustainable Development in March 1997.

Guideline for Environmental Site Investigations in Manitoba, Guideline 98-01, published by Manitoba Sustainable Development, May 2002.

Standard Practice for Environmental Site Assessments: Transaction Screen Process, E 1528-06, published by American Society for Testing and Materials (ASTM).

TABLES

Table 1: Excavation Soil Sample Summary

Table 2: Petroleum Hydrocarbons in Soil



TABLE 1 - EXCAVATION SOIL SAMPLE SUMMARY

Project No.:		19-217-03			Site Location: 421 Osborne Street, Winnipeg, MB		
Location of 0,0 (X,Y):		N/A					
Sample ID	Date/Time	Soil Type	Sample Location	Depth (m)	CVC (ppm)	Sent to Lab	Observations (staining, odour, etc.)
S1	2020-Feb-10 10:00	Clay	NW corner	1.0	25		Dark grey
S2	2020-Feb-10 10:00	Clayey silt	NW corner	2.0	15		Light grey
S3	2020-Feb-10 10:00	Clay	NW corner	3.0	15		Medium grey
S4	2020-Feb-10 10:05	Clay	E side of Hoist 18N	1.0	15		Medium grey
S5	2020-Feb-10 10:05	Clayey silt	E side of Hoist 18N	2.0	20		Light grey, staining
S6	2020-Feb-10 10:05	Clay	E side of Hoist 18N	3.0	60	✓	Medium grey, oily
S7	2020-Feb-10 10:15	Sandy clay fill	W side of Hoist 17N	1.0	20		Dark grey
S8	2020-Feb-10 10:15	Clay	W side of Hoist 17N	2.0	25		Dark grey
S9	2020-Feb-10 10:15	Clay	W side of Hoist 17N	3.0	35		Dark grey
S10	2020-Feb-10 10:20	Clay	E side of Hoist 17N	1.0	50		Medium grey
S11	2020-Feb-10 10:20	Clay	E side of Hoist 17N	2.0	45		Medium grey
S12	2020-Feb-10 10:20	Clay	E side of Hoist 17N	3.0	50		Medium brown, wet
S13	2020-Feb-10 10:40	Sandy clay fill	W side of Hoist 16N	1.0	40		Dark grey
S14	2020-Feb-10 10:40	Clay	W side of Hoist 16N	2.0	45	✓	Medium grey, oily
S15	2020-Feb-10 10:40	Clay	W side of Hoist 16N	3.0	45		Medium brown/grey, oily
S16	2020-Feb-10 10:45	Clay	E side of Hoist 16N	1.0	40		Dark grey
S17	2020-Feb-10 10:45	Clay	E side of Hoist 16N	2.0	45		Medium grey, oily
S18	2020-Feb-10 10:45	Clay	E side of Hoist 16N	3.0	50		Medium brown/grey, oily
S19	2020-Feb-10 11:00	Sandy clay fill	W side of Hoist 15N	1.0	50		Dark grey
S20	2020-Feb-10 11:00	Clay	W side of Hoist 15N	2.0	55	✓	Medium grey, oily
S21	2020-Feb-10 11:00	Clay	W side of Hoist 15N	3.0	45		Medium brown
S22	2020-Feb-10 11:10	Sandy clay fill	E side of Hoist 15N	1.0	55		Dark grey
S23	2020-Feb-10 11:10	Clay	E side of Hoist 15N	2.0	50		Medium/dark grey, oily
S24	2020-Feb-10 11:10	Clay	E side of Hoist 15N	3.0	45		Medium brown, oily
S25	2020-Feb-10 11:30	Sandy clay fill	W side of Hoist 14N	1.0	30		Dark grey
S26	2020-Feb-10 11:30	Clayey silt	W side of Hoist 14N	2.0	50		Light brown/grey
S27	2020-Feb-10 11:30	Clay	W side of Hoist 14N	3.0	60		Medium grey, oily
S28	2020-Feb-10 11:40	Clay	E side of Hoist 14N	1.0	30		Medium grey
S29	2020-Feb-10 11:40	Clay	E side of Hoist 14N	2.0	70	✓	Medium grey, oily
S30	2020-Feb-10 11:40	Clay	E side of Hoist 14N	3.0	55		Medium grey, oily



TABLE 1 - EXCAVATION SOIL SAMPLE SUMMARY

Project No.:		19-217-03			Site Location: 421 Osborne Street, Winnipeg, MB		
Location of 0,0 (X,Y):		N/A					
Sample ID	Date/Time	Soil Type	Sample Location	Depth (m)	CVC (ppm)	Sent to Lab	Observations (staining, odour, etc.)
S31	2020-Feb-10 12:00	Silt	W side of Hoist 13N	1.0	55		Light brown
S32	2020-Feb-10 12:00	Clay	W side of Hoist 13N	2.0	60		Medium grey
S33	2020-Feb-10 12:00	Clay	W side of Hoist 13N	3.0	60		Medium brown
S34	2020-Feb-10 12:10	Clay	E side of Hoist 13N	1.0	60		Dark grey
S35	2020-Feb-10 12:10	Sandy clay fill	E side of Hoist 13N	2.0	65		Light brown/grey, staining
S36	2020-Feb-10 12:10	Clayey sily	E side of Hoist 13N	3.0	80	✓	Medium grey, oily
S37	2020-Feb-10 12:30	Clay	E wall: 4 m from N side	1.0	35		Dark grey
S38	2020-Feb-10 12:30	Sandy clay fill	E wall: 4 m from N side	2.0	45		Medium grey, oily
S39	2020-Feb-10 12:30	Clay	E wall: 4 m from N side	3.0	55	✓	Medium grey/brown, oily
S40	2020-Feb-10 12:40	Clay	E wall: 4 m from S side	1.0	35		Dark grey
S41	2020-Feb-10 12:40	Clay	E wall: 4 m from S side	2.0	40		Medium grey, oily
S42	2020-Feb-10 12:40	Clay	E wall: 4 m from S side	3.0	50		Medium grey, oily
S43	2020-Feb-10 12:50	Clay	SE corner	1.0	35		Medium grey
S44	2020-Feb-10 12:50	Clayey silt	SE corner	2.0	45		Light grey, staining
S45	2020-Feb-10 12:50	Clay	SE corner	3.0	45		Light grey, staining
S46	2020-Feb-10 13:00	Clay	W side of Hoist 13S	1.0	35		Dark grey
S47	2020-Feb-10 13:00	Clayey silt	W side of Hoist 13S	2.0	40		Light grey, staining
S48	2020-Feb-10 13:00	Clay	W side of Hoist 13S	3.0	55	✓	Medium grey, oily
S49	2020-Feb-10 13:10	Clay	E side of Hoist 14S	1.0	35		Dark grey
S50	2020-Feb-10 13:10	Clayey silt	E side of Hoist 14S	2.0	35		Light grey, staining
S51	2020-Feb-10 13:10	Clay	E side of Hoist 14S	3.0	50		Medium grey, oily
S52	2020-Feb-10 13:15	Clay	W side of Hoist 14S	1.0	30		Dark grey
S53	2020-Feb-10 13:15	Silty clay	W side of Hoist 14S	2.0	40		Light grey, staining
S54	2020-Feb-10 13:15	Clay	W side of Hoist 14S	3.0	45		Medium grey, oily
S55	2020-Feb-10 13:20	Clay	E side of Hoist 15S	1.0	30		Medium grey
S56	2020-Feb-10 13:20	Clay	E side of Hoist 15S	2.0	35		Medium grey, oily
S57	2020-Feb-10 13:20	Clay	E side of Hoist 15S	3.0	30		Medium brown
S58	2020-Feb-10 13:25	Silty clay	W side of Hoist 15S	1.0	40		Light brown
S59	2020-Feb-10 13:25	Clay	W side of Hoist 15S	2.0	40		Medium grey, oily
S60	2020-Feb-10 13:25	Clay	W side of Hoist 15S	3.0	35		Medium grey, oily



TABLE 1 - EXCAVATION SOIL SAMPLE SUMMARY

Project No.:		19-217-03			Site Location: 421 Osborne Street, Winnipeg, MB		
Location of 0,0 (X,Y):		N/A					
Sample ID	Date/Time	Soil Type	Sample Location	Depth (m)	CVC (ppm)	Sent to Lab	Observations (staining, odour, etc.)
S61	2020-Feb-10 13:30	Clay	E side of Hoist 16S	1.0	35		Dark grey
S62	2020-Feb-10 13:30	Clay	E side of Hoist 16S	2.0	60		Medium grey
S63	2020-Feb-10 13:30	Clay	E side of Hoist 16S	3.0	50		Medium grey/brown, oily
S64	2020-Feb-10 13:40	Clay	W side of Hoist 16S	1.0	60		Dark grey
S65	2020-Feb-10 13:40	Clay	W side of Hoist 16S	2.0	45		Medium grey, oily
S66	2020-Feb-10 13:40	Clay	W side of Hoist 16S	3.0	65	✓	Medium grey, oily
S67	2020-Feb-10 14:00	Sandy clay fill	E side of Hoist 17S	1.0	40		Dark grey
S68	2020-Feb-10 14:00	Clayey silt	E side of Hoist 17S	2.0	45		Light grey
S69	2020-Feb-10 14:00	Clay	E side of Hoist 17S	3.0	50		Medium grey, oily
S70	2020-Feb-10 14:10	Clay	W side of Hoist 17S	1.0	45		Dark grey
S71	2020-Feb-10 14:10	Clay	W side of Hoist 17S	2.0	55		Medium grey, oily
S72	2020-Feb-10 14:10	Clay	W side of Hoist 17S	3.0	55	✓	Medium grey/brown, oily
S73	2020-Feb-10 14:30	Sandy clay fill	E side of Hoist 18S	1.0	35		Dark grey
S74	2020-Feb-10 14:30	Clay	E side of Hoist 18S	2.0	40		Medium grey
S75	2020-Feb-10 14:30	Clay	E side of Hoist 18S	3.0	45		Medium grey/brown
S76	2020-Feb-10 14:35	Sandy clay fill	SW corner	1.0	35		Dark grey
S77	2020-Feb-10 14:35	Clay	SW corner	2.0	40		Medium grey, oily
S78	2020-Feb-10 14:35	Clay	SW corner	3.0	40		Medium grey/brown, oily
S79	2020-Feb-10 14:45	Clay	Floor: W of Hoist 18	3.5	45		Medium grey/brown, oily
S80	2020-Feb-10 14:45	Clay	Floor: W of Hoist 18	3.5	65	✓	Medium grey/brown, oily
S81	2020-Feb-10 14:45	Clay	Floor: b/w Hoist 17 &18	3.5	40		Medium grey/brown
S82	2020-Feb-10 14:50	Clay	Floor: b/w Hoist 17 &18	3.5	40		Medium grey/brown
S83	2020-Feb-10 14:50	Clay	Floor: b/w Hoist 16 &17	3.5	50		Medium grey/brown
S84	2020-Feb-10 14:50	Clay	Floor: b/w Hoist 16 &17	3.5	50		Medium grey/brown
S85	2020-Feb-10 15:00	Clay	Floor: b/w Hoist 15 &16	3.5	55	✓	Medium grey/brown, oily
S86	2020-Feb-10 15:00	Clay	Floor: b/w Hoist 15 &16	3.5	55		Medium grey/brown
S87	2020-Feb-10 15:00	Clay	Floor: b/w Hoist 14 &15	3.5	50		Medium grey/brown
S88	2020-Feb-10 15:15	Clay	Floor: b/w Hoist 14 &15	3.5	60	✓	Medium grey/brown, grey staining
S89	2020-Feb-10 15:15	Clay	Floor: b/w Hoist 13 &14	3.5	55		Medium grey/brown
S90	2020-Feb-10 15:15	Clay	Floor: b/w Hoist 13 &14	3.5	50		Medium grey/brown

**TABLE 2
PETROLEUM HYDROCARBONS IN SOIL**

Sample ID	Depth (m)	Sample Date	Parameters							
			BTEX				Hydrocarbon Fractions			
			Benzene ⁶	Toluene	Ethylbenzene	Xylenes (total)	F1 (C ₆ -C ₁₀)	F2 (>C ₁₀ -C ₁₆)	F3 (>C ₁₆ -C ₃₄)	F4 (>C ₃₄)
S6	3.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50
S14	2.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	130	4350	590
S20	2.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	27	1730	241
S29	2.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	26	2020	280
S36	3.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	27	1350	171
S39	3.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	67	[7310]	809
S48	3.0 (subsoil)	2020-FEB-10	0.0269	0.116	0.016	0.091	<10	<25	244	57
S66	3.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	117	[8260]	1100
S72	3.0 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	182	[18300]	2370
S80	3.5 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50
S85	3.5 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	<25	130	<50
S88	3.5 (subsoil)	2020-FEB-10	<0.0050	<0.050	<0.015	<0.071	<10	<25	913	107
Regulatory Guidelines										
CCME Guidelines (surface)^{4,5}			2.8	330	430	230	800	1,000	5,000	10,000
CCME Guidelines (subsoil)^{4,5}			2.9	660	860	460	800	1,000	5,000	10,000

- Notes:
- All concentrations are in mg/kg (i.e., ppm).
 - The consistency of the soil samples was primarily fine-grained material therefore the fine-grained guidelines were used (fine-grained means soil having a median grain size of <75 µm).
 - “Surface” refers to soil samples from the surface to 1.5 m; “subsoil” refers to soil samples that are >1.5 m. All of the samples analyzed would be considered subsoil since they were from depths greater than 1.5 m.
 - CCME Guidelines include:
 - for BTEX: *Canadian Environmental Quality Guidelines for the Protection of Environment and Human Health*, commercial guidelines.
 - for hydrocarbon fractions: *Canada-Wide Standards (CWS) for Petroleum Hydrocarbons (PHCs) in Soil*, commercial guidelines.
 - Site specific guidelines exclude the pathways for the protection of potable groundwater and freshwater aquatic life.
 - CCME Guideline for benzene uses the 10⁻⁵ incremental risk of cancer.
 - [#]** Concentrations greater than the CCME Guidelines are shown in **bold**.



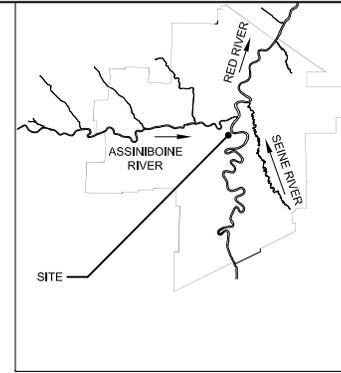
FIGURES

Figure 1: Site Location and Excavation Details
Figure 2: Laboratory Results



EXCAVATION LOCATION

SCALE 1:4000



KEYMAP



LEGEND

- S17 ● SOIL SAMPLE LOCATION
- EXCAVATION BOUNDARIES
- ▨ UPPER SHELF (< 1.0 m BELOW CONCRETE)

NO.	DATE	ISSUE / REVISION
0	FEB 2020	REPORT



420 Turenne Street
Winnipeg, MB
R2J 3W8
Phone: (204) 233-1694
Fax: (204) 235-1579

ENG. STAMP:



Certificate of Authorization
ENG-TECH Consulting Limited
No.2475

CLIENT:

CITY OF WINNIPEG

PROJECT:
EXCAVATION ASSESSMENT
421 OSBORNE STREET
WINNIPEG, MANITOBA

DWG DESCRIPTION:
SITE LOCATION AND EXCAVATION
DETAILS

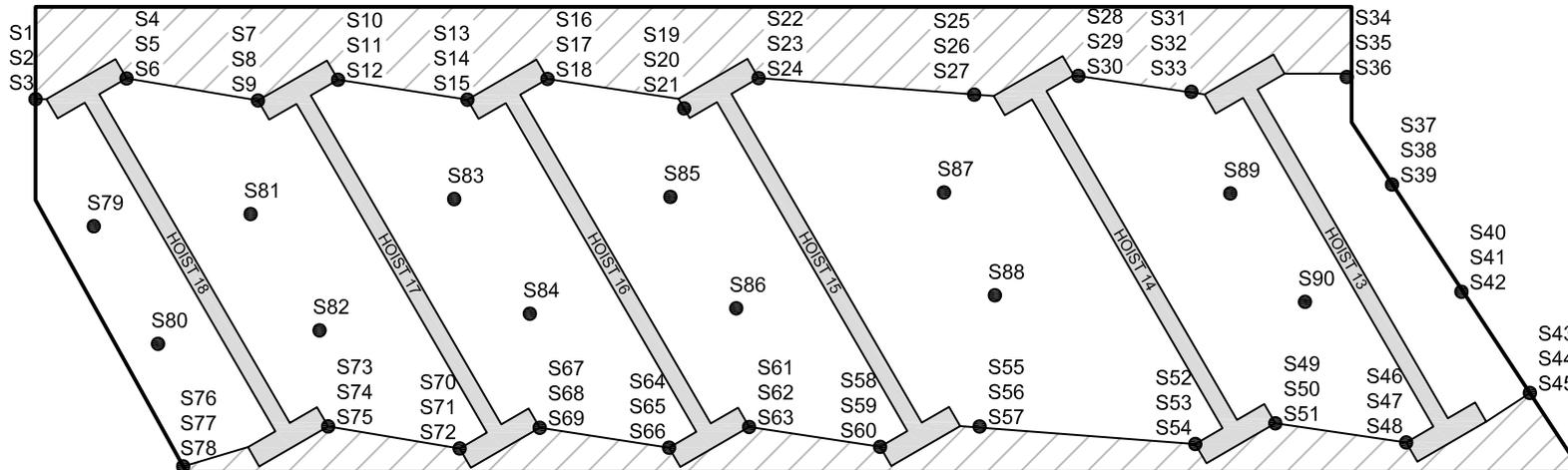
SCALE:

AS SHOWN

DRAWN BY: WGH	DATE: FEBRUARY 2020
------------------	------------------------

FILE No.: 19-217-03	CLIENT DWG/FIG. No.:
------------------------	----------------------

ENG-TECH DWG/FIG. No.: 1	NO.: 0
-----------------------------	-----------



SOIL SAMPLE LOCATIONS

SCALE 1:200



S6
 PHC F3 = <50 ppm
 PHC F4 = <50 ppm

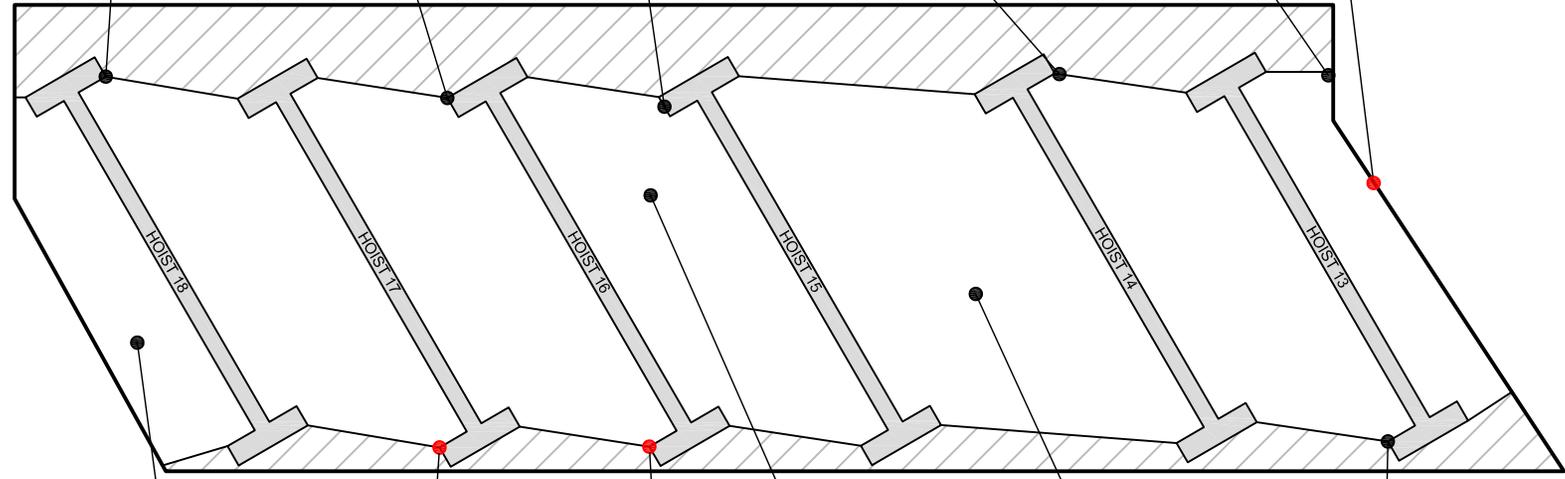
S20
 PHC F3 = 1,730 ppm
 PHC F4 = 241 ppm

S36
 PHC F3 = 1,350 ppm
 PHC F4 = 171 ppm

S14
 PHC F3 = 4,350 ppm
 PHC F4 = 590 ppm

S29
 PHC F3 = 2,020 ppm
 PHC F4 = 280 ppm

S39
 PHC F3 = 7,310 ppm
 PHC F4 = 809 ppm



S80
 PHC F3 = <50 ppm
 PHC F4 = <50 ppm

S66
 PHC F3 = 8,260 ppm
 PHC F4 = 1,100 ppm

S88
 PHC F3 = 913 ppm
 PHC F4 = 107 ppm

S72
 PHC F3 = 18,300 ppm
 PHC F4 = 2,370 ppm

S85
 PHC F3 = 130 ppm
 PHC F4 = <50 ppm

S48
 PHC F3 = 244 ppm
 PHC F4 = 57 ppm

LEGEND

S17 ● SOIL SAMPLE LOCATION

□ EXCAVATION BOUNDARIES

▨ UPPER SHELF (<1.0 m BELOW CONCRETE)

PHC = PETROLEUM HYDROCARBON

F3 = FRACTION 3

F4 = FRACTION 4

SAMPLE CONCENTRATIONS SHOWN IN RED (I.E., 7,310 ppm) ARE GREATER THAN THE APPLICABLE CRITERIA.

NO.	DATE	ISSUE / REVISION
0	FEB 2020	REPORT

420 Turenne Street
 Winnipeg, MB
 R2J 3W8
 Phone: (204) 233-1694
 Fax: (204) 235-1579

ENG. STAMP:

Engineers
 Geoscientists
 MANITOBA
 Certificate of Authorization
 ENG-TECH Consulting Limited
 No.2475

CLIENT:
 CITY OF WINNIPEG

PROJECT:
 EXCAVATION ASSESSMENT
 421 OSBORNE STREET
 WINNIPEG, MANITOBA

DWG DESCRIPTION:
 LABORATORY RESULTS

SCALE:
 1:200

DRAWN BY: WGH DATE: FEBRUARY 2020

FILE No.: 19-217-03 CLIENT DWG/FIG. No.:

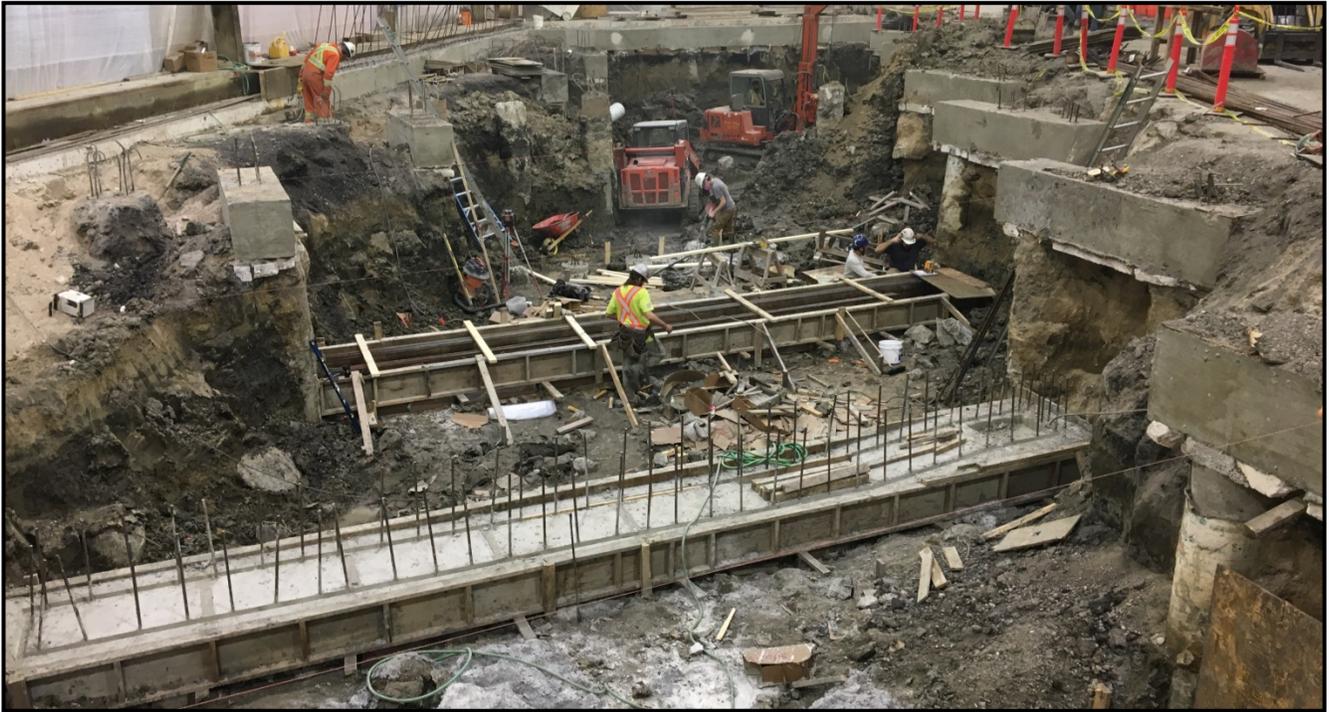
ENG-TECH DWG/FIG. No.: 2 NO.: 0

APPENDICES

Appendix A – Site Photographs
Appendix B – Laboratory Reports

APPENDIX A

Site Photographs (2)



PHOTOGRAPH #1: Excavation as seen facing east from west side of excavation.

PHOTOGRAPH #2: Oily surface on the soil at S27 at approximately 2.0 metres below grade.



APPENDIX B

Laboratory Reports (1)



ENG-TECH Consulting
ATTN: WALTER HOLOWKA
420 Turenne Street
Winnipeg MB R2J 3W8

Date Received: 11-FEB-20
Report Date: 18-FEB-20 14:06 (MT)
Version: FINAL

Client Phone: 204-233-1694

Certificate of Analysis

Lab Work Order #: L2415429
Project P.O. #: NOT SUBMITTED
Job Reference: 19-217-03
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

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ADDRESS: 1329 Niakwa Road East, Unit 12, Winnipeg, MB R2J 3T4 Canada | Phone: +1 204 255 9720 | Fax: +1 204 255 9721
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2415429-1 6 Sampled By: CLIENT on 10-FEB-20 @ 16:00 Matrix: SOIL BTEX and F1-F4 by Tumbler Method BTX plus F1 by GCMS Benzene Toluene Ethyl benzene o-Xylene m+p-Xylenes F1 (C6-C10) Surrogate: 4-Bromofluorobenzene (SS) CCME Total Extractable Hydrocarbons F2 (C10-C16) F3 (C16-C34) F4 (C34-C50) Surrogate: 2-Bromobenzotrifluoride Chrom. to baseline at nC50 CCME Total Hydrocarbons F1-BTEX Total Hydrocarbons (C6-C50) Sum of Xylene Isomer Concentrations Xylenes (Total) Miscellaneous Parameters Moisture	<0.0050 <0.050 <0.015 <0.050 <0.050 <10 111.4 <25 <50 <50 88.9 YES <10 <76 <0.071 32.4		0.0050 0.050 0.015 0.050 0.050 10 70-130 25 50 50 60-140 10 76 0.071 0.10	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg % mg/kg mg/kg mg/kg % mg/kg mg/kg mg/kg mg/kg %	10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20	12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20	R4997484 R4997484 R4997484 R4997484 R4997484 R4997484 R4997484 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996418
L2415429-2 14 Sampled By: CLIENT on 10-FEB-20 @ 16:05 Matrix: SOIL BTEX and F1-F4 by Tumbler Method BTX plus F1 by GCMS Benzene Toluene Ethyl benzene o-Xylene m+p-Xylenes F1 (C6-C10) Surrogate: 4-Bromofluorobenzene (SS) CCME Total Extractable Hydrocarbons F2 (C10-C16) F3 (C16-C34) F4 (C34-C50) Surrogate: 2-Bromobenzotrifluoride Chrom. to baseline at nC50 CCME Total Hydrocarbons F1-BTEX Total Hydrocarbons (C6-C50) Sum of Xylene Isomer Concentrations Xylenes (Total) Miscellaneous Parameters Moisture	<0.0050 <0.050 <0.015 <0.050 <0.050 <10 128.4 130 4350 590 87.4 YES <10 5070 <0.071 29.1		0.0050 0.050 0.015 0.050 0.050 10 70-130 25 50 50 60-140 10 76 0.071 0.10	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg % mg/kg mg/kg mg/kg % mg/kg mg/kg mg/kg mg/kg %	10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 10-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20	12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 12-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20 13-FEB-20	R4997484 R4997484 R4997484 R4997484 R4997484 R4997484 R4997484 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996480 R4996418
L2415429-3 20 Sampled By: CLIENT on 10-FEB-20 @ 16:10 Matrix: SOIL BTEX and F1-F4 by Tumbler Method BTX plus F1 by GCMS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2415429-3 20 Sampled By: CLIENT on 10-FEB-20 @ 16:10 Matrix: SOIL							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	113.6		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	27		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	1730		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	241		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	89.3		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	2000		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	30.9		0.10	%		13-FEB-20	R4996418
L2415429-4 29 Sampled By: CLIENT on 10-FEB-20 @ 16:15 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	124.6		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	26		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	2020		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	280		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	89.2		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	2330		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	29.6		0.10	%		13-FEB-20	R4996418
L2415429-5 36 Sampled By: CLIENT on 10-FEB-20 @ 16:20 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2415429-5 36 Sampled By: CLIENT on 10-FEB-20 @ 16:20 Matrix: SOIL							
BTX plus F1 by GCMS							
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	106.8		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	27		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	1350		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	171		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	89.7		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	1550		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	32.6		0.10	%		13-FEB-20	R4996418
L2415429-6 39 Sampled By: CLIENT on 10-FEB-20 @ 16:25 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	109.3		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	67		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	7310		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	809		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	87.6		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	8180		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	29.5		0.10	%		13-FEB-20	R4996418
L2415429-7 48 Sampled By: CLIENT on 10-FEB-20 @ 16:35 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	0.0269		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	0.116		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2415429-7 48 Sampled By: CLIENT on 10-FEB-20 @ 16:35 Matrix: SOIL							
BTX plus F1 by GCMS							
Ethyl benzene	0.016		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	0.091		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	115.0		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	<25		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	244		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	57		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	88.5		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	301		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	0.091		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	28.6		0.10	%		13-FEB-20	R4996418
L2415429-8 66 Sampled By: CLIENT on 10-FEB-20 @ 16:50 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	124.2		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	117		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	8260		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	1100		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	92.0		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	9470		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	24.2		0.10	%		13-FEB-20	R4996418
L2415429-9 72 Sampled By: CLIENT on 10-FEB-20 @ 16:45 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2415429-9 72 Sampled By: CLIENT on 10-FEB-20 @ 16:45 Matrix: SOIL							
BTX plus F1 by GCMS							
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	119.2		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	182		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	18300		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	2370		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	87.3		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	20900		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	30.9		0.10	%		13-FEB-20	R4996418
L2415429-10 80 Sampled By: CLIENT on 10-FEB-20 @ 16:50 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	111.2		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	<25		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	<50		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	<50		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	91.3		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	<76		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	35.2		0.10	%		13-FEB-20	R4996418
L2415429-11 85 Sampled By: CLIENT on 10-FEB-20 @ 16:55 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2415429-11 85 Sampled By: CLIENT on 10-FEB-20 @ 16:55 Matrix: SOIL							
BTX plus F1 by GCMS							
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	107.4		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	<25		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	130		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	<50		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	90.6		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	130		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	31.8		0.10	%		13-FEB-20	R4996418
L2415429-12 88 Sampled By: CLIENT on 10-FEB-20 @ 17:00 Matrix: SOIL							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Toluene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
Ethyl benzene	<0.015		0.015	mg/kg	10-FEB-20	12-FEB-20	R4997484
o-Xylene	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
m+p-Xylenes	<0.050		0.050	mg/kg	10-FEB-20	12-FEB-20	R4997484
F1 (C6-C10)	<10		10	mg/kg	10-FEB-20	12-FEB-20	R4997484
Surrogate: 4-Bromofluorobenzene (SS)	104.4		70-130	%	10-FEB-20	12-FEB-20	R4997484
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	<25		25	mg/kg	13-FEB-20	13-FEB-20	R4996480
F3 (C16-C34)	913		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
F4 (C34-C50)	107		50	mg/kg	13-FEB-20	13-FEB-20	R4996480
Surrogate: 2-Bromobenzotrifluoride	91.9		60-140	%	13-FEB-20	13-FEB-20	R4996480
Chrom. to baseline at nC50	YES				13-FEB-20	13-FEB-20	R4996480
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		18-FEB-20	
Total Hydrocarbons (C6-C50)	1020		76	mg/kg		18-FEB-20	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		18-FEB-20	
Miscellaneous Parameters							
Moisture	30.8		0.10	%		13-FEB-20	R4996418

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BTEXS+F1-HSMS-WP	Soil	BTX plus F1 by GCMS	EPA 8260C
The soil methanol extract is added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
F1-F4-CALC-WP	Soil	CCME Total Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001-S
Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.			
In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.			
In samples where BTEX and F1 were analyzed, F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.			
In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.			
Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:			
1. All extraction and analysis holding times were met.			
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.			
3. Linearity of gasoline response within 15% throughout the calibration range.			
Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:			
1. All extraction and analysis holding times were met.			
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.			
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.			
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.			
F2-F4-TMB-FID-WP	Soil	CCME Total Extractable Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001
A soil or sediment sample is extracted with 1:1 hexane/acetone in a tumbler, followed by a silica gel clean up to facilitate separation of the hydrocarbons from other polar extractions. An aliquot of the solvent is analyzed using a gas chromatograph equipped with a flame ionization detector.			
MOISTURE-WP	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
Moisture content in solid matrices is determined gravimetrically after drying to constant weight at 105°C.			
XYLENES-SUM-CALC-WP	Soil	Sum of Xylene Isomer Concentrations	CALCULATED RESULT
Total xylenes represents the sum of o-xylene and m&p-xylene.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Conservation and Climate

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Adolfo Laufer
Project Manager
City of Winnipeg, Transit Department
421 Osborne Street
Winnipeg, MB R3L 2A2

March 4, 2020

Dear Mr. Laufer:

Re: 421 Osborne Street, Winnipeg, Manitoba;
Review under the Contaminated Sites Remediation Act

This letter is to acknowledge receipt of the report entitled "*Excavation Assessment Winnipeg Transit Garage Building, 421 Osborne Street, Winnipeg, Manitoba*" prepared by Eng-Tech Consulting Limited dated February 2020 for the above-noted property (the site).

Manitoba Conservation and Climate concurs that the report submitted adequately documents the environmental conditions at the site at this time.

It is the position of Manitoba Conservation and Climate that no further remedial activities are required at the site at this time. The site is not designated as either a contaminated site or an impacted site pursuant to The Contaminated Sites Remediation Act, C.C.S.M, c. C205 and it will not be added to either the contaminated site registry or the impacted site registry at this time. In the event that any residual contamination remaining in the soil results in some form of exposure concern in the future, the site may be designated and the responsible party will be directed by this department to initiate any remedial measures.

It should be noted that the position of Manitoba Conservation and Climate as stated in this letter is based on the information provided to this office by Eng-Tech Consulting Limited. No additional site monitoring was performed by Manitoba Conservation and Climate.

If you have any questions regarding this letter, please contact Warren Rospad, Contaminated Sites Program Specialist at 204-330-2685 or warren.rospad@gov.mb.ca. Please note that electronic submissions are preferred for all documents and correspondence.

Sincerely,

Shannon Kohler
Director

c. File: 46432
Walter Holowka (Eng-Tech Consulting Limited)