

UCLUELET SKATEPARK EXPANSION

UCLUELET B.C.

SPECIFICATIONS

02/24/2017

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**NEWLINE
SKATEPARKS**

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Part 1 General

1.1 GENERAL

- .1 Testing and inspections will be required of all materials and works as called for in the specification sections.
- .2 The Contractor shall pay for all tests and inspections called for in the specifications, including but not limited to, concrete testing, compaction of backfill and soil testing.
- .3 The Owner may request and undertake additional testing of materials and construction for quality control. The Contractor shall ensure that the Owner's representative and testing agency shall have free right of access for purposes of inspection or sampling to any site, including plants or mills, where work is in progress producing materials for use in this project to permit the taking of samples and conducting tests.
- .4 The Owner shall pay for any tests additional to what is called for in the specifications.
- .5 Minimum testing requirements on this project include the following in addition to all tests identified above and in the individual specification sections.
 - .1 Concrete tests including:
 - a. At minimum one set concrete tests for taken from pours in the completion of all walls, stairs and ledges. Provide one additional set of concrete tests for every 50m³ of wall, stair and ledge quantities. Concrete testing for walls, stairs and ledges to consist of three concrete cylinders tested for compressive strength at 7, 14 and 28 days as well as tests for slump and air content.
 - b. Shotcrete will be tested by coring three core samples from a separate test panel created outside of the finished work. Test panel to be minimum 350mm x 350mm x 140mm thick. At minimum one test panel is to be built and three core samples are to be taken. One additional test panel and three additional core samples are to be completed for every 50m³ of shotcrete. Shotcrete testing to consist of three concrete cores tested for compressive strength at 7, 14 and 28 days.
 - c. At minimum one set concrete tests for taken from pours in the completion of all flat slab work. Provide one additional set of

concrete tests for every 50m³ of flat slab quantities. Concrete testing for flat slabs to consist of three concrete cylinders tested for compressive strength at 7, 14 and 28 days as well as tests for slump and air content.

- .2 Concrete cylinder samples and shotcrete test panels to remain on site and be protected for minimum of 5 days during the course of the work to ensure identical environmental conditions of temperature and humidity while curing.
- .3 Concrete cylinder samples to be labeled along with a reference plan in order to accurately trace the date of the pour and the project location for which they represent.
- .4 Compaction tests including:
 - a. Subgrade shall be inspected and approved by a geotechnical engineer prior to placing any sub base or granular base material.
 - b. Sub base compaction test location points completed for every 100m².
 - c. Granular base compaction test location points completed for every 80m².
 - d. compaction tests to be accompanied by a reference design layout plan.
- .5 Provide original test results to the consultant.
- .6 Inspection panels for concrete work will be required prior to authorization for general concrete work within the skatepark. The Contractor and the contract administrator shall agree to prepare one bank panel or one transition panel for review of shape and finish.
 - .1 The Contractor may choose to construct the inspection panel within the contract area but may be required to remove the work if it does not meet specification for shape and finish.
 - .2 The consulting team will utilize a 'true' dimensional straight edge to check for consistent shape over the entire panel. A radius template will be used to check the shape of the transition panel. No discrepancy greater than 6mm over 2.4m will be acceptable.
 - .3 Written approval from the consultant is required prior to additional

concrete pours. Additional concrete poured without written approval of the inspection panels are done so at the risk of rejection.

- .4 Shotcrete must be used for all transition panels in excess of 1m height.
- .5 The approved inspection panels will become the quality assurance standard for the remainder of the work.

1.2 SKATEPARK SPECIFIC CONSTRUCTION EXPERIENCE

.1 **General:**

Note that cast-in-place concrete skatepark construction is a specialized trade and requires both experience with and appreciation for the smallest details that affect the quality of environment and the safety of park users. Design specifications provide a very limited range for deviation from the technical drawings and contractors are required to present specific team qualifications and proficiency with this highly technical, concrete construction project. For the safety of the end user and the protection of the owner, selection of the successful construction team will consider all previous experience, references, and qualifications.

.2 **Required Contractor Experience:**

Contractors must demonstrate minimum of (5) years experience in providing cast-in-place concrete work for skateparks similar in scope to that specified herein and that include skatepark bowls/pools with similar transition heights and design to the bowls/pools designed for this contract. Contractors must demonstrate successful experience through past project documentation and references.

Contractors must have completed (5) public concrete skate park facilities with a minimum size of 930 square metres (10,000 square feet) and that include comparable terrain features. Parks must be open and in good operating condition for at least one year. Minimum (2) projects must be recent (completed within the last two years). Minimum (2) projects must be at least four years old. Only those projects where the complete construction of the facility has been the sole responsibility of your firm will be considered acceptable projects.

.3 **ACI Shotcrete Nozzleman Certification:**

The Contractor's proposed Shotcrete Nozzle Operator(s) must be qualified under the ACI Shotcrete Nozzleman Certification Program and have at least (5) years of experience in shotcrete as applied to Skateparks. Contractors must provide proof of certification. Contractors must provide (3) project references (skateparks only) that the Shotcrete Nozzle Operator(s) was directly involved with applying shotcrete. Only qualified

and approved Shotcrete Nozzle Operator(s) are permitted to perform shotcrete work on this project. Qualified and approved Shotcrete Nozzle Operator(s) must be onsite during all major shotcrete work. The Contract Administrator reserves the right to reject any contractors with Shotcrete Nozzle Operator(s) that do not meet the required skills and experience criteria.

.4 Head Concrete Finisher:

The Contractor's proposed Head Concrete Finisher must have at least (5) years of experience in concrete finishing as applied to concrete skateparks. Contractors must provide (3) project references (skateparks only) that the Head Concrete Finisher was directly involved with Finishing Skatepark Concrete in a lead role. Only qualified and approved Concrete Finishers are permitted to perform finishing work on this project. The Head Concrete Finisher must be onsite during all major finishing work. The Contract Administrator reserves the right to reject any contractors with a Head Concrete Finisher that does not meet the required skills and experience criteria.

.5 Evidence of Experience:

AT THE TIME OF BID CLOSING contractors **MUST** submit to Owner/Consultant satisfactory documentation of the aforementioned experience and qualifications. Contractors are required to list the name and location of minimum (5) cast-in place concrete skateparks exceeding 10,000 square feet. Submissions must contain the Project Name & Location, Owner's Name and Contact Information, Consultant Name and Contact Information, Project Size, Contract Value, Completion Date, Project Supervisor and/or Key Personnel responsible for this experience for each of the qualifying projects. Contractors are required to provide at least five photographs of each project including construction progress and completed work. If a Contractor cannot provide this information or if it is unverifiable, work under this Section and any other related Section cannot be completed by this Contractor and bid is subject to rejection on the grounds of informality and non-compliance.

BIDDING CONTRACTORS MUST COMPLETE THE FOLLOWING

(6) PAGE QUESTIONNAIRE

AND SUBMIT WITH THEIR BID SUBMISSION

FAILURE TO DO SO MAY RESULT IN DISQUALIFICATION OF YOUR BID

Contractor Qualification Questionnaire for a Cast-in-Place Concrete Skatepark

Please answer all of the following questions and include this form with your submission. If a question is not applicable please mark it with **N/A**.

Note that cast-in-place concrete skatepark construction is a specialized trade and requires both experience and appreciation for the smallest details that affect quality of environment and the safety of park users. Design specifications provide a very limited range for deviation from the technical drawings. The following questionnaire will provide contractors with the opportunity to present specific team qualifications and proficiency with this highly technical, concrete construction project. For the safety of the end user and the protection of the owner, selection of the successful construction team will consider all previous experience, references, and qualifications.

1. Company Profile:

Company Name: _____

Is the Contractor a (check one): [] Corporation [] Sole Proprietor [] Joint Venture
[] Other

If the answer is "other" to the previous question please describe your company structure:

How many years has the contractor in its present corporate structure been in business?

How many years has the contractor in its present corporate structure been building cast-in-place concrete Skateparks? _____

How many full time employees does the Contractor currently employ? _____

Is the Contractor a member of any Construction or Skatepark Associations? [] Yes [] No

Please list any applicable associations that the contractor is a member in good standing of:

2. Please list the name and location of **4 cast-in-place concrete skateparks** that the Contractor has constructed in a **General Contractor Role** that exceed **700m²**. 2 projects must be recent (completed within last 2 years), while the 2 others must reference projects that are at least 4 years old. Please include an Owner contact name along with a phone number or email address for each. At least 3 photographs (of the completed facility) for each project must also be attached.

Facility Name	Location Owner	Size Phone # or email
---------------	-------------------	--------------------------

a

b

c

d

3. Has the Contractor ever built a cast-in-place concrete skatepark bowl/pool with similar transition heights and design to the bowl/pool design in this contract? [] Yes [] No

Please list any cast-in-place concrete skateboard park bowl/pools that the Contractor has completed below:

Facility Name	Location Owner	Size Phone # or email
---------------	-------------------	--------------------------

a _____

b _____

c _____

d _____

4. Please list the name of the Contractor's proposed Foreman:

Please provide 3 project references (cast-in-place concrete skateparks preferred) that the Foreman was directly involved with in a significant role:

Facility Name	Location Owner	Size Phone # or email
---------------	-------------------	--------------------------

a _____

b _____

c _____

The Foreman as noted above must be onsite for all significant site procedures and key site reviews by the design consultant. Should the Contractor wish to substitute the above Foreman with another Foreman the Contractor shall make an application to the Owner for approval at least 3 business days in advance. The Owner reserves the right to reject the substitute Foreman.

5. Please list the name of the Contractor's proposed Shotcrete Nozzle Operator(s):

Is the proposed Nozzle Operator(s) qualified under the ACI Shotcrete Nozzleman Certification Program? [] Yes [] No (If "Yes" please attach proof of certification)

Does the proposed Nozzle Operator(s) have at least 5 years of experience in shotcrete as applied to Skateparks? [] Yes [] No

Please provide 3 project references (skateparks only) that the Nozzle Operator(s) was directly

Facility Name	Location Owner	Size Phone # or email
---------------	-------------------	--------------------------

a _____

b _____

c _____

Only nozzle operator(s) listed above are permitted to perform shotcrete work on this project. The Contract Administrator reserves the right to reject any contractors with nozzle operators that do not meet their skills criteria. Should the Contractor wish to substitute the above nozzle operator with another nozzle operator the Contractor shall make an application to the Owner for approval at least 3 business days in advance. The Owner reserves the right to reject the substitute operator.

6. Please list the name of the Contractor's proposed Head Concrete Finisher:

Does the proposed Finisher have at least 5 years of experience in concrete finishing as applied to concrete skateparks? [] Yes [] No

Please provide 3 project references (skateparks only) that the Finisher was directly involved with Finishing Concrete in a lead role:

Facility Name	Location Owner	Size Phone # or email
---------------	-------------------	--------------------------

a

b

c

The Concrete Finisher as noted above must be onsite during all major finishing work on this project. Should the Contractor wish to substitute the above Finisher with another Head Finisher the Contractor shall make an application to the Owner for approval at least 3 business days in advance. The Owner reserves the right to reject the substitute Finisher.

7. Certificate of Recognition (COR) Safety Program Requirement:

Each proponent shall be registered in a COR appropriate to their industry from a recognized Canadian Provincial safety organization. Certification shall be evident by the proponent including a copy of their COR certificate with this submission.

8. Additional Qualifications:

Please list any additional qualifications or reasons that the Contractor feels are relevant to their proof of exceptional past performance building cast-in-place concrete skateparks. Please attach additional documents, photos, letters of reference etc. as necessary and list them below:

END OF SECTION 01 43 00

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the supply and Installation of skatepark concrete and workmanship and is intended to be read in conjunction with the appropriate sections listed in the index in addition to those listed below.
- .2 The Site Foreman must be onsite for all significant site procedures and key site reviews by the design consultant.

1.2 REFERENCES

- .1 Comply with ASTM F2480-06 Standard Guide For In-Ground Concrete Skateparks

1.3 TESTING

- .1 Arrange for testing of the concrete by an independent testing agency approved by the Owner/Consultant. The contractor pays for all testing called for in the specifications. Submit all test reports to the Owner / Consultant.
- .2 To facilitate testing services:
 - .1 Furnish such casual labour as is necessary to obtain and handle samples at the project and at the sources of materials.
 - .2 Provide and maintain for the use of the testing agency facilities acceptable for storing and curing of test cylinders.
 - .3 Advise the testing agency sufficiently in advance of the operation to allow for the desired quality tests and for the assignment of personnel.
- .3 Conduct routine testing of materials, and resulting concrete for compliance with the technical requirements of the specifications. Testing shall be undertaken as specified.
- .4 The use of testing services does not relieve the Contractor of his responsibility to furnish materials and construction in compliance with the Contract Documents.

Part 2 Products

2.1 USE MATERIALS COMPLYING WITH CSA A23

- .1 **Cement**

- .1 Type 10 - Normal Portland cement or as specified in the geotechnical report and confirmed by the consultant.
- .2 **Aggregates**
 - .1 Fine aggregate - natural sand.
 - .2 Coarse aggregate - gravel or crushed stone.
- .3 **Additives**
 - .1 Air-entraining agents - as specified.
 - .2 fibre reinforcement in all concrete (minimum dosage as recommended by the fiber manufacturer)
 - .3 Water reducing agents - use throughout.
 - .4 Ensure admixtures are compatible with each other and with construction materials used in contact with concrete.
 - .5 Do not use calcium chloride.
- .4 **Reinforcement**
 - .1 All concrete must be reinforced. Reinforcement to be laid in accordance with design drawings and notes. Refer to details for specific areas. Reinforcing steel shall be of type and grade stated on drawings or specified. Unless otherwise noted or specified, all bars shall be deformed and in accordance with ASTM F2480-06 Standard Guide For In-Ground Concrete Skateparks, all welded bars shall be in accordance with ASTM F2480-06 Standard Guide For In-Ground Concrete Skateparks. All reinforcing steel shall bear identifying marks of specification to which it has been rolled and all bars which are not so marked shall not be used in structure. All reinforcing steel shall be a bendable grade.
 - .2 Welding of reinforcing is not permitted without written approval of the consultant.
 - .3 Clear cover for reinforcement:
 - Cast against soil minimum 40mm
 - .4 Dowels and anchor bolts should be placed BEFORE the concrete is set.
 - .5 Any dowels and anchor bolts placed AFTER the concrete is set shall be anchored using proper epoxy materials and processes.
 - .6 Unless otherwise noted, reinforce concrete with 10M @ 450mm on centre each way.
- .5 **Anchor Bolts and Anchor Assemblies**
 - .1 see section 05 50 00 Metal Fabrications
- .6 **Angle Plates and Steel Support Brackets:**
 - .1 Painted with zinc-rich primer or as specified in project details.

Part 3 Execution

3.1 FORMWORK

- .1 Forms shall be so constructed that the finished concrete will conform with the shapes, lines, grades and dimensions indicated on the plan.
- .2 Use "paper-faced" form plywood for exposed concrete surfaces as designated on the drawings.
- .3 Form walls using plastic cone ties for concrete walls. Arrange all ties in symmetrical, aligned vertical and horizontal rows. They shall be so arranged that when the forms are removed, no ties shall be within 25mm of any exposed surface. Wire ties may be permitted only on light work; they shall not be used through surfaces where discoloration will be objectionable. All wall reinforcing shall be continuous at corners and intersections. Use corner bars or hooks.
- .4 Plug, tape and seal all cracks and holes in forms to withstand pressure and remain watertight.
- .5 Design forms to permit removal without damage to finish.
- .6 Clean and condition formwork before each use. Repair or replace any damaged form that may affect the concrete finish.
- .7 After removal of plastic cone ties, plug tie holes with cement plugs or patching compound, taking care not to damage surrounding edge of concrete.
- .8 Lumber used in forms shall be free from warp. For any exposed surfaces, it shall be dressed to a uniform width and thickness and be free from loose knots, decay or other defects. For unexposed surfaces and rough work, undressed lumber may be used if means be taken to prevent leakage of mortar.
- .9 Unless otherwise specified, suitable molding or bevels shall be placed at angles or forms to round or bevel the horizontal concrete edges and re-entrant angles on concrete as shown on details.
- .10 The inside of forms may be coated with non-staining mineral oil or other approved liquid or thoroughly wetted, (except in freezing weather). Where oil is used, it shall be applied before the reinforcement is placed.
- .11 Care shall be taken to ensure that forms do not become dried and warped before concrete is deposited.

- .12 Before concrete is placed, forms and reinforcement shall be checked and approved by the Owner / Consultant. 24 hours notice shall be provided to the owner / consultant. Where timely inspection is not possible a photographic record may be substituted. Any concrete poured without approval from owner / consultant is done so at the contractor's risk of rejection and removal.
- .13 Forms shall not be disturbed until the concrete has adequately hardened and removed in a regular sequence of elapsed time between pour and removal.
- .14 All horizontal concrete edges without steel edging shall be chamfered as applicable and where shown on drawings, minimum 19mm @1.1.
- .15 Do formwork to Provincial Occupational Health and Safety Regulations and as follows:
 - .1 Form materials for concrete surfaces which will be exposed to view, or which require smooth and uniform surfaces for applied finishes or other purposes, shall consist of square edged smooth panels of plywood. Panels shall be made in a true plane, clean, free of holes, surface markings and defects.
 - .2 Form release agents and curing agents shall be compatible with applied finishes where applicable. Do not use release agents containing wax or oil in connection with concrete to receive applied coatings.
 - .3 Ties in exposed work shall generally be placed symmetrically about any section with plywood sheets and from each wall section.
 - .4 Grout all holes.
 - .5 Set to proper grade and alignment. Assure positive drainage.
 - .6 Construct straight and warp free with no bulging when concrete placed. Fit tightly at joints and corners.

3.2 MIX DESIGNS

- .1 Contractor to submit mix design to Consultant for approval 2 weeks prior to first pour. The construction of concrete skateboard parks requires a high quality and 'workable' concrete mix. The mix design supplied in this specification is a starting point whereby the contractor may solicit a final mix design from the local ready-mix plant. Local granular variations require that a unique mix design be submitted by the contractor to the consulting team for review and approval prior to any delivery on site.
- .2 Flat work and Vertical Elements (Reinforced)
 - .1 Class of Exposure C-2

- .2 Minimum compressive strength at 28 days of 32MPA.
 - .3 Slump 80 +/- 20 max.
 - .4 Maximum water cement ratio 0.40
 - .5 Air content 5% to 8%
 - .6 Maximum size of coarse aggregate 19mm.
 - .7 Use water reducing agents throughout.
- .3 Wet Mix Shotcrete Design for Bowl and Transition areas.
- .1 Class of Exposure C-2
 - .2 Minimum compressive strength at 28 days of 35MPA.
 - .3 Slump 70 +/- 20 max.
 - .4 Maximum water cement ratio 0.40
 - .5 Air content 5% to 8%
 - .6 Maximum size of coarse aggregate 10mm.
 - .7 Use water reducing agents throughout.

3.3 CHEMICAL ADMIXTURES

- .1 No Calcium Chloride
- .2 Water reducers: accelerators and retarders where deemed necessary by the Contractor.
- .3 Admixtures for flowing concrete where deemed necessary by the Contractor.

3.4 STANDARD OF WORKMANSHIP

- .1 Comply with ASTM F2480-06 Standard Guide For In-Ground Concrete Skateparks.
- .2 Skatepark shall be constructed in accordance with the layout plan and details provided.
- .3 Finishing shall produce a first class, smooth surface, free from irregularities, or imperfections. Surface defects greater than 6mm from specified surface finishes shall be corrected.
- .4 Inspect formed surfaces for defects immediately after removal of formwork.
- .5 Remove or cut back to a depth of 19mm from the surface of the concrete all bolts, ties, nails or other metal that is not required and repair immediately.
- .6 Grout all steel inserts in strict conformance with grout manufacturer's

printed instructions.

- .7 Remove imperfections such as bulges, fins, lips and stains to permanently exposed surfaces as directed by Consultant, by chipping or grinding and patch to match adjacent surfaces. Do not proceed with grinding until the concrete has sufficiently hardened to prevent dislodgement of coarse aggregate particles.
- .8 Curved and flat shapes to be screeded using accurately cut screed boards and templates in accordance with drawing sections. Reinforce screeds and templates and keep of manageable size to avoid distortion.

3.5 COORDINATION

- .1 Determine the requirements of other trades, inform concerned trades and assume responsibility for location, installation and quality of all items which affect the work of this section.
- .2 Have all inserts and form ties placed in the formwork before reinforcing steel is placed. Divert reinforcement around inserts as approved by the Consultant. Do not allow other trades to cut reinforcing steel to clear inserts.

3.6 TOLERANCES FOR CONCRETE

- .1 Variation from Level or Plumb:
For wall and slab surfaces:
plus or minus 6mm (1/4") over 2.4m distance for all panels. Level and true concrete panels are extremely important to the safety and 'usability' of the park. All panels will be checked for imperfections in concrete finish, shape and level true to the intent of the design.
- .2 Variation in size and location of sleeves and openings:
plus or minus 6mm (1/4").
- .3 Variation in the thickness of slabs and walls:
plus or minus 6mm (1/4").

3.7 TOLERANCE FOR REINFORCEMENT

- .1 Placing Tolerance:
 - .1 Place within 6mm (1/4") with respect to concrete thickness.
 - .2 Place within 25mm (1") with respect to center to center spacing.
 - .3 Minimum 40mm (1 1/2") clear cover from any adjacent surface

3.8 JOINTS

- .1 Make joints conform to detail sheets unless otherwise indicated.
- .2 Leave the surface of horizontal construction joints rough with 6mm (1/4") deep ridges and valleys.
- .3 Blast clean joints of loose material, laitance and form oil before the next pour is made.
- .4 Locate and install control joints where shown on drawings.
- .5 Except where shown otherwise, provide saw cut control joints in slab on grade in accordance with ASTM F2480-06 Standard Guide For In-Ground Concrete Skateparks and in locations as shown on the drawings.
- .6 Saw cuts shall be completed when concrete has hardened sufficiently that cutting can be performed without damaging slabs. Contractor to take weather and curing times into consideration to avoid premature thermal cracking of the slab prior to cuts.
- .7 Install expansion joints around catch basins and along lengths adjacent to concrete curbs, or ledges/seatwalls.
- .8 Avoid re-entrant corners into flat slab areas. Curve such corners, provide extra reinforcement and place control joint or saw joint to such corners.
- .9 Mark or sawcut concrete paving at intervals indicated on the drawings (control joints), strike the joint to a penetration of 30% of the paving thickness or as per drawings, mark curb only at the expansion joints, and form marked joints as indicated on the drawings with special tools.
- .10 Finish exposed surfaces with a smooth finish, broom swept as per drawings, or medium sandblasted finish as per drawings, and correct surface irregularities before final set.
- .11 Install 12mm or 10mm expansion joint adjacent to all vertical structures, concrete edges, curbs, walls and/or where shown and as shown on the drawings. Set pre-cut joints below finished grade and finish to surface with sealant, backing rod and pre-formed joint filler rodofoam or equal, as per drawings.
- .12 Stop reinforcement on either side of expansion joint.
- .13 Sawcut within 12 hours of pouring or as directed by the Consultant.

3.9 PANEL POURING

- .1 Typically the skatepark concrete is placed in individual panels and segments to suit designed compound surfaces.
- .2 The construction joint between panels shall have continuous rebar extended through forms for connection to neighboring panels and into the flat slabs. Flat slabs will be reinforced with 10M rebar @ 450mm on centre maximum. Tie every bar extending into flat slab (300mm minimum extensions) to rebar grid to allow some movement between unique panels.
- .3 Drainage slopes must be planned with care from slab section edges to drain path shown on drawings or direct to drain.
- .4 When placing, ensure good consolidation throughout and especially along joints and edges.

3.10 REMOVAL OF FORMS

- .1 Ensure concrete is sufficiently cured prior to removal of the forms.

3.11 CURING AND PROTECTION

- .1 Properly cure slabs using a cure and seal product or keep slabs moist for at least 7 consecutive days after placing unless otherwise approved by consultant.
- .2 Cure all concrete in skatepark for 7 days prior to allowing any vehicular traffic with heavy loads on the slab.

3.12 WINTER CONCRETE

- .1 Only pour unprotected concrete when temperatures are forecast to remain at least 4 degrees Celsius (40F) for a minimum period of four days. Unforeseen changes in weather after a winter concrete pour will require the use of insulating blankets or heated enclosures for a minimum period of 4 days. Should suspension of work be required for periods of cold weather the contractor shall consult with the Consultant to determine a safe manner in which to leave the site until work can resume.
- .2 For winter conditions accelerating admixtures or Type III Hi-Early cement may be used in concrete mix design.
- .3 Snow, ice and frost must be removed from all concrete forms and the subbase before pouring concrete.

- .4 Ensure that the temperature of the subbase and any other surfaces that come in contact with the concrete are not below freezing.
- .5 Never begin final finishing operations while bleed water is present.
- .6 Avoid overworking of cooled slabs exhibiting delayed setting characteristics.
- .7 Take care to protect edges and corners with insulating blankets during periods of low temperature (between 2-4 degrees Celsius) to limit heat loss in two or more directions.
- .8 Decision making regarding pouring concrete under winter concrete conditions, along with the protective measures taken, the dates, the work completed and the ambient temperature readings shall be incorporated as part of the permanent records of the job. Make records available to consultant.
- .9 The use of salts, chemicals or other foreign materials to lower the freezing point of concrete are not permitted.

3.13 FINISHING SURFACES

- .1 Ensure all patching appears monolithic and uniform with the adjoining concrete.
- .2 Finish surfaces to produce smooth, uniform surfaces free of open texturing and exposed aggregate. Do not work more mortar into surface than is required. Do not use neat cement as drier to facilitate finishing.
- .3 Round outside edges with 10mm radius edging tool unless shown differently in details for various locations.
- .4 Schedule of finishes:
Smooth Finish:
 - .1 Smooth finish all concrete surfaces in the skatepark including all walls and stair risers except where specified. Use steel or magnesium trowel to produce a smooth, dense surface with no irregularities on all flat and ramped slabs. Tolerances to flat plane shall be no greater than 6mm in 2.4m. Smooth finish to be non-textured with no exposed aggregate except where specified.
 - .5 Remove defective concrete, blemishes and embedded debris; repair as required and directed by consultant.

- .6 Concrete surfaces to be complete and tight against all coping and steel edges. Proper coping protection to prevent concrete build-up on steel surfaces must be maintained at all times.
- .7 Prior to final completion of concrete elements, dress imperfections with dressing stone and grinder as directed by consultant. This will include slab surfaces, edges, control and construction joints, coping/slab joints and walls.

3.14 COLOURED CONCRETE

- .1 Related Work: Sample colours should approximate the colour of broom finished concrete flatwork made with medium-gray cement. It is noted that concrete colour is altered by many factors, including cement colour, slump, finishing practices and curing method.
- .2 As Requested: Submit product data and manufacturer's instructions for:
 - 1. Colour admixture.
 - 2. Expansion joint fill material.
- .3 Samples:
 - 1. Samples for Colour Selection: As requested submit colour additive manufacturer's colour chart and sample chip set; indicate colour additive number and required dosage rate. Samples indicate general colour and may vary from concrete finished in field according to Specifications.
 - 2. Expansion Joint Fill Material: Submit one 12-inch length.
- .4 Delivery Documentation: As requested record batch tags for each load of concrete, for informational purposes.
- .5 Do not change brand of cement, pigment brand or source of aggregate during course of Work.
- .6 Colour Additives: Mix in accordance with manufacturer's instructions. Mix until colour additives are uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.
- .7 Concrete Colour:
 - 1. Cement: Colour shall be gray.

2. Sand: Colour shall be locally available natural sand and complying with the specifications herein.
 3. Aggregate: Concrete producer's standard aggregate complying with the specifications herein.
 4. Colour Additives: Dosage rate shall be based on weight of Portland Cement, fly ash, silica fume, lime and other cementitious materials but not aggregate or sand.
- .8 Dosage rate of colour additive shall not exceed 10 percent of weight of cementitious materials in mix.
- .9 Protect adjacent work from potential concrete stains including but not limited to dissimilar paving types, walls, columns, railing posts, light fixtures, plant materials, to satisfaction of the owner / consultant.
- .10 Immediately remove unintended coloured concrete stain on adjacent work.

3.15 CLEAN-UP

- .1 Promptly as the work proceeds and upon completion, clean-up and remove from the site, rubbish and surplus material resulting from the work of this section.

END OF SECTION 03 30 00

Part 1 General

1.1 REFERENCE

- .1 American Society of Testing and Materials (ASTM)
 - A27 Specification for Steel Castings, Carbon, for General Application
 - A36 Specification for Structural Steel
 - A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A307 Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - A366 Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
 - A500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- .2 American Welding Society (AWS)
 - D1.1 Structural Welding Code - Steel
- .3 Steel Structures Painting Council (SSPC)
 - SSPC-PA 1 Paint Application Specification No. 1
 - SSPC Paint 12 Paint Specification No. 12 Cold Applied Asphalt Mastic (Extra Thick Film)
 - SSPC Paint 20 Paint Specification No. 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic")
 - SSPC-SP1 Surface Preparation Specification No. 1 "Solvent Cleaning"
 - SSPC-SP2 Surface Preparation Specification No. 2 "Hand-Tool Cleaning"
 - SSPC-SP3 Surface Preparation Specification No. 3 "Power Tool Cleaning"

1.2 SUBMITTALS

- .1 Product Data: Submit product data for products used in metal fabrications, including paint products, grout and fasteners at the request of the Consultant prior to fabrication.
- .2 Shop Drawings: As requested submit detailed shop and erection drawings of each metal fabrication indicated. Shop drawings must be submitted where contractor proposes a deviation from the design drawings. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- .3 Qualification data for firm specified in 1.3.1 to demonstrate their capabilities and experience.

1.3 QUALITY ASSURANCE

- .1 Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that shown on the drawings, with sufficient production capacity to produce required units without causing delay in the work.
- .2 Use of damaged items is prohibited except by specific authorization of Consultant in writing.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.
- .2 Storage on Site: Store materials in a location and in a manner to avoid damage. Stacking shall be done in a way which will prevent bending. Store metal components and materials in a clean, dry location. Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that will permit circulation of air inside the cover.
- .3 Keep handling on-site to a minimum. Exercise care to avoid damage to finishes of material.

1.5 PROJECT CONDITIONS

- .1 Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.
- .2 Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual

opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

Part 2 Products

2.1 FERROUS METALS

- .1 Metal Surfaces, General: Form metal fabrications exposed to view upon completion of the work, provide materials selected for their surface flatness, smoothness and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness.
- .2 Steel Plates, Shapes, and Bars: ASTM A36.
- .3 Steel Pipe: ASTM A53, Type S, Grade B, standard weight (schedule 80), black finish, unless otherwise indicated.
- .4 Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

2.2 FASTENERS

- .1 General: Provide **zinc-coated** fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required. Suspect/counterfeit bolts will not be accepted and will be replaced at Contractor's expense.
- .2 Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.

2.3 PAINT

- .1 Shop Primer for Ferrous Metal: Red oxide, lead- and cadmium-free, corrosion-inhibiting primer complying with performance requirements and,
- .2 Galvanizing Paint: High zinc dust content paint with dry film containing not less than 94% zinc dust by weight and complying with SSPC-Paint-20 and,
- .3 Finish Paint: Exterior grade Tremclad rust paint or high performance metal surface paint. – Color Black

2.4 FABRICATION

- .1 Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of material indicated or specified for various components of each metal fabrication.

- .2 Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- .3 Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.
- .4 Shear and punch metals cleanly and accurately. Remove burrs.
- .5 Grind exposed edges to a radius of approximately 1/32 inch (0.794 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- .6 Remove sharp or rough areas on exposed traffic surfaces.
- .7 Weld corners and seams continuously to comply with AWS recommendations and the following:
 - .1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - .2 Obtain fusions without undercut or overlap.
 - .3 Remove welding flux immediately.
 - .4 At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matched those adjacent.
- .8 Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated. Locate joints where least conspicuous.
- .9 Provide for anchorage of type indicated; coordinate with supporting elements. Fabricate and space anchoring devices to provide adequate support for intended use.
- .10 Shop Assemblies: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- .11 Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- .12 Fabricate joints that will be exposed in a manner to exclude water, or provide weep holes where water may accumulate.

2.5 ROUGH HARDWARE

- .1 Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required. Fabricate items to sizes, shapes, and dimensions required.

2.6 LEDGER ANGLES

- .1 Fabricate shelf and ledger angles from steel angles of sizes indicated and for attachment to concrete. Provide slotted holes to receive 1/2 inch (12.7mm) bolts.

2.7 STEEL PIPE GUARDRAILS AND HANDRAILS

- .1 General: Fabricate pipe guardrails and handrails to comply with requirements indicated for dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacing, and anchorage.
- .2 Interconnect guardrails and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to which end is joined, weld all around and grind smooth.
- .3 Form changes in directions of railing members as follows:
 - .1 By use of welded prefabricated steel elbow fittings.
 - .2 By bending, of radius indicated.
 - .3 By mitering at elbow bends.
- .4 Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
- .5 Close exposed ends of pipe by welding 3/16 inch (4.8 mm) thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch (6.4 mm) or less.
- .6 Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of guardrails and handrails to other work. Furnish inserts and other anchorage devices for connecting guardrails and handrails to concrete or masonry work.
- .7 Where indicated on plan, match to existing fencing. Use same measurements, shapes, gauge, size and finish.

2.8 STEEL AND IRON FINISHES

- .1 General: Shop-paint uncoated edges and surfaces, except those to be embedded, welded or galvanized, unless otherwise indicated. Comply with requirements of SSPC-PA 1 for shop painting.
- .2 Galvanizing: Unless otherwise indicated all items indicated under this section shall be Hot dipped galvanized with zinc coating in compliance with the following requirements:
 - .1 ASTM A123 for galvanizing both fabricated and non fabricated iron and steel products made of uncoated rolled, pressed, and forced shapes, plates, bars, and strip 0.0299 inch (0.7595 mm) thick and heavier.
 - .2 ASTM A153 for galvanizing iron and steel hardware.
 - .3 Surface Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below.
 - 1. Remove oil, grease and similar contaminants in accordance with SP-1, "Solvent Cleaning".
 - 2. Remove loose rust, scale, spatter, slag and other deleterious materials in accordance with SSPC, utilizing the following methods as required:
 - SP-2 "Hand-Tool Cleaning"
 - SP-3 "Power-Tool Cleaning"
 - SP-7 "Brush-Off Blast Cleaning"
- .3 Finished Painting: Immediately after finished surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 3.0 mils (0.076 mm)
 - .1 Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - .2 Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection.

Part 3 Execution

3.1 EXAMINATION

- .1 Contractor shall examine the areas and conditions under which metal fabrication items are to be installed. Notify the consultant in writing of conditions detrimental to the proper and timely completion of the work. Do

not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the contractor and consultant.

3.2 PREPARATION

- .1 Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.3 INSTALLATION, GENERAL

- .1 Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- .2 Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment and elevation with edges and surfaces level and plumb when measured from established lines and levels.
- .3 Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- .4 Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Avoid welding, cutting, or abrading the surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections. When necessary to weld, cut or abrade surfaces of previously galvanized metals, clean up area and paint with zinc rich primer prior to finished painting.
- .5 Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work and the following:
 - .1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - .2 Obtain fusion without undercut or overlap.
 - .3 Remove welding flux immediately.
 - .4 At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surfaces matches those adjacent.

3.4 INSTALLATION OF STEEL PIPE GUARDRAILS AND HANDRAILS

- .1 Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
 - .1 Cast anchor plates flush with finished concrete and weld attachment points to anchor plates.
 - .2 Cast or core handrail posts into concrete embedded 450mm minimum. Where annular space exists, fill annular space with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's directions.

3.5 ADJUSTING AND CLEANING

- .1 Touch-Up Painting of Steel Items: Immediately after erection, clean field welds, bolted connections, abraded areas of shop paint and paint exposed areas with same material as used for shop painting and finishing to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
- .2 For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION 05 50 00

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies joint sealants for masonry and concrete.

1.2 SUBMITTALS

- .1 As requested, provide samples of Manufacturer's product brochures and product names, range of colours in each type of sealant for selection by Consultants.

1.3 ENVIRONMENTAL CONDITIONS

1. Do not apply any sealant at ambient temperatures below 4°C without consulting Manufacturer and obtaining Consultant's approval. Apply only to completely dry surfaces.

Part 2 Products

2.1 MATERIALS

- .1 All sealants utilized in the sealant system shall be compatible.
- .2 Provide sealant formulation recommended by the Manufacturer for the type of joint, substrate and service conditions applicable.
- .3 Colours: charcoal/grey so as to blend with surround concrete features or as specified in drawings.
- .4 Sealant Type: Single-component, polyurethane base, moisture curing, non-sag, elastomeric sealant, Sikaflex 1a or approved equal meeting all standards and performance requirements.
- .5 Sealant Backing: Extruded, foamed, closed cell, round, polyethylene urethane, neoprene or vinyl rod, 30% greater diameter than joint width, with Shore 'A' hardness of 20 and 830 - 900 KPa tensile strength, and manufactured especially for the purpose.
- .6 Expansion Joint Filler: Preformed PVC closed cell, Rodofoam by Sternson Canada limited or approved equal.
- .7 Joint Primer: As recommended by sealant Manufacturer for type of surface being primed.

Part 3 Execution

3.1 PREPARATION

- .1 Clean joints walls and spaces, which are to be sealed and ensure that they are dry and free of dust, loose mortar, oil, grease and other foreign material. Clean ferrous metals of all rust, mill scale and foreign materials by wire brushing, grinding or sanding.
- .2 Clean all metal surfaces to be sealed, except pre-coated metals, with clean rags and wipe dry with clean cloth. Clean pre-coated metals with solutions or compounds which will not injure finish and which are compatible with joint primer and sealant. Check that ferrous metal surfaces are painted before applying sealant.

3.2 APPLICATION

- .1 Apply sealant using hand-operated guns fitted with suitable nozzles and equipment approved by sealant Manufacturer. Apply in strict accordance with Manufacturer's directions and recommendations.
- .2 Apply sealant under pressure to assure good adhesion to sides of joints and to completely fill all voids in joint.
- .3 Form surface of sealant smooth, concave, free from ridges, wrinkles, sags, air pockets and embedded foreign matter.
- .4 Upon completion, remove masking, sealant smears and droppings from adjacent and other surfaces.
- .5 Allow proper curing before park is utilized or allowing any traffic including foot traffic.

END OF SECTION 07 92 00

Part 1 General

1. This section specifies filling, rough grading, excavation and backfilling. This section covers work required throughout the site.

SCOPE OF WORK

1. Complete all site clearing and stripping as per specifications and drawings.
2. The Contractor shall provide grade stakes and any other necessary installation control services required during construction.
3. Complete all excavation, filling and rough grading to bring site to required sub-grade as per specifications and drawings.
4. Complete all compaction of native materials as per specifications and drawings.
5. Complete haulage of excess fill material as required. Excess clean fill may be placed on site in locations as determined by the Consultant/Owner within the limits of the contract.
6. Import and compact all structural sub-base and base as specified.

REFERENCES

1. Construction Specifications for Compacting – as per MMCD or approved provincial equivalent
2. Material Specifications for Aggregates - as per MMCD or approved provincial equivalent

Part 2 Products

1. Structural Sub Base : Compactable native material or granular fill approved for use by the geotechnical engineer.
2. Structural Base : Granular 'A' fill material as specified or alternative granular fill approved for use by the geotechnical engineer.
3. General Non-Structural Fill : Clean fill material, free from debris and deleterious material approved for use by the consultant or the owner.

Part 3 Execution

GENERAL EXCAVATION

1. Stake out the locations of all items requiring excavation and obtain the approval of the Consultant before commencing work.
2. Dispose of excavated material in designated site fill areas unless it is not approved for use as fill material or backfilling material by the Consultant.
3. Excavate to the elevations and dimensions indicated or required for construction work. All depths detailed are shown depth after compaction.
4. Obtain the approval of the Consultant of all excavations before proceeding with construction activities.
5. Where bearing capacity of the subsoil appears to be insufficient, obtain the written approval of the Consultant to have soil investigations carried out. Costs for such testing, if required, will be paid by the Owner, at cost.
6. Fill extra or over excavations with concrete or as directed at no cost to the Contract. Extra or over excavations are defined as excavations that exceed the requirements of the details, specifications or drawings.
7. Correct unauthorized excavation at no extra cost.

SHORING AND BRACING

1. Any shoring and bracing required shall comply with all safety requirements and applicable regulations within the Occupational Health and Safety Act latest edition.

INSTALLATION OF STRUCTURAL SUB BASE

1. Where necessary strip topsoil and deleterious materials and stockpile as directed in the drawings and specifications.
2. Fill with suitable fill material in uniform layers as per the geotechnical recommendations.
3. Shape and compact each layer to the line and cross section and density specified before placing succeeding layer. Remove stones greater than the fully compacted depth.

4. Provide finished rough grade parallel to finished grade, allowing for the placing of the specified surface material and base to a tolerance of plus or minus 50mm (2") and compact to density as per the geotechnical recommendations.
5. Compact each layer at a moisture content suitable for obtaining the required density.

INSTALLATION OF STRUCTURAL BASE

1. Place specified base material in a uniform layer.
2. Shape line and cross section as per drawings.
3. Provide finished base parallel to finished grade, allowing for the placing of the concrete to a tolerance of plus or minus 13mm (1/2") and compact to density as per the geotechnical recommendations.
4. Compact at a moisture content suitable for obtaining the required density.

EXCAVATION - PLANTING PITS AND PLANTING BEDS

1. Excavate planting pits and beds to the following depths unless specified otherwise on the drawings:

Trees 600mm (24") below finished grade
Shrubs 400mm (16") below finished grade

BACKFILLING

1. Do not commence backfilling of structures, utilities, etc., until work has been approved by the owner or consultant. Photo documentation may be substituted at the discretion of the owner or consultant.
2. Ensure areas to be backfilled are free of debris, snow, ice, water or frozen ground.
3. Place specified backfill materials in continuous layers and compact as specified.
4. Backfill simultaneously on both sides of walls to equalize soil pressure.
5. Make good any settlement or subsequent damage to adjacent structures

or to other work under this contract caused by improper or inadequate compaction.

TESTING

1. Reference Quality Assurance Section 01 43 00.

MAINTENANCE

1. Maintain all grades until total performance of completed park works. Maintenance will include all filling and re-grading to retain and preserve the required shapes, tolerances and elevations.
2. Cleaning of roads and walkways as a result of mud tracking and both off and on the site is the responsibility of the Contractor.
3. Dust Control is the responsibility of the Contractor.

GUARANTEE

1. Guarantee all work in this section from slipping, sinking, eroding, or any other change in grade for a warranty period as specified within Section 01 78 36 Warranties.

END OF SECTION 31 00 00

Part 1 General

1.0 DESCRIPTION

- .1 This Section specifies the requirements for demolishing, salvaging and removing wholly or in part various items designated to be removed or partially removed and for backfilling resulting trenches, holes and pits.

1.2 RELATED WORK

- .1 31 23 00 - Excavation and Fill

1.4 SITE PERIMETER SAFETY FENCING

- .1 Maintain rigid safety fence around the perimeter of the park as indicated during mandatory site meeting, during the length of the contract.

1.5 DISPOSAL OF MATERIALS

- .1 Dispose off-site of the work to an approved waste disposal site all, bituminous pavements, contaminated soil, timber, metal/plastic polystyrene products, debris and concrete rubble.

1.6 PROTECTION

- .1 Protect in accordance with 31 23 00 - Excavation and Fill.
- .2 Protect existing items designated to remain. In event of damage to such items, immediately replace or make repairs to approval of Consultant and at no cost to Owner.

1.7 MEASUREMENT FOR PAYMENT

- .1 Work to be done under this specification is considered to be included in the tendered price and will not be considered additional for payment unless circumstances unknown or unforeseen are encountered. If circumstances unknown or unforeseen are encountered notify the owner and the consultant immediately.

1.8 PREPARATION

- .1 Inspect site and verify with Consultant items designated for removal, disposal, salvage and items to remain.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
- .3 Notify utility companies before starting demolition.

1.9 REMOVAL

- .1 Remove items as indicated on demolition plan.
- .2 Do not disturb adjacent items designated to remain in place.

1.10 BACKFILL

1. Backfill all resulting holes, pits and trenches in accordance with 31 23 00 – Excavation and Fill and appropriate individual specification sections.

1.11 RESTORATION

1. On completion of removals, grade areas in an even grade as shown on the drawings.

1.12 SITE CLEANUP

1. Upon completion of work, remove debris, trim surfaces and leave work site clean.

END OF SECTION 31 10 00

PART 1 - GENERAL

1.0 General Requirements

- .1 The General Conditions and Division 1, General Instructions, Special Requirements, are part of this Section and shall apply as if written here.

1.1 Scope of Work

- .1 Excavating as required for each item of this Contract.
- .2 Backfilling as required for each item of this Contract.
- .3 Finish rough grading in all landscape areas of the site as directed.
- .4 Export and dispose of surplus materials off site. Pay disposal fees and any required analytical lab testing charges.
- .5 Supply and pay for imported materials to achieve the grades and levels indicated on the drawings.

1.2 Testing

- .1 Make work available for testing at any time and suspend construction if so directed by the Consultant until test results are available.

1.3 Protection

- .1 Protect all excavations from freezing and water. Supply and operate as many pumps or other dewatering devices as necessary to keep excavations free of water at all times.
- .2 Erect warning signs and protective barriers in accordance with all applicable regulations.
- .3 Do not disturb soil within the branch spread of existing trees or shrubs that are designated for preservation or on adjacent property. If it is necessary to excavate through tree roots, it shall be done by hand methods and all roots shall be cut with a sharp hand saw. Trim neatly all cuts.
- .4 Locate and protect all buried services. The Contractor shall be held responsible for all damages to utilities and structures resulting from his work.
- .5 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

- .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered (as indicated). Obtain direction of Consultant before moving or otherwise disturbing utilities or structures.
- .7 Protect existing buildings and surface features which may be affected by work from damage while work is in progress and repair damage resulting from work.

PART 2 - PRODUCTS

2.1 Materials

- .1 19mm Clear Crushed Stone: Clean, hard, durable crushed gravel or stone, free from shale, clay, friable materials, organic matter and other deleterious substances and graded within the following limits when tested meet the following gradation requirements:

<u>M.T.C. Sieve Designation</u>	<u>% Passing</u>
26.5 mm	100
22.4 mm	95-100
19.0 mm	90-100
16.0 mm	65-80
13.2 mm	45-80
9.5 mm	20-55
4.75 mm	0-10

- .2 Granular 'A' (pit sourced): Clean, hard, durable sand & gravel, free from shale, clay, friable materials, organic matter and other deleterious substances when tested meet the following gradation requirements.

<u>M.T.C. Sieve Designation</u>	<u>% Passing</u>
37.5 mm	100
16.0 mm	62-100
9.5 mm	48-73
4.75 mm	33-55
1.18 mm	15-45
300 um	5-22
75 um	0-8

- .3 Granular 'B' (pit sourced): Clean, hard, durable sand & gravel, free from shale, clay, friable materials, organic matter and other deleterious substances when tested meet the following gradation requirements.

<u>M.T.C. Sieve Designation</u>	<u>% Passing</u>
160 mm	100
37.5 mm	*
22.4 mm	57-100
4.75 mm	25-100
1.18 mm	10-85
300 um	5-40
75 um	0-8

- * When Granular 'B' is used for Granular backfill for pipe subdrains, 100% of the material shall pass the 37.5 mm sieve.
- .4 Backfilling Local Site Fill Material: Selected material from excavations or other sources, free of debris, roots, organic matter, rocks over 75mm diameter, and other deleterious and toxic materials.
- .5 General Use of Materials:
 - .1 Use appropriate materials as specified under Section of Work. If not specified under Section, refer to Construction Drawings.
 - .2 Use 19mm clear crushed stone in areas requiring drainage.
 - .3 Granular 'A' and/or 19mm crusher run recycled concrete materials are to be used under areas to be paved, and to backfill excavation, unstable areas in existing subgrade, or as a base for built structures, subject to the Consultant's approval.
 - .4 Local site fill materials (such as asphalt, concrete, granular, topsoil and subsoil) are to be used under areas intended for the creation of the berm, subject to the Consultant's approval.
- .6 Stockpile fill materials in areas approved by Consultant. Stockpile granular materials in manner to prevent segregation.

PART 3 - EXECUTION

3.1 Excavation (see Site Specific Notes on Drawings)

- .1 Prior to excavation, the Contractor shall have all services staked out.
- .2 The Contractor shall carefully excavate to the elevations and dimensions indicated or required for the construction of the work.
- .3 Remove concrete, masonry demolished foundations and rubble and other non functional obstructions encountered during excavation.

- .4 For trench excavation, unless otherwise authorized by Consultant in writing, do not excavate more than 30m of trench in advance of installation operations and do not leave trench open overnight.
- .5 Keep excavations free of water while work is in progress, and protect open excavations against flooding and damage due to surface run-off.
- .6 Excavation must not interfere with normal 45 degree splay of bearing from bottom of any footing.
- .7 Do not disturb soil within branch spread of trees or shrubs that are to remain. Obtain Consultant's approval prior to excavating through roots. Excavate by hand and cut roots with sharp axe or saw. Seal cuts with approved tree wound dressing.
- .8 Where bearing capacity of sub-soil appears to be insufficient, the Contractor shall obtain the written approval of the Consultant before doing any further work.
- .9 All excavations shall be sufficiently shored and braced to prevent caving-in and to adequately support existing structures, roads, services and any other aspect of the work.
- .10 Excavated materials shall be used for filling only if approved by the Consultant
- .11 All excavations for footings shall be carried to undisturbed soil and to a minimum depth of 1.2m unless shown otherwise on the drawings.
- .12 Notify Consultant when soil at bottom of excavation appears unsuitable and proceed as directed by Consultant.
- .13 Obtain Consultant's approval of completed excavation.
- .14 Remove unsuitable material from trench bottom to extent and depth directed by Consultant.
- .15 Where required due to unauthorized over-excavation, correct as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Granular 'A' or 'B' fill compacted to minimum of 98% Standard Proctor Density, as directed by Consultant.
- .16 Dispose of surplus and unsuitable excavated material in approved location

off site.

3.2 Backfilling (see Site Specific Notes on Drawings)

- .1 Ensure that all areas to be backfilled are free of debris, snow, ice, water, frozen ground, organic matter or other deleterious substances.
- .2 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
 - .3 Place backfill simultaneously on either side of structures, walks, etc., to equalize soil pressures.
 - .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 pressures and obtain approval from Consultant.
 - .5 Place material by hand under, around and over installations until 600mm of cover is provided. Dumping material directly on installations will not be permitted.
 - .6 Install drainage and filter system in backfill as indicated on drawings.
 - .7 Place backfill material in continuous horizontal layers not exceeding 150mm in depth and compact filled and disturbed areas to minimum Standard Proctor Density of 85% under planted or grassed areas and 98% under walks and paved areas.

3.3 Testing (see section 01 43 00 Quality Assurance)

- .1 Be responsible for inspection and testing of soil compaction under walks and paved areas.
- .2 Make good any corrective work to paving and walks when settlement has occurred due to insufficient compaction of subgrades.
- .3 Inspection and testing of soil compaction will be carried out by designated approved testing company or laboratory.
- .4 Submit two (2) copies of inspection and soil testing report to Owner and one (1) copy of Consultant.

- .5 Make good any settlement or damage to other work under this Contract caused by improper or inadequate compaction.
- .6 The cost of testing shall be paid by the contractor.

3.4 Finish Rough Grading

- .1 Finish rough grade using bulk fill material required to complete the works of this Contract.
- .2 Under areas to be paved, under all structures and at any other locations specifically shown on the drawings or details, the subgrade shall be compacted to a minimum dry density of 98% Standard Proctor Density and evidence shall be provided for the required compaction.
- .3 Uniform slopes shall be constructed between points for which finished grades or contours are shown. Existing grades shall be met and blended in, in a smooth manner, 2% minimum away from buildings or structures.
- .4 Establish and maintain subgrade parallel to the proposed finished grade and shape to allow adequate surface run-off and prevent ponding, scouring and erosion. If directed by the Consultant, the Contractor shall provide temporary relief, or diversionary swales and ditches at no additional cost to the Owner.
- .5 Finish rough grading shall not be done when soil is frozen or wet.
- .6 In all areas where fill is to be placed on the existing grade, the surface shall be scarified to a minimum depth of 75mm in order to provide a good bond and prevent slipping of fill or topsoil.

3.5 Clean-Up

- .1 Do final cleaning upon completion of work of this Section.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Work for this Section includes, but is not necessarily limited to:
 - .1 Supply and installation of all drainage pipe, services and fittings.
 - .2 Trenching and excavation as necessary.
- .2 Co-ordinate work in this section with work in all other sections and grading and drainage drawings.

1.2 NOTIFICATION OF UTILITIES

- .1 Contractor must obtain locates from all utilities concerned and must obtain all necessary permits with regard to this installation.

1.3 INSPECTION OF MATERIALS

- 1. The Contractor shall inspect all materials for damage in transit. No defective material shall be accepted. Any material subsequently damaged shall be removed from the site immediately.
- 2. The Consultant for this project may order tests made of any material delivered to the site and may reject materials pending the result of tests.
- 3. Any material found to be defective in manufacture, or damaged before or after acceptance from the carrier, will be rejected by the Consultant for this project and the Contractor shall promptly remove such defective material from the site.

Part 2 Products

2.1 MATERIALS

- .1 All rigid drainage lines shall be 150mm dia. hard PVC drain line unless otherwise specified.
- .2 All flexible drainage lines shall be 100mm dia, perforated "Big-O" weeping tile, with filter fabric, unless otherwise specified.
- .3 Pipe to be sized as per drawings.
- .4 Pipe material shall be resistant to chemicals present in soils and ground water and shall be resistant to deterioration from ultraviolet light.
- .5 Tubing must be of uniform colour and density, free from any defects.

- .6 Use manufactured bends and fittings at any change of direction or wye connection.
- .7 All ends to be capped with manufactured caps.

Part 3 Execution

3.1 TRENCHING

- .1 All trenches are to be excavated starting from the lowest elevation at the outlet and proceed upgrade.
- .2 All excavated material is to be removed and used as fill for surrounding areas if suitable. All unsuitable material shall be removed off-site.
- .3 Remove disturbed or softened material from trench bottom before placing bedding material. Maintain trench free from water and soft materials during placement of pipe bedding, pipe installation and trench backfill to ensure proper compaction of granular materials.
- .4 Backfill with imported granular material or approved native material as specified in Contract documents. The Consultant for this project may permit native material for all above uses subject to suitability of native material for said use. Native material approved for re-use to be handled, stockpiled and compacted using construction method appropriate for given moisture content and weather conditions.
- .5 Restore all disturbed surfaces to condition at least equal to that which existed prior to construction. Make good any damage to adjacent lands or improvements. Install topsoil and sod in areas of soft landscape in accordance with contract documents.

3.2 PIPE CONFIGURATION

- .1 Trenching alignment and depth as shown on Contract drawings.
- .2 A minimum grade of 1.5% shall be maintained throughout or as otherwise specified on the Contract drawings.
- .3 Invert elevations and slope on pipe as shown on Contract drawings.
- .4 All intersections of pipe shall be angled to facilitate 'snaking' or flushing of clogged lines.

3.3 GRANULAR BEDDING

- .1 Fill over-excavation below design elevation with granular bedding placed and compacted to 95% SPD.
- .2 Place granular bedding material across full width of trench bottom in uniform layers to depth shown on details.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe. Do not use blocks when bedding pipe.
- .4 Use imported bedding material when native material is deemed unsuitable for backfill by the Consultant or when trench has been excavated in rock.

3.4 PIPE INSTALLATION

- .1 Handle pipe in accordance with pipe manufacturer's recommendations. Do not use chains or cables passing through pipe bore so that weight of pipe bears on pipe ends.
- .2 Lay and join pipes to manufacturer's instructions and specifications except as noted otherwise.
- .3 Horizontal tolerance: plus or minus 50mm from specified alignment. Vertical tolerance: plus or minus 25mm from specified grade.
- .4 Lay pipes on prepared bed true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .5 Face socket ends up-grade.
- .6 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of water and foreign materials.
- .7 When required cut pipes as recommended by pipe manufacturer, without damaging pipe or its coating and leave a smooth end at right angles to axis of pipe.
- .8 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as specified otherwise.

END OF SECTION 33 46 00