

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 00 – Cleaning and Waste Management
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 30 00 – Cast in Place Concrete

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-O86.1, Engineering Design in Wood (Limit States Design).
 - .3 CSA O121, Douglas Fir Plywood.
 - .4 CSA O151, Canadian Softwood Plywood.
 - .5 CAN3-O188.0-[M78], Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
 - .6 CSA S269.1-[1975], Falsework for Construction Purposes.
 - .7 CAN/CSA-S269.3-[M92], Concrete Formwork.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI Exterior Plywood for Concrete Formwork.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121 CAN/CSA-O86.1
 - .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.
- .2 Tubular column forms: round, spirally wound laminated fiber forms internally treated with release material. Spiral pattern not to show in hardened concrete where exposed in the finished condition.

- .3 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 dia. in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form release agent: non-toxic, biodegradable, low VOC.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene
- .6 Falsework materials: to CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Contract Administrator's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .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 Align form joints and make watertight. Keep form joints to minimum.
- .10 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 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.
- .13 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.

- .14 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place until concrete has reached sufficient strength to carry dead loads and all possible construction loads liable to be imposed upon it.
- .2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .3 Space reshoring in each principal direction at not more than 3000 mm apart.
- .4 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN3-A23.3, Design of Concrete Structures for Buildings.
 - .3 CSA G30.3, Cold Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5, Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
 - .6 CAN/CSA-G40.21, Structural Quality Steels.
 - .7 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, 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, and spacings of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada .
- .3 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated..

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Contract Administrator.
- .2 Reinforcing steel: billet steel, grade 400W, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-30.18.

- .4 Cold-drawn annealed steel wire ties: to CSA G30.3.
- .5 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.
- .6 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .7 Mechanical splices: subject to approval of Contract Administrator.
- .8 Plain round bars: to CAN/CSA-G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Contract Administrator's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Do not weld reinforcement without prior approval of the Contract Administrator.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.

Part 3 Execution

3.1 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 which develop cracks or splits.

3.2 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 asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Contract Administrator's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 10 00 - Concrete Forming and Accessories.
- .2 Section 03 20 00 - Concrete Reinforcing.
- .3 Section 05 50 00 - Metal Fabrications.
- .4 Section 07 11 13 - Bituminous Dampproofing.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
 - .2 ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
 - .3 ASTM C494, Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C827, Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - .5 ASTM C939, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.
 - .6 ASTM D1751, Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A5, Portland Cement.
 - .2 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .3 CAN/CSA-A23.2, Methods of Test for Concrete.
 - .4 CAN/CSA-A23.5, Supplementary Cementing Materials.
 - .5 CAN/CSA A363, Cementitious Hydraulic Slag.

1.3 CERTIFICATES

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.
- .3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate a cleaning area for tools to limit water use and runoff.
- .4 Carefully coordinate the specified concrete work with weather conditions.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .6 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.
- .7 Choose least harmful, appropriate cleaning method which will perform adequately.

Part 2 Products

2.1 MATERIALS

- .1 Portland cement: to CAN/CSA-A5.
- .2 Supplementary cementing materials: to CAN/CSA-A23.5.
- .3 Cementitious hydraulic slag: to CAN/CSA-A363.
- .4 Water: to CAN/CSA-A23.1.
- .5 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
- .6 Air entraining admixture: to ASTM C260.
- .7 Chemical admixtures: to ASTM C494. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
 - .1 Compressive strength: minimum 50 MPa at 28 days.
 - .2 Consistency:
 - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30s.
 - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portion) 125 to 145%.
 - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125 %.
 - .4 Dry pack to manufacturer's requirements.

- .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 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.
- .11 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .12 Weep hole tubes: plastic.
- .13 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.
- .14 Dampproofing:
 - .1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2, and to Section 07 11 13 - Bituminous Dampproofing.
- .15 Polyethylene film: 6 mil thickness to CAN/CGSB-51.34.

2.2 MIXES

- .1 Concrete for all parts of the Work shall be homogeneous and when hardened shall have the required strength, resistance to deterioration, durability, resistance to abrasion, water tightness, appearance and other specified properties.
- .2 Concrete mixes shall be proportioned by the supplier to meet the requirements for cement type, compressive strength, class of exposure, maximum aggregate size, slump, air content, and admixtures as specified in the Contract Documents.
- .3 Concrete supplier to coordinate slump and cement content with Contractor considering the performance criteria and Contractors requirements for placement and workability.
- .4 Do not add calcium chloride to concrete.
- .5 Refer to project Geotechnical Report for requirements for Sulphate Resistance of concrete at or below grade. A copy of the Geotechnical Report is available at the office of the Contract Administrator for viewing upon request.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .3 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .4 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

- .5 In locations where new concrete is dowelled 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 positions as indicated.
- .6 Do not place load upon new concrete until authorized by Contract Administrator.

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.
- .2 Sleeves and inserts.
 - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated 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 x 100 mm not indicated, must be approved by Contract Administrator.
 - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Contract Administrator before placing of concrete.
 - .4 Check locations and sizes of sleeves and openings shown on drawings. Coordinate opening requirements from all disciplines and notify Contract Administrator of discrepancies prior to placement of reinforcing.
 - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts.
 - .1 Set anchor bolts to templates under supervision of appropriate trade 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 minimum 100 mm diameter. Drilled holes to be to manufacturers' recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .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 ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .6 Finishing.
 - .1 Finish concrete in accordance with CAN/CSA-A23.1.
 - .2 Use procedures acceptable to Contract Administrator or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.

- .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
- .4 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .7 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 construction 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.
- .8 Dampproof membrane.
 - .1 Install dampproof membrane under concrete slabs-on-grade inside building.
 - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

3.3 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated in accordance with CAN/CSA-A23.1 and Section 01 45 00 - Quality Control.
- .2 Costs of tests will be paid for as specified in Section 01 29 83 - Payment Procedures.
- .3 Take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .5 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

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C109/C109M-05, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens.).
 - .2 ASTM C827-Ola(2005), Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - .3 ASTM C939-02, Test Method for Flow of Grout for Preplaced Aggregate Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A5-93, Portland cement..CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
 - .3 CAN/CSA-A23.1-00, Concrete Materials and Methods of Concrete Construction.
 - .4 CAN/CSA-A23.2-00, Methods of Test for Concrete.

1.2 SAMPLES

- .1 At least 4 weeks prior to commencing work, inform Contract Administrator of proposed source of aggregates and provide access for sampling.
 - .1 10 kg of each type of Portland cement.
 - .2 5 L of curing compound.
 - .3 1 m length of each type of joint filler.

1.3 CERTIFICATES

- .1 Minimum 4 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 quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1-00.
- .3 Provide certification that plant, equipment and materials to be used in concrete comply with requirements of CAN/CSA-A23.1-00.

1.4 QUALITY ASSURANCE

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

Part 2 Products

2.1 MATERIALS

- .1 Portland cement to CAN/CSA-A5 Type 10.
- .2 Water to CAN/CSA-A23.1-00.
- .3 Aggregates fine and coarse to CAN/CSA-A23.1-00.
- .4 Shrinkage compensating grout: premixed compound consisting of metallic, non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
 - .1 Compressive strength: 50 MPa at 28 days.
 - .2 Consistency:
 - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30s.
 - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portion) 125 to 145%.
 - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portion) 100 to 125%.
 - .4 Dry pack to manufacturer's requirements.
 - .5 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.
 - .6 Provide 6 mil poly vapour barrier under all slabs on grade. Min lap 6" and joint sealed with caulk.

2.2 REINFORCEMENT

- .1 Reinforcing Steel: 276 MPa yield grade. Dowels: ASTM A615; 276 MPa.

2.3 CONCRETE MATERIALS

- .1 Cement: CAN/CSA-A438, Air Entrained Portland type, grey colour.
- .2 Edit the following paragraph to suit local availability. Specify if special aggregates are required.

.3 Fine and Coarse Mix Aggregates: CAN/CSA-A438.

.4 Water: Potable, not detrimental to concrete.

2.4 ACCESSORIES

.1 Curing Compound: Type 2 Standard of Acceptance: conforming to ASTM D175.

.2 Liquid Surface Sealer: coli film. Standard of Acceptance: manufactured by Master Builders.

.3 Joint Sealers: The Isolation or expansion joint filler shall be a pre-formed, rot proof, non-extruded, resilient type bituminous fibre, conforming to the requirements of ASTM D1751. The Isolation/Expansion Joint Filler shall be Flexcell by Sternsom Limited or approved equal.

2.5 CONCRETE MIX

.1 Mix and deliver concrete in accordance with CAN/CSA-A438.

Part 3 Execution

3.1 SUBBASE

.1 Section 31 23 10 – Excavating, Trenching & Backfilling.

.2 Section 32 11 23 – Aggregate Base Courses

3.2 PREPARATION

.1 Moisten base to minimize absorption of water from fresh concrete.

3.3 FORMING

.1 Form vertical surfaces to full depth; place and secure to correct location, profile, and gradient.

.2 Coat forms with form release agent to permit easy stripping and dismantling without damaging concrete.

.3 Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.4 REINFORCEMENT

.1 Place reinforcement at mid-height of slabs-on-grade.

3.5 PLACING CONCRETE

.1 Place concrete continuously over the full width of the panel and between predetermined construction joints.

.2 Place concrete to broom pattern.

- .3 Cure and protect concrete in accordance with CAN/CSA-A438.

3.6 JOINTS

- .1 Saw cut contraction joints 5 at 2.0m on centre at an optimum time after finishing. Cut 1/3 into depth of slab.

3.7 FINISHING

- .1 Finish exposed surface to a smooth, uniform finish, free of open texturing and exposed aggregate.
- .2 Wood float finish surface to provide none-skid texture.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep.
- .4 Curbs: Light broom.
- .5 Direction of Texturing: Transverse to pavement direction.
- .6 Place sealer on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.8 JOINT SEALING

- .1 Separate pavement from vertical surfaces with 13 mm thick joint filler.
- .2 Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- .3 Extend joint filler from bottom of pavement to within 13 mm of finished surface.

3.9 PROTECTION

- .1 Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20- [95], Surface Sealer for Floors.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1- [94] , Concrete Materials and Methods of Concrete Construction.

1.2 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include application instructions for concrete floor treatment.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away for public.
- .4 Use chemical hardeners that are non-toxic, biodegradable and have zero or low VOC's.
- .5 Dispose of surplus chemical and finishing materials in accordance with federal, provincial and municipal regulations.
- .6 Dispose of waste from stripping of floors in a manner that will not have unfavourable effects on the environment.

1.5 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:

- .1 Make the work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than [10] EC from [7] days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by [flooring] manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .2 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 CHEMICAL HARDENERS

- .1 Type 1- Sodium silicate.
- .2 Water: potable.

2.2 SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based.
- .2 Surface sealers may not be manufactured or formulated with aromatic solvents formaldehyde halogenated solvents mercury lead cadmium hexavalent chromium and their compounds.

2.3 WET CURE

- .1 Clear polyethylene film to ASTM C171, minimum thickness 0.15 mm.

2.4 MIXES

- .1 Mixing, ratios and application in accordance with manufacturer's instructions.

2.5 JOINT SEALANT

- .1 Joint sealants to Section 07 92 00 – Joint Sealing.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that surfaces are ready to receive work and elevations are as indicated on drawings.

3.2 PREPARATION OF SLAB

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges [unless otherwise indicated].
- .2 Saw cut control joints to CSA-A23.1, 24 hours maximum after placing of concrete.

3.3 APPLICATION

- .1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .2 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .3 Clean overspray. Clean sealant from adjacent surfaces.
- .4 Finish concrete floor surfaces in accordance with CAN3-A23.1M.
- .5 Uniformly spread, screed, and float concrete. Do not use grate tampers or mesh rollers. Do not spread concrete by vibration.
- .6 Steel trowel surfaces that will receive carpeting, resilient flooring.
- .7 Steel trowel all surfaces left exposed to view.
- .8 Apply hardener on concrete floor surfaces that do not receive additional flooring material. Apply in accordance with manufacturer's recommendations.
- .9 Apply sealer on floor surfaces to receive hardener. Apply in accordance with manufacturer's recommendations.
- .10 Saw cut control joints as called for to CAN3-A23.3-M94.

3.4 TOLERANCES

- .1 Maintain surface flatness, with maximum variation of 3 mm in 3 m.
- .2 In areas with floor drains, maintain floor level at walls and pitch surfaces uniformly to drains at 20 mm per meter nominal as indicate on drawings.

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Drypacking of gap between precast/prestressed slabs at all locations where load bearing walls are parallel to length of slab.
- .2 Perimeter caulking.
- .3 Electrical holes.
- .4 Concrete topping

1.2 REFERENCES

- .1 CAN/CSA-A23.1-09/A23.2-09 - Concrete Materials and Methods of Concrete Construction/ Methods of Test for Concrete.
- .2 CSA-A23.3-04 (R2010) - Design of Concrete Structures.
- .3 CSA-A23.4-09 - Precast Concrete - Materials and Construction.
- .4 CSA-A3000-08 - Cementitious Materials Compendium.
- .5 CSA-G40.20-04/G40.21-04 - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
- .6 CSA-W47.1-09 - Certification of Companies for Fusion Welding of Steel.
- .7 CPCI (Canadian Precast/Prestressed Concrete Institute) Design Manual – 4th Edition.
- .8 ASTM A416/A416M-06 - Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
- .9 ASTM A123/A123M-09 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .10 PCI (Precast Concrete Institute) MNL 116 Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
- .11 CSA W59-03 (R2008) Welded Steel Construction (Metal Arc Welding).
- .12 CSA W186-M1990 (R2007) Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .13 PCI (Precast Concrete Institute) Manual for Design of Hollowcore Slabs.

1.3 PERFORMANCE REQUIREMENTS

- .1 Size components to withstand design loads as per the Contract documents.
- .2 Maximum Allowable Deflection of Planks as per CSA A23.3 and the Contract documents.
- .3 Design components to accommodate construction tolerances, as per relevant CSA codes.

- .4 Precast components to be designed with concrete mix that will achieve 41 MPa compressive strength at 28 days, with properties according to CSA A23.1 Table 2 for Class N exposure. Slump and air tests not applicable according to CSA A23.1 Clause 8.9.6.
- .5 Grout mix to be 20 MPa at 28 days.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Hollowcore Manufacturer to provide information and drawings to Contractor to coordinate with other work having a direct bearing on work of this section.
 - .2 Contractor to coordinate field cut openings with affected section.
- .2 Pre-installation Meetings:
 - .1 Contractor to convene one (1) week before starting work of this section.
 - .2 Contractor to discuss anchor and weld plate locations, sleeve locations, and cautions regarding cutting or core drilling.

1.5 QUALIFICATIONS OF MANUFACTURER

- .1 Fabricate precast/prestressed concrete elements certified by the Canadian Standards Association in the appropriate category(ies) according to CSA Standard A23.4-00 "Precast Concrete - Materials and Construction". The precast concrete manufacturer shall be certified in accordance with the CSA Certification program for Structural Precast/Prestressed Concrete prior to submitting a Bid and must specifically verify as part of the Bid that he/she is currently certified in the appropriate category(ies):
 - .1 Precast Concrete Products - Architectural
(I) Non-Prestressed or (II) Prestressed
 - .2 Precast Concrete Products - Structural
(I) Non-Prestressed or (II) Prestressed
 - .3 Precast Concrete Products - Specialty
(I) Non-Prestressed or (II) Prestressed
- .2 Only precast concrete elements fabricated by certified manufacturers are acceptable to The City.
- .3 Certification must be maintained for the duration of the fabrication and erection for the project. Fabricate precast concrete elements in accordance with Manitoba Building Code requirements.
- .4 The precast concrete manufacturer shall be a member in good standing with the Canadian Precast/Prestressed Concrete Institute (CPCI) and have a proven record and satisfactory experience in the design, manufacture and erection of precast concrete facing units of the type specified. The company shall have adequate financing, equipment, plant and skilled personnel to detail, fabricate and erect the work of this Section as required by the Specification and Drawings. The size of the plant shall be adequate to maintain the required delivery schedule.

1.9 QUALITY ASSURANCE

- .1 Perform welding to CSA-W59-03 (R2008) and W186-M1990 (R2007).
- .2 Welder: Qualified within previous twelve (12) months to CSA-W47.1-09.

- .3 Maintain plant records and quality control program during production of precast planks. Make records available upon request.
- .4 Fabricator Qualifications: CPCI Certified Company specializing in manufacturing the Products specified in this section with [documented] experience.
- .5 Erector: Company specializing in performing the work of this section with minimum five (5) years documented experience.
- .6 Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.

1.6 SUBMITTALS FOR REVIEW

- .1 Product Data: Indicate standard component configuration, design loads, deflections, and cambers.
- .2 Shop Drawings: Indicate plank locations, connection details, edge conditions, bearing requirements, support conditions, dimensions, openings, [openings intended to be field cut.] and relationship to adjacent materials, to be stamped, signed and dated by a qualified engineer licensed in the province of Manitoba.
- .3 Installation Data: Fabricator's special installation requirements, indicating special procedures and perimeter conditions requiring special attention.

1.7 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for design load and on-site handling requirements.
- .2 Conform to NBC equivalent thickness to achieve 1 hour rating for floor assembly.

1.8 DELIVERY, STORAGE, AND PROTECTION

- .1 Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
- .2 Mark each member with date of production.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Cement, aggregates, water, admixtures: To CSA A23.4 and CSA A23.1.
- .2 Prestressing steel: Uncoated 7 wire cable conforming to CSA G279.
- .3 Reinforcing steel: To CSA G30.18.
- .4 Anchorages and couplings: To CSA A23.1.
- .5 Embedded steel: To CSA G40.21, Type M300W
- .6 Welding materials: To CSA W48.1.

- .7 Bearing pads: 3mm masonite smooth one side.
- .8 Insulation: Expanded polystyrene to CAN/CGSB-51-20.
- .9 Air entrainment admixtures: To CSA A266.1.
- .10 Chemical admixtures: To CSA A266.2.

2.2 CONCRETE MIXES

- .1 Use concrete mix designed to produce 41 MPa (6000 psi) compressive strength at 28 days with a maximum water/cement ratio to CSA A23.1, Table 7 for Class D exposure.
- .2 Air entrainment of concrete mix: To CSA A266.4.
- .3 Admixtures: To CSA A266.4, CSA A266.5.
- .4 Do not use calcium chloride or products containing calcium chloride.

2.3 GROUT MIX

- .1 Cement grout: One-part type 10 Portland cement 2 1/2 parts sand, sufficient water for placement and hydration.

2.4 FABRICATION

- .1 Manufacture units in accordance with CSA A23.4.
- .2 Mark each precast unit to correspond to the identification mark on shop drawings for location on a part of unit which will not be exposed.
- .3 Provide hardware suitable for handling elements.
- .4 Provide 50mm (2") thick insulation plug at each cell end of hollow core at exterior [optional].
- .5 Nominal Thickness: 203 mm.
- .6 Nominal Plank Width: 1220 mm.

2.6 FINISHES

- .1 Plant Finish: Top surface: as extruded or required by Contract documents or floor system design requirements.
- .2 Plant Finish: Bottom surface: as extruded; may contain small surface holes caused by small air bubbles, minor chipping, or spalling at edges or ends, without major discolouration.
- .3 Supporting Steel Devices: Hot dip galvanized.

2.8 SOURCE QUALITY CONTROL [AND TESTS]

- .1 Provide testing and analysis of site placed concrete and grout as required by Contract documents.

- .2 Provide shop inspection and testing for stressing strands.
- .3 Test samples in accordance with specified standards.

Part 3 Execution

3.1 EXAMINATION

- .1 Contractor to verify that site conditions are ready to receive work and field measurements are as indicated on approved drawings.
- .2 Verify supporting structure is ready to receive work.

3.2 ERECTION

- .1 Erect elements within the allowable tolerances indicated or specified.
- .2 Erection tolerances to be non-cumulative in accordance with CSA A23.4, Section 10.
- .3 Install 3mm masonite bearing pads, smooth side up when bearing on concrete or masonry supports.
- .4 Set units in a tight, level position on true level bearing surface provided by others. Minimum bearing 90mm (3 1/2") on masonry and 75mm (3") on structural steel.
- .5 Fasten precast/prestressed units in place as indicated on reviewed shop drawings.
- .6 Level differential elevation of horizontal joints with grout to slope not more than 1:12.
- .7 Clean field welds with a wire brush and touch up with primer.
- .8 Field cut holes and openings up to 150mm (6") diameter for mechanical trades. Openings larger than 150mm (6") to be located on shop drawings at time of approval to be formed in the plant or cut in field. Do not cut reinforcing without prior approval of the precast hollow core slab manufacturer and the Engineer.

3.3 TOPPING

- .1 Contractor shall provide a suitable top finish to accept direct application of finished flooring/roofing as per room finish schedule.
- .2 Where concrete topping is to be applied by others, refer to the appropriate specifications. The top surface of the precast/prestressed slabs is to be raked (roughened) for bonding of the topping. Thicknesses as indicated on drawings.

3.4 CLEANING

- .1 Clean weld marks, dirt, or blemishes from surface of exposed members, caused by the work of this trade.
- .2 Clean field welds with wire brush and touch up with galvanized paint.
- .3 Upon completion of the work in this section, all surplus materials and debris shall be removed from this site.

3.5 PROTECTION OF FINISHED WORK

- .1 Protect members from damage caused by field welding or erection operations performed by the work of this trade.
- .2 Provide non-combustible shields during welding operations, as required.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for both load bearing and non-load bearing, plant-precast architectural concrete.

1.2 WORK INCLUDED

- .1 Design, supply, delivery and installation of:
 - .1 Precast concrete insulated wall panels.
 - .2 Field sealing of all precast concrete wall panels inside where accessible and outside between precast panels and between precast and foundation walls.
 - .3 Take delivery and cast into precast work boxes/inserts/openings required by other trades.
- .2 Supply information required for installation of bracing, supports, inserts and similar accessories required for work under this Contract supplied and installed by others.
- .3 Provide on-site review by Professional Engineer registered in the Province of Manitoba at commencement of wall panel erection to verify proper handling, bracing, erection and connection procedures are being observed in accordance with Precast Engineer design assumptions. Provide Certification letter under seal at completion of precast wall panel erection stating that wall panel erection has been completed in accordance with design assumptions, sage working practices and in a good workmanlike manner to appropriate field tolerances.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A775/A775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .2 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - .3 ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness.
 - .4 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CSA-A23.3, Design of Concrete Structures.
 - .3 CAN/CSA-A23.4/A251, Precast Concrete-Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products.
 - .4 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).

- .1 CAN/CSA-A23.5, Supplementary Cementing Materials.
- .5 CAN/CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.
- .6 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .7 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .8 CSA G279, Steel for Prestressed Concrete Tendons (Metric Version).
- .9 CAN/CSA-S6, Canadian Highway Bridge Design Code.
- .10 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).
- .11 CSA W59, Welded Steel Construction (Metal Arc Welding) (Metric Version).
- .12 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 PCI (Precast Concrete Institute) MNL 116 Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
- .5 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.4 DESIGN REQUIREMENTS

- .1 Design precast elements to CSA-A23.3, CSA-A23.4 and to resist handling, stockpiling, shipping and erection stresses.
- .2 Design precast elements to carry loads specified by as indicated, in accordance with NBCC and the Manitoba Building Code. Design shall include resistance to creep, shrinkage and temperature effects, as well as wind and earthquake loads.
- .3 Design connections/attachments of precast elements to load/forces specified by Professional Engineer and to compensate for unevenness and dimensional differences in structure to which they are secured. Connections shall be designed to withstand long-term corrosion for exposed elements.
- .4 Tolerate structural deflection of span/360 due to live load and distortion of structure, under design criteria conditions, without imposing load on panel assembly.
- .5 Submit three copies of detailed calculations and design drawings for typical precast elements and connections.
- .6 Requirements: Design and fabricate insulated panels, brackets and anchorage devices so that when installed they will:
 - .1 Compensate for allowable construction tolerances in structure to which they are secured.
 - .2 Tolerate structural deflection of span/360 due to live load and distortion of structure, without imposing load on panel assembly.
 - .3 Adequately sustain themselves, and superimposed wind, snow loads, without exceeding deflection of span/360.
 - .4 Permit no water infiltration into the building under design loads.
- .7 Insulate panels to provide a minimum RSI 3.52 (R20) wall assembly.

1.5 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.4, Section 10, except as noted herein.

1.6 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with CSA-A23.4, CSA-A23.3, Section 01330 – Submittal Procedures and requirements of this Section.
- .2 Submit fully detailed and dimensioned shop drawings. Include the following items:
 - .1 Design calculations for items designed by manufacturer.
 - .2 Tables and bending diagrams of reinforcing steel.
 - .3 Finishing schedules.
 - .4 Methods of handling and erection.
 - .5 Openings, sleeves, inserts and related reinforcement, including embedded handling hardware.
- .3 Consult reviewed shop drawings relating to interface elements and show exact location of inserts and anchors required to be cast in precast units for interface elements.
- .4 Provide shop drawings to, and obtain approvals from, the Authorities Having Jurisdiction prior to fabrication.
- .5 Each drawing submitted shall bear stamp and signature of qualified Professional Engineer registered or licensed in the Province of Manitoba, Canada.

1.7 SAMPLES:

- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures. Unless otherwise noted, minimum size 300 x 300 x 25 mm. Finish exposed face as described in this Section. Make samples until final unconditional Contract Administrator's approval is obtained. All work shall match approved production run samples.
- .2 Produce, deliver and erect where directed by Contract Administrator on project site, full size precast concrete units incorporating required details and co-operate with work of adjoining trades to demonstrate

1.8 QUALIFICATIONS OF MANUFACTURER

- .1 Precast concrete elements shall be fabricated and erected by a manufacturing plant certified by Canadian Standards Association according to CSA A251. Precast concrete manufacturer shall be certified prior to submitting a Bid and to specifically verify as part of the Bid that the plant is currently certified in Architectural Precast Concrete Products (designated category AC per CSA A251). Only precast elements fabricated in such certified plants shall be acceptable to The City, and plant certification shall be maintained for duration of fabrication, erection and until warranty expires.
- .2 The precast concrete manufacturer shall have a proven record and satisfactory experience in the design, manufacture and erection of architectural precast concrete of the type specified. The company shall have adequate financing, equipment, plant, and skilled personnel to detail, fabricate and erect the work of this Section. The size of the plant shall be adequate to maintain the required delivery schedule.

1.9 BY-LAWS AND CODES

- .1 Conform with applicable requirements of the Manitoba Building Code, National Building Code and local authorities having jurisdiction.
- .2 Design and provide reinforcement, anchors and supports as required by codes and to Contract Administrator approval. Submit relevant design data prepared by a Registered Structural Engineer for approval if so requested by the Contract Administrator.

1.10 DELIVERY, STORAGE AND PROTECTION

- .1 Accept full responsibility for delivery, handling and storage of units.
- .2 Deliver, handle and store precast units [in a near vertical plane at all times], and by methods approved by the manufacturer. Do not permit units to contact earth or staining influences or to rest on corners. Do not stockpile defective units but remove from site.
- .3 Construct easels for stacking units and place non-staining spacers between each unit. If wood is used it shall be wrapped with polyethylene.
- .4 Protect holes and reglets from water and ice during freezing weather.

1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .2 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .3 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

1.12 WARRANTY

- .1 The Contractor hereby warrants that the precast architectural elements will not spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, in accordance with GC12.3, for two years.
- .2 Warranty shall be in writing and shall warrant work under this Section to be free from defects for the period stipulated.

Part 2 Products

2.1 MATERIALS

- .1 Cement, colouring material, aggregates, water, admixtures: to CSA-A23.4 and CSA-A23.1. Supplementary cementing materials: to CSA-A23.5.
- .2 Exposed aggregate: to match selected finish sample.
- .3 Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.
- .4 Reinforcing steel: to CSA-G30.18.

- .5 Welded wire fabric: to CSA-G30.5.
- .6 Forms: to CSA-A23.4.
- .7 Hardware and miscellaneous materials: to CSA-A23.4.
- .8 Anchors and supports: to CSA-G40.21, Type 300 W, galvanized after fabrication.
- .9 Welding materials: to CSA-W48.1.
- .10 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m² to CAN/CSA-G164.
- .11 Steel primer: to CAN/CGSB-1.40.
- .12 Air entrainment admixtures: to CSA-A23.1.
- .13 Chemical Admixtures: to CSA-A23.1.
- .14 Zinc-rich primer: to CAN/CGSB-1.181.
- .15 Surface retarder: water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.
- .16 Insulation: Extruded polystyrene (XPS) to CAN/ULC-S701, Type 4 and Polyisocyanurate Insulation (ISO) to CAN/ULC-S704, Type 1, Class 2. See Section 07 21 13 – Board Insulation.
- .17 Bearing pads: neoprene, 60 durometer hardness to ASTM D2240, and 17 MPa minimum tensile strength to ASTM D412, moulded to size or cut from moulded sheet.
- .18 Shims: plastic or steel.
- .19 Curing compound: not permitted without prior approval of Contract Administrator.

2.2 CONCRETE MIXES

- .1 Proportion normal density concrete in accordance with CSA-A23.4, Alternative 1, to give following properties:
 - .1 Cement: use Type 10 [Type 30] Portland cement. Use white or grey cement in facing matrix.
 - .2 Minimum compressive strength at 28 days: 30 MPa.
 - .3 Class of exposure: F-2.
 - .4 Nominal size of coarse aggregate: 12 mm.
 - .5 Maximum water/cementing material ratio: 0.50.
 - .6 Air content: 4 to 7%.
- .2 Use of calcium chloride is not permitted.

2.3 MANUFACTURE

- .1 Manufacture units in accordance with CSA-A23.4.

- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit which will not be exposed.
- .3 Design and attach anchors and inserts to precast concrete elements to carry design loads.
- .4 Galvanize anchors and steel embedments after fabrication and touch up with zinc-rich primer after welding.
- .5 Ensure that surfaces to receive sealant are smooth and free of laitance to provide a suitable base for adhesion. Ensure that release agents do not deleteriously affect the sealing of the joints.
- .6 Cast panels face down in accurate rigid forms designed to withstand high-frequency vibration. Set reinforcing anchors and auxiliary items as detailed. Cast in anchors, blocking and inserts supplied by other Sections as required to accommodate their work. Vibrate concrete continuously during casting until full thickness is reached. Provide necessary holes and sinkages for flashings, anchors, cramps, etc. as indicated and/or required. Separately and accurately batch cement and aggregates uniformly by weight to ensure maintenance of even and uniform appearance.
- .7 Anchors, lifting hooks, shear bars, spacers and other inserts or fittings required shall be as recommended and/or designed by manufacturer for a complete and rigid installation. Lift hooks shall be adequately sized to safely handle panels according to panel dimension and weight. Anchors/inserts shall be concealed where practical.
- .8 Burn off lift cables, paint and fill in where required if unit is damaged due to burn off.

2.4 FINISHES

- .1 Final finish and color of precast units to be approved by Contract Administrator.
 - .1 Interior exposed side of panels to be smooth finish: a cast using smooth steel form liners.
 - .2 Exterior exposed side of panels to be rubbed finish:
 - .1 Rub exposed face surface of precast concrete panels with carborundum bricks and water until hollows, lines, form marks and surplus materials have been removed.
 - .2 Leave surface finish uniformly smooth.
 - .3 Do not use mortar or grout in rubbing, other than cement paste drawn from green concrete by rubbing process.
 - .4 Clean panels.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Contract Administrator with certified copies of quality control tests related to this project as specified in CSA-A23.4 and CSA-A251.
- .2 Provide Contract Administrator with records from in-house quality control programme based upon plant certification requirements to for inspection and review.
- .3 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

- .4 Precast plants shall keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide them to Contract Administrator for review upon request.

Part 3 Execution

3.1 GENERAL

- .1 Do precast concrete work in accordance with CSA-A23.4 and CSA-A23.3.
- .2 Supply anchors for precast units required to be cast into the concrete frame to the Contractor for installation. Provide such items in ample time to meet construction program. Supply layout drawings as per locating accurately the position of all cast-in items to be installed.
- .3 Provide and install sufficient temporary bracing to brace precast units adequately, at all stages of construction, so that units will safely withstand loads to which they may be subjected. This temporary bracing shall remain in position until all connections have been completed.

3.2 ERECTION

- .1 Erect precast elements straight, level and square within allowable tolerances as specified.
- .2 Precast supplier to have a Professional Engineer, registered in the Province of Manitoba, on site at start of erection to verify proper site methods and shoring.
- .3 Non-cumulative erection tolerances in accordance with CSA-A23.4, Section 10.
- .4 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .5 Grout underside of unit bearing plates where indicated with shrinkage compensating grout.
- .6 Fasten precast panels in place as indicated on reviewed shop drawings.
- .7 Secure bolts with lockwashers, tack-weld nut to bolt, or damage bolt thread.
- .8 Uniformly tighten bolted connections with torque indicated.
- .9 Do not weld or secure bearing plates at sliding joints.
- .10 Set units dry, without mortar, attaining specified joint dimension with steel shims.
- .11 Clean field welds with wire brush and touch-up galvanized finish with zinc-rich primer.
- .12 Remove shims and spacers from joints of non-load bearing panels after fastening but before sealant is applied.
- .13 Apply sealant to joints in precast panels to Section 07 92 00 – Joint Sealing.

3.3 WELDING

- .1 Do welding in accordance with CSA-W59 for welding to steel structures and CSA-W186 for welding of reinforcement.

3.4 CLEANING

- .1 Obtain approval of cleaning methods from Contract Administrator before cleaning soiled precast concrete surfaces.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA A23.4-00/A251-00 Precast Concrete - Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products

1.2 SCOPE OF WORK

- .1 Provide precast splash pads where required and shown on drawings to ensure positive drainage away from building at downspout or drain outlet locations.

1.3 DRAINAGE STANDARD

- .1 Install splash pads to guarantee a minimum slope of 3% away from building without settlement for a minimum distance of 3 meters.

1.4 PROTECTION

- .1 Protect bench marks and existing structures, lawns, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic.

1.5 WARRANTY

- .1 Make good any settlement of splash/pads fill and topsoil for a period of one year from Substantial Completion of the project. Pay all costs in making good paving, lawns, etc., damaged by such settlement, at no cost to The City or Contract Administrator.

Part 2 Products

2.1 PRECAST CONCRETE SPLASH PADS

- .1 Precast Concrete Rain Natural Splash pad: to be Barkman Concrete Ltd. 12" mm (305 mm) wide x 30" (762 mm) long, model No: 105604. Locate at all scupper locations
- .2 Precast Concrete Rain Natural Splash pad: to be Barkman Concrete Ltd. 14.5" (368 mm) wide x 51" (1295 mm) long, model No: 105608. Locate at all sump pit discharges.
 - .1 Mounting Brackets for 51" (1295 mm) Splash Pads shall be Barkman Concrete Mounting Bracket, Model No: 105610
- .3 Levelling course: shall be 6 mm dia. crushed limestone down
- .4 Contact for Splash Pads and Mounting Brackets:
 - Barkman Concrete
 - 909 Gateway Road
 - Winnipeg. MB R2K 3L1
 - Telephone No. (204) 667-3310

2.2 FILL MATERIALS

- .1 Sub-surface gravel: Pit-run, crushed natural stone, free from shale, clay, friable materials and debris.
- .2 Surface Gravel (exposed): Clean natural stone, free from clay, shale and organic matter, 19mm to 38mm (5/8" to 1 1/2") size.
- .3 Sand: Clean natural river or bank sand, free from silt, clay, loam friable or soluble materials, and organic matter.
- .4 Crushed Stone: Angular crushed natural limestone, free from shale, organic matter and debris, maximum stone size 12mm (1/2") (75% passing).
- .5 Sub-soil: Free from roots, rock larger than 76mm (3") in size and building debris.

2.3 TOPSOIL

- .1 In accordance with Section 32 91 19.13 – Topsoil Placement and Grading.

2.4 SOD

- .1 In accordance with Section 32 92 23 – Sodding.

Part 3 Execution

3.1 PREPARATION

- .1 Determine extent of modification required to existing surface conditions to accommodate new splash pads.
- .2 Locate splash pads to ensure best drainage away from building and the least interference with landscape or building elements such as shrubs, walkways, windows etc.
- .3 Perform minor excavations as required to sub-surface for final grades.
- .4 Carefully remove existing sod and retain for replacement as required.
- .5 Firmly compact sub-soil to receive any required fill.

3.2 BACKFILLING AND TOPSOIL

- .1 In accordance with Sections 31 23 10 – Excavation, Trenching and Backfilling and 32 91 19.13 – Topsoil Placement and Grading.
- .2 Backfill areas to grades, levels and elevations as required with appropriate fill and topsoil materials to ensure positive drainage away from the building.
- .3 Perform backfilling and topsoil operations systematically and as early as possible to allow maximum time for natural settlement and required compaction.
- .4 Firmly compact fill to receive finished surface material.

3.3 GRAVEL BED

- .1 In accordance with Section 32 11 23 – Aggregate Base Courses.
- .2 Provide a compacted gravel bed of minimum 100 mm (4") depth beneath new splash pads.
- .3 Gravel levelling base to extend min. 75 mm (3") past splash pads.

3.4 PLACING OF SOD

- .1 In accordance with Section 32 92 23 – Sodding.

3.5 SPLASH PADS PLACEMENT

- .1 Place splash pads on compacted material to fully support concrete with no hollows or bows below.
- .2 Ensure required 3% slope.
- .1 Install Barkman Concrete Natural Splash Pads as per manufacturer's specifications.
- .2 Install Barkman Concrete Mounting Brackets as per manufacturer's specifications

3.6 CLEAN-UP

- .1 Remove all excess materials and leave the site finished and in clean condition in accordance with Section 01 74 00 – Cleaning and Waste Management.

END OF SECTION