

Part 1 General

1.1 Related Sections

- .1 Section 07900 - Joint Sealants.

1.2 References

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-O86.1-94, Engineering Design in Wood (Limit States Design).
 - .3 CSA O121-M1978, Douglas Fir Plywood.
 - .4 CSA O151-M1978, Canadian Softwood Plywood.
 - .5 CSA O153-M1980, Poplar Plywood.
 - .6 CAN3-O188.0-M78, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
 - .7 CSA O437 Series-93, Standards for OSB and Waferboard.
 - .8 CSA S269.1-1975, Falsework for Construction Purposes.
 - .9 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 Shop Drawings

- .1 Submit shop drawings for formwork and falsework in accordance with Section 01330 - Submittal Procedures.
- .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.
- .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- .4 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Manitoba, Canada.

1.4 Waste Management and Disposal

- .1 Place materials defined as hazardous or toxic waste in designated containers.
- .2 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .3 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.
 - .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.
- .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 liner:
 - .1 Plywood: high density overlay Douglas Fir to CSA O121.
 - .2 Waferboard: to CAN3-O188.0.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm²/s at 40°C, flashpoint minimum 150°C, open cup.
- .6 Falsework materials: to CSA-S269.1.
- .7 Sealant: to Section 07900 - Joint Sealers.

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 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners , joints, unless specified otherwise.
- .12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .13 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.
- .14 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .15 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 Removal and Reshoring

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 5 days for walls and sides of beams.
 - .2 5 days for columns.
 - .3 7 days for beam soffits, slabs, decks and other structural members, or 5 days when replaced immediately with adequate shoring to standard specified for falsework.
 - .4 5 days for footings and pile caps.
- .2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 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.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

Construction of Cindy Klassen Recreation Complex
Facility Enhancement Project
The City of Winnipeg
Bid Opportunity No.: 518-2007

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END OF SECTION

Part 1 General

1.1 Related Sections

- .1 Section 03300 - Cast-in-Place Concrete.

1.2 References

- .1 American Concrete Institute (ACI)
 - .1 ACI 315R-80, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
 - .1 ANSI/ACI 315-80, Details and Detailing of Concrete Reinforcement.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 775/A 775M-91c, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN3-A23.3-94, Design of Concrete Structures for Buildings.
 - .3 CSA G30.3-M1983(R1991), Cold Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5-M1983(R1991), Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CSA G30.14-M1983(R1991), Deformed Steel Wire for Concrete Reinforcement.
 - .6 CSA G30.15-M1983(R1991), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - .7 CAN/CSA-G30.18-M92, Billet-Steel Bars for Concrete Reinforcement.
 - .8 CAN/CSA-G40.21-M92, Structural Quality Steels.
 - .9 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .10 CSA W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 Shop Drawings

- .1 Submit shop drawings including placing of reinforcement in accordance with Section 01330- 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, spacings and locations 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. Provide type C tension lap splices unless otherwise indicated.

1.4 Waste Management and Disposal

- .1 Separate and recycle waste materials.

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 400, 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 Deformed steel wire for concrete reinforcement: to CSA G30.14.
- .6 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.
- .7 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .8 Mechanical splices: subject to approval of Contract Administrator.
- .9 Plain round bars: to CAN/CSA-G40.21.

2.2 Fabrication

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

2.3 Source Quality Control

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

- .2 Upon request inform Contract Administrator of proposed source of material to be supplied.

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 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 03100 - Concrete Forms and Accessories.
- .2 Section 03200 - Concrete Reinforcement.
- .3 Section 03410 - Plant – Precast Structural Concrete.
- .4 Section 04051 - Masonry Procedures.
- .5 Section 05500 - Metal Fabrications.

1.2 References

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-95, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
 - .2 ASTM C260-94, Specification for Air-Entraining Admixtures for Concrete.
 - .3 ASTM C309-94, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .4 ASTM C494-92, Specification for Chemical Admixtures for Concrete.
 - .5 ASTM D412-92, Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
 - .6 ASTM D624-91, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .7 ASTM D1751-83(1991), Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .8 ASTM D1752-84(1992), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CGSB 81-GP-1M-77, Flooring, Conductive and Spark Resistant.
- .3 Canadian Standards Association (CSA)
 - .1 CSA-A3001, Portland Cement.
 - .2 CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
 - .3 CSA-A23.2-04, Methods of Test for Concrete.
 - .4 CAN/CSA-A23.5-M86(R1992), Supplementary Cementing Materials.
 - .5 CAN/CSA A363-M88(R1996), Cementitious Hydraulic Slag.

1.3 Samples

- .1 Submit samples in accordance with Section 01330 - Submittal Procedures.
- .2 At least 4 weeks prior to commencing work, inform Contract Administrator of proposed source of concrete.

1.4 Certificates

- .1 Submit certificates in accordance with Section 01330 - Submittal Procedures.
- .2 Minimum 4 weeks prior to starting concrete work submit to Contract Administrator Consultant 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 Waterstops.
 - .9 Waterstop joints.
 - .10 Joint filler.
- .3 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.

1.5 Quality Assurance

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01450 - Quality Control for Contract Administrator's approval for following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.

1.6 Waste Management and Disposal

- .1 Separate and recycle waste materials.
- .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, noncombustible 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 CSA A3001.
- .2 Supplementary cementing materials: to CAN/CSA-A23.5.
- .3 Cementitious hydraulic slag: to CAN/CSA-A363.
- .4 Water: to CSA-A23.1.
- .5 Aggregates: to 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 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 portions) 100 to 125 %.
 - .4 Dry pack to manufacturer's requirements.
- .9 Curing compound: to CSA-A23.1 white and to ASTM C309.
- .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 Ribbed waterstops: extruded PVC Arctic Grade of sizes indicated with shop welded corner and intersecting pieces with legs not less than 300 mm long:
- .12 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.

2.2 Mixes

- .1 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1 to give following quality for concrete in pile caps, grade beams, and all exterior concrete.
 - .1 Cement:
 - .1 Type HS Portland cement.
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Maximum water-to-cementing materials ratio 0.40.
 - .4 Class of exposure: S1.
 - .5 Nominal size of coarse aggregate: 20 mm.
 - .6 Slump at time and point of discharge: 50 to 100 mm.
 - .7 Air content: 4 to 7 %.
 - .8 Chemical admixtures: following admixtures in accordance with ASTM C494, type, quantity, water reducing, strength increasing, set retarding, accelerating strength increasing, air entraining, super plasticizers.
- .2 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1 to give following quality for concrete in slabs, columns, walls.
 - .1 Cement:
 - .1 Type GU Portland cement.
 - .2 Minimum compressive strength at 28 days: 30 MPa.
 - .3 Maximum water-to-cementing materials ratio 0.55.
 - .4 Class of exposure: N.
 - .5 Nominal size of coarse aggregate: 20 mm.
 - .6 Slump at time and point of discharge: 50 to 100 mm.
 - .7 Chemical admixtures: following admixtures in accordance with ASTM C494, type, quantity, water reducing, strength increasing, set retarding, accelerating, strength increasing, air entraining, super plasticizers.
- .3 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1 to give following quality for concrete in concrete topping.
 - .1 Cement:
 - .1 Type GU Portland cement.
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Maximum water-to-cementing materials ratio 0.45.
 - .4 Class of exposure: N.
 - .5 Nominal size of coarse aggregate: 12 mm.
 - .6 Slump at time and point of discharge: 50 to 100 mm.

- .7 Chemical admixtures: following admixtures in accordance with ASTM C494, type, quantity, water reducing strength increasing, set retarding, accelerating, strength increasing, air entraining, super plasticizers.
- .4 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1 to give following quality for concrete in concrete masonry.
 - .1 Cement:
 - .1 Type GU Portland cement.
 - .2 Minimum compressive strength at 28 days: 20 MPa.
 - .3 Maximum water-to-cementing materials ratio 0.55.
 - .4 Class of exposure: N.
 - .5 Nominal size of coarse aggregate: 10 mm.
 - .6 Slump at time and point of discharge: 50 to 100 mm.
 - .7 Chemical admixtures: following admixtures in accordance with ASTM C494, type, quantity, water reducing strength increasing, set retarding, accelerating, strength increasing, air entraining, super plasticizers.

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 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 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 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.
- .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 minimum 25 mm larger in diameter than bolts used or to manufacturer's recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with shrinkage compensating grout or epoxy grout.
- .4 Dovetail anchor slots:
 - .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
 - .2 Install continuous vertical anchor slots at 800 mm oc where concrete walls are masonry faced.
- .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 CSA-A23.1.
 - .2 Use procedures acceptable to Contract Administrator or those noted in 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 Provide screed, scratch, finish where bonded topping or terrazzo is to be applied. Provide depressions to accommodate bonded topping or terrazzo.
 - .5 Provide screed float swirl-trowelled finish unless otherwise indicated.
 - .6 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .7 Toppings.
 - .1 Topping mixture to meet following requirements:
 - .1 Bonded overlay, minimum 50 mm thick.
 - .2 Place bonded topping over hardener base course in accordance with CSA-A23.1 and topping manufacturer's recommendations.
 - .3 Follow instructions by Contract Administrator in case conflicting requirements arise between CSA-A23.1 and manufacturer's recommendations.
 - .4 Apply latex bonding agent modified cement/sand grout to base course in accordance with CSA-A23.1 and manufacturer's recommendations before placing bonded topping. Observe manufacturer's safety recommendations.
- .8 Waterstops.

- .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
 - .2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Contract Administrator.
- .9 Joint fillers.
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Contract Administrator. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .2 Locate and form isolation, construction, and expansion joints as indicated. Install joint filler.
 - .3 Use 12 mm thick joint filler to separate slabs from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

3.3 Site Tolerance

- .1 Concrete tolerance in accordance with CSA-A23.1 straight edge method.

3.4 Field Quality Control

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Contract Administrator in accordance with CSA-A23.1 and Section 01450 - Quality Control.
- .2 Owner will pay for costs of tests as specified in Section 01293 - Payment Procedures: Testing Laboratory Services.
- .3 Contract Administrator will arrange for additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

END OF SECTION

Part 1 General

1.1 Related Sections

- .1 Section 03300 - Cast-in-Place Concrete.

1.2 References

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 412-98a, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - .2 ASTM D 2240-97e1, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-92, Ready Mixed Organic Zinc-Rich Coating.
 - .3 CAN/CGSB-51.20-M87, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CAN3-A23.3-94, Design of Concrete Structures for Buildings.
 - .3 CAN3-A23.4-94, Precast Concrete - Materials and Construction.
 - .4 CSA-A251-M1982(R1998), Qualification Code for Manufacturers of Architectural and Structural Precast Concrete.
 - .5 CSA-G30.15-M1983(R1991)(R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - .6 CAN/CSA-G30.18-M92(R1998), Billet-Steel Bars for Concrete Reinforcement.
 - .7 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .8 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .9 CSA-G279- M1982(R1998), Steel for Prestressed Concrete Tendons.
 - .10 CSA-W47.1-92(R1998), Certification of Companies for Fusion Welding for Steel Structures.
 - .11 CSA-W48.1-M1991(R1998), Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.
 - .12 CSA-W59-M1989, Welded Steel Construction (Metal Arc Welding).
 - .13 CSA-W186-M1990(R1998), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 Design Requirements

- .1 Design precast elements to CAN3-A23.3 and CAN3-A23.4 to carry handling stresses.

- .2 Design precast elements to carry loads as indicated, in accordance with National Building Code of Canada (NBC).
- .3 Design connections/attachments of precast elements to load/forces specified.
- .4 Submit 6 copies of detailed calculations and design drawings for typical precast elements and connections for Contract Administrator for review 4 weeks prior to manufacture.

1.4 Performance Requirements

- .1 Tolerance of precast elements to CAN3-A23.4, Section 10.

1.5 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures, and in accordance with CAN3-A23.3 and CAN3-A23.4.
- .2 Include the following items:
 - .1 Design calculations for items designed by manufacturer.
 - .2 Details of prestressed and non-prestressed members, reinforcement and their connections.
 - .3 Camber.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
 - .6 Openings, sleeves, inserts and related reinforcement.
- .3 Ensure each drawing submitted bears stamp and signature of qualified professional engineer registered or licensed in provinces of Manitoba, Canada.

1.6 Qualifications

- .1 Precast concrete elements to be fabricated and erected by manufacturing plant certified by Canadian Standards Association in appropriate categories according to CSA-A251.
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender and to specifically verify as part of tender that plant is currently certified in appropriate categories, Structural, Prestressed, and Hollow-Core.
- .3 Only precast elements fabricated in such certified plants to be acceptable to owner, and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

1.7 Waste Management and Disposal

- .1 Separate and recycle waste materials.
- .2 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.

1.8 Warranty

- .1 Contractor hereby warrants that precast element will not spall or show visible evidence of corrosion of embedded steel and cracking, except for normal hairline shrinkage cracks, in accordance with CCDC GC 24, but for 5 years.

Part 2 Products

2.1 Materials

- .1 Cement, aggregates, water, admixtures: to CSA-A23.1 and CAN3-A23.4.
- .2 Reinforcing steel: to CAN/CSA-G30.18.
- .3 Prestressing steel tendons and bars: to CSA-G279.
- .4 Welded wire fabric: to CSA-G30.15.
- .5 Hardware and miscellaneous materials: to CSA-A23.1.
- .6 Forms: to CAN3-A23.4.
- .7 Anchors and supports: to CAN/CSA G40.21 Type 300 W galvanized after fabrication.
- .8 Welding materials: to CSA-W48.1.
- .9 Welding electrodes: to CSA-W48.1 and certified by Canadian Welding Bureau.
- .10 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m² to CAN/CSA-G164.
- .11 Zinc-rich primer: to CAN/CGSB-1.181.
- .12 Bearing pads: smooth, 3 mm high impact plastic coropad for main floor hollowcore.
- .13 Bearing pads: neoprene, 50 durometer hardness to ASTM D 2240, and 5.5 MPa minimum tensile strength to ASTM D 412, moulded to size or cut from moulded sheet, 10 mm thick, 75 mm wide continuous for second floor hollowcore.

2.2 Mixes

- .1 Concrete.
 - .1 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1, to give following properties: for concrete in piles.
 - .1 Cement: use Type HS Portland cement.
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Maximum water-to-cementing material ratio 0.40.

- .4 Class of exposure: S1.
- .5 Nominal size of coarse aggregate: 20 mm.
- .6 Air content: 4 to 7%.
- .2 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1, to give following properties: for concrete in hollowcore.
 - .1 Cement: use Type GU Portland cement.
 - .2 Minimum compressive strength at 28 days: 40 MPa.
 - .3 Class of exposure: N.
 - .4 Nominal size of coarse aggregate: 12 mm.
 - .5 Water cement ratio: 0.40.

2.3 Manufactured Units

- .1 Manufacture units in accordance with CAN3-A23.4, and CSA-A251.
- .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 Provide hardware suitable for handling elements.
- .4 Provide cardboard at each cell end of floor units of hollow core design.
- .5 Galvanize anchors and steel embedments after fabrication and touch up with zinc-rich primer after welding.

2.4 Finishes

- .1 Finish units to commercial grade to CAN3-A23.4, Section 24.

2.5 Source Quality Control

- .1 Provide Contract Administrator with certified copies of quality control tests related to this project as specified in CAN3-A23.4 and CSA-G279.
- .2 Inspect prestressed concrete tendons in accordance with CSA-G279.
- .3 Provide records from in-house quality control programme based upon plant certification requirements to Contract Administrator for inspection and review.
- .4 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .5 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Contract Administrator for review upon request.

Part 3 Execution

3.1 Erection

- .1 Do precast concrete work in accordance with CAN3-A23.4 and CAN3-A23.3.
- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .3 Non-cumulative erection tolerances in accordance with CAN3-A23-4, Section 10.
- .4 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .5 Grout underside of unit plastic bearing plates with shrinkage compensating grout.
- .6 Fasten precast units in place as indicated on reviewed shop drawings.
- .7 Clean field welds with wire brush and touch-up galvanized finish with zinc-rich primer.

3.2 Cleaning

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for pre-cast concrete parking curbs

1.2 RELATED SECTIONS

- .1 Section 01330 - Submittal Procedures
- .2 Section 03200 - Concrete Reinforcement

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Barkman Concrete Ltd. pre-cast Parking Bumper Curbs: Item # 43-30000.

2.2 FABRICATION

- .1 Fabricate: 200 mm wide x 140 mm high x 2438 mm long.
- .2 Finish: commercial grade; grey colour.
- .3 Fabricate 2 holes per unit, as indicated, to permit securing with curb anchors.

Part 3 Execution

3.1 INSTALLATION

- .1 Install curbs as indicated on the Construction Drawings.
- .2 Secure curbs in position by inserting curb anchors 15mm x 431mm into holes drilled in pavement and packing solidly with shrinkage compensating grout with top of anchor no higher than top of curb.
- .3 Replace damaged and defective units as directed by Contract Administrator.

END OF SECTION