

DIVISION 03 - CONCRETE

Section	Title	Pages
03 10 00	Concrete Forming	1-4
03 20 00	Concrete Reinforcing	5-8
03 30 00	Cast-in-Place Concrete	9-20
03 35 00	Concrete Finishing	21-22
03 41 13	Precast Concrete Hollow Core Planks	23-28

Division 04 – Masonry

Section	Title	Pages
04 22 00	Concrete Unit Masonry	29-36

Division 05 – Metals

Section	Title	Pages
05 12 00	Structural Steel Framing	37-44

Division 06 – Wood, Plastics, and Composites

Section	Title	Pages
06 10 00	Rough Carpentry	45-52

END OF TABLE



1 GENERAL

1.01 DESCRIPTION

- .1 Related work specified elsewhere:
 - .1 Curbs, Gutters, Sidewalks and Driveways Section 32 16 00
 - .2 Concrete Reinforcing Section 03 20 00
 - .3 Cast-in-Place Concrete Section 03 30 00
 - .4 Concrete Finishing Section 03 35 00
 - .5 Structural Steel Framing Section 05 12 00

1.02 REFERENCE STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 CSA A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/ Test Methods and Standard Practices for Concrete
- .2 CSA O86 Engineering Design in wood
- .3 CSA O121 Douglas Fir Plywood
- .4 CSA O151 Canadian softwood plywood
- .5 CSA O153 Poplar Plywood
- .6 CSA S269.1 Falsework for Construction Purposes
- .7 CSA S269.3 Concrete Formwork
- .8 Ontario Building Code

1.03 INSPECTION AND TESTING

- .1 Immediately before concrete is placed, all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, thoroughly clean, properly treated and free from snow, ice or other foreign materials.



- .2 Temporary openings shall be provided at the bottom of all deep units, such as columns and walls, to facilitate cleaning and inspection. In restricted units they shall be located so that water can be used to wash out debris. They shall be closed with patches flush on the inside. Cleanouts shall be located bearing architectural considerations in mind.
- .3 Forms shall not have patches, broken edges, or joint widths greater than 1.5 mm (1/16"), except for cleanouts as noted above.

2 PRODUCTS

2.01 MATERIALS

- .1 Forms
 - .1 Type A Concrete: Concrete form materials for this type of concrete shall be as per "Rough Form Finish", CSA A23.1, Section 24.3.5.
 - .2 Type B Concrete: Concrete form materials for this type of concrete shall be as per "Smooth Form Finish", CSA A23.1, Section 24.3.6. Form work shall be high density overlay plywood, 19 mm Douglas Fir plywood with phenolic resin impregnated cellulose fibre sheet bonded on face. Back and all edges sealed.
 - .3 Type C Architectural Concrete: Concrete form materials for this type of concrete shall be as per "Formwork for Special Architectural Finishes", CSA A23.1, Section 27.4. Form work shall be high density overlay plywood, 19 mm Douglas Fir plywood with phenolic resin impregnated cellulose fibre sheet bonded on face. Back and all edges sealed. Seal joints between panels with closed cell PVC foam tape with pressure sensitive adhesive on one side.
 - .4 Round Column Forms: Shall be lined with no horizontal joints, no vertical seams and no diagonal lines apparent on stripped columns.
 - .5 Non-Exposed Concrete Surfaces: Plywood in accordance with CAN/CSA A23.1 Section 24, Item 24.3.2.
 - .6 Exposed Concrete Surfaces: Minimum 19 mm (3/4") thick plywood coated one side with an approved resin, elastomer or overlay, conforming to CSA 086.1, new at start of work. 1220 x 2440 mm (4 ft. x 8 ft.) sized sheets, unless noted otherwise.
 - .7 Form Release Agent: Chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms. Form release agents and curing agents shall be compatible with applied finishes where



applicable. Do not use release agents containing wax or oil in contact with concrete to receive applied coatings.

1. Vegetable based: 100% biodegradable, zero-VOC, rapeseed or soy-based.
 2. Water based: Biodegradable, maximum VOC content allowed: 55 grams/litre
- .8 Form Ties: Removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface. For architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
1. Type A and Type B Concrete: Ties shall generally be placed symmetrically about all sections with plywood sheets and from each wall section.
 2. Type C Concrete: Ties shall be placed in accordance with reviewed shop drawings and mock-up.
 3. Cone-Tie Hole Plugs: Pre-formed concrete tie hole plugs shall be inserted and sealed into cone tie holes in exposed architectural concrete areas within 10 mm recess to plug surface.
- .9 All formwork shall conform with CSA A23.1.

2.02 DESIGN

- .1 Formwork design and inspection is solely the responsibility of the Contractor.

3 EXECUTION

3.01 ERECTION

- .1 Erect and brace formwork plumb and true.
- .2 Forms shall be so constructed that the finished concrete will conform to the shapes, lines, grade and dimensions indicated on the drawings. Particular care to be taken with all exposed concrete.
- .3 Apply form coating in accordance with manufacturer's recommendations prior to placing of reinforcing steel. Remove any excess form coating.
- .4 Install all inserts including anchors, ties, bolts, nailers, form for holes and such like as required by work of this or other trades.

- .5 Untreated forms shall be kept wetted down to prevent shrinkage prior to the placing of the concrete and shall be surface wetted at the time of placing.
- .6 Where concrete is to be exposed, forms shall be laid so that joints are kept to a minimum and located in an orderly and symmetrical arrangement where possible.
- .7 Strength and rigidity of forms shall be such that they will not deflect or leak mortar.
- .8 Forms for exposed exterior concrete shall not be reused if there is any evidence of surface wear and tear which will impair the quality of the concrete. Forms shall be thoroughly cleaned and re-lubricated with approved form oils before reuse.
- .9 Removal of form ties shall be done carefully to avoid marking concrete and to allow for patching. Grout bottom of form tie hole to prevent rust staining.
- .10 At times of placing, all formwork shall have been thoroughly washed and shall be clean and free of all dirt and debris. Formwork shall be wetted down to eliminate suction as far as practicable and wash water shall be drained away.
- .11 Refer to the structural drawing for minimum curing time prior to stripping.

3.02 CLEAN UP

- .1 Remove debris and excess material in accordance with the Waste Management Plan.

END OF SECTION 03 10 00



1 GENERAL

1.01 DESCRIPTION

- .1 Related work specified elsewhere:
 - .1 Curbs, Gutters, Sidewalks and Driveways Section 32 16 00
 - .2 Concrete Reinforcing Section 03 20 00
 - .3 Cast-in-Place Concrete Section 03 30 00
 - .4 Concrete Finishing Section 03 35 00
 - .5 Structural Steel Framing Section 05 12 00

1.02 REFERENCE STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 CSA-A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/ Test Methods and Standard Practices for Concrete.
- .2 CCSA G30.18 Billet-Steel Bars for Concrete Reinforcing.
- .3 CSA W186-M1990 Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Provide weldable reinforcement to CSA G30.18 and perform welding to CSA W186.
- .5 Ontario Building Code.

1.03 INSPECTION AND TESTING

- .1 Placing and reinforcement shall be reviewed by the Consultant prior to any concrete being placed in the section to be poured.
- .2 All steel required for the section shall be placed before permission will be given to place concrete.
- .3 Furnish mill certificates of physical and chemical analysis in accordance with CSA G30.18, if requested.

1.04 SUBMITTALS

- .1 Shop Drawings:
 - .1 Prepare and check reinforcing steel and mesh placing drawings and bar bending and cutting schedules for all steel reinforcing for structural concrete. All drawings and schedules shall be prepared and checked by competent personnel experienced with this type of work.
 - .2 Structural drawings take precedence over placement drawings and bar schedules unless otherwise instructed in writing by the Engineer.

1.05 DELIVERY AND STORAGE

- .1 Reinforcing steel, welded wire fabric and accessories shall be delivered, handled and stored in a manner which prevents contamination from bond-reducing foreign matter and damage to its fabricated form.
- .2 Ship bundles of bar reinforcement, identified clearly in accordance with bar list.

1.06 CLEANING

- .1 All reinforcement, before being placed, shall be clean from loose, scaly rust, dirt, oil, paint or other coatings that may be detrimental. A slight film of red rust will not be considered objectionable.

2 PRODUCTS

2.01 MATERIALS

- .1 All reinforcing steel, unless otherwise noted, shall be deformed bars of Grade 400 new billet steel conforming to the current CSA G30.18.
- .2 Welded wire fabric shall conform to CSA G30.18 and W186, sizes and gauges as shown on the drawings.
- .3 Provide all accessories such as stirrups, hanger bars, spirals, wire ties, chairs, spacers, supports and other devices required to install and secure the reinforcing properly, to CSA-A23.1.
- .4 Provide 300W deformed bars where welded dowels are specified. Weld to CSA W59-18. Weldable rebar is not an acceptable substitute.

2.02 FABRICATION

- .1 All reinforcing bars shall be bent cold. Reinforcing bars shall not be straightened or re-bent.



- .2 Location of reinforcement splices not shown on the drawings shall be approved by the Consultant and shall, for beams and slabs, be away from points of maximum stress in the steel. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear in accordance with CSA A23.3.
- .3 All welded wire fabric of 6.4 mm (1/4") diameter and larger bar sizes shall be provided in flat sheet unless otherwise authorized by the Consultant.

3 EXECUTION

3.01 ERECTION

- .1 Reinforcement of the size and shapes shown on the drawings shall be accurately placed in accordance with the Placement Drawings, Structural Drawings, requirements of the Ontario Building Code 2012, CSA A23.1 and CSA A23.3.
- .2 Clear distance between bars, except for columns, shall be not less than the nominal diameter of the bar, or 25 mm (1") or one and one third (1 1/3) times the maximum size of the coarse aggregate. Bars placed in two or more layers shall have a minimum clear distance between the layers of not less than 25 mm (1") and shall be placed directly above and below each other.
- .3 Clear distance between bars in columns shall be not less than one and one half the nominal diameter of the bars or 38 mm (1 1/2") or one and one half (1 1/2) times the maximum size of the coarse aggregate.
- .4 Reinforcing steel shall, where not otherwise shown on the Structural Drawings, be protected by the clear cover of concrete over the reinforcements as follows:
 - .1 Where concrete is deposited against the ground without the use of forms, not less than 75 mm (3").
 - .2 Where concrete is placed against forms to be exposed to weather, or be in contact with the ground, not less than 50 mm (2") for bars larger than 15M and not less than 38 mm (1 1/2") for bars 15M and smaller.
 - .3 In slabs and walls not exposed to the ground or weather, not less than 25 mm (1").
 - .4 In beams, girders and columns not exposed to the ground or weather, not less than 38 mm (1 1/2").
 - .5 The foregoing clear covers shall be maintained within ± 6 mm (1/4").
 - .6 Reinforcement shall be adequately supported by metal chairs, spacers or hangers and secured against displacement within the tolerance permitted, and in accordance with CSA A23.1 and CSA A23.3.



- .7 For concrete exposed to view, all chairs and items in contact with the exposed surface shall be to the Consultant's approval.

3.02 FIELD BENDING

- .1 Field bending of reinforcing will be authorized provided standard details of reinforcement are followed per CSA A23.1 and General Notes, including minimum bend radii, standard hook dimensions, minimum lap lengths etc. Use proper bending tools of required radii for all bends. Do not bend reinforcing with an open pipe or against an edge.
- .2 When field bending, bend without heat, applying slow, steady pressure.
- .3 Replace bars which develop cracks or splits.

3.03 CLEAN UP

- .1 Remove debris and excess material in accordance with the Waste Management Plan.

END OF SECTION 03 20 00



1 GENERAL

1.01 DESCRIPTION

- .1 Related work specified elsewhere:
 - .1 Aggregate Base Courses Section 32 11 23
 - .2 Curbs, Gutters, Sidewalks and Driveways Section 32 16 00
 - .3 Concrete Forming Section 03 11 00
 - .4 Concrete Reinforcing Section 03 20 00
 - .5 Fibrous Reinforcing Section 03 24 00
 - .6 Concrete Finishing Section 03 35 00
 - .7 Structural Steel Framing Section 05 12 00
 - .8 Bituminous Damp Proofing Section 07 11 13

1.02 REFERENCE STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 CSA-A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/ Test Methods and Standard Practices for Concrete.
- .2 CSA G30.18 Billet-Steel Bars for Concrete Reinforcing.
- .3 CCSA W186-M1990 Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 CSA-A3000 Cementitious Material Compendium.
- .5 Ontario Building Code.

1.03 SUBMITTALS

- .1 Samples:
 - .1 Submit sample chips of specified colours indicating colour additive number and required dosage rate.

- .2 Submit (3) samples 610 x 610 mm indicating concrete colour range, texture and uniformity.
- .2 Mock Up:
 - .1 Provide slab mock up in an isolated, unexposed slab area for approval of finish and colour. Accepted mock up may remain part of work.

1.04 INSPECTION AND TESTING

- .1 Placing and reinforcement shall be reviewed by the Consultant prior to any concrete being placed in the section to be poured.
- .2 All steel required for the section shall be placed, before permission will be given to place concrete.
- .3 Furnish mill certificates of physical and chemical analysis in accordance with CSA G30.18-09, if requested.
- .4 All required sampling, preparation of specimens and testing shall be performed by an independent testing agency appointed by the Owner and approved by the Engineer of Record ("Engineer" henceforth). The testing agency shall report immediately to the Engineer when any procedure is contrary to the specifications and good practice.
- .5 Testing costs will be paid by the Owner. The testing agency shall submit all invoices for services rendered to the Engineer for approval.
- .6 Cost of supplying materials for samples shall be borne by the Contractor. Contractor to inform Testing Agency with sufficient notice prior to concrete pour, and cooperate with same in obtaining required samples.
- .7 The testing agency will perform the following:
 - .1 Review mix designs for conformance with specifications, providing written report to Engineer.
 - .2 Test cement and aggregates for conformance with the material requirements of the specification.
 - .3 Supply cylinder moulds, sample the concrete, make and cure test cylinders and perform compressive strength tests in accordance with CSA A23.2.
 - .4 Make slump tests and air content tests in accordance with CSA A23.2 for each concrete test.



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- .5 Take three (3) test cylinders for each 50 cu.m. or fraction thereof and for each class of concrete placed in any one day, except that in no case shall a class of concrete be represented by less than three (3) tests.
 - .6 All cylinders shall be made from concrete taken from the forms.
 - .7 The Engineer may at his discretion reduce or eliminate the test cylinders to be taken for minor pours or pours not of structural significance.
 - .8 A compression strength of one cylinder of each set shall be performed at the test specimen age of seven (7) days.
 - .9 Compression strength test of the remaining two cylinders of each group shall be performed at the test specimen age of twenty-eight (28) days.
 - .10 One 28-day strength test shall mean the average compressive strength of two (2) companion test specimens.
 - .11 Test results shall meet "Concrete Test Strength Requirements" of the Ontario Building Code.
 - .12 Certified copies of the test reports shall be forwarded to the Engineer, Contractor and Concrete Producer.
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- .8 Should any test indicate concrete below strength, the Engineer shall have the right to stop work on the suspect area until subsequent tests are made. The Contractor shall bear the cost of such required tests. Should all tests indicate below strength concrete, the Contractor shall remove this portion of the work at the Engineer's request. The removal and replacement of this work will be at the Contractor's expense.
 - .9 Contractor shall supply proposed mix designs to Testing Agency and obtain approval from Engineer minimum 14 days prior to first concrete pour.
 - .10 The contractor shall prepare and submit concrete mix designs based on materials to be used on site indicating materials, quantities and mixing procedure as required to obtain the slumps, strength, finishes and air contents specified on the drawings.
 - .11 The contractor shall submit the mix designs with all necessary local material information to an independent Testing Agency for review for conformance with specifications. The Testing Agency will provide a written report to the Consultant for review. The Contractor shall supply proposed mix designs to the Testing Agency and obtain approval from Consultant minimum 21 days prior to first concrete pour.
 - .12 The contractor shall be responsible to follow the approved mix designs and
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procedures on site. All finished concrete shall be visually reviewed and to the approval of the Consultant.

- .13 Should any concrete appear to be significantly below strength or of unacceptable appearance, the Consultant shall have the right to reject the work on the suspect area or specify required repair work. The Contractor shall bear the cost of such remedial work.

1.05 DELIVERY AND STORAGE

- .1 Reinforcing steel, welded wire fabric and accessories shall be delivered, handled and stored in a manner which prevents contamination from bond-reducing foreign matter and damage to its fabricated form.
- .2 Ship bundles of bar reinforcement, identified clearly in accordance with bar list.

1.06 PROTECTION

- .1 Cold Weather Requirements: Shall be in accordance with CSA A23.1.
- .2 Hot Weather Requirements: Shall be in accordance with CSA A23.1.

1.07 CLEANING

- .1 All reinforcement, before being placed, shall be clean from loose, scaly rust, dirt, oil, paint or other coatings that may be detrimental. A slight film of red rust will not be considered objectionable.

2 PRODUCTS

2.01 MATERIALS

- .1 All reinforcing steel, unless otherwise noted, shall be deformed bars of Grade 400 new billet steel conforming to the current CSA Specification G30.18-09.
- .2 Welded wire fabric shall conform to CSA A23.2, sizes and gauges as shown on the drawings.
- .3 Provide all accessories such as stirrups, hanger bars, spirals, wire ties, chairs, spacers, supports and other devices required to install and secure the reinforcing properly, to CSA A23.1.
- .4 Provide 300W deformed bars where welded dowels are specified. Weld to CSA W59. Weldable rebar is not an acceptable substitute.
- .5 Cement: Type 10, Normal Portland, shall conform CSA A3000.



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- .6 Aggregates: Fine and coarse, shall conform to CSA A23.1.
 - .7 Water: Mixing water for concrete shall be clean and free from injurious amounts of oils, acids, alkali, organic matter, or other deleterious substances.
 - .8 Air Entraining Admixtures: Shall conform to the requirements of the latest issue of ASTM C260, such as:
 - .1 "N.V.R." by Sternson Ltd.
 - .2 "DAREX AEA" by Grace Construction Materials.
 - .3 "MB-VR" by Masters Builders.
 - .9 Curing Compounds: to CSA A23.1 white Type 1 - chlorinated rubber, suitable for interior use and compatible with floor finish adhesives.
 - .10 Integral Concrete Colour Additive: Colour additives shall contain pure, concentrated mineral pigments specially processed for mixing into concrete and complying with ASTM C979/C979M. Colour additives containing carbon black are not acceptable. Approved Product:
 - .1 Davis Colours, colour to be selected by Consultant.
 - .11 Form Coatings: Non-staining form coatings such as "NOX-CRETE" by Grace Construction Materials or other pre-approved.
 - .12 Isolation Joint Filler: 12 mm thick asphalt impregnated rigid board of cane fibre such as:
 - .1 "FLEXCELL" by Sternson Ltd.
 - .2 "GIVENTAKE" by Spicers.
 - .3 "KORK-PAK" by Grace Construction Materials.
 - .13 Water Stops:
 - .1 Size: 6" x 3/8".
 - .2 Type: DURAJOINT TYPE '5' or other pre-approved.
 - .3 Material: P.V.C. shall be as shown on drawings.
 - .14 Under slab damp proof membrane/vapour barrier: 6 mm thick polyethylene film.
 - .15 Joint Sealant: Shall be self-levelling two (2) part polyurethane type, conforming to CGSB 19.24 Type 1, or Federal Specification TT-S-00227E, Type II, Class A.
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Approved Type: Iso-Flex 880 GB (Self-Levelling) Sealant as manufactured by Harry S. Peterson Co. Inc., Sternson RC2-SL, Vulkem 245, or other pre-approved sealant. Colour as selected by the Architect from standard range. Primers and bond breakers as required to install the perimeter joint sealant system shall be provided in strict accordance with sealant manufacturer's recommendations.

- .16 Sonotube Form: Are to be non-spiral, smooth pvc liner with no visible seams.

2.02 MIXES

- .1 Proportions: As recommended in CSA A23.1; to be a guide for the water cement ratio to give durable concrete. Minimum cement content for concrete exposed to view to be 300 kg per cubic metre, unless otherwise specified.
- .2 Strengths, Slumps, Sizes of Aggregates: See Structural drawings.
- .3 Admixtures:
 - .1 Specified air entraining agent shall be added to all concrete exposed to weather. The amount of air entrainment to be 6% + 1%, unless noted otherwise on structural drawings or approved by the Engineer.
 - .2 Obtain Engineer's approval before using chemical admixtures other than those specified. Chloride admixtures not permitted without the Engineer's approval.
- .4 Consistency: Concrete materials shall be proportioned to provide a workable mix that can be handled, placed and worked into angles and corners of forms and around reinforcing steel and inserts. The mix proportions shall not be such that the concrete will easily segregate or cause excessive water to collect on the surface.

2.03 FABRICATION

- .1 All reinforcing bars shall be bent cold. Reinforcing bars shall not be straightened or re-bent.
- .2 Location of reinforcement splices not shown on the drawings shall be approved by the Consultant and shall, for beams and slabs, be away from points of maximum stress in the steel. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear in accordance with CSA A23.3.
- .3 All welded wire fabric of 6.4 mm (1/4") diameter and larger bar sizes shall be provided in flat sheet unless otherwise authorized by the Consultant.

3 EXECUTION



3.01 GENERAL

- .1 All concrete shall be "controlled concrete" according to CSA A23.1 and as defined by the Ontario Building Code.

3.02 OPENINGS AND INSERTS

- .1 Provide and cast-in all sleeves, frameouts, inserts and fastening devices shown on the drawings, except as otherwise specified. This includes but is not limited to OWSJ support, Precast Hollow Core Panel support, sunshade/trellis support and structural stair support. Sleeves, openings, etc., greater than 300 mm x 300 mm not indicated on structural drawings must be approved by the Engineer.
- .2 Anchor bolts and other anchoring devices for beams, columns and wall panels shall be supplied by the respective trade and installed under this section in accordance with the trade-approved shop drawings.
- .3 Sleeves, inserts and fastening devices required by other trades, but not shown on the drawings shall be supplied by the respective trade and installed under this section. The installation shall be checked and verified by the respective trade.
- .4 Openings and driven fasteners required in the concrete work after the concrete is placed shall be approved by the Engineer.
- .5 Notify other trades sufficiently in advance to ensure that provision is made for openings, inserts and attachments.
- .6 Paint exposed threads of anchor bolts with a mixture of molybdenum disulfide in oil before nuts are installed.
- 7 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as indicated, obtain approval of all modifications from the Engineer before placing concrete.
- .8 Check locations and sizes of sleeves, openings, etc., shown on structural drawings with architectural, mechanical and electrical drawings.

3.03 ELEVATOR PIT

- .1 Coordinate forming and finish of concrete elevator pit with manufacturer. Pit floor beneath cylinders and buffer to be flat and level within 3 mm full width of hoistway.

3.04 RECESS SLAB - CERAMIC TILE



- .1 Recess concrete slab at the ground floor level where ceramic tile is specified to achieve a level finish surface with adjacent finishes. Allow for thickset mortar bed min. depth 32 mm sloped to drain + depth of tile.

3.05 CONCRETE SUPPLY

- .1 Submit a copy of the proposed concrete mixes, approved by the Testing Agency for review by the Engineer before any concrete is delivered to the site.
- .2 Transportation shall be done in such a fashion that no segregation occurs.
- .3 Concrete which has commenced to stiffen shall not be used nor shall it be re-tempered with additional water or cement for use.

3.06 MIXING AND DELIVERY

- .1 Concrete shall be mixed in a mechanical batch mixer of a type approved by the Engineer and meeting requirements of CSA A23.1.
- .2 Mixing time shall conform to CSA A23.1. Mixers shall be rotated at the rate recommended by the manufacturer of the equipment.
- .3 Concrete from the mechanical batch mixer shall be transported to the project site in agitating or non-agitating equipment conforming to CSA A23.1.
- .4 Ready-mixed or transit-mixed concrete shall be batched, mixed and transported in accordance with CSA A23.1.

3.07 CONVEYING

- .1 Concrete shall be conveyed from the mixer to the place of final deposit by methods that will prevent separation or loss of materials.
- .2 Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end without separation of materials.
- .3 Conveying of concrete shall be in accordance with CSA A23.1.

3.08 ERECTION

- .1 Reinforcement of the size and shapes shown on the drawings shall be accurately placed in accordance with the Placement Drawings, Structural Drawings, requirements of the Ontario Building Code 2012, CSA A23.1 and CSA A23.3.
- .2 Clear distance between bars, except for columns, shall be not less than the

nominal diameter of the bar, or 25 mm (1") or one and one third (1 1/3) times the maximum size of the coarse aggregate. Bars placed in two or more layers shall have a minimum clear distance between the layers of not less than 25 mm (1") and shall be placed directly above and below each other.

- .3 Clear distance between bars in columns shall be not less than one and one half the nominal diameter of the bars or 38 mm (1 1/2") or one and one half (1 1/2) times the maximum size of the coarse aggregate.
- .4 Reinforcing steel shall, where not otherwise shown on the Structural Drawings, be protected by the clear cover of concrete over the reinforcements as follows:
 - .1 Where concrete is deposited against the ground without the use of forms, not less than 75 mm (3").
 - .2 Where concrete is placed against forms to be exposed to weather, or be in contact with the ground, not less than 50 mm (2") for bars larger than 15M and not less than 38 mm (1 1/2") for bars 15M and smaller.
 - .3 In slabs and walls not exposed to the ground or weather, not less than 25 mm (1").
 - .4 In beams, girders and columns not exposed to the ground or weather, not less than 38 mm (1 1/2").
 - .5 The foregoing clear covers shall be maintained within ± 6 mm (1/4").
 - .6 Reinforcement shall be adequately supported by metal chairs, spacers or hangers and secured against displacement within the tolerance permitted, and in accordance with CSA A23.1 and CSA A23.3.
 - .7 For concrete exposed to view, all chairs and items in contact with the exposed surface shall be to the Consultant's approval.
- .5 Preparation:
 - .1 Notify the Engineer and the independent testing agency at least 48 hours prior to any concrete operation. No concrete shall be delivered to the project unless permission to pour has been obtained from the Engineer.
 - .2 All excavations for footings and all forms shall be pumped clear of water before placing concrete therein.
 - .3 Formwork shall have been completed, reinforcement shall have been secured in place; expansion joint material, anchors, and other embedded items shall have been positioned; and the entire preparation reviewed by the Engineer, or the Engineer's agent prior to placing concrete.



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- .4 Formwork shall have been thoroughly washed and shall be clean and free of all dirt and debris. Formwork to be wetted down to eliminate suction as far as practicable and wash water to be drained away.
 - .5 Under slab dampproof membrane/vapour barrier: Install membrane over prepared granular base to entire areas of slabs-on-grade. Lap membrane minimum 150 mm at joints and seal using tape or sealant, to produce continuous installation. Seal punctures in membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal using tape or sealant.
 - .6 Depositing:
 - .1 Concrete shall be deposited in the forms as close as is practicable to its final position to avoid segregation due to rehandling of flow and in approximately horizontal lifts to maintain a level surface.
 - .2 To prevent segregation, the vertical height of free fall of concrete shall not exceed 1500 mm.
 - .3 When placing has started, it shall be carried on as a continuous operation until placement of the panel or section is completed. The top surface shall be kept level throughout the pour.
 - .4 While concrete is being placed, it shall be consolidated thoroughly and uniformly by means of vibrators or finishing machines to secure a dense, homogeneous structure, close bond with reinforcing and smooth formed surfaces.
 - .5 Vibrator to be the internal type having a minimum frequency of 7,000 revolutions per minute. A spare vibrator shall be on hand during all concrete placing. Extreme care shall be taken to ensure that internal type vibrators do not disturb the reinforcing steel or the forms.
 - .6 Ensure reinforcement and inserts are not disturbed during concrete placement.

3.09 FIELD BENDING

- .1 Field bending of reinforcing will be authorized provided standard details of reinforcement are followed per CSA A23.1 and General Notes, including minimum bend radii, standard hook dimensions, minimum lap lengths etc. Use proper bending tools of required radii for all bends. Do not bend reinforcing with an open pipe or against an edge.
- .2 When field bending, bend without heat, applying slow, steady pressure.



- .3 Replace bars which develop cracks or splits.

3.10 FINISHING - UNFORMED SURFACES

- .1 Finishing shall conform to CSA A23.1 as specified under Section 03 35 00 - Concrete Finishing.
- .2 Unless noted otherwise, floor finishes shall have gaps less than or equal to 8 mm under a 3000 mm straight edge.
- .3 Provide trowel finish for interior floor surfaces. After the concrete has been placed, struck off, consolidated and screeded, the surface shall be bull floated and steel troweled to produce a smooth, dense surface. Where indicated to receive future finishes, the slab must not be finished or cured in such a way as to prevent future adhesion of finishes.
- .4 Provide broom finish at exterior ramps. Concrete shall be placed as concrete finish above, except that the surface shall be given a light broom finish by drawing the broom perpendicular to the length of sidewalk or slab, leaving a uniform sand textured finish.

3.11 FINISHES - FORMED SURFACES

- .1 All formed surfaces shall be treated in accordance with CSA A23.1 as specified under Section 03 35 00 Concrete Finishes.
- .2 All round columns exposed to view to be formed with sonotubes (see Section 2.1.16).

3.12 CURING

- .1 Concrete shall be cured in accordance with CSA A23.1.
- .2 Slabs shall be cured using curing compound as specified. Coverage rate and method of application shall be in accordance with Manufacturer's printed specifications.
- .3 Freshly placed concrete shall be protected from the effects of direct sunshine, drying winds, cold, excessive heat and running water, by the use of adequate tarpaulins or other suitable material to cover completely or enclose all freshly finished surfaces, until the end of the curing period.

3.13 CONSTRUCTION JOINTS

- .1 The location and detail of all construction joints not detailed on the Structural drawings shall be approved by the Engineer.

- .2 Construction joints shall conform to CSA A23.1.
- .3 In beams and slabs, construction joint locations shall be approved by the Engineer prior to their installation. Proper key and dowels or extensions of reinforcing shall be provided at all construction joints.

3.14 JOINT FILLERS AND SEALERS

- .1 Provide joint fillers and sealers at interior slabs on grade at junctions with vertical surfaces and at exterior concrete paving at the location and to the details shown on the drawings.
- .2 Particular care shall be taken to construct clean joints free from any foreign material which will impair the proper function of the joint.
- .3 Joint filler material shall be anchored to the previously poured concrete surface.
- .4 Unless shown otherwise, joint filler shall extend for the full depth of the joint and shall terminate 12 mm below the top of the joint. The 12 mm space shall be filled with joint sealer specified.

3.15 CLEAN UP

- .1 Remove debris and excess material in accordance with the Waste Management Plan.

END OF SECTION 03 30 00



1 GENERAL

1.01 DESCRIPTION

- .1 Related work specified elsewhere:
 - .1 Concrete Reinforcement Section 03 20 00
 - .2 Cast-in-Place Concrete Section 03 30 00
 - .3 Joint Sealants Section 07 92 00

1.02 REFERENCE STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 CSA-A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/
Test Methods and Standard Practices for Concrete.

2 PRODUCTS

2.01 MATERIALS

- .1 Concrete materials to Section 03 30 00 - Cast-in-Place Concrete and reinforcement to Section 03 20 00 - Concrete Reinforcement.
- .2 Absorptive mat or fabric for curing.
- .3 Non metallic floor hardening: premixed, quartz aggregate abrasion resistant hardener.
- .4 Curing and sealing compound: to ASTM C309 Type 1 Class B, clear.
- .5 Additives and hardener to be compatible.
- .6 Waterproof membranes (see other sections)

3 EXECUTION

3.01 FLOOR FINISH

- .1 Floor slab surfaces shall be finished to Class B in accordance with Table 22 as defined in Clause 7.5, "Straight Edge Method", of CSA A23.1.
- .2 Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.
- .3 Saw cut crack-control joints to CSA A23.1.

- .4 Apply floor curing and sealing compound to manufacturer's instructions to all slabs on grade. Cure to manufacturer's recommendations.
- .5 Cure concrete in accordance with CSA A23.1 except where specified otherwise.
- .6 Provide any housekeeping pads for electrical and mechanical equipment.
- .7 Slope floor to drain at 5mm/m. except as indicated otherwise. Floors to be level around walls.
- .8 Provide non-slip light broom finish to exposed interior steps and landings. Provide non-slip medium broom finish to exposed exterior steps, ramps and landings.
- .9 Slab on grade to be cured using an absorptive mat or fabric kept continuously wet.
- .10 Confirm with traffic membrane supplier for other requirements for parking areas.

3.02 PROTECTION

- .1 Protect concrete to be left exposed throughout the course of construction. Make good damaged areas to the approval of the Engineer.

END OF SECTION 03 35 00



1 GENERAL

1.01 DESCRIPTION

- .1 The General conditions of the Contract and Supplementary General Conditions apply to this Division, except as qualified herein and/or excluded.
- .2 Refer to the drawings and specifications.
- .3 Related work specified elsewhere:
 - .1 Cast-in-Place Concrete Section 03 30 00
 - .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 (minimum 37 mm (1 1/2")).
 - .2 Structural Steel Framing Section 05 12 00

1.02 REFERENCE STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 CSA A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/ Test Methods and Standard Practices for Concrete.
- .3 CSA A23.3 Design of Concrete Structures.
- .4 CSA A23.4 Precast Concrete-Materials and Construction.
- .5 CSA A283 Qualification Code for Concrete Testing Laboratories.
- .7 CSA G30.18 Billet Steel Bars for Concrete Reinforcement.
- .8 CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .9 CSA W186-M1990 Welding of Reinforcing Bars in Reinforced Concrete



Construction.

- .10 CSA W47.1 Certification of Companies for Fusion Welding of Steel.
- .11 ULC-S701.1 Standard for Thermal Insulation, Polystyrene Boards.
- .12 CSA W59 Welded Steel Construction (Metal Arc Welding).

1.03 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 "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 tender. The manufacturer must specifically verify as part of its tender that it is currently certified in the appropriate category:

- .1 Precast Concrete Products – Structural

(I) Prestressed

Only precast concrete elements fabricated by certified manufacturers are acceptable to the Owner. Certification must be maintained for the duration of the fabrication and erection for the project. Fabricate precast concrete elements in accordance with Ontario Building Code requirements.

- .2 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.

1.04 DESIGN CRITERIA

- .1 Design precast/prestressed concrete units to CSA A23.3 and to carry handling stresses.
- .2 Design loads in accordance with applicable codes and per Structural drawings for use and occupancy, wind, temperature, and earthquake.
- .3 Consider vibration characteristics in accordance with National Building Code.
- .4 Design prestressed units to meet two (2) hours fire resistance rating.



- .5 Design to tolerate structural deflection of span/360 due to live load.

1.05 ALLOWABLE TOLERANCES

- .1 Conform to the requirements of CSA A23.4-Section 10.
- .2 Refer to related Sections of this Specification and fabricate work to accommodate the specified tolerances.

1.06 SOURCE QUALITY CONTROL

- .1 Upon request, provide Engineer with certified copies of quality control tests and inspection related to project as specified in CSA A23.4.
- .2 Inspection of prestressed concrete tendons is required.
- .3 Make available records from in-house quality control program based upon plant certification requirements for inspection and review.
- .4 Upon request, provide Engineer with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .5 In addition to quality control, an independent inspection and testing company may be appointed by the owner to verify compliance with this Specification. Cost of an independent inspection is to be paid for by the owner.
- .6 Cooperate with Inspector to facilitate his work.

1.07 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Shop Drawings, Product Data and Samples.
- .2 Submit shop drawings in accordance with CSA A23.4 and CSA A23.3. Upon request, the following items shall be provided:
 - .1 Design calculations for items designed by the Manufacturer.
 - .2 Estimated camber.
 - .3 Finishing schedules.
 - .4 Methods of handling and erection.
 - .5 Openings, inserts and related reinforcement.



- .6 Each drawing submitted to bear stamp of qualified Professional Engineer registered in the Province of Ontario.
- .3 Show the system of identifying units for erection purposes on shop drawings and apply a similar mark on all units at the time of manufacture.

1.08 WARRANTY

- .1 This Contractor hereby warrants that the precast/prestressed elements will not spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, in accordance with the General Conditions warranty clause, for a one-year period.

1.09 DELIVERY, STORAGE AND PROTECTION

- .1 Accept full responsibility for delivery, handling and storage of units.
- .2 Deliver, handle and store precast/prestressed units using methods approved by the manufacturer. Do not permit units to contact earth or staining influences or to rest on corners.

2 PRODUCTS

2.01 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 ULC-S701.1.
- .9 Air entrainment admixtures: To CSA A23.2.
- .10 Chemical admixtures: To CSA A23.2.

2.02 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 A23.2
- .3 Admixtures: To CSA A23.2.
- .4 Do not use calcium chloride or products containing calcium chloride.

2.03 GROUT MIX

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

2.04 MANUFACTURE

- .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 50 mm (2") thick insulation plug at each cell end of hollow core at exterior.

3 EXECUTION

3.01 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 3 mm 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 90 mm (3 1/2") on masonry and 75 mm (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 150 mm (6") diameter for mechanical trades. Openings larger than 150 mm (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.
- .9 All precast/prestressed components shall be erected by experienced workers under the supervision of a qualified superintendent with a minimum of five (5) years' experience.

3.02 TOPPING / SKIMCOAT

- .1 This contractor shall provide a suitable top finish to accept direct application of finished flooring/roofing as per room finish schedule.
- .2 Where concrete skim coat (19 mm (3/4") thick) 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 skim coat. Do not rely on this skim coat for shear transfer.

3.03 EXPOSED CEILINGS

- .1 Caulk exposed ceiling longitudinal joints, using standard caulking.
- .2 The underside of precast shall be finished as per CSA A23.4 (clause 24.2.2) STANDARD FINISH.

3.04 CLEAN UP

- .1 Upon completion of the work of this section, all surplus material and debris shall be removed from the site.
- .2 If required, clean exposed face work by washing and brushing only, as precast is erected. Use approved masonry cleaner if washing and brushing fails to achieve required finish. Remove immediately materials that may set up or harden. This section is not responsible for soiling or damage by others.

END OF SECTION 03 41 13



1 GENERAL

1.01 DESCRIPTION

- .1 Related work specified elsewhere:
 - .1 Concrete Forming Section 03 11 00
 - .2 Concrete Reinforcing Section 03 20 00
 - .3 Cast-in-Place Concrete Section 03 30 00
 - .4 Concrete Finishing Section 03 35 00
 - .5 Thermal Insulation Section 07 21 00
 - .6 Firestopping Section 07 84 00
 - .7 Joint Sealants Section 07 92 00
 - .8 Metal Doors and Frames Section 08 11 00
 - .9 Painting Section 09 91 00

1.02 REFERENCE STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 Work of this Section to comply with CSA A371 "Masonry Construction for Buildings", CSA S304.1 "Masonry Design for Buildings" and the Ontario Building Code.
- .2 Ensure fire rated walls, partitions, or separations indicated on drawings are constructed in accordance with Part 3 of Ontario Building Code.

2 PRODUCTS

2.01 MATERIALS

- .1 Concrete Block
 - .1 Hollow units to conform to CSA A165 Series, strengths as indicated on Structural drawings.
 - .2 Normal aggregates for concrete masonry units to conform to CSA A23.1.

- .3 Type of block shall be normal weight.
- .4 Special Units: 'H' blocks, bullnose and corner blocks, base blocks, fillers, bond beam and lintel blocks and other similar items as indicated and required to maintain bonds and even faces without any exposed cut faces or cavities.
- .5 Nominal sizes as indicated on the drawings.
- .6 Units shall be as follows:
 - .1 Standard grey block.
 - .2 Refer to Architectural drawings and Structural drawings for extent and location of each type of block.
- .2 Acoustic Assemblies
 - .1 For acoustic assemblies at wall/deck junctions refer to details and to Section 09 81 00. Allow for structural deflection.
- .3 Fire Separations
 - .1 For fire separation assemblies at wall/deck junctions refer to details and to Section 07 84 00. Allow for structural deflection.
- .4 Mortar Materials
 - .1 Mortar: Shall conform to CSA A179, and shall be type "S". Colour to match concrete block.
 - .2 Water: Clean, free from deleterious amounts of acids, alkali and foreign materials.
 - .3 Cement: Shall conform to CSA A3000, normal Portland cement, colour to be grey.
 - .4 Mortar Aggregate: Shall conform to CSA A179; washed and kept clean, sharp, free from organic materials.
 - .5 Anti-freeze Compounds: No anti-freeze liquid, salts or other substances shall be used in the mortar to lower the freezing point.
- .5 Reinforcing, Anchors, Accessories
 - .1 Ladder masonry joint reinforcing shall conform to CSA G36.4/G30.18.



- .2 Ladder masonry joint reinforcement shall be as indicated on the structural drawings.
- .3 Reinforcing shall be as indicated on structural drawings.
- .4 All masonry connectors and materials to CSA A370, "Connectors for Masonry".
- .6 Mortar Mixes
 - .1 Composition in parts by volume of mortars where applicable shall be in accordance with that stated in CSA A179.

3 EXECUTION

3.01 EXAMINATION

- .1 Examine work of other trades for defects or discrepancies and report same in writing to the Engineer of Record ("Engineer" henceforth).
- .2 Installation of any part shall constitute acceptance of such surfaces as being satisfactory.

3.02 INSPECTION

- .1 All materials delivered on the job shall be certified to be in accordance with specifications, by the Engineer. Non-certified materials will be rejected and shall be removed from the site.

3.03 SAMPLES AND MOCK-UP

- .1 Submit samples of materials for review, if requested by the Engineer; material on job shall match accepted samples.
- .2 Prior to commencement of work, construct mock-up of required masonry for the Engineer's acceptance. Mock-up shall be approximately 1m high and 1m long, showing method of bonding, flashing and jointing (headers or use of wall reinforcement), etc.
- .3 The accepted mock-up wall shall become minimum acceptable standard or workmanship and shall remain on site as finished part of the work.

3.04 DELIVERY/STORAGE

- .1 Cementitious materials shall be stored in accordance with the requirements of CSA A3000. Storage of aggregates shall be in accordance with CSA A23.1.

- .2 Stack masonry units to avoid chipping.
- .3 Protect from weather and soil.
- .4 All materials shall be kept clean and dry.
- .5 Deliver cement and mortar ingredients with manufacturer's seals and labels intact.
- .6 Any exposed units stained or chipped or materials affected by inadequate protection shall be replaced at the Contractor's expense.

3.05 PROTECTION

- .1 Protect work of other sections from damage from work of this section.
- .2 Cold Weather Requirements:
 - .1 Adequate equipment shall be used for heating the masonry materials and protecting the masonry during freezing or near-freezing weather. No frozen material or materials containing ice shall be used, nor shall properly protected material be placed against any surface that has a frost film.
 - .2 Sand shall be heated in such a manner as to remove frost or ice. Water or sand shall not be heated to a temperature above 70°C. When necessary to remove frost, the masonry units shall be heated.
 - .3 Whenever the temperature of the surrounding air is below 5°C; all newly constructed masonry laid in mortar, in which high-early strength Portland cement is used, shall be maintained at a temperature of at least 10°C for not less than 24 hours by means of enclosures, artificial heat, or by other protective methods acceptable to the Engineer. When any cementing material other than high-early strength Portland cement is used, this temperature shall be maintained for at least 72 hours.
 - .4 All methods and materials for the protection of the fresh masonry work against freezing shall be subject to review by the Engineer. In general, the methods and materials not commonly accepted as suitable for the protection of reinforced concrete construction in freezing weather shall not be used. Salt, calcium chloride or other chemicals for lowering the freezing temperature of the mortar shall not be used.
- .3 Top of all work shall be covered with polyethylene tarpaulin when work is discontinued.



3.06 SPECIAL CLEANING

- .1 Surplus mortar shall be removed immediately from walls, floors, etc.
- .2 At completion of work all holes or defective mortar shall be pointed or replaced as directed.
- .3 At completion of pointing and removal of all temporary work, remove all rubbish and surplus materials, brush and clean all masonry.
- .4 Recommendations of block suppliers shall be followed with respect to cleaning.
- .5 Sample panel if required to be cleaned in presence of the Engineer 28 days before proceeding with building cleaning.
- .6 Protect adjacent surfaces and work from damage during cleaning process.

3.07 LAYING-UP

- .1 Lay true to line, level, accurately spaced courses in running bond or stack bond, and thickness as detailed. Keep plumb throughout corners, reveals, plumb and true.
- .2 Bed and vertical joints evenly and solidly filled with mortar.
- .3 Exterior and vertical corners shall be fully bonded. Interior wall intersections, masonry bonded or equivalent masonry reinforcement.
- .4 Block Joints: Concave, firmly pointed, and compacted with round bar tool; at all exposed interior block wall faces.
- .5 All joints of uniform thickness in straight parallel lines.
- .6 Do not wet concrete block before laying unless recommended by Manufacturer.
- .7 Concrete masonry units shall have face shells and end joints fully filled with mortar and joints shall be squeezed tight. Slushing or mortar into joints not permitted.
- .8 All masonry shall be tied into vertical structural framing members in exterior walls, using specified masonry ties.
- .9 Where non-bearing partitions extend to underside of structural system above refer to structural detail. Allow for structural deflection.
- .10 Where fresh masonry abutts partially or fully set masonry, clean exposed surface and dampen existing surface for best possible bond.



- .11 Tothing not permitted. Rack back one half unit length where stop-off necessary in horizontal run of masonry.
- .12 All exposed work shall be pointed; units shall be selected at site for matching texture, colour, appearance, size and bond; with no exposed cut-facts, spalls, chips, cracks, cavities, or other defects; with no mortar stains; and to match approved sample panels.
- .13 Bearings: Fill voids in concrete block with concrete solid to foundation where bearings for steel, concrete beams or lintels occur. Reinforce as specified.
- .14 Fill block cells solid with concrete grout (as specified) at following locations:
 - .1 All Ends of walls, both free and abutting other work.
 - .2 All jambs of all openings.
 - .3 All courses under plates, requiring bearing.
 - .4 All fixings for fixtures and other work built into and fixed to blockwork including brackets, bearers, bolts and inserts.
 - .5 Support all horizontal concrete grout filled courses with expanded metal or other acceptable grout stop in bed joints under.
 - .6 All cells containing reinforcing bars.

3.08 CUTTING AND PATCHING

- .1 Build in all chases, piping, ducts, sleeves, grounds, blocking, inserts, etc. as required for other trades. Co-operate fully with other trades concerned to ensure correct size, shape and location.
- .2 Do all cutting, filling, drilling, patching, making good for other trades in masonry work.
- .3 Engineer's acceptance shall be obtained before cutting any part or areas which may impair appearance or strength of the work.
- .4 Chases requiring patching not permitted without Engineer's acceptance.
- .5 All cutting to be with high speed electric tools for exposed work; clean, true and free from spalls, chips and similar defects.

3.09 LINTELS, BUILT-IN WORK

- .1 Set all loose and miscellaneous items of steel and iron, including all isolated beams, lintels, shelf-angles, bearing plates, ventilators and all other loose iron and steel work specified for erection or setting by others when built into masonry work. These items shall be grouted in place.
- .2 Fill voids solidly with mortar around metal door frames.
- .3 Install nailing inserts, wall plugs, where walls are strapped. Locate nailing inserts at 400 mm centres each way.

3.10 CONCRETE BLOCK LINTELS AND BOND BEAMS

- .1 Supply and install concrete block lintels for openings in masonry walls as detailed. Reinforce with bars as noted and fill solid with concrete grout. At junction with concrete walls or columns provide dowel bars as noted on structural drawings.
- .2 Install Bond Beams: To locations as indicated on drawings, using continuous reinforcing of size as shown on drawings. Fill bond beams with concrete grout as specified. Bond beams to be same width as wall.

3.11 MASONRY REINFORCEMENT AND ANCHORS

- .1 As shown and indicated on structural drawings and notes. Work to CSA A370, "Connectors for Masonry".
- .2 Reinforcing at non-load bearing walls: Install masonry joint reinforcing mesh as specified in every alternate course; more than 150 mm thickness reinforce with metal tie bars as specified below in .3.
- .3 Reinforcing at load bearing walls, fire wall and partitions over 150 mm thickness: refer to structural details tie abutting walls together with steel anchors as specified, to locations as indicated on drawings; fill block cells solid and bed tie bars in mortar joints.
- .4 Masonry joint reinforcing shall be built continuously with minimum 150 mm laps into bed joints, every second bed-joint throughout entire wall. Mortar cover at exterior face to be 16mm. Mortar cover at interior face to be 12 mm.
- .5 Masonry joint reinforcement shall not extend through control joints, unless noted on drawings.
- .6 Masonry joint reinforcement shall be placed in first two consecutive block bed joints over all openings.
- .7 Reinforcing steel bars as and where shown on the drawings.



3.12 MORTAR

- .1 All mortar shall be used within two (2) hours of mixing at temperature of 28°C, two and a half (2.5) hours under 28°C.
- .2 Mortar may be retempered within two (2) hours of mixing to replace water lost by evaporation.

3.13 ERECTION TOLERANCES

- .1 Variation from Mean Plane: Walls shall be constructed as true planes and when tested with a 3m straight edge placed anywhere on the wall in any direction shall be true within 3 mm.
- .2 Variation from the Plumb: Surfaces of columns and walls shall be plumb within 6 mm in 3 m.
- .3 Variation from the Level: Variation from the level for any masonry course shall not exceed 6 mm in any bay or 6 mm maximum.
- .4 Variation from Position: Variation in location from the individual position shown and variation in the related position of columns, walls and partitions shall not exceed 6 mm in any bay or 6 m maximum distance.
- .5 Variation in the Sizes of Wall Openings: A 3 mm maximum variation is allowed from the actual designated size of wall openings.

3.14 CLEAN UP

- .1 Remove debris and excess material in accordance with the Waste Management Plan.

END OF SECTION 04 22 00

1 GENERAL

1.01 DESCRIPTION

- .1 Related work specified elsewhere:
 - .1 Metal Fabrications _____ Section 05 50 00
 - .2 Applied Fireproofing _____ Section 07 81 00
 - .3 Painting Section 09 91 00

1.02 REFERENCE STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 CSA S16 Steel Structures for Buildings.
- .2 CISC Code of Standard Practice.
- .3 CSA S136 Cold Formed Steel Structural Members.
- .4 CSA W47.1 Certification of Companies for Fusion Welding of Steel Structures.
- .5 CSA W59 Welded Steel Construction (Metal-Arc Welding).
- .6 CSA G40.20-04/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
- .7 CSA-G164-18 Hot Dipped Galvanizing of Irregularly Shaped Articles.
- .8 Ontario Building Code.

1.03 QUALIFICATIONS

- .1 All Steel Fabricators must have full approval of the Canadian Welding Bureau under CSA W47.1

1.04 EXAMINATION

- 1 All dimensions shall be taken from the drawings and checked against the building. Be responsible for the correctness of such measurements and report to the Engineer of Record ("Engineer" henceforth) in writing all discrepancies between measurements at building and those shown on drawings prior to commencing work. Verify location of anchor bolts and embedded steel and

ensure that work prepared by other trades is at a proper elevation, on line, level and true.

1.05 SUBMITTALS

- .1 Shop Drawings
 - .1 Submit shop drawings prepared under the supervision of a Professional Engineer registered in Ontario. Drawings of components designed by the Fabricator shall be signed and sealed by the Registered Professional Engineer.
 - .2 Submit shop drawings in accordance with General Conditions and General Notes.
 - .3 Structural drawings are not prepared to be used in sepia form as Erection drawings. Design drawings include Architectural, Mechanical, and Electrical drawings.
 - .4 Shop drawings shall complete details necessary for fabrication and erection of the component parts of the structure, including location, type, size and extent of all welds. Splices not shown on the shop drawings will not be accepted.
 - .5 Review of Shop drawings constitutes review of general methods only and will not include approval of dimensions, figures or quantities. The structural steel supplier is responsible for structural design, correct fabrication and proper fitting of various items.

1.06 INSPECTION AND TESTING

- .1 The Registered Professional Engineer sealing the Steel Fabricator's shop drawings is also responsible for all field review of their work and shall provide a letter to the Engineer confirming that the work has been completed in accordance with the final reviewed steel shop drawings and all structural requirements.
- .2 The Owner will engage and pay for the services of a Welding Engineer and a Testing Agency, to submit written reports to the satisfaction of the Engineer.
- .3 Allow free access to all parts of the works for the purposes of inspection at all times.
- .4 Prior to commencement of work provide a schedule of shop fabrication.
- .5 Submit certified results of testing in accordance with CSA G40.20/G40.21 properly correlated to the elements being fabricated.
- .6 High tensile bolts will be tested in accordance with CSA S16.



- .7 Submit certified copy of mill reports covering chemical and physical properties of steel used in this work, upon request.
- .8 For the purposes of bidding, assume all welds will be examined by a non-destructive testing method.
- .9 Testing of all connections and splices not indicated on the design drawings shall be undertaken by an independent testing agency approved by the Engineer and will be to the Structural Steel Sub-Contractor's account.
- .10 If more than 5% re-inspection is required due to faulty workmanship, the Structural Steel Sub-Contractor will be required to pay for this re-inspection.
- .11 The Engineer may reject at any time during the progress of the work a piece of material for any member which he may find defective or not in accordance with the detailed drawings. This material may be rejected notwithstanding any previous acceptance and components so rejected shall be replaced at no expense to the Owner. In case of dispute, the decision of the Engineer shall be final.

1.07 STORAGE AND HANDLING

- .1 Be responsible for the protection of all steel work during fabrication, shipping, storage and construction. All small bends and damage shall be reported to the Engineer for instructions. Steel work, which is bent, broken or otherwise damaged, shall be repaired or replaced by the Structural Steel Sub-Contractor at no cost to the Owner.
- .2 Be responsible for proper scheduling of delivery and erection for the structural steel, all in accordance with the construction schedule.

1.08 CO-ORDINATION WITH OTHER TRADES

- .1 Supply all necessary instructions and drawings to other trades for setting bearing plates, anchor bolts, and other members that are built in with the work of other trades. Supply the necessary material in accordance to the construction schedule.

1.09 FIREPROOFING

- .1 All exposed structural steel supporting a floor assembly must have applied fireproofing: reference Section 07 81 00.

1.10 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

- .1 Architecturally exposed structural steel is all steel which is left exposed to view in the completed building and is noted "AESS" on the documents.
- .2 Note that all exposed steel is to be considered as "AESS."
- .3 In addition to the requirements of this Section, the requirements of the AISC Code of Standard Practice for Steel Buildings and Bridges for Architecturally Exposed Standard Steel shall apply, except as varied herein.

2 PRODUCTS

2.01 MATERIALS

- .1 All steel shall be new unless otherwise indicated and be of sizes and shapes listed in the current CISC handbook and as indicated on the drawings.
- .2 Rolled shapes and welded wide flange sections shall be to CSA G40.21-350W.
- .3 Plates and flat bars shall be to CSA G40.21-300W.
- .4 Hollow structural sections shall be to CSA G40.21-350W Class C.
- .5 Pipe sections shall be to ASTM A53, with a minimum specified yield strength of 240 MPa.
- .6 High strength bolts shall be to ASTM A325.
- .7 Bolts and nuts anchored into concrete or wood are to ASTM A307.
- .8 Primers for exterior exposure shall be zinc chromate Type 1, conforming to CGSB 1-GP-40d.
- .9 Primers for interior exposure shall be CISC/CPMA Standard 1-73 Primer or other pre-approved.
- .10 Galvanizing – Hot dipped galvanizing with zinc coating 600 g/m² to CSA-G164 Hot Dipped Galvanizing of Irregularly Shaped Articles.
- .11 Applied fireproofing: reference Section 07 81 00.
- .12 Structural steel to contain 75% post consumer recycled content and 90% total recycled content. Fabricator to provide mill certificate to verify recycled content.

2.03 DESIGN

- .1 All trusses and connections not detailed on the drawings shall be designed by the Fabricator to the reference standards unless otherwise noted.



- .2 All bolted connections for bracing, trusses, and roof struts shall utilize friction connections.
- .3 Connections shall be designed for the forces shown on the drawings and shall allow for the effects of beam deflections. Provide a minimum of two (2) 19 mm diameter A325 bolts or an equivalent weld for all beam to girder connections.
- .4 Column to beam and girder connections shall allow for a horizontal stability force in all directions equal to 2% of the design column axial load in addition to all other loads.

3 EXECUTION

3.01 FABRICATION

- .1 All fabrication shall be to CSA S16.
- .2 All Welding shall be to CSA W59, by welders qualified in accordance with CSA W47.1.
- .3 All fabricated units shall be straight and true and without sharp kinks or bends.
- .4 All hollow structural sections shall be closed airtight with end plates sealed with welds.
- .5 All plates and shapes shall be inspected visually for laminations. Repair plates or shapes that contain laminations in a manner to be reviewed by the Engineer.
- .6 Fabricate structural steel in accordance with final reviewed Shop drawings and Structural drawings.
- .7 Hot dipped galvanizing to be to CSA G164.
- .8 Galvanized surfaces exposed to view to be uniform in appearance, free of large spots, patches or other gross defects.
- .9 All exterior exposed steel and exterior steel in contact with exposed timber elements including all connecting hardware to be hot dipped galvanized.
- .10 If sizes of members shown on drawings are unavailable, provide available equivalent member next size (or thickness) larger.



3.02 CLEANING AND PRIMING

- .1 All steel shall be thoroughly cleaned of all loose mill scale, loose rust, oil or dirt.
- .2 All steel shall be primed except for steel to be encased in concrete, steel to be fireproofed, steel which will receive shear studs, and faying surfaces of friction connections.
- .3 Structural steel to be primed for interior exposure shall be cleaned in accordance with CISC/CPMA Standard 1-73 (minimum).
- .4 Structural steel to be primed for exterior exposure or to receive a shop or field paint finish shall be cleaned in accordance with SSPC-SP6 "Commercial Blast Cleaning".
- .5 All primers shall be spray-applied strictly in accordance with the Manufacturers instructions. Apply one (1) coat of primer thoroughly and evenly and work well into the joints and other open spaces.
- .6 After erection and after connections are completed, provide a field touch up coat of primer to all surfaces that had no shop coat, or have been chipped or scraped.
- .7 Where required, all hot dipped galvanizing shall conform to CSA G164.
- .8 Apply 2 coats of galvanized paint protection to hot dipped galvanized surfaces damaged by transportation, erection or site welding.

3.03 ERECTION

- .1 Supervise the setting of bases, anchor bolts, and other steel to concrete connections. Cutting of base plates to accommodate anchor bolts shall be cause for rejection of base plates.
- .2 Install all temporary bracing that is required to stabilize the work against wind, earthquake and construction loads. Keep structure true and plumb until completion of the building.
- .3 As erection progresses, the work shall be securely bolted up to take care of all dead loads, wind, earthquake, and erection stresses. Any failure to make proper and adequate provisions for stresses during erection shall be solely the responsibility of the Structural Steel Sub-Contractor.
- .4 The Structural Steel Erector shall be responsible for the design of all hooks, erection connections and handling gear.

- .5 Whenever piles of materials, erection equipment, or other loads are carried during erection, proper provision shall be made to take care of stresses resulting from same.
- .6 All structural steel shall be assembled and erected in accordance with the reviewed erection drawings and specified reference standards.
- .7 Structural steel work shall be carefully located at the proper elevation and rigidly secured in place, using steel shims. All spaces under the steel shall then be filled with non-shrink, pre-mix, non-metallic grout, pre-approved by the Engineer.
- .8 Plumb, level and align individual members of steel work as specified in CSA S16.
- .9 All exposed steel work shall be finished and assembled to provide the best possible visual appearance to the satisfaction of the Engineer.
- .10 Obtain written permission from the Engineer prior to field cutting or altering of structural members.
- .11 Clean and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

3.04 WELDING

- .1 All welding shall be done by the shielded metal-arc method in accordance with the requirements CSA W59. The welding operators shall have passed within the preceding six (6) months, the qualification test as set forth in CSA W47.1.
- .2 Submit welding procedures prepared and sealed by a Professional Engineer registered in the Province of Ontario familiar with this discipline to the Engineer for his examination and comments, where requested.
- .3 Surfaces to be welded shall be free from loose scale, rust, paint, or other foreign matter. Where weld material is deposited in two or more layers, each layer shall be cleaned before the next layer is deposited. Care shall be taken to minimize stresses due to heat expansion, contraction and distortion by using proper sequence in welding and by approved methods.
- .4 Welding consumables for all processes shall be fully approved by the Canadian Welding Bureau and certified by the manufacturers as complying with the requirements of this specification. Such certificates shall be no more than two years old.
- .5 Electrode strengths to be equal to E70xx or better.

- .6 All exposed welding shall be finished to provide the best possible visual appearance to the satisfaction of the Engineer and the Architect (AESS). Types of weld are:

'A'- Architectural: Continuous, formed with 'rod' or 'stick' application, with even surface, bead width not to vary by more than + 2 mm, but welds to be filled with metal filler and sanded smooth, no weld splatter.

'B' - Standard: Spot or continuous welds formed with 'wire' application. All visible welds, within 3 m vertically and horizontally of an accessible viewpoint are to be type 'A'. All other welds are type 'S' unless noted otherwise on the drawings. Samples of fillet and butt welds of 'A' and 'S' types on min. 150 mm material are required for approval prior to start of fabrication.

3.05 CLEAN-UP

- .1 Make good to the satisfaction of the Architect any damage or injury to the work of other trades. Remove all debris and scrap resulting from the execution of this trade in accordance with the Waste Management Plan.

END OF SECTION 05 12 00



1 GENERAL

1.01 DESCRIPTION

- .1 Related work specified elsewhere:
 - .1 Cast-in-Place Concrete Section 03 30 00
 - .2 Structural Steel Framing Section 05 12 00
 - .3 Metal Fabrications Section 05 50 00
 - .4 Glued-Laminated Construction Section 06 18 00
 - .5 Composite Lumber Section 06 71 13
 - .6 Finish Carpentry Section 06 20 00
 - .7 Architectural Woodworks Section 06 40 00
 - .8 Vapour Retarders Section 07 26 00
 - .9 Thermal Insulation Section 07 21 00
 - .10 Metal Roof Panels Section 07 41 13
 - .11 Wood Siding Section 07 46 23
 - .12 Sheet Metal Flashing and Trim Section 07 62 00
 - .13 Painting Section 09 91 00
 - .14 Wiring Devices Section 26 27 26

1.02 REFERENCED STANDARDS

All codes and documents referred to in this Section are to be the current adopted edition. Where there are differences between the specifications and drawings and the standards, codes or acts, the most stringent shall govern.

- .1 Ontario Building Code.
- .2 N.L.G.A. Standard Grading Rules for Canadian Lumber.
- .3 CSA O121 "Douglas Fir Plywood."
- .4 CSA O151 Canadian Softwood Plywood.

- .5 CGSB-51.34-M86 "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."
- .6 CSA-O141-05 "Softwood Lumber."
- .7 CSA O86 "Engineering Design in Wood (Limit States Design)."
- .8 CSA B111 "Wire Nails, Spikes and Staples."
- .9 ASTM A307 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength."
- .10 CSA G40.20/G40.21 "General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel."
- .11 CSA A123.3-05 "Asphalt Saturated Organic Roofing Felt."
- .12 CSA O80 Series "Wood Preservation."
- .13 CSA-G164 Hot Dipped Galvanizing of Irregularly Shaped Articles.

1.03 COOPERATION

- .1 Cooperate, assist, cut for and make good after other trades, unless otherwise specified.
- .2 Provide location, centering and bracketing for all trades and wood framing for plumbing, heating, electrical and other trades. Make good all defects and fully complete the rough carpentry.

1.04 EXISTING CONDITIONS

- .1 Prior to start of work, examine existing conditions, existing elevations, centre to centre column grid dimensions and existing element sizes at interface with new steel work.
- .2 Report any unsatisfactory conditions to the Consultant in writing prior to commencement of work.
- .3 Start of work shall imply acceptance of conditions.

1.05 STORAGE AND HANDLING

- .1 Protect materials from weather during transit to job site.
- .2 All timber items shall be stored under cover, on raised supports, not in contact with the ground, and stacked for maximum air circulation and ventilation until installed.

- .3 Store materials in such a way as to prevent damage or loss or impairment of their structural or other essential properties.
- .4 Do not use steel straps to tie lumber which is to be exposed to view.

2 PRODUCTS

2.01 MATERIAL - GENERAL

- .1 Refer to N.L.G.A. Standard Grading rules for Canadian Lumber. All softwood lumber shall conform to CSA O141 and CSA O86.

2.02 LUMBER - IDENTIFICATION

- .1 All marked at mill and end-marked; delivered to site with certificates as to species, grades, stress grades, seasoning, moisture content, and other evidence as required by Architect to show compliance with specifications.

2.03 MOISTURE CONTENT

- .1 For all dimensional lumber: maximum 19% exterior, 12% interior, unless otherwise specified; protect all lumber against moisture before and after installation to prevent defects.

2.04 FRAMING LUMBER GRADES

- .1 Studs: SPF.#2 or better, conforming to N.L.G.A. 121-C, unless otherwise specified, S4S. TimberStrand may be substituted where required for strength.
- .2 Light Framing: K.D. S.P.F. #2 or better, conforming to N.L.G.A. 122-B, unless otherwise specified, S4S.
- .3 Joists, Nailers, Plates and Blocking: K.D. S.P.F. #2 or better, conforming to N.L.G.A. 124-C, unless otherwise specified, S4S.
- .4 Solid Posts: Douglas Fir #1, unless otherwise specified, rough sawn.
- .5 Strapping and Nailing Strips: Hem-Fir, Construction Grade, unless noted otherwise.

2.05 PLYWOOD

- .1 Plywood to conform to CSA O141 or CSA 151, 1220 mm x 2440 mm sheets.
- .2 Sheathing: Douglas-Fir plywood or Canadian Softwood Plywood (CSP) Exterior Sheathing Grade with waterproof glue, thickness as detailed. Provide tongue & groove edges for floor and roof sheathing; square-edged for wall sheathing. Provide fire rated plywood for roof sheathing.



- .3 Wall Backing: fir plywood, thickness as detailed, exterior grade, and preservatively treated when used as backing for windows and exterior door frames.
- .4 Provide 19 mm (3/4") thick G1S fir plywood mounting boards for installation of electrical and telephone panels where shown on electrical drawings. Paint with intumescent paint.

2.06 ACCESSORIES

- .1 Including machine bolts, washers, lag bolts, drift pins, dowels and such like. Shall conform to CSA B33.1; nails, spikes and staples shall conform to CSA B111, galvanized in exterior locations, high humidity areas, and elsewhere where liable to corrosion, and in treated lumber.
- .2 Resilient Floor Underlayment: Install and provide to meet the requirements of the National Floor Covering Association.
- .3 Framing adhesive: 3M, Borden or pre-approved alternate. Use to fasten all plywood to joists, single layer application and where shown.
- .4 Vent screen: black fibreglass insect screen.
- .5 Miscellaneous Flashings: 0.020 aluminium.

2.07 CONNECTION STEEL

- .1 Shall be medium structural steel, conforming to CSA G40.20/G40.21, Grade 300W hot dipped galvanized.

2.08 VAPOUR BARRIER

- .1 Conforming to CGSB-51-34-M86, 6 mil polyethylene.

2.9 BREATHER FELT (BUILDING PAPER)

- .1 Conforming to CSA A123.3, No. 15, breather-type, asphalt impregnated sheathing paper, water repellent.

2.10 PRESSURE TREATED WOOD

- .1 All wood noted as treated to conform to the following:
- .2 To be treated with pressure applied chromated copper arsenate (C.C.A.) preservative salts conforming to CSA O80 (Boliden salt treatment or similar pre-approved).



- .3 All wood members and plywood backing in contact with concrete, masonry or below grade including bottom wall plates and all wood enclosed in roof assemblies, to be preservatively treated.

2.11 WOOD PRESERVATIVES

- .1 Conforming to CSA 080-M1989, mineral spirit solutions such as copper naphthenate or pentachlorophenol base. Wood to be treated by immersion (not by brush) all to manufacturer's recommendations.

3.0 EXECUTION

3.1 WORKMANSHIP

- .1 Erection methods and procedures shall meet minimum set out in the Ontario Residential Standards. Where this specification exceeds the above standards, the specification shall govern. Work to be done by skilled tradesmen in accordance with best trade practice and as directed by the Structural Engineer and Architect.
- .2 Backing for cabinets: at all wall-hung cabinets, provide heavy duty blocking and backing designed to accept weight of cabinets and contents. If contents of cabinets is not explicitly specified on drawings, assume cabinets will be used to store paper products.
- .3 Co-ordinate and install fabricated steel components supplied under other sections.
- .4 Provide and install wood blocking as required and where detailed in stud walls at door jambs, and to receive wood benches, handrails, grab bars, towel rails, and washroom accessories and fixtures.
- .5 Coordinate and provide blocking for all mechanical and electrical equipment as required.

3.02 ROUGH FRAMING

- .1 Make adequate provision for possible erection stresses. Set framing into correct position, arrange true to lines, levels and elevations, plumb and uniformly spaced as required. Securely brace members in place to maintain them plumb and true until permanently fixed and held in the structure.

3.03 EXPOSED FRAMING

- .1 Select for appearance.

3.04 ALL FRAMING NAILING

- .1 Lengths and spacings at least in accordance with Ontario Residential Standards.

3.05 FIRESTOPS

- .1 Shall be constructed from 22 ga. galvanized steel, 38 mm (1 1/2") 22 ga. material, full partition width, constructed to cut off all concealed draft openings, and forming an effective fire barrier.

3.06 EXTERIOR WALL FRAMING

- .1 Studs: Refer to the drawings for the sizes for all walls. All studs for walls shall be set at 410 mm (16") on centre unless otherwise noted. Length to be full height between plates (except at openings), and no splicing allowed. Use single bottom plate and double top plate. Except where noted otherwise, double studs at all openings, triple studs at corners and intersections. Use one row of girts 38 mm (1 1/2") x width of the stud, for studs over 2900 mm (9'-6") long, or as otherwise shown on the drawings and nailed securely.

- .2 Openings in Walls: Double up studs at openings with full length cripples from plate to lintel. Lintels are made up of two pieces of 38 mm (1 1/2") lumber, separated with spacers, to the depth of studs and nailed together to form a single unit. Lintels to bear minimum 38 mm (1 1/2") on cripples.

Sills in window openings, etc. to be minimum 38 mm (1 1/2") x stud width, set on cripples at jambs and on intermediate bearing as required. Double sills at openings over 1800 mm (6'-0").

- .3 Plywood Wall Sheathing: Sheath exterior stud walls using specified plywood sheathing. Sheathing shall be nailed using 15 mm (3") common nails 300 mm (12") on centre for intermediate bearing and 150 mm (6") on centre around perimeter supports. Plywood shall be applied so that all adjacent edges are separated by 2 mm (1/16").

3.07 INTERIOR PARTITION FRAMING

- .1 Refer to drawings for the sizes of studs for interior walls. All studs for wall shall be set at 410 mm (16") on centre unless otherwise noted. Length of stud to be full height between plates (except at openings) and no splicing allowed. Use single bottom plate and double top plate, double studs at all openings, triple studs at corners and intersections, unless noted otherwise.
- .2 Girts to be 38 mm (1 1/2") x stud width x space between studs; set on flat either in line and/or toe nailed; or staggered to permit back nailing through stud. Use girts at locations where studs exceed 2100 mm (7'-0") in length. Locate girts to divide the stud heights equally.
- .3 Where fixtures of other hanging devices occur, provide blocking between studs to suit, and where required.

3.08 ROOF FRAMING



- .1 Rafters: Of specified lumber, installed with crowns on top, straight, parallel, plumb, square, to supports as required, regularly spaced as noted on the drawings. No rafter may be cut or drilled in any manner which will adversely affect its strength and safety. Bear rafters directly on wood sills. Rafters to be accurately set and rigidly secured in place.
- .2 Bridging: All bridging shall be scissor type, from 50 mm x 75 mm (2" x 3") material and nailed twice at each end with 75 mm (3") nails. Rafters to be bridged at intervals not exceeding 2100 mm (7'-0") on centre. The ends of bridging shall be kept back from upper and lower edges of the rafters so as not to be affected by the shrinkage of the rafters.
- .3 Framing of Roof Openings: In accordance with N.B.C. Residential Standards.
- .4 Notching of Rafters: Notching of rafters shall be permitted as indicated, by dimensions and drawings. Any ends requiring notching to bring to proper levels not indicated on the drawings shall be approved by the Architect.
- .5 Roof Plywood: Install specified plywood panels with surface grain at right angles to rafters. Panels shall be fastened to supports using common, annularly grooved nails, spaced at intervals not exceeding 150 mm (6") along all edges supported on framing nor 300 mm (12") along intermediate supports.
- .6 Roof decking: D-Fir, 38 mm x 152 mm (1 1/2" x 6") tongue and groove decking, Select grade. Install in random pattern to CSA 086.1-M94 with 2 nails per plank at each support.

3.09 STRAPPING

- .1 Apply pressure treated strapping where indicated on drawings. Securely nail vertically on stud lines (over building paper).
- .2 Apply strapping where required to provide backing for finishes to follow. Securely nail, staple or shoot straps in place uniformly spaced, all shimmed and straightened to dead flat planes. Strapping to be minimum 20 mm x 38 mm @ 410 mm (3/4" x 1 1/2" @ 16") on centre unless otherwise required. Generally arrange direction and spacing of straps to suit the bearings and finishes, preferably cross strapping over wood bearings and under wood finishes.

3.10 NAILERS

- .1 Of treated Douglas Fir, sizes as indicated and as required to be continuous unless otherwise indicated.

3.11 ADDITIONAL ITEMS

- .1 The contractor shall make allowance for and provide and install items as required for strength and against movement and deflection, such as blocking, bracing,

backing, in-fill pieces, fasteners, furring, grounds, shims, bucks, dowels, bolts and washers, and other hardware, whether indicated or not, as directed by the structural engineer or architect and as required by building bylaws and National Building Code. No additional funds will be paid to the Contract to provide such additional items to complete the project as intended.

3.12 FURRING

- .1 All services, piping, ductwork, and other items projecting or becoming visible through finished surfaces shall be furred out as required whether indicated or not. Furr out surfaces of walls, columns, ceilings, etc. as required to provide planes of finished surfaces on desired lines and/or elevations. Furring to be minimum (38 mm x 38 mm @ 410 mm (1 1/2" x 1 1/2" @ 16")) on centre with plates, etc. unless otherwise required. Finish surface of furring to match surrounding materials.

3.13 WALL SHEATHING PAPER

- .1 Cover exterior wall sheathing with specified building paper (breather felt). Lap all joints 75 mm (3"), and on horizontal joints lap upper sheet over lower sheets. Return paper around framed openings. Repair torn and defective areas prior to applying exterior finishes.

3.14 VAPOUR BARRIER

- .1 Apply a double layer of specified vapour barrier over entire area of insulated walls and ceilings and floors. Apply on the warm side of insulation and over wood framing; and below roof insulation. Lap all joints a minimum 75 mm (3") and at solid bearing. Lap second layer minimum 1200 mm (4'-0"). Staple vapour barrier at 100 mm (4") on centre along edges at solid bearing. Fold back into reveals of all openings, and bring up tight against electrical outlets, registers and any other items and seal with recommended sealant where leakage may occur. Repair all breaks and defects before covering.

3.15 WOOD PRESERVATIVES

- .1 For wood requiring preservative treatment apply wood preservative to all wood that is cut or drilled on site, using two (2) coats of specified preservative to all fresh cuts or holes.
- .2 All timber in contact with concrete and roofs and where shown by Consultant, to be preservatively treated.

END OF SECTION 06 10 00