

Approved: 2006-09-30

SPEC NOTE DESCRIPTION: This Section specifies the choice of two alternatives for specifying and ordering concrete, either performance or prescriptive criteria and includes the materials, mixes, accessories, preparation, construction and verification for cast-in-place concrete.

SPEC NOTE ENVIRONMENT: Fly ash is a coal combustion by product of electrical power generation. These by-products rapidly accumulate and can cause disposal problems. Coal fly ash can be used as a component in concrete production. Each tonne of fly ash cement used to replace one tonne of traditional cement ingredients saves one barrel of oil associated with the costs of mining materials. MTL 2004-16(TR-R) - Use of Fly Ash and Slag in Concrete: A Best Practice Guide by PWGSC and NRCan (<ftp://ftp.pwgsc.gc.ca/rps/docentre/st/st252-e.pdf>) and ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete provide two references.

SPEC NOTE: This Section 03 30 00 has been renumbered to meet the recommendations of the MasterFormat 2004 classification system. Prior to January 2005, this NMS section was numbered Section 03300 - Cast-in-Place Concrete in accordance with MasterFormat 1995.

Part 1 General

SPEC NOTE: Limit section listings to only those sections containing specific information that would directly affect the work of this section. Do not include Division 01 sections in this listing.

1.1 RELATED SECTIONS

- .1 [____].

1.2 MEASUREMENT PROCEDURES

SPEC NOTE: Edit the following paragraphs to suit contract type.

- .1 Measurement Procedures: in accordance with Section [01 29 00 - Payment Procedures] [____].
- .2 Measure cast-in-place concrete [in sub-structure] [____] in cubic metres calculated from neat dimensions [as indicated] [authorized in writing by [Departmental Representative] [Engineer] [Consultant] [____]].
 - .1 Concrete placed beyond dimensions indicated will not be measured.
- .3 No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
- .4 No deductions will be made for volume of concrete less than [0.1] [m² in cross sectional area] [m³ in volume] [____] displaced by individual drainage openings.
- .5 Cast-in-place concrete [in superstructure] [____] will not be measured but will be paid for as a fixed price item.
- .6 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.
- .7 Measure supply and installation of waterstops in lineal metres installed.

1.3 REFERENCES

SPEC NOTE: Edit the following paragraphs to suit specific project.

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C260-[01], Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-[03], Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C330-[04], Standard Specification for Lightweight Aggregates for Structural Concrete.
 - .4 ASTM C494/C494M-[05], Standard Specification for Chemical Admixtures for Concrete.
 - .5 ASTM C1017/C1017M-[03], Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .6 ASTM D412-[98a(2002)e1], Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .7 ASTM D624-[00e1], Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .8 ASTM D1751-[04], Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .9 ASTM D1752-[04a], Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC 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(R1988)], Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-[2004], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-[00(R2003)], Qualification Code for Concrete Testing Laboratories.
 - .3 CAN/CSA-A3000-[03], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-[03], Cementitious Materials for Use in Concrete.

1.4 ACRONYMS AND TYPES

SPEC NOTE: Refer to CAN/CSA A3001 for complete list of Definitions.

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
 - .1 Type GU or GUb - General use cement.
 - .2 Type MS or MSb - Moderate sulphate-resistant cement.

- .3 Type MH or MHb - Moderate heat of hydration cement.
- .4 Type HE or Heb - High early-strength cement.
- .5 Type LH or LHb - Low heat of hydration cement.
- .6 Type HS or HSb - High sulphate-resistant cement.
- .2 Fly ash:
 - .1 Type F - with CaO content less than 8%.
 - .2 Type CI - with CaO content ranging from 8 to 20%.
 - .3 Type CH - with CaO greater than 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.

1.5 DESIGN REQUIREMENTS

SPEC NOTE: CSA-A23.1/A23.2, gives two Alternatives for specifying concrete. Alternative 1 - is a performance based specification where the concrete producer assumes responsibility for concrete mix proportioning and performance of the concrete as delivered, and the contractor assumes responsibility for the concrete in place. Alternative 2 - is a prescriptive based specification where the Engineer assumes responsibility for concrete mix proportioning and performance of the concrete.
SPEC NOTE: Select one of the following two Alternatives.

- .1 [Alternative 1 - Performance] [____] : in accordance with [CSA-A23.1/A23.2] [____], and as described in Mixes of PART 2 - PRODUCTS.
- .2 [Alternative 2 - Prescription] [____]: in accordance with [CSA-A23.1/A23.2] [____], and as described in Mixes of PART 2 - PRODUCTS.

1.6 SUBMITTALS

- .1 Submittals in accordance with Section [01 33 00 - Submittal Procedures] [____].
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section [01 47 15 - Sustainable Requirements: Construction] [____] and Section [02 61 33 - Hazardous Materials] [____].
- .3 At least [4] [____] weeks prior to beginning Work, submit to [Departmental Representative] [Engineer][Consultant] [____] samples of following materials proposed for use:
 - .1 [5] [____] L of curing compound.
 - .2 [1] [2] [____] m length of each type of joint filler.
 - .3 [____] m length of each type of waterstops.

SPEC NOTE: When selecting Alternative 2 - Prescription Method, use the following 3 paragraphs.

- .4 [3] [____] kg of each type of supplementary cementing material.
- .5 [10] [____] kg of each type of blended hydraulic cement.
- .6 [5] [____] kg of each admixture.

SPEC NOTE: When selecting Alternative 2 - Prescription Method of specifying concrete, use the following paragraph for verification of compliance.

- .4 Submit [testing] [inspection] results [and] [reports] for review by [Departmental Representative] [Engineer] [Consultant] [___] and do not proceed without written approval when deviations from mix design or parameters are found.
- .5 Concrete pours: submit accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .6 Concrete hauling time: submit for review by [Departmental Representative] [Engineer] [Consultant] [___] deviations exceeding maximum allowable time of [120] [___] for concrete to be delivered to site of Work and discharged after batching.

1.7 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section [01 45 00 - Quality Control] [___].
- .2 Site Meetings: in accordance with [Section [01 32 17 - Construction Progress Schedule - Critical Path Method (CPM)] [___]] [Section [01 32 18 - Construction Progress Schedules - Bar (GANTT) Chart] [___]], convene pre-installation meeting [one] [___] week prior to beginning [concrete works] [___].
 - .1 Ensure [key personnel,] [site supervisor,] [Departmental Representative] [Engineer] [Consultant] [___] [speciality contractor - finishing, forming] [concrete producer] [testing laboratories] attend.
 - .2 Verify project requirements.
- .3 Submit to [Departmental Representative] [Engineer] [Consultant] [___], minimum [4] [___] weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
 - .1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials used in concrete mixture will meet specified requirements.
- .4 Minimum [4] [___] weeks prior to starting concrete work, submit proposed quality control procedures for review by [Departmental Representative][Engineer] [Consultant] [___] on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.
 - .8 [___].

SPEC NOTE: When selecting Alternative 1 - Performance Method of specifying concrete, use the following paragraph for verification of compliance of performance requirements.

- .5 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to [Departmental Representative] [Engineer] [Consultant] [___] verifying compliance that

concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

SPEC NOTE: Use the following paragraph for PWGSC projects.

- .6 Health and Safety Requirements: do construction occupational health and safety in accordance with Section [01 35 30 - Health and Safety Requirements] [____].

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed [120] [____] minutes after batching.
- .1 Modifications to maximum time limit must be agreed to [Departmental Representative][Engineer] [Consultant] [____] [laboratory representative] [____] and concrete producer as described in CSA A23.1/A23.2.
- .2 Deviations to be submitted for review by [Departmental Representative] [Engineer][Consultant] [____].

SPEC NOTE: Specify the delivery rate according to the project size.

- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Waste Management and Disposal:
- .1 Separate waste materials for [reuse] [and] [recycling] [____] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [____].

SPEC NOTE ENVIRONMENT: Chemical cleaning is usually done with water-based mixtures. A small amount of acid or alkali is included to separate the dirt from the surface. Their acid or alkaline properties can lead to reactions between cleaner and concrete as well as mortar, painted surfaces, glass, metals, and a host of other building materials. Chemical cleaning can have an abrading effect on the concrete surface that may change the appearance of a surface compared to that of an adjacent uncleaned surface.

SPEC NOTE ENVIRONMENT: When mechanical cleaning methods (blasting, chipping, grinding) are employed, there will be some loss of decorative detail, increased surface roughness, and rounding of sharp corners. Mechanical cleaning can have an abrading effect on the concrete surface that may change the appearance of a surface compared to that of an adjacent uncleaned surface.

- .2 Divert unused concrete materials from landfill to local [quarry] [facility] [____] approved by [Departmental Representative] [Engineer][Consultant] [____].
- .3 Provide an appropriate area on the job site where concrete trucks can be safely washed.
- .4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the [Departmental Representative] [Engineer][Consultant] [____].
- .5 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
- .6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid

with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

Part 2 Products

SPEC NOTE: A context sensitive link to McGraw-Hill Construction's product information web site has been added to this NMS section by Spex.ca, as a publisher enhancement. To review potentially suitable products for use in this section, go to <http://sweets.construction.com>. This link does not imply Spex.ca's nor PWGSC's endorsement of any information provided by McGraw-Hill, nor it's suitability for use.

2.1 SUSTAINABLE REQUIREMENTS

SPEC NOTE ENVIRONMENT: Choose products and materials with recycled content or resource efficient characteristics whenever possible. Use least toxic sealants, fillers, compounds, adhesives, sealers and finishes necessary to comply with the requirements of the project.

- .1 Materials and resources in accordance with Section [01 47 15 - Sustainable Requirements: Construction] [___].

.1 [___].

SPEC NOTE: SUSTAINABLE: Edit the following paragraph to include sustainable requirements related to verification of this project for attaining environmental performance goals.

- .2 Do verification requirements in accordance with Section [01 47 17 - Sustainable Requirements: Contractor's Verification].

SPEC NOTE ENVIRONMENT: When a concrete surface must resist bacteria, and fungi for hygienic or aesthetic reasons, consider using adapted products.

2.2 MATERIALS

SPEC NOTE ENVIRONMENT: For Federal Government projects, the use of Supplementary Cementing Materials (SCMs) such as fly ash, ground granulated blast-furnace slag (GGBFS), silica fume or natural pozzolans, should be considered as partial replacement of cement in concrete, in order to reduce greenhouse gas emissions (GHG), unless it is not technically or economically feasible. The use of recyclable industrial by-products such as SCMs, results in sustainable "green" concrete and offers additional benefits including an increase in the conservation of raw materials, energy, resource recovery, and a reduction in the quantities of waste requiring disposal. Refer to CAN/CSA-A3001 - Cementitious Materials for Use in Concrete.

SPEC NOTE ENVIRONMENT: Inclusion of SCMs may affect the workability and curing time of concrete. Delete reference to fly ash when Alternative 1 is being used.

- .1 Cement: to CAN/CSA-A3001, Type [GU] [___].

SPEC NOTE: Use of supplementary cementing materials can affect properties of plastic and hardened concrete and hence their use must be evaluated before use.

- .2 [Blended] [___] hydraulic cement: Type [GU] [___] to [CAN/CSA-A3001] [___].

SPEC NOTE: For full types of supplementary cementing materials refer to CSA A23.1/A23.2: N - Natural pozzolan, F - Fly ash (low calcium content), CI - Intermediate calcium content, CH - High calcium content, S - Ground granulated blast-furnace slag, and SF - Silica fume.

- .3 Supplementary cementing materials: with minimum [20] [___]% [Type [F] [CI] [CH] fly ash replacement] [N] [GGBFS], by mass of total cementitious materials to CAN/CSA-A3001.
- .4 Water: to [CSA-A23.1] [___].

SPEC NOTE: Alkali aggregate reactivity problems may occur under certain circumstances. Ensure that the mix proportioning is adjusted so as to prevent such problems, and that the specifications are amended accordingly. Refer to CSA A23.2 and define the life cycle according to the applicability of the table in that standard.

- .5 Aggregates: to [CAN/CSA-A23.1/A23.2] [ASTM C330].
- .6 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to [ASTM C494] [ASTM C1017]. [Departmental Representative] [Engineer] [Consultant] [___]to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .3 Corrosion-inhibiting admixture: to [___].
 - .4 Lithium-based admixture: to [___].
 - .5 Shrinkage-reducing admixture (SRA): to [___].
 - .6 Viscosity-modifying agent (VMA): to [___].
- .7 Shrinkage compensating grout: premixed compound consisting of [metallic] [non-metallic] aggregate, [Portland] [___] cement, water reducing and plasticizing agents to [CSA-A23.1/A23.2] [___].
 - .1 Compressive strength: [___] MPa at [28] [___] days.
 - .2 Net shrinkage at [28] [___] days: maximum [___] %.
- .8 Non premixed dry pack grout: composition of non metallic aggregate [Portland] [___] cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of [___] MPa at [___] days.
- .9 Post-Tensioning ducts: to CSA-A23.1/A23.2.
- .10 Curing compound: to [CSA-A23.1/A23.2 [white] [___]] [and] [ASTM C309, [Type 1-chlorinated rubber] [Type 1-D with fugitive dye]] [___].

SPEC NOTE: When choosing ribbed waterstops select welded corners. When choosing labyrinth waterstops select prewelded corners.

- .11 [Mechanical] [___] waterstops: [ribbed] [labyrinth] extruded PVC [Arctic Grade] [___] of sizes indicated [with [shop welded] [prewelded] corner and intersecting pieces with legs not less than [___] mm long] [___] :
 - .1 Tensile strength: to ASTM D412, method [A] [___], Die "C", minimum [___] MPa.
 - .2 Elongation: to ASTM D412, method [A] [___], Die "C", minimum [275] [250] %.
 - .3 Tear resistance: to ASTM D624, method [A] [___], Die "B", minimum [30] [___] kN/m.

- .12 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
 - .2 Sponge rubber: to ASTM D1752, Type I, [flexible] [firm] grade.

SPEC NOTE: Specify Type II for standard cork.

- .3 [Self-expanding] [standard] cork: to ASTM D1752, Type [II] [III].
- .13 Weep hole tubes: [galvanized steel] [plastic] [___].
- .14 Dovetail anchor slots: minimum [0.6] [___] mm thick galvanized steel with insulation filled slots.

SPEC NOTE: Dampproof membrane should only be used under special circumstances. Refer to NRC publication "The Use of Vapour Barriers Under Concrete Slabs on Ground" by R.G. Turenne.
SPEC NOTE: Add other performance requirements such as permeability, weight, puncture resistance, and tensile strength, if considered necessary.

- .15 Dampproof membrane:
 - .1 Kraft/polyethylene membrane:
 - .1 Plain: [.05] [.10] [.75] mm thick polyethylene film bonded to asphalt treated creped kraft.
 - .2 Reinforced: two [.05] [.10] [.75] mm thick polyethylene films bonded each side of asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.
 - .3 Membrane adhesive: as recommended by membrane manufacturer.
 - .2 Bitumen impregnated protection board: [___].
 - .3 Cavity drainage board: [___].
- .16 Dampproofing:
 - .1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2, [and to Section [07 11 13 - Bituminous Dampproofing] [___]] [___].
- .17 Polyethylene film: [___] mm thickness to CAN/CGSB-51.34.

SPEC NOTE: Include description of bonding adhesive only if Portland Cement grout not used.

- .18 Bonding adhesive: [___].
- .19 Topping: [___].

2.3 MIXES

SPEC NOTE: Choose one of the following two paragraphs for specifying concrete in accordance with the Design Requirements selected in Part 1, either Alternative 2 - Prescriptive or Alternative 1 - Performance. Repeat paragraphs for each different mix required and edit to suit. If more than one mix is used in project, carefully identify them and co-ordinate specifications with drawings. When selecting Alternative 1 - Performance, delete the following paragraph.

SPEC NOTE: When selecting Alternative 2 Prescriptive Method, specify the concrete mix proportioning and ensure submittals of materials to be used have been included for testing. Specify the proportions of the components of the concrete, the air content and the slump value as indicated in CSA A23.1/A23.2.

- .1 Alternative 2 - Prescriptive Method for specifying concrete: owner's concrete mix in accordance with CAN/CSA-A23.1.
 - .1 Ensure materials to be used in concrete mix have been submitted for testing.
 - .2 Co-ordinate construction methods to suit [Departmental Representative] [Engineer] [Consultant] [___] concrete mix proportions and parameters.
 - .3 Identify and report immediately to [Departmental Representative] [Engineer] [Consultant] [___] when concrete mix design and parameters pose anticipated problems or deficiencies related to construction.
 - .4 [Departmental Representative] [Engineer] [Consultant] [___] to proportion concrete mix for [normal] [HVSCM] [___] including:
 - .1 Class of exposure: [C-XL] [C-1].
 - .2 Intended application: [___].
 - .3 Aggregate: [normal-density] [structural low-density] [high-density], [FA] [FA1] [FA2], maximum size [___], alkali aggregate reactivity [___] kg/m³ of concrete.
 - .4 Admixture: [air-entraining] [chemical to ASTM C 494/C 494M] [corrosion-inhibiting] [lithium-bases] [SRA] [VMA] [___] kg/m³ of concrete.

SPEC NOTE: Use the following paragraph when SCMs are used as partial replacement of cement. Select and proportion by mass required.

- .5 Supplementary cementing materials: with minimum [20] [___]% [Type [F] [CI] [CH] fly ash replacement] [N] [GGBFS], by kg/m³ of total cementitious material.
- .6 Water: [___] kg/m³ of concrete.
- .7 Maximum W/CM ratio: [.32] [.37] [.50].
- .8 Air content category: [1] [2].
- .9 Slump: at time and point of discharge [___] to [___] mm.
- .10 Quality Plan: [___].

SPEC NOTE: In the following paragraph include other special requirements in colour, finish or appearance.

- .11 Other special requirements: [___].

SPEC NOTE: When selecting Alternative 1 - Performance Method, specify performance criteria as indicated in CSA A23.1/A23.2.

- .2 Alternative 1 - Performance Method for specifying concrete: to meet [Departmental Representative] [Engineer] [Consultant] [___] performance criteria in accordance with CAN/CSA-A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity: [___].
 - .2 Placeability: [___].
 - .3 Workability: free of [surface blemishes] [loss of mortar] [colour variations] [segregation].

- .4 Finishability: [___] amount of bleeding.
- .5 Set time: [___].
- .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: [C-XL] [C-1].
 - .2 Minimum compressive strength at [28] [56] [90] [120] age: [35] [50] [70] MPa.
 - .3 Intended application: [___].
 - .4 Volume stability: acceptable volume change range [___] due to shrinkage, creep and freeze thaw cycle.
 - .5 Surface texture: [non-skid finish] [steel trowel finish].
 - .6 Geometrical requirements: [[___]% slope for drainage] [___].
 - .7 Pre-Qualification: [___].

SPEC NOTE: In the following paragraph include other special requirements in colour, finish or appearance.

- .8 Other special requirements: [___]. Provide quality management plan to ensure verification of concrete quality to specified performance.
- .4 Concrete supplier's certification.
- .5 Other performance requirements: [___].

Part 3 Execution

3.1 PREPARATION

- .1 Obtain [Departmental Representative's] [Engineer][Consultant's] [___] approval before placing concrete.
 - .1 Provide [24] [___] hours notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section [03 20 00 - Concrete Reinforcing] [___].
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete [will not be permitted] [is permitted only after approval of equipment and mix] [___].
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain [Departmental Representative's] [Engineer][Consultant's] [___] approval of proposed method for protection of concrete during placing and curing [in adverse weather] [___].
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.

- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

SPEC NOTE: Delete the following paragraph if dowelling is not to be used.

- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
- .1 Place steel dowels [of deformed steel reinforcing bars] [____] and pack solidly with [shrinkage compensating grout] [epoxy grout] [____] to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by [Departmental Representative][Engineer] [Consultant] [____].

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.
- .2 Sleeves and inserts:
- .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by [Departmental Representative] [Engineer][Consultant] [____].
- .2 Where approved by [Departmental Representative] [Engineer][Consultant] [____], set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
- .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by [Departmental Representative] [Engineer] [Consultant] [____].
- .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from [Departmental Representative] [Engineer] [Consultant] [____] before placing of concrete.
- .5 Check locations and sizes of sleeves and openings shown on drawings.
- .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete. Anchor bolts:
- .7 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
- .8 With approval of [Departmental Representative] [Engineer] [Consultant] [____], 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] [to manufacturers' recommendations] [____].
- .9 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .10 Set bolts and fill holes with [shrinkage compensating grout] [epoxy grout] [____].
- .11 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .3 Drainage holes and weep holes:

- .1 Form weep holes and drainage holes in accordance with Section [03 10 00 - Concrete Forming and Accessories] [___]. If wood forms are used, remove them after concrete has set.
- .2 Install weep hole tubes and drains as indicated.

SPEC NOTE: Co-ordinate the following paragraph with Section 04 05 10 - Common Work Results for Masonry.

- .4 Dovetail anchor slots: in accordance with [Section 04 05 10 Common Work Results for Masonry] [___].
 - .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
 - .2 Install continuous vertical anchor slots at [800] [___] mm on centre 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 and curing:

SPEC NOTE: Provide schedule of exposed or architectural finish requirements to walls.

- .1 Finish concrete in accordance with CSA-A23.1/A23.2.
 - .1 Schedule: [___].
- .2 Use procedures as reviewed by [Departmental Representative] [Engineer][Consultant] [___] [or those noted in CSA-A23.1/A23.2] [___] to remove excess bleed water. Ensure surface is not damaged.

SPEC NOTE: Identify finish and compatible curing compound.

- .3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: [___]. Provide written declaration that compounds used are compatible.

SPEC NOTE: Applies to conductive and static disseminating surface treatment and conductive and static disseminating monolithic or bonded topping.

- .4 [Finish concrete floor to meet requirements of CSA-A23.1/A23.2. Class [___] [___].
- .5 [Concrete floor to have finish hardness equal or greater than Mohs hardness [___] [___] in accordance with CSA-A23.1/A23.2.
- .6 Provide [screed] [swirl-trowelled] [scratch] [___] finish where [bonded topping] [terrazzo] [floor tile] [___] is to be applied. [Provide depression[s] to accommodate [bonded topping] [terrazzo] [floor file] [___] [___].
- .7 [Provide [screed] [float] [swirl-trowelled] [___] finish unless otherwise indicated] [___].
- .8 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated. Toppings:

SPEC NOTE: Indicate details of special concrete mix for topping or identify at least three appropriate proprietary products.

- .9 Topping mixture to meet following requirements: [Monolithic,] [Bonded overlay] [___] mm thick: [___].

- .10 In pouring base course, make allowance for [monolithic] [and] [bonded overlay] [___] topping thickness.
 - .11 Apply [cement/sand grout] [latex bonding agent modified cement/sand grout] [epoxy bonding agent] to base course in accordance with CSA-A23.1/A23.2.
 - .12 Place [monolithic] [bonded] topping in accordance with CSA-A23.1/A23.2 and topping manufacturer's recommendations.
 - .13 Ensure that joints in topping are of same material as those in base course. Also ensure that their locations precisely match those in base course. [Provide [dividers] [edge strips] [reinforcing mesh] [___] as indicated] [___].
- .7 Waterstops:
- .1 Install waterstops to provide continuous water seal.
 - .2 Do not distort or pierce waterstop in way as to hamper performance.
 - .3 Do not displace reinforcement when installing waterstops.
 - .4 Use equipment to manufacturer's requirements to field splice waterstops.
 - .5 Tie waterstops rigidly in place.
 - .6 Use only straight heat sealed butt joints in field.
 - .7 Use factory welded corners and intersections unless otherwise approved by [Departmental Representative] [Engineer][Consultant] [___].
- .8 Joint fillers:
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by [Departmental Representative][Engineer] [Consultant] [___].
 - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form [isolation] [construction] [expansion] [___] joints as indicated.
 - .4 Install joint filler.
- SPEC NOTE: Other forms of bond breaker may be substituted in place of joint filler with approval of Departmental Representative/Engineer/Consultant.*
- .5 Use [12] [___] mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to [within [12] [___] mm of] [___] finished slab surface unless indicated otherwise.
- .9 Dampproof membrane:
- .1 Install dampproof membrane under concrete slabs-on-grade inside building.
 - .2 Lap dampproof membrane minimum [150] [___] mm at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete.
 - .4 Use patching material at least [150] [___] mm larger than puncture and seal.

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance in accordance with CSA-A23.1/A23.2 [straightedge method] [FF = [___] : FL = [___] [waivness method] [___]] [to tolerance schedule as indicated] [___].

3.4 FIELD QUALITY CONTROL

SPEC NOTE: Use the following paragraph for accurate records of poured concrete and testing, and co-ordinate with PART 1 - SUBMITTALS as specified below.

- .1 Site tests: conduct following test [in accordance with Section [[01 45 00 - Quality Control] [____]] [____] and submit report as described in PART 1 - SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump tests.
 - .3 [____].
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by [Departmental Representative] [Engineer] [Consultant] [____] for review in accordance with [CSA-A23.1/A23.2] [____].
 - .1 Ensure testing laboratory is certified in accordance with [CSA A283] [____].
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between [testing laboratory] [____] and [Departmental Representative] [Engineer] [Consultant] [____].
- .4 [Departmental Representative] [Engineer] [Consultant] [____] will pay for costs of tests as specified in Section [01 29 83 - Payment Procedures for Testing Laboratory Services] [____].
- .5 [Departmental Representative] [Engineer] [Consultant] [____] will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

SPEC NOTE: When pull-out test method is used, the inserts shall be located on the design drawing and placed before pouring concrete. Specify making good (repair) concrete surface after completion of tests.

- .6 Non-Destructive Methods for Testing Concrete: in accordance with CSA-A23.1/A23.2.

SPEC NOTE: Use the following paragraph for Private Sector projects and co-ordinate with General Conditions of the Contract.

- .7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 VERIFICATION

SPEC NOTE: When selecting Alternative 1 - Performance Method, use the following paragraph.

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - Products, by [Departmental Representative] [Engineer] [Consultant] [____] and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

END OF SECTION