PART E

SPECIFICATIONS

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.1.1 *The City of Winnipeg Standard Construction Specifications* is available in Adobe Acrobat (.pdf) format on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at http://www.winnipeg.ca/matmgt.

E1.1.2 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.2 The following Drawings are applicable to the Work:

Drawing No.	Drawing
B129-04-01	2004 Bridge Maintenance - North Approach Remedial Works, Sheet 1 of 2
B129-04-02	2004 Bridge Maintenance - North Approach Remedial Works, Sheet 2 of 2

E2. PEDESTRIAN TRAFFIC CONTROL

E2.1 Description

The Specification covers the requirements for pedestrian control.

The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E2.2 Notification

The Contractor shall notify the City of Winnipeg Customer Services at 986-5640 forty-eight hours in advance of Work taking place at the sites. This call is necessary so that the public can be notified of impending traffic control.

E2.3 Construction Methods

(a) General

The Contractor will be responsible for pedestrian traffic control at the site acceptable to the Contract Administrator.

(b) Specific

The Contractor shall maintain a safe pedestrian/cycle/wheelchair crossing of the worksite for the duration of the project by constructing a temporary crossing. The crossing shall be suitably ramped with maximum 6 % slopes and be of a minimum width of 1500 mm. The crossing shall be constructed to follow all provincial and building codes.

E2.4 Measurement and Payment

The provision of pedestrian traffic control will not be measured and will be paid for at the Contract Lump Sum Price for "Pedestrian Traffic Control" in accordance with this specification, accepted by the Contract Administrator.

E3. CAST-IN-PLACE CONCRETE PILES

E3.1 Description

The Work covered under this item shall include all concreting operations related to construction of cast-in-place concrete pile foundations in accordance with this Specification and as shown on the Drawings.

The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E3.2 Materials

(a) General

The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

(b) Handling and Storage of Materials

All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard CAN3-A23.1, "Storage of Materials," except as otherwise specified herein.

(c) Cement

Cement shall be Type 50, Sulphate-Resistant Cement, conforming to the requirements of CSA Standard CAN3-A5.

(d) Supplementary Cementing Materials

Use of Pozzolans, fly ash, or silica fume will not be permitted for use in structural concrete supplied under this Specification.

(e) Water

Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

(f) Aggregate

The Contractor shall furnish in writing to the Contract Administrator, the location of the sources where aggregate will be obtained, in order that same may be inspected and tentatively approved by the Contract Administrator. Changes in the source of aggregate

supply during the course of the Contract will not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(a) Fine Aggregate

Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains; free from injurious amounts of dust, soft or flaking particles, shale, alkali, organic matter, loam, or other deleterious substances.

Fine aggregate shall be well-graded throughout and shall conform to the following grading requirements:

Gradation of Fine Aggregates	
Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
10,000	100%
5,000	95% - 100%
2,500	80% - 100%
1,250	50% - 90%
630	25% - 65%
315	10% - 35%
160	2% - 10%
80	0% - 3%

(b) Coarse Aggregate (20 mm Nominal)

Coarse aggregate shall conform to the requirements of CAN3-A23.1, Section 5, Aggregates. Coarse aggregate shall be clean and free from alkali, organic, or other deleterious matter, shall have an absorption not exceeding 3%, and shall conform to the following gradation requirements.

Gradation of 20 mm Coarse Aggregate	
Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
28,000	100%
20,000	90% - 100%
10,000	25% - 60%
5,000	0% - 10%
2,500	0% - 5%
80	0% - 1%

(g) Admixtures

No admixtures other than air-entraining agent shall be used without the written authorization of the Contract Administrator, unless otherwise specified in these Specifications. It shall be the Contractor's responsibility to ensure that any admixture is compatible with all other constituent materials.

(h) Reinforcing Steel

Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

All reinforcing steel shall conform to the requirements of CSA Standard G30.12, Grade 400 MPa, Billet-Steel Bars for Concrete Reinforcement.

(i) Curing Compound

Curing compound shall be liquid member-forming and conform to the requirements of ASTM Standard C309 and the proposed standard ASTM P198. Rate of application shall be the rate required to meet the requirements of ASTM P198 for the texture of concrete the curing compound is being applied to.

The curing compound shall be resin-based and white-pigmented.

(j) Patching Mortar

The patching mortar shall be made of the same material and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted, and the mortar shall consist of not less than 1 part cement to 2 1/2 parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water and bonding agent shall be no more than necessary for handling or placing.

(k) Miscellaneous Materials

Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

E3.3 Concrete Mix Design

Proportioning of fine aggregate, coarse aggregate, cement, water, and air entraining agent shall be such as yield concrete having the required strength and workability as follows:

i) Minimum Compressive Strength at 28 days = 32 MPa.
ii) Maximum Water/Cement Ratio = 0.45.
iii) Minimum Cement Content = 340 kg/m^3.
iv) Slump = 80 mm ± 30 mm.
v) Aggregate: 20 mm Nominal.
vi) Air Content: 5.0% to 8.0%.
vii) Cement - Type 50.

E3.4 Equipment

All equipment shall be of a type approved by the Contract Administrator and shall be kept in good working order.

E3.5 Construction Methods

(a) Location and Alignment of Piles

Piles shall be placed in the positions shown on the Drawings and as directed by the Contract Administrator in the field.

The deviation of the axis of any finished pile shall not differ by more than 1% from the vertical.

(b) Buried Utilities

The Contractor shall exercise caution when constructing the pile foundations in the vicinity of existing buried utilities. The Drawings show the approximate locations of existing buried utilities. The Contractor shall be responsible for obtaining the exact location of the buried utilities from the appropriate Utility Authority prior to installing the piles.

The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operations in constructing cast-in-place concrete piles, as determined by the Contract Administrator.

(c) Excavation

Excavations for piles shall be made with equipment designed to remove a core of the diameter shown on the Drawings. All piles shall be drilled for the minimum length indicated on the Drawings.

Upon reaching the required elevation, the bottom of the bore shall be cleaned and, if called for, belled out to the required dimensions and elevations as shown on the Drawings or as directed by the Contract Administrator in the field.

All excavated material from the piles shall be promptly hauled from the site to an approved disposal area as located by the Contractor. No excavated material shall be stockpiled on the riverbank.

Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3% in one hour or 20% in twenty-four hours.

Immediately after stripping and patching, formed surfaces shall receive an application of the approved curing compound.

(d) Form Removal

Forms shall not be removed for a period of at least 24 hours after the concrete has been placed. Removal of forms shall be done in a manner to avoid damage to, or spalling of, the concrete.

The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.

Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

(e) Patching of Formed Surfaces

Immediately after forms around the top exposed length of the pile have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair of surface finishing started before this inspection may be rejected and required to be removed..

All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.

Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be well-brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the surface and left for one hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

E3.6 Quality Control

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works that are not in accordance with the requirements of this Specification.

The Contractor shall be responsible for making a thorough inspection of the materials to be supplied under this Contract. All material shall be free of surface imperfections and other defects.

E3.7 Measurement and Payment

(a) Construction of Cast-in-Place Concrete Piles

The construction of cast-in-place concrete piles, complete with reinforcing steel, will not be measured and will be paid for at the Contract Unit Price per linear metre for "Cast-in-Place Concrete Piles" in accordance with this Specification, accepted by the Contract Administrator.

E4. REINFORCED CONCRETE RETAINING WALL CONSTRUCTION

E4.1 Description

The Work covered under this item shall include the reconstruction of designated existing asphalt pathway, excavation, removal of existing handrail, the construction of new concrete retaining wall, backfill, and the installation of a neoprene compression seal.

The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E4.2 Materials

(a) General

The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials supplied under this Specification shall

be subject to inspection and testing by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

The Contractor shall supply all materials incidental to these Works. All materials must be on hand prior to commencement of the Work.

(b) Concrete Aggregate

The Contractor shall furnish in writing to the Contract Administrator, the location of the sources where aggregate will be obtained, in order that same may be inspected and tentatively approved by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract will not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(a) Fine Aggregate

Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains; free from injurious amounts of dust, soft or flaking particles, shale, alkali, organic matter, load, or other deleterious substance.

Fine aggregate shall be well-graded throughout and shall conform to the following grading requirements:

Sieve Size	Percent of Total Dry Weight Passing Each Sieve
10 mm	100%
5 mm	95% - 100%
2.5 mm	80% - 100%
1.25 mm	50% - 90%
630 µm	25% - 65%
315 µm	10% - 35%
160 µm	2% - 10%
80 µm	0% - 3%

b) Coarse Aggregate (20 mm Nominal)

Coarse aggregate shall be clean and free from alkali, organic, or other deleterious matter, shall have an absorption not exceeding 3%, and shall conform to the following gradation requirements:

Sieve Size	Percent Passing
28 mm	100%
20 mm	90% - 100%
10 mm	25% - 60%
5 mm	0% - 10%
2.5 mm	0% - 5%
80 µm	0% - 1%

(c) Cement

All cement, unless hereinafter specifically stated, shall be Type 10 Portland Cement.

(d) Water

Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

(e) Admixtures

(a) Air-Entraining Agent

The air-entraining agent shall conform to the requirements of ASTM Standard C260. It shall produce a satisfactory air void system and an air content within the ranges specified in CSA A23.1 for each class of concrete.

(b) Water-Reducing Agent

Water-reducing agent shall conform to the requirements of ASTM Standard C494.

(c) Superplasticizing Agent

If the Contract Administrator authorizes the use of a superplasticizing agent, the superplasticizing agent shall conform to the requirements of ASTM Standard C494. The agent shall be free of chlorides and shall not affect the air-entraining agent's stability to produce a satisfactory air-void system.

(f) Latex Bonding Agent

Latex bonding agent shall be ACRL-STIX, as supplied by Speciality Construction Products, or equal as approved by the Contract Administrator.

(g) Curing Compound

Curing compound shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309 and the proposed Standard ASTM P198. Rate of application shall be 1.5 times the rate required to meet the requirements of ASTM P198 for the texture of concrete to which the curing compound is being applied.

Curing compounds shall be resin-based and white-pigmented.

(h) Epoxy Adhesive

Epoxy adhesive shall be ST431, as manufactured by Sternson Limited or equal as approved by the Contract Administrator.

(i) Concrete Supply

Unless otherwise specified in these Specifications, only the use of a ready-mix concrete plant will be permitted. Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of CSA Standard CAN3-A23.1, "Production of Concrete," except that the transporting of ready-mixed concrete in non-agitating equipment will not be permitted unless prior written approval is received from the Contract Administrator.

Unless otherwise directed by the Contract Administrator, the discharge of ready-mixed concrete shall be completed within one and a half (1.5) hours after the introduction of the mixing water to the cement and aggregates.

The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

(j) Fly Ash

Use of fly ash will be permitted for use in structural concrete supplied under this Specification to a maximum of 10% of the cement content. The use of fly ash to reduce the cement content below the minimum indicated requirement will not be permitted.

(k) Miscellaneous Materials

The Contractor shall supply all materials, as approved by the Contract Administrator, to ensure the satisfactory completion of the concrete repair works.

(l) Concrete Strength and Workability

Proportioning of fine aggregate, coarse aggregate, cement, water and air-entrainment agent shall be such as to yield concrete having the required strength and workability as follows:

(i) Specified Compressive Strength @ 28 Days - 35 MPa
(ii) Minimum Cement Content = 340 kg/m^3
(iii) W/C ratio = 0.40
(iv) Slump = 80 mm ± 20 mm
(v) Aggregate: 20 mm Nominal
(vi) Air Content: 5 to 8 percent
(vii) Superplasticizer: optional

The Contractor shall submit the proposed mix designs at least two weeks before the commencement of concrete placing operations.

(m) Reinforcing Steel

Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

All reinforcing steel shall be supplied in accordance with the approved Shop Drawings.

All reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400W, Billet-Steel Bars for concrete reinforcement. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibits flaws in manufacture or fabrication, such material shall be immediately removed from the site and replaced with acceptable reinforcing steel.

All reinforcing steel shall be straight and free from paint, oil, mill-scale, and injurious defects. Surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross section area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard G30.18.

(n) Bar Accessories

Bar accessories shall be of a type approved by the Contract Administrator. They shall be made from a non-rusting material or galvanized steel, and shall not stain, blemish, or spall the concreted surface for the life of the concrete.

Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

(o) Non-shrink Grout

Grout as specified hereinafter shall be used for the grouting of all reinforcing steel dowels into existing concrete and for bearing surfaces.

Non-shrink grout shall consist of a pre-mixed non-metallic non-shrink grout. Approved products are:

1) M-Bed Standard grout as manufactured by Sternson Ltd.

2) CPD Non-shrink grout

3) Set Non-shrink grout as manufactured by Master Builders.

4) Sika 212 - Non-shrink grout

5) Or equal, as approved by the Contract Administrator.

The grout shall be of a consistency suitable for the application intended, as approved by the Contract Administrator.

(p) Fibre Joint Filler

Fibre joint filler shall be rot-proof and of the preformed, non-extruding, resilient-type, made with a bituminous fibre such as "Flexcell," or equal as approved by the Contract Administrator, and shall conform to the requirements of ASTM Standard D1751.

(q) Flexible Joint Sealant

Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining grey polyurethane, approved by the Contract Administrator and applied in strict accordance with the manufacturer's instructions, including appropriate primers. Approved products are Vulkem 116 by Mameco; Sonolastic NP1 by Sonneborne; RC-1 by Permapol; and Sikaflex by Sika; Bostik Chem Calk 900 by Bostik; or equal as approved by the Contract Administrator.

(r) Formwork

Formwork materials shall conform to CSA Standard CAN/CSA-A23.1 and American Concrete Institute Publication SP:4, "Formwork for Concrete."

No formwork accessories will normally be allowed to be left in place within 50 mm of the surface following form removal. However, if the Contract Administrator does permit these

items to be left in place, they must be made from a non-rusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

Boards used for formwork shall be fully seasoned and free from defects that may mar the surface, such as knots, warps, cracks, etc.

Forms for exposed surfaces that do not require a formliner shall be new plywood or steel as authorized by the Contract Administrator.

Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion, all the forces to which the forms will be subjected.

Whalers shall be spruce or pine, with minimum dimension of 100 mm x 150 mm.

(s) Neoprene Compression Seal

The neoprene compression seal will be model DS Brown CV-1752 and will be supplied by the City to the Contractor f.o.b. the City Bridge Yard. The Contractor is to supply the compatible bonding agent.

(t) Bonding Grout

The grout for bonding new concrete to existing concrete shall consist of the following constituents, by weight:

.1 1 part water

.2 1 part latex bonding agent

.3 1½ parts Type 10 Portland cement

The consistency of the bonding grout shall be such that it can be applied to the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

(u) Expanding Joint Filler

Expanding joint filler shall be compressed to 20% of its expanded width and be a polyurethane foam, impregnated throughout with a latex modified asphalt. Approved products are “Emseal,” by Emseal Corporation or “Willseal.” Manufacturer’s recommended primer and top coat are to be used.

(v) Granular Backfill Material

Granular backfill material shall be sound, free from organic material, and meet the following gradation requirements:

Canadian Metric Sieve Size	Percent of Total Dry Weight Passing
50 000	100%
20 000	75% - 100%
5 000	45% - 85%
2 500	35% - 55%
315	15% - 35%
160	5% - 20%
80	0% - 7%

E4.3 Equipment

(a) General

All equipment shall be of a type approved by the Contract Administrator. The equipment shall be in good working order, kept free from hardened concrete or foreign materials, and shall be cleaned at frequent intervals.

The Contractor shall have sufficient standby equipment available on short notice.

E4.4 Reinforcing Steel Shop Drawings

No reinforcing steel shop drawings will be required for this project.

E4.5 Construction Methods

(a) Excavation and Other Removals

Excavation and other removals shall include parts of asphalt pathway, and existing handrail. Equipment used for removals shall not damage the structure that is to remain.

Dispose of all removals off-site to the satisfaction of the Contract Administrator unless approved by the Contract Administrator for backfill.

(b) Placing of Reinforcing Steel

Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.

Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete, which may have been deposited on the steel from previous concrete placement, before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior approval of the Contract Administrator shall be obtained where other splices must be made. Welded splices shall conform to CSA Standard W186, and are subject to prior written approval of the Contract Administrator.

Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel will not be permitted without the prior approval of the Contract Administrator. A minimum of twenty-four (24) hours' advance notice shall be given to the Contract Administrator prior to the placing of any concrete to allow for inspection of the reinforcement.

(c) Formliner

Install formliner on exposed formed concrete surfaces.

(d) Placing Structural Concrete

Placing of concrete, once started, shall be continuous. No concrete shall be placed against concrete that has sufficiently hardened to cause the formation of seams of "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as approved.

Concrete shall be placed as nearly as possible in its finish position. Rakes or mechanical vibrators shall not be used to transport concrete.

The maximum drop of free concrete into the forms shall not be greater than 1.5 m; otherwise, rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used.

All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms; eliminating all air or stone pockets that may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators, when immersed, shall have a minimum frequency of 7,000 revolutions per minute.

Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds) but not long enough for segregation to occur. Spare vibrators in working condition shall be kept on the job site during all placing operations.

Concrete shall not be placed during rain or snow, unless adequate protection is provided for formwork and concrete surfaces.

(e) Finishing of Unformed Surfaces

All unformed concrete surfaces shall be given a magnesium or steel float finish.

(f) Curing

The use of curing compound will not be allowed on concrete areas that are to receive additional concrete or waterproofing.

While forms are in place, the top of concrete placements shall be flooded with water so that there is sufficient water to run down the inside of the forms if possible.

Freshly-finished concrete shall have either a curing compound applied or be covered and kept moist by means of wet polyester curing blankets immediately following finishing operations and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter. Construction joints shall only be covered and kept saturated by means of wet polyester curing blankets for the curing period.

Curing compounds shall be applied at the rate of not less than 4 m^2/L. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.

Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3º in any one hour period or 20º in any twenty-four hour period.

Formed surfaces shall receive, immediately after stripping and patching, the same application of curing compound as finished surfaces, with the exception of the deck soffit surfaces.

After completing the finishing of unformed surfaces, where curing compound is not permitted, the surfaces shall be promptly covered with a minimum of a single layer of clean, damp polyester curing blanket.

Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator.

(g) Form Removal

The Contract Administrator must be notified in writing at least 24 hours prior to any form removal. The Contractor must receive written approval from the Contract Administrator prior to beginning Work.

The minimum strength of concrete in place for safe removal of soffit forms for horizontal or inclined members, as well as vertical forms shall be 20 MPa, with the added provisions that the member shall be of sufficient strength to carry safely its own weight, together with superimposed construction loads, and that the forms shall stay in place a minimum of five days unless otherwise approved by the Contract Administrator.

Field-cured test specimens, representative of the in-place concrete being stripped will be tested, as specified in this Specification, to verify the concrete strength.

(h) Patching of Formed Surfaces

Immediately after forms have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair or surface finishing started before this inspection may be rejected and required to be removed.

All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.

Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be thoroughly brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the adjacent surface and left for one hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

(i) Finishing of Formed Surfaces

All objectionable fins, projections, offsets, streaks, or other surface imperfections shall be removed by approved means to the Contract Administrator's satisfaction. Cement washes of any kind shall not be used.

Concrete shall be cast against forms that will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects that will impair the texture of concrete surfaces shall not be used. All fins on the concrete surfaces shall be removed.

(j) New Concrete Strip on Existing Deck

Construct a new concrete strip on the existing concrete deck as shown on the Drawings. Remove sufficient existing asphalt and concrete deck to allow for the installation of a minimum 75 mm thick new concrete strip (as a joint seal nosing). Supply and install the bonding rebar as shown on the Drawings and bonding grout just prior to the installation of the new concrete. Cure the concrete in accordance with the other concrete of this section.

(k) Install Neoprene Compression Seal

Pick up from the City Bridge Yard the neoprene compression seal supplied by the Owner for this project. Install the seal where shown on the Drawings in accordance with manufacturer's directions complete with a bonding agent. The bonding agent is to be supplied by the Contractor.

(l) Backfill

Place backfill, as required, in maximum 150 mm lifts and compact to 95% of Standard Proctor Density.

(m) Asphalt

Place the asphalt on the pathway in accordance with Standard Construction Specification CW 3410-R5.

E4.6 Measurement and Payment

(a) Reinforced Concrete Retaining Wall Construction

The construction of the reinforced concrete retaining wall, including all works of this section, except asphalt, will not be measured and will be paid for at the Contract Lump Sum Price for "Reinforced Concrete Retaining Wall Construction" in accordance with this Specification, accepted by the Contract Administrator.

(b) Reconstruct Asphalt Pathway

The reconstruction of the asphalt pathway will not be measured and will be paid for at the Contract Lump Sum Price for "Reconstruct Asphalt Pathway" in accordance with this Specification, accepted by the Contract Administrator.

E5. CONCRETE REPAIRS

E5.1 Description

This Specification shall cover all operations relating to the repair of designated concrete as herein specified.

The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E5.2 Materials

(a) General

The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

(b) Testing and Approval

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the Owner for any materials taken by the Contract Administrator for testing purposes.

All materials shall be approved by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

(c) Concrete Repair Mortar

The concrete repair mortar shall be a shrinkage compensated, fibre reinforced product suitable for application by hand trowelling or spraying or pouring. The mortar product shall be EMACO S88 CI for trowelling or spraying or EMACO S66 C1 for form and pour by MTB Protection and Repair or equivalent as approved by the Contract Administrator.

(d) Welded Wire Fabric

Welded wire fabric shall be in accordance with CSA Standard G30.14 Deformed Steel Wire for Concrete Reinforcement. It shall be hot-dip galvanized to a minimum net retention of 600 g/m^2.

(e) Anchors for Welded Wire Fabric

Anchors for anchoring the welded wire fabric to the properly prepared concrete surface shall be a suitable stainless steel anchor with a diameter of 6 mm.

E5.3 Equipment

All equipment shall be of a type accepted by the Contract Administrator and shall be kept in good working order.

E5.4 Construction Methods

(a) Concrete Preparation

Prepare the concrete surfaces in accordance with the manufacturer's directions. Install welded wire fabric when using the S88 repair mortar when the longest direction of the repair is over 3 m long or when the overlay is greater than 25 mm in depth.

(b) Application

Apply the repair mortar and cure it in accordance with the manufacturer's directions.

E5.5 Measurement and Payment

Concrete repair will not be measured and will be paid for at the Contract Lump Sum Price for "Concrete Repair" in accordance with this Specification, accepted by the Contract Administrator.

E6. SODDING

E6.1 Further to standard City of Winnipeg Specification CW 3510-R7, the measurement and payment of the sodding is changed to:

Measurement and Payment

The supply and placement of sod will not be measured and will be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, in accordance with this Specification, accepted by the Contract Administrator.

Items of Work:

Sodding:

i) Supply and Placement and 30 Day Maintenance