



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 638-2008

SUPPLY AND DELIVERY OF TRAFFIC SIGNAL CABLE

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 SUPPLY AND DELIVERY OF TRAFFIC SIGNAL CABLE

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 4:00 p.m. Winnipeg time, September 9, 2008.

B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.

B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. ENQUIRIES

B3.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.

B3.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall promptly notify the Contract Administrator of the error, discrepancy or omission at least five (5) Business Days prior to the Submission Deadline.

B3.3 If the Bidder is unsure of the meaning or intent of any provision therein, the Bidder should request clarification as to the meaning or intent prior to the Submission Deadline.

B3.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.

B3.5 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.

B3.6 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

B4. ADDENDA

B4.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.

B4.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.

B4.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt>

B4.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Division internet site for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B4.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 8 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B5. SUBSTITUTES

- B5.1 The Work is based on the materials, equipment, methods and products specified in the Bid Opportunity.
- B5.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B5.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least seven (7) Business Days prior to the Submission Deadline.
- B5.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the material, equipment, method or product as either an approved equal or alternative;
 - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
 - (c) identify any anticipated cost or time savings that may be associated with the substitute;
 - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the Contract;
 - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the Contract.
- B5.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.
- B5.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, only to the Bidder who requested approval of the substitute.
- B5.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he wishes to inform.
- B5.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B5.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B13.
- B5.9 No later claim by the Contractor for an addition to the price(s) because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B6. BID SUBMISSION

- B6.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices.

- B6.2 Further to B6.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B5.
- B6.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely in ink, to constitute a responsive Bid.
- B6.4 The Bid Submission may be submitted by mail, courier or personal delivery, or by facsimile transmission.
- B6.5 If the Bid Submission is submitted by mail, courier or personal delivery, it shall be enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address, and shall be submitted to:
- The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1
- B6.5.1 Samples or other components of the Bid Submission which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid Submission.
- B6.6 Bidders are advised not to include any information/literature except as requested in accordance with B6.1.
- B6.7 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, may result in the Bid being determined to be non-responsive.
- B6.8 If the Bid Submission is submitted by facsimile transmission, it shall be submitted to (204) 949-1178.
- B6.8.1 The Bidder is advised that the City cannot take responsibility for the availability of the facsimile machine at any time.
- B6.9 Bids submitted by internet electronic mail (e-mail) will not be accepted.
- B7. BID**
- B7.1 The Bidder shall complete Form A: Bid, making all required entries.
- B7.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
 - (d) if the Bidder is carrying on business under a name other than his own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B7.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B7.2.
- B7.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.
- B7.4 Paragraph 10 of Form A: Bid shall be signed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in his own name, it shall be signed by the Bidder;
- (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
- (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers;
- (d) if the Bidder is carrying on business under a name other than his own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B7.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.

B7.4.2 All signatures shall be original.

B7.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B8. PRICES

B8.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B8.1.1 Prices on Form B: Prices shall include:

- (a) duty;
- (b) freight and cartage;
- (c) Provincial and Federal taxes [except the Goods and Services Tax (GST) and Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable] and all charges governmental or otherwise paid;
- (d) profit and all compensation which shall be due to the Contractor for the Work and all risks and contingencies connected therewith.

B8.1.2 Prices on Form B: Prices shall not include the Manitoba Association for Resource Recovery Corporation (MARRC) Environmental Handling Charge (EHC) which shall be extra where applicable.

B8.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.

B8.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

B8.4 Prices from Non-Resident Bidders are subject to a Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B9. QUALIFICATION

B9.1 The Bidder shall:

- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Bidder does not carry on business in Manitoba, in the jurisdiction where the Bidder does carry on business; and
- (b) be financially capable of carrying out the terms of the Contract; and

- (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.

B9.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt/debar.stm>.

B9.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) have successfully carried out work similar in nature, scope and value to the Work; and
- (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
- (c) have a written workplace safety and health program, if required, pursuant to The Workplace Safety and Health Act (Manitoba).

B9.4 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B9.5 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B10. OPENING OF BIDS AND RELEASE OF INFORMATION

B10.1 Bids will not be opened publicly.

B10.2 Following the Submission Deadline, the names of the Bidders and their bid prices (unevaluated, and pending review and verification of conformance with requirements or evaluated prices) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt>

B10.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract Amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt>

B10.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B11. IRREVOCABLE BID

B11.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 9 of Form A: Bid.

B11.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work for the time period specified in Paragraph 9 of Form A: Bid.

B12. WITHDRAWAL OF BIDS

B12.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

- B12.1.1 Notwithstanding C21, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.
- B12.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 10 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B12.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
 - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 10 of Form A: Bid; and
 - (c) if the notice has been given by any one of the persons specified in B12.1.3(b), declare the Bid withdrawn.
- B12.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B11.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law.

B13. EVALUATION OF BIDS

- B13.1 Award of the Contract shall be based on the following bid evaluation criteria:
- (a) compliance by the Bidder with the requirements of the Bid Opportunity (pass/fail);
 - (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B9 (pass/fail);
 - (c) Total Bid Price and;
 - (d) economic analysis of any approved alternative pursuant to B5.
- B13.2 Further to B13.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid Submission is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities if the interests of the City so require.
- B13.3 Further to B13.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid or in other information required to be submitted, that he is responsible and qualified.
- B13.4 Further to B13.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.
- B13.4.1 If there is any discrepancy between the Total Bid Price written in figures, the Total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.
- B13.4.2 Further to B13.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.
- B13.5 This Contract will be awarded as a whole.

B14. AWARD OF CONTRACT

- B14.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

- B14.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.
- B14.2.1 Without limiting the generality of B14.2, the City will have no obligation to award a Contract where:
- (a) the prices exceed the available City funds for the Work;
 - (b) the prices are materially in excess of the prices received for similar work in the past;
 - (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;
 - (d) only one Bid is received; or
 - (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.
- B14.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B13.
- B14.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his Bid upon written request to the Contract Administrator.
- B14.4 Notwithstanding C4 and Paragraph 6, the City will issue a Purchase Order to the successful Bidder in lieu of the execution of a Contract.
- B14.5 The Contract Documents, as defined in C1.1(n) (ii) in their entirety shall be deemed to be incorporated in and to form a part of the Purchase Order notwithstanding that they are not necessarily attached to or accompany said Purchase Order.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for the Supply and Delivery of Goods* (Revision 2008 05 26) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for the Supply and Delivery of Goods* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at http://www.winnipeg.ca/matmgt/gen_cond.stm
- C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Supply of Goods*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

D1.1 In addition to the *General Conditions for the Supply and Delivery of Goods*, these Supplemental Conditions are applicable to the Work of the Contract.

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of supply and delivery of traffic signal cable.

D2.2 The major components of the Work are as follows:

- (a) Polyethylene Insulated, Polyethylene jacketed cable with Copper shield and ripcord;
- (b) Polyethylene Insulated, Polyethylene jacketed cable with Aluminum / Mylar shield and ripcord.

D3. DEFINITIONS

D3.1 When used in this Bid Opportunity:

- (a) "**ANSI**" means National Standards Institute;
- (b) "**ASTM**" means American Society for Testing and Materials.
- (c) "**AWG**" means American Wire Gauge
- (d) "**UL**" means Underwriters Laboratories Inc

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is:

Mr. Bill Woroby, P. Eng
Project Manager Engineer
Public Works
106 – 1155 Pacific Avenue
Winnipeg, MB R3E 3P1

Telephone No.: (204) 794 - 4346

Facsimile No.: (204) 986 - 5302

D5. NOTICES

D5.1 Notwithstanding C21.3, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following address or facsimile number:

The City of Winnipeg
Chief Financial Officer
Administration Building, 3rd Floor
510 Main Street
Winnipeg MB R3B 1B9

Facsimile No.: (204) 949 - 1174

SUBMISSIONS

D6. AUTHORITY TO CARRY ON BUSINESS

- D6.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

SCHEDULE OF WORK

D7. COMMENCEMENT

- D7.1 The Contractor shall not commence any Work until he is in receipt of a notice of award from the City authorizing the commencement of the Work.
- D7.2 The Contractor shall not commence any Work until:
- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D6;
 - (ii) evidence of the workers compensation coverage specified in C6.16.
 - (b) the Contractor has attended a meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a meeting.

D8. DELIVERY

- D8.1 Goods shall be delivered within seventy-five (75) Calendar Day(s) of the placing of an order, f.o.b. destination, freight prepaid to:

Public Works Stores
1277 Pacific Avenue
Winnipeg, MB

- D8.2 The Contractor shall confirm each delivery with the Contract Administrator or his/her designate, at least two (2) Business Days before delivery.
- D8.3 Goods shall be delivered between 8:30 a.m. and 3:30 p.m. on Business Days.

MEASUREMENT AND PAYMENT

D9. PAYMENT

- D9.1 Further to C10, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

D10. PAYMENT SCHEDULE

- D10.1 Further to C10, payment shall be in Canadian funds net thirty (30) Calendar Days after receipt and approval of the Contractor's invoice.

WARRANTY

D11. WARRANTY

- D11.1 Warranty is as stated in C11.

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B5.

E2. GOODS

- E2.1 The Contractor shall supply and deliver traffic signal cable in accordance with the requirements hereinafter specified.
- E2.2 Item No. 1 - This specification covers six (6) pair polyethylene insulated, polyethylene jacketed traffic signal cable with (copper) electrical shielding and ripcord, rated 300 volts, for use in underground conduit or as aerial cable supported by a messenger, as traffic communications and data acquisition cable suitable for limited power use.
 - E2.2.1 Cable under this specification shall be composed of uncoated copper conductors individually insulated with heat-stabilized polyethylene. The insulated conductors shall be twisted into pairs and laid up in a compact form and bound with suitable moisture-resistant tape. The cable core and moisture-resistant tape, shall be completely wrapped in an electrically continuous (copper) metallic shield over top of which shall be installed a single continuous length of cord (the "ripcord"). The cable core, moisture resistant tape, copper shield and ripcord shall be completely enclosed in a polyethylene compound jacket.
 - E2.3 Item No. 2 – This specification covers two (2), or four (4), or eight (8) paired, polyethylene insulated, polyethylene jacketed traffic signal cable, rated 600 volts, with a ripcord and with aluminum/mylar shields on each conductor pair, for use in underground conduit or as aerial cable supported by a messenger, as traffic communications signalling cable or as lead-in cable for inductive loop detectors.
 - E2.3.1 Cable under this specification shall be composed of copper conductors individually insulated with heat-stabilized polyethylene. The insulated conductors shall be twisted into pairs. Each conductor pair shall have a bare metallic drain wire, with each conductor pair and its associated drain wire completely enclosed in an electrically continuous aluminum / mylar metallic shield. The shielded pairs shall be laid up in a compact cable form and the cable core bound with a suitable moisture-resistant tape. Over top of the moisture-resistant tape, shall be installed a single continuous length of cord (the "ripcord"). The cable core, moisture-resistant tape, and ripcord shall be completely enclosed in a polyethylene compound jacket.

E3. CONDUCTORS

- E3.1 The conductors as shown in E2.2 shall be copper and shall, before insulating, conform to the requirements of ASTM (American Society for Testing and Materials) Designation B-3, latest revision.
- E3.2 The conductors shall be solid and uncoated.
- E3.3 Twelve (12) individual conductors shall be supplied, each conductor # 19 AWG (American Wire Gauge) and twisted to form six (6) individual conductor pairs.
- E3.4 The conductors as shown in E2.3 shall be copper and shall, before insulating, conform to the requirements of ASTM (American Society for Testing and Materials) Designation B-3, latest revision.

- E3.5 The conductors shall be solid.
- E3.6 Four (4), or Eight (8) or Sixteen (16) individual conductors shall be supplied, each conductor # 14 AWG (American Wire Gauge) and twisted to form two (2), or four (4), or eight (8) individually shielded conductor pairs.

E4. INSULATION

- E4.1 The insulating compound shall be polyethylene.
- E4.2 The insulation as shown in E2.2 shall be applied concentrically about the conductor. The minimum acceptable average thickness of the insulation shall be not less than 15 mils (0.38 mm). The minimum acceptable thickness at any point shall be 13 mils (0.33 mm). The method of measurement and the apparatus used shall be in accordance with Underwriters Laboratories, Inc. Standard UL 62 ANSI (American National Standards Institute) C33.1.
- E4.3 The insulation after application to the conductors shall comply with the requirements specified for Class 30 Thermoplastic Polyethylene compound in Underwriters Laboratories, Inc. Standard UL 62 ANSI C33.1, except that the temperature for the cold bend test shall be minus $55.0 \pm 2.0^{\circ}$ C.
- E4.4 The insulation of the finished conductors before cabling shall withstand without break down the application of a 60 or 3,000 Hertz, 4,000 volt essentially sinusoidal spark test potential (RMS) in accordance with the method and using equipment specified in Underwriters Laboratories, Inc. Standard UL 83 ANSI C33.8.
- E4.5 The insulation as shown in E2.3 shall be applied concentrically about the conductor. The minimum acceptable average thickness of the insulation shall be not less than 25 mils (0.635 mm). The minimum acceptable thickness at any point shall be 22 mils (0.569 mm). The method of measurement and the apparatus used shall be in accordance with Underwriters Laboratories, Inc. Standard UL 62 ANSI (American National Standards Institute) C33.1.
- E4.6 The insulation after application to the conductors shall comply with the requirements specified for Class 30 Thermoplastic Polyethylene compound in Underwriters Laboratories, Inc. Standard UL 62 ANSI C33.1, except that the temperature for the cold bend test shall be minus $55.0 \pm 2.0^{\circ}$ C.
- E4.7 The insulation of the finished conductors before cabling shall withstand without break down the application of a 60 or 3,000 Hertz, 7,500 volt essentially sinusoidal spark test potential (RMS) in accordance with the method and using equipment specified in Underwriters Laboratories, Inc. Standard UL 83 ANSI C33.8.

E5. IDENTIFICATION OF PAIRS

- E5.1 The polyethylene compound as shown in E2.2 shall be used for conductor insulation shall be coloured, so as to identify (1) the "wire" and "mate" conductor for each pair and (2) each pair in the completed cable.
- E5.2 Base colours shall be obtained by the use of coloured polyethylene insulating compound. "Tracers" shall be extruded white stripes which shall be an integral part of the insulation, formed in such a manner as to afford distinctive circuit colour coding throughout the length of each "mate" conductor. The white tracer shall form a continuous longitudinal or spiral line throughout the length of the "mate" conductor.

- E5.3 The colours of each “wire” and “mate” conductor of each pair, together with the pair numbers shall be in accordance with City of Winnipeg Traffic Signals Colour Code defined by Table 5.3A.

TABLE 5.3A
Conductor Color and Sequence for Cables
 Varies from IMSA Specification 40-2 (1991), TABLE 5.2

Pair No.	Wire Color	Mate Color
1	Blue	Blue with White Tracer
2	Orange	Orange with White Tracer
3	Green	Green with White Tracer
4	Brown	Brown with White Tracer
5	Slate	Slate with White Tracer
6	Red	Red with White Tracer

- E5.4 The polyethylene compound as shown in E2.3 shall be used for conductor insulation shall be coloured, so as to identify (1) the “wire” and “mate” conductor for each pair and (2) each pair in the completed cable.

- E5.5 Base colours shall be obtained by the use of coloured polyethylene insulating compound. “Tracers” shall be extruded coloured stripes which shall be an integral part of the insulation, formed in such a manner as to afford distinctive circuit colour coding throughout the length of each “mate” conductor. The coloured tracer shall form a continuous longitudinal or spiral line throughout the length of the “mate” conductor.

- E5.6 The colours of each “wire” and “mate” conductor of each pair, together with the pair numbers shall be in accordance with the City of Winnipeg Traffic Signals Colour Code defined by Table 5.3B.

TABLE 5.3B
City of Winnipeg Traffic Signals Color Code
Conductor Color and Sequence for Two (2), or Four (4), or Eight (8) Paired Cables
 [Varies from IMSA Specification 20-2 (1991), TABLE 5.2]

Pair No.	Wire Color	Mate Color
1	Black	Black with Green Tracer
2	Red	Red with Green Tracer
3	Orange	Orange with Green Tracer
4	Blue	Blue with Green Tracer
5	Green	Green with White Tracer
6	Brown	Brown with White Tracer
7	Slate	Slate with White Tracer
8	Violet	Violet with White Tracer

Note: Higher pair numbers represent the outer-most conductors in the core.

E6. TWISTING

- E6.1 The insulated conductors as shown in E2.2 and E2.3 shall be twisted into pairs.
- E6.2 Lengths of lay of pairs shall be staggered so, that pairs having the same length of lay shall be separated by at least two pairs having different lengths of lay.

E6.3 To help ascertain pair identity of the two wires comprising a pair, the maximum length of lay of pairs twisted shall not exceed six inches (152 mm).

E7. CORE ASSEMBLY

E7.1 In multi-pair cables the pairs as shown in E2.2 and E2.3 shall be laid up symmetrically with lay not more than 15 times the assembled core diameter.

E7.2 Each subsequent layer of twisted pairs may be laid in a direction opposite to that of adjacent layers, or alternatively, unidirectional lay may be used. The outer layer shall be left hand lay.

E7.3 Fillers shall be used when necessary to secure a uniform assembly of conductors or a firm compact cylindrical core. The core shall be fabricated to ensure the smallest possible core diameter.

E8. FILLERS

E8.1 Fillers as shown in E2.2 shall be used when necessary to ensure a firm compact cylindrical core. The core shall be fabricated so as to ensure **the smallest possible core diameter**. Fillers, when used, shall be of a non-metallic, moisture-resistant, non-wicking material which shall have no injurious effect upon other component parts of the cable. The filler shall not wick when tested as follows: One inch (25.4 mm) of the jacket shall be removed from one (1) end of a one foot (0.305 m) length of cable. This end shall be supported vertically in a two (2") inch (50.8 mm) deep dye (Gentian Violet or equivalent) and water solution for twenty (24) hours. The dye shall not have visibly coloured the top end of the cable.

E9. CABLE TAPE

E9.1 The conductor assembly as shown in E2.2 shall be covered with a wrapping of a moisture-resistant tape applied so as to lap at least ten (10%) percent of its width.

E10. DRAIN WIRE

E10.1 Each of the two (2), or four (4), or eight (8) individual drain wires as shown in E2.3 shall be associated with each conductor pair shall be a seven (7)-strand tinned copper, non-insulated conductor, having a cross-sectional area and equivalent current-carrying capacity of a #19 AWG copper conductor.

E11. SHIELDING

E11.1 The shield as shown in E2.2 shall consist of a single fully annealed copper tape applied longitudinally or helically around the core. If applied longitudinally, it shall be corrugated. If helically, it must lap at least 15 percent of its width.

E11.2 The copper tape employed for the shield shall have a thickness of not less than four (4) Mills (0.10 mm).

E11.3 Where splicing of the shielding tape is necessary the shield tape shall be joined during the manufacturing process by means of cold weld, electric weld or soldering with non-acid flux.

E11.4 Each of the two (2), or four (4), or eight (8), shields as shown in E2.3 shall consist of a single aluminum mylar tape applied longitudinally or helically over each individual conductor pair and attendant drain wire associated with each pair. If applied longitudinally it shall be corrugated. If helically, it must lap at least fifteen (15%) percent of its width. The aluminum mylar shield tape shall be applied with its **aluminum** side facing **inward**, such that it faces the conductor pair (and attendant drain wire) for which it forms a shield, and its **mylar** side facing **outward**, facing the moisture-resistant tape layer.

- E11.5 Each aluminum mylar shield shall completely cover one single twisted conductor pair, and shall also cover the attendant drain wire associated with each pair.
- E11.6 The aluminum mylar tape employed for the shield shall have a thickness of not less than one (1) Mil (0.025mm).
- E11.7 Where splicing of the shielding tape is necessary the shield tape shall be joined during the manufacturing process by means of cold weld or electric weld. Any other process proposed by the manufacturer for splicing the shielding tape shall be submitted with complete manufacturing details and guaranteed performance specifications to the City of Winnipeg for approval prior to manufacture of the cable.

E12. RIPCORD

- E12.1 Overtop of the taped (i.e. both moisture-resistant tape and copper shield) as shown in E2.2 shall be conductor assembly shall be supplied a single continuous length of nylon or polyester cord, known as the "ripcord." The ripcord shall be laid longitudinally along the taped and shielded cable core assembly, immediately underneath the jacket material. The purpose of the ripcord is to assist to skin and remove the jacket material.
- E12.2 Overtop of the moisture-resistant tape (and immediately below the outer jacket material) as shown in E2.3 shall be supplied a single continuous length of nylon or polyester cord, known as the "ripcord." The ripcord shall be laid longitudinally along the entire length of cable core, immediately underneath the outer jacket material. The ripcord may be moulded into the inner surface of the outer jacket material. The ripcord shall be no larger than 20 mils (0.508 mm) in total diameter, and shall be constructed of either one or two strands, sufficiently strong to sever the jacket material without breaking. The purpose of the ripcord is to assist to skin and remove the jacket material.

E13. JACKET

- E13.1 The taped conductor assembly and ripcord as shown in E2.2 and E2.3 shall be covered with a tight fitting black thermoplastic polyethylene compound jacket suitable for exposure to sunlight, atmospheric temperatures and stresses reasonably expected in normal installation.
- E13.2 The jacket shall be applied tightly over the core assembly as shown in E2.2 and ripcord and it shall be smooth, free from holes, splits, blisters and other imperfections. The jacket material shall meet the requirements of Table 12.2A.

**TABLE 12.2A
 PHYSICAL PROPERTIES OF POLYETHYLENE JACKET**

Property	Test Method	Requirements
Tensile strength	ASTM D2633, Latest Rev.	1,700 Psi Min. (11.72 MPa)
Elongation	ASTM D2633, Latest Rev.	400% Min.
Cold Bend	ASTM D2633 at -55.0 ± 1.0°C	No Cracks
Environmental Cracking	ASTM D1693, Latest Rev.	No Cracks
Absorption Coefficient	ASTM D3349, Latest Rev.	3,200*

NOTE: Certification of Compliance with this requirement issued by the manufacturer of the polyethylene compound shall suffice in lieu of testing of the finished cable jacket.

- E13.3 The thickness of the jacket shall be UNIFORM at all points along the circumference and shall be 45 Mils (1.14 mm) minimum average acceptable thickness, with a minimum acceptable thickness at any point of 36 Mils (0.91 mm) and maximum acceptable thickness of 54 Mils. The

method of measurement and the apparatus used shall be in accordance with Underwriters Laboratories, Inc. Standard UL 62 (ANSI C33.1).

- E13.4 The exterior surface for clauses E2.2 and E2.3 of the jacket shall be smooth, free of wrinkles, grooves and undulations.
- E13.5 The jacket shall be clauses E2.2 and E2.3 durable and tough, yet flexible and capable of readily being skinned by means of the ripcord.
- E13.6 The jacket shall be applied tightly over the core assembly as shown in E2.3 and ripcord and it shall be smooth, free from holes, splits, blisters and other imperfections. The jacket material shall meet the requirements of Table 13.2A.

**TABLE 13.2A
 PHYSICAL PROPERTIES OF POLYETHYLENE JACKET**

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Cold Bend	ASTM D2633 at $-55.0 \pm 1.0^{\circ}\text{C}$	No Cracks
Environmental Cracking	ASTM D1693, Latest Rev.	No Cracks
Absorption Coefficient	ASTM D3349, Latest Rev.	3,200*

NOTE: Certification of Compliance with this requirement issued by the manufacturer of the polyethylene compound shall suffice in lieu of testing of the finished cable jacket.

- E13.7 The thickness of the jacket shall be UNIFORM at all points along the circumference, and **for two (2) and four (4) pair cables** shall be 45 Mils (1.14 mm) minimum average acceptable thickness, with a minimum acceptable thickness at any point of 36 Mils (0.91 mm) and maximum acceptable thickness of 54 Mils (1.37 mm). The method of measurement and the apparatus used shall be in accordance with Underwriters Laboratories, Inc. Standard UL 62 (ANSI C33.1).
- E13.8 The thickness of the jacket shall be UNIFORM at all points along the circumference and **for eight (8) pair cable** shall be 54 Mils (1.37 mm) minimum average acceptable thickness, with a minimum acceptable thickness at any point of 48 Mils (1.22 mm) and maximum acceptable thickness of 60 Mils (1.52 mm). The method of measurement and the apparatus used shall be in accordance with Underwriters Laboratories, Inc. Standard UL 62 (ANSI C33.1).

E14. IDENTIFICATION

- E14.1 Each shipping length of cable shall be indelibly marked to show the remaining length of cable, in metres, on the outer surface of the cable jacket, one mark per metre. The readily legible “length remaining” digits shall be applied at one metre intervals on the outer jacket surface by means of “indent printing” or alternatively in indelible white or light coloured contrasting ink, which cannot be rubbed off or washed off.
- E14.2 In most cases, each shipping length of cable will bear a “zero” mark at the inner end of the cable on the reel, with incrementing metre mark values throughout the length of the cable. Exceptions may be permitted to allow “non-zero” markings at the inner end of the reel, should defective sections of cable have to be removed as a consequence of failing the voltage rating tests on the finished cable.
- E14.3 The cable jacket shall also bear the legend “**WPG YYMM**” (YY = Year and MM = Month of manufacture) in legible characters, applied to the outer surface of the cable jacket by means of indent printing or indelible white or light coloured contrasting ink, which cannot be rubbed off or

washed off. This legend shall also include the **voltage rating** of the cable, and shall be applied in one metre intervals along the entire length of cable.

E15. PACKING AND MARKING FOR SHIPMENT

- E15.1 Reels as shown in E2.2 and E2.3 shall be substantially constructed and in good condition with drum diameters sufficient to prevent damage to the cables shipped on it. Reels shall have a diameter of 48 inches.
- E15.2 The width of each reel shall be 27 inches.
- E15.3 The cables shall be suitably protected. Each end of the cable shall be available for testing and visual inspection of the metre markings, and shall be properly sealed against moisture and protected against injury. The innermost cable end (normally bearing the "zero" mark, shall protrude no more than 0.5 metre through the side of the reel.
- E15.4 Reels shall be capable of being supported by a two (2) inch diameter shaft inserted in holes centered within the circular reel flanges. Steel arbour hole plates shall be provided on all reels.
- E15.5 Each reel shall be plainly and permanently marked with the manufacturer's full description of the cable, giving the type and length of the cable on the reel, the number and size of the conductors in the cable and the voltage rating.
- E15.6 Each reel shall bear a unique reel number.
- E15.7 Each reel shall contain a continuous length of cable filled to within two (2) inches of the outer edge of the reel, excepting the last reel, which may be under filled to complete the order.
- E15.8 Empty reels to be returned (minimum of 10 reels per shipment) at vendor's expense to be included in the contract.

E16. REEL DEPOSIT

- E16.1 The Contractor shall include, **if applicable**, reel deposit charges on Form B: Prices, if this item is not completed it will be understood that there are no reel deposit charges apply.
- E16.2 The Contractor shall pay all transportation charges both ways on all items in accordance with D8.1. The items will be used by the City of Winnipeg when the reel is emptied, the Contract Administrator will inform the Contractor's for the return instruction.

E17. SAMPLING, INSPECTION AND ACCEPTANCE

- E17.1 Inspection and tests as shown in E2.2 and E2.3 shall be made prior to shipment and at the place of manufacture.
- E17.2 The manufacturer shall furnish the Contract Administrator, upon a request in suitable form a certified report of the tests made on the cables to show compliance with this specification. No payment for any cable supplied shall be made until a satisfactory test report has been furnished to and accepted by the Contract Administrator.
- E17.3 The manufacturer shall be required to supply the Contract Administrator, upon a request in advance of the delivery of the required quantity of cable, a sample of the finished and tested cable, the sample being at least one (1) metre in length, containing at least two (2) sequential metre markings. No cable shall be delivered to the City until the sample length of cable has been examined, inspected and accepted by the Contract Administrator.
- E17.4 Tests on Finished Individual Conductors – Each finished conductor as shown in E2.2 shall meet the spark test requirement of Paragraph E4.4 (4,000 volt) as soon as possible prior to cabling. All spark test failures shall be repaired before cabling.

- E17.5 Tests on Finished Cable – Each conductor as shown in E2.2 shall be tested against other conductors and shield. The individual conductors of each length of completed cable shall withstand without break down (1) the application for one minute of a 60 Hertz, 1,000 volt essentially sinusoidal test potential (RMS) in accordance with the method and using equipment specified in Underwriters Laboratories, Inc. Standard UL 83 (ANSI C33.8) or (2) a DC test which shall be a short duration (5 second minimum) application of a DC voltage of ten times the Voltage Rating of the cable, also each processed length of finished cable shall have an Insulation Resistance of 13,000 Megohms per 1,000 feet (42,650 Megohms per kilometre) at 60°F. The test voltages must be not less than 200 Volts DC nor more than 500 Volts DC.
- E17.6 Tests on Finished Individual Conductors – Each finished conductor as shown in E2.3 shall meet the spark test requirement of Paragraph E4.4 (7,500 volt) as soon as possible prior to cabling. All spark test failures shall be repaired before cabling.
- E17.7 Tests on Finished Cable – Each conductor as shown in E2.3 shall be tested against other conductors and shields. The individual conductors of each length of completed cable shall withstand without break down (1) the application for one (1) minute of a 60 Hertz, 2,500 volt essentially sinusoidal test potential (RMS) in accordance with the method and using equipment specified in Underwriters Laboratories, Inc. Standard UL 83 (ANSI C33.8) or (2) a DC test which shall be a short duration (five (5) second minimum) application of a DC voltage of ten times the Voltage Rating of the cable.