THE CITY OF WINNIPEG

TENDER

TENDER NO. 112-2022

2022 INDUSTRIAL STREET RENEWAL PROGRAM – MURRAY PARK ROAD AND VARIOUS OTHER LOCATIONS

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 2022 Industrial Street Renewal Program – Murray Park Road and Various Other Locations

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, April 1, 2022.

B2.2 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 Tender, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.

B3.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Tender will be provided by the Contract Administrator to all Bidders by issuing an addendum.

B3.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Tender will be provided by the Contract Administrator only to the Bidder who made the enquiry.

B3.5 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.

B3.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

B4. CONFIDENTIALITY

B4.1 Information provided to a Bidder by the City or acquired by a Bidder by way of further enquiries or through investigation is confidential. Such information shall not be used or disclosed in any way without the prior written authorization of the Contract Administrator. The use and disclosure of the confidential information shall not apply to information which:

(a) was known to the Bidder before receipt hereof; or

(b) becomes publicly known other than through the Bidder; or

(c) is disclosed pursuant to the requirements of a governmental authority or judicial order.

B4.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Tender to the media or any member of the public without the prior written authorization of the Contract Administrator.

B5. ADDENDA

B5.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Tender, or clarifying the meaning or intent of any provision therein.

B5.2 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.

B5.3 Addenda will be available on the MERX website at www.merx.com.

B5.4 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the MERX website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B5.5 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid/Proposal. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B5.6 Notwithstanding B3, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D4.

B6. SUBSTITUTES

B6.1 The Work is based on the Plant, Materials and methods specified in the Tender.

B6.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B6.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.

B6.4 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 Plant, Material or method 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 proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;

(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 proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.

B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her 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.

B6.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

B6.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

B6.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B6.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her 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 B17.

B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B7. BID COMPONENTS

B7.1 The Bid shall consist of the following components:

(a) Form A: Bid;

(b) Form B: Prices;

(c) Form G1: Bid Bond and Agreement to Bond.

B7.2 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.

B7.3 The Bid shall be submitted electronically through MERX at www.merx.com.

B7.3.1 Bids will **only** be accepted electronically through MERX.

B7.4 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B17.1(a).

B8. BID

B8.1 The Bidder shall complete Form A: Bid/Proposal, making all required entries.

B8.2 Paragraph 2 of Form A: Bid/Proposal shall be completed in accordance with the following requirements:

(a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her 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/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B8.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B8.2.

B8.3 In Paragraph 3 of Form A: Bid/Proposal, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B8.4 Paragraph 13 of Form A: Bid/Proposal shall be signed in accordance with the following requirements:

(a) if the Bidder is a sole proprietor carrying on business in his/her 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/her 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.

B8.4.1 The name and official capacity of all individuals signing Form A: Bid/Proposal should be entered below such signatures.

B8.5 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.

B9. PRICES

B9.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B9.1.1 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in D31. Any such costs shall be determined in accordance with D31.

B9.2 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.

B9.3 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.

B9.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B9.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.

B9.5.1 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

B9.6 Form B: Prices is organized into Parts: Part 1 of the Work and Part 2 of the Work. Bidders shall provide a total price for each Part and, on the summary sheet, a Total Bid Price consisting of the sum of prices for Part 1 and Part 2.

B10. DISCLOSURE

B10.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.

B10.2 The Persons are:

(a) N/A

B11. CONFLICT OF INTEREST AND GOOD FAITH

B11.1 Further to C3.2, Bidders, by responding to this Tender, declare that no Conflict of Interest currently exists, or is reasonably expected to exist in the future.

B11.2 Conflict of Interest means any situation or circumstance where a Bidder or employee of the Bidder proposed for the Work has:

(a) other commitments;

(b) relationships;

(c) financial interests; or

(d) involvement in ongoing litigation;

that could or would be seen to:

(i) exercise an improper influence over the objective, unbiased and impartial exercise of the independent judgment of the City with respect to the evaluation of Bids or award of the Contract; or

(ii) compromise, impair or be incompatible with the effective performance of a Bidder's obligations under the Contract;

(e) has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of its participation in the Tender process or the Work; or

(f) has knowledge of confidential information (other than confidential information disclosed by the City in the normal course of the Tender process) of strategic and/or material relevance to the Tender process or to the Work that is not available to other bidders and that could or would be seen to give that Bidder an unfair competitive advantage.

B11.3 In connection with its Bid, each entity identified in B11.2 shall:

(a) avoid any perceived, potential or actual Conflict of Interest in relation to the procurement process and the Work;

(b) upon discovering any perceived, potential or actual Conflict of Interest at any time during the Tender process, promptly disclose a detailed description of the Conflict of Interest to the City in a written statement to the Contract Administrator; and

(c) provide the City with the proposed means to avoid or mitigate, to the greatest extent practicable, any perceived, potential or actual Conflict of Interest and shall submit any additional information to the City that the City considers necessary to properly assess the perceived, potential or actual Conflict of Interest.

B11.4 Without limiting B11.3, the City may, in its sole discretion, waive any and all perceived, potential or actual Conflicts of Interest. The City's waiver may be based upon such terms and conditions as the City, in its sole discretion, requires to satisfy itself that the Conflict of Interest has been appropriately avoided or mitigated, including requiring the Bidder to put into place such policies, procedures, measures and other safeguards as may be required by and be acceptable to the City, in its sole discretion, to avoid or mitigate the impact of such Conflict of Interest.

B11.5 Without limiting B11.3, and in addition to all contractual or other rights or rights at law or in equity or legislation that may be available to the City, the City may, in its sole discretion:

(a) disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of its employees proposed for the Work;

(b) require the removal or replacement of any employees proposed for the Work that has a perceived, actual or potential Conflict of Interest that the City, in its sole discretion, determines cannot be avoided or mitigated;

(c) disqualify a Bidder or employees proposed for the Work that fails to comply with any requirements prescribed by the City pursuant to B11.4 to avoid or mitigate a Conflict of Interest; and

(d) disqualify a Bidder if the Bidder, or one of its employees proposed for the Work, has a perceived, potential or actual Conflict of Interest that, in the City's sole discretion, cannot be avoided or mitigated, or otherwise resolved.

B11.6 The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in its sole discretion.

B12. QUALIFICATION

B12.1 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; 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.

B12.2 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 website at https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf

B12.3 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).

B12.4 Further to B12.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

(a) Written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) in the form of:

(i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/.

B12.5 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.

B12.6 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.

B13. BID SECURITY

B13.1 The Bidder shall include in its Bid Submission bid security in the form of a digital bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in Form G1: Bid Bond and Agreement to Bond, available on The City of Winnipeg, Corporate Finance, Materials Management Division website at https://www.winnipeg.ca/MatMgt/templates/files/eBidsecurity.pdf.

B13.2 Bid security shall be submitted in a digital format meeting the following criteria:

(a) The version submitted by the Bidder must have valid digital signatures and seals;

(b) The version submitted by the Bidder must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) The version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding B13.2(a).

B13.3 Bonds failing the verification process will not be considered to be valid and the bid shall be determined to be non-responsive in accordance with B17.1(a).

B13.4 Bonds passing the verification process will be treated as original and authentic.

B13.4.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

B13.5 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly formed with the successful Bidder and the contract securities are furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B13.6 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Tender.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

B14.1 Bids will not be opened publicly.

B14.2 Following the submission deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the MERX website at www.merx.com.

B14.3 After award of Contract, the name(s) of the successful Bidder(s) and their Contract amount(s) will be available on the MERX website at www.merx.com.

B14.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).

B14.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

B15. IRREVOCABLE BID

B15.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B15.2 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 until a Contract for the Work has been duly formed and the contract securities have been furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B16. WITHDRAWAL OF BIDS

B16.1 A Bidder may withdraw his/her Bid without penalty prior to the Submission Deadline.

B17. EVALUATION OF BIDS

B17.1 Award of the Contract shall be based on the following bid evaluation criteria:

(a) compliance by the Bidder with the requirements of the Tender, or acceptable deviation therefrom (pass/fail);

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B12 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B6.

B17.2 Further to B17.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid 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.

B17.2.1 Any bid with an apparent imbalance between the unit prices in Part 1 and Part 2 may be determined to be non-responsive and rejected by the Award Authority in its sole discretion, acting reasonably.

B17.3 Further to B17.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is qualified.

B17.4 Further to B17.1(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.

B17.4.1 Further to B17.1(a), in the event that a unit price is not provided on Form B: Prices, the City may determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B17.4.2 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

B18. AWARD OF CONTRACT

B18.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B18.2 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 qualified, and the Bids are determined to be responsive.

B18.2.1 Without limiting the generality of B18.2, 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.

B18.3 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of D31 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.

B18.4 Where an award of Contract is made by the City, the award shall be made to the qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B17.

B18.4.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

B18.5 As noted in D3 and identified in Form B: Prices, the Work of Part 2 will be contingent upon Manitoba Hydro approving funding for the Work. If sufficient funding for Part 2 Work is not approved by Manitoba Hydro the City shall have the right to eliminate all or any portion of Part 2 Work in accordance with D2.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

C0.1 The *General Conditions for Construction* (Revision 2020-01-31) are applicable to the Work of the Contract.

C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

C0.2 A reference in the Tender to a section, clause or subclause with the prefix "**C**" designates a section, clause or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

D1.1 In addition to the General Conditions for Construction, these Supplemental Conditions are applicable to the Work of the Contract.

D2. FORM OF CONTRACT DOCUMENTS

D2.1 Notwithstanding C4.1(c) and C4.4, the Contract Documents will be provided to the Contractor electronically and there will be no requirement for execution and return to the City by the Contractor. Accordingly, the provisions under C4.4(a) and C4.4(b) are no longer applicable.

D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of two parts:

(a) Part 1 – City Funded Work

(b) Part 2 – Manitoba Hydro Funded Work

Part 1 – City Funded Work

D3.2 City Funded Work shall consist of:

(a) Asphalt Pavement Reconstruction
  (i) Murray Park Road from Sturgeon Road to Cree Crescent (West Leg), including construction of multi-use pathway

(b) Concrete Pavement Reconstruction
  (i) Milt Stegall Drive from Yukon Avenue to Sargent Avenue

(c) Pavement Rehabilitation
  (i) Dundas Street from Yukon Avenue to Sargent Avenue
  (ii) Murray Park Road from Cree Crescent (West Leg) to Saulteaux Crescent, including construction of multi-use pathway from Cree Crescent (West Leg) to Moray Street
  (iii) Yukon Avenue from St. James Street to Empress Street

(d) Railway Crossing and Associated Works
  (i) Moray Street South of Saulteaux Crescent (North Leg)
  (ii) Saulteaux Crescent (East Leg)

(e) Water and Waste Work
  (i) Dundas Street, Milt Stegall Drive, Murray Park Road and Yukon Avenue

Part 2 – Manitoba Hydro Funded Work

D3.3 Manitoba Hydro Funded Work shall consist of:

(a) Street Lighting Installation and Associated Works
  (i) Street lighting installation on Murray Park Road from Sturgeon Road to Moray Street

D3.4 The City currently has no approved funding in the Capital Budget for Part 2 of the Work, but is anticipating receiving notification about funding from the Manitoba Hydro by late May. Part 2 of the Work is contingent upon Manitoba Hydro approving sufficient funding.

D3.4.1 Further to C7.1, if notice of sufficient funding is not received, the City shall have the right to eliminate all or any portion of Part 2, and the Contract Price will be reduced accordingly.

D3.4.2 Further to C7.5, C7.5.1, and C7.6, a reduction in the Contract Price pursuant to D3.4.1 shall not be considered in calculating the aggregate reduction in the Contract Price for purposes of C7.5.

D3.4.3 If all or any portion of Part 2 is eliminated pursuant to D3.4.1, the time periods stipulated in D20 for Substantial Performance of the Work and in D21 for Total Performance of the Work will be reduced proportionally by the Contract Administrator acting reasonably.

D3.5 The major components of the Work are as follows:

(a) Asphalt Pavement Reconstruction
- (i) Clearing and grubbing
- (ii) Removal of existing asphalt pavement
- (iii) Excavation
- (iv) Installation of subdrains
- (v) Compaction of existing subgrade
- (vi) Placement of separation/filtration geotextile fabric and geogrid
- (vii) Placement of sub-base and base course materials
- (viii) Construction of concrete curb and gutter
- (ix) Construction of concrete median slab
- (x) Placement of 75 mm of Type IA asphalt and 75 mm of Type III asphalt for roadway and shoulders
- (xi) Placement of two 40 mm lifts of Type IA asphalt with pavement repair fabric for multi-use pathway
- (xii) Construction of multi-use pathway
- (xiii) Regrading of existing ditches
- (xiv) Sodding and seeding

(b) Concrete Pavement Reconstruction
- (i) Installation of catch basins and sewer service pipe
- (ii) Removal of existing concrete pavement
- (iii) Excavation
- (iv) Installation of subdrains
- (v) Compaction of existing subgrade
- (vi) Placement of separation/filtration geotextile fabric and geogrid
- (vii) Placement of sub-base and base course materials
- (viii) Construction of 230 mm plain-dowelled concrete pavement (main line)
- (ix) Construction of 200 mm reinforced concrete pavement (approaches)
- (x) Construction of 180 mm barrier curb
- (xi) Construction of 100 mm monolithic curb and sidewalk with blockouts and paving band
- (xii) Adjustment of existing manholes
- (xiii) Placement of Type IA asphalt for tie-ins

(c) Pavement Rehabilitation
- (i) Installation of catch basins/catch pits and sewer service pipe/drainage connection pipe
- (ii) Removal of existing asphalt pavement where required
- (iii) Renewal of miscellaneous concrete slabs (200 mm reinforced concrete pavement)
- (iv) Placement of pavement repair fabric at various locations
- (v) Renewal of concrete barrier curb
- (vi) Renewal of existing sidewalk

(vii) Construction of 100 mm monolithic concrete sidewalk with blockouts and paving band on Yukon Avenue

(viii) Adjustment of existing manholes/catch basins

(ix) Placement of asphalt overlay

Dundas Street – Type IA asphalt (average thickness 85 mm)

Murray Park Road Eastbound – Type IA asphalt (average thickness 85 mm)

Murray Park Road Westbound – Type IA asphalt (average thickness 50 mm) and Type III asphalt (average thickness 75 mm)

Yukon Avenue – Type IA asphalt (average thickness 85 mm)

(x) Placement of Type IA asphalt for tie-ins

(xi) Construction of multi-use pathway on Murray Park Road

(xii) Boulevard restoration

(d) Railway Crossing and Associated Works

(i) Excavation, compaction of existing subgrade, placement of separation/filtration geotextile fabric and 75 mm Type IA asphalt for multi-use pathway on Moray Street

(ii) Construction of concrete sidewalk on Saulteaux Crescent (East Leg)

(iii) Removal of asphalt pavement

(iv) Removal of concrete pavement (Saulteaux Crescent (East Leg))

(v) Construction of 230 mm plain dowelled concrete pavement and 180 mm modified barrier curb (Saulteaux Crescent (East Leg))

(vi) Removal and disposal of existing track

(vii) Installation of new 115 lb jointed track, including welds

(viii) Installation of rail seal

(ix) Placement of Type IA asphalt pavement

(x) Boulevard restoration

(e) Water and Waste Work

(i) External point repair (Dundas Street)

(ii) Replacement of manhole risers (Murray Park Road)

(iii) Replacement of manhole (Yukon Avenue)

(iv) Insulation of water services (Milt Stegall Drive and Murray Park Road)

(f) Street Lighting Installation and Associated Works

(i) Installation and removal of temporary overhead spans

(ii) Removal of existing street light poles and bases

(iii) Installation of new pre-cast concrete bases including luminaires and appurtenances

(iv) Installation of new street lighting cables in conduit (trenching and boring) and street light poles, including cable termination

(v) Installation of ground rods

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is AECOM Canada Ltd., represented by:

Blair Cockrell
Project Coordinator

Telephone No. (204) 928-8431
Email Address blair.cockrell@aecom.com

D4.2 At the pre-construction meeting, Blair Cockrell will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D5. CONTRACTOR'S SUPERVISOR

D5.1 At the pre-construction meeting, the Contractor shall identify his/her designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D5.2 At least two (2) Business Days prior to the commencement of any Work on the site, the Contractor shall provide the Contract Administrator with a phone number where the supervisor identified in D5.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D6. NOTICES

D6.1 Except as provided for in C22.4, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid/Proposal.

D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator identified in D4.

D6.3 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following facsimile number:

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services
Facsimile No.: 204-947-9155

D7. FURNISHING OF DOCUMENTS

D7.1 Upon award of the Contract, the Contractor will be provided with ‘issued for construction’ Contract Documents electronically, including Drawings in PDF formal only.

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

D8.1 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.

D9. SAFE WORK PLAN

D9.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D9.2 The Safe Work Plan shall be prepared and submitted in the format shown in the City’s template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/safety/default.stm

D9.3 Notwithstanding B12.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D10. INSURANCE

D10.1 The Contractor shall provide and maintain the following insurance coverage:

(a) commercial general liability insurance, in the amount of at least two million dollars ($2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

(b) automobile liability insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The limit of liability shall not be less than $2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence;

(c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation;

(d) Property insurance for all field offices and portable toilets used by the contractor directly or indirectly in the performance of the Work on the project that may be owned, rented, leased or borrowed.

D10.2 All policies shall be taken out with insurers licensed to carry on business in the Province of Manitoba.

D10.3 All subcontractors performing work on the project shall provide the contractor with evidence of insurances as outlined in D10.1(a) and D10.1(b) above and be registered with Workers Compensation Board of Manitoba and maintain insurance and workers compensation coverage throughout the performance of the work. The Contractor shall provide the contract administrator with evidence of the same prior to the commencement of any work.

D10.4 Deductibles shall be borne by the Contractor.

D10.5 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in the C4.1 for the return of the executed Contract Documents, as applicable.

D10.6 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D11. CONTRACT SECURITY

D11.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond until the expiration of the warranty period in the form of:

(a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; and

(b) a labour and material payment bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H2: Labour and Material Payment Bond), in an amount equal to fifty percent (50%) of the Contract Price.

D11.1.1 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:

(a) the version submitted by the Contractor must have valid digital signatures and seals;

(b) the version submitted by the Contractor must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) the version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) the verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) the results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D11.1(b).

D11.1.2 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in its discretion, exercised reasonably, allows.

D11.1.3 Digital bonds passing the verification process will be treated as original and authentic.

D11.2 The Contractor shall provide the City Solicitor with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D11.3 The Contractor shall, as soon as practicable after entering into a contract with a Subcontractor:

(a) give the Subcontractor written notice of the existence of the labour and material payment bond in D11.1(b); and

(b) post a notice of the bond and/or a copy of that bond in a conspicuous location at the Site of the Work.

D12. SUBCONTRACTOR LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at or prior to a pre-construction meeting, or at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the C4.1 for the return of the executed Contract Documents, if applicable.

D13. DETAILED WORK SCHEDULE

D13.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract Documents, as applicable.

D13.2 If, prior to submitting the Detailed Work Schedule, the Contractor does not receive notification pursuant to D14.4 that all or some portion of Part 2 of the Work may be commenced, he/she shall complete the Detailed Work Schedule for only Part 1 of the Work assuming that, if all of

Part 2 is eliminated, the time periods stipulated in D20 for Substantial Performance of the Work and in D21 for Total Performance of the Work will be reduced by three (3) Working Days.

D13.3 If, after submitting the Detailed Work Schedule, the Contractor receives notification that all or any portion of Part 2 of the Work may be commenced, he/she shall submit a revised Detailed Work Schedule no later than two (2) Business Days from receipt of the notification.

D13.4 The detailed work schedule shall consist of the following:

(a) a Gantt chart for the Work acceptable to the Contract Administrator.

D13.5 Further to D13.4(a), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

SCHEDULE OF WORK

D14. COMMENCEMENT

D14.1 The Contractor shall not commence any Work until he/she is in receipt of an award letter from the Award Authority authorizing the commencement of the Work.

D14.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:
  (i) evidence of authority to carry on business specified in D8;
  (ii) evidence of the workers compensation coverage specified in C6.15;
  (iii) the twenty-four (24) hour emergency response phone number specified in D5.2.
  (iv) the Safe Work Plan specified in D9;
  (v) the pedestrian and cyclist accessibility plan specified in E2;
  (vi) evidence of the insurance specified in D10;
  (vii) the contract security specified in D11;
  (viii) the subcontractor list specified in D12;
  (ix) the detailed work schedule specified in D13; and
  (x) the direct deposit application form specified in D28.

(b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.

D14.3 The Contractor shall not commence the Work on the Site before May 16, 2022, and shall commence the Work on Site no later than May 24, 2022, as directed by the Contract Administrator and weather permitting.

D14.4 The Contractor shall not commence Part 2 of the Work as described in D3 and identified in Form B: Prices, unless prior to May 16, 2022, he/she has received notification from the Contract Administrator that the City has received notice of sufficient funding from Manitoba Hydro.

D14.5 The City intends to award this Contract by April 30, 2022.

D14.5.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D15. WORKING DAYS

D15.1 Further to C1.1(tt);

D15.1.1 The Contract Administrator will determine daily if a Working Day has elapsed and will record his/her assessment. On a weekly basis the Contract Administrator will provide the

Contractor with a record of the Working Days assessed for the preceding week. The Contractor shall sign each report signifying that he/she agrees with the Contract Administrator's determination of the Working Days assessed for the report period.

D15.1.2 Work done to restore the Site to a condition suitable for Work, shall not be considered "work" as defined in the definition of a Working Day.

D15.1.3 When the Work includes two or more major types of Work that can be performed under different atmospheric conditions, the Contract Administrator shall consider all major types of Work in determining whether the Contractor was able to work in assessing Working Days.

D16. RESTRICTED WORK HOURS

D16.1 Further to clause 3.10 of CW 1130, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed between 2000 hours and 0700 hours, or on Saturdays, Sundays, Statutory Holidays and or Civic Holidays.

D17. WORK BY OTHERS

D17.1 Further to C6.25, the Contractor's attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working with in the project limit, approach roadway, adjacent roadways or right-of-way. The activities of these agencies may coincide with the Contractors execution of work and it will be the Contractor's responsibility to cooperate to the fullest extent with other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of Contract.

D17.2 Work by others on or near the Site will include but not necessarily be limited to:

(a) Manitoba Hydro (Distribution)
  (i) hookup of Contractor machinery to temporarily stabilize distribution poles on the west side of Milt Stegall Drive during roadway excavation and backfill with sub-base material
  (ii) stabilize distribution poles with a primary dip on the west side of Milt Stegall Drive during roadway excavation and backfill with sub-base material
  (iii) safety watch for the 25kV line at the Boeing plant at 99 Murray Park Road
  (iv) electrical supply and inspection of new street lighting hardware (to be installed by the Contractor) and the energizing of the new street light plant on Murray Park Road

(b) Manitoba Hydro (Gas)
  (i) lowering and/or rock wrapping of gas mains/services
  (ii) safety watch for gas mains as required

(c) City of Winnipeg Geomatics Branch – various works on survey monuments

(d) City of Winnipeg Transit – temporary relocation of bus stops

(e) City of Winnipeg, Water and Waste Department – checking of main line water valves

(f) Railway Contractor (to be determined) – Reconstruction of railway track of the MacDon lead from Saulteaux Crescent (West Leg) to Winpak on the east side of Saulteaux Crescent (East Leg)

D17.3 Further to D17.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others. The Contractor must include and accommodate Work by Others identified in D17.2 or additional parties, in their construction schedule as per D13 and accommodate the necessary area on site required for the Work by Others to complete the Work.

D18. SEQUENCE OF WORK

D18.1 Further to C6.1, the sequence of work shall comply with the following:

D18.1.1 Providing that the Work on each street is completed in a similar order to the order that the Work was commenced in, the Contractor will be permitted to have a maximum of three (3) streets under construction at any one time. Completion of a street means that all of the necessary concrete, asphalt including approaches and landscaping Work is completed to the satisfaction of the Contract Administrator. **Moray Street and Saulteaux Crescent (East Leg) railway crossing project locations will not be included in the number of streets permitted to be under construction at any one time.**

D18.1.2 Where the Contractor utilizes two (2) or more crews that work independently on the same major component of the Work as identified in D3, the Contract Administrator may approve an increase to the maximum number of streets under construction at any time.

D18.1.3 Placing the topsoil and finished grading of all boulevard and median areas shall be completed prior to commencing construction of asphaltic concrete overlays, including scratch courses.

D18.1.4 The Work on Murray Park Road shall be completed in two stages in accordance with the following:

(a) Stage 1 – Asphalt reconstruction from Sturgeon Road to Cree Crescent (West Leg) and pavement rehabilitation eastbound from Cree Crescent (West Leg) to Saulteaux Crescent, including south side multi-use pathway construction from Sturgeon Road to Saulteaux Crescent.

(b) Stage 2 - Pavement rehabilitation westbound from Cree Crescent (West Leg) to Saulteaux Crescent, including north side multi-use pathway construction from Saulteaux Crescent to Moray Street.

D18.1.5 The Work on Dundas Street shall be completed in two stages in accordance with the following:

(a) Stage 1 – Pavement rehabilitation northbound from Yukon Avenue to Sargent Avenue.

(b) Stage 2 – Pavement rehabilitation southbound from Yukon Avenue to Sargent Avenue

D18.1.6 The Work on Milt Stegall Drive shall be completed in two stages in accordance with the following:

(a) Stage 1 – Concrete pavement reconstruction southbound from Yukon Avenue to Sargent Avenue.

(b) Stage 2 – Concrete pavement reconstruction northbound from Yukon Avenue to Sargent Avenue.

D18.1.7 The Work on Yukon Avenue Street shall be completed in two stages in accordance with the following:

(a) Stage 1 – Pavement rehabilitation eastbound from St. James Street to Empress Street.

(b) Stage 2 – Pavement rehabilitation westbound from St. James Street to Empress Street.

D18.1.8 The Work at the rail crossings on Moray Street and Saulteaux Crescent (East Leg) will not be permitted to occur simultaneously.

D19. CRITICAL STAGES

D19.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) The railway Work and adjacent pavement Work on Moray Street included on Drawing CT-19 must be completed within five (5) consecutive Working Days.

(b) The railway Work and adjacent pavement Work on Saulteaux Crescent included on Drawing CT-20 must be completed within ten (10) consecutive Working Days.

D19.2 When the Contractor considers the Work associated with the Moray Street and Saulteaux Crescent (East Leg) Critical Stages to be completed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D19.3 The date on which the Moray Street and Salteaux Crescent (East Leg) Work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of Moray Street and Saulteaux Crescent (East Leg) Critical Stages have been achieved.

D20. SUBSTANTIAL PERFORMANCE

D20.1 The Contractor shall achieve Substantial Performance within seventy (70) consecutive Working Days of the commencement of the Work as specified in D14.

D20.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D20.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D21. TOTAL PERFORMANCE

D21.1 The Contractor shall achieve Total Performance within seventy-five (75) consecutive Working Days of the commencement of the Work as specified in D14.

D21.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D21.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D22. LIQUIDATED DAMAGES

D22.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

(a) Moray Street Railway Crossing Critical Stage - One Thousand dollars ($1,000);

(b) Saulteaux Crescent (East Leg) Railway Crossing Critical Stage - One Thousand dollars ($1,000);

(c) Substantial Performance – Three Thousand dollars ($3,000);

(d) Total Performance – One Thousand dollars ($1,000).

D22.2 The amounts specified for liquidated damages in D22.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve Critical Stages, Substantial Performance or Total Performance by the days fixed herein for same.

D22.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D23. COVID-19 SCHEDULE DELAYS

D23.1 The City acknowledges that the schedule for this Contract may be impacted by the COVID-19 pandemic. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the health and safety of workers and the public, directives from health authorities and various levels of government and in close consultation with the Contract Administrator.

D23.2 If the Contractor is delayed in the performance of the Work by reason of the COVID-19 pandemic, the Work schedule may be adjusted by a period of time equal to the time lost due to such delay and costs related to such delay will be determined as identified herein.

D23.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether COVID-19 will affect the start date. The Contractor shall provide sufficient evidence that the delay is directly related to COVID-19, including but not limited to evidence related to availability of staff, availability of Material or work by others.

D23.4 For any delay related to COVID-19 and identified after Work has commenced, the Contractor shall within seven (7) Calendar Days of becoming aware of the anticipated delay declare the additional delay and shall provide sufficient evidence as indicated in D23.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D23.5 The Work schedule, including the durations identified in D16 to D21 where applicable, will be adjusted to reflect delays accepted by the Contract Administrator. No additional payment will be made for adjustment of schedules except where seasonal work, not previously identified in the Contract, is carried over to the following construction season.

D23.6 Where Work not previously identified is being carried over solely as a result of delays related to COVID-19, as confirmed by the Contract Administrator, the cost of temporary works to maintain the Work in a safe manner until Work recommences, will be considered by the Contract Administrator. Where the Work is carried over only partially due to COVID-19, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D23.7 Any time or cost implications as a result of COVID-19 and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

D24. SCHEDULED MAINTENANCE

D24.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Reflective Crack Maintenance as specified in CW 3250-R7;

(b) Sod Maintenance as specified in CW 3510-R10.

D24.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D25. JOB MEETINGS

D25.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D25.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D26. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D26.1 Further to C6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D27. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D27.1 Further to B12.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B12.4.

MEASUREMENT AND PAYMENT

D28. PAYMENT

D28.1 Further to C12, the City shall make payments to the Contractor by direct deposit to the Contractor's banking institution, and by no other means. Payments will not be made until the Contractor has made satisfactory direct deposit arrangements with the City. Direct deposit application forms are at https://winnipeg.ca/finance/files/Direct_Deposit_Form.pdf.

WARRANTY

D29. WARRANTY

D29.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire one (1) years thereafter for pavement rehabilitation works, and two (2) years thereafter for asphalt and concrete pavement reconstruction works, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D29.2 Notwithstanding C13.2 or D29.1, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if:

(a) a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.

D29.2.1 In such case the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

D30. DISPUTE RESOLUTION

D30.1 The entire text of C21.4 is deleted, and amended to read: "Intentionally Deleted".

D30.2 The entire text of C21.5 is deleted, and amended to read:

(a) If Legal Services has determined that the Disputed Matter may proceed in the Appeal Process, the Contractor must, within ten (10) Business Days of the date of the Legal Services Response Letter, submit his written Appeal Form, in the manner and format set out on the City's Materials Management Website, to the Chief Administrative Officer, and to the Contract Administrator. The Contractor may not raise any other disputes other than the Disputed Matter in his Appeal Form.

D30.3 Further to C21, prior to the Contract Administrator's issuance of a Final Determination, the following informal dispute resolution process shall be followed where the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator ("Dispute"):

(a) In the event of a Dispute, attempts shall be made by the Contract Administrator and the Contractor's equivalent representative to resolve Disputes within the normal course of project dealings between the Contract Administrator and the Contractor's equivalent representative.

(b) Disputes which in the reasonable opinion of the Contract Administrator or the Contractor's equivalent representative cannot be resolved within the normal course of project dealings as described above shall be referred to a without prejudice escalating negotiation process consisting of, at a minimum, the position levels as shown below and the equivalent Contractor representative levels:

(i) The Contract Administrator;

(ii) Supervisory level between the Contract Administrator and applicable Department Head;

(iii) Department Head.

D30.3.1 Names and positions of Contractor representatives equivalent to the above City position levels shall be determined by the Contractor and communicated to the City at the pre-commencement or kick off meeting.

D30.3.2 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.

D30.3.3 Both the City and the Contractor agree to make all reasonable efforts to conduct the above escalating negotiation process within twenty (20) Business Days, unless both parties agree, in writing, to extend that period of time.

D30.3.4 If the Dispute is not resolved to the City and Contractor's mutual satisfaction after discussions have occurred at the final escalated level as described above, or the time period set out in D30.3.3, as extended if applicable, has elapsed, the Contract Administrator will issue a Final Determination as defined in C1.1(v), at which point the parties will be governed by the Dispute Resolution process set out in C21.

THIRD PARTY AGREEMENTS

D31. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D31.1 In the event that funding for the Work of the Contract is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, the following terms and conditions shall apply, as required by the applicable funding agreements.

D31.2 Further to D31.1, in the event that the obligations in D31 apply, actual costs legitimately incurred by the Contractor as a direct result of these obligations ("Funding Costs") shall be determined by the actual cost to the Contractor and not by the valuation method(s) outlined in C7.4. In all other respects Funding Costs will be processed in accordance with Changes in Work under C7.

D31.3 For the purposes of D31:

(a) **"Government of Canada"** includes the authorized officials, auditors, and representatives of the Government of Canada; and

(b) **"Government of Manitoba"** includes the authorized officials, auditors, and representatives of the Government of Manitoba.

D31.4 Modified Insurance Requirements

D31.4.1 If not already required under the insurance requirements identified in D10, the Contractor will be required to provide wrap-up liability insurance in an amount of no less than two million dollars ($2,000,000) inclusive per occurrence. Such policy will be written in the joint names of the City, Contractor, Consultants and all sub-contractors and sub-consultants and include twelve (12) months completed operations. The Government of Manitoba and its Ministers, officers, employees, and agents shall be added as additional insureds.

D31.4.2 If not already required under the insurance requirements identified in D10, the Contractor will be required to provide builders' risk insurance (including boiler and machinery insurance, as applicable) providing all risks coverage at full replacement cost, or such lower level of insurance that the City may identify on a case-by-case basis, such as an installation floater.

D31.4.3 The Contractor shall obtain and maintain third party liability insurance with minimum coverage of two million dollars ($2,000,000.00) per occurrence on all licensed vehicles operated at the Site. In the event that this requirement conflicts with another licensed vehicle insurance requirement in this Contract, then the requirement that provides the higher level of insurance shall apply.

D31.4.4 Further to D10.5, insurers shall provide satisfactory Certificates of Insurance to the Government of Manitoba prior to commencement of Work as written evidence of the insurance required. The Certificates of Insurance must provide for a minimum of thirty (30) days' prior written notice to the Government of Manitoba in case of insurance cancellation.

D31.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D31.5 Indemnification By Contractor

D31.5.1 In addition to the indemnity obligations outlined in C17 of the General Conditions for Construction, the Contractor agrees to indemnify and save harmless the Government of Canada and the Government of Manitoba and each of their respective Ministers, officers, servants, employees, and agents from and against all claims and demands, losses, costs, damages, actions, suit or other proceedings brought or pursued in any manner in respect of any matter caused by the Contractor or arising from this Contract or the Work, or from the goods or services provided or required to be provided by the Contractor, except those resulting from the negligence of any of the Government of Canada's or the Government of Manitoba's Ministers, officers, servants, employees, or agents, as the case may be.

D31.6 Records Retention and Audits

D31.6.1 The Contractor shall maintain and preserve accurate and complete records in respect of this Contract and the Work, including all accounting records, financial documents, copies of contracts with other parties and other records relating to this Contract and the Work during the term of the Contract and for at least six (6) years after Total Performance. Those records bearing original signatures or professional seals or stamps must be preserved in paper form; other records may be retained in electronic form.

D31.6.2 In addition to the record keeping and inspection obligations outlined in C6 of the General Conditions for Construction, the Contractor shall keep available for inspection and audit at all reasonable times while this Contract is in effect and until at least six (6) years after Total Performance, all records, documents, and contracts referred to in D31.6.1 for inspection, copying and audit by the City of Winnipeg, the Government of Manitoba and/or the Government of Canada and their respective representatives and auditors, and to produce them on demand; to provide reasonable facilities for such inspections, copying and audits,

to provide copies of and extracts from such records, documents, or contracts upon request by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada and their respective representatives and auditors, and to promptly provide such other information and explanations as may be reasonably requested by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada from time-to-time.

D31.7 Other Obligations

D31.7.1 The Contractor consents to the City providing a copy of the Contract Documents to the Government of Manitoba and/or the Government of Canada upon request from either entity.

D31.7.2 If the Lobbyists Registration Act (Manitoba) applies to the Contractor, the Contractor represents and warrants that it has filed a return and is registered and in full compliance with the obligations of that Act, and covenants that it will continue to comply for the duration of this Contract.

D31.7.3 The Contractor shall comply with all applicable legislation and standards, whether federal, provincial, or municipal, including (without limitation) labour, environmental, and human rights laws, in the course of providing the Work.

D31.7.4 The Contractor shall properly account for the Work provided under this Contract and payment received in this respect, prepared in accordance with generally accepted accounting principles in effect in Canada, including those principles and standards approved or recommended from time-to-time by the Chartered Professional Accountants of Canada or the Public Sector Accounting Board, as applicable, applied on a consistent basis.

D31.7.5 The Contractor represents and warrants that no current or former public servant or public office holder, to whom the Value and Ethics Code for the Public Sector, the Policy on Conflict of Interest and Post Employment, or the Conflict of Interest Act applies, shall derive direct benefit from this Contract, including any employment, payments, or gifts, unless the provision or receipt of such benefits is in compliance with such codes and the legislation.

D31.7.6 The Contractor represents and warrants that no member of the House of Commons or of the Senate of Canada or of the Legislative Assembly of Manitoba is a shareholder, director or officer of the Contractor or of a Subcontractor, and that no such member is entitled to any benefits arising from this Contract or from a contract with the Contractor or a Subcontractor concerning the Work.

FORM H1: PERFORMANCE BOND
(See D11)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

_____ ,
(hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), in the sum of

_____

_____ dollars ($_____.____)

of lawful money of Canada to be paid to the Obligee, or its successors or assigns, for the payment of which sum the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has entered into a written contract with the Obligee for

TENDER NO. 112-2022

2022 Industrial Street Renewal Program – Murray Park Road and Various Other Locations
which is by reference made part hereof and is hereinafter referred to as the “Contract”.

NOW THEREFORE the condition of the above obligation is such that if the Principal shall:

(a) carry out and perform the Contract and every part thereof in the manner and within the times set forth in the Contract and in accordance with the terms and conditions specified in the Contract;
(b) perform the Work in a good, proper, workmanlike manner;
(c) make all the payments whether to the Obligee or to others as therein provided;
(d) in every other respect comply with the conditions and perform the covenants contained in the Contract; and
(e) indemnify and save harmless the Obligee against and from all loss, costs, damages, claims, and demands of every description as set forth in the Contract, and from all penalties, assessments, claims, actions for loss, damages or compensation whether arising under "The Workers Compensation Act", or any other Act or otherwise arising out of or in any way connected with the performance or non-performance of the Contract or any part thereof during the term of the Contract and the warranty period provided for therein;

THEN THIS OBLIGATION SHALL BE VOID, but otherwise shall remain in full force and effect. The Surety shall not, however, be liable for a greater sum than the sum specified above.

AND IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable as Principal, and that nothing of any kind or matter whatsoever that will not discharge the Principal shall operate as a discharge or release of liability of the Surety, any law or usage relating to the liability of Sureties to the contrary notwithstanding.

IN WITNESS WHEREOF the Principal and Surety have signed and sealed this bond the

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

By: _____ (Seal)
(Attorney-in-Fact)

FORM H2: LABOUR AND MATERIAL PAYMENT BOND
(See D11)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Principal"), and

_____ ,
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), for the use and benefit of claimants as herein below defined, in the amount of

_____

_____ dollars ($_____.____)

of lawful money of Canada, for the payment whereof we, the Principal and the Surety jointly and severally bind ourselves firmly by these presents.

WHEREAS the Principal has entered into a written contract with the Obligee for

TENDER NO. 112-2022

2022 Industrial Street Renewal Program – Murray Park Road and Various Other Locations

which is by reference made part hereof and is hereinafter referred to as the “Contract”.

NOW THEREFORE the condition of the above obligation is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labour, service and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void, otherwise it shall remain in full force and effect subject, however, to the following conditions:

(a) A claimant is defined as one having a direct contract with the Principal for labour, service and material, or any of them, used or reasonably required for use in the performance of the contract, labour, service and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment (but excluding rent of equipment where the rent pursuant to an agreement is to be applied towards the purchase price thereof) directly applicable to the Contract;

(b) The above-named Principal and Surety hereby jointly and severally agree with the Obligee that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant’s work, labour or service was done or performed, or materials were furnished by such claimant, may sue on this bond, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon;

(c) No suit or action shall be commenced hereunder by any claimant

    (i) unless claimant shall have given written notice to the Principal and the Surety above-named, within one hundred and twenty (120) days after such claimant did or performed the last of the work, labour or service, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work, labour or service was done or performed. Such notice shall be served by mailing the same by registered mail to the Principal, and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the Province of Manitoba;

(ii) after the expiration of one (1) year following the date on which Principal ceased work on said Contract; including work performed under the guarantees provided in the Contract;

(iii) other than in a court of competent jurisdiction in the Province of Manitoba.

(d) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

(e) The Surety shall not be liable for a greater sum than the specified penalty of this bond.

The Principal and Surety hereby agree that The Guarantors' Liability Act (Manitoba) shall apply to this Bond.

IN TESTIMONY WHEREOF, the Principal has hereunto set its hand affixed its seal, and the Surety has caused these presents to be sealed and with its corporate seal duly attested by the authorized signature of its signing authority this

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

By: _____ (Seal)
(Attorney-in-Fact)

FORM J: SUBCONTRACTOR LIST
(See D12)

2022 Industrial Street Renewal Program – Murray Park Road and Various Other Locations

Portion of the Work	Name	Address
SURFACE WORKS:		
Supply of Materials:		
Concrete		
Asphalt		
Base Course (slab replacement and partial slab patches)		
Base Course (limestone)		
Sub-Base (limestone)		
Pavement Repair Fabric		
Sod		
Railway track materials		
Installation/Placement:		
Concrete		
Asphalt		
Base Course and Sub-Base		
Pavement Repair Fabric		
Sod		
Joint Sealant		
Railway Track Materials		
Clearing and Grubbing		
UNDERGROUND WORKS		
Supply of Materials:		
Sewer Service Pipe/Drainage Connection Pipe		
Catch Basins/Catch Pits		
Frames and Covers		
Installation/Placement:		
Sewer Service Pipe/Drainage Connection Pipe		
Catch Basins/Catch Pits		

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Spec/Default.stm

E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.2.3 Further to C2.4(d), Specifications included in the Tender shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B6. In every instance where a brand name or design specification is used, the City will also consider approved equals and/or approved alternatives in accordance with B6.

E1.4 The following are applicable to the Work:

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
CT-00	Cover Sheet and Location Plan	A1
CT-01	Murray Park Road – Construction Signage and Staging – Stage 1	A1
CT-02	Murray Park Road – Construction Signage and Staging – Stage 2	A1
CT-03	Dundas Street, Milt Stegall Drive and Yukon Avenue – Construction Signage and Staging – Stage 1	A1
CT-04	Dundas Street, Milt Stegall Drive and Yukon Avenue – Construction Signage and Staging – Stage 2	A1
CT-05	Dundas Street – Yukon Street to Sargent Avenue	A1
CT-06	Yukon Avenue – St. James Street to Station 0+110	A1
CT-07	Yukon Avenue – Station 0+110 to Station 0+230	A1
CT-08	Yukon Avenue – Station 0+230 to Empress Street	A1
CT-09	Milt Stegall Drive – Yukon Avenue to Station 0+070	A1
CT-10	Milt Stegall Drive – Station 0+070 to Sargent Avenue	A1
CT-11	Murray Park Road – Station 1+000 to Station 1+100	A1
CT-12	Murray Park Road – Station 1+100 to Station 1+200	A1
CT-13	Murray Park Road – Station 1+200 to Station 1+320	A1
CT-14	Murray Park Road – Station 1+320 to Station 1+440	A1
CT-15	Murray Park Road – Station 1+440 to Station 1+560	A1
CT-16	Murray Park Road – Station 1+560 to Station 1+700	A1
CT-17	Murray Park Road – Station 1+700 to Saulteaux Crescent	A1
CT-18	Murray Park Road – Saulteaux Crescent to Moray Street – Asphalt Pathway Construction	A1
CT-19	Moray Street – South of Saulteaux Crescent North Leg – Proposed Crossing Reconstruction M 0.2 CoW Macdon Lead	A1
CT-20	Saulteaux Crescent – Moray Street to Moray Street – Proposed Crossing Reconstruction M 0.35 CoW Macdon Lead	A1

E1.5 Street light drawings will be provided to the Contractor prior to commencement of construction.

E2. SITE REQUIREMENTS FOR ACCESSIBILITY

E2.1 The Contractor shall provide the Contract Administrator with an Accessibility Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

E2.2 The Accessibility Plan shall demonstrate how the Contractor will accommodate the safe passage of pedestrians and cyclists in accordance with the Manual of Temporary Traffic Control, the Contract Drawings, Staging and Signage Plans, and Streets By-Law No. 1481/77 at all times for the duration of the Construction. Unless noted in the Contract, the Accessibility Plan must include a written plan for the following:

(a) How the Contractor will maintain at least one crossing in each direction for each intersection (one north/south crosswalk and one east/west crosswalk).

(b) How the Contractor will maintain access to bus stops within the site.

(c) How the Contractor will maintain access to pedestrian corridors and half signals.

(d) How the Contractor will maintain cycling facilities.

(e) How the Contractor will maintain access to residents and businesses unless otherwise noted in the Contract.

(f) Any required detour signage at adjacent crossings to facilitate sidewalk or active transportation pathway closures.

E2.3 The Accessibility Plan may also include figures, sketches, or drawings to demonstrate the proposed plan.

E2.4 The Accessibility Plan shall include written details on how the Contractor intends to review, maintain, and document all items related to the Accessibility Plan on-site during Construction, including, but not limited to:

(a) Signage

(b) Temporary Ramping

(c) Transit Stops

(d) Detour Signage

E2.5 At minimum, the Contractor shall review the site conditions on a daily basis to ensure the all features related to the Accessibility Plan are in place. The site review is intended to correct deficiencies as a result of unforeseen events such as wind, traffic, or the general public. Deficiencies that are direct result of the Contractors actions must be corrected immediately.

E2.6 Any changes to the Accessibility Plan must be submitted to the Contract Administrator a minimum of 5 Working Days prior to the required change for approval.

E2.7 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.

E2.8 Failure to produce records that demonstrate that the site was maintained in compliance with the Accessibility Plan or deficiencies as a direct result of actions by the Contractor that are not immediately corrected may result in a pay adjustment. The rate of pay adjustment will be as per the following schedule:

(a) First Offence – A warning will be issued and documented in the weekly site meeting.

(b) Second Offence - A field instruction to immediately correct the site will be issued by the Contract Administrator.

(c) Third and subsequent Offences – A pay reduction will be issued in the amount of $250.00 per instance, per day.

E3. MOBILIZATION AND DEMOBILIZATION PAYMENT

DESCRIPTION

E3.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the project location(s).

E3.2 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 Works as hereinafter specified.

E3.3 The inclusion of a payment item for the Work under this Specification shall not release or reduce the responsibilities of the Contractor under any other specification in this Contract.

SCOPE OF WORK

E3.4 Further to C12 of the General Conditions, where Mobilization and Demobilization is included as a bid item, it shall consist of the following, as applicable:

(a) Mobilization shall include, but not be limited to:
   (i) All activities and associated costs for transportation of the Contractor's personnel, equipment, and operating supplies to the site, and/or sites, and/or between sites;
   (ii) Establishment of offices, buildings, other necessary general facilities and equipment parking/staging areas for the Contractor's operations at the site or sites;
   (iii) Premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable;
   (iv) General cleanup and housekeeping needed maintain a neat and orderly project site and/or sites;
   (v) Development and implementation of the Accessibility Plan as per E2;
   (vi) Other job-related items.

(b) Demobilization shall include, but not be limited to:
   (i) All activities and costs for transportation of personnel, equipment, and supplies not used in the project from the site, and/or sites, and/or between sites;
   (ii) Disassembly, removal, and site cleanup and restoration of offices, buildings, and other facilities assembled on the site and/or sites;
   (iii) Repair of access roads, temporary haul roads, and equipment parking areas leaving the project site in the same or better condition than at the start of the project;
   (iv) General cleanup and housekeeping needed to restore a neat and orderly project site;
   (v) Monitoring, maintenance and reporting of the Accessibility Plan as per E2.

E3.5 Access to the site, equipment parking, and staging areas are limited to that shown on the drawings or as approved by the Contract Administrator.

MEASUREMENT AND PAYMENT

E3.6 The lump-sum price for the Mobilization and Demobilization bid item shall not exceed five percent (5.00%) of the total bid price for the Contract.

E3.6.1 Further to B9, B17, C12 and E3.6, should the lump sum price exceed 5% of the Total Bid Price the lump sum price will be reduced to 5% of the Total Bid Price, the Total Bid Price will be determined using the reduced lump sum price and payment will be based on the reduced lump sum price.

E3.7 Payment for Mobilization:

(a) 60% of the lump-sum price will be paid to the contractor for Mobilization on the first Progress Estimate for the Contract.

E3.8 Payment for Demobilization:

(a) The remaining 40% of the lump-sum price will be paid upon:

(i) Restoration of the site and/or sites to the satisfaction of the Contract Administrator;

(ii) Distribution of the Declaration of Total Performance.

E3.9 Mobilization and Demobilization will be paid only once (to a maximum of 100%), regardless of the number of times the Contractor mobilizes to the site and/or sites.

E3.10 Pay Reduction for Accessibility Plan

(a) The Demobilization payment will be reduced by the number of pay adjustments incurred in accordance with E2 and as determined by the Contract Administrator.

E4. GEOTECHNICAL REPORT

E4.1 Further to C3.1, the geotechnical report is provided to aid the Contractor's evaluation of the pavement structure and/or existing soil conditions. The geotechnical report is contained in Appendix 'G'.

E5. OFFICE FACILITIES

E5.1 The Contractor shall supply office facilities meeting the following requirements:

(a) The field office shall be for the exclusive use of the Contract Administrator.

(b) The building shall be conveniently located near the site of the Work.

(c) The building shall have a minimum floor area of 20 square metres, a height of 2.4m with two windows for cross ventilation and a door entrance with a suitable lock.

(d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18oC or 24-25oC.

(e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.

(f) The building shall be furnished with one desk, one drafting table, one table 3m x 1.2m, one stool, and a minimum of 8 chairs.

(g) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.

(h) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he/she deems it necessary.

E5.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E5.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance.

E5.4 On a one time basis, where directed by the Contract Administrator, the Contractor shall relocate the office facilities to a location more convenient for the remaining Work.

E6. PROTECTION OF EXISTING TREES

E6.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

(a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.

(b) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 x 100 x 2400mm wood planks, or suitably protected as approved by the Contract Administrator.

(c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

(d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.

(e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

E6.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his/her designate.

E6.3 No separate measurement or payment will be made for the protection of trees.

E6.4 Except as required in clause E6.1(c) and E6.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

E7. TRAFFIC CONTROL

E7.1 Further to clauses 3.6, 3.7 and 3.8 of CW 1130:

(a) Where directed by the Contract Administrator, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW3410.

(b) The Contractor shall be designated as the Authorized Construction Agency for this Contract.

(c) In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contractor ("Construction Agency" in the manual) shall be responsible for supplying, placing, maintaining and removing the appropriate temporary traffic control devices as specified by the MTTC, the Traffic Management Branch of the City of Winnipeg Public Works Department, and the drawings and specifications for this Contract. **The Contractor shall bear all costs associated with the supply, placement, maintenance and removal of temporary traffic control devices by their own forces or subcontractor.**

(d) Restoration and/or installation of permanent signage will be completed by the Traffic Services Branch of the City of Winnipeg.

E7.2 **Further to E7.1(b) and E7.1(c), in accordance with the MTTC, as the Authorized Construction Agency the Contractor shall be responsible for and bear all costs associated with supplying, placing, maintaining and removing the regulatory signage indicated on the construction staging and signage plans approved by the Traffic Management Branch (Drawings CT-01 to CT-04).** In cases where the Contractor is unable to perform the responsibilities noted above, the Contract Administrator shall make arrangements

with the Traffic Services Branch of the City of Winnipeg to supply, place, maintain and remove these traffic control devices. The Contractor is authorized and responsible to supply, place, maintain and remove the traffic control devices in the following situations for this Contract (as identified in Section 2.04 of the MTTC):

(a) Parking restrictions,

(b) Stopping restrictions,

(c) Turn restrictions,

(d) Full or directional closures on a Regional Street,

(e) Traffic routed across a median on a divided street;

(f) Traffic reversals where the direction of travel in a lane is reversed;

(g) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.

E7.3 The Contractor shall remove and stockpile any signage not required during construction, such as, but not limited to parking restrictions, turn restrictions and loading restrictions.

E7.4 Further to E7.2 and E7.3, the Contractor shall make arrangements with the Traffic Services Branch of the City of Winnipeg to reinstall the permanent regulatory signs after the Contract work is complete. At this time the Contractor shall make arrangements to drop off the stockpiled materials to the Traffic Services yard.

E7.5 Further to E7.1 and E7.2, where the Contract Administrator has determined that the services of the Traffic Services Branch are required, the City shall bear the costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E7.6 The Traffic Services Branch of the City of Winnipeg will supply and install advance warning signage (timeframe) for the complete closures of Moray Street and Saulteaux Crescent for railway work.

E7.7 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.

E7.8 Any proposed changes to the approved construction staging and signage drawings must be submitted to the Contract Administrator a minimum of five (5) Working Days prior to the required change for approval.

E7.9 If the Contract Administrator determines that the Contractor is not performing Traffic Control in accordance with this specification, Traffic Services may be engaged to perform the Traffic Control and the Contractor shall bear the costs associated by Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E8. TRAFFIC MANAGEMENT

E8.1 Further to clause 3.7 of CW 1130:

(a) Single lane closures on intersecting and/or adjoining Regional Streets shall only be permitted during non-peak periods when required for construction activities when approved by the Traffic Management Branch. Storage/parking of materials, equipment or vehicles is not permitted on Regional Streets at any time unless approved by the Contract Administrator, in consultation with the Traffic Management Branch.

E8.1.1 The construction staging and signage drawings include details on traffic management, pedestrian access and signage placement for Dundas St, Milt Stegall Drive, Murray Park Road and Yukon Avenue and are identified in E1.4.

E8.1.2 Moray Street must remain open to two-way traffic at the railway crossing, except when the road is closed for railway track work and adjacent pavement work.

E8.1.3 Any proposed changes to the approved construction staging and signage drawings must be submitted to the Contract Administrator a minimum of five (5) Working Days prior to the required change for approval.

E8.1.4 Intersecting local street, median opening and private approach access shall be maintained at all times unless joint/slab repairs or planing/paving operations require temporary closure. Temporary closures are to be staggered such that consecutive intersections are not closed at the same time. Traffic on intersecting regional/collector streets (Empress Street, St. James Street, Sargent Avenue and Sturgeon Road) shall be maintained at all times unless planing/paving operations require temporary complete closures. Temporary complete closures shall be no longer than 10 minutes during asphalt planing/paving operations and shall be completed during off peak hours.

E8.1.5 Flag persons may be necessary to maintain the flow of traffic during certain work operations.

E8.1.6 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E8.1.7 Access to existing bus stops must be maintained at all times, unless relocation of a stop is approved by the Contract Administrator and Winnipeg Transit. Per the MTTC, bus stops must be fully accessible throughout the site with loading ramps.

E8.1.8 Ambulance/emergency vehicle access must be maintained at all times.

E9. REFUSE AND RECYCLING COLLECTION

E9.1 While access to refuse and/or recycling collection vehicles is restricted, on collection day(s) the Contractor shall move all of the affected property owners refuse and/or recycling materials to a nearby common area, prior to an established time, in accordance with E9.2 to permit the normal collection vehicles to collect the materials. Immediately following recycling collection the Contractor shall return recycling receptacles to the addresses marked on the receptacles.

E9.2 Collection Schedule:

Dundas Street from Yukon Avenue to Sargent Avenue

Collection Day(s):	**Varies**
Collection Time:	**Varies**
Common Collection Area:	**Private collection, coordinate temporary relocation of full-size bins as required**

Milt Stegall Drive from Yukon Avenue to Sargent Avenue

Collection Day(s):	**City collection – Friday, Private collection – varies**
Collection Time:	**Varies**
Common Collection Area:	**City small carts to be relocated to edge of roadway, Private Collection coordinate temporary relocation of bins as required**

Murray Park Road from Sturgeon Road to Saulteaux Crescent

Collection Day(s):	**Varies**
Collection Time:	**Varies**
Common Collection Area:	**Private Collection, coordinate access to properties**

Yukon Avenue from St. James Street to Empress Street

Collection Day(s):	**Varies**
Collection Time:	**Varies**
Common Collection Area:	**Private collection, coordinate temporary relocation of full-size bins as required**

E9.3 No measurement or payment will be made for the work associated with this specification.

E10. PEDESTRIAN SAFETY

E10.1 During the concrete reconstruction of Milt Stegall Drive, a temporary snow fence shall be installed along the edges of the roadway excavation, to the satisfaction of the Contract Administrator. The Contractor shall be responsible for maintaining the snow fence in a proper working condition. No measurement for payment shall be made for this work.

E11. WATER OBTAINED FROM THE CITY

E11.1 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

E12. SURFACE RESTORATIONS

E12.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E13. INFRASTRUCTURE SIGNS

E13.1 The Contractor shall obtain infrastructure signs from the Traffic Services Sign Shop at 421 Osborne Street. The Contractor shall mount each sign securely to a rigid backing material approved by the Contract Administrator. The Contractor shall fasten each sign to a suitable support and erect and maintain one sign at each street as directed by the Contract Administrator. When the Contract Administrator considers the Work on the street complete, the Contractor shall remove and dispose of the signs and supports. No measurement for payment will be made for performing all operations herein described and all other items incidental to the work described

E14. SUPPLY AND INSTALLATION OF PAVEMENT REPAIR FABRIC

DESCRIPTION

E14.1 General

E14.1.1 This specification covers the supply and installation of pavement repair fabric.

E14.1.2 Referenced Standard Construction

(a) CW 3130 – Supply and Installation of Geotextile Fabrics.

MATERIALS

E14.2 Storage and Handling

E14.2.1 Store and handle material in accordance with Section 2 of CW 3130.

E14.3 Pavement Repair Fabric

E14.3.1 Pavement repair fabric will be a product included in Section 8 of the City of Winnipeg, Public Works – Approved Products for Surface Works.

CONSTRUCTION METHODS

E14.4 General

E14.4.1 Install pavement repair fabric at random locations as directed by the Contract Administrator.

E14.4.2 The extent of the placement limits and quantities required will be determined by the Contract Administrator and provided 48 hours prior to the placement of asphalt.

E14.4.3 Proceed with installation upon completion and acceptance of the asphalt levelling course.

E14.4.4 Install fabric in accordance with the manufacturer's specifications and recommendations.

E14.4.5 Only construction equipment required to place the final asphalt surface course will be allowed to travel on the exposed fabric.

E14.4.6 Replace damaged or improperly placed fabric.

E14.4.7 Ensure temperature of the asphalt material does not exceed the melting point of the fabric.

MEASUREMENT AND PAYMENT

E14.5 Pavement Repair Fabric

E14.5.1 The supply and installation of the pavement repair fabric will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Pavement Repair Fabric". The area to be paid for will be the total number of square metres of pavement repair fabric supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E15. PORTLAND CEMENT CONCRETE SIDEWALK WITH BLOCK OUTS FOR INDICATOR SURFACES

DESCRIPTION

E15.1 This specification shall supplement CW 3325-R5 "Portland Cement Concrete Sidewalks".

CONSTRUCTION METHODS

E15.2 Add the following to section 9 :

E15.2.1 As shown on the drawings and as directed by the Contract Administrator, construct sidewalk with block outs and/or monolithic curb and sidewalk with block outs, to allow for the installation of indicator surfaces.

E15.2.2 Verify dimensions of paving stones (indicator surface) prior to construction of the block-outs. Gaps between paving stones and concrete pavement shall not exceed five (5) millimetres.

E15.2.3 Concrete curbs for monolithic curb and sidewalk with block outs shall be constructed in accordance with CW 3240.

MEASUREMENT AND PAYMENT

E15.3 Add the following to section 12 :

E15.3.1 Construction of concrete sidewalks with block outs for indicator surfaces will be measured on surface area basis. The surface area to be paid for shall be the number of square

metres constructed in accordance with this specification and accepted by the Contract Administrator, as computed by measurements made by the Contract Administrator.

BASIS OF PAYMENT

E15.4 Add the following to section 13 :

E15.4.1 Construction of concrete sidewalks with block outs for indicator surfaces will be paid for at the Contract Unit Price per square meter for the “Items of Work” listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this specification.

E15.4.2 Items of Work:

(a) 100 mm Sidewalk with Block Outs

(b) 150 mm Sidewalk with Block Outs

(c) Monolithic Curb and 100 mm Sidewalk with Block Outs*

(d) Monolithic Curb and 150 mm Sidewalk with Block Outs*

* - reveal height and type

E15.4.3 Concrete thickness greater than the specified sidewalk thickness as a result of shaping the base material to accommodate the block outs is incidental to the listed Items of Work.

E16. PAVING STONES FOR INDICATOR SURFACES

DESCRIPTION

E16.1 This specification shall supplement CW 3330-R5 “Installation of Interlocking Paving Stones”

MATERIALS

E16.2 Add the following to section 5 :

E16.2.1 Paving Stones for indicator surfaces shall be :

Barkman Concrete paving stones -
Charcoal Holland Paver (60mm X 210 mm X 210 mm)
https://www.barkmanconcrete.com/

CONSTRUCTION METHODS

E16.3 Add the following to section 9.2 “Preparation of Sub-grade, Sub-base and Sand-base” :

E16.3.1 Preparation of Sand-Base for Paving Stones in Sidewalk Block Outs.

E16.3.2 Place a 15mm layer of bedding sand in the blocked out sidewalk areas.

E16.3.3 The bedding sand shall be spread and levelled so that the paving stones when installed are 5 mm higher than the finished grade.

E16.3.4 No more sand shall be spread than can be covered in with paving stone on the same day.

E16.3.5 The bedding sand shall not be compacted or disturbed prior to laying the paving stones.

E16.4 Add the following to section 9.3 “Installation of Paving Stones” :

E16.4.1 For indicator surface paving stones, commence installation of paving stones against the long edge of the block out to obtain the straightest possible course of installation.

MEASUREMENT AND PAYMENT

E16.5 Add the following to section 12 :

E16.6 Supply and Installation of Paving Stones for Indicator Surfaces

E16.6.1 Paving stones for indicator surfaces will be measured on surface area basis. The surface area to be paid for shall be the number of square metres constructed in accordance with this specification and accepted by the Contract Administrator, as computed by measurements made by the contract Administrator.

BASIS OF PAYMENT

E16.7 Add the following to section 13 :

E16.7.1 The supply and installation of paving stones for indicator surfaces will be paid for at the Contract Unit Price per square meter for “Paving Stone Indicator Surface”, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this specification.

E16.7.2 Concrete thickness greater than the specified sidewalk thickness as a result of shaping the base material to accommodate the block outs is incidental to the listed Items of Work.

E17. SUPPLY AND INSTALL WATERMAIN AND WATER SERVICE INSULATION

DESCRIPTION

E17.1 Notwithstanding 3.12 of CW 2110, this specification covers the supply and installation of insulation in roadway excavations over watermains and water services.

E17.2 Referenced Standard Construction Specifications

(a) CW 2030 – Excavation Bedding and Backfill

(b) CW 3110 – Sub –grade, Sub-base and Base Course Construction

E17.3 Referenced Standard Details

(a) SD-018 - Watermain and Water Service Insulation

MATERIALS

E17.4 Acceptable insulation is:

(a) Extruded Polystyrene rigid foam insulation – Type 4, 4” in thickness.

DOW - Roofmate or Highload 40

Owen’s Corning - Foamular 350 or Foamular 400.

2” X 48” X 96”, 2” X 24” X 96”, 4” X 24” X 96”

E17.5 Sand Bedding :

(a) In accordance with CW 2030

CONSTRUCTION METHODS

E17.6 Prior to the installation of any sub-base material or geotextile material, locate all existing water services. Further to SD-018, where directed by the Contract Administrator, excavate the sub-grade to allow the top of the insulation to be installed flush with the surrounding sub-grade. Install the insulation on a level surface centered over the located watermain or water service for the full width of the roadway excavation. Install sand bedding if required to level the surface. Stockpile and dispose of excavated material in accordance with CW 3110.

E17.7 Thickness of insulation is 100 mm (4”). If using 50 mm (2”) panels 2 layers are required. Total width of insulation to be as directed by the Contract Administrator. Place sufficient full width panels to meet or exceed the specified width.

E17.8 Place insulation panels adjacent to each other over the specified area with no gaps between panels and less than 15mm of elevation difference along the adjoined edges. Where 2” thick panels are being used, offset the top layer to prevent the panel joints from aligning with the joints in the lower layer.

E17.9 Use full panels of insulation where possible. Where necessary cut insulation panels to obtain coverage to specified lengths. Insulation pieces shall be a minimum of dimension of 300 mm in width or length.

E17.10 Take appropriate measures to ensure panels are not displaced when installing geotextiles and during backfilling operations.

MEASUREMENT AND PAYMENT

E17.11 Watermain and Water Service Insulation shall be measured on an area basis and paid for at the Contract Unit Price per square metre of “Watermain and Water Service Insulation”. The area to be paid for shall be the total square meters of watermain and water service insulation supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

(a) Excavation of the roadway subgrade in accordance with E17.6 will not be measured for payment and will be included in the payment for “Watermain and Water Service Insulation”.

E18. CONCRETE CONSTITUENT MATERIALS, MIX DESIGN REQUIREMENTS, AND HOT AND COLD WEATHER CONCRETING

DESCRIPTION

E18.1 General

E18.1.1 PORTLAND CEMENT CONCRETE PAVEMENT WORKS shall be in accordance with CW3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS, except as otherwise specified herein.

E18.1.2 This specification covers Portland cement concrete constituent materials and design requirements for the preparation of Portland Cement Concrete for all concreting operations relating to the construction of pavements, curbs, gutters, private approaches, bull-noses, median slabs, median, safety median and boulevard splash strips, sidewalk and other related concrete works.

E18.1.3 This specification also covers hot and cold weather concreting.

E18.1.4 Replace 2.0 Definitions of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 1.2 of this specification.

E18.1.5 Replace 5.3 Portland Cement Concrete Constituent Materials of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 2.0 MATERIALS of this specification.

E18.1.6 Replace 6.0 Design Requirements of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 3.0 DESIGN REQUIREMENTS of this specification.

E18.1.7 Replace 9.8. Weather Conditions of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 4.0 HOT AND COLD WEATHER CONCRETING of this specification.

E18.1.8 Replace 13.0 Basis of Payment of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 5.1 BASIS OF PAYMENT FOR CW 3310-R17 of this specification.

E18.1.9 Replace 13.0 Basis of Payment of CW 3230-R8, FULL-DEPTH PATCHING OF EXISTING PAVEMENT SLABS AND JOINTS with 5.2 BASIS OF PAYMENT FOR CW 3230-R8 of this specification

E18.1.10 Replace 13.0 Measurement and Payment for CW 3235-R9, RENEWAL OF EXISTING MISCELLANEOUS CONCRETE SLABS with 5.3 MEASUREMENT AND PAYMENT FOR CW 3235-R9 of this specification

E18.1.11 Replace 4.0 Measurement and Payment for CW 3240-R10, RENEWAL OF EXISTING CURBS with 5.4 MEASUREMENT AND PAYMENT FOR CW 3240-R10 of this specification

E18.1.12 Replace 13.0 Basis of Payment for CW 3325-R5, PORTLAND CEMENT CONCRETE SIDEWALK with 5.5 BASIS OF PAYMENT FOR CW 3325-R5 of this specification.

E18.1.13 This specification also replaces 2.0 Definitions, 5.3 Portland Cement Concrete Constituent Materials, 6.0 Design Requirements, 9.8. Weather Conditions, and 13.0 Basis of Payment of CW3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS where other specifications (e.g. CW3230-R8, CW3235-R9, CW3240-R10, CW3325-R5) reference CW3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS.

E18.1.14 All requirements and tests shall be in accordance with the latest edition of CSA A23.1-19/CSA A23.2-19, except as otherwise specified herein.

E18.2 Definitions

E18.2.1 Reinforced Concrete Pavement - A Portland Cement Concrete pavement with distributed steel reinforcement in the pavement slab and with deformed tie bars across longitudinal joints and smooth dowels across transverse contraction joints. Distributed steel reinforcement consists of smooth or deformed bars.

E18.2.2 Plain-Dowelled Pavement - A Portland Cement Concrete pavement with no reinforcing steel in the pavement slab and with deformed tie bars across longitudinal joints and smooth dowels across transverse contraction joints.

E18.2.3 Type 1 Concrete shall be used for expressways, major arterials, minor arterials, industrial/commercial collectors, residential major collectors, residential minor collectors, and industrial/commercial local pavements.

E18.2.4 Type 2 Concrete shall be used for residential roads and alleys, curb and gutter sections, curbs, commercial approaches, residential approaches, miscellaneous concrete slab and splash strips. Type 1 Concrete can be used instead of Type 2 Concrete.

E18.2.5 Type 3 is early opening concrete and shall be used for 24 hours early opening after placement.

E18.2.6 Type 4 is early opening concrete and shall be used for 72 hours early opening after placement.

E18.2.7 Type 5 Concrete shall be used for Sidewalks. Type 1 or Type 2 Concrete can be used instead of Type 5 Concrete.

E18.2.8 Type 6 Concrete is cold weather concreting and shall replace all other concrete types for all applications when cold weather exists, except Type 8.

E18.2.9 Type 7 is concrete for restoration of utility pavement cuts.

E18.2.10 Type 8 is concrete for temporary restoration.

E18.2.11 Coarseness Factor - A measure of the coarseness of the combined aggregate materials being incorporated into the concrete mix, defined as the percentage of all plus 2 500 sieve particles, which are also retained on the 10 000 sieve. Coarseness Factor = 100 (cumulative % retained on 10 000 Sieve divided by the cumulative % retained on 2 500 Sieve).

E18.2.12 Hot weather is defined as one or a combination of the ambient air temperature being at or above 27 °C, or when there is a probability of the temperature rising above 27 °C during the concrete placing period (as forecast by the nearest official meteorological office), or the evaporation rate that exceeds 0.75 kg/m^2 /h due to high concrete temperature (maximum temperature of 32 °C for fresh concrete), low relative humidity and high wind speed that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results.

E18.2.13 Cold weather is defined as a period when there is a probability of the ambient air temperature falling below 5 °C within 24 hours of placing or the average daily temperature for three consecutive days has fallen to, or is expected to fall, below 5°C as forecast by the nearest official meteorological office. The daily temperature is the mean temperature which is the average of the maximum and minimum temperature during the period from midnight to midnight.

E18.2.14 The protection period is the time required to prevent concrete from being affected by exposure to cold weather and to develop a minimum compressive strength of 24 MPa. Concrete compressive strength shall be determined by maturity meters and field cured cylinders. In no case shall the protection period be less than seven (7) days.

MATERIALS

E18.3 Concrete Constituent Materials

E18.4 Aggregates

E18.4.1 Aggregate shall consist of crushed stone or gravel or a combination of these materials conforming to the requirements of this Specification.

E18.4.2 Each of the fine- and coarse-fractions of the combined aggregate shall meet all the requirements of CSA A23.1, Table 10 (FA1) and Table 11, respectively and shall be handled and weighed separately to maintain uniformity. The supplier shall provide the City of Winnipeg, Research and Standards Engineer with test data in accordance with CSA A23.2-30A to demonstrate that the material will produce concrete of acceptable quality that meets all the relevant requirements of this Specification.

E18.4.3 The combined aggregate gradation and allowable deviations shall comply with the requirements in Table CW 3310.1.

TABLE CW 3310.1 – Combined Aggregate Gradation Limits and Allowable Deviations

Sieve Size	Percent of Total Dry Weight Passing Each Sieve	Allowable Deviation From The Job Mix Formula, % By Mass Passing Sieve
28 000	100%	--
20 000	90% - 100%	± 2%
14 000	75% - 95%	± 2%
10 000	60% - 75%	± 3%
5 000	35% - 50%	± 3%
2 500	27% - 35%	± 2%
1 250	20% - 30%	± 2%
630	10% - 20%	± 2%
315	5% - 10%	± 2%
160	1% - 4%	± 1%

80	0% - 2%	± 1%

E18.4.4 The fineness modulus of fine aggregate shall be not less than 2.3 nor more than 3.1.

E18.4.5 Aggregates shall conform to CSA-A23.1, Clauses 4.2.3.1 to 4.2.3.6. Each of the fine- and coarse-fractions shall comply with the physical requirements in Table CW 3310.2 and the test results shall be provided with the mix design submittal.

TABLE CW 3310.2 – Limits for Deleterious Substances and Physical Properties of Aggregates

Material	Parameter	Test Method	Maximum Limits	Frequency of Test
coarse aggregate	Clay lumps	CSA A23.2-3A	0.25%	2 years
	Low density granular material	CSA A23.2-4A	0.5%	2 years
	Material finer than 80 µm	CSA A23.2-5A	1.0%	1 year
	Relative density and absorption	CSA A23.2-12A	Note*	1 year
	Flat and elongated particles - Flat particles	CSA A23.2-13B	25%	1 year
	- Elongated particles		40%	
	Petrographic examination** – PN	CSA A23.2-15A	125	1 year
	Unconfined freeze-thaw	CSA A23.2 24A	6%	Twice per season
	Alkali-silica reactivity	CSA A23.2-25A	0.15%	2 years
	Alkali-carbonate reactivity	CSA A23.2-26A	Note*	1 year
	Micro-Deval	CSA A23.2-29A	17%	Twice per season
fine aggregate	Clay lumps	CSA A23.2-3A	1%	2 years
	Low density granular material	CSA A23.2-4A	0.5%	2 years
	Material finer than 80 µm	CSA A23.2-5A	3.0%	1 year
	Organic impurities	CSA A23.2-7A	free from injurious amounts	2 years
	Petrographic examination**	CSA A23.2-15A	Note**	1 year
	Micro-Deval	CSA A23.2-23A	20%	1 year
	Alkali-silica reactivity	CSA A23.2-25A	0.15%	2 years

- *No acceptance/rejection values; however, the results shall be submitted.

- **Petrographic examinations shall be used to calculate the petrographic number (PN), to provide an appraisal of the physical-mechanical quality of coarse aggregate. Determination of PNs applies solely to coarse aggregates and should not be used for fine aggregates. The petrographic report for the fine aggregate shall include a comment on the suitability of the material for use in the production of concrete mix.
- The Coarseness Factor of the combined aggregate shall be between 45 and 65.
- Quarried limestone and dolomite shall not be acceptable as concrete aggregate materials.

E18.5 Hydraulic Cement

E18.5.1 Hydraulic Cement shall be either General Use (GU) or General Use Limestone (GUL) conforming to the requirements of the latest edition of CSA A3001. High-early-strength Portland cement (HE) may also be used for cold weather concreting only. Cement shall be kept in weather tight storage that will protect it from moisture and contamination, and in such a manner as to permit inspection, sampling and identification, where required, of each lot.

E18.6 Supplementary Cementing Materials

E18.6.1 Fly ash shall conform to the requirements of CSA A3001 Class F. Fly ash shall be added to concrete mixtures as a separate constituent material. The use of blended hydraulic cement is not permitted.

E18.7 Water

E18.7.1 Potable water, which is water suitable for human consumption, is permitted to be used as mixing water in concrete without testing. Non-potable water and combined water shall conform to ASTM C1602M, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete. The concrete supplier shall maintain documentation on the characteristics of the mixing water in compliance with the requirements of Tables 1 and 2 in ASTM C1602M. Testing to verify compliance with the requirements in Table 1 shall be conducted on the Type 1 hand placement paving mix with fly ash. The testing frequency for mixing water shall be in accordance with Appendix X1 of ASTM C1602M. Information on the testing frequency of the concrete mixing water shall be included in the concrete suppliers' quality control program. The source(s) of concrete mixing water and test data indicating compliance with ASTM C1602M shall be provided with the Mix Design Statement submitted to the City of Winnipeg, Research and Standards Engineer.

E18.8 Admixtures

E18.8.1 Air-Entraining Admixture

(a) The air-entraining admixture shall conform to the requirements of ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.

E18.8.2 Chemical Admixtures

(a) Chemical admixtures shall conform to the requirements of ASTM C494, Standard Specification for Chemical Admixtures for Concrete. Chloride-based chemical admixtures will not be permitted under any circumstances.

E18.8.3 Cold-Weather Admixture Systems

(a) Cold-weather admixture systems shall conform to the requirements of ASTM C1622, Standard Specification for Cold-Weather Admixture Systems.

DESIGN REQUIREMENTS

E18.9 Concrete Suppliers

E18.9.1 The City of Winnipeg, Research and Standards Engineer will maintain a list of approved concrete suppliers. To obtain approval, concrete suppliers must annually submit the following information to the Research and Standards Engineer prior to April 1st.

(a) Concrete suppliers Approval Guidelines and Application is available at the City of Winnipeg, Corporate Finance, Material Management Division website at: https://www.winnipeg.ca/matmgt/Spec/Default.stm.

(b) Names of suppliers and sources for all materials and admixtures.

(c) Concrete mix designs with unique mix design codes signed and dated by person selecting the mix proportions.

(d) Copy of valid Concrete Manitoba certificate for concrete batch plant.

(e) Copies of valid scale calibration reports for the concrete batch plant.

(f) Test data for aggregates (in accordance with clause 51.4).

(g) The mill certificate for the cement and fly ash including chemical and physical composition and analysis, fly ash source and name of supplier.

(h) Sieve analysis test reports for the individual aggregates and the combined aggregate gradations to be used in the concrete. The sieve analysis test reports shall be representative of the material to be used during concrete production.

(i) Performance data from trial batches prior to construction to demonstrate the concrete mix will achieve the performance criteria in Table CW 3310.3.

TABLE CW 3310.3: Performance Criteria and Testing

	Time (day)	Type 1	Type 2	Type 3, and Type 6	Type 4	Type 5	Type 7**	Type 8
A minimum of one (1) set* of concrete compressive strength tests for the slipform paving mix with and without fly ash according to CSA A23.2-9C	@ 1	--	--	20 MPa	--	--	--	--
	@ 3	15 MPa	15 MPa	--	20 MPa	--	--	--
	@ 7	20 MPa	20 MPa	--	--	--	--	--
	@ 28	35 MPa	32 MPa	35 MPa	35 MPa	--	--	--
A minimum of two (2) sets* of concrete compressive strength tests for the hand placement paving mix with and without fly ash according to CSA A23.2-9C	@ 1	--	--	20 MPa	--	--	--	--
	@ 3	15 MPa	15 MPa	24 MPa	20 MPa	12 MPa	20 MPa	12 MPa
	@ 7	20 MPa	20 MPa	--	--	--	--	--
	@ 28	35 MPa	32 MPa	35 MPa	35 MPa	30 MPa	35 MPa	30 MPa
Air-void test according to ASTM C457	@ 28	See Note ***						
Rapid chloride penetrability test (RCPT) according to CSA A23.2-23C	@ 56	See Note ****						

*Each set contains at least three (3) cylinders at each specified date. The average of each set shall be equal to or greater than the specified strength, with no single result less than 85% of the specified strength.

** Type 7 is concrete for restoration of utility pavement cuts and shall be adjusted to meet the specified strength for other types based on the application and shall include set retarders or hydration stabilizers to extend the discharge time to 150 min.

***A minimum of one sample for air-void test at 28 days shall be performed for each cement for Type 1, Type 2, and Type 3 with fly ash, and Type 6. The air-void test shall meet the following requirements:

- Spacing factor shall not exceed 230 µm, with no single value greater than 260 µm; and,
- Air content shall be greater than or equal to 5.0% and less than 8.0%.

****A minimum of two samples for rapid chloride penetrability test shall be performed for Type 1, Type 2 and Type 3 for mixes with and without fly ash. For Type 1 and Type 3, the average penetrability shall be equal to or less than 1250 coulombs at 56 days based on the charge passed, with no single result greater than 1500 coulombs for mixes with and without fly ash. For Type 2, the average of chloride ion penetrability shall be equal to or less than 1500 coulombs at 56 days based on the charge passed, with no single result greater than 1750 coulombs.

(j) Quality control program for all materials, including a proposed sampling and testing plan with minimum sampling and testing frequencies;

(k) The laboratory(s) to be used and its credentials;

(l) The quality control personnel and their qualifications; and,

(m) Frequency of production equipment inspection, verification of calibration, and any certification of the production facility.

E18.10 The City of Winnipeg, Research and Standards Engineer will conduct inspections at least once a year during production. Samples of materials may be taken and tested.

E18.11 Testing for qualification or acceptance purposes shall be done in accordance with this Specification and the applicable test procedures and standard practices of CSA A23.2. There shall be no charge for any materials taken for testing purposes.

E18.12 Changes in the source of any concrete constituent materials will not be permitted without approval of the City of Winnipeg, Research and Standards Engineer. For new sources, all materials shall be tested.

E18.13 Once approved, all concrete shall be supplied in accordance with the approved Mix Design Statement. No changes in the concrete mix designs will be permitted without written permission from the City of Winnipeg, Research and Standards EngineerConcrete Properties.

E18.14 Concrete Suppliers

E18.14.1 The Mix Design Statements for all concrete types shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval. The concrete mix shall be proportioned such as to yield concrete having the required workability, strength and durability in Table CW 3310.4.

TABLE CW 3310.4 – Concrete Properties

	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8
Minimum Cementitious Content (kg/m^3)	360	340	360	360	320	400	340	300
Maximum Supplementary Cementing Materials – Fly Ash** (%) (see Note 2)	20%	20%	15%	20%	15%	0%	20%	20%
Maximum Water/Cementitious Ratio								
- Slip form paving	0.4	0.4	0.4	0.4	-	0.35	-	-
- Hand placement	0.42	0.42	0.42	0.42	0.42	0.36	0.42	0.45
Slump (mm)								
- Slip form paving	50 ± 20	50 ± 20	50 ± 20	50 ± 20	-	50 ± 20	-	-
- Hand placement	70 ± 20	70 ± 20	70 ± 20	70 ± 20	80 ± 20	70 ± 20	100±20	100±20
Nominal Maximum Aggregate Size (mm)	20	20	20	20	20	20	20	20
Air Content (%)	5-8	5-8	5-8	5-8	5-8	5-8	5-8	5-8
Minimum Compressive Strength (MPa)								
- @ 1 days	-	-	20	-	-	20		-
- @ 3 days	15	15	-	20	-	24	Note 1*	-
- @ 7 days	-	-	-	-	-	-		-
- @ 28 days	35	32	Note 1*	Note 1*	30	Note 1*		30
Maximum Rapid Chloride Penetrability Test***	1500	1750	Note 1*	Note 1*	-	Note 1*	-	-

(coulombs) @ 56 days. (see Note 3)

*The concrete shall meet Type 1 or Type 2 based on the application.
**The use of fly ash in concrete mix will be permitted. The Contractor will have the option to replace cement up to but not exceeding the above limits, by weight of total cementitious materials, depending on the concrete type. The use of fly ash will be permitted when the average daily temperature is 10˚C and rising for the next five (5) consecutive days of placement as forecast by the nearest official meteorological office. The use of fly ash will not be permitted when the average daily temperature is below 10˚C and the average daily temperature for more than five (5) consecutive days has fallen to, or is expected to fall, below 10˚C within fourteen (14) days of placement as forecast by the nearest official meteorological office unless authorized in writing by the City of Winnipeg, Research and Standards Engineer.
***The concrete supplier shall develop and submit maturity relationships for Type 1 and Type 6 mixes.

***Rapid chloride penetrability test will be required where there is evidence of concrete damage as a result of inadequate curing and adverse weather conditions, including hot weather, wind, rain, sleet, snow and cold weather. The Contract Administrator shall be allowed access to all sampling locations and reserves the right to take samples for testing at any time.

E18.15 Plant Quality Control

E18.15.1 The concrete supplier shall provide quality control for the plant to ensure all materials meet the approved mix designs. This information shall be submitted bi-weekly and will be monitored by the City of Winnipeg, Research and Standards Engineer. Failure to submit the quality control results shall be cause for immediate suspension of the concrete supplier.

E18.15.2 A new mill certificate for cement and fly ash shall be provided monthly during production.

E18.15.3 Check tests of any concrete constituent materials may be undertaken by a Testing Laboratory designated by the City of Winnipeg, Research and Standards Engineer. The concrete supplier shall be equipped with a suitable means or device for obtaining a representative sample of the cement and fly ash. The device shall enable the sample to be readily taken in proximity to the cement or fly ash weigh hopper and from a container or conveyor holding only cement or fly ash to prevent contamination. Any materials which fails to comply with the requirements of CSA A3001 will be rejected, notwithstanding any certificate of acceptance that may have been previously given. Materials that have been rejected must be removed immediately by the concrete supplier.

HOT AND COLD WEATHER CONCRETING

E18.16 The Contractor shall be responsible for taking all necessary measures to protect freshly laid concrete from adverse weather conditions, including hot weather, wind, rain, sleet, snow and cold weather, except as otherwise specified herein.

E18.16.1 Hot weather concreting

(a) When the ambient air temperature is at or above 27 °C, or when there is a probability of the temperature rising above 27 °C during the placing period (as forecast by the nearest official meteorological office), the Contractor shall provide protection for the concrete from the effects of hot and/or drying weather conditions.

(b) When drying conditions are greater than or equal to 0.75 kg/m^2/hr as estimated by use of Figure D1, Appendix D, Guidelines for Curing and Protection of CSA A23.1, the plastic concrete surface shall be protected from drying by application of an evaporation retardant. The evaporation retardant shall be applied according to the manufacturer's recommendations.

E18.16.2 Cold weather concreting

(a) When there is a probability of the air temperature falling below 5 °C within 24 h of placing or the average daily temperature for more than three successive days is fallen to, or is expected to fall, below 5°C as forecast by the nearest official meteorological office, cold weather concreting requirements shall apply.

(b) Concrete shall be placed on unfrozen base material, free of water, snow, and ice. Frozen base material will be identified by measuring the surface temperature using

infrared thermometers or similar devices. If the surface temperature is less than or equal to 0°C, the base will be considered frozen. The Contractor shall use suitable heating methods to maintain the base temperature above 0°C. Salt shall not be used to thaw ice, snow, or frost.

(c) Type 6 Concrete shall be used for cold weather concreting.

(d) Where less than 30 cubic meters of concrete will be placed, the Contractor shall protect the concrete using a minimum of one layer of insulated tarp with R-value more than 5 for a minimum of seven (7) days after completion of placing operations unless otherwise specified by the Contract Administrator.

(e) Where 30 cubic meters of concrete or more will be placed, a minimum of three maturity meters shall be used. One maturity meter shall be placed in the final 4 m of paving, and the two other maturity meters shall be placed at locations designated by the Contract Administrator. Each maturity meter shall be capable of recording the time and temperature at three depths, ½ inch below the surface, mid slab and ½ inch above the bottom of the pavement. Locations where the maturity meters are placed shall be protected in the same manner as the rest of the concrete.

(f) The Contract Administrator shall provide all necessary wires and connectors for maturity meters. The Contractor shall be responsible for the placement, protection, and maintenance of all wires and connectors. No additional measurement or payment will be made for the placement, protection, and maintenance of all wires and connectors.

(g) The Contractor shall maintain the internal concrete temperature above 10 °C during the protection period, a minimum of seven (7) days after completion of placing operations, and until the concrete has developed a minimum compressive strength of 24 MPa. Temperature and concrete compressive strength shall be determined by maturity meters and field cured cylinders. A minimum of four (4) readings for temperature shall be collected in the first three (3) days and then two times daily thereafter.

(h) The Contractor shall provide suitable protection methods to the Contract Administrator for approval such as insulation (blankets and boards), heating systems such as electric blankets and hydronic heating systems, unheated or heated enclosures, or a combination of the methods to maintain the internal concrete temperature above 10 °C. In no case shall the protection method be less than one layer of insulated tarp with R-value more than 5.

(i) If the internal concrete temperature at any location in the concrete falls below 10 °C but not less than 5°C during the curing period, supplemental heat shall be introduced immediately.

(j) If the internal concrete temperature at any location in the concrete falls below 5 °C during the curing period, cores shall be collected and tested at 28 days. The cores will be tested in accordance with ASTM C856, Standard Practice for Petrographic Examination of Hardened Concrete and CSA A23.2-14C, Obtaining and testing drilled cores for compressive strength testing. Concrete damaged by frost, as determined by the compressive strength test or Petrographic analysis, shall be removed and replaced at the Contractor's expense. All costs associated with coring, transmittal of cores, and petrographic examination and compressive testing shall be borne by the Contractor regardless of the outcome of the examination.

(k) If the internal concrete temperature at any location in the concrete falls below 0 °C during the curing period, concrete shall be removed and replaced by the Contractor at his own expense.

(l) The protection method shall not be completely removed until the concrete has cooled to the temperature differential given in CSA A23.2, Table 20. The Contractor shall provide suitable methods for gradual cooling to the Contract Administrator for approval such as loosening the forms while maintaining cover with plastic sheeting or insulation, gradual decrease in heating inside an enclosure, or turning off the heat and allowing the enclosure to slowly equilibrate to ambient temperature. If the concrete

cracks due to a sudden temperature change, concrete shall be removed and replaced by the Contractor at his own expense.

(m) Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at his own expense.

(n) No additional measurement or payment will be made for cold weather concreting.

BASIS OF PAYMENT FOR CW 3310-R17

E18.17 Concrete Pavements, Median Slabs, Bullnoses and Safety Median

E18.17.1 Construction of concrete pavements, median slabs, bull-noses and safety median will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification. The unit price shall be reduced for deficiencies in pavement thickness as per Clause E18.19 of this Specification.

Items of Work:

(i) “Construction of 250 mm Type (*) Concrete Pavement (**)(***)"

(ii) “Construction of 230 mm Type (*) Concrete Pavement (**)(***)”

(iii) “Construction of 200 mm Type (*) Concrete Pavement (**)(***)”

(iv) “Construction of 150 mm Type (*) Concrete Pavement (**)(***)”

(v) “Construction of Type (*) Concrete Median Slabs (****)”

(vi) “Construction of Monolithic Type (*) Concrete Median Slabs (****)”

(vii) “Construction of Type (*) Concrete Safety Medians (****)”

(viii) “Construction of Monolithic Type (*) Concrete Curb and Sidewalk (****)”

(ix) “Construction of Monolithic Type (*) Concrete Bull-noses”

(x) *Specify the Concrete Type

**Specify either Reinforced or Plain-Dowelled

***Specify Slip Form Paving if required

****Specify referenced Standard Detail.

E18.18 Concrete Pavements for Early Opening

E18.18.1 Construction of concrete pavements for early opening will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification. The unit price shall be reduced for deficiencies in pavement thickness as per Clause E51.19 of this Specification.

Items of Work:

(i) “Construction of 250 mm (Type *) Concrete Pavement For Early Opening (**)(***)”

(ii) “Construction of 230 mm (Type *) Concrete Pavement For Early Opening (*)(**)(***)”

(iii) “Construction of 200 mm (Type *) Concrete Pavement For Early Opening (*)(**)(***)”

(iv) “Construction of 150 mm (Type *) Concrete Pavement For Early Opening (*)(**)(***)”

*Specify either Type 3 or Type 4

**Specify either Reinforced or Plain-Dowelled

***Specify Slip Form Paving if required

E18.19 Pavement Thickness Tolerances

E18.19.1 At the option of the Contract Administrator, pavement thickness may be determined by coring pavement sections representing each day's pour and determining the pavement thickness by averaging the depth of the cores.

E18.19.2 Pavement found deficient in thickness by more than five (5%) percent shall be paid for at the reduced price. The reduced price = P_R x contract price;

P_R is in % and T_D is in %

Where: $P_R = 100 - [(T_D - 5) / 5]$ x 25

Where: T_D = thickness deficiency greater than or equal to 5%, up to 10%

E18.19.3 When the pavement thickness is deficient by more than ten (10%) percent and the judgement of the Contract Administrator is that the area of such deficiency should not be removed and replaced, payment will be fifty (50%) percent of Contract Unit Price.

E18.19.4 The cost of initial cores will not be paid for by the Contractor. Additional cores requested by the Contractor to determine the extent of areas deficient in thickness, shall be paid for by the Contractor.

E18.20 Concrete Curbs, Curb and Gutter, and Splash Strips

E18.20.1 Construction of concrete curbs, curb and gutter, and splash strips will be paid for at the Contract Unit Price per metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work:

(i) “Construction of Type (*) Concrete Barrier Curb (**)"
(ii) “Construction of Type (*) Concrete Modified Barrier Curb (**)”
(iii) “Construction of Type (*) Concrete Curb and Gutter (**)”
(iv) “Construction of Type (*) Concrete Mountable Curb (**)”
(v) “Construction of Type (*) Concrete Lip Curb (**)”
(vi) “Construction of Type (*) Concrete Curb Ramp (**)”
(vii) “Construction of Type (*) Concrete Safety Curb (**)”
(viii) “Construction of Type (*) Concrete Splash Strips (***)”

* Specify the Concrete Type
** Specify height, type and Referenced Standard Detail
***Specify height, monolithic or separate, type, width, and referenced Standard Detail

E18.20.2 No measurement or payment shall be made for supply or placement of bonding grout for concrete curbs.

E18.20.3 Drilled curb ramp tie bars are to be paid in accordance with CW 3230.

E18.21 Dowel Assemblies

E18.21.1 Supply and installation of dowel assemblies will be paid for at the Contract unit Price per metre for "Supply and Installation of Dowel Assemblies", measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

E18.22 Drilled Tie Bars and Dowels

E18.22.1 Supply and installation shall be in accordance with Clause 9.2.3 of CW 3310-R17.

BASIS OF PAYMENT FOR CW 3230-R8

E18.23 Full Slab Replacement

E18.23.1 Replacement of complete slabs will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work: Slab Replacement

(i) 250mm Type (*) Concrete Pavement (**)
(ii) 230mm Type (*) Concrete Pavement (**)
(iii) 200mm Type (*) Concrete Pavement (**)
(iv) 150mm Type (*) Concrete Pavement (**)

* Specify the Concrete Type
** Specify either Reinforced or Plain-Dowelled

E18.24 Full Depth Partial Slab Patches

E18.24.1 Full-depth partial slab patches will be paid for at the Contract Unit Price per square metre for "Items of Work", listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work: Partial Slab Patches

(i) 250mm Type (*) Concrete Pavement (**)
(ii) 230mm Type (*) Concrete Pavement (**)
(iii) 200mm Type (*) Concrete Pavement (**)
(iv) 150mm Type (*) Concrete Pavement (**)

* Specify the Concrete Type
** Specify class of patch

E18.25 Dowels in Drilled Holes

E18.25.1 Installation of dowels into hardened concrete will be paid for at the Contract Unit Price for "Drilled Dowels"*, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

*Specify diameter(s) of dowels

E18.26 Tie Bars in Drilled Holes

E18.26.1 Installation of tie bars into hardened concrete will be paid for at the Contract Unit Price for "Drilled Tie Bars"* measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

*Specify size(s) of tie bars.

MEASUREMENT AND PAYMENT FOR CW 3235-R9

E18.27 Removal of Miscellaneous Concrete Slabs

E18.27.1 Removal of miscellaneous concrete slabs will be measured on an area basis and paid for at the Contract Unit Price per square metre for the “Items of Work” listed here below. The area to be paid for will be the total number of square metres of existing miscellaneous concrete slabs removed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work: Miscellaneous Concrete Slab Removal

(i) Median Slab
(ii) Monolithic Median Slab
(iii) Safety Median
(iv) 100mm Sidewalk
(v) 150mm Reinforced Sidewalk
(vi) Bullnose
(vii) Monolithic Curb and Sidewalk

E18.28 Installation of Miscellaneous Concrete Slabs

E18.28.1 Installation of miscellaneous concrete slabs will be measured on an area basis and paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below. The area to be paid for will be the total number of square metres of miscellaneous concrete slabs installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work: Miscellaneous Concrete Slab Installation

(i) Type (*) Concrete Median Slab**
(ii) Type (*) Concrete Monolithic Median Slab**
(iii) Type (*) Concrete Safety Median**
(iv) Type (*) Concrete 100mm Sidewalk**
(v) Type (*) Concrete 150mm Reinforced Sidewalk***
(vi) Type (*) Concrete Bullnose**
(vii) Type (*) Concrete Monolithic Curb and Sidewalk**

* Specify the Concrete Type
** referenced Standard Detail to be specified
*** renewal area to be specified

E18.28.2 All costs for installing sign support clamps and constructing isolations for boulevard and median appurtenances will be included in the payment for the "Items of Work" listed for miscellaneous concrete slab installation.

E18.28.3 All costs for excavation, sub-grade compaction, placement of sub-base, placement of leveling course and backfill materials, slabs installation and boulevard grading to the limits as identified in Section 3.2 of this specification will be included in the payment for the "Items of Work" listed for Installation of Miscellaneous Concrete Slabs.

E18.28.4 Additional base course over and above leveling course material will be paid in accordance with CW 3110.

E18.29 Miscellaneous Concrete Slab Renewal

E18.29.1 Miscellaneous concrete slab renewal will be measured on an area basis and paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below. The area to be paid for will be the total number of square metres of existing miscellaneous concrete slabs removed and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work: Miscellaneous Concrete Slab Renewal

(i) Type (*) Concrete Median Slab**
(ii) Type (*) Concrete Monolithic Median Slab**
(iii) Type (*) Concrete Safety Median**
(iv) Type (*) Concrete 100mm Sidewalk* (***)

(v) Type (*) Concrete 150mm Reinforced Sidewalk (***)
(vi) Type (*) Concrete Bullnose**
(vii) Type (*) Concrete Monolithic Curb and Sidewalk**

* Specify the Concrete Type
** referenced Standard Details to be specified.
*** renewal area to be specified.

a.) Less than 5 sq. m
b.) 5 sq. m to 20 sq. m
c.) Greater than 20 sq. m

E18.29.2 All costs for the slab removal, excavation, sub-grade compaction, placement of leveling course and backfill materials, slabs installation and boulevard grading to the limits as identified in Section 3.3 of this specification will be included in the payment for the "Items of Work" listed for Miscellaneous Concrete Slab Renewal.

E18.29.3 Additional base course over and above leveling course material will be paid in accordance with CW 3110.

E18.29.4 All costs for installing sign support clamps and constructing isolations for boulevard and median appurtenances will be included in the payment for the "Items of Work" listed for Miscellaneous Concrete Slab Renewal.

E18.30 Adjustment of Precast Concrete Sidewalk Blocks

E18.30.1 Adjustment of precast concrete sidewalk blocks will be measured on an area basis and paid at the Contract Unit Price per square metre for "Adjustment of Precast Sidewalk Blocks". The area to be paid for will be the total number of square metres of precast concrete sidewalk blocks adjusted to grade in accordance with this specification, accepted and measured by the Contract Administrator.

E18.30.2 No measurement or payment will be made for any precast sidewalk blocks damaged or lost during replacement.

E18.31 Supply of Precast Concrete Sidewalk Blocks

E18.31.1 Supply of precast concrete sidewalk blocks will be measured on an area basis and paid at the Contract Unit Price per square metre for "Supply of Precast Sidewalk Blocks". The area to be paid for will be the total number of square metres of precast concrete sidewalk blocks supplied in accordance with this specification, accepted and measured by the Contract Administrator.

E18.32 Removal of Precast Concrete Sidewalk Blocks

E18.32.1 Removal of precast concrete sidewalk blocks will be measured on an area basis and paid at the Contract Unit Price per square metre for "Removal of Precast Sidewalk Blocks". The area to be paid for will be the total number of square metres of precast concrete sidewalk blocks removed in accordance with this specification, accepted and measured by the Contract Administrator.

MEASUREMENT AND PAYMENT FOR CW 3240-R10

E18.33 Concrete Curb Removal

E18.33.1 Concrete curb removal will be measured on a length basis and paid for at the Contract Unit Price per metre for the "Items of Work" listed here below. The length to be paid for will be the total number of metres of concrete curb removed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work: Concrete Curb Removal

(i) Barrier*

(ii) Modified Barrier*
(iii) Curb and Gutter
(iv) Mountable Curb
(v) Lip Curb
(vi) Modified Lip Curb
(vii) Curb Ramp
(viii) Safety Curb
(ix) Splash Strips**

* Integral or Separate to be specified.
** Monolithic or Separate.

E18.33.2 Removal of existing asphalt material immediately in front of the curb that is required for installation will be included in the payment for the "Items of Work" listed for Concrete Curb Removal when the asphalt overlay is not identified to be removed.

E18.34 Concrete Curb Installation

E18.34.1 Concrete curb installation will be measured on a length basis and paid for at the Contract Unit Price per metre for the "Items of Work" listed here below. The length to be paid for will be the total number of metres of concrete curb or splash strip installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work: Concrete Curb Installation

(i) Type (*) Concrete Barrier**
(ii) Type (*) Concrete Modified Barrier**
(iii) Type (*) Concrete Curb and Gutter**
(iv) Type (*) Concrete Mountable Curb**
(v) Type (*) Concrete Lip Curb**
(vi) Type (*) Concrete Modified Lip Curb**
(vii) Type (*) Concrete Curb Ramp**
(viii) Type (*) Concrete Safety Curb**
(ix) Type (*) Concrete Splash Strips***

* Specify the Concrete Type
** reveal height, type and reference to Standard Detail to be specified.
*** reveal height, monolithic or separate, type, width and reference to Standard Detail to be specified.

E18.34.2 The placement and compaction of asphalt material immediately in front of the curb will be included in the payment for the "Items of Work" listed for Concrete Curb Installation when the asphalt overlay is not identified to be removed.

E18.34.3 No payment will be made for leveling course.

E18.34.4 Base course will be paid in accordance with CW 3110.

E18.34.5 Supply and placement of bonding grout for concrete curbs will not be measured for payment.

E18.35 Concrete Curb Renewal

E18.35.1 Concrete curb renewal will be measured on a length basis and paid for at the Contract Unit Price per metre for the "Items of Work" listed here below. The length to be paid for will be the total number of metres of concrete curb or splash strip removed and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work: Concrete Curb Renewal

(i) Type (*) Concrete Barrier** (***)
(ii) Type (*) Concrete Modified Barrier**
(iii) Type (*) Concrete Curb and Gutter** (***)
(iv) Type (*) Concrete Mountable Curb**
(v) Type (*) Concrete Lip Curb**
(vi) Type (*) Concrete Modified Lip Curb**
(vii) Type (*) Concrete Curb Ramp**
(viii) Type (*) Concrete Safety Curb**
(ix) Type (*) Concrete Splash Strips (***) (****)

* Specify the Concrete Type
* reveal height, type and referenced Standard Detail to be specified.
** renewed length to be specified.

a.) Less than 3 m
b.) 3 m to 30 m
c.) Greater than 30 m

*** reveal height, monolithic or separate, type, width and reference to Standard Detail to be specified.

E18.35.2 All costs for removal, excavation, sub-grade compaction, leveling course and backfill materials, curb installation and boulevard grading to the limits as identified in Section 3.4 of this specification will be included in the payment for the “Items of Work” listed for Concrete Curb Renewal.

E18.35.3 Base course will be paid in accordance with CW 3110.

E18.35.4 For installation lengths greater than 30 metres, the length will include breaks for approaches, isolations or fixed obstacles such as light standards or poles.

E18.35.5 Curb ramp tie bars are to be paid in accordance with CW 3230.

E18.35.6 Supply and placement of bonding grout for concrete curbs will not be measured for payment.

BASIS OF PAYMENT FOR CW 3325-R5

E18.36 Concrete Sidewalks

E18.36.1 Construction of concrete sidewalks will be paid for at the Contract Unit Price per square metre for "100 mm Type (*) Concrete Sidewalk", measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

E18.37 Leveling Course

E18.37.1 No payment shall be made for leveling course.

E18.38 Excavation, Sub-grade Compaction, and Base Course

E18.38.1 Excavation, sub-grade compaction, and additional base course shall be paid for in accordance with Specification CW 3110.

E19. WORKING AROUND MANITOBA HYDRO POLES

GENERAL REQUIREMENTS

E19.1 When completing roadway excavation around Manitoba Hydro wood poles, Manitoba Hydro Safety Watch will be required. The Contractor shall provide equipment capable of stabilizing

the pole while excavation and placement of granular sub-base materials to full thickness is completed. Equipment shall be acceptable to Manitoba Hydro and the Contract Administrator.

E19.2 Manitoba Hydro personnel will be responsible for securing the Contractor's equipment to each wood pole, except where a primary dip is located on the wood pole. If the primary dip is present, Manitoba Hydro will complete the stabilization.

MEASUREMENT AND PAYMENT

E19.3 The Work described in this specification shall be considered incidental to "Excavation" and no measurement or payment will be made.

E20. INSTALLATION OF STREET LIGHTING AND ASSOCIATED WORKS

E20.1 DEFINITIONS

LIMITS OF APPROACH means the shortest distance that is permissible between live high voltage (>750 volts) conductors or apparatus and any part of a worker's body, material or tools being handled, or equipment operated.

MANITOBA HYDRO CENTRAL STORES means Manitoba Hydro's Waverley Service and Reclaim Centre - 1840 Chevrier Blvd - Winnipeg, Manitoba

OVERHEAD FEED means an electrical supply via an overhead conductor connected between streetlight standards. Typically strung between standards on a temporary basis.

OVERHEAD SOURCE means an electrical supply from Manitoba Hydro's system. (Typically, an overhead conductor from a wooden distribution pole or a DIP/RISER located on a wooden distribution pole.)

RECLAIM material means existing material that has been removed from Manitoba Hydro's system and to be returned to Manitoba Hydro.

SCRAP material means existing material that has been removed from Manitoba Hydro's system and to be recycled/disposed of by the Contractor.

SURPLUS material means new material that has been requisitioned by the Contractor and not incorporated into the work at the end of the Contract.

WORK CLEARANCE means an ELECTRICAL AND/OR NATURAL GAS FACILITIES LOCATE form (see SAMPLE ONLY included as Appendix D) issued by each of Manitoba Hydro's Customer Service Centre (CSC) affected to permit work to commence (Permit to work).

E20.2 DESCRIPTION

E20.2.1 The work shall consist of the supply of all supervision, labour, materials (except as indicated under MATERIAL SUPPLIED BY MANITOBA HYDRO below) insurance, tools, backfill and equipment (and their maintenance), transportation, fuel, oil, meals and lodging, mobilization and de-mobilization, and warranty of workmanship as required to install and remove temporary Overhead Feeds, remove existing street light poles as required, install new street light poles and associated underground cables/conduits, all in accordance with the requirements specified in the tender documents.

E20.3 WORK LOCATIONS

E20.3.1 The proposed street light installation and removals are included in Form B for the following project location:

(a) Murray Park Road from Sturgeon Road to Moray Street

COORDINATION OF WORK

E20.3.2 The Contractor shall provide a minimum of ten (10) working days notice to Manitoba Hydro prior to the start of construction. The work shall be conducted and coordinated with Manitoba Hydro in a manner to ensure street lighting is maintained at all times for the duration of the work. The construction drawings provide the Proposed Sequence of Construction.

E20.3.3 The Contractor shall obtain Work Clearance from Manitoba Hydro's Customer Service Centre(s) (CSC) affected prior to the work commencing. No additional compensation shall be paid to the Contractor for delays obtaining Work Clearance for any reason.

E20.3.4 Manitoba Hydro's CSC will provide the Limits of Approach applicable to the Contractor on the Work Clearance form.

E20.4 ORIENTATION

E20.4.1 Prior to the commencement of the proposed work, the Contractor's crew foremen, electricians, and other key personnel shall attend one (1) day of orientation provided by Manitoba Hydro for various operations such as cable handling, cable splicing/termination, installation of street light poles, concrete bases, luminaires and various other construction standards and procedures. The Contractor will be responsible for all costs associated with personnel salaries, travel, sustenance and overheads, etc., during training.

E20.5 PRE-CONSTRUCTION MEETING

E20.5.1 Prior to the commencement of the work, the Contractor shall attend a pre-construction meeting with Manitoba Hydro. The agenda for this meeting shall include but not be limited to the following:

(a) Reference the Contractor's Safe work Procedures;

(b) Prime Contractor;

(c) materials;

(d) sequence of construction;

(e) communication plan;

(f) any training requirements & qualifications;

(g) Drawing and Project review;

(h) a review of the Contractor's proposed work schedule; and

(i) any and all other topics of clarification that the Contractor and the Contract Administrator may wish to discuss.

E20.5.2 The Contractor's cost to attend this pre-construction meeting shall be incorporated into the unit prices for the work.

E20.6 QUALIFICATIONS AND CERTIFICATION

E20.6.1 The Contractor's Crew Foreman, installers and other key Contractor's Personnel shall possess the necessary certification, licensing, training, experience and familiarity with safety rules, procedures and hazards relating to the work. Journeyman Power Line Technician (PLT), Journeyman Lineman, Journeyman Cableman or Journeyman Electricians shall be required to perform portions of this work.

E20.6.2 Journeyman Power Line Technician (PLT), Journeyman Cableman and Journeyman Lineman are also required to possess a "Limited Specialized Trade Licence – 'M-P' Licence – Power Line" issued by the Province of Manitoba.

E20.6.3 Office of the Fire Commissioner Bulletin OFC 18 – 002 dated May 23, 2018 regarding Electrician Licenses discusses the requirements for a "Limited Specialized Trade Licence – 'M-P' Licence – Power Line".

For more information contact:
Office of the Fire Commissioner

500-401 York Avenue
Winnipeg, Manitoba R3C 0P8
Tel. 204-945-3373
Fax 204-948-2089
Toll Free: 1-800-282-8069
firecomm@gov.mb.ca

E20.6.4 Licensed Journeyman Electricians or Journeyman PLT or Journeyman Cableman or Journeyman Lineman ARE REQUIRED for all cable handling operations included but not limited to: disconnecting cables in the handhole, installation and removal of temporary overhead feeds, installation and connection of ground rods, streetlight cable splices, termination of streetlight cables in handholds and at luminaires. The Contractor shall employ sufficient qualified personnel on its crews to conform to the Electrician's Licensing Act. The Contractor shall be prepared to provide proof of licences to Manitoba Hydro upon request.

E20.6.5 The Contractor shall assess the hazards associated with the work and have documented Safe work Procedures to perform the work. It is the Contractor's responsibility to train employees on these procedures. The Contractor shall be prepared to provide proof of training to Manitoba Hydro upon request.

E20.7 REFERENCED STANDARD CONSTRUCTION SPECIFICATIONS

E20.7.1 In addition to these Specifications, the work to be performed by the Contractor relative to the installation and/or replacement of street lighting poles, concrete bases and associated cabling shall be in accordance with the following:

(a) Manitoba Hydro 66kV and Below Standards;

(b) CSA C22.3 No. 7 (latest edition);

(c) Canadian Electrical Code (CEC) Part 1 (latest edition); and

(d) Any other applicable codes

(e) (collectively, the "Standards")

E20.7.2 Revisions and updates to the Manitoba Hydro 66kV and Below Standards are issued periodically and the latest issued version of the Standard will apply. For the convenience of the Contractor for bidding purposes, excerpts of the Manitoba Hydro 66kV and Below Standards have been included as Appendix A.

E20.7.3 In some cases, Municipal, Provincial or Federal laws or this Technical Specification may be more stringent than the CSA Standards. Whenever conflict exists, the Contractor shall comply with the most stringent requirements applicable at the place of the work.

E20.8 TOOLS, EQUIPMENT AND MATERIALS

E20.8.1 The Contractor shall be required to provide all tools and equipment required for performing the specified tasks. Equipment shall be in good operating condition, shall be properly maintained using original equipment manufacturer replacement parts and shall be provided with letters of testing/inspection from the manufacturer when requested. Where the equipment is provided as a kit with multiple parts and tools, the kit shall be complete with all parts required to perform the designed task. Contractor fabricated tools or equipment will not be accepted for use.

E20.8.2 The Contractor shall obtain the following specific Electrical Equipment including but not limited to:

(a) Compression tool or tools and associated dies to perform compressions to a maximum size of 1/0 Al (MD-6 compression tools shall not be used).

(b) Approved compression tools are:

Manufacture	Type	Model No.	Range

Burndy	In-line, battery	PATMD68-14V	350 Kcmil AL
Cembre	In-line, battery	B54Y (06V081E)	4/0 AWG AL
Burndy	Pistol, battery	BUR PAT60018V	350 Kcmil AL

E20.8.3 Dies shall be of the type shown in Standard CD210-21 and CD 210-24 only, must have identical markings, and compression tool die must match die number stamped on connector.

(a) Modiewark Model #4444 or Fluke 1AC-II Volt Alert potential Indicator

(b) Voltage meter – Fluke model #T3C

(c) Insulated wire cutters – used for cutting cable ends square.

E20.8.4 Alternative equipment manufacturers may be considered upon request by the Contractor and shall be approved for use by Manitoba Hydro prior to use.

E20.8.5 Manitoba Hydro may reject any tools or equipment that do not appear to be in good condition or fail to successfully provide the required function.

E20.9 MATERIAL SUPPLIED BY MANITOBA HYDRO

E20.9.1 Manitoba Hydro shall supply all street light poles, concrete bases, breakaway bases, luminaires, street light arms, ground rods, compression sleeves, grommets, nuts, electrical cables, conduits, relays, cable guards, Gel-caps and all other materials noted in the Standards. The Contractor shall sign receipts indicating the location on which the materials are to be used. The material shall be picked up by the contractor from the following locations:

E20.9.2 Manitoba Hydro Central Stores (contact personnel will be provided to the successful contractor).

E20.9.3 Materials requested will be supplied to the Contractor by Manitoba Hydro upon presentation of Manitoba Hydro's Stores Material Order Form. The Contractor shall assume all responsibilities for the loading, unloading, transportation, proper handling, secure storage and working of the materials and shall make replacements at its own expense in case any material is damaged, stolen or lost due to improper handling, storage or poor workmanship.

E20.9.4 The Contractor shall, at the time of materials release, check and confirm the quantity of materials. Shortages, discrepancies, or damages to materials shall be immediately reported in writing to Manitoba Hydro.

E20.9.5 After commencing performance of the work, the Contractor shall continually monitor all material required for the timely completion of the work and shall report additional material requirements to Manitoba Hydro a minimum of 72 hours prior to materials being required to perform the work. No additional compensation shall be paid as a result of delays due to material shortages where additional material requirements were not reported a minimum of 72 hours prior to being required for the work on an active project.

E20.10 MATERIAL SUPPLIED BY CONTRACTOR

E20.10.1 The Contractor shall be responsible to furnish gravel, sand, ¾" down limestone, ¼" down limestone, protective hose (i.e. typically 2" fire hose), duct seal and pit-run material for backfilling around street light poles and around cables as per the Standards. The cost of furnishing the above listed materials shall be incorporated into the unit prices for the work.

E20.11 SURPLUS, RECLAIM AND SCRAP MATERIAL

E20.11.1 Upon completion of the work, the Contractor shall, at its own expense, deliver to Manitoba Hydro Central Stores, all Surplus materials furnished by Manitoba Hydro and not used in the work, regardless of the location of said material at that time.

E20.11.2 In addition, the Contractor shall, at its own expense, deliver to Manitoba Hydro Central Stores all Reclaim materials from the work specifically HPS luminaires. Manitoba Hydro

shall be responsible for the proper disposal of Reclaim HPS luminaires. The HPS bulb shall remain installed and unbroken in the Reclaim luminaire. The Contractor shall handle the Reclaim luminaires with care and shall avoid breaking the bulb or refractor.

E20.11.3 Manitoba Hydro's preference is to recycle as much Scrap Material as practicable. The Contractor is responsible to remove the Scrap Material, transport to the recycler or Manitoba Hydro approved disposal site, pay for any disposal fees and may retain any recycling value.

E20.12 DE-ENERGIZATION AND LOCKOUT

E20.12.1 **Manitoba Hydro -** Where a standard is supplied from an Overhead Source, Manitoba Hydro's staff shall be responsible to disconnect and isolate the street light standard or standards between the standard and Overhead Source. Some street light standards may be temporarily fed from an Overhead Source. This Overhead Source shall be disconnected and removed by Manitoba Hydro staff prior to commencing with the work. The streetlight circuits will not be Locked Out by Manitoba Hydro.

E20.12.2 **The Contractor** - The Contractor shall assess the hazards associated with the work and employ its own Safe Work Procedure for the work to be performed. The Contractor's Safe Work Procedure shall include provisions that the street light circuits will not be Locked Out by Manitoba Hydro. The Contractor's Safe Work Procedure shall achieve Lock Out or techniques equivalent to Lock Out.

E20.12.3 The Contractor shall complete a job planning form (an example is included as Appendix E) on a daily basis before any work commences and provide Manitoba Hydro with copies of the job plans if requested.

E20.13 TEMPORARY OVERHEAD FEEDS

E20.13.1 Manitoba Hydro in consultation with the Contractor will determine if temporary lighting will be provided by the existing street lights or from the new street lights.

E20.13.2 When using the existing poles for temporary lighting, Manitoba Hydro shall remove an Overhead Source in accordance with DE-ENERGIZATION AND LOCKOUT section above, prior to the Contractor installing a #4 duplex overhead conductor between the existing poles. The #4 duplex overhead conductor will normally be attached to the tenon of the davit arm near the luminaire with a pre-form grip. Older poles may require a spool insulator be attached to the pole using a pre-form grip to support the #4 duplex overhead conductor. A short length of 2C/#12 copper conductor is connected to the terminals of the luminaire brought out and connected to the #4 duplex overhead conductor. The final span to the Overhead Source shall be installed by Manitoba Hydro.

E20.13.3 When using the new poles for temporary lighting, the Contractor shall install the new bases, poles and #4 duplex overhead conductor. The #4 duplex overhead conductor will be attached to the tenon of the davit arm near the luminaire with a pre-form grip. A short length of 2C/#12 copper conductor is connected to the terminals of the luminaire brought out and connected to the #4 duplex overhead conductor. The final span to the Overhead Source shall be installed by Manitoba Hydro.

E20.13.4 All material used to provide the temporary overhead feed shall be returned to Manitoba Hydro. Care shall be taken to coil and tag Reclaim conductor for reuse. If used, insulators shall be handled carefully to prevent breakage.

E20.14 SAFE EXCAVATION

E20.14.1 The work shall be performed in accordance with the requirements of Manitoba Hydro's Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B and Manitoba Workplace Safety and Health Regulation 217 latest revision.

E20.15 SAFE HANDLING

E20.15.1 The Contractor shall apply handling techniques in accordance with Manitoba Workplace Health and Safety Regulation 217 (latest revision).

E20.16 ELECTRIC CABLES AND CONDUITS

(a) The Contractor shall use diligent care and proper equipment in handling of all cables, so as not to injure the jacket and avoid gouging, kinking, scratching or abrading the cables. If any material is damaged to any extent, the Contractor shall repair the damages at its own expense, in a manner approved by Manitoba Hydro or will be charged the full cost of the damaged items.

(b) Cable reels shall not be dropped and must be handled and placed/stored in an upright position at all times and shall not be laid flat for any purpose or reason. Cable reels shall be adequately supported on hard surface to prevent the reel from sinking into the ground that can cause undue stress on the cables. Cable reels should be inspected for damages prior to use. If a cable reel is found to be defective, such defect shall be reported immediately to Manitoba Hydro.

(c) The Contractor shall place all material and string the cables in such a manner as to cause the least interference with normal use of the land, street or roadway. All material shall be unloaded in a manner to preserve its condition, prevent loss and/or theft and permit easy access for Manitoba Hydro's inspection.

(d) The Contractor shall provide Manitoba Hydro's inspector sufficient opportunity, in the sole discretion of Manitoba Hydro, to inspect the work.

E20.17 PRECAST CONCRETE BASES

E20.17.1 The Contractor shall handle, store, transport and unload the precast concrete bases in a manner to prevent damage to the threaded bolts and conduit casing.

E20.17.2 Precast Concrete Bases are extremely heavy. Approximate weight of pre-cast concrete bases are found in the Standards. The Contractor shall only use equipment rated for such weight.

E20.18 STREET LIGHT POLES AND ARMS

E20.18.1 The Contractor shall handle, store, transport, and provide proper load securement for the poles and arms in a manner to prevent damage.

E20.19 LUMINAIRES

E20.19.1 The Contractor shall handle, store, transport and unload the luminaires in their original packaging and in a manner to prevent damage.

E20.20 SMALL MATERIAL

E20.20.1 Photo electric cells, shorting caps, shims, nut covers and associated supplies shall be kept in a suitable warehouse provided by the Contractor at its own expense. Photo electric cells shall be transported and stored in such a manner as to prevent breakage.

E20.21 CARE OF MATERIALS

E20.21.1 The Contractor shall assume all responsibilities of all the materials and shall replace, at its own expense, any materials damaged, stolen or lost due to improper handling or poor workmanship.

E20.22 WIRE AND CABLE REEL STORAGE

E20.22.1 Cable reels shall be stored with the flanges upright and resting on a hard surface. At temporary storage sites where the soil may be soft, preservative-treated plywood sheets may be used to keep the flanges from sinking into the ground.

E20.22.2 If cable reels must be pancaked or stored on their side in vertical racks, do not lift the reel by the top flange. Spacers (two 2 X 4s placed wide side up) should be placed under the bottom flange and between the reels in order to create a space to insert the forks and lift the reels without damaging the cable.

E20.23 REEL HANDLING

E20.23.1 When off-loading reels from a truck, reels shall be lowered using a hydraulic gate, hoist or forklift truck. When a reel is rolled from one point to another, care must be taken to see that the reel does not straddle objects such as rocks, pipes, curbs or wooden blocks which could damage the cable or protective covering. A reel should always be rolled on hard surfaces to avoid sinkage and in the opposite direction to the cable wraps to ensure that the reel is rolled in such a direction as to tighten the cable on the reel.

E20.23.2 When using a hoist, install a mandrel through the reel arbour hole and attach a sling. Use a spreader bar approximately 6 inches longer than the overall reel width placed between the sling ends just above the reel flanges. This will prevent bending of the reel flanges and damage to the cable.

E20.23.3 If a forklift is used to move a reel, the reel is to be approached from the flange side. Position the forks such that the reel is lifted by both reel flanges. The lift forks shall not contact the cable.

E20.23.4 Returnable reels shall be returned promptly to Manitoba Hydro Central Stores and in no case later than three (3) days after the completion of the work unless otherwise mutually agreed between the Contractor and Manitoba Hydro.

E20.24 PRESSURIZED WATER/VACUUM EXCAVATION

E20.24.1 Pressurized water/vacuum excavation (PW/VE) shall be used to daylight all buried utilities and structures where excavation by other mechanical means would be expected to provide a physical risk to that utility or structure.

E20.24.2 The work shall be performed in accordance with the requirements of Manitoba Hydro’s Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B.

E20.25 REMOVAL STREET LIGHT POLE FROM EXISTING BASE

E20.25.1 This shall include all work required to remove a street light pole from an existing base as set forth in this Technical Specification. The pole may be on an existing precast concrete base, steel power installed screw base or poured in place concrete base.

E20.25.2 The Contractor shall furnish all labour, supplies and materials (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary for the removal of the street light pole from the existing base. Care shall be taken to preserve the luminaire. The luminaire shall be reinstalled on the new street light pole or returned to Manitoba Hydro's stores as instructed by the Manitoba Hydro.

E20.25.3 The Contractor shall be responsible to transport all Surplus and Reclaim materials to Manitoba Hydro Central Stores and transport and dispose of all Scrap material as set forth in this Specification.

E20.26 REMOVAL OF BASE AND DIRECT BURIED STREET LIGHT POLE

E20.26.1 This shall include all excavation, whether by auger, pressurized water/vacuum excavation, by hand, or by other methods which may be necessary to remove a base or direct buried street light pole. The base may be poured in place concrete, steel power installed or precast concrete.

E20.26.2 The Contractor shall be responsible to transport all Surplus and Reclaim materials to Manitoba Hydro Central Stores and transport and dispose of all Scrap material as set forth in this Specification.

E20.26.3 The Contractor is responsible to supply all backfill material as specified in the Standards and carry out all backfill, compacting and leveling of all excavations and voids for removed bases and direct buried street light poles so as to be ready for top soil and seed or sod or as directed by Manitoba Hydro.

E20.27 INSTALLATION OF FOUNDATION - CONCRETE BASE

E20.27.1 This shall include all excavation, whether by auger, pressurized water/vacuum excavation, by hand, or by other methods which may be necessary to replace or install a concrete base as set forth in this Specification.

E20.27.2 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary to install a new or replace a concrete base. Excavation for the precast concrete base shall be to a diameter and depth specified in Standard CD 300-6. All excess material is to be removed by the Contractor.

E20.27.3 The concrete base shall be set on a bed of ¾" down limestone. The concrete base backfill material shall be compacted in lifts no more than 150 mm. Backfill material shall be ¾" down limestone. Compacting of backfill material shall be done using a hydraulic tamper. Alternative tamping methods shall be approved by Manitoba Hydro. Underground cables entering the concrete base shall be protected by a length of protective hose supplied by the Contractor and a layer of sand surrounding the cables to protect it from the limestone. The concrete base shall be installed level in all 4 directions. Final grade must be established prior to installing the concrete bases.

E20.27.4 The completed backfill shall be at least equal in compaction to undisturbed soil, as required by the Municipal authorities or elsewhere in this Specification. The Contractor shall level all excavations.

E20.27.5 Should settlement occur in the excavation and cause a depression in the surface, the Contractor shall repair the surface. Placing of additional backfill material due to settlement shall be at the Contractor's expense.

E20.27.6 The concrete base shall be oriented in the proper direction to allow the easy entrance of the underground cables into the plastic pipe preinstalled in the concrete base. Care shall be taken to prevent damage to the insulation or jacket of the conductors. The cable shall be left long enough to extend one (1) metre beyond the top of the hand hole.

E20.28 BASE MOUNTED STREET LIGHT POLES

E20.28.1 This shall include all work required to install the street light pole on the concrete base as set forth in this Specification.

E20.28.2 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary for the installation of the pole (straight shaft or davit) on the concrete base.

E20.28.3 Unless otherwise specified on the construction drawings, the Contractor shall orient the poles so that the hand hole is on the left side of the pole when viewed from the road. A worker should be able to see oncoming traffic when working in the hand hole.

E20.28.4 The Contractor shall level the street light pole in all 4 directions. Leveling shims may be used.

E20.28.5 Tightening of bolts shall be performed in a manner that brings the surfaces up evenly. All nuts shall be tightened and torqued in accordance with Standard CD 300-9. The Contractor shall install the nut covers included with the pole.

E20.28.6 Unless otherwise specified, excess underground cable and 2C-12 wire shall be left inside the hand hole with the hand hole cover loosely installed.

E20.28.7 Existing street light poles may have street signs attached. The Contractor shall remove the signs from the existing pole and temporarily reattach the signs to the new pole. The Contractor shall notify Manitoba Hydro of the location where the signs have been removed.

E20.29 LUMINAIRES AND ASSOCIATED WIRING

E20.29.1 The Contractor shall furnish labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary to install the

luminaire and associated wiring. Unless otherwise specified, the luminaire shall be installed with a tilt of zero (0) degrees. The Contractor shall install a length of 2 conductor No. 12 gauge (2C-12) wire from the terminals of the luminaire, through the arm (if applicable), down the pole to the hand hole. One (1) metre of 2C-12 wire shall be left at the hand hole. Impact equipment (air or electric) shall not be used to tighten luminaire mounting bolts. The Contractor shall be liable for damage due to over tightening.

E20.29.2 The Contractor shall verify the luminare voltage matches the source voltage as shown on the construction drawings. If luminaire voltage does not match the source voltage, the Contractor shall re-wire the luminaire in accordance with the wiring diagram provided. NOTE: Not applicable for LED luminaires.

E20.29.3 As specified on the construction drawings, the luminaire will require either a photo electric cell (PEC) or shorting cap installed. When installing the PEC the eye shall be oriented north. The Contractor shall also install the appropriate wattage bulb in the luminaire. NOTE: Bulb installation not applicable for LED luminaires.

E20.30 BREAK AWAY BASES

E20.30.1 Break away bases shall be installed in accordance with Standard CD 300-10. The height of the concrete base above grade shall not exceed 50mm. The surface of the concrete base shall be flat and level. A reaction plate shall be installed between the concrete base and the break-away base.

E20.30.2 The Contractor shall torque the couplers in accordance with Standard CD 300-10. Impact tools shall not be used to tighten or torque couplers or nuts associated with a break away base.

E20.31 SPLICING/CONNECTING CABLES

E20.31.1 The electric cable shall be spliced/terminated as per Standards CD 215-12, CD 215-13, CD 310-1, CD 310-4, CD 310-9 and CD 310-10 with the exception that the Contractor will use a GELCAP-SL-2/0 splice kit (See Appendix C). Termination in the hand hole may include the installation of an inline fuse holder.

E20.31.2 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary to splice/terminate the street light conductor(s).

E20.32 EXCAVATION

E20.32.1 The Contractor shall furnish all labour, supplies and material (except as indicated in the Section "MATERIAL SUPPLIED BY MANITOBA HYDRO") necessary for the completion and maintenance of grade and line of the street light cables and conduit including water control if found to be necessary. The trench shall be graded to conform to the street light cables and conduit so that the street light cables and conduit rest firmly on a smooth surface throughout its length. All stones or other objects which, in the opinion of Manitoba Hydro might damage the street light cable jacket and conduit shall be removed. Where the presence of rock or other condition prevent a satisfactory bed for the cables, 150 mm of well-tamped, clean soil or ¼" down crushed limestone shall be placed in the bottom of the trench. In this case, the spoil bank from trenching operations shall not be allowed to fall into the trench or mix with the soil to be used in backfilling the trench. Loose debris or foreign matter and the spoil bank shall be placed so as not to hinder drainage, damage property, or obstruct traffic.

E20.32.2 Trenches shall be dug to such a depth that will provide a minimum cover of 600 mm from final grade in sodded areas and 1000 mm in roadways in accordance with Standard CD 305-1.

E20.33 LAYING CABLES

E20.33.1 Cables are to be lowered in the trench in an orderly fashion so as to maintain a consistent path and straight alignment. All cables shall be lowered in a continuous run (NO

SPLICING) and in accordance with the construction drawings; and shall maintain the necessary separation, where required. All cables shall be of continuous runs and capped and sealed if they are not being installed in the pole at that time. Cables shall not be dragged over paved surfaces.

E20.33.2 Once a cable is cut its ends must be sealed immediately with an approved and appropriately sized, heat shrink or cold shrink sealing cap to prevent moisture ingress unless the cable is being installed in the pole at that time.

E20.33.3 During the removal of the cable, the reels shall be placed on jacks, stands or trailers with a bar through the arbour holes which will allow the reel to be turned easily, and the cable to be paid out. Cables can be paid out from the bottom or the top of the reel. Cable in coils shall be handled in a similar manner. This can be achieved by supporting the coil in a vertical plane and rotating it by hand as the cable is carefully uncoiled. The cable shall never be pulled over the flange of a reel, or pulled off the side of a coil, since this will introduce a twist in the cable.

E20.33.4 During installation, under no circumstance is the cable to be subjected to a bending radius tighter than that detailed in the Standards.

E20.33.5 Where specified in the Standards or on the construction drawings, the Contractor shall install the street light cable in a conduit.

E20.34 INSTALLING CONDUIT AND CABLE BY BORING (HORIZONTAL DIRECTIONAL DRILLING)

E20.34.1 The Contractor shall dig the approaches and openings necessary to install boring equipment, and the boring equipment used shall be of such a nature as to minimize the opening size required. The boring equipment shall produce a straight hole without unnecessary dips or bends. The bore hole shall be only slightly larger than the outside diameter of the conduits or cables to minimize possible settlement. Cables and conduits shall be pulled in with pulling eyes or using a kellum grip in a manner so as to guard against damage.

E20.34.2 During construction as the drill bit crosses each existing facility a lookout shall be assigned by the Contractor to visually confirm the drill bit is maintaining a minimum 300 mm clearance from the existing facility all in accordance with Manitoba Hydro Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B. Maximum pulling tensions on any streetlight cable shall be limited to 2.9 kN/0.65 kips.

E20.34.3 Drilling fluids and associated waste materials shall be disposed of in a manner that minimizes environmental effects.

E20.34.4 The Contractor shall properly compact the backfill material and will be responsible for placing additional material should settlement occur for the duration of the warranty period.

E20.35 BURIED UTILITY CROSSINGS

E20.35.1 All buried obstructions are not necessarily shown on the reference drawings and the locations of those indicated are approximate only.

E20.35.2 The Contractor shall determine the location of all buried obstructions and shall notify the appropriate authorities and obtain all necessary permits prior to excavation, trenching and directional drilling near or across such obstructions. All buried obstructions where the new buried cable route crosses other utilities including but not limited to gas, water, sewer, telephone and electric lines shall be exposed as per each utilities guidelines by the Contractor, including the use of Pressurized Water/Vacuum Equipment (PW/VE) where necessary. Should any damage occur to such lines during the course of the work, the Contractor shall be responsible for the damage and the costs of repairs to buried obstructions caused by its operations and shall fully indemnify the City of Winnipeg and Manitoba Hydro from and against all claims arising out of such damage. Manitoba Hydro Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix B shall be followed when crossing natural gas pipelines and electrical cables by the directional boring method.

E20.35.3 The PW/VE technique, used to expose underground plant in certain conditions, must be performed in accordance with each utility's requirements, including but not limited to Manitoba Hydro, Manitoba Telecom Services, Shaw Cable, etc. PW/VE costs that the Contractor will incur during the work must be factored into the Contractor's bid prices. The Contractor shall not be entitled to extra compensation for the use of PW/VE on the work.

E20.35.4 The Contractor shall be responsible to supply all backfill material and carry out all backfill, compacting and leveling of all excavations so as to be ready for topsoil and seed or sod or as directed by Manitoba Hydro.

E20.36 BENDING CABLES/CONDUITS AND INSTALLATION INTO STANDARDS

E20.36.1 It is desired to reduce to a minimum the required number of bends and to lay the cables/conduits to conform to the contour of the ground and maintain a normal covering. This shall be accomplished by cutting the trench slightly deeper in approaches to road crossings and drainage ditches. It is intended that the Contractor shall eliminate unnecessary bending by operating the trenching machine at various depths rather than by finishing grading the trench by hand whenever practical.

E20.36.2 Sharp bends of the cables/conduits shall be avoided at all times. All bends shall meet the requirements set out in this Specification. If excessive bending was exerted on any cable, the cable shall be replaced at the Contractor's cost. During installation, under no circumstance is the cable to be subjected to a bending radius tighter than that detailed in the Standards. At street light poles the Contractor shall install the ends of the cables into the plastic pipe preinstalled in the concrete base. Care shall be taken to prevent damage to the insulation or jacket of the conductors. Underground cables entering the concrete base shall be protected by a length of protective hose supplied by the Contractor and by a layer of sand surrounding the cables to protect it from the limestone. The cable shall be left long enough to extend one (1) metre beyond the hand hole. The street light cable in the trench shall be installed in conduit for mechanical protection and the ends sealed with duct seal supplied by the Contractor. Care shall be taken to prevent damaging the cable where it exits the conduit. The conduit shall only be installed into the concrete base if conduit sizes make it practicable.

E20.36.3 Unless otherwise directed, excess underground cable and 2C-12 wire shall be left inside the hand hole with the hand hole cover loosely installed.

E20.37 BACKFILL

E20.37.1 All backfilling material within 300 mm of the cables/conduits shall be clean, free of sod, vegetation, organic material, stones or other debris, and of a consistency as to not create significant voids or air spaces around the cables/conduits. Other backfilling material shall be free of stones greater than 150 mm on their maximum dimension. Where cinders or very acid soil are encountered or where gravel or incompressible fill is required by Municipal authorities, ¼" down crushed limestone shall be placed all around the cables for a depth of at least 300 mm. The completed backfill shall be at least equal in compaction to undisturbed soil or as directed by Manitoba Hydro. Backfill material is to be placed and compacted in lifts not exceeding 300 mm. All excess material is to be removed by the Contractor.

E20.37.2 Tamping or flushing methods must be used where necessary to give the required compaction. Where tamping is used, hand tampers shall be used to at least 300 mm above the cable before machine tamping may be used. The Contractor shall level all excavations so as to be ready for topsoil and seed or sod or as directed by the Manitoba Hydro. Should settlement occur in the excavation and cause a depression in the surface, the Contractor shall repair the surface to the satisfaction of the Manitoba Hydro at the Contractor's cost.

E20.37.3 Excavations remaining where poles have been removed shall be backfilled with spoil, pit run gravel or ¾" down limestone and compacted in lifts of 150mm as directed by Manitoba Hydro. The top 300 mm of the excavation shall be backfilled with topsoil.

E20.37.4 Excavations remaining where utility crossings have been exposed shall be backfilled with sand or clean spoil and compacted in lifts of 150mm. The top 300 mm of the excavation shall be backfilled with topsoil.

E20.37.5 Backfill of all excavations shall be in accordance with City of Winnipeg Standard Construction Specification CW 2030 (latest revision), to the satisfaction of the authority having jurisdiction and Manitoba Hydro.

E20.38 DEFECTIVE WORK & WARRANTY

E20.38.1 If any portion of the work fails to comply with the requirements of this Specification, fails within the Warranty period, or if the final tests prove or indicate the existence of any fault or defect in the work, or any part thereof, Manitoba Hydro may forthwith re-execute or make good the faulty or defective work or alter the same to make it comply with requirements of the Specification at the Contractor's expense. Manitoba Hydro shall give the Contractor notice together with particulars of such failure, fault or defect, Manitoba Hydro's cost to re-execute or make good the faulty or defective work and the Cost shall be deducted from the Contract.

E20.38.2 At the completion of the work for each location, Manitoba Hydro shall prepare and issue a Network Commissioning Report, a sample of which is included as Appendix F, to the Contractor. The Network Commissioning Report shall be dated indicating the commencement of the Warranty period for the work performed at the location.

E20.39 AS-BUILT DRAWING

E20.39.1 The Contractor shall provide an as-built drawing or mark-up drawing to Manitoba Hydro which accurately displays the "as-built" location of the buried street light cables, conduits and street light poles.

E20.40 MEASUREMENT AND PAYMENT

E20.40.1 Removal of 25' to 35' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Removal of 25' to 35' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the pole, base, luminaire, appurtenances, use of pressurized water/vacuum excavation, transportation of Reclaim, Surplus and Scrap material, payment of associated disposal fees and all other items incidental to the work included in the Specification.

E20.40.2 Removal of 45' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Removal of 45' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the pole, base, luminaire, appurtenances, use of pressurized water/vacuum excavation, transportation of Reclaim, Surplus and Scrap material, payment of associated disposal fees and all other items incidental to the work included in the Specification.

E20.40.3 Installation of Conduit and #4 AL C/N or 1/0 AL Triplex Streetlight Cable in Conduit by Open Trench Method

(a) This pay item will be measured on a linear metre basis and paid for at the Contract Unit Price per linear metre for "Installation of Conduit and #4 AL C/N or 1/0 AL Triplex streetlight cable in Conduit by open trench method." The number of meters to be paid

for at the Contract Unit Price shall be measured and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the conduit, pulling cable into the conduit, backfilling the trench, buried utility crossings, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E20.40.4 Installation of 50 mm Conduit by Boring Method complete with Cable Insertion (#4 AL C/N or 1/0 AL Triplex)

(a) This pay item will be measured on a linear metre basis and paid for at the Contract Unit Price per linear metre for “Installation of 50 mm conduit or conduits by boring method complete with cable insertion (#4 AL C/N or 1/0 AL Triplex).” The number of meters to be paid for at the Contract Unit Price shall be measured and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of 50mm conduit or conduits by boring method, inserting the #4 AL C/N or 1/0 AL Triplex streetlight cable into the conduit(s), buried utility crossings, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E20.40.5 Installation of cable (#4 AL C/N or 1/0 AL Triplex) by boring method.

(a) This pay item will be measured on a linear metre basis and paid for at the Contract Unit Price per linear metre for “Installation of cable(s) (#4 AL C/N or 1/0 AL Triplex) by boring method.” The number of meters to be paid for at the Contract Unit Price shall be measured and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the cable or cables by boring method, buried utility crossings, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E20.40.6 Installation of 25'/35' Pole, Davit Arm and Precast Concrete Base Including Luminaire and Appurtenances

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Installation of 25'/35' pole, davit arm and precast concrete base including luminaire and appurtenances.” The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the pole, davit arm, base, luminaire, appurtenances, placing the cable(s) into the base, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E20.40.7 Installation of 45' Pole, Davit Arm and Precast Concrete Base Including Luminaire and Appurtenances

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Installation of 45' pole, davit arm and precast concrete base including luminaire and appurtenances.” The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the pole, davit arm, base, luminaire, appurtenances, placing the cable(s) into the base, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E20.40.8 Installation of One (1) 10' Ground Rod at Every Third Street Light, at the End of a Street Light Circuit or Anywhere Else as Shown on the Design Drawings. Trench #4 Ground Wire up to 1 m From Rod Location to New Street Light and Connect (Hammerlock) to Top of Ground Rod

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Installation of one (1) 10' ground rod at every third street light, at the end of a street light circuit or anywhere else as shown on the design drawings. Trench #4 ground wire up to 1 m from rod location to new street light and connect (hammerlock) to top of the ground rod.” The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full

for performing all operations herein described including install one (1) 10' ground rod, trench the #4 ground wire to the new streetlight pole, connect (hammerlock) ground wire to rod and all other items incidental to the work included in the Specification.

E20.40.9 Installation of Lower 3 m of Cable Guard, Ground Lug, Cable Up Pole, and First 3 M Section of Ground Rod Per Standard CD 315-5

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Install/lower 3 m of Cable Guard, ground lug, cable up pole, and first 3 m section of ground rod per Standard CD 315-5". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installing the lower section of cable guard, ground lug, ground rod, coiling cable(s) up the pole and all other items incidental to the work included in the Specification.

E20.40.10 Installation and Connection of Externally-Mounted Relay and PEC Per Standards CD 315-12 and CD 315-13

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Installation and connection of externally-mounted relay and PEC per Standards CD 315-12 and CD 315-13".The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including mounting the relay, PEC, wiring as per the schematic and all other items incidental to the work included in the Specification.

E20.40.11 Termination of 2/C #12 Copper Conductor to Street Light Cables Per Standard CD310-4, CD310-9 or CD310-10

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Terminate 2/C #12 copper conductor to street light cables per Standard CD310-4, CD310-9 or CD310-10".The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including connection of the 2/C # 12 copper conductor to the #4 C/N or 1/0 Al Triplex cable(s) using a GELCAP-SL-2/0 splice kit and all other items incidental to the work included in the Specification.

E20.40.12 Splicing #4 AL C/N or 2 Single Conductor Street Light Cables

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Splicing #4 Al C/N or 2 single conductor street light cables". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including splicing the #4 AL C/N or 2 single conductor cables in accordance with Standard CD 215-12 and CD 215-13 and all other items incidental to the work included in the Specification.

E20.40.13 Splicing 1/0 AL Triplex Cable or 3 Single Conductor Street Light Cables

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Splicing 1/0 AL triplex cable or 3 single conductor street light cables". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including splicing the 1/0 Al triplex cable or set of 3 single conductor cables in accordance with Standard CD 215-12 and CD 215-13 and all other items incidental to the work included in the Specification.

E20.40.14 Installation of Break-Away Base and Reaction Plate on Base-Mounted Poles up to 35'

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Installation of break-away base and reaction plate on base mounted poles up to 35'". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the reaction plate,

break-away base and all other items incidental to the work included in the Specification.

E20.40.15 Installation of Overhead Span of #4 Duplex Between New or Existing Streetlight Poles and Connect Luminaire to Provide Temporary Overhead Feed

(a) This pay item will be measured on per span basis and paid for at the Contract Unit Price per span for "Installation of Overhead Span of #4 duplex Between New or Existing Streetlight Poles and Connect Luminaire to Provide Temporary Overhead Feed". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including attachment of the #4 duplex overhead conductor using a perform grip (c/w spool insulator(s) to davit arm if necessary), sagging conductor, connection of luminaire using 2C#12 copper conductor and all other items incidental to the work included in the Specification.

E20.40.16 Removal of Overhead Span of #4 Duplex Between New or Existing Streetlight Poles to Remove Temporary Overhead Feed

(a) This pay item will be measured on a per span basis and paid for at the Contract Unit Price per span for "Removal of Overhead Span of #4 duplex Between New or Existing Streetlight Poles to Remove Temporary Overhead Feed". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by the Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the #4 duplex overhead conductor, spool insulator(s) and all other items incidental to the work included in the Specification.

E20.40.17 Expose Underground Cable Entrance of Existing Streetlight Pole and Install New Streetlight Cable(s).

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Expose Underground Cable Entrance of Existing Streetlight Pole and Install New Streetlight Cable(s)". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including excavation and exposure of the underground cable entrance by any means necessary including use of pressurized water/vacuum excavation, installation of the new streetlight cables(s), backfill, compaction and all other items incidental to the work included in the Specification.

E21. TRACK CONSTRUCTION

DESCRIPTION

E21.1 Supply and Construct 115# Jointed Track Complete

E21.1.1 The unit price submitted on the Form B shall include the entire cost to supply all labour, equipment and materials, including ballast, to construct Class Two (2) track, utilizing new 115# Jointed track complete, and new #1 hardwood ties. Crossing ties shall be utilized where a crossing surface is installed.

E21.2 Track Removal and Disposal

E21.2.1 The unit price submitted on the Form B shall include the entire cost to supply all labour and equipment to dismantle, load, haul, and dispose of removed track material, including disposal of used railway ties at an approved disposal site.

E21.3 Supply and Install Railseal

E21.3.1 The unit price submitted on the Form B shall include the entire cost to supply labour, equipment and material to install Railseal on newly constructed track on 9' #1 HDWD ties in accordance with track owners recommended methods, engineering track standards, and standard plans, as specified in the specifications.

E21.4 Supply and Install Welds

E21.4.1 The unit price submitted on the Form B shall include the entire cost to supply labour, equipment and material to install welds on newly constructed track within the crossing surface in accordance with track owners recommended methods, engineering track standards, and standard plans, as specified in the specifications.

GENERAL

E21.5 All work is to be completed to the satisfaction of the Owner. All work shall be carried out in accordance with best practices and the railway's engineering track standards, and standard plans.

E21.6 Track will be required to pass inspection by a railway's representative, prior to the project being deemed complete.

E21.7 All track and turnouts shall be built to standard drawings and specifications, subject to the approval of the Owner.

E21.8 All crossings shall be built to standards and specifications, subject to the approval of the Owner.

REFERENCES

E21.9 Recommended Methods.

E21.10 System Special Instructions.

E21.11 Items in the GENERAL section above will be provided electronically upon request.

WORK NOT INCLUDED IN THE CONTRACT

E21.12 Supply of all rail, ties, ballast, OTM and associated track materials between main track turnouts up to and including switch point derails.

E21.13 Supply of all thermite weld kits.

E21.14 Supply and erection of all track signs and associated assembly materials and mounting posts along track Owner's R/W.

PRODUCTS

E21.15 Materials

E21.15.1 Contractor supplied rail shall be New min 40' 115 lb jointed. All rail shall be control cooled, straight, free of kinks and be in compliance with current AREMA Specifications, Chapter 4.

E21.15.2 Wood ties shall be new 7" x 9" x 8.5' track ties. All ties shall be #1 hardwood grade ties, treated with a creosote-coal tar solution to a net retention of 9.2 lbs per cubic foot minimum for mixed hardwoods and 7 lbs per cubic foot minimum for oak. Wood ties shall conform to current AREMA Specifications, Chapter 30 "Ties", for size, quality, treatment, and defects.

(a) New #2 6" x 8" x 8.5' hardwood ties may be used on tangent track with written approval from the Owner.

E21.15.3 No ties will be accepted with the following defects:

(a) Broken tie – tie which is broken through the entire depth of the tie.

(b) Split tie – tie split end to end for the entire depth of the tie.

(c) Split tie end – tie end split resulting in poor surface and gauge.

(d) Cut tie – tie which is rail or plate cut, or adzed to a depth of 2 inches or more on No.1 ties, or more than 1 inch on No.2 ties.

(e) Crushed tie – tie which has the bearing surface under the rail crushed one inch or more deep to the extent it cannot hold surface, line or gauge.

(f) Spike killed tie – Condition is indicated by numerous splits at the tie end and/or loose or high spikes, wide gauge and poor alignment.

(g) Decayed tie – tie which is rotted, hollowed or deteriorated and cannot hold spikes, gauge or surface.

(h) Damaged tie – tie which is damaged to a depth of 2 inches or more due to derailments, dragging equipment or fire.

(i) Worn tie – tie that is worn or rounded on the bottom resulting in poor surface and line or the inability to hold spikes.

E21.15.4 Crossing ties shall be new 7" x 9" x 9' track ties. All ties shall be hardwood grade ties, treated with a creosote-coal tar solution to a net retention of 9.2 lbs per cubic foot minimum for mixed hardwoods and 7 lbs per cubic foot minimum for oak. Wood ties shall conform to current AREMA Specifications, Chapter 30 "Ties", for size, quality, treatment, and defects.

E21.15.5 Rail anchors shall be new or manufacturer certified refurbished, drive-on-type and of standard manufacture, as approved by the Owner, of the proper size to fit 115 lb rail sections.

E21.15.6 Tie plates shall be new or PW and measure a minimum of 7½" x 11" for 5 ½" base on tangent and curves up to 2 degree. 14" tie plates shall be used on curves 2 degree < 8 degree. Curves of 8 degrees and over shall be cast plates complete with screw spikes and clips. All non-cast tie plates shall have 6 spike holes. All tie plates are to be double shoulder with 1:40 cant, free of injurious defects and foreign material, and shall conform to current AREMA Specifications for 115 lb rail.

E21.15.7 Joint bars shall be new or PW, toeless type, free of foreign material and without injurious defects. They shall conform to current AREMA Specifications, and must be to the proper design and dimensions for the rail on which it is to be applied. 115 lb joint bars shall have 6 bolt holes and measure a minimum 36" in length.

E21.15.8 Encapsulated (coated) insulated new joint bars complete, together with appropriate plates, are to be used as required for jointed rail sections, and shall be in accordance with CN standard plans.

E21.15.9 Compromise rails shall be new and consist of a single piece of rail, with a forged transition from 136 lb to 115 lb rail.

E21.15.10 Track spikes must be new 5/8" square with reinforced throat design. All track spikes shall conform to current AREMA Specifications for High-Carbon Steel Track Spikes, Chapter 5, Part 2. Length of track spike under its head shall be 6".

E21.15.11 Track bolts with nuts must be new. Bolts and nuts shall conform to current AREMA Specifications. Bolts and nuts shall be to the appropriate size for the bolt holes in the rail section with length sufficient for a full nut and spring washer and ¼" thread exposed.

E21.15.12 New spring washers of the appropriate size to fit the track bolt used shall conform to current AREMA Specifications. Each track bolt shall receive one spring washer.

E21.15.13 Chemical plugs are required for hardwood ties and shall conform to current AREMA Specifications, Chapter 30.

E21.15.14 Crossing planks shall be new hardwood treated pre-bored, sized for rail being used and meeting current track owners standard.

E21.15.15 Crossing lag bolts shall be new hex ¾" x 12" complete with ¾" flat washer.

E21.15.16 Hinge derails for 115 lb rail shall be Hayes EB7 hinge type and shall be right or left hand as required complete with post, sign and mounting kit.

E21.15.17 Double switch point derails shall be per CN TS2210 modified by CN Engineering Specifications for Industrial Tracks 15 Nov 2015 A14.

E21.15.18 Rock ballast gradation shall be 2-1/2" minus in size with a minimal amount of fines as per CN Specification 12-20C Class 2. Walking ballast shall conform to AREMA Size No. 5, and meet the quality requirements as shown in the AREMA Table No. 1 and No. 2. All ballast shall be crushed to assure abrasive edges. Frozen ballast, at time of placement, will not be accepted.

(a) Contractor shall furnish written test results to the Owner that indicates the crushed rock ballast is in accordance with the limiting values referenced.

(b) The crushed rock ballast shall have at least 75% of the particles by mass with two or more fractured faces and at least 98% of the particles by mass with one fractured face. The above percentages will be required within each sieve size coarser than 3/4-inch (19 mm).

(c) Material in sample finer than No. 4 (4.76 micron) sieve will not be considered in determining the percentage of fractured faces.

(d) Grading of ballast shall be determined by ASTM C 136, latest edition.

(e) Amount of material finer than No. 200 (74 micron shall be determined by ASTM C 117, latest edition.

(f) The percent of wear due to abrasion shall be less than 30% for the ballast per ASTM C 535 Grading.

(g) The crushed rock ballast or trowelling stone shall contain less than 30% by mass of flat pieces. In cases of dispute the test method "Determination of Flakiness Index" contained in British Standard 812 shall be used.

(h) The absorption of the ballast shall be less than 0.5%. ASTM C 127.

(i) Ballast gradation to be as follows.

Sieve Size		% Passing
2-1/2"	63 mm	100%
2"	50 mm	70 – 90%
1-1/2"	37.5 mm	40 – 70%
1"	25 mm	0 – 25%
¾"	19 mm	0 - 3%
No. 200	0.75 mm	0 -1%

TRACK CONSTRUCTION

E21.16 General

E21.16.1 Contractor shall exercise care in the unloading and distribution of track material and in the construction of trackage to avoid disturbing the surface of the subballast and the seeding and mulching on the side slopes. Any damage to either the subballast surface or side slopes caused by Contractor's operations shall be repaired at Contractor's expense to the satisfaction of the Owner.

E21.16.2 Contractor shall provide for the movement, handling, and laying of rail in such a manner as to avoid damage to new roadbed, subballast, and rail. Care must be exercised to avoid twisting or damaging rail. During handling, Contractor shall be responsible for damage to rail to the extent that sections thereof damaged, in the opinion of the Owner, are unsuitable for use in track, such rail section shall be replaced at the sole expense of the Contractor.

E21.17 Handling of Material

E21.17.1 Contractor shall be responsible for all track material. The Contractor's responsibility begins at Contractor's loading of materials, unloading of materials to ground at site locations,

continues through its placement into the track structure and until final acceptance of the track by the Owner and Railway.

E21.17.2 No additional compensation will be allowed for segregating or replacing materials of questionable quality or condition. After inspection by the Owner, the Contractor may be advised if material in question is suitable for use. If material is rejected by the Owner, the Contractor will replace the rejected material at his expense.

E21.17.3 The Contractor's responsibility for materials continues through its placement into the track structure and until final acceptance of the track by the Owner and Railway. If materials are damaged, lost, or wasted through the Contractor's negligence, poor workmanship or handling, the Contractor shall replace said materials in kind at no additional cost.

E21.18 Execution

E21.18.1 Timber ties shall be unloaded and handled in such a manner as not to damage them, using approved handling equipment. Pulling timber ties into position with picks or shovels will not be permitted. Tie tongs shall be used for this purpose.

(a) Cross ties shall be placed at a design spacing of 20" center to center except where crossing planks are to be installed they shall be placed at 19 ½" center to center. The cross ties shall be placed on the approved finished subballast, perpendicular to center line of track, with the right hand (in the direction of increasing stationing) ends of cross ties being parallel with and each end of the cross tie being the same distance from center line of track, except on curves, where cross ties are to be aligned to the inside of the curve. All rail joints are to be suspended between ties.

(b) If spikes are pulled from any timber tie, the hole shall immediately be filled by injecting an approved chemical plug material in hardwood ties.

(c) Lay timber ties with heartwood face down, and if not possible to determine position of the heartwood, lay the widest surface of the timber tie down.

(d) Top surface of timber ties shall be clean and smooth to provide full bearing for tie plates. The bottom of the rail, the tie plate and the wearing surface of the timber tie shall be broom cleaned before the rail is laid.

E21.18.2 Tie plates shall be used under running rails on all track where timber ties are placed.

(a) Tie plates should be free of dirt and foreign material when installed.

(b) Care must be exercised to see that canted tie plates are applied so as to cant the rail inward.

(c) Tie plates must be placed square with the rail and centered on the tie. Particular care must be given to see that the tie plate shoulders and spike heads are never under the base of the rail and that the tie plates are well seated with full even bearing on the ties and the rail is properly seated on the tie plate. After rails are in place, outside shoulder of tie plate shall be in full contact with outside edge of rail base.

(d) The same size tie plate must be used opposite one another on each cross tie. Plates from different manufacturers must not be intermixed.

(e) Sweep off all granular material from ties prior to placement of tie plates.

(f) Sweep off all granular material from tie plates prior to placement of rail.

(g) Cutting or burning of tie plates is not permitted.

E21.18.3 Cross ties shall be spiked as per table below, based on less than 20 MGT's per year.

SPIKING PATTERNS NO.	FIELD	GUAGE	MGT'S PER YEAR	DEGREE OF CURVE: TANGENT & LESS THAN 2 DEG.	2 DEG. TO LESS THAN 6 DEG.	6 DEG. TO LESS THAN 8 DEG	8 DEG. AND GREATER
B			0 - 20	X			
C		OR 	0 - 20		X		
			MORE THAN 20	X			
D			0 - 20			X	
			MORE THAN 20		X		
E			0 - 20			X	
			MORE THAN 20			X	
G							X
TURNOUTS SPIKING PATTERN 'E' OR 'G' WILL BE APPLIED TO TURNOUTS AS PER TRACK DIAGRAM PLATES WILL BE APPLIED TO TURNOUTS AS PER TRACK DIAGRAM							

E21.18.4 Turnouts shall be spiked with Spike Pattern E from a point 39’ in front of the points to a point 39’ beyond the last switch tie on the tangent and to a point 39’ beyond the E.C. of the return curve.

(a) Rolled plates are not permitted.

E21.18.5 Installation of joint bars complete with tightened bolts must occur before spiking rail.

(a) Uniform track gauge must be maintained when spiking and must be checked by use of standard track gauge.

(b) The right hand rail going in the direction of increasing stationing shall be spiked to cross ties, and the opposite rail shall be brought to standard gauge of 4’-8½” measured at right angles between the rails, 5/8” below the top of rail. Gauge to be checked at every third tie by using a tested and approved track gauge. Curves shall have gauge widened in accordance with the following table:

Degree of Curve	Gauge
10 degrees or less	4’-8½”
Greater than 10 degrees	Increased 1/16 inch per degree of curvature

(c) Spikes will be driven only with a standard spike maul, sledge hammer, pneumatic or hydraulic spiking hammer or spiking machine.

(d) All spikes shall be started and driven vertically with the face of the spike in contact with the base edge of the rail and so driven as to allow 1/8 inch to 3/16 inch space between the underside of the head of the spike and the top of the base of the rail. In no case shall the spikes be overdriven or straightened while being driven. When spikes are driven by machine, work shall be closely supervised to see that they are driven with a hammer centered exactly over each spike head and drive spike vertically. Set stop on the machine to prevent overdriving.

(e) No spike shall be within 2” of the end of a joint bar. Do not strike rail directly with a maul, either on top when driving, or on side to obtain track gauge.

(f) Withdraw spikes which are incorrectly driven and fill hole by injecting an approved chemical plug material in hardwood ties. Locate replacement spike at another hole in tie plate.

(g) When installing screw spikes or drive screw spikes:

i) Drill a plumb 11/16” (17 mm) by 6” pilot hole. Do not drill through the tie.

ii) Do not use washers with screw or drive screw spikes on wood ties.

iii) Screwspikes must run (turned) into the tie. They must not be driven into the tie.

iv) Drive screw spikes can either be driven or turned into the tie.

v) Do not over tighten the screw or twist screw spikes. This can strip the wood fibers in ties.

E21.18.6 As required assemble temporary track rail joints before fastening rails to timber ties using joint bars with 6 track bolts and a spring washer for each bolt, first removing all dirt, loose mill scale, and rust from contact surfaces of joint bars and rails.

(a) Holes for track bolts shall only be drilled by an approved type of rail drill. Under no circumstances shall new holes be drilled between two holes already drilled.

(b) Rail joints shall be applied so that bars are not cocked between base and head of rail.

(c) If necessary to force joint bar into position, strike lower edge of bar lightly with 4 lb maul. Do not drive bolts in place. Under no circumstances shall rail be struck in web with tool or any metal object.

(d) Tighten bolts in sequence, beginning at joint center and working out to ends. Bolts shall be tightened to required torques, as outlined in this specification. If a bolt tightening machine is not used, a standard track wrench with a 42” long handle may be used.

E21.18.7 The proper stagger of insulated joints is 2 cribs (approximately 3’- 4”) unless otherwise instructed.

(a) The end post of the joint must be located at the center of the crib, unless:

i) The joint cannot be suspended, then a specifically designed insulated tie plate must be used under the center post, or

ii) The joint is specifically designed to be centered on a tie and a special tie plate is installed under the center post.

(b) Rail ends where insulated joints are to be installed shall conform to the following:

i) The end face shall be saw cut and bolt holes drilled to the proper size and location for the rail section.

ii) All rough edges and burrs shall be removed from the end face and bolt holes.

(c) All rust, scale, dirt or other foreign matter must be removed from the rail joint area and from the joint bars before the joint is installed.

(d) If the end post projects above the top of rail, it must be trimmed so that the top is below the top of rail, but not exceeding 1/8” below.

(e) Track near insulated joints shall be adequately anchored. Non-glued insulated joints will be considered as joints and will be anchored to the correct standard.

(f) Rail anchors must not be applied on the sides of ties adjacent to bootlegs.

(g) Rail end overflow must be removed at insulated joints by slotting in accordance with track owners standards. The gap should be filled with silicone sealer to prevent the influx of dirt and grinding material.

E21.18.8 Compromise Joints and Rails

(a) To determine the hand of the joint, face the joint from the center of the track. When the larger rail section is on the left side of the joint, it is a left hand joint. When the larger section is on the right, it is a right hand joint.

(b) A compromise joint consists of one gauge side and one field side. The rail sections that the compromise bar will fit are indicated at each end of the bar.

(c) Compromise joint bars must not be modified from their initial design to fit a different rail section. Rail shall only change by one rail weight per bar location.

(d) Compromise joints (except 132/136) must not be installed in turnouts, or within 20’ of an open deck bridge, turnout, highway crossing or railroad crossing.

(e) Compromise rails consist of a single piece of rail forged to transition from one section to another. Determination of the hand of a compromise rail is the same as the compromise joint. Ensure the gauge marking of the rail is always toward the centerline of the track.

i) Compromise rails shall be tamped with the correct size tie plates under the corresponding rail section.

(f) The center of the compromise joints or compromise rails must be centered in a crib to allow full support of a sound tie on either side.

E21.18.9 Derails shall be installed as per track owners standards.

(a) Derails are classified as either right or left hand. A right hand derail is installed on the right hand rail and derails toward the right.

i) Care must be taken to ensure derails are located properly.

ii) Tracks equipped with a derail shall have the switch stand lever painted yellow.

iii) All derails must be equipped with an approved switch lock that has been chained, or cabled, to the derail or operating stand.

(b) Hinge Derails

i) Derails are to be installed such that in the derailing position the derail block covers the ball of the rail and lie flat on the top of the rail throughout the underside of the derailing block surface and will bear directly on sound ties.

ii) A steel shim, of the correct thickness and with holes punched or drilled for all fasteners, may be necessary under the derail to ensure the block lies flat on top of the rail.

a) Where 2” shims or extender/elevator plates are used, tie screws of 1” longer must be used.

iii) Ties, to which derails are fastened, must be sound and well tamped and have the top surfaces in the same plane.

a) Tie plates are not to be installed at the derail location.

iv) Derails must be installed at right angles to the rail and will be fastened with1” x 6½” lag screws.

v) Derails which have been manufactured to accommodate eight or more fasteners must be fastened with a minimum of eight fasteners.

a) Where derails are manufactured to accommodate less than eight fasteners, all available holes must be used.

vi) Derails must be properly lubricated and adjusted for ease of movement.

vii) Derails must be painted yellow and have signs installed.

(c) Switch Point Derails

i) Switch point derails to be installed as per CN TS2210 modified by CN Engineering Specifications for Industrial Tracks 15 Nov 2015 A14.

ii) Switch point derails will be operated with rigid switch stands. The throw of a switch point derail is 5”.

iii) All derails equipped with operating stands shall have a derail target, in accordance with TS 720, mounted to the mast which is visible when lined in the derailing position. Conventional switch targets and tips are not to be used.

E21.18.10 The Contractor shall provide such equipment, tools, and materials necessary and required for turnout construction.

(a) Install turnouts in accordance with the appropriate standard plans

(b) Rail gaps at maintrack turnout panels shall be welded.

i) Rail gaps at non maintrack turnout panels may be welded.

(c) Minimum 14" tie plates are to be used in turnout construction.

(d) All switch ties must be as laid out on standard plans, properly spaced and square to through track. Switch ties are not to be cut.

(e) The turnout stock-rail must be bent horizontally, as shown on the standard plan. Only standard carbon and 3HB rail, in 115 lb section or smaller, may be field bent with an approved bender.

For safety reasons, under no circumstances are head hardened rails or rails greater than 115 lb to be bent in the field.

(f) Ensure the switch point fits snugly against the stock rails for the entire length of the planed portion. Points will not overhang gauge plates nor be more than one inch back from front edge. Running surface of points will be ¼" above stock rail, as measured at the location where the distance between gauge face of stock rail and gauge face of switch point when tight against the stock rail is 4½".

(g) Bolt switches, frogs and guard rails fully. Provide washers and cotter pins for bolts. Grade 8 bolts are identified by six radial lines on the head of the bolt and are to be tightened as per:

Grade 8 Bolts

Size of Bolt		Torque
Inches		Ft-Lb.
1		840
1-1/4		1675
1-3/8		2500

(h) All turnouts must be fully spiked or fastened with tie screws and clips. Spikes are to be fully driven or timber tie screws drawn down.

(i) Switch stands shall be located as per drawings.

(j) Switch stands must be plumb, securely spiked, bolted or lagged to the head block ties. They must also be secured with lock or keeper as supplied.

(k) Standard throw of switch points as measured at the No. 1 switch rod and at the No.5 switch rod of turnouts equipped with auxiliary throw mechanism must be set in accordance with the appropriate standard plan.

(l) Switch rods and transit clips must not contact the side of the tie or the slide plate.

(m) All switch stands must be equipped with the appropriate reflectorized target assembly (in some locations a double bladed target tip is required). Target assemblies will be properly adjusted to display green when the switch is lined for the normal route and yellow when lined for the diverging route.

(n) Install switch rod bolts and connecting rod bolts, except the bolt under the switch stand, with the nut on the upper side to permit ready inspection of the cotter pin.

(o) Install the connecting rod bolt under the switch stand with the head on the upper side.

(p) Install cotter pins on all connecting and switch rod bolts.

(q) Position the handle on the switch stand so that when the switch is in the normal position it faces away from the frog and the track, and moves in the same direction as the points when the switch is lined for the diverging route. Switch handles of rigid switch stands will be adjusted such that they cannot be placed in locking position with normal pressure when 1/8" shim placed between point and stock rail at first rod.

(r) Lubricate switch stands, switch plates, connecting rod bolts and spring frogs properly after assembly.

(s) Stock rails must be properly seated in the switch plate, have no lateral movement in the plates and switch plates have no movement on the ties.

(t) Care must be taken in adjusting braces to avoid over-driving and rotating the stock rails out of the seat of the plate.

(u) Flangeways must be clear of obstructions and not less than 1½" deep, not less than 1¾" wide and not more than 2" wide.

(v) Guard Check Gauge

i) The minimum distance from the gauge line of a frog to the guard line of its guard rail or guarding face, as measured across the track at right angles to the gauge line is 4′-6¼″.

(w) Guard Face Gauge

i) The maximum distance between guard lines as measured across the track at right angles to the gauge line is 4′-5 1/8″.

(x) Fully anchor the rail on both tracks through turnouts except where anchors will interfere with switch points. Fully anchor for 200 feet in both directions beyond the turnout.

(y) Once installed, line new turnouts for through movement and spike the switch point. Switch points shall remain spiked until inspected by the Owner.

E21.19 Jointed Rail

E21.19.1 The method and equipment used by the Contractor in handling and movement and the laying of rail will be subject to the approval of the Owner.

(a) Rail shall be free of dirt and foreign material when installed

(b) Rail will only be cut square and clean by means of a rail saw with all burrs removed. Torch cut rail will not be allowed to remain in the track. When sawing rail for reuse saw cut must be made at least 4" (100 mm) from any torch mark on the rail.

(c) The Contractor will ensure that rails are laid such that gauge faces of rail are matched according to their previous position in track such that the gauge side remains the gauge side.

(d) Rail must not be struck with mauls, sledgehammers or other heavy objects.

(e) Rail of different chemistries or manufacturers shall not be mixed in any given stretch. Use compromise bars to join rails of different sections. Bars which join rails of more than one weight difference are not allowed.

(f) Jointed rail shall be laid with staggered joints. The stagger between joints of opposite rails must not be less than 12 feet. Rail joints must be kept clear of crossing planks and be a minimum of 20' from the end of planks.

(g) Rail temperature shall be measured periodically throughout the day with at least two accurate thermometers placed on the base of the rail near the web, away from wind and out of the direct rays of the sun and away from all sources of artificial heat or cold. The thermometer shall be left in place for at least 10 minutes prior to taking a reading. A pyrometer may also be used to measure rail temperature.

i) When using pyrometers to determine rail temperature, the pyrometer should be pointed into the shaded portion of the web of the rail. Rail temperature must be taken at intervals of approximately 150'.

(h) Expansion space between rail ends must be provided. Expansion space of the proper dimension between rail ends can be obtained through the use of shims of the correct thickness as per tables below.

Table 5-5-4. Rail End Openings for Allowance of Expansion

33-Foot Rail 160 Joints per Mile		39-Foot Rail 135 Joints per Mile		78-Foot Rail 68 Joints per Mile	
Rail Temperature Degrees F	**Expansion Inches**	**Rail Temperature Degrees F**	**Expansion Inches**	**Rail Temperature Degrees F**	**Expansion Inches**
Below –10	5/16	Below 6	5/16	Below 35	5/16
–10 to 14	1/4	6 to 25	1/4	35 to 47	1/4
15 to 34	3/16	26 to 45	3/16	48 to 60	3/16
35 to 59	1/8	46 to 65	1/8	61 to 73	1/8
60 to 85	1/16	66 to 85	1/16	74 to 85	1/16
Over 85	None	Over 85	None	Over 85	None

(i) Fibre, hardwood, or metal shims may be used to obtain the proper expansion space by bringing rail ends squarely together against the expansion shims. Expansion shims must not be removed until the rail is properly spiked, the bolts tightened and rail anchors applied.

(j) When new rail adjoins rail previously in track the old rail will be built up by welding at the joint to protect the end of the new rail.

(k) Rail is to be placed to avoid mismatch however where rail end mismatch exceeds ¼" on the top or the gauge side of a rail joint, it shall be reduced by grinding, welding or replacement of the rail.

(l) Rail ends with excessive flow will be repaired by slotting. Crushed or battered rail ends will be cut off.

(m) Nicked or gouged rail shall be rejected and replaced as determined by the Contractor, at the sole cost of the Contractor, for any rail damage due to the Contractor's handling. This includes the cost of the replacement rail, transportation, welds, and any associated costs in the change out of the defect.

(n) Upon completion of the day's work, all rail laid must be fully spiked, bolted and anchored.

E21.19.2 All cross ties shall be anchored to a minimum box pattern of every second tie. The same ties on opposite rails shall be boxed.

(a) Only the proper tools or machines will be used when applying or removing anchors. The use of spike mauls is prohibited. When applying anchors by machine ensure the machine is properly adjusted.

(b) Anchors must be installed from gauge to field side of rail to insure full bearing surface against the side of the tie, bearing against the adjacent tie and remain tight on the rail. Anchors must be on the same side of the same tie on both rails. Ties are to be at right angles to the rail before applying anchors. Anchors improperly installed will be removed and applied correctly without additional charge by the Contractor. Anchors will only be removed when the rails is still in the track and done such as to prevent damage to the anchor or rail.

(c) Anchors must be fully driven; however, care must be taken to avoid over-driving as this may fracture or spread the metal, resulting in loss of holding power. Any rail anchor that is fractured or with metal spread will be rejected and replaced with another anchor at the Contractor's expense.

(d) Anchors shall be installed only to the rail section for which they are designed and shall only be the same type of anchor to any one tie.

(e) Care must be exercised in the spacing of anchors to ensure that no anchors are located on any tie under or adjacent to the ends of a rail joint bar, at least 2 inches from a plant or field weld, bond wires, insulated joints or other signal or track appliances.

(f) Anchor rail immediately after laying.

(g) Bumping posts shall have 10 ties in front of and all ties behind fully box anchored.

(h) Fully box anchor every tie 200 feet on either side of turnouts, insulated joints, track crossings, and derails.

THERMITE FIELD WELDING

E21.20 General

E21.20.1 All rail joints between CWR strings and compromise rail shall be thermite field welded.

E21.20.2 Field welds should be made at the time of rail laying regardless of temperature. When the field welding of a rail joint cannot be completed, each rail must be bolted with at least two bolts on each side of the joint before the track is placed in temporary service (four bolts per joint). The use of eight hole splice bars may be approved if unable to complete thermite welds prior to cold weather.

E21.20.3 Holes for complete bolting of cut rails shall be drilled by an approved type of rail drill. Under no circumstances shall new holes be drilled between two holes already drilled. Cutting rails or drilling holes in cut rails by means of acetylene or electric torch will not be permitted.

E21.21 Execution

E21.21.1 All thermite field welding shall be supervised and performed by an experienced rail welding supervisor and welder certified by the manufacturer of the welding equipment.

E21.21.2 Contractor shall inform the Owner daily of the location of completed welds in order for the Owner to arrange for testing and inspection. A record shall be kept by the Contractor for each field weld made during new track construction and copied to the Owner.

E21.21.3 All equipment and material required in the production of thermite welds shall be furnished by the Contractor. Thermite welding materials and equipment shall be as manufactured by Boutet or Orgotherm.

E21.21.4 The thermite welding method and procedure shall conform to current AREMA Specification, Chapter 4, and with the instructions from the welding kit manufacturer (Boutet or Orgotherm) and as specified herein. Boutet or Orgotherm self-preheating weld kits shall be applied in strict accordance with manufacturer instructions, these Specifications, and to the satisfaction of the Owner.

E21.21.5 Winter thermite welding. Hot thermite weld material has the potential to become explosive whenever it comes in contact with moisture. Under winter conditions, the source of moisture may be in the form of snow and/or frost in the ballast. It is imperative that manufacturers' procedures for welding be followed at all times. In addition, the following precautions MUST be taken when thermite welding in the presence of snow and/or frost.

In no case, must thermite welding be performed when the temperature is below O^{o}F (-18°C).

(a) A minimum of a 10' radius must be cleared of snow around the weld area. When this in not practical due to embankment constraints, snow must be cleared to at least the edge of the ballast section.

(b) A hydraulic rail puller MUST be used on all closure welds.

(c) Rail pullers will not be removed until the weld has cooled below 700°F (389°C).

(d) It is recommended to install an approved drip pan with dry sand under the weld area to prevent any excess molten metal from contacting any moisture that may be

present. It may be necessary to heat the ballast with a torch in order to facilitate removal.

(e) After igniting the charge ensure everyone is clear of the weld area by at least 40 feet and remains in the clear until the reaction and pour are complete.

(f) All preheat and tear down times must be strictly adhered to. Note, 5 minutes is the minimum time required before the removal of slag pans, crucible and normal de-molding begins.

(g) A dry location must be secured to place the waste material. (it is recommended to use a steel drum or rack on back of a truck for disposal of the weld waste).

(h) To prevent rapid cool down an approved cooling blanket or cooling box MUST be used. The weld must be covered immediately after hot grinding and remain covered until the weld has cooled below 400°F (222°C).

E21.21.6 Wearing of all protective clothing and safety equipment is required during welding operations.

E21.21.7 Prior to welding, rail must be visually examined for physical defects and must meet the criteria within this specification for alignment and wear. Any rail not meeting the criteria must be reported to the Owner immediately.

		WEIGHT OF RAIL		
		100 lb. and smaller	112 / 115 lb.	132 / 136 / 141 lb.
TYPE OF WELD	Standard Thermite	0.125” (3 mm)	0.30” (8 mm)*	0.30” (8 mm)*
	Step Down Thermite Kit 136 NEW to			0.375” (10 mm)
	Flash Butt Welder	0.20” (5 mm)		

*If Vertical Rail Base Offset exceeds 1/8” (3 mm) a sloped base plate must be used

E21.21.8 Thermite welds shall be located as close as possible to the center of tie cribs. The weld shall not be closer than 4” to the edge of the tie and in no case shall a weld be situated over a tie plate. Contractor shall re-space ties as necessary to prevent a weld from sitting on a tie. Field welded joints are to be centered between ties.

(a) Contractor shall tamp and dress track, as necessary, to provide firm support at the weld.

(b) Contractor shall plug with the appropriate plug type for the tie and re-drive all necessary spikes.

(c) Contractor shall re-apply and adjust anchors as necessary to conform to specified anchor pattern.

E21.21.9 No holes closer than 6” from the weld will be permitted in the rail. Distance is measured from the cut face to the closest edge of the hole.

E21.21.10 Thermite welds will not be made within 6’ of another field weld or within 3’ of a plant weld without written approval by the Owner.

E21.21.11 Welding gaps for thermite welds shall be 1” except where approved wide gap welds are used.

E21.21.12 All rail ends shall be saw cut. The cut must be square and perpendicular to the rail axis, with a variation not exceeding 0.03” and all scale, rust and burrs must be removed.

E21.21.13 Overflow on rails shall be ground off for 2” beyond the mold area.

E21.21.14 Vertical rail end alignment shall be made along the running surface of the rails, such that a flat running surface will result on cool down. Any difference in height of rails shall be in the vertical base offset.

E21.21.15 Vertical misalignment of rail ends on the base underside must not exceed 1/8” on thermite welds.

E21.21.16 Horizontal alignment must be straight for at least 36” through the weld area. To meet this requirement when welding in curved track, rail positioners (aligners) must be used.

E21.21.17 Horizontal rail end alignment shall be made along both sides of the head, web and base edges of the rail. Adjustments shall be made such that:

(a) On new rails, or rails with comparable gauge face wear, any difference in the width of head, web or base shall be divided equally on either side.

(b) On rails with uneven head width, the bases and webs of the rails shall be aligned so that the horizontal offset in the head, web or base does not exceed 0.06”. The gauge and field sides of the railhead shall be blended in by grinding.

E21.21.18 Head bond weld nuggets of exothermic rail bonds, which fall within the mold are, must be completely removed by grinding prior to thermite welding.

E21.21.19 Immediately prior to mold installation the rail ends and surface area that will be exposed to the thermite material must be cleaned a minimum distance of 6” from the end with a wire brush or a grinding wheel in order for this area to be free of grease, rust, and other foreign material, along with any other recommendations of the welding kit manufacturer.

E21.21.20 Molds must be centered over the weld gap.

E21.21.21 During sealing of the molds, cardboard inserts must be placed over the molds to prevent any foreign material from falling into the mold cavity.

E21.21.22 Check the plastic bag containing the charge, ensuring that the bag is sealed and has not been punctured in handling.

E21.21.23 Before preheating, check the rail temperature with a rail thermometer, if the rail temperature is below 60 degrees Fahrenheit both rails must have supplemental heat applied to raise the rail temperature to at least 100 degrees Fahrenheit.

(a) The length of the rail to be supplementally heated shall be between 30 and 36 inches for rail temperatures between 60 degrees Fahrenheit down to 16 degrees Fahrenheit.

E21.21.24 A rail expander will be placed on the rail to maintain the correct gap and crown unless temperature conditions are such that the possibility of rail movement is eliminated.

(a) If a change in rail temperature is anticipated while the weld is being poured or while it is cooling, the rail expander should be adjusted to compensate for any stresses which will occur at the weld due to a change in temperature.

(b) Depending upon the type of change expected, one of the following procedures will assist in preventing temperature induced stresses from affecting the quality of the weld.

i) Rail temperature is low and a raise in temperatures is anticipated, the rail expander should be set up to expand the gap and enough pressure built up to cause a slight increase in the gap. This should prevent any subsequent decrease in gap width.

ii) Rail temperature is high and a drop in temperature is anticipated, the rail expander should be set up to pull and enough pressure built up to cause a slight subsequent increase in width.

iii) Whenever either of the above procedures is required, the final gap width must be as stated in the manufacturer’s instructions for the rail weight being welded.

iv) The rail expander must remain on the rail until the weld is complete and has cooled to 700 degrees F. This is verified when the center of the weld around its entire periphery will not melt a 700 degree F tempilstick.

v) When the rail expander is removed, it must be released in a gradual manner.

E21.21.25 Rail ends will be preheated prior to welding to a sufficient temperature and for a sufficient time to ensure full fusion of the weld metal to the rail ends without cracking of the rail or weld, per manufacturer's instructions. Preheating must not be interrupted and the heat shall be uniformly distributed over the rail ends. The preheat time specified for the process must be adhered to.

E21.21.26 Ignition must be pre-formed immediately after preheating.

E21.21.27 During the pour, the crucible must be centered over the mold. When the pour is completed the molten slag must be allowed to solidify for three minutes prior to removing the slag pot. For the CJ One shot crucible, the slag pot must not be removed until 5 minutes after the pour. The weld must not be sheared until 6.5 minutes after the pour.

E21.21.28 In the event of a leak, apply molded fusal paste with the end of a wood handle at least 36" in length. Never attempt to stop a leak in any other manner.

E21.21.29 Should the thermite reaction or the time delay of the self-tapping thimble be abnormal, the weld must be rejected.

E21.21.30 With multi-use crucibles if the reaction is abnormal and the automatic thimble doesn't tap, the crucible should be left standing over the mold for 5 minutes. If the thimble releases during that time, the metal will pour into the mold and although the weld will have to be cut out, there is no danger of personal injury. The loaded crucible should then be carefully set aside and no attempt made to empty it until the metal has cooled. After cool down, the metal is easily dumped.

E21.21.31 With power shears or a sledge hammer and hot cut chisel, remove the excess metal, while still hot, off the sides of the ball of the rail.

E21.21.32 Never dump hot slag or any molten material on wet soil, wet ballast, or into water. To extinguish a metal fire, use only dry sand. The use of vapor forming extinguishing materials is forbidden.

E21.21.33 The mold shall be left in place after tapping for a sufficient time to permit complete solidification of the molten metal and proper slow cooling to prevent cracking and provide a complete weld with the proper hardness and ductility.

E21.21.34 Thermite welds shall be ground hot. When hot grinding, the weld shall be left at least 0.032" above the parent rail steel on the running surface, to ensure it does not shrink below the rail head upon cool down. The contour radius, gauge face and field side of the head shall be hot ground flush or blended in where necessary. Do not grind the rail head free hand.

E21.21.35 After the weld has cooled to ambient temperature it shall be cold ground, flush with the rail surface and blended in where necessary. Do not grind the rail head free hand. Check the final contour of the rail head with a 36" straight edge.

E21.21.36 The weld must be protected against water or any liquid for two hours after finish grinding. Welds shall be allowed to cool normally, without induced cooling.

E21.21.37 Date and initials of welder and Contractor's name shall be placed on the web of the rail with metal marking paint and all welds shall have a number based upon a numbering system established by the Contractor and approved by the Owner. These marks will be placed on the field side of the rail being welded.

E21.21.38 Contractor shall not add more rail than what was removed when installing insulated joints, replacement rail, and performing welds after final de-stressing of the CWR.

E21.21.39 Contractor shall provide sufficient time to allow welds to cool to 450 degrees Fahrenheit and have completed the finish grinding prior to any equipment movement across welds.

E21.21.40 With the “unfinished” base of the thermite welds the Contractor will need to exercise caution when adjusting the rail so as not to bind the rail at a tie plate, or allow the ties to be skewed.

E21.21.41 No additional welds shall be installed within 3‘ of an existing plant weld and 6’ of an existing thermite weld.

E21.22 Field Quality Control

E21.22.1 All welds giving fault indication by ultrasonic inspection or visible inspection, being unacceptable, shall be replaced at Contractors expense. This includes the addition of a rail plug and additional welds where required.

(a) Ultrasonic testing of all completed welds in the track shall be carried out as specified herein.

(b) All testing and submittals shall be performed as directed by the Owner at no cost to the Owner.

(c) Welds not meeting the following requirements will be rejected.

i) Each weld shall have full penetration and complete fusion with no evidence of surface or internal fissures or cracks.

ii) Porosity or slag type defects shall not exceed 0.040 inches in any dimension and the total area of all defects shall not exceed 0.024 square inches.

iii) Conformance to alignment tolerances.

(d) If a defective weld is found, it shall be cut out and a new section not less than 10’ long on tangent track and not less than 20’ long on curved track shall be inserted, welded with two thermite welds, and re-tested all at Contractor’s expense.

(e) Ultrasonic testing will be performed by a competent material testing service as determined by the Owner.

(f) All welds shall be visually inspected by the Contractor and Owner for surface cracks and alignment. Welds with surface cracks visible to the eye or not within the alignment tolerances will not be acceptable.

BALLASTING AND SURFACING

E21.23 General

E21.23.1 Ballast as required, shall be supplied by Contractor. Contractor shall haul and unload all crushed rock ballast material, surface, tamp, line, finish surface, regulate, and power broom new track constructed. All track shall be surfaced and tamped as soon as possible after unloading ballast.

(a) Ballast shall be placed to a minimum depth below the bottom of the ties at grade point to the dimensions and widths (minimum 12” shoulders for CWR) as shown on the drawings. Ballast shall be compacted by approved tamping methods to hold track firmly in place. All tamping operations shall be performed with an approved power tamper machine.

(b) Placement of ballast and surfacing of track shall be done in a manner such that all tolerances and requirements of these specifications shall be retained by the track structure for a period of 1 year from the time of acceptance.

E21.23.2 The Contractor at their expense shall provide all the plant, equipment, and labor necessary to unload and transport the ballast to the track construction site and distribute the ballast to the track structure.

E21.24 Execution

E21.24.1 Contractor will direct the unloading and distribution of ballast and will be fully responsible for all aspects of the unloading and distribution, subject to approval by the Owner. All costs associated with any equipment derailed during ballasting including repairs to damaged railway equipment will be the responsibility of the contractor.

E21.24.2 When unloading ballast in the center of the track, a plow tie may be used in order to evenly spread ballast and prevent excessive rock from accumulating on the rail and possibly derailing cars.

E21.24.3 After unloading ballast, all cars must be completely empty and doors closed and locked prior to releasing.

(a) Inspect the inside of the car to ensure it is completely empty with no ballast on the hanging on the side slopes.

E21.24.4 Power tamping machines are to be used throughout all track construction. Manual tamping will not be allowed. The use of a ballast compactor together with the power tamping machines may be used with the written permission of the Owner.

(a) Tamping machines are to be automatic multi-tooled with a minimum of 8 tamping feet per rail and having automatic profile reference beams of not less than 75'.

(b) Each tool shall have a tamping pressure sufficient to close the ballast beneath each tie. The foot of each tool shall be a minimum of 1½" x 3" at all times.

(c) A junior tamping machine less the reference beam may be used in conjunction with a lead machine provided that all other characteristics of the lead machine are the same on the junior tamper. The tamping machine with the reference beam will tamp a minimum of every second tie.

(d) Any proposed ballast compaction equipment shall be listed by the Contractor, submitted to the Owner and is subject to acceptance by the Owner.

E21.24.5 No part of the track structure will be raised more than 3" in any one lift. New track construction will have to be worked more than once and the Contractor will have to apply additional ballast to conform to the ballast cross section shown within the Typical Track Section drawings.

E21.24.6 Each lift is to be tamped from a line 16" inside each rail on both sides of and to the ends of the ties. Center area between these limits shall be filled lightly with ballast but not tamped. Tamping shall proceed, simultaneously; at both ends of the tie making sure ballast is forced directly under the ties and against the sides and ends of the ties.

(a) Too many insertions with a power tamper may cause a center bound track condition. Generally two squeezes per tie up to 1½" of raise with one additional insertion and squeeze for each additional 1" of raise is required with insertion depth being a minimum of 1½" below the bottom of tie.

(b) When the track has been raised to within 2" of final grade, the final lift shall be made by raising the track up to grade stake elevation making necessary allowance for settlement. The ballast shall be applied under the ties for their entire length.

E21.24.7 During raising and tamping, if any crib area is void of ballast below the bottom of the tie then the area of the track is to be re-tamped following the application of additional ballast.

E21.24.8 While raising and tamping, track levels shall be constantly used to ensure correct surface and cross level.

(a) Contractor will finish each point on the track to within a maximum of ½" deviation from zero cross level on tangent. Average cross level on tangent and super elevation on curves will be as specified.

(b) Contractor will finish the track so that the difference in cross level between any two points less than 62' apart on tangents and on curves between the spirals must be no more than 1". Deviation from zero cross level at any point on tangent may not be more than ½". Variations in cross level on spirals in any 31' may not be more than ¾". Track

will be finished so that the deviation from uniform profile on either rail at the mid-ordinate of a 62' chord may not be more than 1¼".

(c) Contractor will finish the track so that the horizontal alignment between any two points 62' apart on tangent track will deviate from a straight line by no more than ¾". Mid ordinate of a 62' chord between two points on the gauge side of the outer rail will be one inch per degree of curve with an allowable tolerance of plus or minus 5/8".

E21.24.9 After track has been brought to true surface, elevation, and grade, it shall be given a final lining and placed in true alignment and grade conforming to the elevations and alignment according to the drawings and the ballast dressed to the design ballast cross section.

E21.24.10 When raising track, the Contractor has a tolerance of plus or minus ½" to the design grade as long as requirements of this Section are met. If not raised to the established grade, then the Contractor will unload ballast in sufficient quantity and continue to surface the track to comply with the tolerances.

(a) All ties are to be straightened and re-spaced as necessary immediately prior to unloading ballast for the final raise.

(b) If the Contractor raises the track too high to comply with the allowable tolerance, Contractor, at his expense, will excavate the ballast sufficiently to lower the track and then surface the track again to bring it into full conformity.

E21.24.11 When track is lifted or jacked, care must be exercised by the Contractor to avoid stressing or permanently bending the rail, joints, or turnout components.

E21.24.12 When surfacing through a turnout with boltless adjustable rail braces, switch points and stock rails will be blocked to prevent displacement of stock rail from the switch plate.

E21.24.13 Tamp turnout ties for 16" on each side of main and turnout rails. Headblock ties to be tamped as above with no voids under remainder of tie.

E21.24.14 Turnout tie cribs are to be full except to prevent contact with rods and for drainage as required.

E21.24.15 Contractor will correct any hanging or skewed tie that is a result of his tamping and raising the track. Tie plates will be positioned so that the shoulder is against the outside base of rail for the entire length of the shoulder.

(a) Contractor will plug and re-drive all high or loose spikes and will chemically plug and replace all spikes removed.

(b) Contractor will replace and/or adjust all tie plates and rail anchors knocked off or that worked loose or were damaged during the surfacing and regulating. The anchors must remain matched across from each other on each rail. Tie plates must remain square to the tie.

E21.24.16 Contractor will provide the ballast section as shown in the Typical Track Section drawings. No dirt or foreign materials will be allowed into the ballast section.

E21.24.17 After track has been brought to true surface, elevation, and grade it shall be given a final lining and placed in true alignment conforming to design and the ballast shall be trimmed neatly to the dimensions and widths of the Typical Track Section drawings.

(a) Cribs shall be filled to top of tie.

(b) No ballast will be left on top of ties, spikes, fasteners and plates.

(c) Ballast at insulated joint locations will be dressed by hand to avoid damage to signal wires and to avoid leaving piles in ballast in the track.

E21.24.18 Surplus ballast shall be spread evenly along the ballast slopes. Dressing of the ballast by placing earth higher than the toe and thus preventing proper drainage will not be permitted. After all ballast placement has been completed, the track shall be given a complete power broom finish with approved machinery. Contractor shall ensure that the top of ballast rock matches the top of tie surface and that no excess ballast remains on the top of rail, top of tie, base of rail, top of tie plate, spike, anchor, or roadway crossing surface.

E21.24.19 Contractor shall exercise caution while regulating ballast shoulders so as to avoid track misalignments and to avoid obstructing adjacent drainage ditches, structures, or culverts with ballast, dirt, vegetation, or other material.

(a) If Contractor obstructs an adjacent drainage ditch, structure, or culvert, he will have to initiate the cleaning of those as soon as possible.

(b) Contractor is responsible to ensure that the partially ballasted track in his work area does not buckle out of alignment. If a misalignment of the track occurs as a result of the Contractor's operations, he must correct at his expense.

CROSSINGS

E21.25 General

E21.25.1 This section includes the installation requirements of all hardwood crossing surfaces as indicated on the drawings.

E21.25.2 Conform to all applicable Local, Provincial and Federal laws, codes, specifications and ordinances for materials and installation of the crossings as they apply to this specification.

E21.25.3 The Contractor may be allowed, at the Contractor's expense, to supply and install additional temporary crossings as required for convenience and shall make good, at the Contractor's expense, any track material damaged by same. This shall include all material and labour required to meet the specifications of this project. Upon completion of all work these temporary crossings are to be removed, at the contractor's expense.

E21.25.4 Contractor is responsible for any and all approved detouring, detour roadways, all signage, barricading and traffic control that may be necessary to facilitate crossing installation. It shall be the sole responsibility of the Contractor to erect and maintain such detour roadways, signage, barricades and traffic control as required by during the length of time that the road is closed to traffic or while crossing protection is required.

E21.25.5 Track materials and construction execution associated with crossing installation to be in accordance with all parts of these specifications.

E21.26 Execution

E21.26.1 Install new hardwood crossing planks.

(a) Planks will be cut to length as required with the outer ends of all planks beveled so to minimize the effects of dragging equipment.

(b) Planks will be placed such that a flangeway space not less than 3" or more than 4¾" wide shall be provided between the gauge side of the running rails and the planking. A flangeway on the field side of the running rails will not be allowed.

(c) Planks will be fastened to the crossing ties by means of the ¾" x 12" hex lag bolts and washers through the pre-bored holes in the planks. Should additional pilot holes be required they will consist of a 5/8" hole drilled a minimum of 5" into the crossing plank such that they are aligned with every 4th crossing tie.

(d) All wood surfaces exposed by either cutting or drilling must be treated with P2 - Petroleum Creosol.

(e) All cross ties within crossing planks and for a distance of 20' in each direction shall be fully anchored.

(f) Remove all debris from site and leave crossing in a clean condition.

E22. SALT TOLERANT GRASS SEEDING

DESCRIPTION

E22.1 Further to CW 3520 and CW3540, this specification shall cover sub-grade preparation and the supply and placement of Salt Tolerant Grass Seed.

MATERIALS

E22.2 Salt Tolerant Grass Seed

E22.2.1 Salt Tolerant Grass Seed for regional and collector boulevards, medians and interchange areas shall be a mixture composed of:

(a) Seventy percent (70%) Fults or Nuttals Alkaligrass (Puccinellia spp.), twenty percent (20%) Audubon or Aberdeen Creeping Red Fescue and ten percent (10%) Perennial Ryegrass.

EQUIPMENT

E22.3 Scarification equipment shall be suitable for the area being scarified, shall be capable of scarifying the sub-grade to the specified depth and shall be accepted by the Contract Administrator. For confined areas a toothed bucket may be acceptable. For larger areas tilling equipment may be required.

CONSTRUCTION METHODS

E22.4 Preparation of Existing Grade

E22.4.1 Prior to placing topsoil, in areas to be seeded greater in width than 600mm, prepare the existing sub-grade by scarifying to a minimum depth of 75mm and to a maximum depth of 100mm to the satisfaction of the Contract Administrator.

E22.4.2 Scarification shall consist of breaking up and loosening the sub-grade. No scarification shall occur within the edge of a tree canopy (or drip line).

E22.5 Salt Tolerant Grass Seeding

E22.5.1 Salt Tolerant Grass Seed shall be sown at a rate of 2.2 kilograms per 100 square meters.

MEASUREMENT AND PAYMENT

E22.6 Supply, placement and maintenance of Salt Tolerant Grass Seed will be paid for at the Contract Unit Price per square metre for "Salt Tolerant Grass Seeding", measured as specified herein, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification. Payment for Salt Tolerant Grass Seeding shall be in accordance with the following:

(a) Sixty five (65%) percent of quantity following supply and placement.

(b) Remaining thirty five (35%) percent of quantity following termination of the Maintenance Period.

E23. CLEARING AND GRUBBING

DESCRIPTION

E23.1 Further to CW 3010-R4, this specification covers the clearing and grubbing of the proposed multi-use pathway area on the south side of Murray Park Road from Sturgeon Road to Cree Crescent (West Leg).

CONSTRUCTION METHODS

E23.2 Trees shall be removed and disposed of by a pre-qualified subcontractor in accordance with the City's 'Guidelines for Maintaining City Owned Trees'. 'Guidelines for Maintaining City Owned Trees' and a list of pre-qualified contractors are located at:

https://winnipeg.ca/publicworks/parksOpenSpace/UrbanForestry/Homeowner_Tree_Maintenance_Guidelines.stm

E23.3 The Urban Forestry Branch has already approved the removal of trees at this location.

E23.4 The Contract Administrator will notify the Urban Forestry Branch when the trees have been removed.

MEASUREMENT AND PAYMENT

E23.5 Clearing and grubbing will be paid for at the Contract Unit Price per hectare for ‘Clearing and Grubbing’, measured as specified herein, which price shall be payment in full for performing all operations herein described in this specification.

APPENDIX ‘A’

MANITOBA HYDRO ELECTRICAL STANDARDS

Appendix A

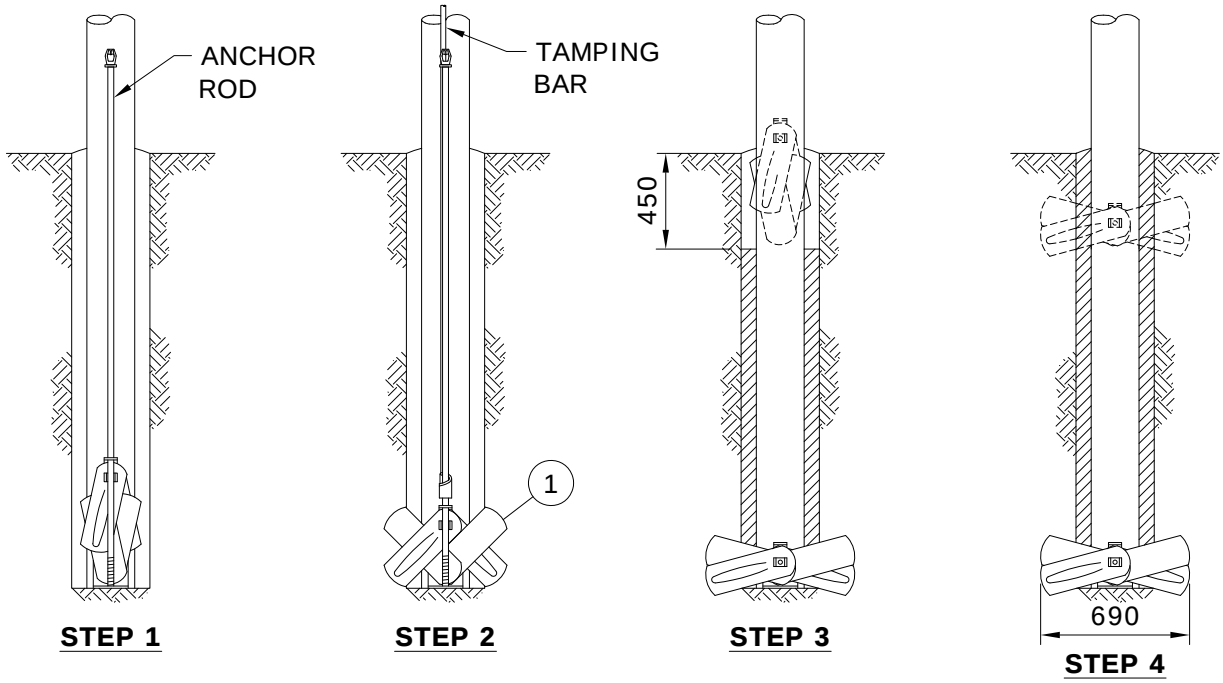
Electrical Standards
(2020 Streetlight Installations)

Refer to electronic copy issued under separate cover

Electric Standards for Streetlight Installations Table of Contents

Updated: April 8, 2020

INSTALLATION INSTRUCTIONS



STEP 1: SCREW A 3/4" ANCHOR ROD (NOT INCLUDED WITH ANCHOR) INTO THE POLE KEY AND LOWER THE ASSEMBLY, IN THE CLOSED POSITION, INTO THE HOLE ON THE SIDE OPPOSITE THE STRAIN.

STEP 2: EXPAND THE KEY INTO SOLID EARTH WITH AN EXPANDING/TAMPING BAR.

STEP 3: WHEN THE KEY IS FULLY EXPANDED, REMOVE THE ROD AND REFILL HOLE, CAREFULLY COMPACTING SOIL BACKFILL IN STAGES, TO WITHIN 450mm OF THE GROUND LEVEL.

STEP 4: INSTALL A SECOND POLE KEY ON THE OPPOSITE SIDE OF THE POLE FROM THE ORIGINAL KEY, AND EXPAND INTO SOLID EARTH WITH A TAMPING BAR.

MATERIAL LIST

ITEM No.	DESCRIPTION	MH CIIC CODE
1.	EXPANDING POLE KEY, 690mm (27 1/4") EXPANDED WIDTH, 276 sq. in. EXPANDING AREA	02 20 01
2.	ROD, ANCHOR 3/4"	71 31 34
3.	BAR, TAMPING	06 10 60

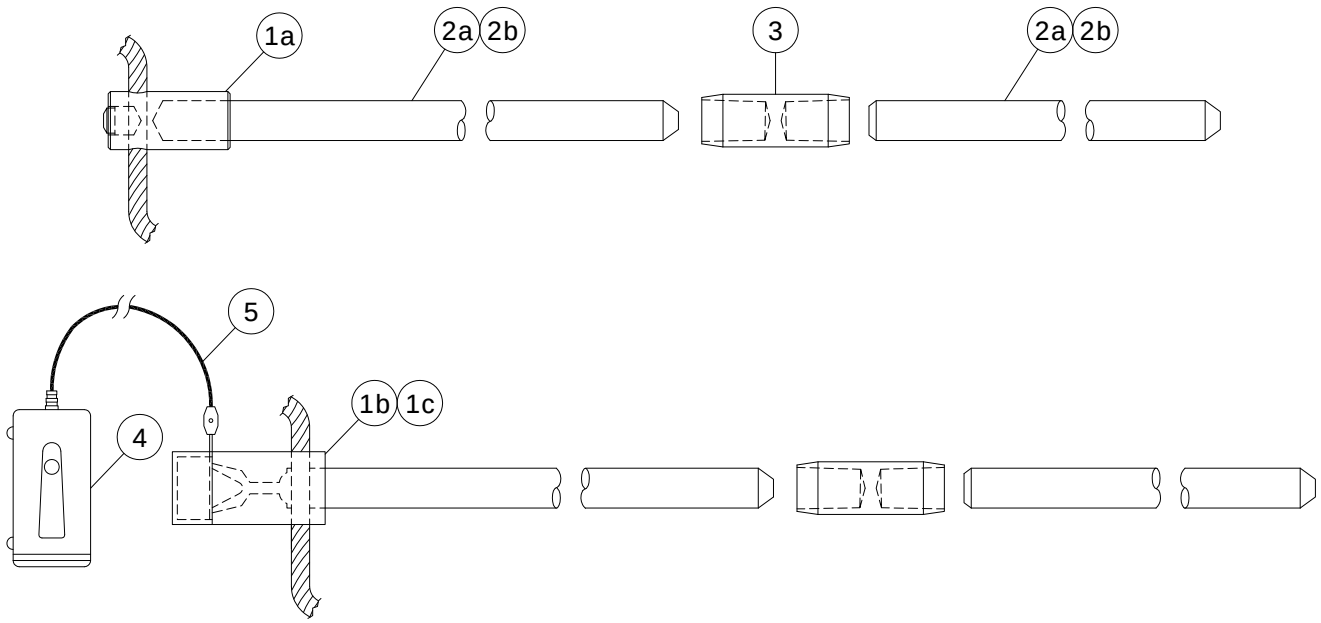
NOTES:

1. USE WITH SLACK SPANS (SEE CD42-30) AND LIGHTLY LOADED POLES WHERE A GUY & ANCHOR CANNOT BE USED (LOADS LESS THAN 3000N).
2. DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY D.R. ORR 15-10-22	17-04	2	REVISED NOTE 1	**COMPONENTS AND INSTALLATION OF EXPANDING POLE KEY ANCHORS**
	16-12	1	REVISED ANCHOR ROD, STEP 4, ITEM NO. 3, & NOTE 1	
	15-06	0	REPLACED CD40-48	

DRAWN	CHECKED	DATE		SHT	REV
C.A.	G.D./D.O.	15-06	**CD 44-30**	0001 OF 1	02

1-04430-DA-24200-0070



COPPERWELD - SECTIONAL

ITEM No.	DESCRIPTION	MH CIIC
1a	HAMMERLOCK FOR #2 & #4 CU	04 60 24
1b 1c	ONE SHOT PLUS FOR 2/0 ONE SHOT PLUS FOR 4/0	03 59 15 03 77 06
2a 2b	10' CU-WELD ROD SECTIONAL (SEE NOTE 2) 6' CU-WELD ROD SECTIONAL	71 70 10 00 68 26
3	COUPLING CU-WELD	00 52 27
4	ELECTRONIC IGNITER FOR ONE SHOT PLUS WITH 15' CORD	03 59 10
5	15' REPLACEMENT CORD	03 67 43

NOTES:

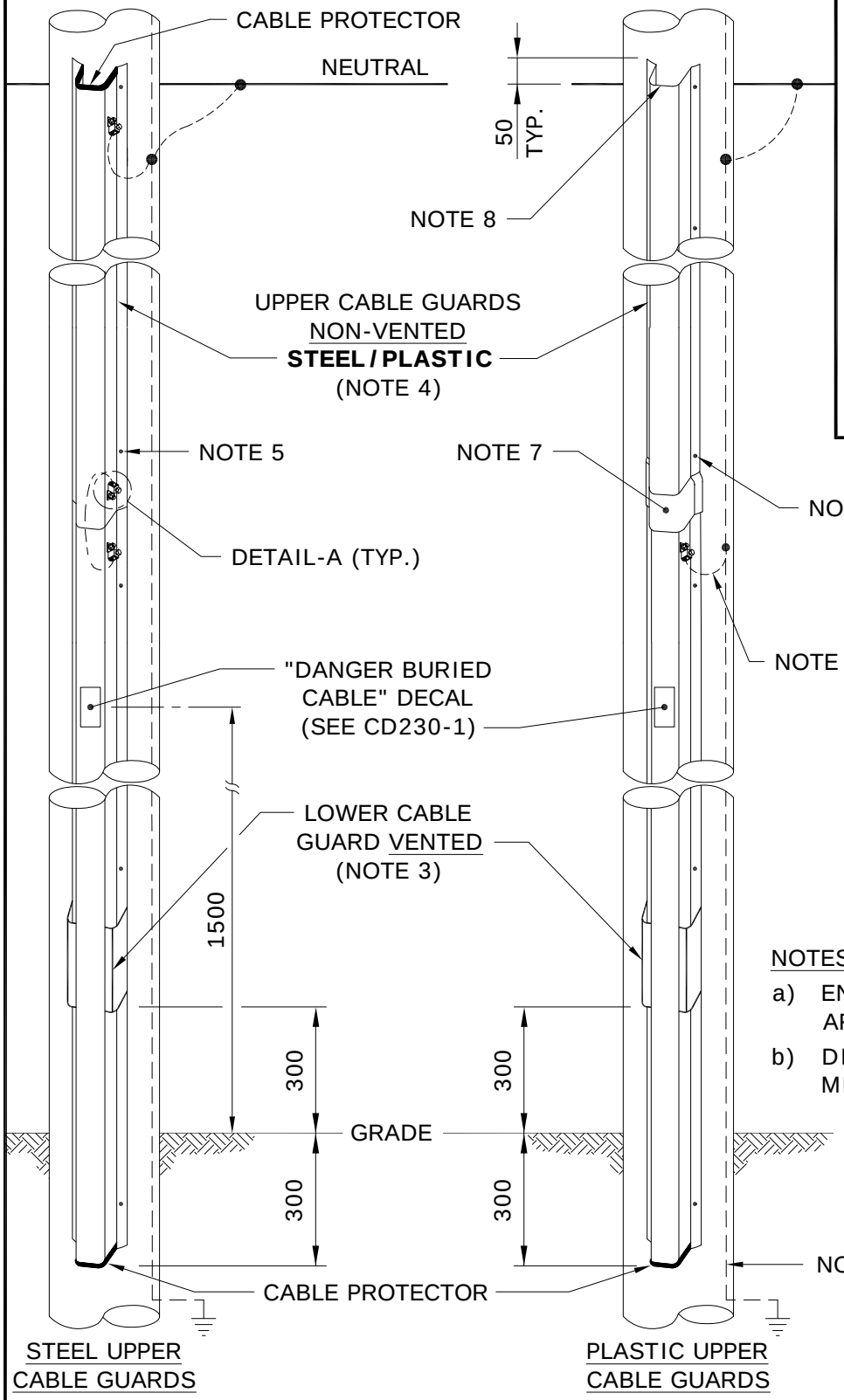
1. FOR 3/4" GROUND RODS. IF A 5/8" GROUND ROD IS ENCOUNTERED, IT IS TO BE REPLACED WITH A 3/4" ROD.

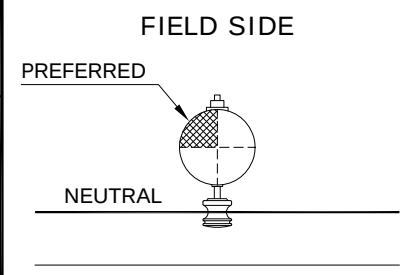
2. FIRST GROUND ROD SHALL BE A 10' ROD.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 99-01-04	13-01	3	ADDED HAMMERLOCK CONNECTOR	**GROUND ROD MATERIAL DETAIL**
	08-07	2	ADDED ELECTRONIC IGNITER & REVISED TABLE	
	00-08	1	REMOVED STEEL AND GALVANIZED RODS, ONE SHOT ADDED	

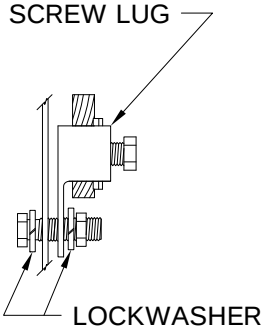
DRAWN	CHECKED	DATE		SHT	REV
R.L.B./CAD	D.F./D.O.	98-08	**CD 50-7**	0001 OF 1	03

1-04430-DA-56800-0003





CABLE GUARD LOCATION
(NOTE 2)



DETAIL-A

NOTES:

a) ENSURE POLE TAG IS VISIBLE AFTER GUARD INSTALLATION.

b) DIMENSIONS SHOWN ARE MILLIMETRES.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 15-10-29	16-04	4	REVISED NOTE	**CABLE GUARD DETAILS ON DIP/RISER POLES**		
	15-10	3	ADDED NOTE a), RESEALED			
	99-10	2	PLASTIC CABLE GUARD AND SHEET 2 ADDED			
DRAWN C.A.	CHECKED J.R.		DATE 15-10	**CD 200-63**	SHT 0001 OF 2	REV 04

1-04431-DA-52090-0034

NOTES:

1. FOR CABLE GUARD SELECTION GUIDE, REFER TO DRAWING CD200-66.
2. TO PROVIDE A SAFER CLIMBING SURFACE AND TO PREVENT VEHICULAR DAMAGE TO THE CABLE GUARD, THE PREFERRED ATTACHMENT OF THE CABLE GUARD TO THE POLE SHOULD BE IN THE QUADRANT AS SHOWN.
3. THE LOWER CABLE GUARD SHALL BE GALVANIZED STEEL AND VENTED.
4. UPPER CABLE GUARD SHALL BE PLASTIC FOR THE 50mm & 90mm GUARDS AND GALVANIZED STEEL FOR THE 130mm GUARD.
5. ATTACH GALVANIZED STEEL CABLE GUARD TO POLE WITH 3/8" LAG SCREWS (72-60-03).
6. ATTACH THE PLASTIC CABLE GUARD TO THE POLE WITH #16 x 2" WOOD SCREWS (72-95-10), C/W FLAT WASHERS (86-10-04).
7. POSITION THE LAP-JOINT OF THE PLASTIC CABLE GUARD DOWN & OVER LAPPED A MINIMUM OF 25mm ONTO THE VENTED CABLE GUARD.
8. ENSURE THAT THE INNER EDGE IS BEVELLED.
9. CABLE GUARD TO EXTEND 50mm ABOVE THE NEUTRAL CONDUCTOR.
10. GROUNDING AND BONDING CONDUCTORS SHALL BE #4 BARE COPPER.
11. FOR GROUNDING CONNECTIONS, REFER TO DRAWING CD200-60.
12. BOND VENTED CABLE GUARD AT THIS POINT.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 99-11-03

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 15-10-29				**CABLE GUARD DETAILS ON DIP/RISER POLES**		
	16-04	2	ADDED FLAT WASHERS TO NOTE 6			
	15-10	1	RESEALED			
DRAWN C.A.	CHECKED J.R.		DATE 15-10	**CD 200-63**	SHT 0002 OF 2	REV 02

1-04431-DA-52090-0034

SECONDARY CABLE	TYPICAL USAGE
#4 AL. CONCENTRIC NEUTRAL	STREET LIGHT CIRCUITS
1/0 AL. TRIPLEX	SECONDARY RESIDENTIAL SERVICES AND HEAVILY LOADED STREET LIGHT CIRCUITS WHERE VOLTAGE DROP MAY BE A PROBLEM
4/0 AL. TRIPLEX	SECONDARY RESIDENTIAL SERVICES
350 TRIPLEX	SECONDARY RESIDENTIAL SERVICES
4/0 AL. TRIPLEX	THREE PHASE SECONDARY SERVICES ADD #2 Cu BARE NEUTRAL UP TO 200 AMP
350 AL. QUADRAPLEX	THREE PHASE SECONDARY SERVICES 400 AMP OR 200A OVER 75m
750 AL. OR 1000 CU.	THREE PHASE SECONDARY SERVICES OVER 400 AMPS

NOTE:

SEE CD225-4 FOR SIZING AND SPACING OF SINGLE AND THREE PHASE CONDUCTORS.

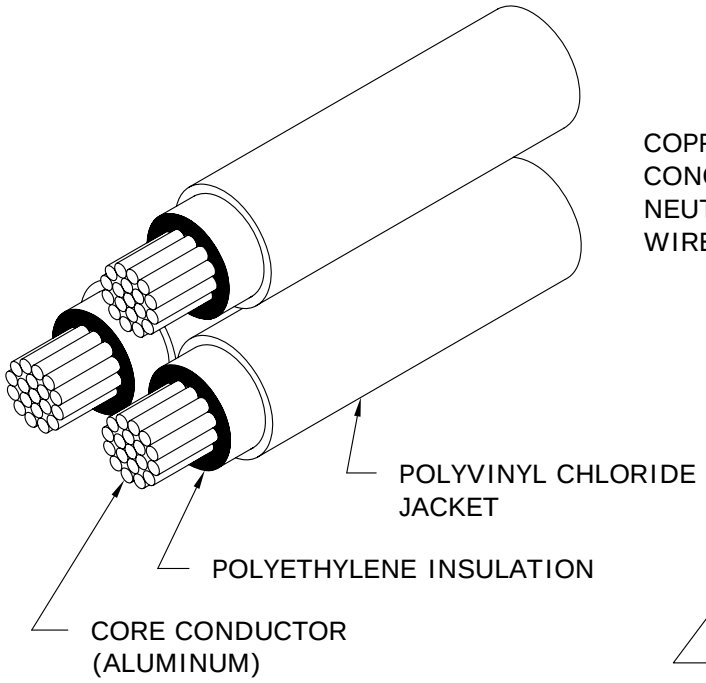
SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 88-03-29

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-01-25	17-01	11	ADDED 4/0 AL TRIPLEX TO TABLE, RESEALED	**UNDERGROUND SECONDARY CABLE**
	06-03	10	ADDED NOTE AND 350 TRIPLEX	
	99-04	9	4/0 AL. TRIPLEX, NOTE CHANGED	

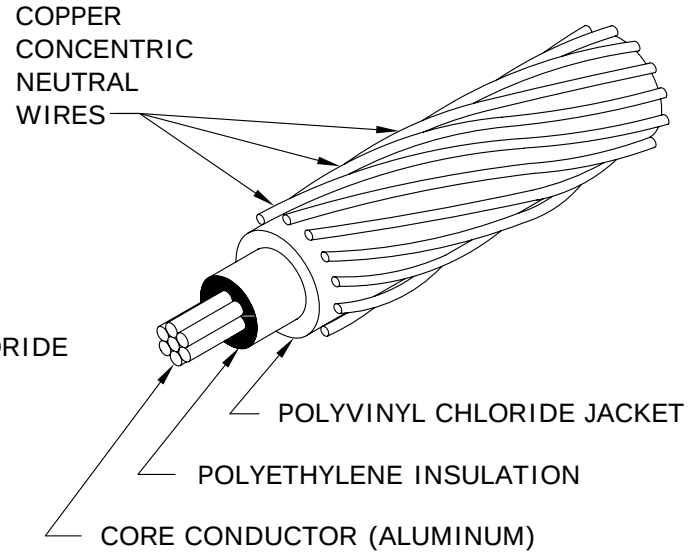
DRAWN	CHECKED	DATE		SHT	REV
C.A.	K.S.	17-01	**CD 210-12**	0001 OF 2	11

1-04431-DA-58041-0008

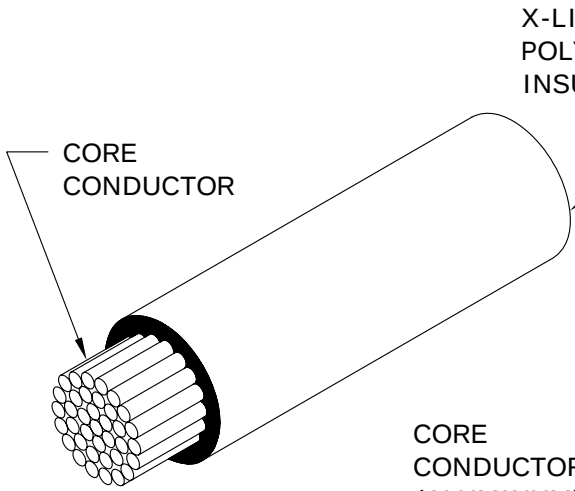
BASIC CONSTRUCTION OF UNDERGROUND SECONDARY CABLES



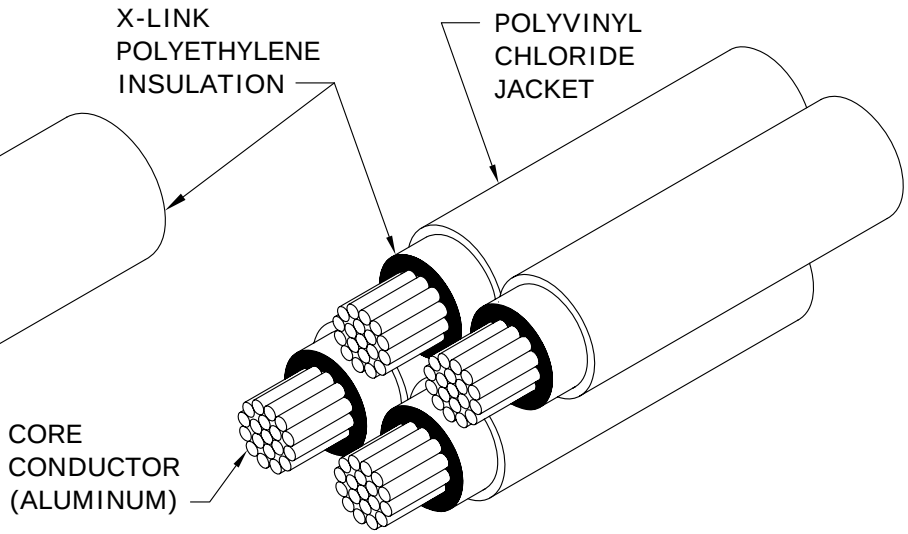
1/0 & 4/0 AND 350 TRIPLEX



 # 4 CONCENTRIC NEUTRAL CABLE



750 kcmil (AL) & 1000 kcmil (CU) RWU



350 kcmil QUADRAPLEX

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03	06-03	2	REPLACED 4/0 TRIPLEX WITH 4/0 & 350 TRIPLEX	**UNDERGROUND SECONDARY CABLE**
	95-01	1	C/N WIRES NO LONGER TINNED	
	93-07	0	500 MCM DELETED 350 750 kcmil ADDED FORMERLY CD210-3	

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	B.H.	93-07	**CD 210-12**	0002 OF 2	02

1-04431-DA-58041-0008

UNDERGROUND SECONDARY CABLE

VOLTAGE RATING	600V	600V	600V	600V	1000V	1000V	1000V
CORE CONDUCTOR SIZE	#4	1/0	4/0	350 kcmil	750 kcmil	1000 kcmil	1000 kcmil
CORE CONDUCTOR MATERIAL	ALUM.	ALUM.	ALUM.	ALUM.	ALUM.	ALUM.	COPPER
TYPE OF CABLE	C/N	TRIPLEX	TRIPLEX	TRIPLEX OR QUADPLEX	1-COND.	1-COND.	1-COND.
NEUTRAL SIZE AND TYPE	#6 CU. Concentric Neutral	1/0 ALUM.	4/0 ALUM.	350 kcmil ALUM.	NONE	NONE	NONE
MIN. BENDING RADIUS (mm)	125	115	150	180	250	300	300
DC RESISTANCE @ 20°C (OHMS/km)	1.360	0.538	0.269	0.163	0.076	0.057	0.035
** DIRECT BURIED AMPACITY (@ 20°C ambient)	125	215	300	420	* 725	* 840	* 1080
VENTED CABLE GUARD AMPACITY (@ 20°C ambient)	100	175	250	330	575	680	855
*** BURIED DUCT AMPACITY (@ 20°C ambient)	70	130	195	265	425	495	630
CONDUCTOR DIAMETER (mm)	5.4	8.9	12.7	15.8	25	26.9	26.9
NOMIMAL DIA. OVER INSUL. (mm)	8.6	12.5	16.5	21.6	31.4	33.5	33.5
NOMINAL DIA. OVER JACKET (mm)	12.74	14.7	17.8	22.8	N/A	N/A	N/A
LINEAL MASS (kg/km)	N/A	760	1320	2200/2900	1330	1369	4983
COLD SHRINK END CAPS (MH CIIC)	N/A	15 31 40	15 31 40	15 31 60	15 31 75	15 31 75	15 31 75
HEAT SHRINK END CAPS (MH CIIC)	03 67 31	03 67 31	03 67 31	03 67 30	01 79 82	03 48 63	03 48 63

* PROVIDED MULTIPLE CONDUCTORS PER PHASE ARE SPACED AS SHOWN IN DRAWING CD225-4.

** CABLES DIRECTLY BURIED OUT OF PADMOUNT TRANSFORMERS OR PEDESTALS.

*** CABLES IN NON-VENTED CABLE GUARDS OR IN CONDUITS LONGER THAN 2 METRES.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

APPROVED

ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 16-03-30

REVISIONS		
17-01	5	REVISED TABLE
16-03	4	ADDED 1000 kcmil ALUM. COND., REVISED DATE, RESEALED
08-12	3	ADDED COLD & HEAT SHRINK CAPS AND LINEAL MASS TO TABLE

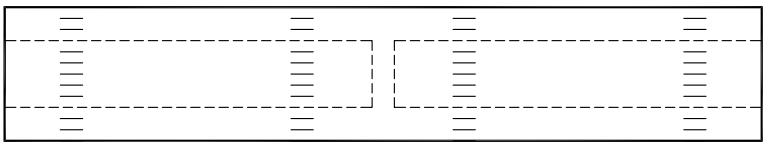
MANITOBA HYDRO DISTRIBUTION STANDARDS

STANDARD UNDERGROUND

SECONDARY CABLE DATA

DRAWN	CHECKED	DATE		SHT	REV
C.A.	J.R.	16-03	**CD 210-15**	0001 OF 1	05

1-04431-DA-58041-0009



- FOR SPLICING SECONDARY ALUMINUM/COPPER CONDUCTORS.
- NOT SUITABLE FOR USE ON PRIMARY CONDUCTORS.
- COMPLETE WITH BARRIER TO PREVENT MOISTURE MIGRATION.
- FILLED WITH SYNTHETIC INHIBITOR.
- STAMPED WITH CONDUCTOR AND DIE SIZE.
- **COMPRESSION TOOL DIE MUST MATCH DIE NUMBER STAMPED ON CONNECTOR.**
- WIRE BRUSH ALL CONDUCTORS PRIOR TO INSTALLING CONNECTOR.

*** UNDERGROUND SECONDARY CABLE COMPRESSION CONNECTORS**

CONDUCTOR SIZE		STORES CODE	TOOL (DIES)	
FROM	TO		PREFERRED	ALTERNATE
#4	#4	74 27 64	Y35 (UCSA 22)	** MD6 (WCSA 22, BG)
1/0	#2	74 27 30		
1/0	1/0	74 27 65		
4/0	1/0	74 27 67	Y35 (UCSA 24)	** MD6 (WCSA 24, 249)
4/0	4/0	74 27 68		
350	4/0	74 27 78	Y35 (UCSA 28)	---
350	350	74 27 72		
750	500	74 27 27	Y46/ADPT (UCSA 30)	---

* FOR CONNECTING INSULATED ALUMINUM TO BARE COPPER, REFER TO DRAWING CD215-13.

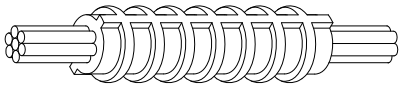
** ROTATE MD6 TOOL 180° AFTER EVERY CRIMP.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03				**UNDERGROUND SECONDARY CABLE COMPRESSION CONNECTORS**
	95-09	2	350-4/0 CONNECTOR ADDED	
	95-01	1	NOTE ON MD6 TOOL ADDED	

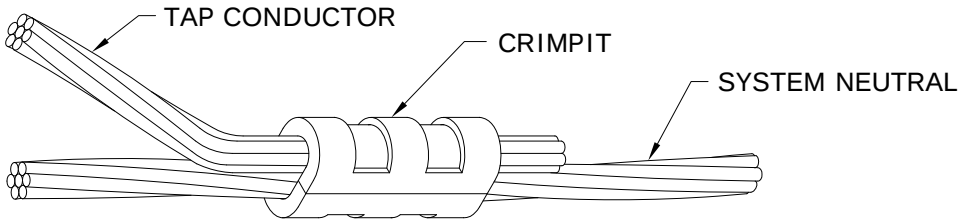
DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	G.W.	93-07	**CD 210-21**	0001 OF 1	02

1-04431-DA-58043-0006

- COMPRESSION TOOL DIE MUST MATCH DIE NUMBER STAMPED ON CONNECTOR.
- WIRE BRUSH CONDUCTORS PRIOR TO INSTALLING COMPRESSION CONNECTORS.



UNDERGROUND NEUTRAL COMPRESSION CONNECTORS			
CONDUCTOR SIZE		STORES CODE	TOOL (DIES)
FROM	TO		
#4	#4	74 32 04	MD6 (162)
#2	#2	74 32 02	MD6 (163)
2/0	2/0	74 31 26	MD6 (166)
4/0	4/0	74 31 28	Y35 (168)
350	350	74 32 31	Y35 (267)



UNDERGROUND NEUTRAL "C" TYPE (CRIMPIT) COMPRESSION CONNECTORS * (FOR USE ON COPPER CONDUCTORS ONLY)			
CONDUCTOR SIZE		STORES CODE	TOOL (DIES)
RUN	TAP		
#6 - #4	#6	74 41 10	MD6 (BG)
#4	#4	74 40 90	MD6 (BG)
#2	#4	74 40 80	MD6 (WC)
#2	#2	74 40 70	MD6 (WC)
1/0 - 2/0	1/0 - 2/0	74 41 12	Y35 (UO)
3/0 - 250	#6 - 2/0	74 41 15	Y35 (U997)
3/0 - 250	3/0 - 250	74 41 16	Y35 (U997)
300 - 500	#6 - 2/0	54 23 60	Y46 (P1011)
300 - 500	3/0 - 250	18 30 74	Y46 (P1011)

* FOR CONNECTING BARE COPPER TO INSULATED ALUMINUM, REFER TO DRAWING CD215-13.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03	10-12	2	ADDED CONNECTOR	**UNDERGROUND NEUTRAL COMPRESSION CONNECTORS**
	95-01	1	NOTES REARRANGED	
	93-07	0	CONNECTORS ADDED, FORMERLY CD210-8	

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	K.C.H.	93-07	**CD 210-24**	0001 OF 1	02

1-04431-DA-58043-0007

THERE ARE THREE METHODS FOR SPLICING 600 VOLT UNDERGROUND SECONDARY CABLES:

1) HEAT SHRINK INSULATING TUBING SPLICE

2) PRE-STRETCHED INSULATING TUBING SPLICE

3) TAPED SPLICE

750 kcmil AND 1000 kcmil CABLES, USED IN CONJUNCTION WITH 3-PHASE COMMERCIAL SERVICES, SHALL NOT BE SPLICED, EXCEPT FOR EMERGENCY REPAIRS.

GENERAL INSTRUCTIONS:

1. a) FOR 1/0 AND 4/0 TRIPLEX CABLES:
   - REMOVE ANY DAMAGED OR CONTAMINATED PORTIONS OF CABLE.
   - TRAIN CABLES INTO FINAL POSITION (DO NOT SNAKE IN TRENCH).
   - CUT CABLES SQUARE AND BUTT ENDS.
   - STAGGER SPLICES.
   - PROCEED TO STEP 2.

   b) FOR #4 CONCENTRIC NEUTRAL CABLE:
   - REMOVE ANY DAMAGED OR CONTAMINATED PORTIONS OF CABLE.
   - TRAIN CABLES INTO FINAL POSITION WITH ENDS OVERLAPPING C/L BY 150mm.
   - TIGHTLY TWIST CONCENTRIC NEUTRAL WIRES INTO A BUNDLED CONDUCTOR FOR APPROXIMATELY 250mm AND TEMPORARILY FOLD BACK.
   - CUT OFF APPROXIMATELY 100mm OF CABLE FROM EACH END.
   - PROCEED TO STEP 2.

2. SELECT APPROPRIATE SLEEVE AND DIE ACCORDING TO DRAWING CD210-21.

3. SELECT SPLICING METHOD (FOR CORRECT MANUFACTURED SPLICES, REFER TO TABLE ON SHEET 2 of 3).

   NOTE:

   FOR SPLICING BARE COPPER NEUTRAL WIRE TO INSULATED ALUMINUM CABLE, REFER TO DRAWING CD215-13.

4. REMOVE JACKET AND INSULATION FROM CABLES AS PER FIGURE 1 OR FOLLOW MANUFACTURERS INSTRUCTIONS; BE CAREFUL NOT TO NICK INSULATION OR CONDUCTOR.

5. CLEAN CONDUCTOR WITH WIRE BRUSH. INSTALL CONNECTOR.

   NOTE:

   EXCEPT FOR TAPED SPLICE, SLIDE TUBING OVER ONE CONDUCTOR BEFORE INSTALLING CONNECTOR.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-10-11	17-10	3	REMOVED RAYCHEM RAYVOLVE SPLICING, RESEALED	**SPLICES FOR UNDERGROUND SECONDARY CABLES**
	96-05	2	NOTES REVISED, SHEET 3 ADDED	
	95-01	1	NOTES 3, 7 & TABLE ADDED	

DRAWN	CHECKED	DATE		SHT	REV
C.A.	K.S.	17-10	**CD 215-12**	0001 OF 3	03

6. CLEAN JACKET (50mm), INSULATION, AND CONNECTOR WITH AN APPROVED CLEANING SOLVENT (S.C.# 43 11 95).

7. COMPLETE SELECTED SPLICE (AS CHOSEN IN STEP 3).

   NOTE:

   TO COMPLETE #4 CONCENTRIC NEUTRAL SPLICE, PROCEED TO STEP 8.

8. FOR #4 CONCENTRIC NEUTRAL CABLE: (CONT'D)

   a) APPLY 1 LAYER OF 1/4 STRETCHED 50mm WIDE RUBBER MASTIC TAPE (S.C.#78 55 28) OVER CENTRE OF COMPLETED SPLICE.

   b) TRAIN TWISTED CONCENTRIC NEUTRAL WIRE (STEP 1b) INTO FINAL POSITION ALLOWING ADEQUATE CLEARANCE FOR MD6 PRESS.

   c) PLACE "C" TYPE COMPRESSION CONNECTOR OVER TWISTED WIRES AND CRIMP. REFER TO DRAWING CD210-24.

   d) TRIM OFF PROTRUDING WIRES AND COMPRESS WITH PLIERS ELIMINATING ANY SHARP ENDS.

   e) APPLY A 100mm STRIP OF 50mm WIDE RUBBER MASTIC TAPE OVER CONNECTOR AND PROTRUDING WIRES.

      NOTE:

      SHINY SIDE AGAINST CONNECTOR AND THE 100mm LENGTH PARALLEL TO CONNECTOR AND WIRE.

   f) FORM TAPED CONCENTRIC NEUTRAL CONNECTION AND WIRES AROUND SPLICE AND CABLE.

   g) APPLY 2 LAYERS 3/4 STRETCHED COLD WEATHER VINYL TAPE (S.C.#78 55 98) OVER TAPED CONCENTRIC NEUTRAL CONNECTION AND SPLICE, APPROXIMATELY 50mm WIDE.

MANUFACTURED SPLICES FOR SECONDARY CABLES

CONDUCTOR SIZE	TYPE OF SPLICE	STORES CODE
#4 TO 1/0	PRESTRETCHED	85 13 10
4/0 TO 350	PRESTRETCHED	85 13 40
	HEAT SHRINK	85 13 50

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

APPROVED

ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-10-11

REVISIONS		
17-08	4	REVISED TABLE, RESEALED
15-02	3	REMOVED RAYVOLVE SPLICE FROM TABLE
08-03	2	REVISED TABLE AND NOTE 6

MANITOBA HYDRO DISTRIBUTION STANDARDS

SPLICES FOR UNDERGROUND SECONDARY CABLES

DRAWN	CHECKED	DATE		SHT	REV
C.A.	K.S.	17-08	**CD 215-12**	0002 OF 3	04

1-04431-DA-58043-0017

FOR TAPED SPLICE

TAPES SHALL ONLY BE APPLIED DIRECTLY FROM ROLL ONTO SPLICE, HALF LAPPED AND STRETCHED TO 3/4 OF THIER ORIGINAL WIDTH.

1. APPLY 3 LAYERS OF SELF-AMALGAMATING ETHYLENE PROPYLENE RUBBER (E.P.R.) TAPE (S.C.#78 55 23) AS PER FIGURE 2.

2. APPLY 2 LAYERS OF COLD WEATHER VINYL TAPE (S.C.#78 55 98) AS PER FIGURE 2.

   OR

   APPLY 3 LAYERS OF SELF-AMALGAMATING HIGH TEMPERATURE SILICONE TAPE (S.C.#03 74 67). VINYL TAPE IS NOT REQUIRED.

NOTE:
DIMENSIONS SHOWN ARE MILLIMETRES.

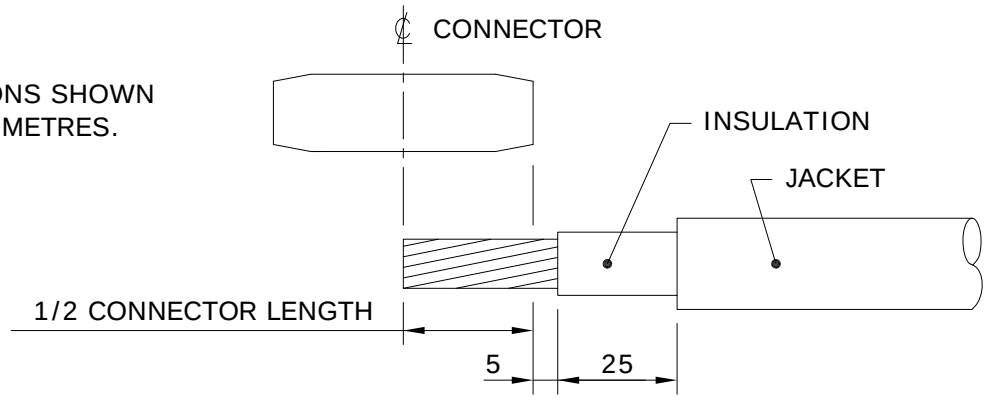


FIGURE 1

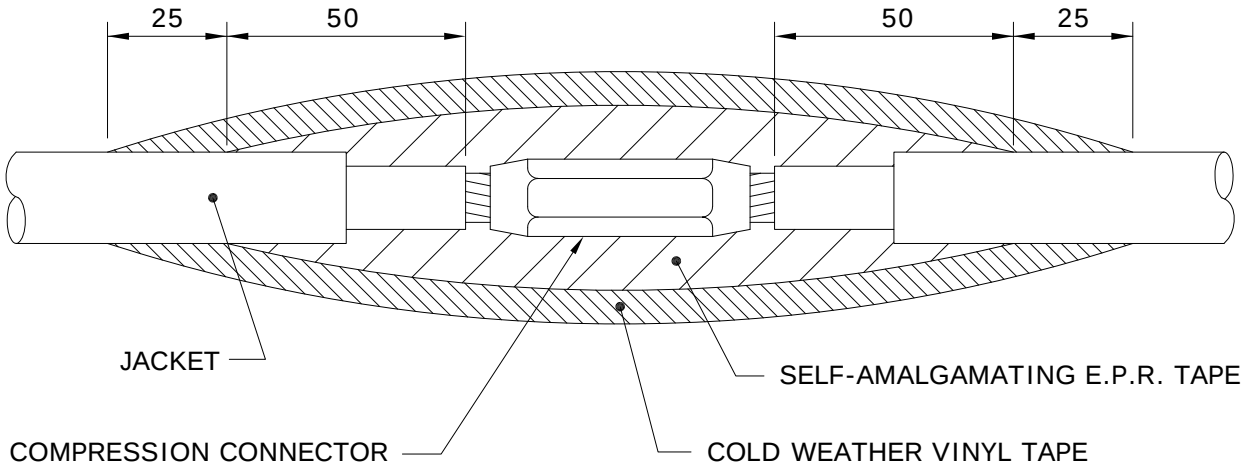


FIGURE 2

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 97-01-08

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 17-10-11				**SPLICES FOR UNDERGROUND SECONDARY CABLES**		
	17-10	2	RESEALED			
	10-12	1	REVISED COMPRESSION CONNECTOR AND NOTE 2			
DRAWN C.A.	CHECKED K.S.		DATE 17-10	**CD 215-12**	SHT 0003 OF 3	REV 02

1-04431-DA-58043-0017

CABLE PREPARATION:

1. REMOVE PVC (POLYVINYL CHLORIDE) JACKET TO DIMENSION "A" PLUS 25mm.

2. REMOVE POLYETHYLENE INSULATION TO DIMENSION "A" PLUS 5mm.
USE ABRASIVE TAPE (SC. 78 50 04) ON ALL CONNECTON SURFACES.

3. INSTALL ROD CONNECTOR AS PER TABLE BELOW AND FIGURE 1.

CONDUCTOR SIZE	* ROD CONNECTOR STORES CODE No.	PRESS	DIE
1/0 ALUMINUM	74 27 62	Y35/MD6	CSA 22
4/0 ALUMINUM	74 27 69	Y35/MD6	CSA 24

* ROD IS FACTORY CRIMPED INTO CONNECTOR

4. CONNECT BARE COPPER STRANDED WIRE TO ROD CONNECTOR AS PER TABLE BELOW. USE ABRASIVE TAPE ON ALL CONNECTON SURFACES.

CONDUCTOR SIZE	CONNECTOR STORES CODE No.	PRESS	DIE
COPPER ROD TO #4 COPPER STRANDED	74 40 90	Y35/MD6	WBG
COPPER ROD TO #2 COPPER STRANDED	74 40 70	MD6	WC

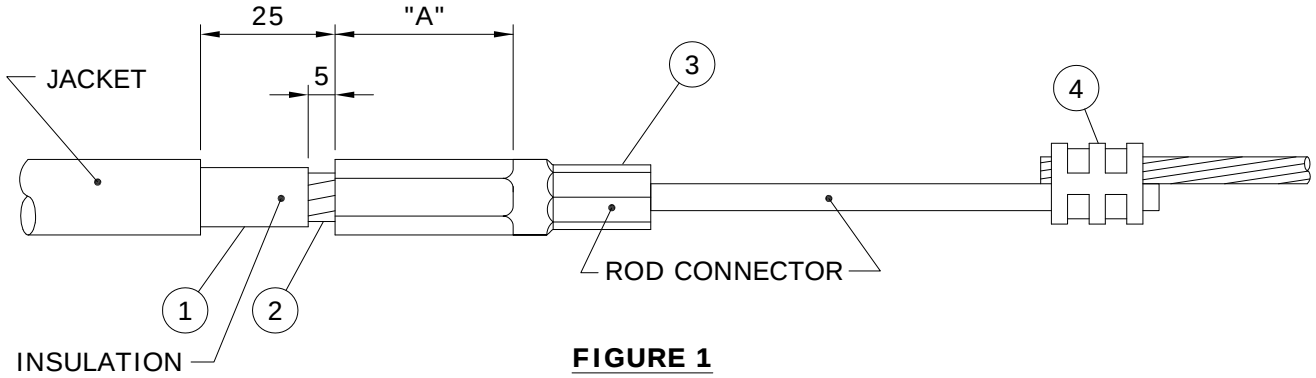


FIGURE 1

NOTE: DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03	08-11	2	REVISED TABLE AND COMPRESSION CONNECTOR	**SPLICING SECONDARY NEUTRAL (BARE COPPER TO INSULATED ALUMINUM)**
	94-10	1	ROD CONNECTOR ADDED	

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	B.H./K.C.H.	94-06	**CD 215-13**	0001 OF 2	02

1-04431-DA-58043-0018

TAPING:

(5) ABRADE ROD PORTION OF ROD CONNECTOR WITH ABRASIVE TAPE AS SHOWN IN FIGURE 2.

(6) CLEAN JACKET, INSULATION & ROD CONNECTOR WITH AN APPROVED CLEANING SOLVENT (S.C.# 43 11 95).

(7) CUT ONE PIECE OF RUBBER MASTIC TAPE (S.C. 78 55 28) INTO EITHER A 50mm WIDE x 75mm LONG STRIP FOR 1/0 CONNECTOR OR A 50mm WIDE x 125mm LONG STRIP FOR 4/0 CONNECTOR.

(8) APPLY THE PRECUT STRIP OF RUBBER MASTIC TAPE 1/4 STRETCHED, SHINING SIDE DOWN ONTO THE ROD AS SHOWN IN FIGURE 2.

(9) APPLY 2 LAYERS OF HALF LAPPED 3/4 STRETCHED SELF AMALGAMATING ETHYLENE PROPYLENE RUBBER TAPE (S.C.# 78 55 23) AS SHOWN IN FIGURE 2.

(10) APPLY 2 LAYERS OF HALF LAPPED 3/4 STRETCHED COLD WEATHER VINYL TAPE (S.C.# 78 55 98) AS SHOWN IN FIGURE 2.

NOTE:

WHEN INSTALLING A MANUFACTURED SPLICE INCLUDE STEPS 5 THRU 8 WITH THE MANUFACTURERS INSTRUCTIONS. THIS WILL PROVIDE THE PROPER INSULATION AND MOISTURE SEAL.

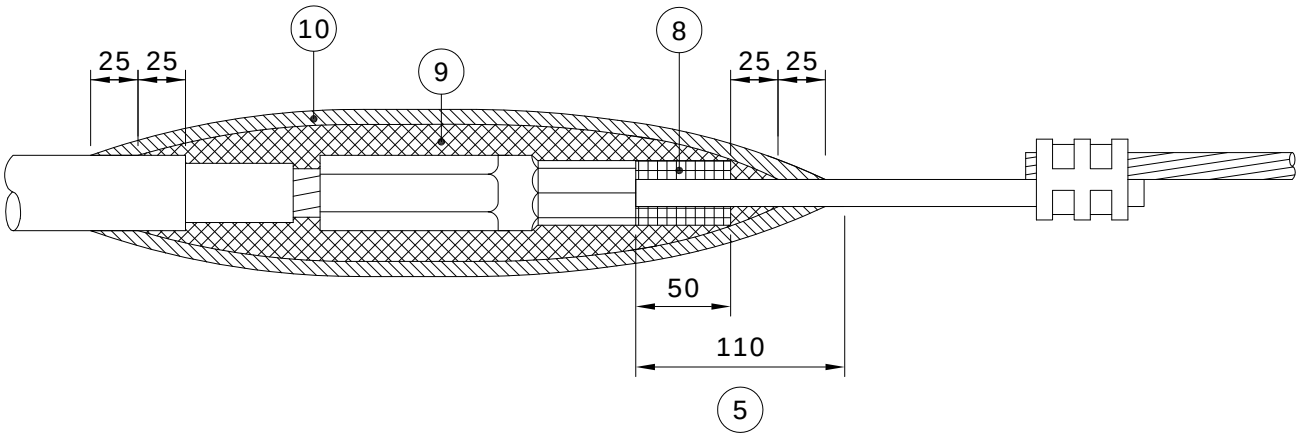
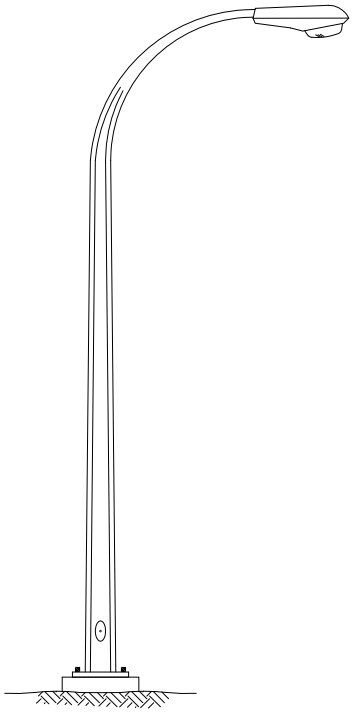


FIGURE 2

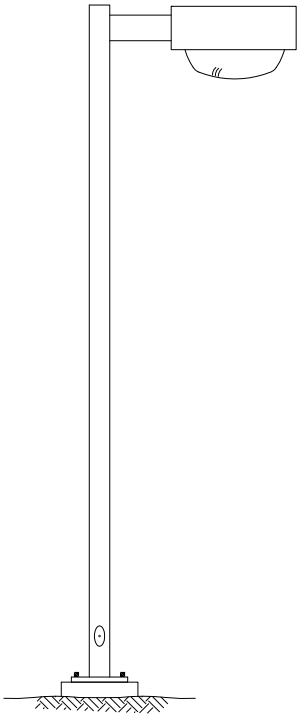
NOTE: DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 94-07-03				**SPLICING SECONDARY NEUTRAL (BARE COPPER TO INSULATED ALUMINUM)**		
	08-11	2	REVISED NOTE 6 & COMPRESSION CONNECTOR			
	94-10	1	TAPING PROCEDURE REVISED			
DRAWN W.B./CAD	CHECKED K.C.H.		DATE 94-06	**CD 215-13**	SHT 0002 OF 2	REV 02

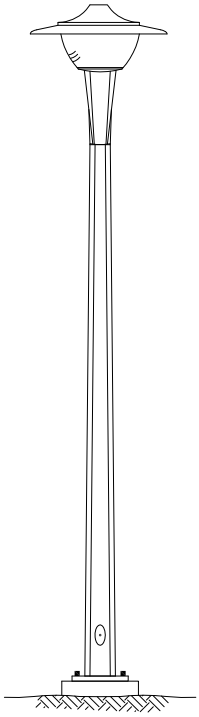
1-04431-DA-58043-0018



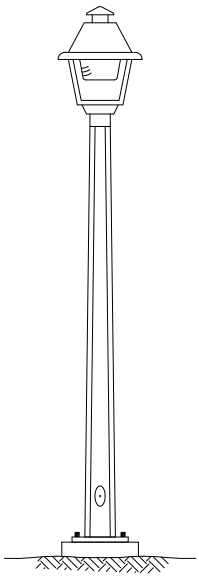
DAVIT BM
(BASE MOUNTED)



SQUARE BM
(BASE MOUNTED)



POST-TOP CONTEMPORARY BM
(BASE MOUNTED)



POST-TOP COLONIAL BM
(BASE MOUNTED)

POLE TYPE	COLOUR	MOUNTING HEIGHT m (ft)	ARM REACH m	BOLT SQUARE mm	BOLT CIRCLE mm	STORES CODE NO.	CABLE LENGTH m **
DAVIT BM	GALVANIZED	7.7 (25)	1.8	179	254	75 42 26	11
DAVIT BM *	GALVANIZED	9.1 (30)	2.4	197	279	75 43 30	13
DAVIT BM	GALVANIZED	10.7 (35)	3.0	206	292	75 44 36	15
DAVIT BM	GALVANIZED	13.7 (45)	3.0	243	343	75 46 45	18
SQUARE BM	DARK BRONZE	6.1 (20)	0.5	179	254	75 42 20	8
SQUARE BM	DARK BRONZE	10.7 (35)	0.5	206	292	75 45 30	14
POST-TOP BM CONTEMPORARY	GALVANIZED	6.1 (20)	N/A	179	254	75 41 22	7
POST-TOP BM COLONIAL	GALVANIZED	4.7 (15)	N/A	179	254	75 41 15	6

NOTES:

***** FOR REPLACEMENT PURPOSES; NOT TO BE USED FOR NEW INSTALLATIONS.

****** LENGTH OF 2 CONDUCTORS #12 CABLE REQUIRED PER POLE.

APPROVED

ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28

REVISIONS		
13-01	3	ADDED CONTEMPORARY AND COLONIAL POLES
12-05	2	REVISED DRAWING & CANCELLED SHEETS 2 AND 3
94-09	1	DELETED ORNAMENTAL

MANITOBA HYDRO DISTRIBUTION STANDARDS

STANDARD STEEL STREET LIGHT POLES

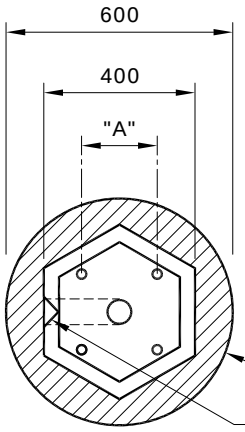
DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	L.D./D.O.	88-06	**CD 300-1**	0001 OF 1	03

1-04431-DA-25620-0001

7.7 - 10.7 STREET LIGHT POLES

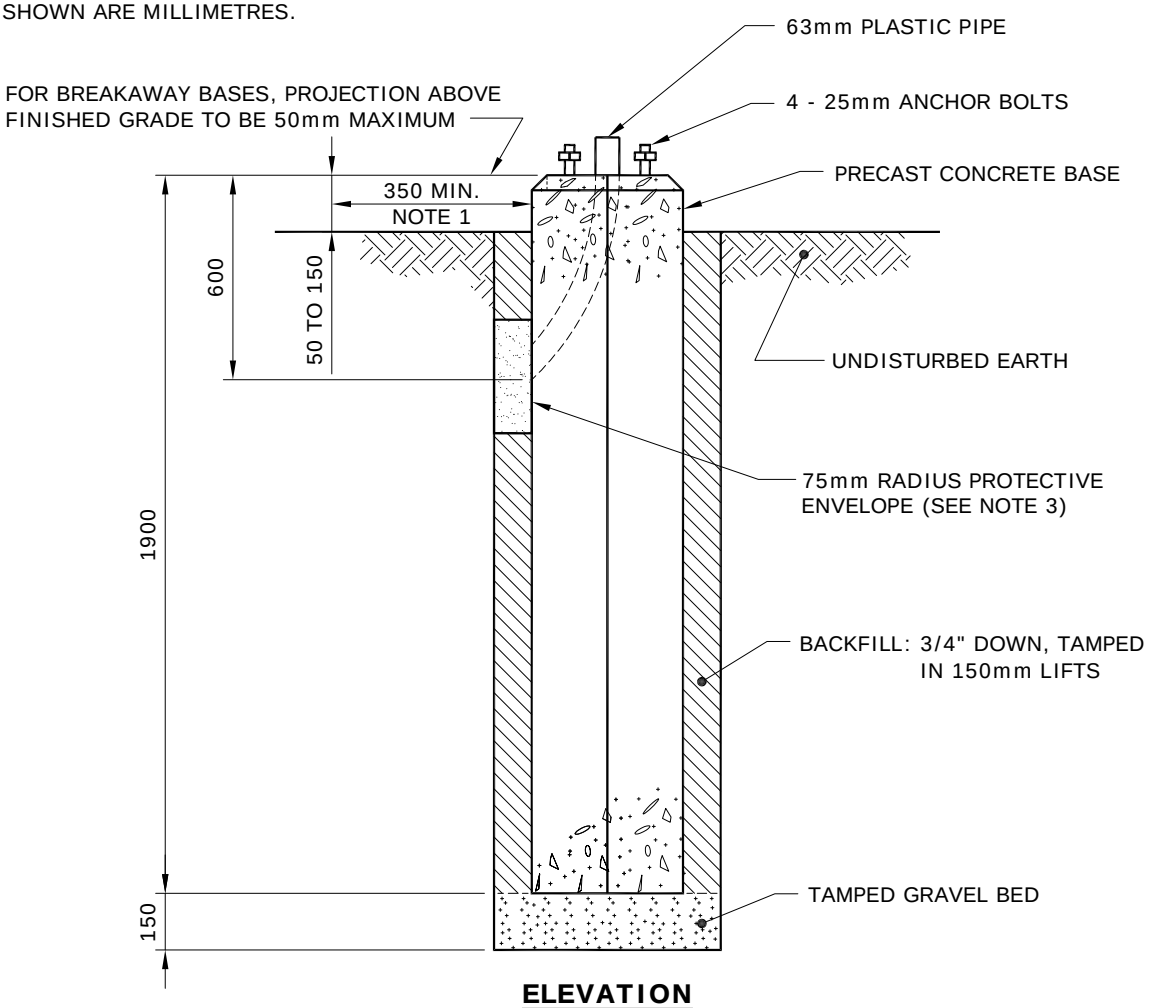
NOTES:

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
   a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
   b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. DIMENSIONS SHOWN ARE MILLIMETRES.



PLAN

"A" BOLT SQUARE	STORES CODE
179	54 11 59
197	54 13 79
206	54 14 89



ELEVATION

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-29	10-08	3	CHANGED BACKFILL NOTES, AND ADDED SHEET 3	**INSTALLATION OF PRECAST CONCRETE BASE**
	99-05	2	SHEET 2 of 2 ADDED, 7.7 - 10.7 STREET LIGHT ADDED	
	96-10	1	V-GROOVE LOCATION, POLY PIPE SIZE NOTES CHANGED	

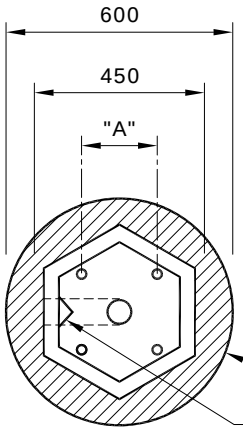
DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	L.D./K.C.H.	88-06	**CD 300-6**	0001 OF 3	03

1-04431-DA-24620-0001

13.7 STREET LIGHT POLE

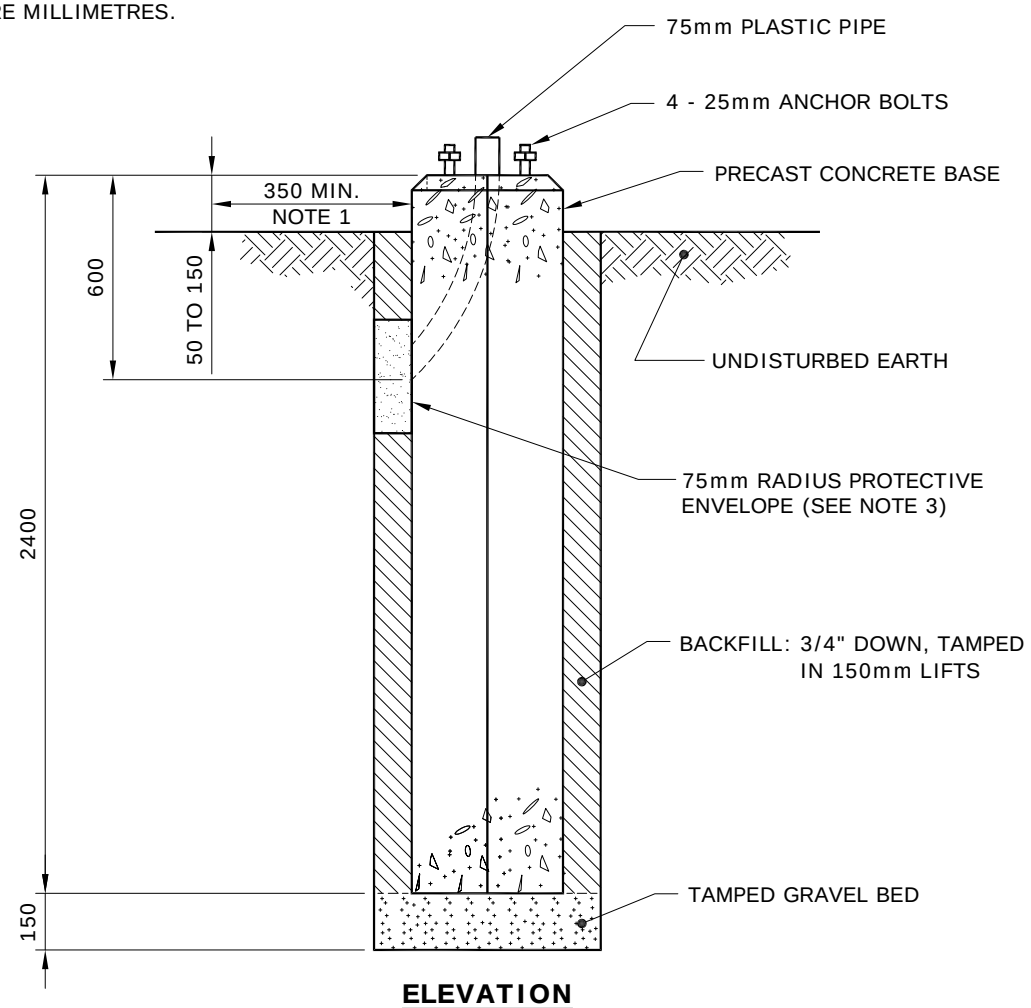
NOTES:

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
   a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
   b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. DIMENSIONS SHOWN ARE MILLIMETRES.



PLAN

"A" BOLT SQUARE	STORES CODE
243	00 06 67



ELEVATION

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-29	10-08 | 1 | CHANGED BACKFILL NOTES, AND ADDED SHEET 3	**INSTALLATION OF PRECAST CONCRETE BASE**

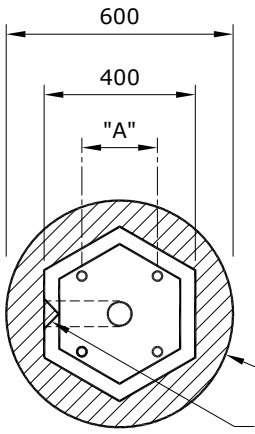
DRAWN	CHECKED	DATE		SHT	REV
R.L.B./CAD	L.D./K.C.H.	99-05	**CD 300-6**	0002 OF 3	01

1-04431-DA-24620-0001

7.7 - 10.7 STREET LIGHT POLES

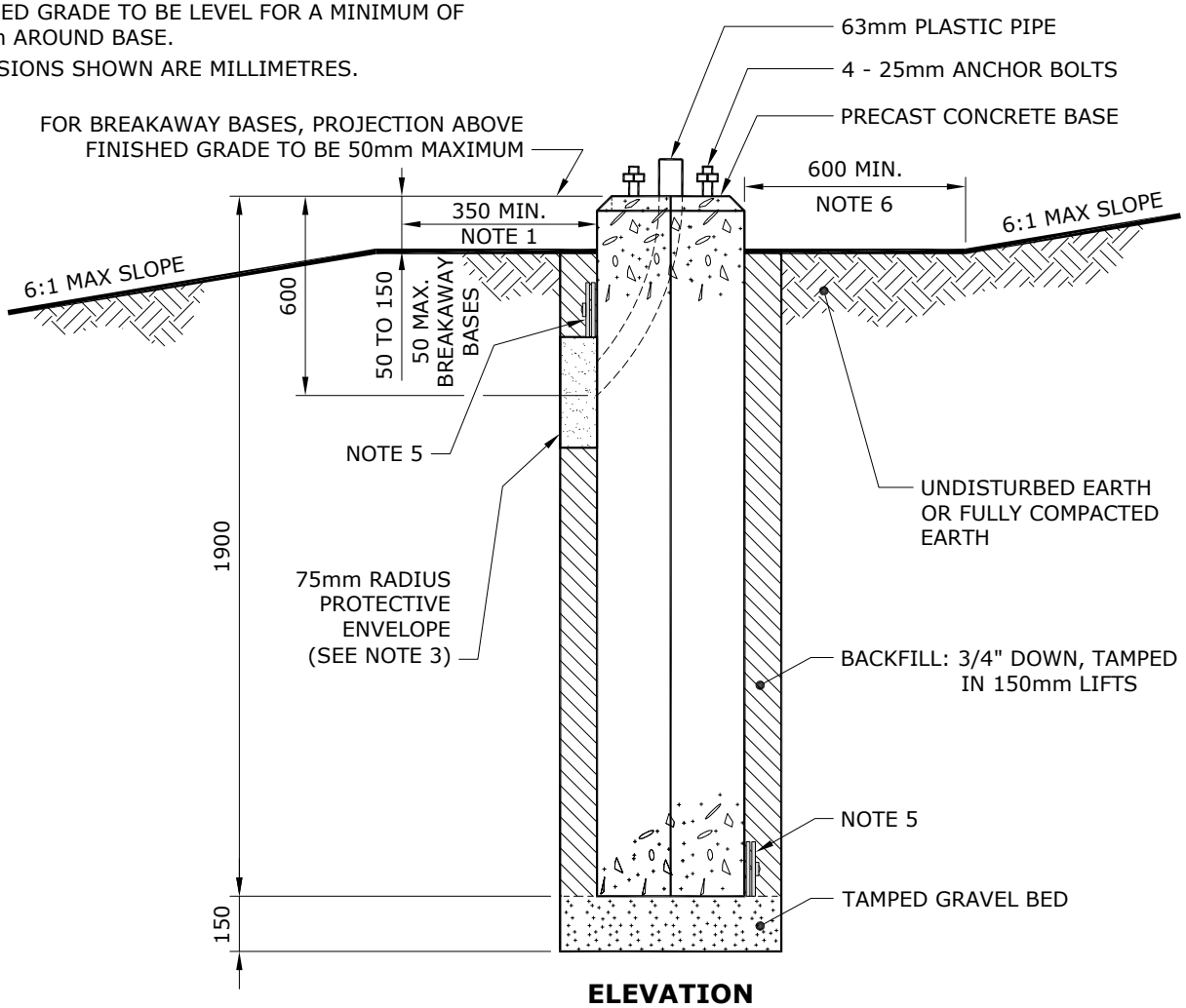
NOTES:

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
   a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
   b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. INSTALL EXPANDING POLE KEY ANCHOR PER CD44-30. ENSURE TOP ANCHOR DOES NOT OBSTRUCT CONDUIT ENTRY HOLE.
6. FINISHED GRADE TO BE LEVEL FOR A MINIMUM OF 600mm AROUND BASE.
7. DIMENSIONS SHOWN ARE MILLIMETRES.



PLAN

"A" BOLT SQUARE	STORES CODE
179	54 11 59
197	54 13 79
206	54 14 89



ELEVATION

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
		INSTALLATION OF PRECAST CONCRETE BASE ON SLOPE

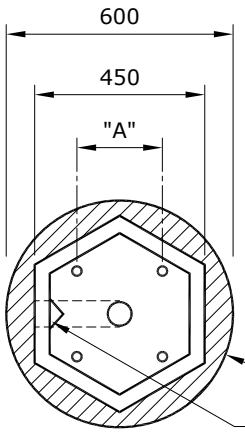
DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	19-10	**CD 300-7**	0001 OF 2	00

1-04431-DA-24620-0009

13.7 STREET LIGHT POLE

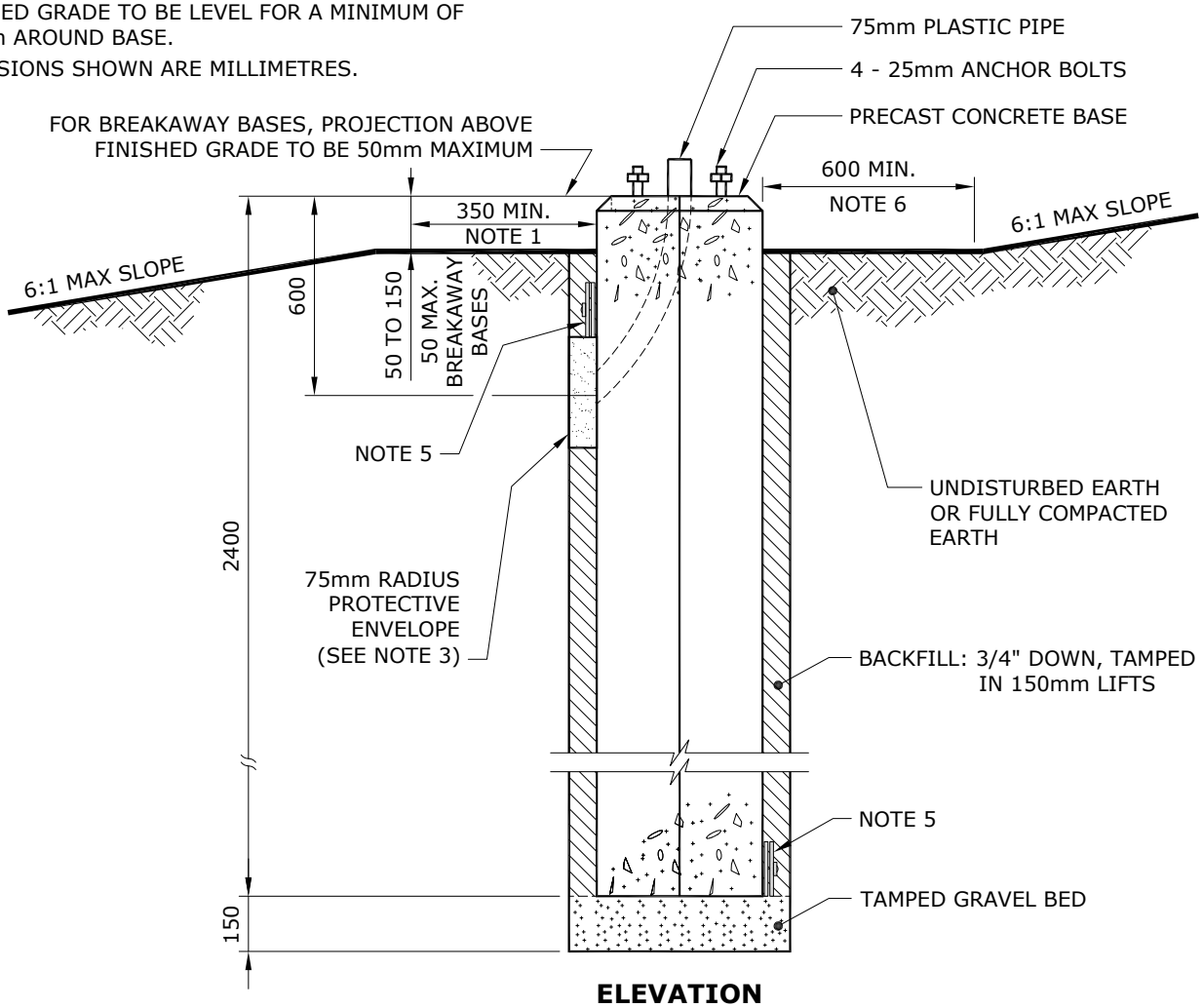
NOTES:

1. FOR FUTURE ACCESS TO LOWER PORTION OF PLASTIC PIPE, LOCATE "V" GROOVE SIDE OF BASE TO ROADWAY PROVIDED THAT:
   a) A MIN. HORIZONTAL SEPARATION OF 350mm IS MAINTAINED TO ANY PAVED SURFACE OR STRUCTURE; OR
   b) IF LESS THAN 350mm, ROTATE BASE 90°
2. ROUTE UNDERGROUND CABLES DIRECTLY INTO PLASTIC PIPE.
3. IN BACKFILL AREA, ENCASE UNDERGROUND CABLES IN A 75mm RADIUS ENVELOPE OF EXCAVATED MATERIAL OR SAND TO PROTECT CABLES. DO NOT BACKFILL WITH EXCAVATED MATERIAL OR SAND MORE THAN 1/6 OF THE WAY AROUND BASE.
4. SEE CD300-9 FOR ANCHOR ROD TIGHTENING METHOD.
5. INSTALL EXPANDING POLE KEY ANCHOR PER CD44-30. ENSURE TOP ANCHOR DOES NOT OBSTRUCT CONDUIT ENTRY HOLE.
6. FINISHED GRADE TO BE LEVEL FOR A MINIMUM OF 600mm AROUND BASE.
7. DIMENSIONS SHOWN ARE MILLIMETRES.



PLAN

"A" BOLT SQUARE	STORES CODE
243	00 06 67



ELEVATION

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
		INSTALLATION OF PRECAST CONCRETE BASE ON SLOPE

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	19-10	**CD 300-7**	0002 OF 2	00

1-04431-DA-24620-0009

TO DEVELOP THE REQUIRED TENSION ON ANCHOR RODS, THE TURN-OF-NUT METHOD IS USED.

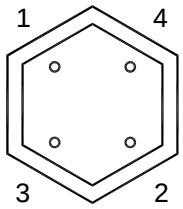
TURN-OF-NUT

1. ENSURE ALL ANCHOR RODS AND NUTS ARE FREE OF DEBRIS AND THAT THE ANCHOR RODS ARE LUBRICATED.

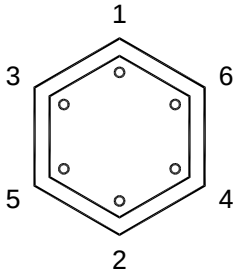
2. PLACE POLE ONTO CONCRETE PILE, INSTALL WASHERS AND NUTS AND TIGHTEN UNTIL DEVELOPING A SNUG-TIGHTENED CONNECTION.

   SNUG-TIGHTENED: THE TIGHTNESS THAT IS ATTAINED AFTER A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL FORCE OF A WORKER USING AN ORDINARY ONE FOOT LONG WRENCH.

3. TIGHTENING OF THE BOLTS MUST BE PERFORMED IN A MANNER THAT BRINGS THE FAYING SURFACES UP "EVENLY" AS PER THE STAR PATTERN TIGHTENING SEQUENCE.



FOUR ANCHOR BOLT PATTERN
(13.7m AND BELOW)



SIX ANCHOR BOLT PATTERN
(16.8m AND 19.8m)

4. ENSURE THE POLE IS PLUMB AND ADD LEVELING SHIMS IF REQUIRED. SNUG-TIGHTEN THE ANCHOR BOLTS AGAIN.

5. BEVELED WASHERS ARE REQUIRED IF THE NUT CANNOT BE BROUGHT INTO FIRM CONTACT WITH THE BASE PLATE.

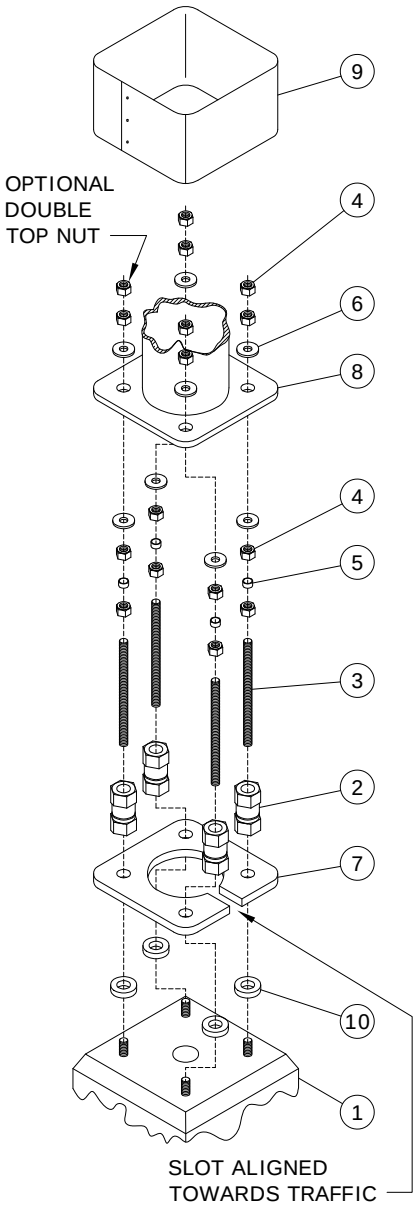
6. MARK THE REFERENCE LOCATION OF THE NUT AFTER SNUG-TIGHTENING THE PLUMB POLE.

7. FINAL TIGHTENING OF NUTS IS PERFORMED IN INCREMENTS AS PER THE STAR PATTERN, WITH A MINIMUM OF TWO FULL TIGHTENING CYCLES. PROPER TENSIONING IS ACHIEVED WHEN THE NUT IS ROTATED 1/3 OF A TURN BEYOND SNUG-TIGHT. THE TOLERANCE FOR THIS IS PLUS 20°.

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY K.C. HAMILTON 10-08-13		**METHOD FOR ANCHOR ROD TIGHTENING**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	10-08	**CD 300-9**	0001 OF 1	00

1-04431-DA-24620-0006



THE FOLLOWING INSTALLATION INSTRUCTIONS ARE APPLICABLE TO NEW OR EXISTING BREAKAWAY BASE INSTALLATIONS ON CONCRETE BASES.

PROCEDURE:

1. CLEAN THE TOP SURFACE OF THE CONCRETE BASE AND ENSURE SURFACE IS FLAT AND LEVEL WITH NO SPALLING OR OTHER SURFACE CONDITIONS THAT MAY AFFECT THE PERFORMANCE OF THE COUPLERS.
2. THE PREFERRED MAXIMUM HEIGHT ABOVE LEVEL GRADE TO THE BASE OF THE COUPLER IS 50mm OR LESS. THIS PROVIDES THE RECOMMENDED CLEARANCE IN THE EVENT OF A COLLISION WITH THE STRUCTURE.
3. MEASURE THE HEIGHT OF THE THREADED ANCHOR BOLTS ABOVE THE REACTION PLATE AND VERIFY THIS MEASUREMENT IS BETWEEN 1 1/4" AND 1 5/8".
4. IF THE EXPOSED LENGTH OF THE ANCHOR BOLT IS GREATER THAN THE RECOMMENDED LENGTH, OPTIONAL SPACERS MAY BE USED (ITEM 10).
5. IT IS RECOMMENDED THAT THE THREADED ANCHOR BOLT-COUPLER CONNECTION BE COATED WITH RUST-INHIBITING GREASE. THIS WILL FACILITATE REMOVAL OF THE COUPLER WHEN IT IS NECESSARY. A SUITABLE PRODUCT FOR THIS APPLICATION IS ARCAN 1, A WHITE, WATER RESISTANT GREASE MARKETED BY IMPERIAL OIL LTD.
6. THREAD THE COUPLER ASSEMBLY ON EACH ANCHOR BOLT (IF THE COUPLER ASSEMBLY UPPER STUD BECOMES LOOSE AS A RESULT OF HANDLING, ENSURE THAT THE STUD IS ENGAGED AT LEAST 38mm, BUT NOT MORE THAN 44mm IN THE COUPLER BEFORE LOCKING WITH THE LOCK NUT.)
7. SNUG UP EACH COUPLER AGAINST THE CONCRETE BASE. TIGHTEN EACH COUPLER ALTERNATELY AND INCREMENTALLY, BY MEANS OF A WRENCH OR A PIPE WRENCH ON THE BOTTOM HEX OF THE COUPLER. USE THE TURN-OF-NUT METHOD AS PER CD300-9.

   NOTE: TIGHTENING THE COUPLER ON THE TOP HEX MAY WEAKEN THE COUPLER AT THE MACHINED GROOVE AND MAKE THE COUPLER UNUSEABLE.
8. BRING THE LEVELING NUTS (AND HENCE, THE LOWER WASHERS) INTO A LEVEL PLANE AS DESIRED MAKING CERTAIN THAT AT LEAST ONE PLASTIC SPACER REMAINS IN CONTACT WITH ITS LEVELING NUT AND ITS LOCK NUT.
9. PLACE THE POLE BASE OVER THE PROTRUDING STUDS, AND SECURE THE POLE WITH THE UPPER WASHERS AND RETAINING NUTS.
10. WITH THE POLE IN THE REQUIRED VERTICAL ORIENTATION, AND BEFORE FINAL TIGHTENING, ENSURE THAT ALL LEVELING NUTS, RETAINING NUTS AND UPPER AND LOWER WASHERS ARE MADE SNUG AGAINST THE POLE BASE PLATE.
11. TIGHTEN THE RETAINING NUTS WITH THE TURN-OF-NUT METHOD AS PER CD300-9.
12. MAKE THE NECESSARY WIRING CONNECTIONS, AND INSTALL THE PROTECTIVE SHROUD.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY D.R. ORR 16-06-27	16-06	4	CORRECTED TYPO, RESEALED	**BREAKAWAY BASE INSTALLATION**
	10-08	3	UPDATED STANDARD, REVISED TITLE, AND ADDED SHEET 2	
	07-06	2	REVISED NOTE 4 AND ADDED NOTE 5	

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	16-06	**CD 300-10**	0001 OF 2	04

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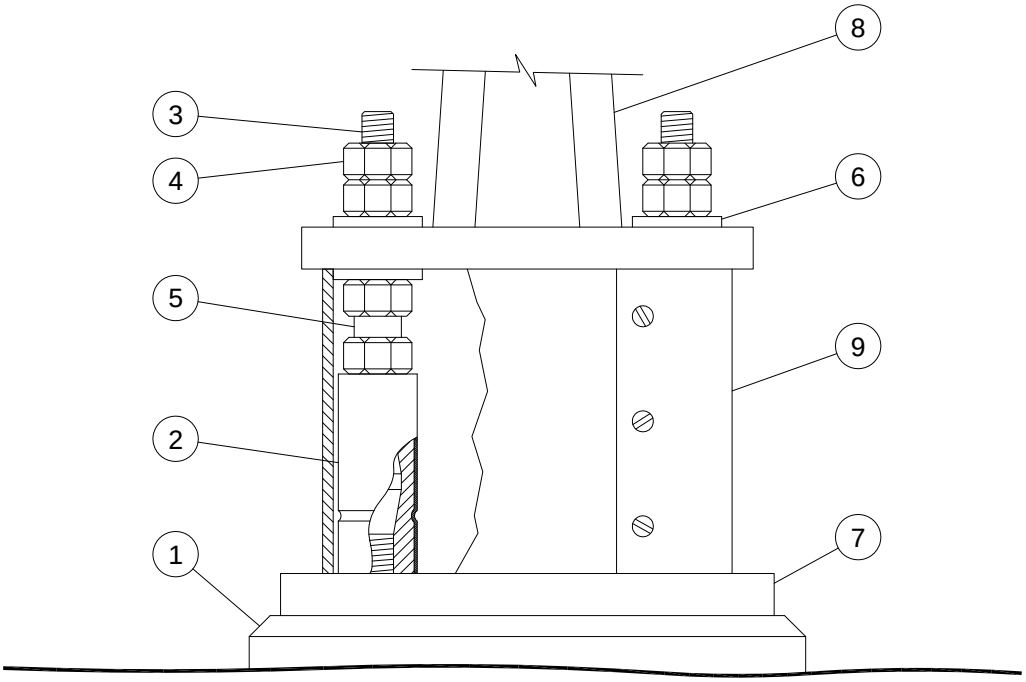


BILL OF MATERIAL		
ITEM NO.	DESCRIPTION	QUANTITY
1	CONCRETE BASE	1
2	COUPLING	4
3	1" - 8 UNC GALV. STUD	4
4	1" - 8 UNC GALV. HEAVY HEX NUT	16
5	SPACER	4
6	1" GALV. FLAT WASHER	8
7	REACTION PLATE	1
8	POLE	1
9	SHROUD ASSEMBLY	1
10	GALV. SHIM	4

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY K.C. HAMILTON 10-08-13		**BREAKAWAY BASE INSTALLATION**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	10-08	**CD 300-10**	0002 OF 2	00

1-04431-DA-24620-0004

STREET LIGHT POLES *

POLE TYPE	MOUNTING HEIGHT m (ft)	MATERIAL	WEIGHT *, ** kg (±10%)
STRAIGHT SHAFT	10.7 (35)	ALUMINUM	91
DAVIT (DB)	11.3 (37)	CONCRETE	998
DAVIT (DB)	13.7 (45)	CONCRETE	1087
POST TOP (DB)	6.1 (20)	CONCRETE	544
DAVIT	7.7 (25)	STEEL	97
DAVIT	9.1 (30)	STEEL	125
DAVIT	10.7 (35)	STEEL	157
DAVIT	13.7 (45)	STEEL	219
DAVIT	16.8 (55)	STEEL	330
DAVIT	19.8 (65)	STEEL	428
POST TOP	4.7 (15)	STEEL	53
POST TOP	6.1 (20)	STEEL	68
STRAIGHT SHAFT	7.7 (25)	STEEL	90
STRAIGHT SHAFT	9.1 (30)	STEEL	113
STRAIGHT SHAFT	10.7 (35)	STEEL	172
STRAIGHT SHAFT	13.7 (45)	STEEL	220
STRAIGHT SHAFT	16.8 (55)	STEEL	388
STRAIGHT SHAFT	19.8 (65)	STEEL	557

* ALL POLES ARE BASE MOUNTED EXCEPT CONCRETE.
** WEIGHTS DO NOT INCLUDE ARMS OR LUMINAIRES.
*** WEIGHTS GATHERED FROM MANUFACTURER'S DRAWING.

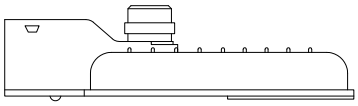
BASES

TYPE	WEIGHT kg (±10%)
179	605
197	605
206	605
243	970
418	2151

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY D.R. ORR 16-01-14	18-04 | 1 | UPDATED TABLES	**RIGGING WEIGHTS OF STREET LIGHT COMPONENTS**

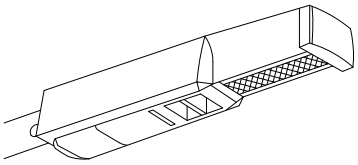
DRAWN	CHECKED	DATE		SHT	REV
C.A.	J.R.	16-01	**CD 300-18**	0001 OF 1	01

1-04431-DA-25620-0010



LED ROADWAY LUMINAIRE

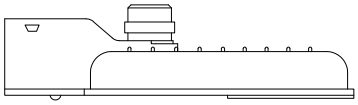
LED ROADWAY LUMINAIRES			
LUMINAIRE WATTAGE (NOMINAL)	REPLACES (HPS)	CIIC	
		GREY	BLACK
40 W LED	70 W HPS	05 15 44	05 15 71
60 W LED	100 W HPS	05 15 45	05 15 73
90 W LED	150 W HPS	05 15 47	05 15 74
150 W LED	250 W HPS	05 15 48	05 15 75
240 W LED	400 W HPS	05 15 49	05 15 76



LED LANE LUMINAIRE

LED LANE LUMINAIRES		
LUMINAIRE WATTAGE (NOMINAL)	REPLACES (HPS)	CIIC
50 W LED	70 W HPS	05 15 50

LED LANE LUMINAIRES ARE AVAILABLE WITH GREY COATING ONLY.



LED DUSK-TO-DAWN LUMINAIRE

LED DUSK-TO-DAWN (AREA) LUMINAIRES		
LUMINAIRE WATTAGE (NOMINAL)	REPLACES (HPS)	CIIC
60 W LED	100 W HPS	05 15 51
90 W LED	150 W HPS	05 15 52

LED DUSK-TO-DAWN LUMINAIRES ARE AVAILABLE WITH GREY COATING ONLY.

- ALL LED LUMINAIRES AUTOMATICALLY ADJUST FOR EITHER A 120V OR 240V SUPPLY.
- ALL LED LUMINAIRES COME WITH A PHOTOCELL RECEPTACLE.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY D.R. ORR 15-02-11				**STANDARD LED LUMINAIRES**		
	16-12	1	REVISED NOTES			
DRAWN C.A.	CHECKED L.D./D.O.	DATE 15-02		**CD 300-24**	SHT 0001 OF 2	REV 01

1-04431-DA-25620-0009

TRENCH AND PLOW-IN LOCATION

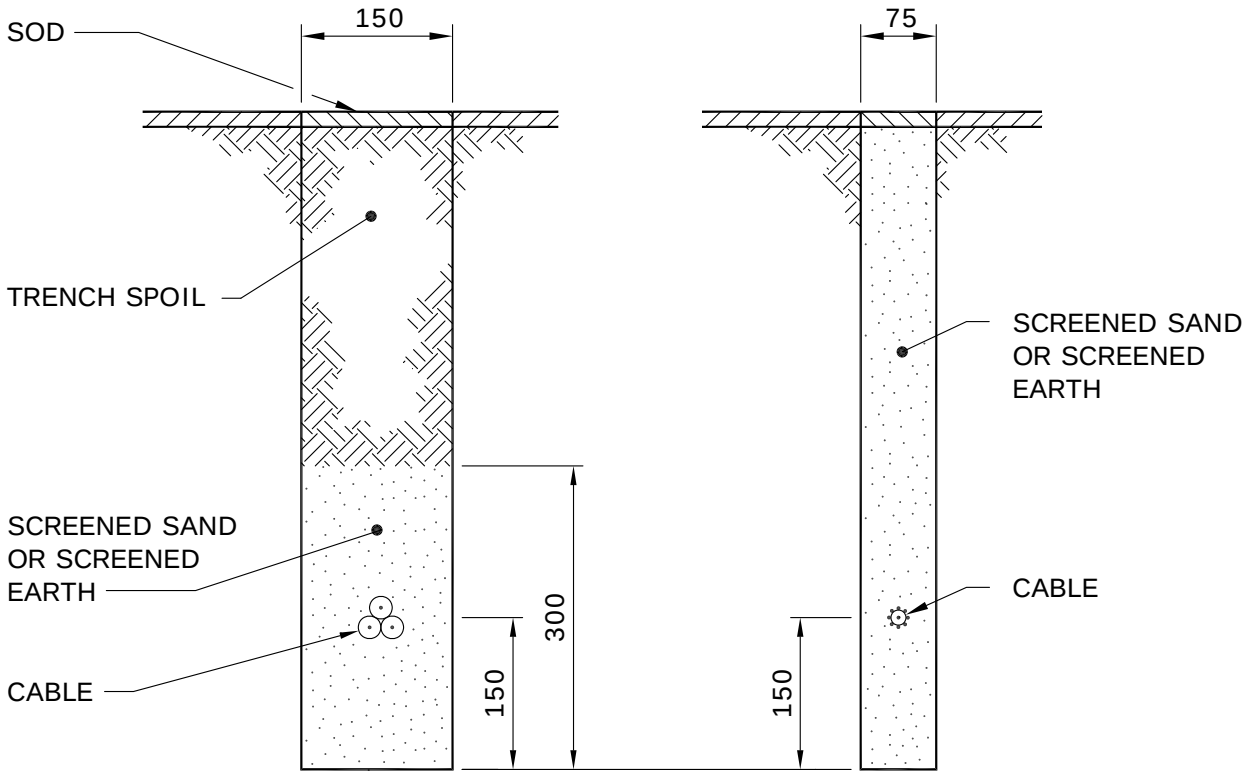
GENERALLY, THE TRENCH LOCATION WILL DICTATE THE LOCATION OF THE LIGHT STANDARDS. CONTACT SHALL BE MADE WITH THE GOVERNING MUNICIPAL AUTHORITY TO DETERMINE THEIR SET BACK REQUIREMENTS. CONTACT SHALL ALSO BE MADE WITH THE CITY OF WINNIPEG UNDERGROUND STRUCTURES OR THE INDIVIDUAL UTILITIES OUTSIDE WINNIPEG TO DETERMINE THE EXISTENCE AND EXACT LOCATION OF OTHER UTILITIES PLANT. THIS INFORMATION WILL BE INCLUDED ON THE WORK ORDER PLANS.

DEPTH OF BURIAL

THE CABLE SHALL BE BURIED BELOW THE SURFACE OF THE EARTH A MINIMUM OF 600mm IN SODDED AREAS AND 1000mm IN ROADWAYS.

TRENCH DETAILS

TYPICAL TRENCH DETAILS FOR SODDED AREAS ARE SHOWN BELOW, FOR TRENCH DETAILS UNDER ROADWAYS REFER TO DRAWING CD205-14. SEE NOTES ON SHEET 2 of 2.



NOTE: DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28	96-01	3	ROADWAY DEPTH ADDED	**PLOWING AND TRENCHING DETAILS FOR UNDERGROUND STREET LIGHT CIRCUITS**
	95-09	2	BURIAL DEPTH NOTE ADDED	
	94-04	1	COMBINED WITH DWG. CD305-2	

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD		88-07	**CD 305-1**	0001 OF 2	03

1-04431-DA-10500-0016

NOTES:

1. FOR TYPICAL TRENCH DETAIL INSTALLATION UNDER ROADWAYS, REFER TO DRAWING CD205-14.

2. THESE ARE ALTERNATIVE TRENCH WIDTHS. A 75mm TRENCH IS PREFERABLE WHERE THE GROUND IS FIRM AND A CLEAN CUT CAN BE MADE. A 150mm TRENCH IS PREFERABLE WHERE THE GROUND IS TOO LOOSE TO MAINTAIN A FIRM TRENCH WALL.

3. THE CABLES INDICATED IN THE VIEWS CAN BE USED IN EITHER TRENCH.

4. THE 75mm TRENCH SHALL BE BACKFILLED WITH SCREENED SAND OR SCREENED EARTH.

5. THE 150mm TRENCH SHALL BE BACKFILLED WITH THE TRENCH SPOIL IF IT IS FREE FROM ROCKS OR DEBRIS. IF THE TRENCH SPOIL CONTAINS ROCKS OR DEBRIS, SCREENED SAND OR SCREENED EARTH SHALL BE INSTALLED AS SHOWN.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28				**PLOWING AND TRENCHING DETAILS FOR UNDERGROUND STREET LIGHT CIRCUITS**
	96-01	2	NOTES REVISED	
	94-04	1	COMBINED WITH DWG. CD305-2	

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD		88-07	**CD 305-1**	0002 OF 2	02

1. **GENERAL**

PLOWED-IN CABLES SHALL BE PULLED TO 1m ABOVE GRADE AT EACH STREET LIGHT STANDARD LOCATION. THE CABLE DEPTH SHALL BE MAINTAINED AT THE 600mm PLOW DEPTH AS CLOSE AS POSSIBLE TO THE STREET LIGHT STANDARD LOCATION BEFORE RAISING THE PLOW. THE PLOW SHALL BE RETURNED TO THE 600mm PLOW DEPTH AS CLOSE AS POSSIBLE TO THE CENTRE LINE OF THE STREET LIGHT STANDARD LOCATION.

CABLES LAID IN TRENCHES SHALL HAVE SUFFICIENT SLACK TO ALLOW FOR FUTURE MOVEMENT OR SETTLING OF THE TRENCH FLOOR. CABLES SHALL PROJECT 1m ABOVE GRADE AT EACH LOCATION.

2. **USE OF POLYETHYLENE PIPE**

2.1 WHERE CABLES ARE INSTALLED UNDER EXISTING PAVEMENT, POLYETHYLENE PIPE SHALL BE INSTALLED TO PROTECT THE CABLES IF THE HOLE IS AUGERED OR PUSHED THROUGH MATERIAL CONTAINING ROCKS, STONES, OR DEBRIS.

2.2 AT THE JUNCTION OF THE MAIN TRENCH AND THE STREET OR DRIVEWAY CROSSING, THE BOTTOM OF THE TRENCH SHALL BE BACKFILLED AND TAMPED TO THE LEVEL OF THE POLYETHYLENE PIPES TO PREVENT SHARP BENDS IN THE CABLE AND TRAPPING OF WATER IN THE PIPE.

3. **SPLICES - UNDERGROUND CABLES**

UNDERGROUND STREET LIGHT CABLES (i.e. #4 ALUMINUM CONCENTRIC NEUTRAL CABLE AND 1/0 TRIPLEXED CABLE) ARE TO BE SPLICED USING AN APPROPRIATE COMPRESSION SLEEVE (SEE DRAWING CD210-21) AND THE SPLICE IS TO BE INSULATED USING ONE OF THE FOLLOWING METHODS:

1) RAYCHEM RAYVOLVE SPLICE
2) PRE-STRETCHED INSULATING TUBING SPLICE
3) HEAT SHRINK INSULATING TUBING SPLICE
4) TAPED SPLICE

FOR COMPLETE INSTRUCTIONS REGARDING THE ABOVE SPLICES, REFER TO DRAWING CD215-12.

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28	94-04 | 1 | DWG. REFERENCE CHANGED	**INSTALLATION OF STREET LIGHT CABLES**

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	W.C.	88-07	**CD 310-1**	0001 OF 2	01

4. **CABLE END CAPS**

STREET LIGHT CABLES WHICH ARE NOT GOING TO BE SPLICED OR TERMINATED IMMEDIATELY FOLLOWING INSTALLATION SHALL BE CUT SQUARE AND SEALED WITH AN END CAP. REFER TO DRAWING CD215-21 FOR DETAILS.

5. **GROUNDING OF STREET LIGHT STANDARDS**

5.1 ALL STREET LIGHT STANDARDS SHALL BE GROUNDED BY CONNECTING THE NEUTRAL TO THE GROUND STUD INSIDE THE STANDARD. REFER TO DRAWING CD310-4 FOR DETAILS.

5.2 A GROUND ROD SHALL BE INSTALLED AND CONNECTED TO THE GROUND STUD AT THE LAST STANDARD ON THE STREET LIGHT CIRCUIT.

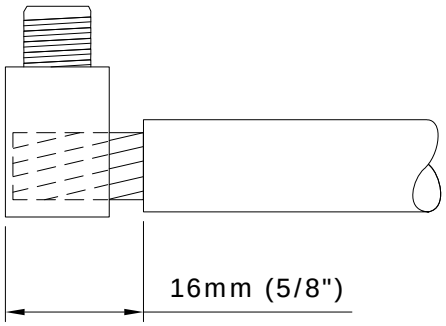
APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28	94-04	1	DWG. REFERENCE CHANGED	**INSTALLATION OF STREET LIGHT CABLES**		
DRAWN W.B./CAD	CHECKED W.C.		DATE 88-07	**CD 310-1**	SHT 0002 OF 2	REV 01

1-04431-DA-56200-0001

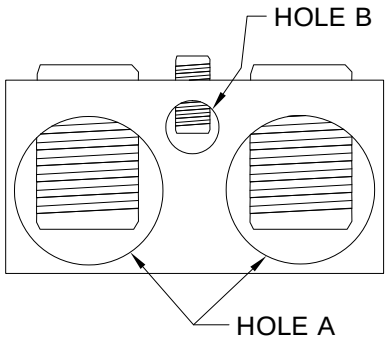
RAYCHEM GELCAP CIIC# 04-29-36

GENERAL INSTRUCTIONS:

1. REMOVE 16mm (5/8") OF INSULATION AND CLEAN EXPOSED ENDS.



2. INSERT CONDUCTORS INTO CORRECT HOLES AND TORQUE AS SHOWN:



HOLE A		HOLE B	
WIRE RANGE	RECOMMENDED TORQUE VALUES	WIRE RANGE	RECOMMENDED TORQUE VALUES
#14 - 2/0 • STREET LIGHT CIRCUIT CABLES • GROUNDING CONNECTIONS • CONCENTRIC NEUTRAL • FUSE HOLDER WIRE	14 - 20 N-m (120 - 180 in-lbs)	#14 - #6 • LAMP LEADS	14 - 17 N-m (120 - 150 in-lbs)

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05		**RAYCHEM GELCAP SPLICE**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	17-11	**CD 310-3**	0001 OF 3	00

1-04431-DA-56200-0006

3. INSTALL CLAMP ON CAP. ENSURE THE TWO PINS ON THE BOTTOM EDGE OF THE CLAMP MATE WITH THE HOLES OF THE CAP AS SHOWN IN FIGURE 1a BELOW.

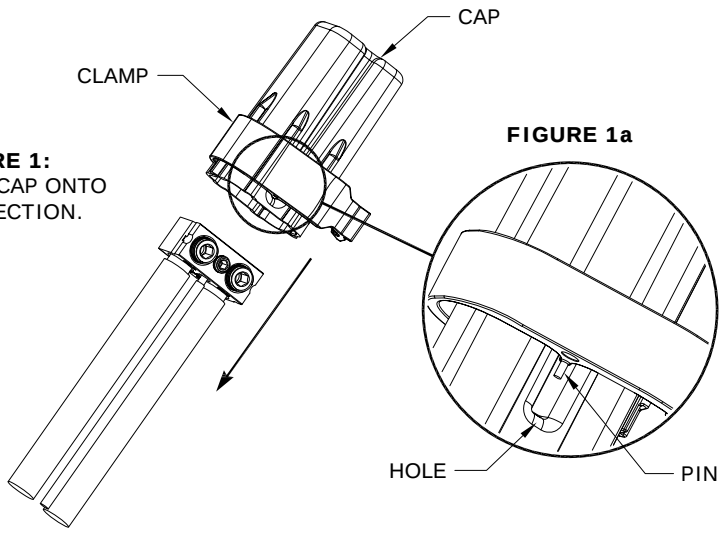


FIGURE 1:
PUSH CAP ONTO CONNECTION.

4. INSTALL CAP BY HOLDING ALL WIRES AND PUSHING THE CAP OVER THE CONNECTION ASSEMBLY UNTIL IT GOES NO FURTHER AS SHOWN IN FIGURE 1 ABOVE.

5. SNAP CLAMP CLOSED. IF NECESSARY, USE PLIERS TO SNAP CLAMP CLOSED AS SHOWN IN FIGURE 2 BELOW.

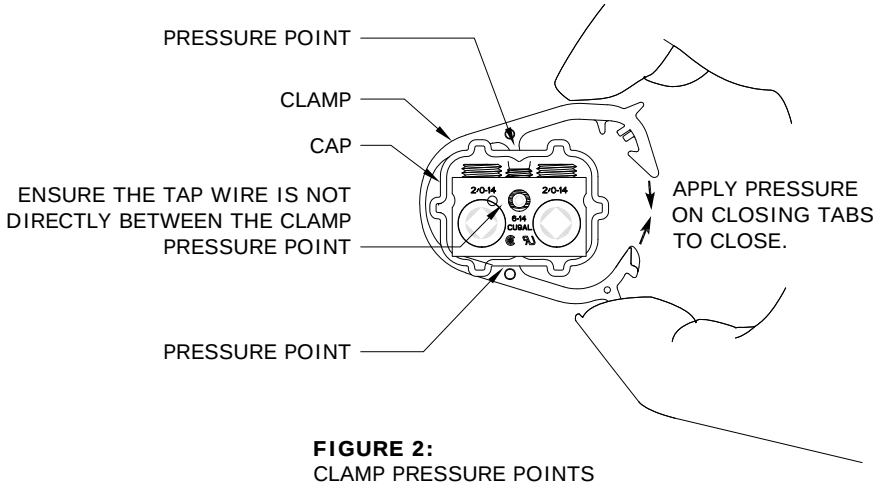
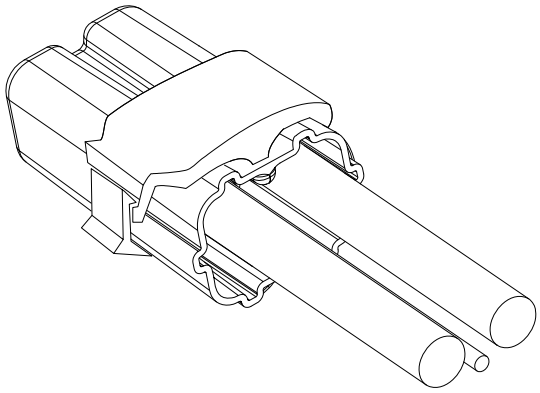


FIGURE 2:
CLAMP PRESSURE POINTS SHOULD FIT INTO OPPOSING GROOVES OF CAP AND APPLY PRESSURE BETWEEN CABLES. SNAP CLAMP CLOSED.

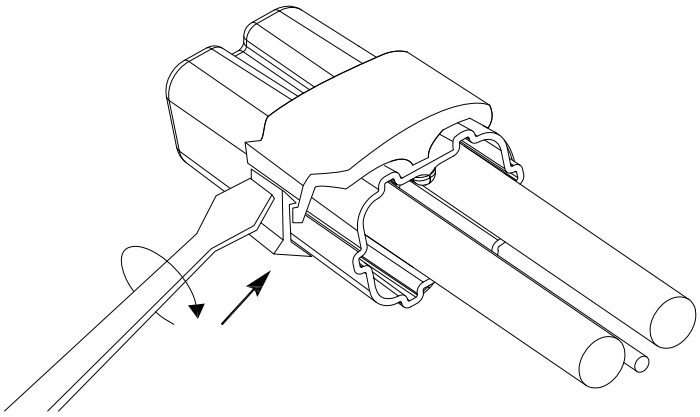
APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05		**RAYCHEM GELCAP SPLICE**		
DRAWN C.A.	CHECKED L.D.	DATE 17-11	**CD 310-3**	SHT 0002 OF 3 / REV 00

1-04431-DA-56200-0006

6. INSPECT THE INSTALLATION BY GENTLY PULLING ON THE CAP ENSURING IT IS LOCKED IN PLACE AND COVERS CONNECTOR AND BARE CONDUCTOR. THERE SHOULD BE NO EXPOSED METAL. ENSURE TAP CABLE IS NOT CAUGHT BETWEEN PRESSURE POINTS OF CLAMP. INSTALLATION IS COMPLETE.

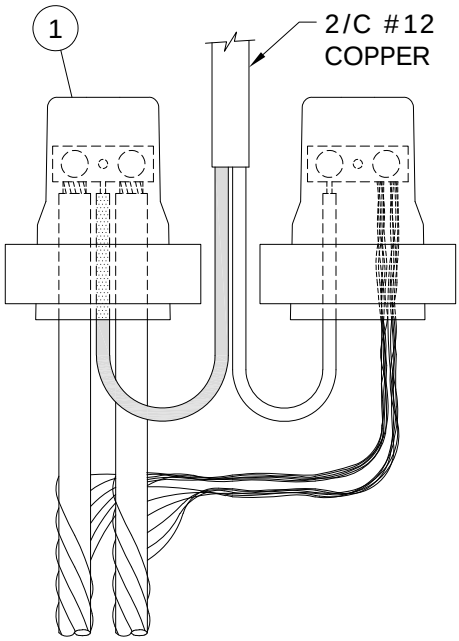


7. TO REMOVE, INSERT SCREWDRIVER BETWEEN THE CLOSING TABS AND TWIST TO OPEN THE CLAMP. REMOVE CAP SLOWLY FROM CONNECTION ALLOWING GEL TO REMAIN IN CAP.

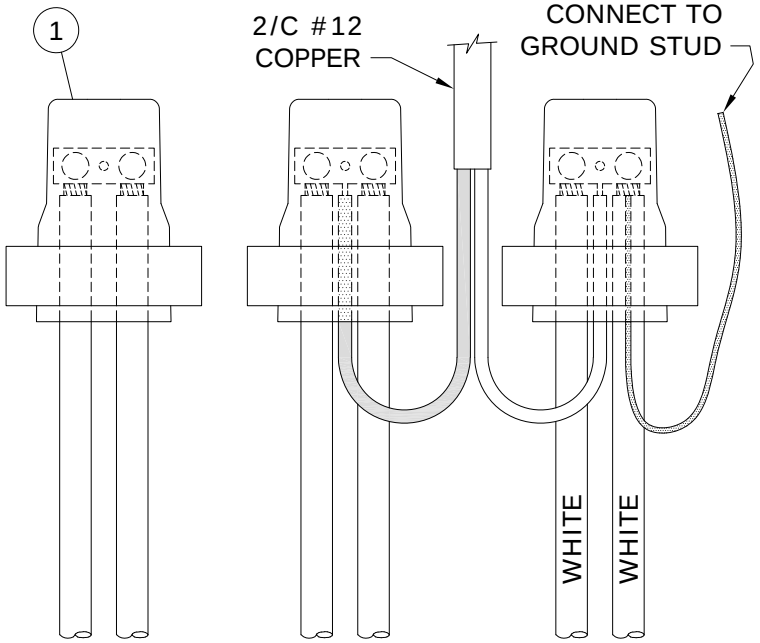


APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05		**RAYCHEM GELCAP SPLICE**

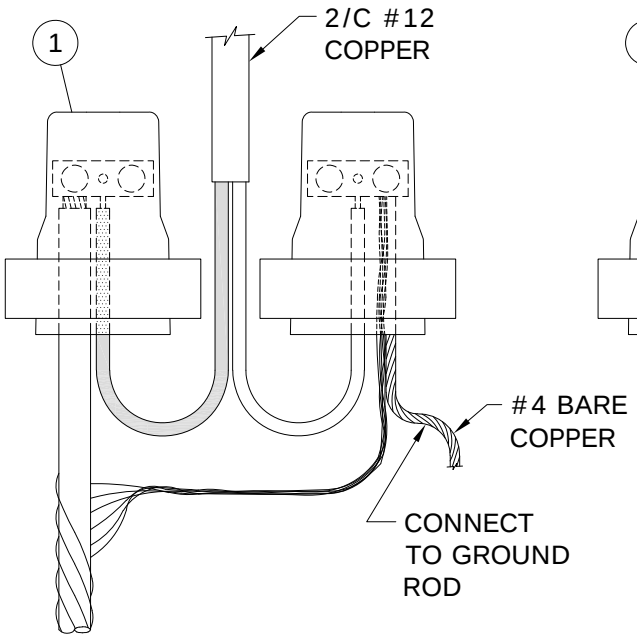
DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	17-11	**CD 310-3**	0003 OF 3	00



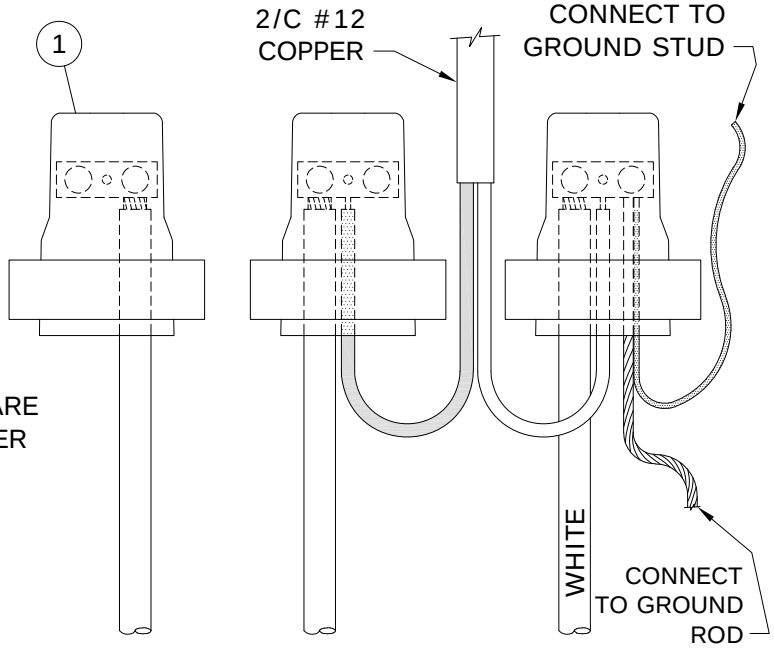
No. 4 ALUMINUM C/N CABLE
(TYPICAL FEED THROUGH)



1/0 ALUMINUM TRIPLEX CABLE
(TYPICAL FEED THROUGH)



No. 4 ALUMINUM C/N CABLE
(TYPICAL END OF CIRCUIT)



1/0 ALUMINUM TRIPLEX CABLE
(TYPICAL END OF CABLE)

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04	2	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT1 TO SHT3, ADDED NEW GELCAP DWG, REVISED TITLE, RESEALED	**CONNECTION DETAIL IN STREET LIGHT STANDARD**
	94-04	1	CONN. REVISED DUE TO INSUL. NEUTRAL	

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	18-04	**CD 310-4**	0001 OF 4	02

1-04431-DA-56200-0002

BILL OF MATERIAL			
ITEM No.	DESCRIPTION	STORES CODE No.	
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX
1	GEL CAP	04-29-36 (2 REQUIRED)	04-29-36 (3 REQUIRED)

NOTES:

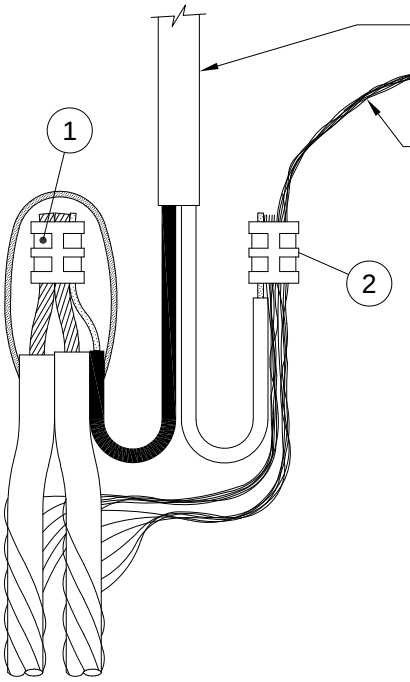
1. **LEAVE SUFFICIENT SLACK ON CONDUCTORS TO ALLOW REMOVAL FROM HANDHOLE FOR MAINTENANCE.**
2. REFER TO DRAWING CD310-3 FOR GEL CAP INSTALLATION INSTRUCTIONS.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

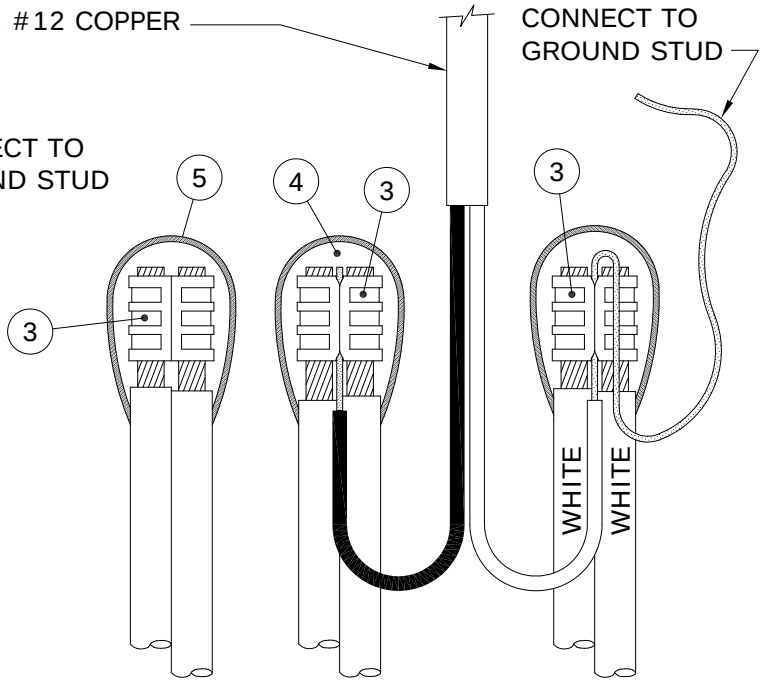
APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04	1	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT2 TO SHT4, ADDED NEW BOM WITH GELCAP, REVISED TITLE, RESEALED	**CONNECTION DETAIL IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	18-04	**CD 310-4**	0002 OF 4	01

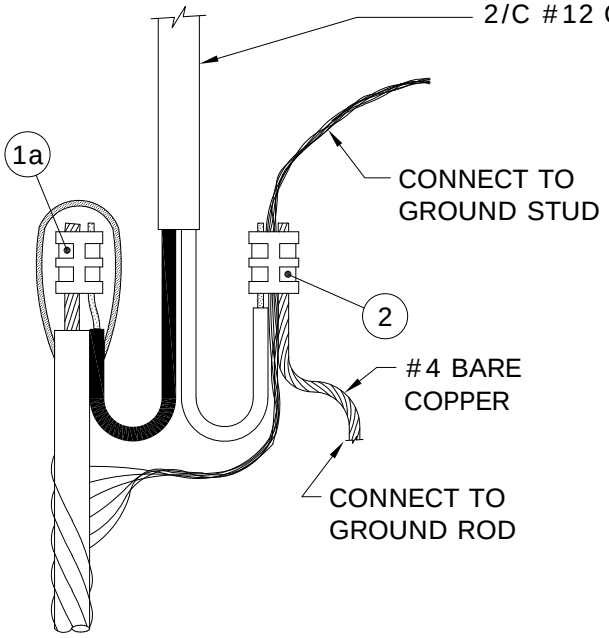
1-04431-DA-56200-0002



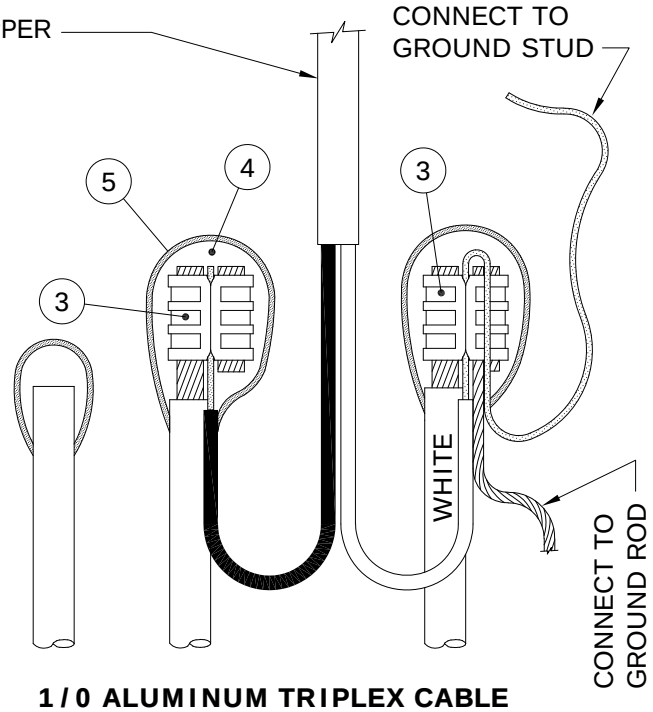
No. 4 ALUMINUM C/N CABLE
(TYPICAL FEED THROUGH)



1/0 ALUMINUM TRIPLEX CABLE
(TYPICAL FEED THROUGH)



No. 4 ALUMINUM C/N CABLE
(TYPICAL END OF CIRCUIT)



1/0 ALUMINUM TRIPLEX CABLE
(TYPICAL END OF CIRCUIT)

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04 | 0 | MOVED FROM SHEET 1	**CONNECTION DETAIL IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	18-04	**CD 310-4**	0003 OF 4	00

1-04431-DA-56200-0002

BILL OF MATERIAL				
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	'C' TYPE AL. COMPRESSION TAP	74-41-30	---	1
1a	'H' TYPE AL. COMPRESSION TAP	74-40-10	---	1 *
2	'C' TYPE CU. COMPRESSION TAP	74-40-90	---	1
3	'H' TYPE AL. COMPRESSION TAP	---	74-40-60	3 **
4	TAPE, SELF-AMALGAMATING EPR	78-55-23	78-55-23	1/4 ROLL
5	TAPE, COLD WEATHER VINYL	78-55-98	78-55-98	1/4 ROLL

* FOR END OF CIRCUIT WHEN USING ONLY ONE CABLE.

** AT END OF CIRCUIT, QUANTITY MAY BE LESS THAN SHOWN.

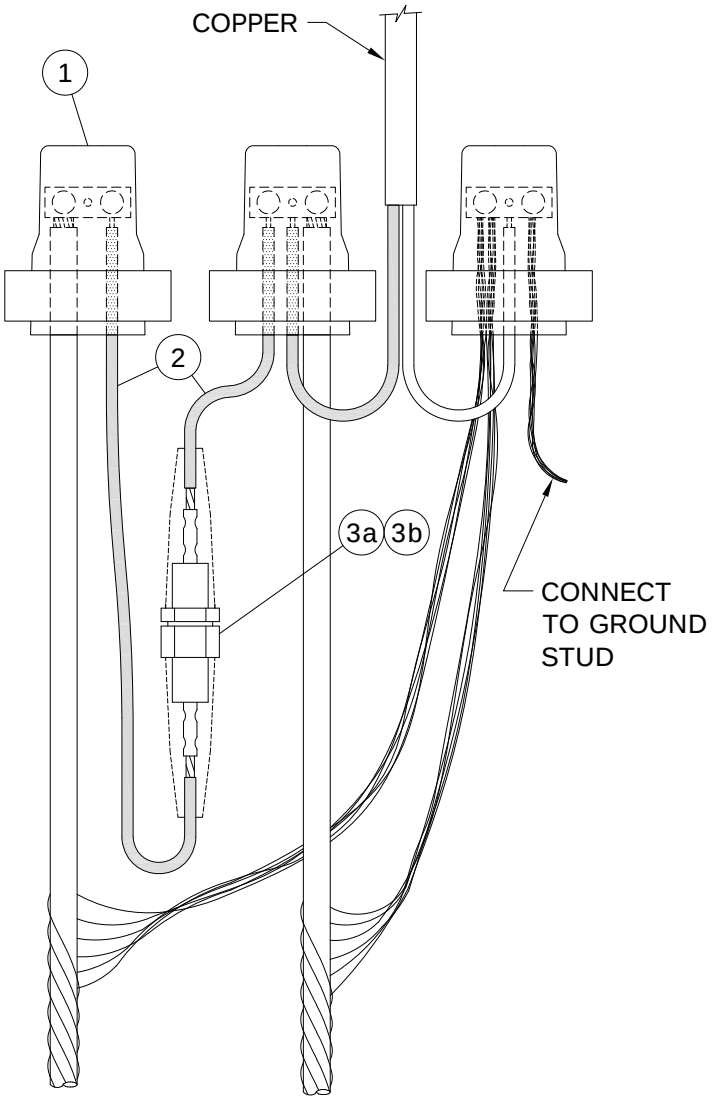
NOTES:

1. **LEAVE SUFFICIENT SLACK ON CONDUCTORS TO ALLOW REMOVAL FROM HANDHOLE FOR MAINTENANCE.**
2. FOR PROPER TAPING PROCEDURE, REFER TO DRAWING CD215-12.

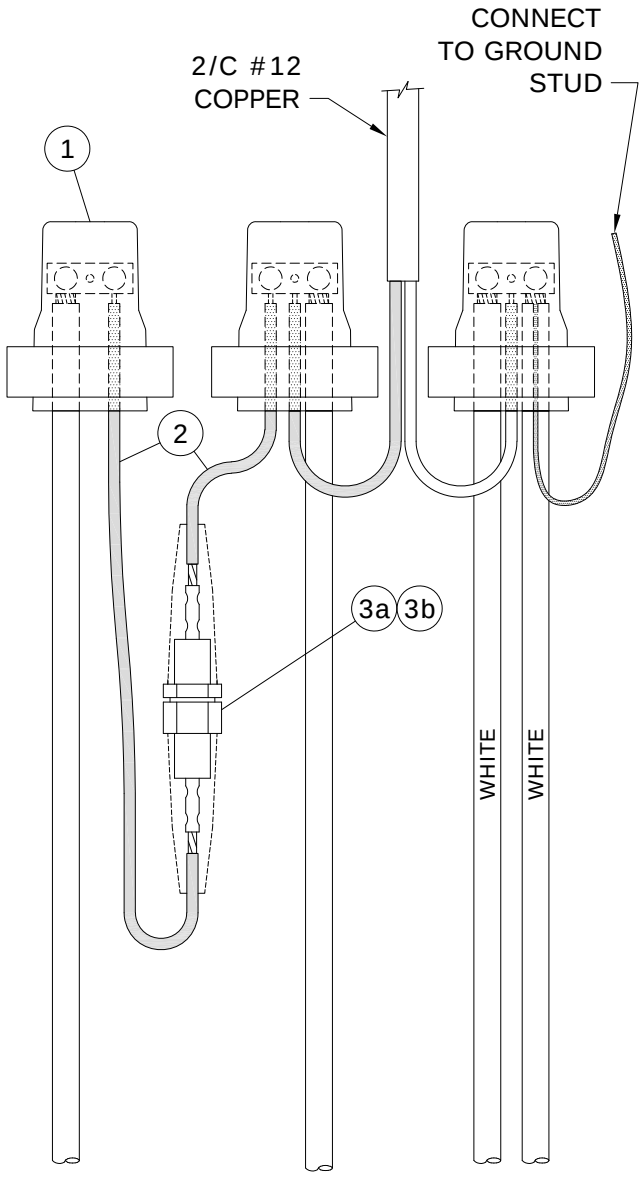
APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04 | 0 | MOVED FROM SHEET 2	**CONNECTION DETAIL IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	18-04	**CD 310-4**	0004 OF 4	00

1-04431-DA-56200-0002



No. 4 ALUMINUM C/N CABLE



1/0 ALUMINUM TRIPLEX CABLE

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05	17-11	2	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT1 TO SHT3, ADDED NEW GELCAP DWG, RESEALED	**STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD**
	94-04	1	CONN. REVISED DUE TO INSUL. NEUTRAL	

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	17-11	**CD 310-9**	0001 OF 4	02

1-04431-DA-56200-0004

BILL OF MATERIAL				
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	GEL CAP	04-29-36	04-29-36	3
2	WIRE, # 8 CU., 600V, PVC	93-10-08	93-10-08	1m
3a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
3b	FUSE, 30A	31-14-30	31-14-30	1

NOTES:

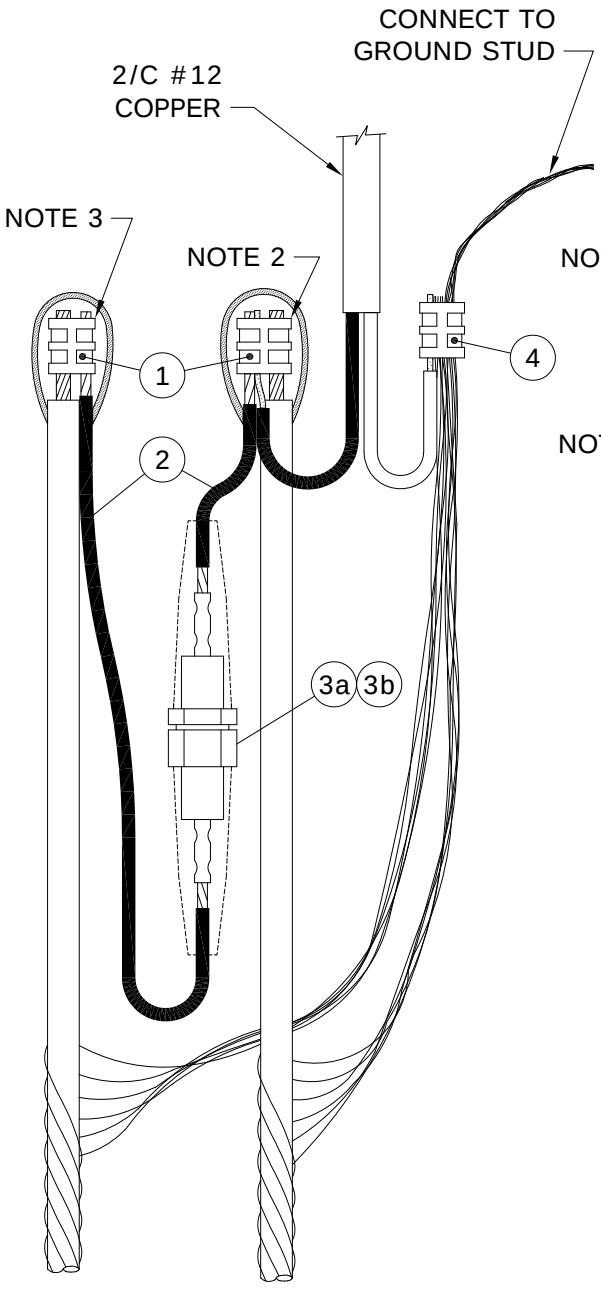
1. **LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
2. FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
3. FOR GEL CAP INSTALLATION INSTRUCTIONS, REFER TO DRAWING CD310-3.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

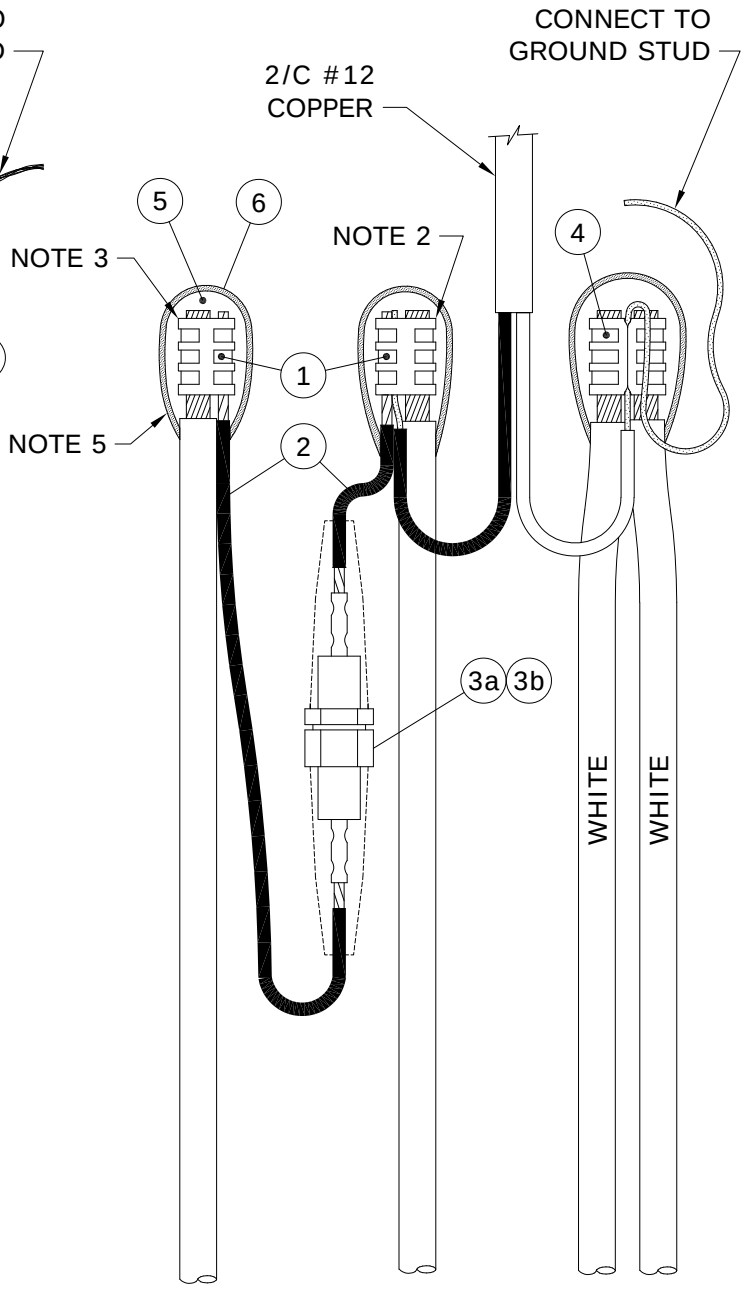
APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05				**STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD**
	17-11	1	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT2 TO SHT4, ADDED NEW BOM WITH GELCAP, RESEALED	

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	17-11	**CD 310-9**	0002 OF 4	01

1-04431-DA-56200-0004



No. 4 ALUMINUM C/N CABLE



1/0 ALUMINUM TRIPLEX CABLE

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05	17-11 | 0 | MOVED FROM SHEET 1	**STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	17-11	**CD 310-9**	0003 OF 4	00

1-04431-DA-56200-0004

BILL OF MATERIAL				
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	'H' TYPE COMPRESSION TAP	74-40-10	74-40-30	2
2	WIRE, # 8 CU., 600V, PVC	93-10-08	93-10-08	1m
3a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
3b	FUSE, 30A	31-14-30	31-14-30	1
4	'C' TYPE COMPRESSION TAP	74-40-90	---	1
	'H' TYPE COMPRESSION TAP	---	74-40-60	1 *
5	TAPE, SELF-AMALGAMATING EPR	78-55-23	78-55-23	1/4 ROLL
6	TAPE, COLD WEATHER VINYL	78-55-98	78-55-98	1/4 ROLL

* WHEN USING 1/0 ALUMINUM TRIPLEX 1 ADDITIONAL 'H' TYPE COMPRESSION TAP (S.C.# 74 40 60) IS REQUIRED TO CONNECT SECOND (FEED THROUGH) HOT LEG.

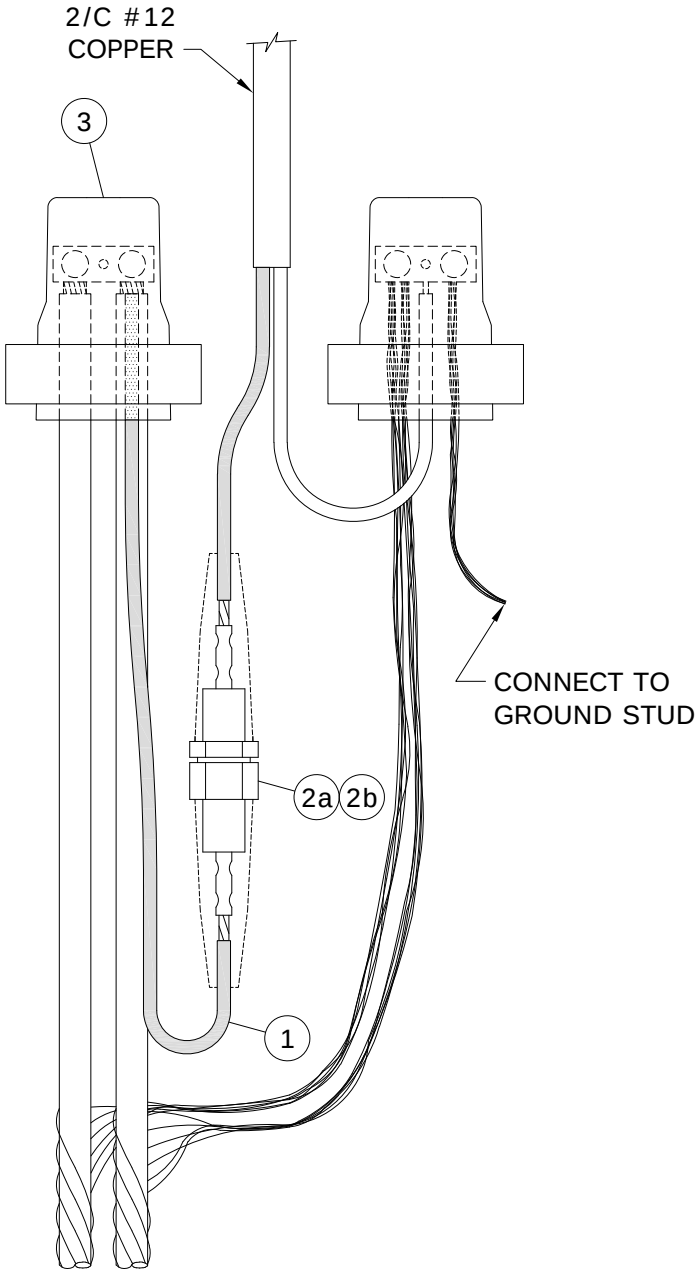
NOTES:

1. **LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
2. INSERT #12 COPPER AND #8 COPPER IN SMALL GROOVE.
3. INSERT DOUBLE THICKNESS OF #8 COPPER IN SMALL GROOVE.
4. FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
5. FOR PROPER TAPING PROCEDURE, REFER TO DRAWING CD215-12.

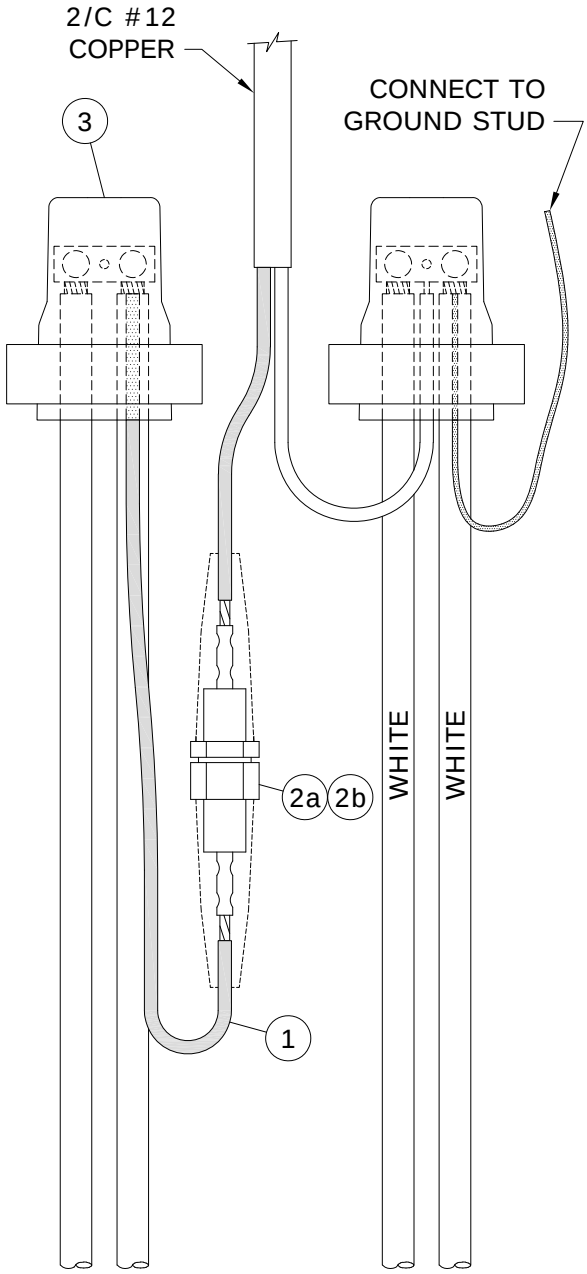
APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-03-05	17-11 | 0 | MOVED FROM SHEET 2	**STREET LIGHT CIRCUIT PROTECTED BY 30A FUSE IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	17-11	**CD 310-9**	0004 OF 4	00

1-04431-DA-56200-0004



No. 4 ALUMINUM C/N CABLE



1/0 ALUMINUM TRIPLEX CABLE

NOTE:

RECOMMENDED FOR PROTECTING LUMINAIRES WHICH ARE TO BE MOUNTED ON STREET LIGHT POLES 16.8m AND HIGHER.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 89-04-28

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS		
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04	3	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT1 TO SHT3, ADDED NEW GELCAP DWG, RESEALED	**INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD**		
	95-01	2	NOTE ADDED			
DRAWN C.A.	CHECKED L.D.		DATE 18-04	**CD 310-10**	SHT 0001 OF 4	REV 03

1-04431-DA-56200-0005

BILL OF MATERIAL				
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	2/C #12 COPPER	93-52-12	93-52-12	1m
2a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
2b	FUSE, STREET LIGHT, 15A	31-14-15	31-14-15	1
3	GEL CAP	04-29-36	04-29-36	2

NOTES:

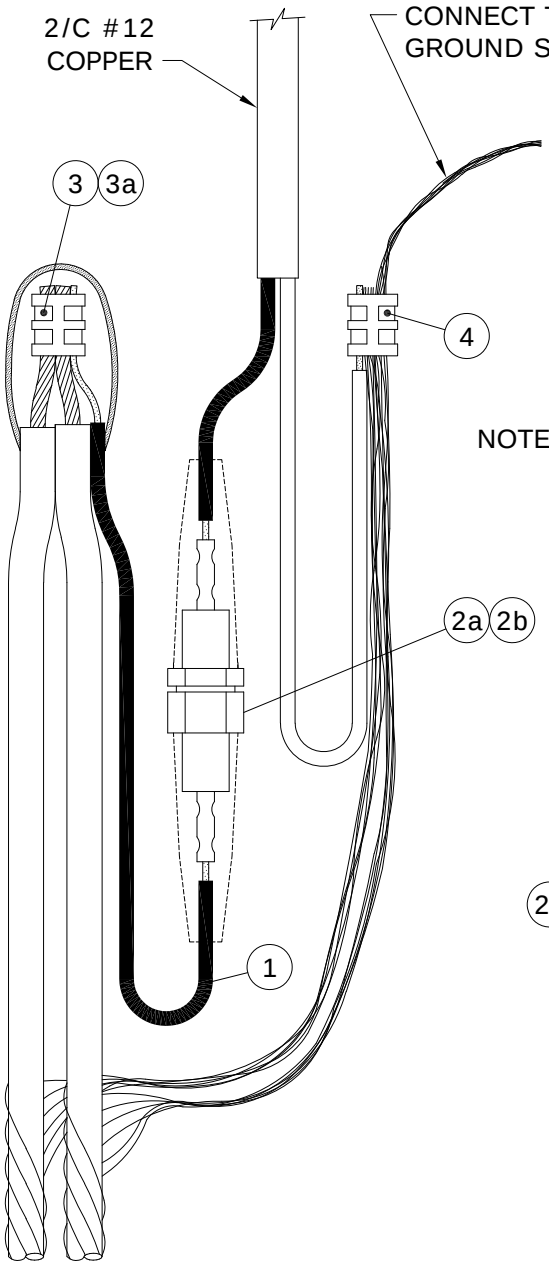
1. **LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
2. FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
3. FOR END OF CIRCUIT, REFER TO DRAWING CD310-4.
4. FOR GEL CAP INSTALLATION INSTRUCTIONS, REFER TO DRAWING CD310-3.

SUPERCEDES ORIGINAL SEALED BY E. WIEBE ON 94-07-03

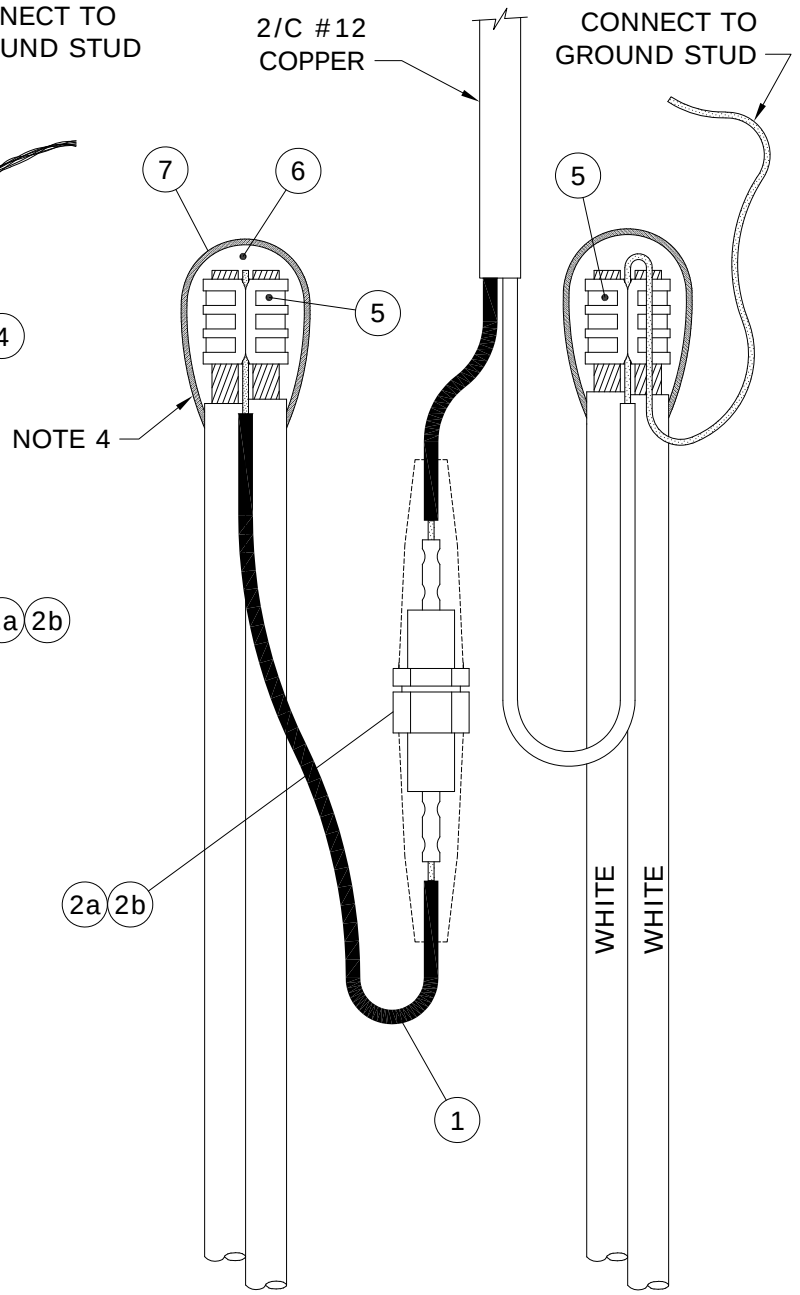
APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04	1	ADDED SHT 3 & 4, MOVED PREVIOUS INFO FROM SHT2 TO SHT4, ADDED NEW BOM WITH GELCAP, RESEALED	**INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	18-04	**CD 310-10**	0002 OF 4	01

1-04431-DA-56200-0005



No. 4 ALUMINUM C/N CABLE



1/0 ALUMINUM TRIPLEX CABLE

NOTE:

RECOMMENDED FOR PROTECTING LUMINAIRES WHICH ARE TO BE MOUNTED ON STREET LIGHT POLES 16.8m AND HIGHER.

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04 | 0 | MOVED FROM SHEET 1	**INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	18-04	**CD 310-10**	0003 OF 4	00

1-04431-DA-56200-0005

BILL OF MATERIAL				
ITEM No.	DESCRIPTION	STORES CODE No.		QUANTITY
		FOR USE WITH #4 AL. C/N	FOR USE WITH 1/0 AL. TRIPLEX	
1	2/C # 12 COPPER	93-52-12	93-52-12	1m
2a	FUSEHOLDER, 15/30A C/W BOOTS	31-91-30	31-91-30	1
2b	FUSE, STREET LIGHT, 15A	31-14-15	31-14-15	1
3	'C' TYPE AL. COMPRESSION TAP	74-41-30	---	1
3a	'H' TYPE AL. COMPRESSION TAP	74-40-10	---	1 *
4	'C' TYPE CU. COMPRESSION TAP	74-40-90	---	1
5	'H' TYPE AL. COMPRESSION TAP	---	74-40-60	3 **
6	TAPE, SELF-AMALGAMATING EPR	78-55-23	78-55-23	1/4 ROLL
7	TAPE, COLD WEATHER VINYL	78-55-98	78-55-98	1/4 ROLL

* FOR END OF CIRCUIT WHEN USING ONLY ONE CABLE.

** AT END OF CIRCUIT, QUANTITY MAY BE LESS THAN SHOWN.

NOTES:

1. **LEAVE SUFFICIENT SLACK ON CONDUCTORS AND FUSE HOLDER TO ALLOW REMOVAL FROM HANDHOLE FOR FUSE REPLACEMENT AND MAINTENANCE.**
2. FOR SPLICING FEED THROUGH HOT LEG, REFER TO DRAWING CD310-4.
3. FOR END OF CIRCUIT, REFER TO DRAWING CD310-4.
4. FOR PROPER TAPING PROCEDURE, REFER TO DRAWING CD215-12.

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY J.J.D. RINGASH 18-05-11	18-04 | 0 | MOVED FROM SHEET 2	**INDIVIDUAL LUMINAIRE PROTECTED BY 15A FUSE IN STREET LIGHT STANDARD**

DRAWN	CHECKED	DATE		SHT	REV
C.A.	L.D.	18-04	**CD 310-10**	0004 OF 4	00

1-04431-DA-56200-0005

SUPPLY VOLTAGES

THE SUPPLY VOLTAGE FOR STREET LIGHT CIRCUITS MAY BE PROVIDED BY POLE-MOUNTED DISTRIBUTION TRANSFORMERS OR BY PAD-MOUNTED DISTRIBUTION TRANSFORMERS.

THE MAJORITY OF ROADWAY LUMINAIRES ARE RATED FOR OPERATION ON EITHER 120 VOLT OR 240 VOLT CIRCUITS AND ARE FACTORY WIRED FOR 120 VOLT OPERATION EXCEPT FOR 400 WATT H.P.S. LUMINAIRES WHICH ARE RATED FOR 120/240 VOLT OPERATION BUT ARE FACTORY WIRED FOR 240 VOLT OPERATION.

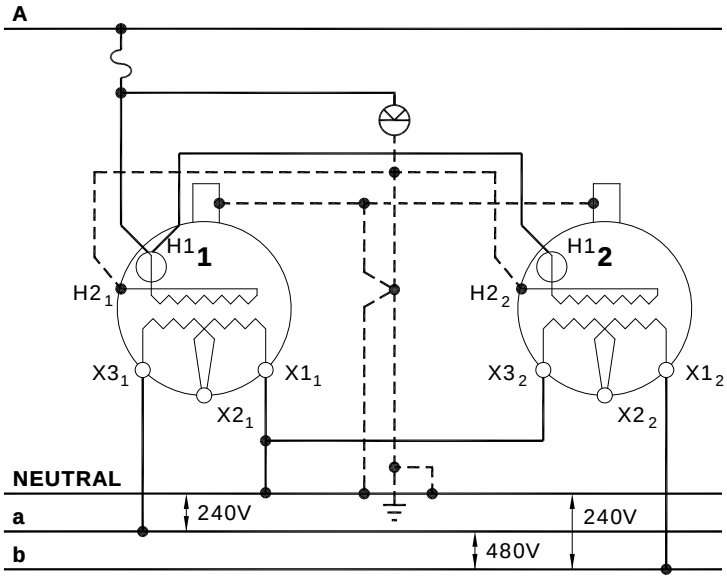
IN CASES WHERE EXCESSIVE VOLTAGE DROP IN A STREET LIGHTING CIRCUIT IS A PROBLEM, A SUPPLY VOLTAGE OF 240/480 MAY BE USED. A SUPPLY VOLTAGE OF 240/480 CAN BE OBTAINED FROM TWO SINGLE PHASE POLE-MOUNTED DISTRIBUTION TRANSFORMERS CONNECTED AS SHOWN ON DRAWING CD315-2. IF A SINGLE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMER WITH A 240/480 VOLT SECONDARY IS REQUIRED, THE TRANSFORMER MUST BE ORDERED FROM THE MANUFACTURER (SEE DRAWING CD315-2).

CAUTION:
PRIOR TO CONNECTING LUMINAIRES TO A 240 VOLT SUPPLY CIRCUIT IT IS IMPORTANT TO CHECK THE INTERNAL CONNECTIONS TO THE TERMINAL BLOCK TO ENSURE THAT THE UNIT IS PROPERLY CONNECTED FOR 240 VOLT OPERATION.

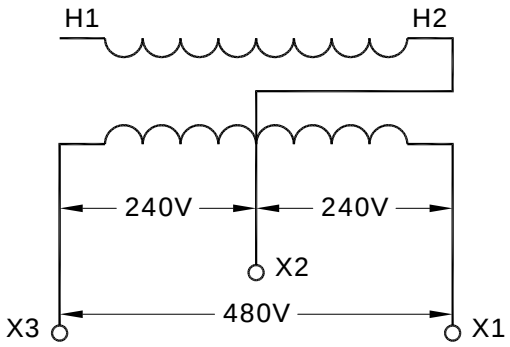
APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28		**SUPPLY VOLTAGES FOR STREET LIGHT CIRCUITS**

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	W.C.	88-08	**CD 315-1**	0001 OF 1	00

1-04431-DA-65620-0001



SECONDARY VOLTAGE 240/480V GROUNDED. TWO SINGLE-PHASE POLE-MOUNTED TRANSFORMERS WITH 120/240V SECONDARIES.



SECONDARY VOLTAGE 240/480V GROUNDED. SINGLE-PHASE PAD-MOUNTED TRANSFORMER AS SUPPLIED BY MANUFACTURER

SAFETY PRECAUTION

1. SINGLE PHASE PAD MOUNTED TRANSFORMERS WITH ABOVE SECONDARY VOLTAGES TO HAVE WARNING SIGN "**CAUTION - 240/480V SECONDARY - SEE NAMEPLATE**", STENCILLED ON THE OUTSIDE OF THE TRANSFORMER NEAR NAMEPLATE.
2. NAMEPLATES OF MODIFIED TRANSFORMERS TO BE REVISED.

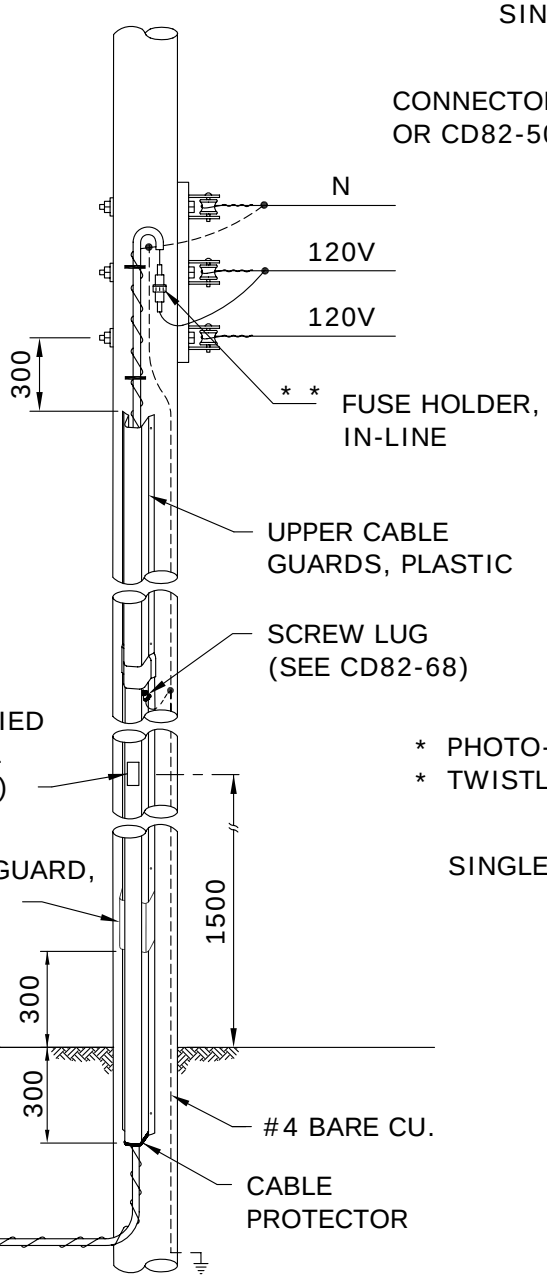
PURCHASE OF 240/480 VOLT TRANSFORMER

1. INCLUDE ABOVE WARNING SIGN REQUIREMENT IN PURCHASE DESCRIPTION.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28	13-01	2	REVISED DIAGRAM	**240/480 VOLT SUPPLY FOR STREET LIGHT CIRCUITS**
	90-04	1	DROPOUT DELETED	

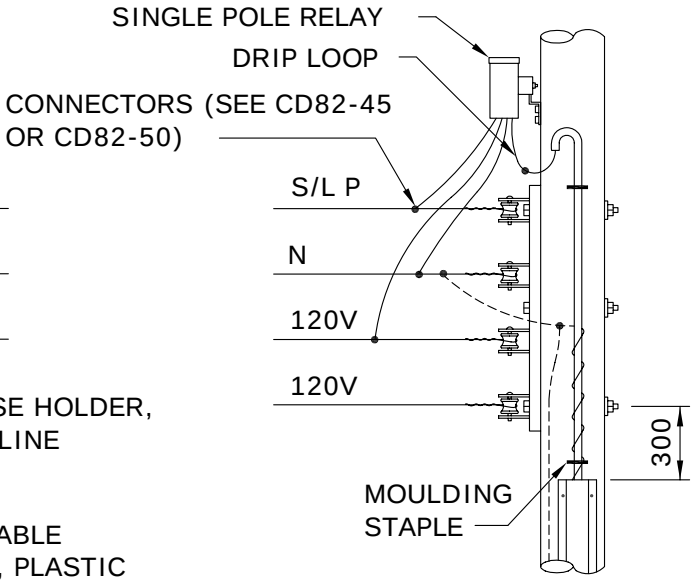
DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	L.D./D.O.	88-08	**CD 315-2**	0001 OF 1	02

1-04431-DA-65620-0002

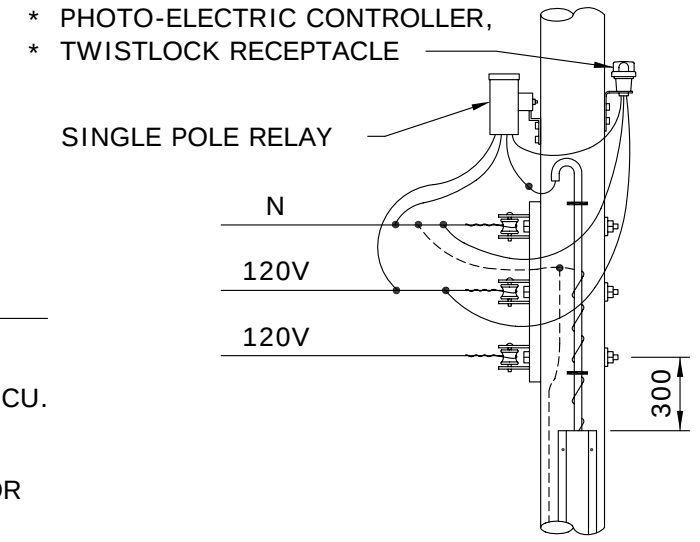


IN-LINE
FUSE PROTECTED

* * USED WHERE POLY ISN'T USED



STREET LIGHT PILOT WIRE
CONTROLLED RELAY



P.E. CELL
CONTROLLED RELAY

* USED WHERE ST./LT. PILOT
DOES NOT EXIST

NOTES:

1. REFER TO DRAWING CD200-63 FOR CABLE GUARD INSTALLATION DETAILS.
2. INSTALL A GROUND ROD AT THE LAST POLE ON THE STREET LIGHT CIRCUIT.
3. DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS			MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28	99-08	3	SHOW VENTED CABLE GUARD, SHEET 2 DELETED	**DIP POLE FOR UNDERGROUND STREET LIGHTING CIRCUIT**
	94-04	2	DWG. REFERENCE CHANGED	
	92-06	1	NOTE 1	

DRAWN	CHECKED	DATE		SHT	REV
R.L.B./CAD	K.C.H.	88-08	**CD 315-5**	0001 OF 1	03

1-04431-DA-65620-0003

CONTROL METHODS

1. LUMINAIRES CONTROLLED INDIVIDUALLY BY PHOTO-ELECTRIC CELL

   THE PREFERRED METHOD FOR PROVIDING ON/OFF CONTROL OF A STREET LIGHT LUMINAIRE IS TO INSTALL A PHOTO-ELECTRIC CELL ON EACH LUMINAIRE, IF LUMINAIRES ARE MOUNTED ON HIGHER POLES (IN EXCESS OF 10.7 M OR 35 FT.) WHERE IT IS DIFFICULT TO REACH THE LUMINAIRE WITH THE LOCAL DISTRICT BUCKET TRUCK, CONSIDERATION SHOULD BE GIVEN TO USING A PHOTO-ELECTRIC CONTROLLED EXTERNALLY-MOUNTED RELAY SYSTEM.

2. PHOTO-ELECTRIC CONTROLLED EXTERNALLY-MOUNTED RELAY

   SEVERAL LUMINAIRES CAN BE CONTROLLED SIMULTANEOUSLY BY INSTALLING A PHOTO-ELECTRIC CONTROLLED, EXTERNALLY MOUNTED RELAY, ON A WOOD POLE (SEE CD315-11) OR ON A STEEL STREET LIGHT POLE (SEE CD315-12). SINGLE POLE (SINGLE CIRCUIT) RELAYS ARE AVAILABLE WITH EITHER A 30 AMP OR A 60 AMP RATING. A BY-PASS SWITCH MAY BE INSTALLED TO PROVIDE A MEANS OF ACTIVATING THE STREET LIGHT CIRCUIT FOR DAYLIGHT MAINTENANCE PURPOSES.

3. STREET LIGHT RELAY USING STREET LIGHT CONTROL

   ACTIVATING SUCCESSIVE SECTIONS OF STREET LIGHTING CIRCUITS BY MEANS OF A SERIES OF RELAYS (KNOWN AS A CASCADE CONTROLLED SYSTEM) IS NO LONGER USED AS A CONTROL METHOD. HOWEVER, SOME CASCADE CONTROLLED RELAY SYSTEMS REMAIN IN SERVICE. THE CONNECTION DIAGRAMS FOR A CASCADE CONTROLLED RELAY SYSTEM ARE SHOWN ON DRAWING CD315-14. DOUBLE POLE (DOUBLE CIRCUIT) RELAYS ARE NO LONGER PURCHASED, THEREFORE, DOUBLE POLE RELAYS WHICH FAIL MUST BE REPLACED WITH TWO SINGLE POLE RELAYS. BOTH THE SINGLE AND DOUBLE POLE OLDER STYLE RELAYS HAVE A 5 AMP FUSE PROTECTING THE RELAY COIL.

4. STREET LIGHT RELAY USING PILOT WIRE CONTROL

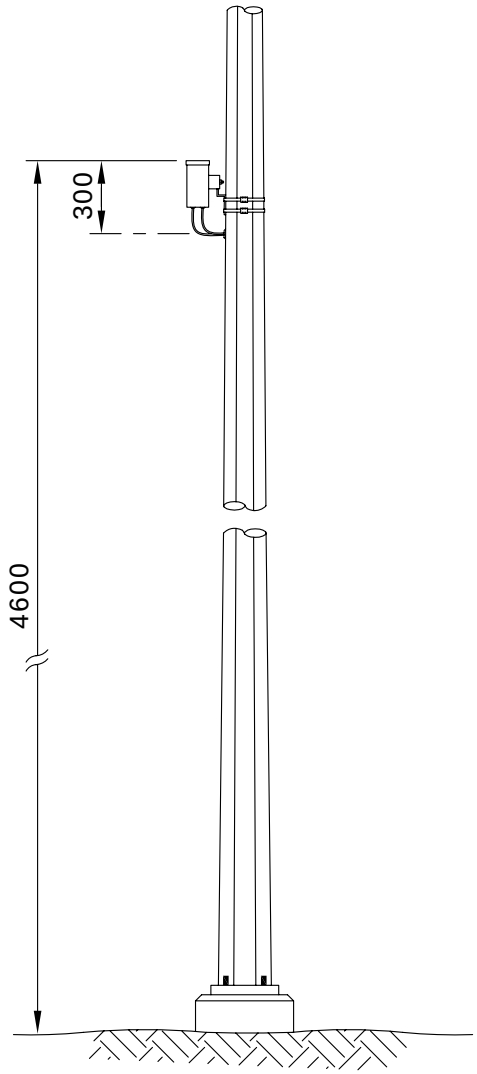
   PILOT WIRE CONTROL SYSTEMS ARE NO LONGER USED FOR NEW CONSTRUCTION. HOWEVER, SOME PILOT WIRE CONTROL SYSTEMS REMAIN IN SERVICE. THE CONNECTION DIAGRAMS FOR PILOT WIRE CONTROL SYSTEMS ARE SHOWN ON DRAWING CD315-15. DOUBLE POLE (DOUBLE CIRCUIT) RELAYS ARE NO LONGER PURCHASED. THEREFORE, DOUBLE POLE RELAYS WHICH FAIL MUST BE REPLACED WITH TWO SINGLE POLE RELAYS.

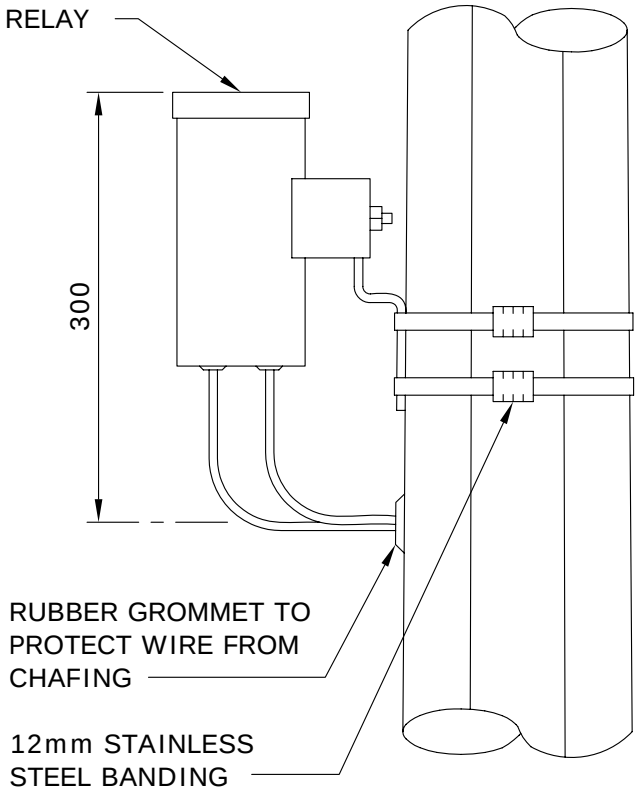
5. PHOTO-ELECTRIC CONTROLLED RELAY IN BASE OF STANDARD

   COMPACT RELAYS, MOUNTED IN THE BASE OF STEEL STREET LIGHT STANDARDS ARE NO LONGER USED FOR NEW CONSTRUCTION. THE COMPACT RELAY IS ACTIVATED VIA THE PHOTO-ELECTRIC CONTROLLER ON THE LUMINAIRE. IF A COMPACT RELAY FAILS AN EXTERNALLY-MOUNTED RELAY AND PHOTO-ELECTRIC CONTROLLER SHOULD BE INSTALLED (SEE CD315-12 AND CD315-13).

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28		**CONTROL METHODS FOR STREET LIGHT CONTROLS**

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	W.C.	88-08	**CD 315-10**	0001 OF 1	00





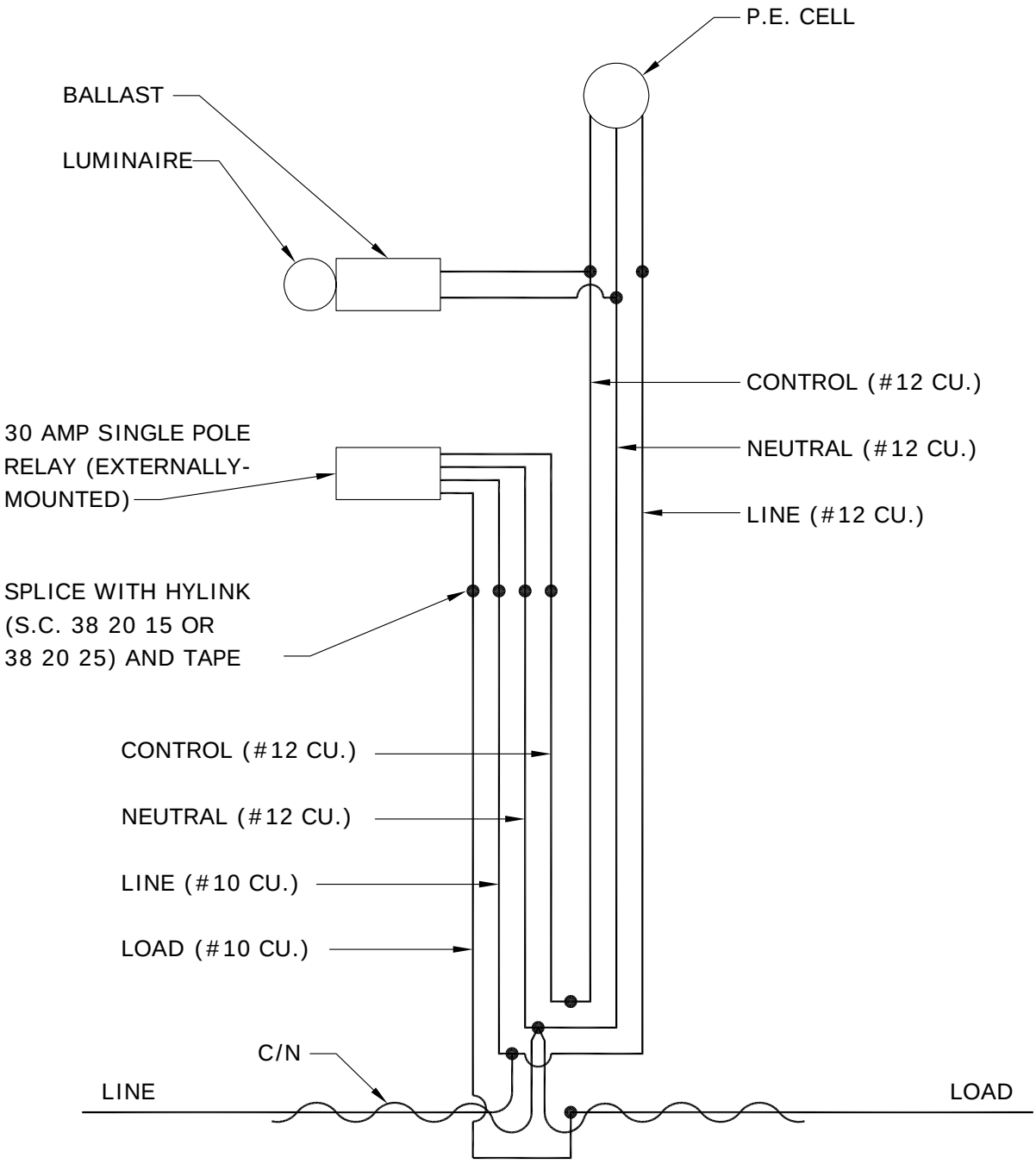
NOTES:

1. DRILL 25mm HOLE AT A POINT 4.3m ABOVE FINISHED GRADE.
2. INSTALL RUBBER GROMMET IN HOLE.
3. BAND RELAY TO POLE USING 12mm STAINLESS STEEL BANDING MATERIAL SO THAT THE TOP OF THE RELAY IS 300mm ABOVE THE CENTRE OF THE HOLE.
4. CONNECT RELAY LEADS TO 4.3m LENGTHS OF EQUAL SIZED CONDUCTOR AND PUSH SPLICES INSIDE POLE.
5. TAPE EXPOSED RELAY LEADS INTO A BUNDLE.
6. DIMENSIONS SHOWN ARE MILLIMETRES.

APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28		**INSTALLATION OF EXTERNALLY-MOUNTED RELAY**

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	W.C.	88-09	**CD 315-12**	0001 OF 1	00

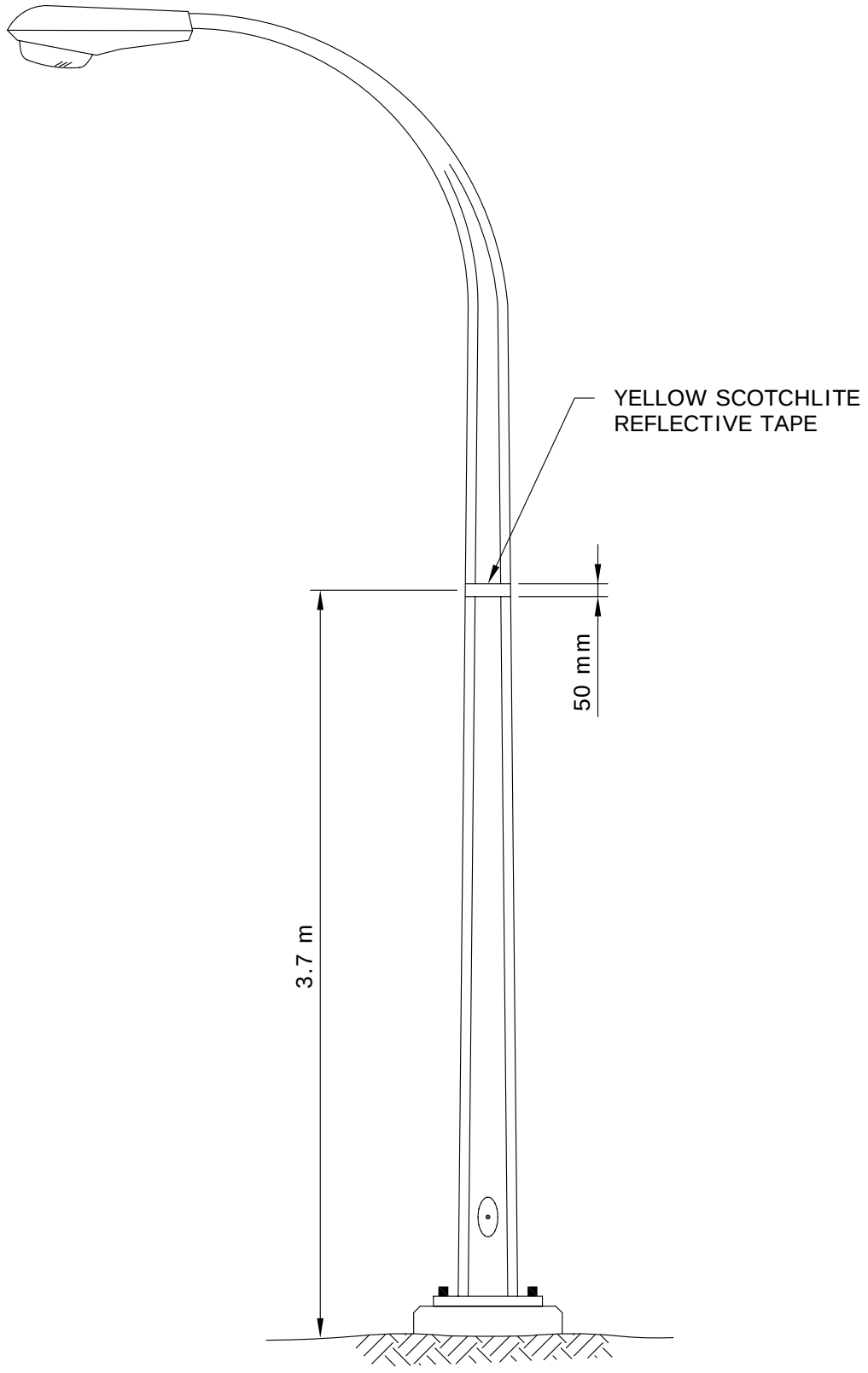
1-04431-DA-65620-0006



APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28	94-03 | 1 | MAXIMUM RELAY SIZE	**CONNECTION SCHEMATIC FOR EXTERNALLY-MOUNTED RELAY**

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	W.C.	88-09	**CD 315-13**	0001 OF 1	01

1-04431-DA-65620-0007



APPROVED	REVISIONS	MANITOBA HYDRO DISTRIBUTION STANDARDS
ORIGINAL DRAWING SEALED BY E.H. WIEBE 89-04-28		**IDENTIFICATION OF FIRST STREET LIGHT STANDARD CONNECTION TO CIRCUIT**

DRAWN	CHECKED	DATE		SHT	REV
W.B./CAD	W.C.	88-09	**CD 315-35**	0001 OF 1	00

1-04431-DA-65620-0014

APPENDIX ‘B’

SAFE EXCAVATION & SAFETY WATCH GUIDELINES

Safe Excavation & Safety Watch Guidelines

For your **SAFETY**

ClickBeforeYouDigMB.com

Or call 1-800-940-3447

Manitoba Hydro

RELEASE OF NATURAL GAS

In the event of any damage to a natural gas pipeline (regardless of whether it is steel, plastic or aluminum) or to its protective pipe coating or tracer wire, however minor, call Manitoba Hydro immediately 204-480-5900 or 1-888-624-9376. In most cases there is no charge for minor repairs.

In case of damage causing a release of natural gas:

- Call 911 and Manitoba Hydro immediately.
- Clear people from the vicinity and prevent people from approaching the area of the leak.
- Shut off all vehicles and equipment. Remove or extinguish all sources of ignition. DO NOT smoke or allow open flame in the presence of natural gas.
- If a gas line has been punctured, do not remove the tool or equipment that punctured the line. This could result in a larger gas leak and pose a greater hazard.
- DO NOT attempt to backfill over a leaking natural gas line or attempt to stop the leak; it is safest to allow the gas to vent into the atmosphere.

Before you start to dig, contact ClickBeforeYouDigMB.com to request to have underground lines located. Manitoba Hydro will be notified and will contact you within three business days to advise of the date we will locate our electric and natural gas lines.

- Once the lines are marked we will provide you with a Facilities Locate form with specific instructions. You must obtain this form prior to excavation.
- If work has not started within 14 calendar days after the locate was provided by Manitoba Hydro, you must contact us to have the lines re-marked and receive an updated Facilities Locate form.
- Contractors must ensure that everyone on the worksite is aware of the presence of all gas and electric facilities and ensure that the Facilities Locate form is kept at the excavation site until the excavation and backfill are complete.
- The location markings must be maintained and kept visible by the person or contractor doing the excavation. Be careful that site operators do not remove the line location markings.

In addition to contacting ClickBeforeYouDigMB.com be sure to contact any other underground services that may be in the area.

This guideline applies to the crossing of Manitoba Hydro electrical conductors and natural gas pipelines only. When Manitoba Hydro fibre optic cables are present contractors will be referred by the Manitoba Hydro Facilities Locator to the Manitoba Hydro communications department for more information.

Manitoba Hydro only locates facilities that it owns and has no knowledge of or responsibility for privately owned facilities. Electric conductors or gas pipes installed past the meter are owned privately by the property owner, and at times are installed below ground before entering the building. Outbuildings that are heated or have electric power, wells, septic systems, pumps, pools and hot tubs are examples where privately owned buried facilities may exist.

This booklet has been prepared by Manitoba Hydro for Manitoba Hydro staff, contractors and homeowners involved with excavation and is available at hydro.mb.ca. Information on excavation and safety watch is included to inform excavators about basic requirements for excavation in the vicinity of buried electric power lines and gas pipelines. Unless otherwise indicated, gas pipelines and underground power cables will be called "lines".

Table of Contents

WHY YOU SHOULD PLAN AHEAD

When you contact ClickBeforeYouDigMB.com before you dig, we can identify buried lines so you can dig safely. This prevents injury or death, costly repairs, equipment damage, service outages, and environmental pollution.

It is YOUR responsibility to contact all owners of buried underground services.

PLANNING LARGE PROJECTS

Determining the location of existing Manitoba Hydro Underground Structures within the work area should be one of the first priorities of any work. Knowing the location of all utilities infrastructure allows the third party to plan work proactively, mitigating the need for costly design changes or delays during construction.

Gas
Manitoba Hydro requests that drawings be submitted for review for all projects involving ground disturbance. Drawings shall be submitted to: gasdesign@hydro.mb.ca.

Drawings will be reviewed by Manitoba Hydro at no cost and a letter providing details of any work restrictions, specific requirements or costs will be provided to the contractor.

Drawings should be submitted a minimum of 4 weeks before the start of any excavation work. Drawings shall include the details of the proposed work and include any gas or electrical line in the work area.

Electric
Contact Manitoba Hydro in Winnipeg at 204-480-5900 or outside Winnipeg at 1-888-MBHYDRO (1-888-624-9376)

You will be referred to the local district office for further instruction.

REGULATIONS

There are several federal and provincial agencies overseeing the operation of and around natural gas pipelines and electric cables. The following regulations and safe practice guides specify requirements for both the contractor and the utility:

- Manitoba Gas Pipeline Act, Regulation 140/92 – Provides the legal definition of an excavation and outlines Excavator and Utility responsibilities.
- National Energy Board Pipeline Damage Prevention Regulations: Authorizations, SOR/2016-124; Obligations of pipeline companies, SOR/2016-133
- Manitoba Workplace Safety and Health Act and Regulation M.R. 217/2006 including Part 26, Excavations and Tunnels - Describes legal responsibilities in regards to excavating safely.
- Guideline for Excavation Work, Manitoba Workplace Safety & Health Division.
- CSA Z247 Damage Prevention Standard.

DEFINITIONS

Daylighting – A term used to describe the uncovering and exposing of underground utilities to daylight without the use of mechanical excavation.

Excavation – includes digging, boring, pushing, ploughing, trenching, grading, post installation and breaking and displacement of soil or other material below the existing level of the ground that will disturb more than the top 150 mm (6 inches) of the ground.

High Pressure gas line – A natural gas line that operates in excess of 700 KPa (100psi).

Hydrovac – A truck or trailer that injects pressurized water from an onboard reservoir tank into the ground through a handheld wand. As the soil cover is liquefied, the resulting slurry is simultaneously extracted by a powerful vacuum and stored in an onboard debris tank for later disposal.

Large diameter pipeline – A natural gas pipeline that is 168.3 mm (6 inches) in diameter or larger, regardless of operating pressure.

Safety Watcher – A person designated by Manitoba Hydro to ensure that workers are not put at risk as a result of special hazards on the work site.

Sonde - A transmitter behind the bore head which registers angle, rotation, direction and temperature data.

Tolerance Zone – The space in which a line or facility is located, and in which special care is to be taken.

White lining – Designating the route and/or work area of the excavation using white paint, stakes and/or flags to outline the work area prior to the locator arriving on the site.

EXCAVATOR PRE-MARKING

Pre-marking your proposed work site allows excavators to accurately communicate to Manitoba Hydro's facility locators where the excavation is to occur. This may be accomplished either electronically or by white lining.

For excavator pre-marking, contact ClickBeforeYouDigMB.com or call 1-800-940-3447 to communicate where the excavation is to occur and:

- Attach a sketch or map that clearly identifies the excavation area via email or
- Pre-mark the excavation area by white lining

In either scenario you will be issued a reference number and notified of the day the locator will be on site.

When a project is too large for or not conducive to pre-marking, face-to-face meetings between Manitoba Hydro's facility locator and the excavators will be arranged at the proposed work site.

White Line
The excavator designates the route and/or area of the excavation using white paint, stakes and/or flags to outline the work area prior to the locator arriving on the site.

White paint, white stakes or white flags with the excavator's company identifier on them are permissible methods of marking.

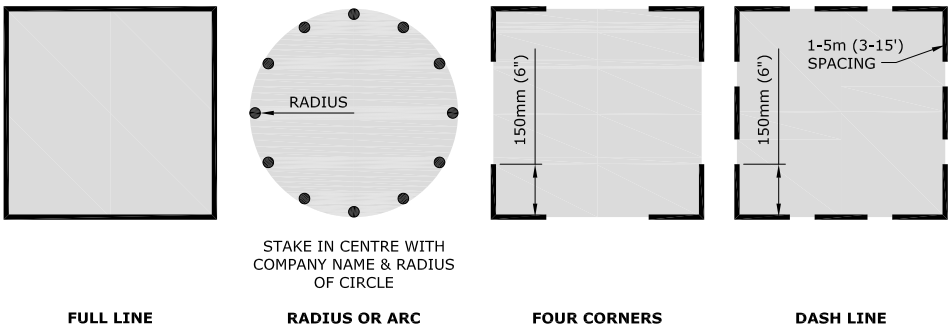
When using stakes or flags to mark the excavation work area, do not drive them into the ground deeper than 150 mm (6 inches). Any activity which disturbs more than 150 mm (6 inches) must have the facilities located.

Guidelines for excavation marking

The following marking illustrations are examples of how excavators may choose to mark their area of proposed excavation. The use of white marking products (e.g. paint, flags, stakes, or a combination of these) may be used to identify the excavation site.

Mark in white paint the proposed area of excavation through the use of a continuous line, dots marking the radius or arcs, dashes marking the four corners of the project, or dashes outlining the excavation project. The recommended size of each dash is approximately 150 – 300 mm (6-12 inches) in length and 20 mm (3/4 inch) in width with interval spacing approximately 1 – 5 metres (3-16 feet) apart. The maximum separation of excavation marks is to be reduced to a length that can be reasonably seen by the operator's locators when the terrain or excavation site conditions warrant it. Dots of approximately 20 mm (3/4 inch) diameter are typically used to define arcs or radii and may be placed at closer intervals in lieu of dashes.

SINGLE POINT EXCAVATION MARKINGS



If an excavation is contained within a 5 metre (16 feet) maximum radius then it can be marked with a single white stake at the centre of the excavation. The stake must clearly state the company identifier and the radius of the excavation in black lettering. This information must be conveyed to Manitoba Hydro.

After the area is Pre-Marked

On the appointed date, the locator will identify the Manitoba Hydro facilities that are located in the designated work area. They will document it using a sketch or map attached to the Electric and/or Natural Gas Facilities Locate Form.

When the locator has completed locating the facilities, they will advise the excavator and indicate whether there is a conflict. The Facilities Locate form will be available and must be on site prior to excavating.

The Manitoba Gas Pipeline Act, Regulation 140/92 and the Workplace Safety and Health Act, regulations M.R.217/2006, part 26.6 require that a valid Facilities Locate form be on the work site at all times until the project is complete.

If an excavation takes place without a current locate form on site, the locate is not valid. The excavator could face consequences which may include fines and/or sanctions by Manitoba Workplace Safety and Health and Manitoba Hydro.

APWA UNIFORM COLOUR CODE

Underground utility marking

WHITE – Proposed Excavation

PINK – Temporary Survey Markings

RED – Electric Power Lines, Cables, Conduit and Lighting Cables

YELLOW – Gas, Oil, Petroleum, or Gaseous Materials

ORANGE – Communication, Alarm or Signal Lines, Cables or Conduit

BLUE – Potable Water

PURPLE – Reclaimed Water, Irrigation and Slurry Lines

GREEN – Sewer and Drain Lines

GUIDELINES FOR EXCAVATION NEAR ELECTRICAL AND NATURAL GAS LINES

Hand Digging to Expose Lines

Mechanical excavation cannot be used within 1 metre (39 inches) of an electrical or gas line until the line is physically exposed by hand. Hand exposing means exposing a buried facility, whose location has been marked by Manitoba Hydro, using non-powered tools such as a Spade or shovel (hand augers are not acceptable). A water pressure/ vacuum system (hydrovac) is an acceptable alternative.

There are several things to remember when hand exposing:

- No one should ever jump on or use their entire body weight on a shovel when digging.
- Use a prying (rather than striking) motion to loosen hard dirt.
- Never probe for the facility using a sharp pointed tool such as a pick axe or pointed bar.
- Dig on an angle if possible, such that any contact with the facility is a glancing blow rather than a direct hit.

Once the line is visible, mechanical excavation equipment can be used in accordance with the guidelines for mechanical excavation.

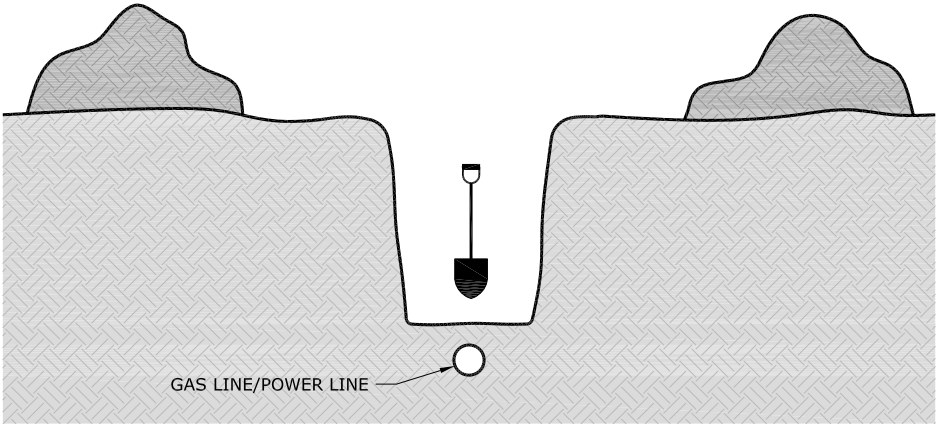
Water Pressure/Vacuum System (Hydrovac)

An alternative to exposing cables by hand digging is to use a water pressure/vacuum system capable of exposing Manitoba Hydro facilities without damage.

Only oscillating head type nozzles are to be used for the water wand. When excavating within 1 metre of a marked line the maximum setting of 38°C (100°F) water temperature and 10,342 Kpa (1,500 psi) must not be exceeded. The end of the vacuum tube shall be neoprene or equivalent. Expose the buried line by using a sweeping motion only, perpendicular to the locate markings, until the line is sighted. IMPORTANT: *After sighting, the line shall not be contacted by spray or vacuum to avoid damage to wraps and coatings.*

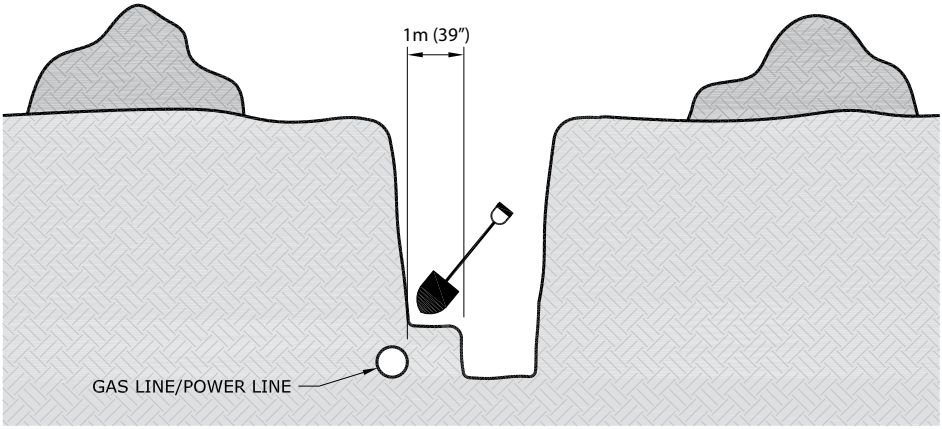
Some acceptable excavation methods:

a) Dig Vertically



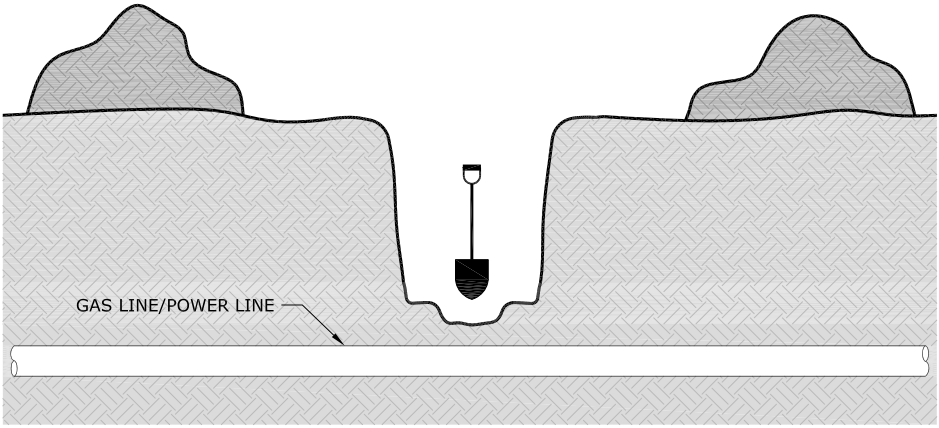
Dig a hole with a shovel directly above the line location until the line is exposed. Take care not to damage the line or coating. Mechanical excavation equipment MUST NOT be used to widen or deepen the hole before exposing the line.

b) Dig Laterally



Dig a trench or bell hole 1 metre (39 inches) from the line location, parallel to the line, then hand dig laterally to expose the line.

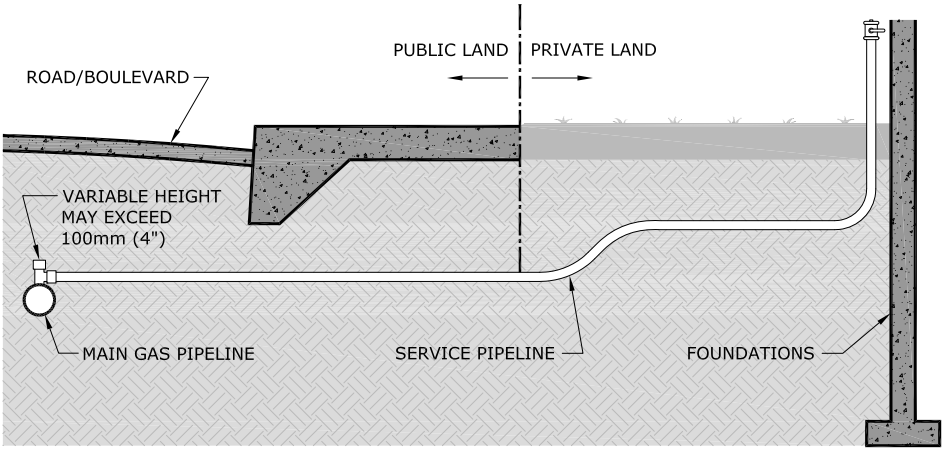
c) Dig Trench and excavate



Dig a trench by hand across the full width of the excavation (perpendicular to or "across from" the line). If the line is not uncovered, mechanically excavate to one half the depth of the trench. Repeat this process until the line is exposed.

Typical Gas Service Installation

(example only does not represent all installations)

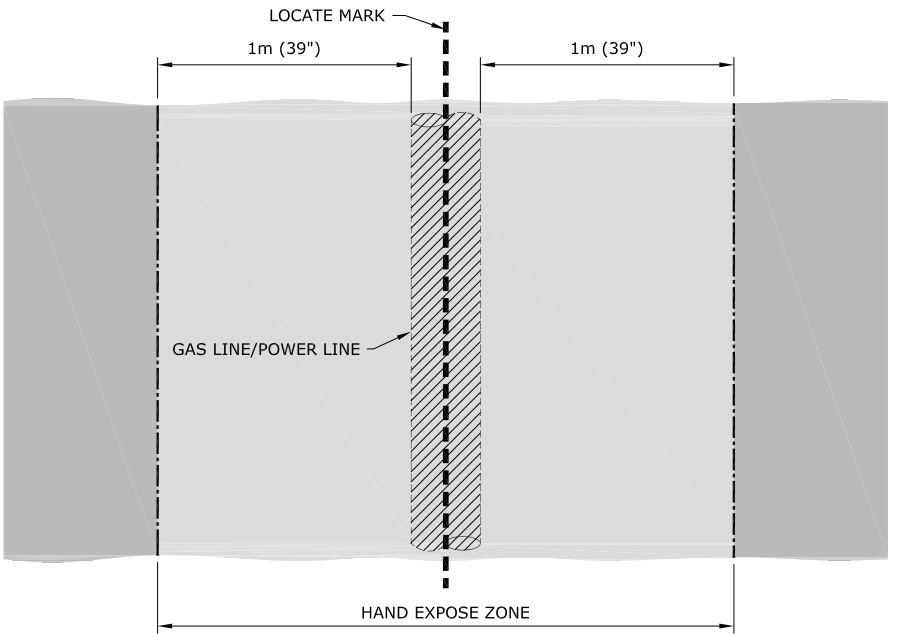


Fittings such as active or abandoned service tees may be present on gas pipelines, exercise care when excavating.

General Approach

- When the line is not visible, mechanical excavation shall not be used within 1 metre (39 inches) of an electrical or gas line.
- When the line is visible, mechanical excavation can be used no closer than 450 mm (18 inches) to natural gas lines and 600 mm (24 inches) to electrical lines.
- When soil conditions permit, a smooth edge bucket is preferred when excavating near gas and electrical lines.
- An observer (excavator staff) located near the line must maintain communication and control of the operator at all times by the use of hand signals and verbal communication. The observer is responsible for maintaining the minimum distance from the pipe. If at any point the observer or operator is unclear of the location or orientation of the line, no digging shall occur until this is confirmed and agreed upon by all on the worksite.

Before line is exposed



Crossing Lines

- When crossing a line, the line is to be exposed for the width of the excavation.
- After the line is daylighted, and provided there is space for excavator access, it is recommended that excavation near the line be performed parallel to the line.

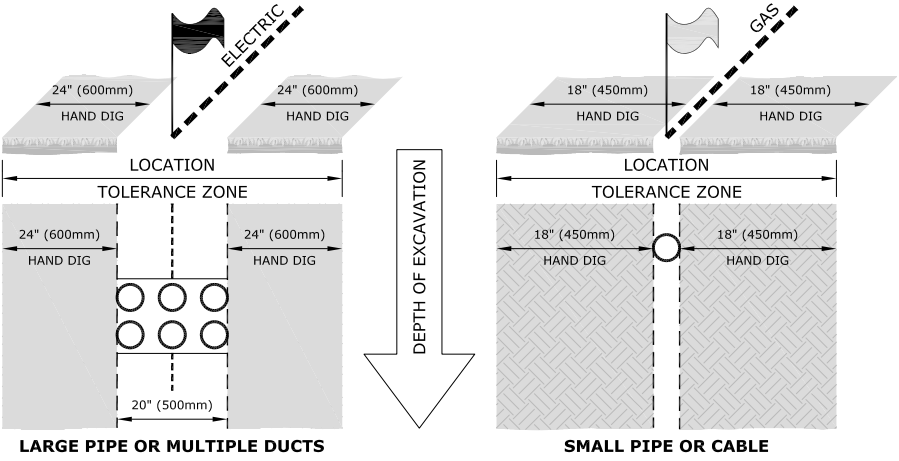
Working Parallel to Lines

- When working parallel to a line it is not necessary to expose the full length of the line to reduce the acceptable mechanical excavation separation. A series of daylight holes along the line is acceptable. The distance between daylight holes will be a maximum of 10 metres (33 feet) or as required to define the location of the line. Daylight holes must be large enough to expose the full width of the line or lines.
- After daylighting and previewing of the line, marks shall be placed a minimum of 450 mm (18 inches) from the outside of the line at each daylight hole for gas and 600 mm (24 inches)

for electrical lines. This tolerance zone should be marked along the entire length of the work area to ensure that the operator maintains proper alignment with the line. With the line daylighted and the tolerance zone marked, it is acceptable to use mechanical excavation on the outside of the marked line of the tolerance zone.

- If at any point the line becomes obscured, it shall be remarked immediately. The observer is responsible for maintaining the minimum distance from the pipe by confirming the machine's distance and alignment with the line. The operator will orient his machine parallel to the line so their bucket remains more than 450 mm (18 inches) away for gas and 600 mm (24 inches) away for electric lines. They must preview the work prior to entering their machine and prior to any trenching.

Once line is exposed



LARGE PIPE OR MULTIPLE DUCTS **SMALL PIPE OR CABLE**

Hard Surface Removal

- Mechanical equipment can be used to remove the asphalt or concrete road/sidewalk surface and should only be used to the depth of that surface.
- Avoid starting the pavement break directly over the marked facility.
- Start a few feet away from the marks and attempt to "peel off" the pavement or break it into small chunks for removal.

Line Exposed

When a length of line is exposed consult the utility for proper handling procedures. The line may need to be supported to prevent settling or sagging.

No Relocation

The line shall not be moved or relocated. No operation or work shall be done that would put stress on the line.

Inspect for Damage

Electric Power Lines – If you suspect a power cable has been damaged, contact Manitoba Hydro to inspect the cable. Do not contact the cable as it may be energized.

Gas Pipelines – Thoroughly clean (with water only) and inspect the exposed gas line for damage to the pipe, yellow plastic pipe covering or tracer wire (used on plastic pipe). If damage is found, notify Manitoba Hydro. They will repair minor damage to the pipe coating or tracer wire at no charge.

Report Contact or Damage – Any contact with or damage to any line or underground cable must be reported immediately to Manitoba Hydro.

Backfilling

To prevent settling or stress, the contractor is required to place clean fill under the power or gas line and compact the fill. The backfill material must be free of rocks, sharp objects or other material that could damage the line.

If the backfill material is frozen, it should be free of large frozen lumps of soil. The backfill material must be gradually placed, not dumped, on the line. Alternatively, the line may be hand padded with 300 mm (12 inches) of screened sand or soft fill before backfilling.

If mechanical protection is required, or if the backfill contains rocks, the cable or pipeline must be enclosed in a 150 mm (6 inches) envelope of screened sand.

Access

Manitoba Hydro utility personnel shall have access to the excavation to inspect the underground line at any time during construction.

Project Closeout

When the excavation project has been completed all flags and stakes used to mark gas and electric lines shall be removed from the site.

SAFETY WATCH

Safety Watch is a program where an employee qualified by Manitoba Hydro observes the excavation work in progress and determines actions to be taken by the contractor to prevent injury, property damage or damage to Manitoba Hydro facilities.

Safety Watch personnel work with the excavator to check that:

- the excavation is done safely;
- rules and procedures related to the excavation are followed;
- the plant is located accurately;
- all documentation is accurate and complete;
- Hydrovac guidelines are followed.

Safety Watch personnel shall be recognized as an authority on site with the ability to shut the job down.

When is a Safety Watch required?

Any excavation within 3 metres (10 feet) of a cable or pipeline may require a Safety Watch. The need for a safety watch will be assessed and identified on the Facilities Locate form. The decision to provide a Safety Watch will be based on the excavation proposed, the type of cable or pipeline, and the proximity of the excavation to the cable or pipeline.

Why is a Safety Watch done?

Safety Watch service is provided to ensure the safety of customers and their contractors when working in close proximity to either energized electrical or pressurized gas lines. In addition, this protects the integrity of the utility lines minimizing the chance of an outage.

NOTE: *Typically, Safety Watch personnel are not provided for low voltage conductors (under 750 volts) or distribution pressure gas mains and services under 168.3 mm (6 inches) diameter. However, Manitoba Hydro staff may assess the situation and choose to provide Safety Watch personnel where conditions warrant.*

Who pays for a Safety Watch?

Generally, Safety Watch service is provided at no cost to the homeowner for minor projects. For larger projects, the contractor may be charged at a cost shared rate. Contact the local district office for further information.

How to arrange for a Safety Watch.

When an underground line is located in response to a Click Before You Dig request, the Manitoba Hydro employee will indicate whether a Safety Watch is required. Call Manitoba Hydro to arrange for a Safety Watch appointment a minimum of three business days before any excavation is to occur.

DIRECTIONAL BORING – CONTRACTOR GUIDELINES

As with all ground disturbance activity, the excavator must first obtain a facilities locate from Manitoba Hydro.

The distance measured to Manitoba Hydro electrical conductor or gas pipeline must always be measured from the **outside** diameter or wall of the Manitoba Hydro facility to the outside diameter of the back reamer. The same measuring methodology must be used when paralleling Manitoba Hydro facilities.

When boring within the tolerance zone of a high pressure or large diameter gas pipeline or any critical distribution gas pipeline or electrical conductor, as identified by Manitoba Hydro's Facilities Locate personnel, qualified natural gas or electric Safety Watch personnel are required.

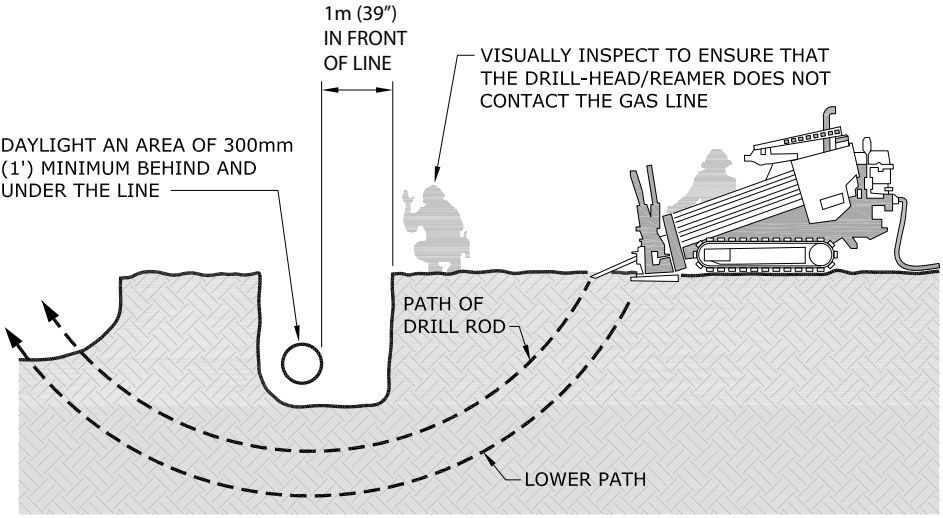
Electrical Conductors and Gas Pipelines

Prior to directional boring across Manitoba Hydro gas and electrical lines, the buried depth must be confirmed. Acceptable practice to verify line depth is to:

- Expose the line by hand digging, or
- Expose the line by water pressure/vacuum excavation; or
- Locate on the side wall of a trench that has been excavated 1 metre (39 inches) on either side of the surface locates; or
- Use reference measurements that are known to be accurate, for example: electrical duct lines.

The drill head and/or back reamer should at all times maintain a minimum of 1 metre (39 inches) clearance from all Manitoba Hydro lines.

Where underground facility congestion does not effectively allow a 1 metre (39 inches) clearance/separation from Manitoba Hydro lines, the contractor may consult with Manitoba Hydro Engineering for site specific direction. Any deviations in clearances/separations must be provided in writing and must be present on-site when the work is being performed.



Observation Hole Required When Crossing Any Manitoba Hydro Facility

The accuracy of the drill head location and depth must be visually verified 1 metre (39 inches) prior to crossing Manitoba Hydro facilities. An observation or discovery hole is required.

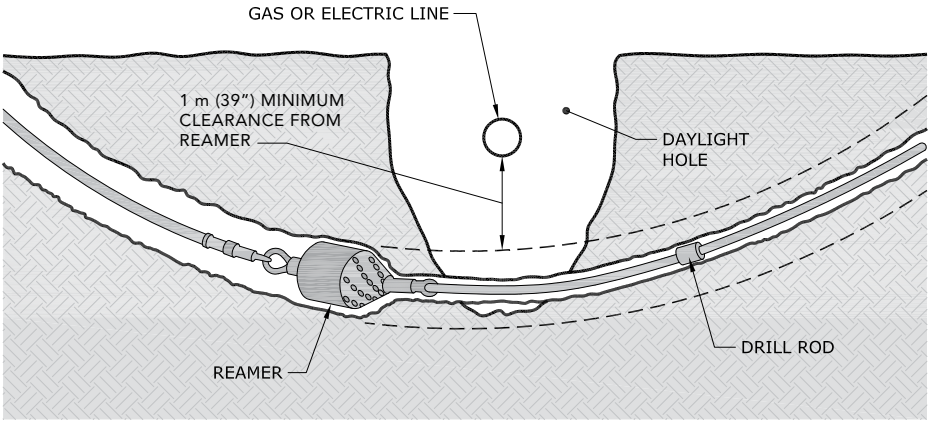
Acceptable practice for opening up the observation hole is using water pressure/vacuum or hand digging.

When boring head and/or back reamers path is crossing above a natural gas pipeline or electrical conductor the boring head and/or back reamer must be visually observed crossing the facility.

When the boring head and/or backreamer's path is crossing below a gas pipeline or electrical conductor an observer must verify that the bore head and/or reamer does not enter the observation hole within 1 metre of the line.

The minimum dimensions of the observation/discovery hole MUST BE:

- 1 metre (39 inches) in front of the gas pipeline or electrical conductor on the near side of the bore path;
- 300 mm (12 inches) on the far side of the bore path;
- 300 mm (12 inches) on each side of the bore path;
- 300 mm (12 inches) below natural gas pipeline or electrical conductor.



Drilling Parallel to Manitoba Hydro Facilities

Paralleling Electrical Conductors & Natural Gas Pipelines

There must be 1 metre (39 inches) of separation between the outside diameter of the back reamer assembly and the outside diameter of any Manitoba Hydro electrical conductors or natural gas pipelines.

NOTE: *When drilling within 1 metre (39 inches) horizontally, the drill must be kept at a depth either deeper or shallower than the existing electrical conductor or natural gas pipeline to maintain 1 metre (39 inches) separation when measured diagonally.*

If 1 metre (39 inches) horizontal separation cannot be maintained, the electrical conductor or natural gas pipeline adjacent to the bore path must be exposed. When it is not possible to de-energize electrical conductors, a Safety Hold-Off must be in place and qualified Safety Watch personnel must be on site.

When suspected of drilling within 1 metre (39 inches) of any gas or electrical lines determined by the boring head (sonde) position readings and the proximity to the locate marks, the location of the conductor or pipeline shall be verified; the electrical conductor or natural gas pipeline adjacent to the bore path must be hand exposed or exposed by water pressure/vacuum excavation as determined by Manitoba Hydro. The frequency of exposures depends on the consistency of the alignment of the existing facility.

Manitoba Hydro facilities must be exposed a minimum of once every 10 metres (33 feet), to confirm alignment. Where there is an alignment change indicated by the locator marks, the Manitoba Hydro facility shall be visually confirmed at each alignment deviation.

UNPLANNED CONTACT WITH ELECTRIC OR NATURAL GAS LINES

This guideline applies to people who come in contact with or simply expose a buried utility line while excavating.

Anyone who comes in contact with buried utility lines should contact the utility owner immediately. Although there may be no apparent external damage, the impact of striking a line can cause internal structural damage that can only be determined and repaired by qualified utility personnel. Generally, we do not charge for this inspection and coating repair.

Abrasions

Even if contact does not cause the utility line to stop working, a nick or cut to the outer, protective sheath of the utility line can allow ground water, laden with salts and other caustic substances, to corrode the line. Abrasions may compromise the sidewall strength of a plastic, steel or aluminum gas line.

Aerial

Cables suspended along utility poles can easily be damaged if struck by a vehicle or a mechanical implement like a hydraulic lift. Cable clamps and other attachments can be pulled apart and component housings may hide damage to the electronic equipment inside.

Stop Work

If any equipment is snared in the utility lines, it should be left in place. Trying to extract, flex or manipulate the line can compound the damage. Operations at the site shall stop immediately. Operators should stay in the equipment unless it is not safe (as in the case of a fire) and all others should be kept clear of the equipment as it may have become energized. If you must leave the equipment, jump clear with both feet together so you are not in contact with the equipment and the ground at the same time. Continue to hop or shuffle with your feet close together until you are a safe distance away.

Call It In

The person involved in the incident should call Manitoba Hydro immediately and report the location of the hit. (In Winnipeg at 204-480-5900 or outside of Winnipeg at 1-888-624-9376.) The exact address, or street intersection, along with what type of contact occurred, will help the utility respond in an appropriate manner.

Notes

ClickBeforeYouDigMB.com®

Or call 1-800-940-3447

In addition to contacting
ClickBeforeYouDigMB.com
be sure to contact other
underground services in the area.

For more information visit
hydro.mb.ca

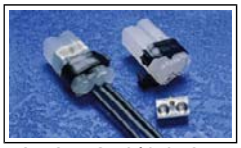
Manitoba Hydro

Rev. 2016 07

APPENDIX ‘C’

GELCAP KIT

GELCAP-SL-2/0-3HOLE(B10) Product Details



GELCAP-SL-2/0-3HOLE (B10)

TE Internal Number: F40658-000

Active

Power Cable Splices, Repair Sleeves and End Seals

Always EU RoHS/ELV Compliant (Statement of Compliance)

Product Highlights:

- Cable Splice
- Splice Type = Stub Splice
- Splice Style = Cap
- GelCap-SL Series
- Motor Connections Application, Street Lights Application

View all Features

Quick Links

Pricing & Availability
Search for Tooling
Product Feature Selector
Contact Us About This Product

Add to My Part List | Request Sample | Find Similar Products | Buy Product

Documentation & Additional Information

Product Drawings:
- None Available

Catalog Pages/Data Sheets:
- None Available

Product Specifications:
- None Available

Application Specifications:
- None Available

Instruction Sheets:
- None Available

CAD Files:
- None Available

Additional Information:
- Product Line Information

Related Products:
- Tooling

Product Features (Please use the Product Drawing for all design activity)

Product Type Features:
- Product Type = Cable Splice
- Splice Type = Stub Splice
- Splice Style = Cap
- Series = GelCap-SL
- Cable Type = Polymeric
- Retention Type = Clamp
- Armored Cable = No
- Jacketed Cable = With

Mechanical Attachment:
- Installation Type = Cold Applied

Configuration Features:
- Conductor (Wire) Size = #14 - 2/0
- Cable Shielding = Without

Industry Standards:
- RoHS/ELV Compliance = RoHS compliant, ELV compliant
- Lead Free Solder Processes = Not relevant for lead free process
- RoHS/ELV Compliance History = Always was RoHS compliant

Printer/Label Features:
- Voltage Rating (kV) = 0.6

Operation/Application:
- Application = Motor Connections, Street Lights

Other:
- Brand = Raychem
- Comment = Clear cap to allow visual inspection.; Port B - power port to light - #14-6 AWG; Kits include connectors

APPENDIX ‘D’

ELECTRIC AND/OR NATURAL GAS FACILITIES LOCATE

0371/f Rev 16 07
v1.93

Manitoba Hydro

ELECTRIC AND/OR NATURAL GAS FACILITIES LOCATE
DEMANDE DE LOCALISATION DE CONDUITES D'ÉLECTRICITÉ ET DE GAZ NATUREL

In case of Emergency, call / *En cas d'urgence, composez le* 480-5900 or / *ou* 1-888 MB HYDRO (1-888-624-9376) outside / *à l'extérieur de Winnipeg*

Address or location of work / *Adresse ou site des travaux*		Notice given by / *Avis signifié par*	
Name of contact on site / *Nom de la personne-ressource sur le site*	Contact tel. no. / *Tél. de la personne-ressource*	Company name (if applicable) / *Nom de l'entreprise (s'il y a lieu)*	Company tel. no. / *Nº de tél. de l'entreprise*
Description of work / *Description des travaux*			

Map no. / *Nº de carte*	MIT Application #	Asbuilt no. / *Nº de plan définitif*	**DATE REQUIRED / *DATE DEMANDÉE***	yyyy mm dd / *a. m. j.*	**TIME REQUIRED / *HEURE DEMANDÉE***	hh mm / *h min.* ☐ **A.M.** ☐ **P.M.**

High pressure / *Haute pression*	**Gas main / *Conduite principale de gaz***	**Service line / *Ligne de desserte***	**Size / *Taille***	**High voltage > 750 V / *Haute tension > 750 V***	**Secondary / *Secondaire***	**Overhead line / *Ligne aérienne***	**Under-ground cable / *Câble souterrain***	**Address or location of work / *Adresse ou site des travaux***

Excavation constitutes a danger to the electrical cables and natural gas mains indicated below. / *Les travaux d'excavation comportent des risques pour les câbles électriques et les conduites de gaz naturel indiqués ci-dessous.*

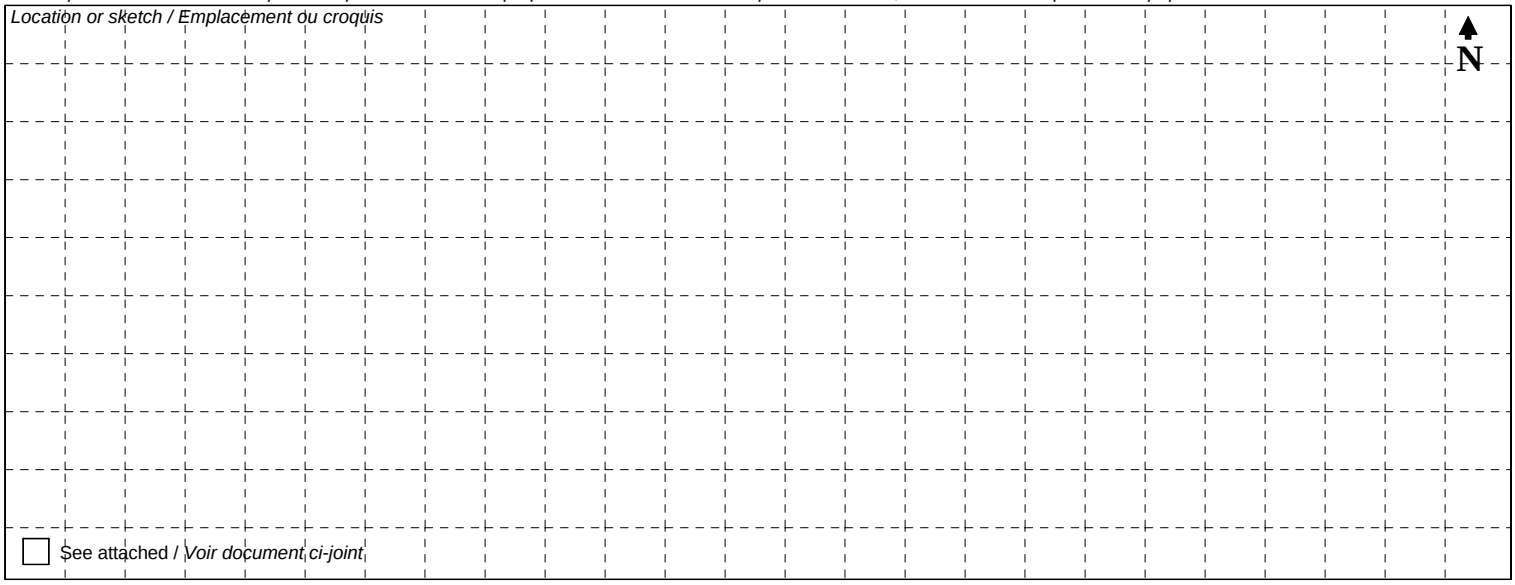
Only the following utilities have been marked / Les services suivants sont les seuls à avoir été marqués :

☐ **Electrical / *Électrique :*** **RED** markings, flags or marked stakes indicate power utility cables. / *Les marques, les drapeaux ou les piquets **ROUGES** indiquent la présence de câbles électriques.*

☐ **Natural Gas / *Gaz naturel :*** **YELLOW** markings, flags or marked stakes indicate natural gas lines. / *Les marques, les drapeaux ou les piquets **JAUNES** indiquent la présence de conduites de gaz naturel.*

Sketch is for illustration purposes only. It is not to scale or in reference to property lines. Refer to actual stakes or markings for location(s). / ***Le croquis n'est qu'une illustration.*** *Il n'est pas à l'échelle et il ne représente pas les limites des propriétés. Pour connaître l'emplacement exact, consulter les marques ou les piquets eux-mêmes.*

Location or sketch / Emplacement ou croquis



☐ See attached / *Voir document ci-joint*

☐ **SAFETY WATCH REQUIRED / *EXIGENCE DE SURVEILLANCE DE SÉCURITÉ :***

☐ **Electricity / *Électricité***

☐ **Natural Gas / *Gaz naturel***

Notify the Utility at least **2 business days in advance** of excavation to request a Safety Watch / *Avertir l'entreprise **2 jours ouvrables avant les travaux** d'excavation pour demander une surveillance de sécurité.*

☐ Work area is within three metres of overhead line. / *La zone de travail est à moins de 3 mètres de distance d'une ligne aérienne.*

☐ Excavation area is within three metres but at least one metre away from power cable or gas line location. / *La zone d'excavation est à moins de 3 mètres et à plus d'un mètre d'un câble électrique ou d'une conduite de gaz.*

☐ **Hand dig within one metre of all markings/staking. / *Creusez manuellement à moins d'un mètre des marques et des piquets.***

☐ Contact the Utility for further instructions before working/digging. / *Communiquez avec le service public avant de commencer à travailler ou à creuser pour obtenir des instructions additionnelles.*

Utility contact name / *Personne-ressource (entreprise)*	Tel. no. / *Nº de tél.*

Prepared by (print name) / *Fait par (nom en caractères d'imprimerie)*	Employee signature / *Signature de l'employé(e)*	**DATE ADVICE GIVEN / *DATE DES CONSEILS***	yyyy mm dd / *a. m. j.*

Received and conditions noted by (print name) / *Reçu et conditions acceptées par (nom en caractères d'imprimerie)*	Signature / *Signature*

The recipient (**must be 18 years of age or older**) acknowledges receipt of the advice herein; and accepts and agrees to the Terms and Conditions as set out on the reverse. / *Le récipiendaire, **qui doit être âgé de 18 ans ou plus**, reconnaît avoir reçu les conseils indiqués dans la présente et accepte les conditions générales indiquées au verso.*

DISTRIBUTION / *DISTRIBUTION :* ORIGINAL / *ORIGINAL* – Office / *Bureau* **COPY / *COPIE :*** Customer / *Abonné*

TERMS AND CONDITIONS:

Wherever used herein, Utility refers to Manitoba Hydro and any employees or agents of the Utility.

You, by signing the front of this Electric and/or Natural Gas Facilities Locate, acknowledge that you are the owner, or an authorized agent for the owner of the location(s) of the excavation ("You") and You agree as follows:

1. The Utility shall not be liable for any claims, damages, costs, liability, damage to property, or injury or death arising from, or caused by the work or excavation, or failure to abide by the location advice or any other terms or conditions provided herein;
2. You agree to indemnify the Utility, its successors and assigns, from and against all causes of action, claims, damages, costs, liability, demands, damage to property, and injury or death which may be alleged, claimed or brought against the Utility by You, your heirs, successors, assigns, employees, contractors, invitees, or by any other third party, in respect or arising out of the work or excavation, or failure to abide by the location advice or any other terms or conditions provided herein;
3. You are responsible to provide supervision and safety watching services in respect of any work or excavation, unless it is otherwise indicated herein that the Utility shall provide same, in which case You are responsible to arrange for same with the Utility as outlined herein;
4. You shall immediately upon demand reimburse the Utility for any losses, claims, costs, or damages to the facilities of the Utility caused by or arising out of the work or excavation, or failure to abide by the location advice or any other terms or conditions provided herein.

INSTRUCTIONS:

Do not excavate (including digging, boring, pushing, ploughing, or trenching the ground) without first hand digging to expose lines at a number of locations sufficient to determine their exact position and depth. If any location appears not to coincide with the markings or stakes, contact the Utility for confirmation of the location. If exposed by the excavation, cable or pipe must be inspected by the Utility for damage or safety hazards.

Do not attempt to locate lines by probing the ground with any pointed tool or object.

Stakes and markings are provided only for the work area specified by you. If work has not started within 14 days after the locate is completed by the Utility, you must again notify the Utility to re-mark the work area and provide an updated Electric and/or Natural Gas Facilities Locate form. Notify the Utility of any changes in the nature of work or work area at least **two business days** before beginning excavation. This form must be kept at the work area until all work has been completed. Any changes in the work or work area that was originally specified by you may require additional staking. Work should not proceed until you have received a new Electric and/or Natural Gas Facilities Locate and all facilities are located and marked.

During the course of the work on any excavation, the excavator shall maintain, and keep in a visible condition, any markings placed there by the Utility. Do not proceed if the stakes or marks have become obliterated or are displaced. From the start of the excavation and until work and backfilling is completed, you must take every precaution to ensure that no damage will result to the lines, their coatings, protective wrapping or cathodic protection devices and no stress will be applied to the lines.

Do not move lines or other installations, dangerous conditions may result at this or other locations.

Safety Watch and High Pressure excavations (as indicated on the front of this form) must be supervised by the Utility.

CAUTION:

Notify the Utility of any damage, or gas and power line disturbances immediately at 480-5900 or 1 888 MB HYDRO (1-888-624-9376) outside Winnipeg.

If natural gas leaks, you must do the following:

- **Notify all persons in any premises that may be affected**
- **Keep traffic and pedestrians out of the area; and**
- **Do not backfill any damaged facilities until the damage has been inspected by the Utility and the Utility has authorized the backfill.**

Leaking natural gas must be allowed to dissipate into the air.

BACKFILLING PRECAUTIONS:

When backfilling, ensure that the cables or pipes will remain in their original position during settlement by thoroughly tamping the backfill under them; and keeping them supported.

Manitoba Hydro only locates facilities that it owns and has no knowledge of or responsibility for locating facilities owned by others.

These instructions are provided as an on-site reference. All excavations must adhere to the current Department of Labour Workplace Safety and Health Regulations and Manitoba Gas Pipe Line Excavations Regulations of the *Gas Pipe Line Act*. Copies of these acts can be obtained from the Utility or the Queen's Printer.

CONDITIONS GÉNÉRALES

Dans les présentes, chaque fois que le terme « Entreprise » est utilisé, il fait référence à Manitoba Hydro, ainsi qu'à tout employé ou agent de l'Entreprise.

En signant au recto le présent formulaire de demande de localisation des conduites d'électricité et de gaz naturel, vous reconnaissez que vous êtes le propriétaire de l'emplacement (des emplacements) de l'excavation ou un agent autorisé de ce dernier (« vous ») et vous convenez de ce qui suit :

1. *L'Entreprise ne doit pas être tenue responsable de toute réclamation ou responsabilité, ou de tous dommages-intérêts, coûts ou dommages causés à la propriété, ou de toute blessure ou tout décès découlant de l'excavation ou causés par cette dernière, ou par tout défaut de respecter les conseils relatifs aux excavations ou toute condition de la présente demande.*
2. *Vous acceptez de garantir l'Entreprise, ses successeurs et ayants droit, contre toute cause d'action, réclamation, responsabilité ou obligation, ou contre tous dommages-intérêts, coûts ou dommages causés à la propriété, ou contre toute blessure ou tout décès qui peuvent être présumés, réclamés ou déposés contre l'Entreprise par vous-même, vos héritiers, successeurs, ayants droit, employés, entrepreneurs ou invités, ou par toute tierce partie, relativement aux travaux ou à l'excavation ou à tout défaut de respecter les conseils relatifs aux excavations ou toute condition de la présente demande.*
3. *Il vous incombe de fournir une supervision et des services de surveillance de sécurité en rapport avec vos travaux ou votre excavation, sauf s'il est indiqué ailleurs dans la présente demande que l'Entreprise est responsable de fournir une telle supervision et de tels services de surveillance. Dans un tel cas, vous êtes responsable de prendre les dispositions appropriées avec l'Entreprise pour assurer une telle supervision et de tels services de surveillance.*
4. *Sur demande, vous devez rembourser immédiatement à l'Entreprise toutes les pertes ou sommes réclamées, ou tous les coûts, dommages-intérêts ou dommages causés aux installations de l'Entreprise qui découlent des travaux ou de l'excavation ou qui sont causés par ces derniers ou par tout défaut de respecter les conseils relatifs aux excavations ou toute condition de la présente demande.*

INSTRUCTIONS

N'entreprenez jamais des travaux d'excavation, y compris le creusage ou le forage de trous, l'entassement ou le labourage du sol, ou le creusage d'une tranchée, sans tout d'abord creuser manuellement pour exposer les conduites à suffisamment d'endroits pour établir leur position et leur profondeur exactes. Si un emplacement ne semble pas coïncider avec les marques ou les piquets, communiquez avec l'Entreprise pour confirmer l'emplacement. Toute ligne ou conduite exposée par les travaux d'excavation doit être inspectée par l'Entreprise afin de vérifier si elle présente des dommages ou des risques pour la sécurité.

N'essayez jamais de localiser des conduites en sondant le sol à l'aide d'un objet ou d'un outil pointu.

Les piquets et les marques ne sont fournis que pour la zone des travaux que vous délimitez. Si les travaux ne sont pas entrepris dans les quatorze jours qui suivent la localisation effectuée par l'Entreprise, vous devez recommuniquer avec l'Entreprise pour faire poser à nouveau des piquets et soumettre un formulaire de localisation de lignes électriques et de conduites de gaz naturel mis à jour. *Vous devez signaler à l'Entreprise toute modification apportée à la nature ou à la zone des travaux au moins* ***deux jours ouvrables*** *avant d'entreprendre l'excavation. Ce formulaire doit demeurer sur le site des travaux jusqu'à ce qu'ils soient terminés. Toute modification apportée à la nature ou à la zone des travaux originalement délimitée peut exiger un piquetage additionnel. Les travaux ne devraient pas être entrepris avant que vous ne receviez un nouveau formulaire de demande de localisation de conduites d'électricité et de gaz naturel et que toutes les installations ne soient localisées et marquées.*

Les piquets et les marques doivent demeurer visibles et en bon état. N'entreprenez pas les travaux si les piquets ou les marques ont disparu ou ont été déplacés. Du début de l'excavation jusqu'à son parachèvement, y compris le remblayage, vous devez prendre toutes les précautions nécessaires pour veiller à ce que les lignes, leur revêtement, leur enveloppe protectrice et les dispositifs de protection cathodique ne soient pas endommagés et à ce qu'aucune contrainte ne s'applique aux lignes.

Ne déplacez pas les lignes ou les autres installations, car cela peut créer des conditions dangereuses à cet emplacement ou à d'autres emplacements.

Toute excavation qui exige une surveillance de sécurité ou porte sur des conduites haute pression (voir le recto du présent formulaire) doit être supervisée par l'Entreprise.

ATTENTION

Vous devez signaler immédiatement à l'Entreprise tous les dommages ou toute perturbation des conduites en composant le 480-5900 ou le 1 888 MB HYDRO (1 888 624-9376) (à l'extérieur de Winnipeg).

En cas de fuite de gaz naturel, vous devez adopter les mesures suivantes :

- ***Avertissez toutes les personnes qui sont dans les locaux qui peuvent être visés.***
- ***Éloignez les piétons et la circulation automobile de la zone.***
- ***Ne remblayez jamais des installations endommagées avant que l'Entreprise n'inspecte les dommages et n'autorise le remblayage.***

Le gaz naturel qui fuit doit avoir la possibilité de se dissiper dans l'air ambiant.

PRÉCAUTIONS RELATIVES AU REMBLAYAGE

Pendant le remblayage, vous devez veiller à ce que les conduites demeurent dans leur position originale pendant le tassement du sol en pilonnant soigneusement le matériau de remblayage sous eux et en les supportant adéquatement.

Manitoba Hydro n'effectue que la localisation des installations qu'elle possède. Elle n'a aucune connaissance des installations que possèdent les autres services publics et n'assume aucune responsabilité pour la localisation de ces installations.

Les présentes instructions sont offertes à titre de référence sur place. Toute excavation doit se conformer au Règlement sur les excavations effectuées à proximité des conduites de gaz de la Loi sur les gazoducs, ainsi qu'aux règlements pertinents sur la sécurité et l'hygiène au travail du ministère du Travail. Vous pouvez vous procurer des exemplaires des documents en vous adressant à l'Entreprise ou aux Publications officielles du gouvernement provincial.

APPENDIX ‘E’

SAMPLE JOB PLAN

Manitoba Hydro

JOB PLAN - ENGINEERING & CONSTRUCTION
Underground Construction - Winnipeg

1. EMERGENCY RESPONSE PLAN

Identify exact location for emergency response:

How will you execute a rescue?

Emergency phone numbers:

911
204-360-HELP (4357)
SCC: 204-474-3369, 204-474-3007, 204-474-3327
VHF: 040
Spill Response no./FSO: Jeff Breakey - 204-871-2003

Dispatch - Daytime - Local CSC
After hours - Electric 204-360-2006 Radio #031
- Gas 204-360-2009 Radio #030
Blowing Gas - Wpg. 204-480-5900
Blowing Gas - Rural 1-888-624-9376

INSTRUCTION: Prepare, discuss and review the job plan with the crew daily and whenever a change is introduced to the job.

2. CURRENT DATE (yyyy mm dd)	Project name	Work Order no.	Description

CSC and Radio Channel	Line or feeder	Blocked ☐ Yes ☐ No	Upstream protective device	Blocking received from	Time	Phone no.

3. HAZARD IDENTIFICATION LIST

1. **M**echanical	2. **E**lectricity	3. **G**ravity	4. **A**pplicable
1.1 Equipment failure	2.1 Live contact HV	3.1 Falling from a height	4.1 Vehicular
1.2 Lifting with a boom	2.2 Live contact LV	3.2 Falling objects	4.2 Kenetic
1.3 Max work loads	2.3 Induction/backfeed HV	3.3 Falling structures	4.3 Thermal
1.4 Vehicle stability	2.4 Induction/backfeed LV	3.4 Rigging failure	4.4 Chemical
1.5 Moving parts/Sharp objects	2.5 Static charge	3.5 Working over water	4.5 Confined Space
1.6 Tension loads/Springs	2.6 Step potential		4.6 Excavations
	2.7 ARC Flash potential		4.7 Vehicle or pedestrian traffic
	2.8 Clothing ignition hazard/ FRC required		4.8 Underground Utilities
	2.9 Lockout/Tagout		4.9 Other, specify:
			4.9.1 _____

Hand contact:	Incident energy -	ARC flash boundary -	ARC Flash PPE Level -
Hot stick Work:	Incident energy -	ARC flash boundary -	ARC Flash PPE Level -

4. JOB STEPS	MAJOR HAZARDS	REQUIRED BARRIERS	PPE: Minimum Hard Hat and Safety Footwear LIST ALL OTHER REQUIRED PPE including eyewear. FRC: ☐ Yes ☐ No	TIMES (LO/TO)

REVIEWED BY	DATE (yyyy mm dd)

5. HAVE WE CONSIDERED (It is critical that we make note of any **changes** that may occur during the work cycle)

People	Procedures	Hardware/Equipment	Environment	Workers Affect on Environment
☐ Qualification of personnel	☐ Limits of approach	☐ Inspection of equipment	☐ Environment checklist	☐ Cause erosion
☐ Other work groups/ contractors	☐ De-energize/Isolation of apparatus	☐ Inspection of tools & PPE	☐ Underground locates	☐ Release/spills (liquids/gases/solids)
☐ Effective Communication	☐ Safety hold off/ Blocking required	☐ Inspection of vehicles	☐ Weather conditions	☐ Waste disposal liquids/solids)
☐ Worker fatigue	☐ Switching orders	☐ Condition of structures	☐ Soil conditions/Shoring	☐ Noise
☐ Pedestrian control	☐ Adequate cover-up	☐ Safe loads for rigging	☐ Lighting conditions	☐ Fire
☐ General public	☐ Grounding apparatus and vehicles	☐ Adequate cover-up	☐ Adjacent structures/ Vegetation	☐ Species at risk (plant and animal)
☐ Traffic control	☐ Work permit/ Clearance to work	☐ Specialized tools - calibrated/tested & up-to-date	☐ Housekeeping	☐ Disturbing waterways/ drainage/wetlands/ burial grounds
☐ Safety watcher	☐ Permit checklists (soft dig, confined space, etc.)		☐ Emergency plan/ procedure	☐ Wildlife Habitat
	☐ Review rescue procedures		☐ Open excavations/ Trench	☐ Bio Security
	☐ Spiking/Stethoscoping		☐ Distractions and Interuptions	
	☐ Cut Hazards/Cut Resistant Gloves			

WHAT ARE THE CHANGES?	HOW WILL THIS AFFECT YOUR WORK?

6. HUMAN ERROR REDUCTION TOOLS (Consider which HER Tools you need to safely execute task or Critical Steps)

☐ **Stop When Unsure / Know When to Stop** Stop when unclear on task / outcomes	☐ **Procedure Use and Adherence** Verify correct / accurate procedure	☐ **Self Check STAR** Stop / Think / Act / Review
☐ **Questioning Attitude** Identify confusion / doubt / uncertainty	☐ **Effective Communication** Send message / paraphrase back / acknowledge	

7. PERSONS WORKING ON THE JOB

Designated person in charge (Print Name): _____ Crew cell no.: _____ Designated person in charge (Signature): _____ Date: yyyy mm dd _____

Print Full Names and classification of crew members:

yyyy mm dd	Initial/Sign off for Tailboard Discussion

8. OTHER CREWS AND VISITORS

Be aware of **all** work crews in the area.

Multi-crew job coordinator _____ Cell phone: _____

WHAT OTHER CREWS ARE ON SITE	PERSON IN CHARGE	HOW WILL THEIR JOB AFFECT YOURS

Any visitors to your site shall read and sign your Plan.

WORKSITE VISITOR SIGN OFF	DATE yyyy mm dd	WORKSITE VISITOR SIGN OFF	DATE yyyy mm dd

APPENDIX ‘F’

NETWORK COMMISSIONING REPORT

NETWORK COMMISSIONING REPORT

FIELD INSTRUCTIONS: Preferred Best Practice

1. Construction Foreman to contact Customer Service Center Supervisor upon completion of project.
2. Customer Service Center Supervisor to provide a delegate that will review project details with Construction Foreman in the field.
3. Delegate to identify deficiencies and record on report. If project is accepted as complete proceed to Step 5.
4. Construction to complete deficiencies and review with delegate.
5. Once project deemed acceptable delegate to sign under "Accepted as complete by Customer Service Center Representative"
6. One copy of report to be attached to working file.
7. One copy of report to be forwarded to Customer Service Center Supervisor with close out package.
8. Construction Manager to sign under "Accepted as Complete by Construction Manager" and file with final close out package.

Network number	Description			
Foreman name (line)	Foreman name (pole)		Foreman name (underground)	
IN-SERVICE DATE	yyyy mm dd	Plan attached ☐ Yes ☐ No	Built as estimated ☐ Yes ☐ No	Field Supervisor responsible for work
GENERAL COMMENTS				

Prepared by (Construction Coordinator/Foreman) : Network Authenticated Signature	yyyy mm dd

Network number

WORK CATEGORIES	APPLICABLE		STATE ALL DEFICIENCIES OR DISCREPANCIES	CORRECTIONS COMPLETED	
	Yes	No		Department	yyyy mm dd
Poles					
Primary System					
Secondary System					
Transformer					
Equipment Data					
Street Lights					
Connect/ Disconnects					
Regulator					
Capacitors					
URD Secondary					
URD Primary					
Terminals					
Materials Location/Condition					
Site Condition					
Sub Transmission System					
Transmission System					
Station System					
GPS Locations Synchronized					

SIGN OFFS (Network Authenticated Signatures):			
Deficiencies identified by (Customer Service Center Representative)	yyyy mm dd	Corrections completed by	yyyy mm dd
WORK COMPLETION			
I hereby accept the Construction and Workmanship of this Order and Consider it to be Complete.			
Accepted as complete by (Customer Service Center Representative)	yyyy mm dd	Accepted as complete by (Construction Manager)	yyyy mm dd

APPENDIX ‘G’

GEOTECHNICAL REPORT

APPENDIX 'G' – GEOTECHNICAL REPORT

The geotechnical report is provided to aid in the Contractor's evaluation of the existing pavement structure and/or soil conditions. The information presented is considered accurate at the locations shown on the Drawings and at the time of drilling. However, variations in pavement structure and/or soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences.

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 01 – Core Hole Summary – Dundas Street (Sargent Avenue to Yukon Avenue)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01A	Dundas Street – 1.9 m E of W Curb, 12 m N of Yukon Ave (Pavement Slab)	Asphalt	0											
		Concrete	220											
CH21-02A	Dundas Street – 1.7 m W of E Curb, 15 m S of NW corner of Western Marble Granite & Tile (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-03A	Dundas Street – 4.0 m E of W Curb, Aligned w/ Transformer Bumper Post (Pavement Slab)	Asphalt	0											
		Concrete	220											
CH21-04A	Dundas Street – 3.0 m W of E Curb, 5 m N of entrance to EMCO (Pavement Joint)	Asphalt	6											
		Concrete	240	No recovery. Specimen decomposed to granular and irretrievable										
CH21-05A	Dundas Street – 4.1 m E of W Curb, 14 m N of entrance of EMCO (Pavement Joint)	Asphalt	0											
		Concrete	240	No recovery. Specimen decomposed to granular and irretrievable										
CH21-06A	Dundas Street – 3.0 m W of E Curb, 11 m S of Sargent Ave (Pavement Slab)	Asphalt	40											
		Concrete	240											

* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 03 – Test Hole Summary – Milt Stegall Drive (Sargent Avenue to Yukon Avenue)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH21-01C	Milt Stegall Drive - 23 m N of Yukon Ave, 5.1 m E of W curb	Asphalt	0			0.3	28.0							
						0.6	26.6	0.0	4.6	22.9	72.5	65.4	24.3	41.1
		Concrete	205			0.9	27.0							
						1.2	29.8							
		Granular Fill	50			1.5	33.3							
						2.4	49.0							
TH21-02C	1090 Milt Stegall Drive - 1.7 m W of E curb	Asphalt	0			0.3	50.6							
						0.6	35.8							
		Concrete	230			0.9	31.1							
						1.2	28.6	0.0	2.4	18.9	78.7	69.9	22.4	47.5
		Granular Fill	0			1.5	27.1							
						2.4	27.1							
TH21-03C	1100 Milt Stegall Drive - 1.5 m E of W curb	Asphalt	0			0.3	21.9							
						0.6	16.2							
		Concrete	280			0.9	25.5	0.0	11.8	23.3	64.9	58.0	19.3	38.7
						1.2	29.1							
		Granular Fill	0			1.5	28.2							
						2.4	46.8							

* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 04 – Test Hole Summary – Murray Park Road (Cree Crescent to Sturgeon Road)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH21-01D	Murray Park Road (EB) - 2.5 m S of Yellow Divider Line, 170 m E of Sturgeon Rd. (Pavement Slab)	Asphalt	300			1.2	9.9	2.4	39.9	38.2	19.5	12.9	9.0	3.9
		Concrete	0			1.5	10.1							
		Granular Fill	760			2.4	10.0							
TH21-02D	Murray Park Road (WB) - 2.2 m N of Yellow Divider Line, 209 m E of Sturgeon Rd. (Pavement Slab)	Asphalt	265			0.6	23.4							
		Concrete	0			0.9	11.4							
						1.2	9.1							
		Granular Fill	190			1.5	11.7							
						2.4	9.1							
TH21-03D	Murray Park Road - 8.8 m N of parking entrance to 300 Cree Cre., 80 m W of Cree Cre. (Pavement Slab)	Asphalt	250			0.3	23.4							
						0.6	28.3							
		Concrete	0			0.9	28.6	0.0	6.8	22.1	71.1	68.6	21.2	47.4
						1.2	23.2							
		Granular Fill	0			1.5	28.8							
						2.4	20.6							
TH21-04D	Murray Park Road (EB) - 7.0 m N of S curb, 38 m W of Cree Crescent (Pavement Slab)	Asphalt	205			0.3	24.6							
						0.6	23.8							
		Concrete	0			0.9	21.6							
						1.2	16.9							
		Granular Fill	0			1.5	13.9							
						2.4	8.8							
TH21-05D	Murray Park Road - WB Turning Lane – 10.5 m N of S curb, 14 m W of Cree Crescent (Pavement Slab)	Asphalt	75			0.3	25.0							
						0.6	16.2	2.4	22.5	35.4	39.7	38.8	11.7	27.1
		Concrete	190			0.9	13.4							
						1.2	12.9							
		Granular Fill	0			1.5	9.8							
						2.4	7.0							

* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 05 – Core Hole Summary – Murray Park Road Eastbound (Cree Crescent to Saulteaux Crescent)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01E	170 Murray Park Road (EB) - 5.5 m N of S curb, 7 m E of 170 Murray Park Road W Entrance (Pavement Slab)	Asphalt	0											
		Concrete	80	Partial recovery. Specimen decomposed to granular and irretrievable										
CH21-02E	158 Murray Park Road (EB) – 1.5 m N of S curb, 12 m E of 170 Murray Park Rd E Entrance (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-03E	Murray Park Road (EB) - 2.0 m N of S curb, 62 m E of entrance to 158 Murray Park Road (Pavement Joint)	Asphalt	0											
		Concrete	80	Partial recovery. Specimen decomposed to granular and irretrievable										
CH21-04E	Murray Park Road (EB) - 5.0 m N of S curb, 80 m W of entrance of 122 Murray Park Road (Pavement Slab)	Asphalt	0											
		Concrete	180											
CH21-05E	Murray Park Road (EB) – 2.0 m N of S curb, 29 m W of entrance of 122 Murray Park Road (Pavement Slab)	Asphalt	0											
		Concrete	190											
CH21-06E	Murray Park Road (EB) – 5.2 m N of S curb, 11 m W of train tracks (Pavement Joint)	Asphalt	0											
		Concrete	190											

* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 06 – Core Hole Summary – Murray Park Road Westbound (Saulteaux Crescent to Cree Crescent)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01F	Murray Park Road (WB) – 3.5 m S of N curb, 39 m W of Saulteaux Crescent (Pavement Slab)	Asphalt	0											
		Concrete	210											
CH21-02F	61 Murray Park Road (WB) – 2.0 m N of S curb, 14 m E of Boeing East Entrance (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-03F	99 Murray Park Road (WB) – 1.8 m S of N curb, 12 m E of Boeing Main Entrance (Pavement Slab)	Asphalt	0											
		Concrete	210											
CH21-04F	170 Murray Park Road (WB) – 2.1 m N of S curb, 100 m E of Cree Cre. (Pavement Slab)	Asphalt	0											
		Concrete	190											

* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Table 11 – Core Hole Summary – Yukon Avenue (Milt Stegall Drive to Empress Street)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01K	Yukon Avenue – 2.0 m N of S Curb, 18 m E of Milt Stegall Dr. (Pavement Joint)	Asphalt	0											
		Concrete	150	No recovery. Specimen decomposed to granular and irretrievable										
CH21-02K	Yukon Avenue – 1.6 m S of N Curb, 42 m E of Milt Stegall Dr. (Pavement Slab)	Asphalt	0											
		Concrete	230											
CH21-03K	Yukon Avenue – 1.7 m S of N Curb, 11 m W of Dundas St. (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-04K	Yukon Avenue – 1.6 m S of N Curb, 2 m W of Dundas St. (Pavement Joint)	Asphalt	0											
		Concrete	160	Partial recovery. Specimen decomposed to granular and irretrievable										
CH21-05K	Yukon Avenue – 2.2 m S of N Curb, 16 m E of Dundas St. (Pavement Joint)	Asphalt	0											
		Concrete	0	No recovery. Specimen decomposed to granular and irretrievable										
CH21-06K	Yukon Avenue – 2.2 m N of S Curb, 10 m W of Empress St. (Pavement Slab)	Asphalt	0											
		Concrete	230											

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-07K	Yukon Avenue – 2.9 m S of N Curb, 24 m W of Empress St. (Pavement Joint)	Asphalt	0											
		Concrete	0	No recovery. Specimen decomposed to granular and irretrievable										
CH21-08K	Yukon Avenue – 5.6 m S of N Curb, 37 m W of Empress St. (Pavement Centerline Joint)	Asphalt	0											
		Concrete	0	No recovery. Specimen decomposed to granular and irretrievable										

* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Table 12 – Core Hole Summary – Yukon Avenue (St James Street to Milt Stegall Drive)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01L	Yukon Avenue – 2.8 m S of N curb, 20 m E of St. James St. (Pavement Joint)	Asphalt	0											
		Concrete	70	Partial recovery. Specimen decomposed to granular and irretrievable										
CH21-02L	Yukon Avenue – 1.8 m N of S curb, 12 m E of St. James St. (Pavement Slab)	Asphalt	0											
		Concrete	210											
CH21-03L	1373 Yukon Avenue – 2.9 m S of N curb, 8 m E of SE corner of IWC (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-04L	Yukon Avenue – 2.1 m S of N curb, 17 m W of Milt Stegall Dr. (Pavement Slab)	Asphalt	0											
		Concrete	160	Partial recovery. Specimen decomposed to granular and irretrievable										
CH21-05L	Yukon Avenue – 2.1 m N of S curb, 38 m W of Milt Stegall Dr. (Pavement Joint)	Asphalt	0											
		Concrete	125	Partial recovery. Specimen decomposed to granular and irretrievable										
CH21-06L	Yukon Avenue – 1.8 m N of S curb, 30 m W NE corner of The Brick (Pavement Slab)	Asphalt	50											
		Concrete	180											

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-07L	1373 Yukon Avenue – 2.5 m S of N curb, 9 m E of SE corner of building (Pavement Joint)	Asphalt	50	No recovery. Specimen decomposed to granular and irretrievable										
		Concrete	150	Partial recovery. Specimen decomposed to granular and irretrievable										

* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Photograph 1: CH21-01A - Dundas Street (Sargent Avenue to Yukon Avenue)

Photograph 2: CH21-02A - Dundas Street (Sargent Avenue to Yukon Avenue)

Photograph 3: CH21-03A - Dundas Street (Sargent Avenue to Yukon Avenue)

Photograph 4: CH21-06A - Dundas Street (Sargent Avenue to Yukon Avenue)

Photograph 5: CH21-01E - Murray Park EB (Cree Crescent to Saulteaux Crescent)

Photograph 6: CH21-02E - Murray Park EB (Cree Crescent to Saulteaux Crescent)

Photograph 7: CH21-03E - Murray Park EB (Cree Crescent to Saulteaux Crescent)

Photograph 8: CH21-04E - Murray Park EB (Cree Crescent to Saulteaux Crescent)

Photograph 9: CH21-05E - Murray Park EB (Cree Crescent to Saulteaux Crescent)

Photograph 10: CH21-06E - Murray Park EB (Cree Crescent to Saulteaux Crescent)

Photograph 11: CH21-01F - Murray Park WB (Cree Crescent to Sturgeon Road)

Photograph 12: CH21-02F - Murray Park WB (Cree Crescent to Sturgeon Road)

Photograph 13: CH21-03F - Murray Park WB (Cree Crescent to Sturgeon Road)

Photograph 14: CH21-04F - Murray Park WB (Cree Crescent to Sturgeon Road)

Photograph 17: CH21-02K - Yukon Avenue (Milt Stegall Drive to Empress Street)

Photograph 18: CH21-03K - Yukon Avenue (Milt Stegall Drive to Empress Street)

Photograph 19: CH21-04K - Yukon Avenue (Milt Stegall Drive to Empress Street)

Photograph 20: CH21-06K - Yukon Avenue (Milt Stegall Drive to Empress Street)

Photograph 21: CH21-01L - Yukon Avenue (St. James Street to Milt Stegall Drive)

Photograph 22: CH21-02L - Yukon Avenue (St. James Street to Milt Stegall Drive)

Photograph 23: CH21-03L - Yukon Avenue (St. James Street to Milt Stegall Drive)

Photograph 24: CH21-04L - Yukon Avenue (St. James Street to Milt Stegall Drive)

Photograph 25: CH21-05L - Yukon Avenue (St. James Street to Milt Stegall Drive)

Photograph 26: CH21-06L - Yukon Avenue (St. James Street to Milt Stegall Drive)

Photograph 27: CH21-07L - Yukon Avenue (St. James Street to Milt Stegall Drive)