THE MANITOBA ELECTRICAL CODE

10TH EDITION, JUNE, 2009

Manitoba Regulation 73/2009

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Manitoba Hydro
Electrical Codes and Standards

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SCHEDULE A

THE MANITOBA HYDRO ACT
(C.C.S.M. c. H190)

Manitoba Electrical Code

Regulation 73/2009
Registered April 8, 2009

Definition
1 In this regulation, "**Code**" means the *Manitoba Electrical Code*, Tenth Edition, 2009. It consists of the *Canadian Electrical Code, Part I*, 21st edition, CSA Standard C22.1-09, as amended by the Schedule to this regulation.

Code adopted with amendments
2 The standards set out in the Code govern the construction, installation, maintenance, repair, extension, alteration and use of electric wiring and related facilities using or intended to use power supplied by Manitoba Hydro, except within The City of Winnipeg and mines and quarries as defined in *The Workplace Safety and Health Act*.

Repeal
3 Manitoba Regulation 81/2006 is repealed.

Coming into force
4 This regulation comes into force on June 1, 2009.

THE MANITOBA HYDRO-ELECTRIC BOARD:

March 19, 2009

V.H. Schroeder
Chair

SCHEDULE

AMENDMENTS TO
THE *CANADIAN ELECTRICAL CODE, PART I*

Amendments to Section 0 — Object, Scope, and Definitions

Section 0 amended

1 Section 0 of the Code is amended

(a) in the definition "Approved", by adding the following after paragraph (b):

(c) the equipment has been given special acceptance by Manitoba Hydro, or

(d) the equipment has been given special acceptance by the Minister of Labour and Immigration for Manitoba;

(b) by adding the following definition:

Chief Electrical Inspector means the person designated by Manitoba Hydro as the chief electrical inspector;

(c) by replacing the definition "Inspection department" with the following:

Inspection department means Manitoba Hydro;

Amendments to Section 2 — General Rules

Rule 2-004 replaced

2 Rule 2-004 is replaced with the following:

2-004 Application for Inspection

(1) No electrical work with respect to installation, alteration, repair or extension of any electrical equipment shall commence until an electrical permit is issued by the inspection department.

(2) Notwithstanding Subrule (1), a person licensed under *The Electricians' Licence Act* (Manitoba) is not required to have an electrical permit for the following electrical work:

(a) the replacement or repair of wiring devices with an electrical rating no greater than 30 amperes, 150 volts to ground and not associated with a location as described by section 18 or 20 of the Code; or

(b) the replacement or repair of electrical equipment not exceeding 30 amperes, 150 volts to ground and associated with a dwelling unit; or

(c) electrical installations:

(i) where the cost of labour and materials (excluding the cost of utilization equipment supplied by the circuitry) does not exceed one hundred dollars ($100.00) as determined by the inspection department in accordance with the current Schedule of Electrical Permit Fees; and

(ii) which are not associated with a hazardous location as described by sections 18 or 20 of the Code; and

(iii) which are not part of a consumers' service; and

(iv) which do not involve the replacement or addition of distribution panels, fusible switches, motor controllers and similar equipment.

(3) An electrical permit may be issued to:

(a) a person licensed under *The Electricians' Licence Act* (Manitoba) to perform such work as is permitted by the person's licence; or

(b) an allied trades person licensed by the Province of Manitoba to perform such electrical work as is permitted by the person's licence; or

(c) a qualified person as defined in the *Canada Occupational Safety and Health Regulations* under the *Canada Labour Code* for the purposes of work on premises regulated by those regulations; or

(d) an owner of residential or farm premises where:

(i) the applicant occupies or will occupy the premises as a dwelling, or the premises are part of the farm operation; and

(ii) the applicant provides electrical plans which have been examined and accepted by the inspection department; and

(iii) the premises, if a building, stands alone or is separated from any other occupancy or other part of the building by a fire wall or fire separation; and

(iv) the work to be performed is not in a hazardous location, as defined in the Code; and

(v) the electrical rating of the installation does not exceed 150 volts to ground, single phase and 200 amperes.

(4) An annual electrical permit may be issued for electrical work of a routine nature in connection with the maintenance or operation of a building or plant where such work is required to be performed at frequent intervals and where the owner or occupant of the building or plant employs his own electricians for that purpose, if the applicant agrees to:

(a) keep a record of all such work as the work is performed; and

(b) produce this record to the inspection department upon request; and

(c) remit to the inspection department such fees as are prescribed by the inspection department upon application for an annual permit; and

(d) pay in full any outstanding fees due to a change in status of the building or plant before the permit is renewed.

(5) An application for an electrical permit shall be made to the inspection department giving the location and ownership of the premises in, upon or about which electrical work is to be done, the purpose of the work, details of the installation as required by Rule 2-014 and any other particulars required by the inspection department.

(6) If an application is approved by the inspection department an electrical permit will be issued.

(7) The inspection department may refuse to issue an electrical permit if:

(a) electrical work done previously by the applicant has not been completed to the satisfaction of the inspection department; or

(b) there are outstanding fees on previous work done by the applicant.

(8) A permittee shall notify the inspection department as soon as the electrical work authorized by the electrical permit is completed or when an inspection is required.

(9) At the request of the permittee, or in other circumstances determined by the Chief Electrical Inspector, the inspection department may inspect the electrical installation pursuant to the electrical permit. If the installation conforms to the Code and the appropriate fees have been paid in full in accordance with the current Schedule of Electrical Permit Fees, the inspection department will, on request, issue a Certificate of Approval.

(10) The Chief Electrical Inspector may establish terms and conditions for the registration of electricians and electrical contractors for the purposes of the Code, based on criteria including but not limited to safety and compliance with the Code. The inspection department may elect to forgo inspections where the permittee or an electrician employed by the permittee has been registered by the inspection department. An electrician shall:

(a) notify the inspection department when an installation has been completed; and

(b) supply the inspection department with a signed declaration that the installation complies with the Code.

The inspection department reserves the right to audit and inspect installations by registered electricians for compliance with the Code and the Schedule of Electrical Permit Fees.

(11) The inspection department may direct the alteration or repair of an existing electrical installation that does not conform with the requirements of the Code.

(12) Where an application for an electrical permit is refused or where a permittee does not agree with an electrical inspection report, defect notice or interpretation of Code rules issued on any particular installation, an appeal may be made in writing to the office of the Chief Electrical Inspector of Manitoba Hydro.

(13) The inspection department may:

(a) prohibit the use of an installation until inspected, tested and approved;

(b) direct the permittee to carry out and produce results of tests on equipment as considered necessary to ensure that the installation is properly installed.

(14) An electrical permit will expire 90 days from the date of issuance unless the installation authorized by the electrical permit is commenced or the inspection department, in its discretion, grants an extension.

(15) An electrical permit will expire 12 calendar months from the date of issuance unless the installation authorized by the electrical permit is not completed and the inspection department, in its discretion, grants an extension.

(16) The issuance of an electrical permit does not obligate the owner of the premises to have the work done by the permittee.

Rule 2-006 struck out

3 Rule 2-006 (Application for Inspection) is struck out.

Rule 2-008 replaced

4 Rule 2-008 (Fees) is replaced with the following:

2-008 Fees

(1) The amount and manner of payment of any fee payable for electrical permits or inspection of electrical installations are as prescribed by the inspection department in the Schedule of Electrical Permit Fees.

(2) Unless an electrical permit fee is payable in accordance with the terms and conditions established under Subrule (3) for pre-authorized monthly billing accounts, an electrical permit fee shall be paid in full before an electrical permit is issued.

(3) Manitoba Hydro may establish terms and conditions for pre-authorized monthly billing accounts for the payment of electrical permit fees.

(4) A cheque or money order in payment of electrical permit or inspection fees shall be made payable to Manitoba Hydro.

(5) The inspection department has the right at any time to make adjustments in the electrical permit fee payable as a result of additions or deletions to the work specified in the electrical permit or to correct errors in the calculation of fees made at the time the electrical permit was issued.

(6) The inspection department will refund any fee paid for an unused electrical permit if application is made within one year of the date of the issuance of the electrical permit, but reserves the right to deduct an amount equal to any costs and expenses that it incurs in connection therewith and will in any case deduct an amount equal to the current minimum fee.

Rule 2-010 struck out

5 Rule 2-010 (Posting of Permit) is struck out.

Rule 2-014 replaced

6 Rule 2-014 (Plans and Specifications) is replaced with the following:

2-014 Plans and Specifications

(1) Plans and specifications are required for:

(a) electrical installations where:

(i) the installation is carried out by an owner of farm or residential premises; or

(ii) the ampacity of the service entrance equipment exceeds 200 amperes single phase or the supply service is multi-phase; or

(iii) the installation operates at voltages in excess of 750 volts; and

(b) installations covered by section 18, 20, 22, 24 or 36 of the Code; and

(c) such other installations as may be prescribed by the inspection department.

(2) Plans and specifications required by Subrule (1) shall be submitted to the inspection department for acceptance before an electrical permit may be issued.

(3) Plans and specifications shall be prepared and signed by, and bear the seal of, a registered professional engineer

(a) when they are required by Subrule (1)(b) for an installation covered by section 18, 20, 24 or 36; or

(b) if the inspection department considers them necessary for any other installation.

(4) The responsible professional engineer for a large or complex installation, as determined by the Chief Electrical Inspector, shall submit a letter to the inspection department stating his or her responsibility for the inspection of construction for the installation to ensure conformity with the approved plans and specifications. Note: Subrule 2-004(1) still applies.

(5) Upon completion of an installation under Subrule (4), the responsible professional engineer shall submit a certificate stating:

"I hereby certify that I have inspected the installation for compliance to the approved plans and specifications and find the installation in compliance with the requirements of the *Manitoba Electrical Code*."

(6) Where current transformer revenue metering is required for an installation, plans and a list of loads, as required by the Manitoba Hydro Customer Metering Standards, are required to be submitted before the revenue metering will be ordered by the inspection department.

Rule 2-025 added
7 The following is added after Rule 2-024:

2-025 Special Acceptance Inspection
A special acceptance inspection may be made of electrical equipment that is not approved by or does not bear the approval mark of an accredited certification organization. In general, this applies to electrical equipment:

(a) of other than a regular line of manufacture; or

(b) manufactured or produced singly or in small quantities; or

(c) built to a customer's order.

Rule 2-030 replaced
8 Rule 2-030 (Deviation or Postponement) is replaced with the following:

2-030 Deviation or Postponement
Notwithstanding Subrule 2-004(9), the inspection department may by special permission approve an installation that does not conform to the standards established by this Code where, in the opinion of the inspection department, the installation provides a standard of safety equivalent to the standard provided by the Code. The special permission shall specify the aspects of the installation that do not conform to the Code and the equivalent electrical requirements.

Amendment to Section 6 — Services and Service Equipment

Rule 6-400 amended
9 Rule 6-400 (Metering Equipment) is amended by renumbering it as Rule 6-400(1) and by adding the following as Subrule (2):

(2) For determining the type of metering equipment required by the supply authority, reference shall be made to supply authority metering standards which shall be amendatory or additional to Rules 6-402 to 6-412.

Amendment to Section 10 — Grounding and Bonding

Subrule 10-700(2) amended
10 Paragraph (a) of Subrule 10-700(2) (Grounding Electrodes) is replaced with the following:

(a) in the case of a rod grounding electrode, consist of 2 rod electrodes (except for a chemically charged electrode where only one need be installed) that are spaced no less than 3 m apart, and are

(i) bonded together with a grounding conductor sized in accordance with Table 17; and

(ii) driven to the full length of the rod; and

(iii) copper clad; and

(iv) not less than 15.8 mm in diameter; or

Amendment to Section 12 — Wiring Methods

Rule 12-2208 replaced
11 Rule 12-2208 (Provisions for Bonding) is replaced with the following:

12-2208 Provisions for Bonding
Metal cable trays shall be adequately bonded at intervals not exceeding 15 m and the size of bonding conductors shall be based on the size of the largest ungrounded conductor or equivalent for multiple conductors carried by the cable tray in accordance with Rule 10-814.

Amendments to Section 26 — Installation of Electrical Equipment

Rule 26-008 replaced

12 Rule 26-008 (Sprinklered Equipment) is replaced with the following:

26-008 Sprinklered Equipment

Electrical service and distribution equipment with ventilation openings located in sprinklered buildings or spaces shall be protected where needed by noncombustible hoods or shields so arranged as to minimize interference with the sprinkler equipment.

Rule 26-700 amended

13 Rule 26-700 (Receptacles, General) is amended by adding the following after Subrule (11):

(12) Where a sump is required by the Winnipeg Building By-law or the Manitoba Building Code for the control of water from a subsurface drainage (weeping tile) system:

(a) a receptacle shall be installed for the connection of the sump pump; and

(b) the receptacle for the sump pump shall be supplied from a branch circuit that supplies no other outlets or equipment.

Rule 26-714 amended

14 Rule 26-714 (Receptacles in Single Dwellings) is amended by adding "and" **at the end of paragraph (b) and adding the following after paragraph (b):**

(c) at least one receptacle shall be provided for each driveway.

Rule 26-724 amended

15 Rule 26-724 (Branch Circuits for Single Dwelling) is amended by adding "and" **at the end of paragraph (b) and adding the following after paragraph (b):**

(c) at least one branch circuit shall be provided solely for the receptacle(s) provided for each driveway as required by paragraph 26-714(c).

Amendment to Section 30 — Installation of Lighting Equipment

Rule 30-504 amended

16 Rule 30-504 (Stairways) is amended by adding the following after Subrule (3):

(4) Notwithstanding Subrule (3) and Appendix G, provisions for 3-way switches must be installed for stairway lighting to basements.

Amendment to Section 46 — Emergency Power Supply, Unit Equipment, Exit Signs, and Life Safety Systems

Rule 46-108 amended

17 Rule 46-108 (Method of Wiring) is amended by replacing Subrule (3) with the following:

(3) Conductors installed in buildings of combustible construction in accordance with Section 12 of this Code shall be:

(a) nonmetallic sheathed cable; or

(b) installed in totally enclosed nonmetallic raceway.

Amendment to Section 76 — Temporary Wiring

Rule 76-006 amended

18 Rule 76-006 (Service Entrance Equipment) is amended by replacing paragraph (d) with the following:

(d) for services not exceeding 200 amperes, on a pole, or on a solid wood post measuring at least 89 mm x 150 mm nominal and adequately braced; or

(e) for services exceeding 200 amperes, on a substantial pole structure; or

(f) for services supplied from underground distribution, on an adequately braced post.

THE REGULATIONS ACT

CERTIFICATE

The undersigned hereby certifies that the attached regulation marked Schedule A is a true copy of the original regulation:

(a) entitled *Manitoba Electrical Code*;

(b) made under *The Manitoba Hydro Act*;

(c) by the Manitoba Hydro-Electric Board;

(d) on the date indicated in the attached Schedule A.

THE MANITOBA HYDRO-ELECTRIC BOARD

March 19, 2009

V.H. Schroeder
Chair

ADMINISTRATION

1. Licences

Electrical installers have been found to be working at the trade without a current licence. Please assure you have a valid licence and be prepared to produce your licence when applying for an electrical permit or when requested by the Electrical Inspector on the job site or work location.

Concerns have been raised by the trade regarding Limited Licence holders doing electrical work outside the scope of the Limited Licence.

For information regarding licences and endorsements that authorize any work associated with the electrical trade see the Government of Manitoba -Mechanical and Engineering website at http://www.gov.mb.ca/labour/safety/me/pdf/me0010elect.pdf

2. Permits

Licence holders are reminded that Rule 2-004 requires electrical permits to be obtained prior to any electrical work being commenced.

Electrical work includes the installation, alteration, repair or extension of electrical equipment. Non-compliance with this requirement will require additional permit fees being levied in accordance with the current Fee Schedule. Continued non-compliance with this requirement may result in permit privileges being suspended.

Permits may be issued to:

(i) Licence holders to do work within the scope of their licences.

(ii) Homeowners to do wiring on their own premises.

Note: For details refer to http://www.gov.mb.ca/labour/safety/me/pdf/me0010elect.pdf
Permits expire after 12 calendar months unless an extension is requested prior to the permit expiry date.

3. Electrical Permit Fees

Costs incurred by the electrical inspection program are intended to be recovered under the Electrical Permit Fee Schedule.

ADDITIONAL INSPECTIONS

The Fee Schedule requires that additional inspections incurred such as for defects found during the initial inspection or to facilitate construction procedures will be charged to the permittee at the hourly rate as defined by Schedule 5 of the current Manitoba Hydro Schedule of Electrical Permit Fees.

SPECIAL TRIPS

Provision is also made in Schedule 5 for cost recovery for special trips whether by road or air. This is in addition to the normal Permit Fee.

PENALTY

When an electrical permit is not obtained prior to the commencement of actual work, through neglect or for some other reason, a penalty of $250.00 will be levied in addition to the normal permit fee plus GST,

REFUNDS

Where overpayment is made on an electrical permit or a permit is cancelled, the fee paid may be refunded less the minimum fee. Where the overpayment is due to Manitoba Hydro overcharging, the minimum fee will be waived.

4. 30 Day Billing

Manitoba Hydro can accommodate monthly billing for electrical permits issued within the Manitoba Hydro electrical inspection jurisdiction. The electrical permit charges will be listed in a billing issued at the end of each month, with payment required by the due date. For your additional convenience, Manitoba Hydro also has a preauthorized payment plan which withdraws the amount due from a financial institution on the due date.

At the same time as the monthly billing is implemented, Manitoba Hydro will accept electrical permit applications by FAX, mail or in person. The electrical permit will be issued and then sent by FAX or mail to the contractor, with the fee being charged on the monthly billing.

Note: No electrical permit applications will be accepted by telephone.

If you are interested in establishing an account to facilitate obtaining electrical permits with a monthly billing of fees, please complete an application form which may be obtained from your local Manitoba Hydro office. The completed form should be returned to Manitoba Hydro.

Once your account has been established, we will forward further information to assist you in submitting applications. It is hoped that this change will significantly reduce the time and costs associated in obtaining electrical permits.

5. Plans and Specifications

Rule 2-014 (2) stipulates that required plans and specifications must be submitted to the inspection department before an electrical permit may be issued.

NOTE: This shall serve as notice that this requirement for plans and specifications submission before a permit may be issued will be strictly enforced

Since metering cannot be ordered until plans are reviewed, non compliance may also delay connection of the installation.

6. Electrical Inspections

The Inspection Department will normally respond to a request for inspection within five working days. For most requests other than for isolated locations, this may be accomplished in a shorter time frame.

Rule 2-004 (8) requires the permittee to notify the Electrical Inspection Department as soon as an inspection is required or work authorized by the electrical permit is completed.

PROGRESS INSPECTIONS (Rough In, Trenches, etc.)

Unless alternative arrangements have been made with the inspector, no part of the wiring installation shall be covered until approval has been granted by the Inspection Department.

FINAL INSPECTIONS

Final inspections should be completed prior to building occupancy. This is especially important in situations where an occupancy permit is required by the building inspection authority or where there are "high health" concerns with livestock confinement buildings such as swine and poultry.

SPECIAL INSPECTIONS

Where special inspections are requested outside normal working hours, weekends, statutory holidays, etc., arrangements can be made for such provided the permittee agrees to pay double the hourly rate for total time required.

If special travel is required, [Reference Permit Fee Schedule 5 (3)] travelling expenses may be charged in addition to the hourly rate. If the permittee is not on 30 day billing, a work authorization form must be signed or payment of estimated fee paid prior to the inspection being conducted.

8. 2009 Manitoba Electrical Code, 10th Edition

Canadian Electrical Code, Part I, 21st Edition Code books may be obtained from CSA or in Manitoba from the Manitoba Electrical League at:

Phone number: (204) 783-4125
Address: 104-1780 Wellington Ave., Wpg., R3H 1B3

NOTE: Work covered under electrical permits issued prior to the effective date of the 10th Edition of the Manitoba Electrical Code may be completed in accordance with the requirements in effect at the date of permit issue.

TECHNICAL INTERPRETATIONS

SECTION 0
OBJECT, SCOPE AND DEFINITIONS

ITEM NO. 1 INTERFACE POINT BETWEEN UTILITY COMMUNICATION OR COMMUNITY ANTENNA DISTRIBUTION SYSTEMS AND CUSTOMER SYSTEMS

The function of a communication or community antenna distribution utility ends at the point of demarcation as defined by the Canadian Radio Telecommunication Commission (CRTC). The point of demarcation is the physical point at which the utility's equipment and wiring ends and the customer's equipment and wiring begins.

SECTION 2
GENERAL RULES

ITEM NO. 2 BREAKERS OF DIFFERING MANUFACTURERS INSTALLED IN PANELBOARDS
Rule 2-024 (WEB Rule 2-020) Use of Approved Equipment

Breakers to be installed in existing or new panelboards shall be approved for use in that panelboard.

ITEM NO.3 SMOKE AND WATER DAMAGE TO CIRCUIT BREAKERS
Rule 2-024 (WEB Rule 2-020) Use of Approved Equipment

CSA Audits and Investigations Department has advised inspection authorities that circuit breakers exposed to water or smoke damage, such as may be experienced in a flood or fire, may not operate under overload or fault conditions. Where circuit breakers have been so exposed they shall be replaced or undergo factory re-certification to ensure safe operation. Equipment taken out of service and deemed unsuitable for use should be destroyed in the presence of the electrical inspector or by the factory.

ITEM NO. 4 FIELD MODIFICATIONS OF ELECTRICAL EQUIPMENT
Rule 2-024 Use of Approved Equipment

Any field modification of electrical equipment voids the existing certification on the equipment (e.g.: drilling or tapping bus work or modifications to switchboards, panelboards, MCC's or other equipment). The modified equipment shall be re-certified by an accreditation organization.

ITEM NO. 5 APPROVAL OF ELECTRICAL EQUIPMENT
Rule 2-024 Use of Approved Equipment

Under the Provisions of the Electrician's Licence Act of the Province of Manitoba, electrical equipment shall be approved before the equipment is used, sold, displayed, advertised, offered for sale or distributed in Manitoba except as specified here-in.

The following will not be deemed as “electrical equipment” and therefore would not be required to be approved under The Electrician’s Licence Act and the Manitoba Electrical Code.

“A maximum of four contactors or relays installed in an approved electrical box (“control box”) provided that:

- The ampere rating of the control box shall not exceed 20 amperes;
- The control box shall have permanent nameplate installed stating the electrical characteristics as stipulated in the Manitoba Electrical Code;
- The control box interior shall have a permanently installed electrical wiring diagram;
- There shall not be any other electrical equipment (such as control transformers, indicating lights or overload devices) installed in or on the control box;
- The control box is marked with the following if the control box is energized from more than one circuit and does not have a means for disconnecting all ungrounded conductors “WARNING: MORE THAN ONE LIVE CIRCUIT”;
- The control box shall only be installed in an ordinary location as stipulated in the Manitoba Electrical Code; and
- The installation within the control box is performed by the holder of a valid Journeyperson Electrician ‘H’ license as recognized under the Electrician’s License Act of Manitoba.”

ITEM NO. 6 INSULATION AND VAPOUR BARRIER BEHIND ELECTRICAL EQUIPMENT

Note that the Manitoba Building Code requires the upper part of foundation walls enclosing a heated space to be insulated from the underside of the sub-floor to not less than 2.4 m (8 feet) below finished ground level. The insulation may be installed on the interior or the exterior of the foundation wall.

Installers are reminded that electrical equipment shall be installed to accommodate the vapour barrier and insulation requirements as per Clauses 9.25.4.3 and 9.25.5.3(1) of the Manitoba Building Code.

ITEM NO. 7 IDENTIFICATION OF UNDERGROUND INSTALLATIONS
Rule 2-100 Marking of Equipment

Rule 2-100 – Identification of equipment serviced by underground cables.
All new underground conductor installations shall be identified with a label indicating the Code year to which the installation was designed, including the U/G Detail and Table utilized to achieve the rated ampacity of the IEEE ampacity calculation.

Rule 2-100 & 4-004 Label – Equipment serviced by underground installations of #1/0 AWG and larger shall be identified with a permanently secured lamicoid label (minimum size: 3” x 5”) posted on or near each service or overcurrent supplying equipment indicating the following:

UNDERGROUND CONDUCTORS

CIRCUIT I.D._____

YEAR INSTALLED _____

DIAGRAM _____ DETAIL _____ TABLE _____

SIZE/TYPE OF CONDUCTOR _____

AMPACITY _____ MAX. OVERCURRENT _____

ITEM NO. 8 MECHANICAL PROTECTION OF CONDUCTORS INSTALLED IN METAL STUDS
Rule 2-108 Quality of Work

For conductors/cables installed under Sections 12, 16, 54, 56 & 60, Rule 2-108 requires that care be taken to prevent damage. Grommets or other acceptable means shall be provided to prevent damage to conductors that are to be installed through metal studs.

ITEM NO. 9 GROUPING OF CABLES IN INSULATED SPACES
Rule 2-122 Use of Thermal Insulation

Subrule (1)(a) of Rule 2-122 requires the use of "special care" to assure safe conductor operating temperatures when heat dissipation is restricted by conductor/cable grouping in thermal insulation.

Cables in insulated spaces shall be separated by at least one cable diameter. Except that two cables shall be permitted to be in contact where passing through holes in structural members.

The practice of bunching or grouping more than two cables in thermal insulation is not acceptable.

ITEM NO. 10 FIRESTOPPING
Rule 2-124 Fire Spread

To delay the spread of fire within a building, certain walls, floors and ceilings are constructed as "fire separations" (See Note 1). Rule 2-126 and Manitoba Building Code Article 3.1.9.1. require that precautions be taken to limit the spread of fire through fire separations where they are penetrated by electrical raceways, cables, or outlet boxes (See Note 3).

Listed below are requirements for commonly encountered situations.

1. Where a fire separation is partly or wholly penetrated by an electrical raceway, cable or outlet box, the penetration shall be:
   a. sealed by an approved fire stop system that complies with Manitoba Building Code Clause 3.1.9.1.(1)(a); or
   b. tightly fitted with no openings around the penetration.

2. Where a firewall (see Note 2) is partly or wholly penetrated by an electrical raceway, cable or outlet box, the penetration shall be sealed using an approved fire stop system that complies with Manitoba Building Code Clause 3.1.9.1.(1)(a).

NOTES:
1. *Manitoba Building Code Article 3.1.9.1. refers to both "fire separations" and "assemblies required to have a fire resistance rating". For clarity, only the term "fire separation" is used in this item.*
2. *A "firewall" is designed to limit the spread of fire from one building to another, whereas a fire separation is only designed to limit the spread of fire within a building. Firewalls are typically constructed of masonry.*
3. *This item deals only with fire stopping. The Manitoba Building Code Articles 3.1.9.2., 3.1.9.3., and 9.10.9.6. should be consulted for the size and type of electrical penetrations that are permitted.*

ITEM NO. 11 MARKING OF EQUIPMENT FOR ARC FLASH
Rule 2-306 Shock and Arc Flash Protection

Electrical equipment such as switchboards, panelboards, industrial control panels, meter socket enclosures and motor control centres that are installed in other than dwelling units shall be field marked to warn persons of potential electric shock and arc flash hazards.

SECTION 4
CONDUCTORS

ITEM NO. 12 SINGLE CONDUCTOR CABLES
Rule 4-004 Ampacity of Wires and Cables

Where the ratings of Tables 1 or 3 are being applied, at least 50% of the total cable length shall be outside the equipment being connected.

ITEM NO. 13 "TEE" SERVICES
Rule 4-004 Ampacity of Wires and Cables

Where "Tee" services are used and the number of conductors in the raceway exceeds three (3) for a distance exceeding 600 mm, the ampacity of the conductors shall be corrected by applying the correction factors of Table 5C.

ITEM NO. 14 RATINGS OF CONDUCTORS IN FIBRE SPACERS, METAL THROATS AND NIPPLES
Rule 4-004(7)(b) Ampacity of Wires and Cables

Fibre Spacers, metal throats and nipples not longer than 150 mm in length may be treated as auxiliary gutters in accordance with Rule 4-004(7)(b) in which case no derating for multiple conductors need be applied to the Table 2 or 4 ratings.

ITEM NO. 15 BONDING BETWEEN ENCLOSURES INTERCONNECTED WITH FIBRE SPACERS AND METAL THROATS

The use of fibre spacers or metal throats will be permitted to interconnect component parts of electrical equipment provided bonding jumpers sized in accordance with Table 16 are installed.

ITEM NO. 16 SHEATH CURRENTS IN DIRECT BURIED SINGLE CONDUCTOR CABLE INSTALLATIONS OTHER THAN CONSUMER'S SERVICE
Rule 4-008 Sheath Currents in Single Conductor Metal Sheathed Cables and associated Appendix B note

Where metal sheathed cable is run underground, the sheath shall be isolated at the load end and a separate bonding conductor run adjacent to the cables. Alternatively, if sheath currents are not eliminated, the cable ampacity shall be derated in accordance with Rule 4-008.

ITEM NO. 17 HARMONICS
Rule 4-022 & 4-024

Harmonic distortion is a regularly appearing distortion of the voltage and current sine waveforms whose frequency is an integral multiple of the fundamental frequency. With a fundamental frequency of 60 Hertz, the 2nd harmonic is 120 Hz, the 3rd harmonic is 180 Hz. and so on.

Harmonic distortion has become a problem in electrical systems due to the proliferation of non-linear loads. Examples of high harmonic producing loads are computers, electronic ballasts, variable speed AC and DC drive systems, UPS systems, SCR's, thyristors, welders, and arc furnaces, etc.

Damaging Effects of Harmonics:

1. Overheating of Neutrals - "Triplen" harmonics (3rd, 6th, 9th, 12th, 15th, etc.) are considered "zero sequence". Instead of cancelling on the neutral for balanced loads, triplen harmonics add. In some cases the neutral current may be 1.73 times the phase current. Care should be taken when sizing neutrals and applying the requirements of rule 4-004(3), 4-022 and 4-024.
2. Temperature Rise of Transformers - Harmonic currents also circulate within transformers resulting in overheating. Care should be taken in the selection and sizing of transformers.
3. Temperature Rise and Reduced Life in Motors
4. Capacitor Failures
5. Disruption in the Operation of Electrical and Computer Controlled Equipment
6. Malfunction of Circuit Breakers
7. Communications Interference (Voice and Data)

Harmonic Study
If harmonic problems are suspected, it is recommended that a harmonic study by a qualified person be undertaken to determine the best solution.

SECTION 6
SERVICES AND SERVICE EQUIPMENT

ITEM NO. 18 SMALL SERVICES
Rule 6-110 Three-Wire Consumer's Services

Rule 6-110 states:
"A three-wire consumer's service shall be provided in all cases where more than two 120V branch circuits are installed, unless such supply is not available from the supply authority."

Refer to Section 0 definitions for Consumer's Service and Service Box.

Intent of this rule:
An overcurrent device is required ahead of a panelboard containing more than two circuits.

ITEM NO. 19 UPGRADING OF EXISTING RESIDENTIAL ELECTRICAL SERVICES
Rule 6-112 Support for the Attachment of Overhead Supply or Consumer's Service Conductors

Where a customer's meter is to be relocated outside or service conductors re-pulled in an existing conduit, the existing supply service attachment point will be acceptable provided:

- the building is a single dwelling;
- the service attachment point is acceptable to the utility;
- the existing conduit is of sufficient size;
- the service drop clearances in effect at the time of installation have not been decreased through landscaping, addition of buildings, or pools, etc.; and
- the attachment point is not less than 3 m above grade except that a variance of 150 mm may be accepted at the discretion of the Inspection Department.

NOTE: *Prior to 1972, a 9 foot (2.7 m) service head and supply service clearance was in effect; between 1972 and 1980, this was increased to 11 feet (3.5 m).*

ITEM NO. 20 SERVICE MASTS AND ATTACHMENTS
Rule 6-112 Support for the Attachment of Overhead Supply or Consumer's Service Conductors

Prior to installing the supply service attachment means, the supply authority shall be consulted to determine whether a single or multi-point rack will be required.

ITEM NO. 21 MEANS OF ATTACHMENT
Rule 6-112 Means of attachment

A means of attachment shall be provided for all supply or consumer's service conductors. The attachment shall be a service mast or attachment provided by the customer on a building or a customer-owned service pole at a location that is acceptable to the supply authority.

Note: When poles are installed they shall be a minimum of a class 6 pole and must be treated with a wood preservative. A timber or post will not meet the requirements of this rule.

ITEM NO. 22 AERIAL SERVICE ATTACHMENT
Rule 6-116 Consumer's Service Head Location

Rule 6-116 of the Code has been relaxed to allow the attachment point of an aerial service to be at the same height as the service head where an undereave bracket is used.

ITEM NO. 23 CONSUMERS SERVICE BOXES
Rule 6-200 Service Equipment

1. The requirements of 6-200(2) are further relaxed to permit outdoor subdivisions of a consumers service to be made:
   (a) In a transformer rated meter mounting device approved with dual lugs on the load side; or
   (b) In an acceptable Customer Service Termination Enclosure (CSTE); or
   (c) At an overhead rack on a pole or building.

2. For the application of Rule 6-104, each subdivision permitted in Subrule (1) shall be considered a consumers service.

3. Each subdivision of the consumer's service shall terminate in a single service box.

4. No other consumer's service may be attached to the supply service.

NOTE: CSTE's may be wall, pad or pole mounted provided the location is acceptable to the supply authority. For the definition of CSTE's, see Manitoba Hydro Customer Metering Standards.

ITEM NO. 24 INSULATION RATING FOR OVERHEAD CONSUMER'S SERVICE CONDUCTORS
Rule 6-302(5) Overhead Consumer's Service Conductors

For compliance with Subrule 6-302(5), conductor/cable insulation shall be rated for -40°C.

ITEM NO. 25 METER SOCKETS SERVED FROM UNDERGROUND SUPPLY SYSTEMS

Single Phase Meter Sockets served from underground supply systems shall be factory equipped with studs on the line side to provide for the connection of compression type wire connectors.

NOTE: This requirement is not enforced for farm metering units or 7 jaw meter sockets

ITEM NO. 26 CUSTOMER SERVICE TERMINATION ENCLOSURE (C.S.T.E.)

A "C.S.T.E." is defined in the Manitoba Hydro Customer Metering Standards Booklet as "an approved outdoor located customer service termination enclosure which may or may not contain revenue metering transformers". Drawings shall be submitted to Manitoba Hydro for approval for any proposed installation using a C.S.T.E.

ITEM NO. 27 UNDERGROUND SUPPLY SERVICE TERMINATION REQUIREMENTS

The minimum size of rigid conduit required from a meter mounting device or a customer owned supply service termination enclosure to the supply trench to accommodate Manitoba Hydro supply conductors is shown in the table below.

These sizes are based on a maximum conduit fill of 40% in accordance with the Manitoba Electrical Code governing customer owned installations.

Confirmation of the cable size should be obtained from your local Manitoba Hydro district office prior to installation of this conduit.

INSULATED CONDUCTOR SIZE	MINIMUM CONDUIT SIZE	MAXIMUM NUMBER OF CONDUCTORS
1/0 AWG	50 mm (2 in.)	5
4/0 AWG	62 mm (2½ in.)	3
3-4/0 & 1-#2	62 mm (2½ in.)	4
350 KCMIL	75 mm (3 in.)	4
750 KCMIL	100 mm (4 in.)	4
1000 KCMIL	125 mm (5 in.)	5

ITEM NO. 28 MANITOBA HYDRO OWNED FARM SERVICE POLES AND STRUCTURES

Manitoba Hydro will not normally permit customer owned electric service facilities to be located on Manitoba Hydro owned poles and structures.

Where customer owned facilities are attached to Manitoba Hydro poles and structures including existing farm service poles the following procedures shall be adhered to:

When the customer requires work to be conducted on electric facilities located more than 3m above grade on a Manitoba Hydro owned pole or structure, the primary supply shall first be de-energized by Manitoba Hydro staff before any work is carried out.

SECTION 8
CIRCUIT LOADING AND DEMAND FACTORS

ITEM NO. 29 VOLTAGE DROP TABLE
Rule 8-102 Voltage Drop

The following tables provide a quick reference for voltage drop calculations with values pre-calculated for 3% voltage drop. For accurate voltage drop calculations, refer to Table D3 in Appendix D of the Code.

The table values are provided for copper conductors. For aluminum conductors find the correct size of copper conductor and add two AWG sizes.

Voltage Drop Table
(Values given in Ampere-feet*)

1 Φ		Nominal Voltage	
		120V	240V
Conductor Size (AWG)	#14	604	1208
	#12	960	1920
	#10	1527	3053
	#8	2429	4858
	#6	3854	7709
	#4	6143	12,287
	#3	7725	15,451
	#2	9730	19,459
	#1	12,329	24,658
	#1/0	15,517	31,034
	#2/0	19,587	39,173
	#3/0	24,658	49,315
	#4/0	31,101	62,202

3 Φ		Nominal Voltage		
		208V	480V	600V
Conductor Size (AWG)	#14	1047	2416	3020
	#12	1664	3840	4800
	#10	2646	6107	7634
	#8	4211	9717	12,146
	#6	6681	15,418	19,272
	#4	10,648	24,573	30,717
	#3	13,391	30,901	38,627
	#2	16,865	38,919	48,649
	#1	21,370	49,315	61,644
	#1/0	26,897	62,069	77,586
	#2/0	33,950	78,346	97,933
	#3/0	42,740	98,630	123,288
	#4/0	53,908	124,404	155,505

- Table values are given in Ampere-feet.
- Divide the table value by the total circuit Amperes to obtain the maximum distance in feet for each conductor.
- Example:
  10A at 120V, using #14 RW90 = 604 ÷ 10 A = 60.4 ft. max. for a 3% voltage drop.

ITEM NO. 30 SINGLE CONDUCTORS IN FREE AIR
Rule 8-104 Maximum Circuit Loading

Due to inconsistencies from the field, the derating factors for conductor ampacities in Rules 8-104(4) & (5) shall be applied.

Sample Calculations for 400A service box:

CONDUCTORS IN FREE AIR
Tables 1 and 3

Non-Continuous Load Rule 8-104		Continuous Load **using 100% rated equipment** Rule 8-104(4)(b)		Continuous Load **using 80% rated equipment** Rule 8-104(5)(b)	
max. cct. loading	= 100% of 400A = 400A	max. cct. loading	= 85% of 400A = 340A	max. cct. loading	= 70% of 400A = 280A
min. conductor ampacity	= 400A	min. conductor ampacity	400A	min. conductor ampacity	= 400A
use #250 kcmil cu (425A) or #350 kcmil al (415A)		use #250 kcmil cu (425A) or #350 kcmil al (415A)		use #250 kcmil cu (425A) or #350 kcmil al (415A)	

MULTI-CONDUCTOR CABLE AND RACEWAYS
Tables 2 and 4

Non-Continuous Load Rule 8-104		Continuous Load **using 100% rated equipment** Rule 8-104(4)(a)		Continuous Load **using 80% rated equipment** Rule 8-104(5)(a)	
max. cct. loading	= 100% of 400A = 400A	max. cct. loading	= 100% of 400A = 400A	max. cct. loading	= 80% of 400A = 320A
min. conductor ampacity	= 400A	min. conductor ampacity	= 400A	min. conductor ampacity	= 400A
use #500 kcmil cu (395A*) or #750 kcmil al (405A)		use #500 kcmil cu (395A*) or #750 kcmil al (405A)		use #500 kcmil cu (395A*) or #750 kcmil al (405A)	

Refer to Rule 8-104, Subrules (4) & (5) in the CEC Handbook for additional examples.

*as allowed in Rule 8-106(1).

ITEM NO. 31 LOADS ADDED TO EXISTING UNDERGROUND INSTALLATIONS
Rule 8-106 Use of Demand Factors

Where load is to be added to an existing underground conductor installation, the requirements of Rule 8-106(8) will be acceptable for the rating applied to the original installation.

Rule 8-106(8) refers the code user to Rule 8-104(4) & (5) for the application of applicable demand factors for continuous loads.

ITEM NO. 32 LOAD INCREASES TO EXISTING SERVICES

Installers should note that Manitoba Hydro requires notification prior to a load increase of 10 kVA/kW/hp or more to any existing service. Furthermore, in the City of Winnipeg network area, Manitoba Hydro requires notification prior to the addition of 5 hp or more to an existing single phase service.

SECTION 10
GROUNDING AND BONDING

ITEM NO. 33 TINGLE VOLTAGE
Rules 10-204, 10-406, 10-806

(a) Subrules 10-204(1)(b), 10-406(5) and 10-806(1) allow for various approved devices to be installed between the system ground and the neutral conductor of a service or distribution system on farm outbuildings.

Electrical Inspectors have the expertise and instruments to investigate tingle voltage complaints. If you suspect tingle voltage is creating a problem, you should contact your Electrical Inspector.

(b) New Barns
When wiring new barns, be advised that the most effective remedial action to prevent problems with tingle voltage is the installation of an equi-potential mat in the floor of the building.

The installation of a mat should be done prior to pouring the floor. When involved in a barn installation, advise your customer of the importance of installing this mat. In dairy and P.M.U. facilities, the important locations are the animal standing areas. For further information Manitoba Hydro has published a data sheet on the problems and remedial actions for tingle voltage. These are available at most Manitoba Hydro offices.

ITEM NO. 34 BONDING OF INTERIOR GAS PIPING
Rule 10-406 Non-electrical Equipment

For the gas pipe bonding requirements in single dwellings, the bonding conductor supplied as an integral part of a cable assembly supplying the appliance may be considered a suitable bonding conductor for the circuit supplied by that cable assembly and may be deemed to meet the intent of Subrule 10-406(4).

ITEM No. 35 BONDING OF RAISED CELLULAR FLOOR ASSEMBLIES
Rule 10-406(6) Non-electrical Equipment

An equipotential plane is defined as: A grid, sheet, mass or masses of conducting material that when bonded together offers negligible impedance to current flow and to prevent a difference in voltage from developing within the plane. This can be achieved by ensuring the equipotential plane is in compliance with rule 10-500.

ITEM NO. 36 GROUND ELECTRODES
Rule 10-700 Grounding Electrodes

A well casing located outdoors and not used as the grounding electrode need not be bonded for the purpose of Rule 10-700(4).

ITEM NO. 37 USE OF SINGLE ROD GROUNDING ELECTRODES
Rule 10-700(2) Artificial Grounding Electrodes

1. Rule 10-700(2) has been relaxed in its application to permit the use of a single copper-clad rod as a grounding electrode provided the following conditions have been met:
   a) The service is single phase and not greater than 200 amperes and 150 volts to ground; and
   b) The service is temporary or supplies a bus shelter, cable television distribution equipment, sign or other similar installation.

2. In underground locations, rod electrodes are not acceptable for temporary builders services as the utility is concerned about damage to the buried conductors. The supply utilities grounding shall be the sole electrode used. To facilitate this, the customer shall supply a grounding conductor between the temporary builders service and the utility supply point.

3. The conductor size for system grounding conductors connected to rod electrodes is based on Table 17 of the code. Where the conductor is larger than No. 3 AWG, an approved wire connector shall be used instead of the washer provided with the eye bolt type rods. When more than one rod is installed they shall be spaced at least 3 m apart and should be installed in undisturbed earth. Rods installed under the basement floor of a building give better results because of the more stable temperature and moisture conditions.

ITEM NO. 38 GROUNDING ELECTRODES
Rule 10-700(2) Grounding Electrodes
Rod Electrodes

A study of existing ground rod electrode installations revealed that installations using galvanized and steel rods were severely corroded at approximately 0.5 m – 1.5 m below grade.

Local soil conditions caused severe corrosion on the ground rod to the point where the rod did not offer a sufficient path to ground.

Similar installations using copper clad rods were satisfactory.

Paragraph 10-700(2)(a) of the CEC has been amended in the Manitoba Electrical to require ground rods to be copper clad only.

SECTION 12
WIRING METHODS

ITEM NO. 39 WIRING IN DUCTS AND PLENUM CHAMBERS
Rule 12-010 Wiring in Ducts and Plenum Chambers

Subrule 12-010(5) is relaxed to include all return air plenums that are constructed of combustible joists in single dwellings.

ITEM NO. 40 AMPACITIES FOR DIRECT BURIED CABLES AND RACEWAYS
Rule 12-012 Underground Installations

Subrule 12-012(8) is relaxed to include cables:

1) Cables shall be permitted to be enclosed or encased in at least 50 mm of concrete or be installed directly below a concrete slab at grade level provided the slab is not less than a nominal 100 mm in thickness and where practical the location of the conduits or cables are marked.

Appendix "B" notes under Rule 4-004 states that the ampacities for direct buried cables and conductors in raceways shall be in accordance with Tables 2 and 4 or IEEE 835 where the installation is not in conformity with the applicable arrangements shown in diagrams B4-1 to B4-4.

ITEM NO. 41 CONDUITS & CABLES IN OR UNDER FLOORS OF ATTACHED GARAGES
Rule 12-012 Underground Installations

Conduits or cables shall not be run in or under the floors of attached garages.

ITEM No. 42 CIRCUIT CONDUCTORS INSTALLED IN RACEWAYS
Rule 12-904 Conductors in Raceways

All conductors of the same circuit shall be contained within the same raceway, unless otherwise permitted in accordance with 12-108 or 4-004(1)(d) and (2)(d).

ITEM NO. 43 VERTICAL RUNS OF CABLE
Rule 12-120 Support of Conductors

The design of cable types Teck90 and RA90 does not provide internal support between the sheath or armour and the internal cable assembly. To avoid injurious strain on conductor terminations, vertical runs of Teck90 and RA90 that exceed 30 m in length shall incorporate a bend or bends equivalent to a total of not less than 90 degrees, in addition to the normal cable supports for each 30 meters of vertical run or portion thereof.

ITEM NO. 44 OVERHEAD OUTDOOR CONDUCTOR AMPACITIES
Rule 12-200 Open Wiring Rules

The ampacity of single weatherproof overhead conductors shall be permitted to be based on column 6 of Table 1 or 3 as applicable.

ITEM NO. 45 WIRING SYSTEMS FOR MODULAR OFFICE FURNITURE
Rule 12-904 Conductors in Raceways

Office areas are often designed with relocateable partitions that are pre-wired with communication and or branch circuit wiring. Before connecting such equipment to the building wiring system, installers are advised to carefully check the manufacturer's installation instructions and equipment marking. In some cases, there may be a restriction on the number of circuits or sources that are permitted to supply the pre-wired furniture.

Code users are reminded that where such circuits are supplied from different transformers or different sources of voltage, the circuits shall be separated in accordance with Subrule 12-904(2).

ITEM NO. 46 PNEUMATIC TUBING IN RACEWAYS
Rule 12-1014 Conductors in Conduit

Electrical raceways may only be used for the purpose of carrying electrical conductors. An exception will be permitted to allow pneumatic tubing in a raceway where all the electrical conductors are designated as Class 2 circuits.

Conduit fill for such raceways shall be calculated in accordance with the requirements of Rule 12-1014 using the diameter of the tubing where the Rule specifies “cable diameter”.

ITEM NO. 47 ELECTRICAL NON-METALLIC TUBING (ENT) INSTALLED OUTDOORS
Rule 12-1500 Electrical Non-metallic Tubing

Electrical Non-metallic Tubing shall not be installed exposed in exterior locations unless specifically approved for sunlight resistance, and so marked as per Rule 2-130

ITEM NO. 48 ELECTRICAL CONDUIT FITTINGS
Rule 12-3014 Accessibility of Junction Boxes

Under the requirements of Rule 12-3014(1), conduit fittings (LB’s, T’s, etc.) equipped with a cover shall be accessible.

ITEM NO. 49 WIRING SPACE IN ENCLOSURES
Rule 12-3032 Wiring Space in Enclosures

Where two or more panelboard interiors are provided in a single enclosure complete with a factory-installed metal barrier between the panelboards, the only openings permitted in this barrier are those required to run the subfeed conductors from one panelboard to the other. These interconnecting conductors are factory installed. No other conductors may be run through these openings.

For the purpose of Subrule 12-3032(3), each panelboard section is deemed a separate enclosure and therefore no branch circuit conductors terminating in any one of the panelboards may be fed through the adjacent panelboard.

ITEM NO. 50 TIEWRAPS

Tiewraps are not an acceptable supporting means for electrical conduits or cables.
Tiewraps will be permitted to secure cables where the weight of the cable is supported in an acceptable manner such as in a cable tray or on top of a unistrut type of supporting means.

ITEM NO. 51 TYPE USEB90 AND USEI90 CABLES

Type USEB90 and USEI90 cables will be permitted for use as underground feeders provided:

a) The installation is in accordance with the requirements of Rule 12-012; and
b) The cables are not installed in or on a building unless in a raceway; and
c) When used on a pole, type USEB90 is installed in rigid conduit to a point at least 2 m above grade or ground level; and
d) Where type USEI90 is installed on a pole or building, it is in a raceway between the underground trench and the above ground termination; and
e) All conduits are sealed to prevent the entrance of moisture.

NOTE: Not for use in overhead services, or portions of overhead services, where no part of the cable installation is installed underground.

ITEM NO. 52 ELECTRICAL CONDUIT SUPPORTS

Electrical conduits shall be securely fastened in place. The use of suspended ceiling support wires are not considered an acceptable means of fastening a conduit.

ITEM NO. 53 PRESERVED WOOD FOUNDATIONS

Installers are advised that the Manitoba Building Code requires preserved wood foundations to conform to CSA Standard CAN/CSA S406-92, “Construction of Preserved Wood Foundations.” This Standard requires that where receptacles or other wiring is placed in exterior walls of a preserved wood foundation, the wiring shall be run vertically within a single stud space, with holes drilled only in the top plates.

Holes are not permitted to be drilled through studs in preserved wood foundations, according to Standard S406-92.

SECTION 14
PROTECTION AND CONTROL

ITEM NO. 54 OVERCURRENT PROTECTION FOR SPLIT RECEPTACLES IN PARKING LOTS
Rule 14-010 Protective and Control Devices Required
Rule 14-302 Construction of Circuit Breakers

Where single phase, 3-wire receptacles are installed in parking lots, they shall be protected in accordance with rules 14-010 and 14-302.

ITEM NO. 55 INTERRUPTING RATINGS OF OVERCURRENT DEVICES
Rule 14-012 Ratings of Protective and Control Equipment

Under the requirements of Rule 14-012, electrical equipment which is required to interrupt fault current, (breakers, fuses and switches) must have ratings sufficient for the voltage employed and for the fault current available at the terminals.

The maximum fault current available at any location is governed by a number of criteria and must therefore be calculated for each installation. Fault current information for individual installations is available from Manitoba Hydro.

To ensure compliance with Rule 14-012, where the available fault current exceeds 10,000 Amperes at any point in the system, electrical drawings submitted for review shall indicate the expected available fault current and the interrupting ratings of all equipment required to interrupt the fault current.

The following criteria will apply to all fault current calculations:

1. The calculation will assume an infinite primary bus.
2. The percent impedance for dry-type transformers will be the percent impedance of the installed transformer.
3. The percent impedance for oil filled transformers will be based on the lesser of:
    (a) The percent impedance of the installed transformer.
    (b) Table No. 1 (below) for all polyphase pole mounted transformers.
    (c) Table No. 2 (below) for all single phase transformers.
    (d) Table No. 3 (below) for all polyphase padmounted transformers.

Table No. 1

POLYPHASE POLE MOUNTED TRANSFORMERS	
RATING	**MINIMUM IMPEDANCE (P.U.)**
Up to 75 kVA	1.5%

Table No. 2

SINGLE PHASE POLE MOUNTED AND PADMOUNTED TRANSFORMERS	
RATING	**MINIMUM IMPEDANCE (P.U.)**
0 – 50 kVA	1.5%
75 kVA	2.0 %
100 – 167 kVA	2.5%

Table No. 3

POLYPHASE PADMOUNTED TRANSFORMERS	
RATING	**MINIMUM IMPEDANCE (P.U.)**
0 – 299 kVA	1.8%
300 kVA	2.0 %
500 kVA	3.0%
750 kVA	3.5%
Above 750 kVA	4.0%

IMPORTANT NOTE:
For installations for all new services or modifications to existing services within the City of Winnipeg 125/216V underground secondary network area, service entrance equipment must consist of a circuit breaker or circuit breaker/fuse combination with a rupturing capacity of at least 100,000 Amperes or a disconnecting switch equipped with Class J, Form 1 high rupturing capacity fuses.

ITEM NO. 56 PANELBOARD/SPLITTER OVERCURRENT PROTECTION
Rule 14-606 Panelboard Overcurrent Protection

Rule 14-606 allows for panelboards to be installed on the secondary side of transformers with overcurrent protection on the primary side provided the panelboard rating is not less than the overcurrent rating in amperes multiplied by the ratio of the primary to the secondary voltage. For the application of this rule, the definition of a "panelboard" includes splitters.

SECTION 16
CLASS 1 AND CLASS 2 CIRCUITS

ITEM NO. 57 CLASS 2 CIRCUITS, 30 VOLTS OR LESS

1. Class 2 Circuits shall be supplied from Class 2 transformers, or
   a) A Class 2 power supply or device; or
   b) Where the voltage does not exceed 20 volts, a 5 ampere (maximum) mini circuit breaker or a 5 ampere non-interchangeable fuse.

2. Lighting fixtures shall be approved in accordance with Rule 16-222(2).

3. The wiring method on the load side of the Class 2 power supply may conform to the applicable requirements of Section 16 of the code for a class 2 system.

4. The wiring method on the line side of the Class 2 power supply shall conform to the applicable requirements of Section 12 of the Code.

5. The Power Supply shall be located and installed in an acceptable manner.

ITEM NO. 58 CLASS 2 SYSTEMS
Rule 16-212 Separation of Class 2 Circuit Conductors from Other Circuits

Rule 16-212 is relaxed to permit Class 2 circuits in the same enclosure or raceway as other systems where the function of the different systems are associated such as the connection to associated remote control equipment.

Where different systems occupy the same enclosure or raceway:
   a) All conductors shall be insulated to the highest voltage in the enclosure or raceway; and
   b) Class 2 systems shall be marked by colour or other acceptable means to clearly indicate the different systems.

SECTION 18
HAZARDOUS LOCATIONS

ITEM NO. 59 WOODWORKING SHOPS
Rules 18-300 to 18-326 Class III, Division 1 Locations

1. Classification
The Electrical Code classifies wood working shops as Class III, Division 1 locations. The following relaxations to Class III requirements will be permitted where:

a) Adequate dust control equipment is installed; or
b) The accumulation of dust and flyings will be minimal.

2. Wiring Methods
a) Surface wiring may be either Rigid PVC conduit, or Electrical Metallic Tubing (EMT) utilizing Rain-Tite couplings and connectors. Boxes and fittings shall comply with Rule 18-302(2).
b) Concealed wiring may be type AC or NM cable. Concealed boxes and fittings may be ordinary type.

3. Covers for Switches and Receptacles
Switch and receptacle covers may be of the weatherproof type. Where duplex receptacles are used a separate self-closing cover will be required for each section of the receptacle.

4. Lighting
General purpose fluorescent lighting fixtures may be installed:

a) If mounted directly on the ceiling; or
b) If suspended, and provided with adequate dust shields to prevent the accumulation of dust.

5. Heating
Unit electric air heaters, other than those approved for the location, will be permitted provided the following requirements are met:

a) Motors are of the totally enclosed type;
b) The unit is designed to minimize the accumulation of dust and other debris;
c) The enclosures for electrical parts of the heater shall prevent the entrance of dust; and
d) The exposed surface* temperature of the heater shall not exceed 165 degrees Celsius under normal conditions and 218 degrees Celsius under abnormal conditions such as fan failure.

* *Exposed surface means a surface exposed to the air. e.g. Motor enclosure, heater sheath, etc. A "GX" rated heater will generally meet these requirements.*

SECTION 20
FLAMMABLE LIQUID AND GAS DISPENSING AND SERVICE STATIONS,
GARAGES, BULK STORAGE PLANTS, FINISHING PROCESSES, AND AIRCRAFT HANGARS

ITEM NO. 60 AIRCRAFT HANGARS
Rules 20-500 to 20-522 Aircraft Hangars

Rules 20-500 to 20-522, inclusive, apply to locations used for storage or service of aircraft. These requirements may be relaxed by special permission for hangars designed for "private use" aircraft provided the electrical installation meets the minimum requirements of Rules 20-200 to 20-206, inclusive, for a residential storage garage.

SECTION 22
LOCATIONS IN WHICH CORROSIVE LIQUIDS OR VAPOURS
OR EXCESSIVE MOISTURE ARE LIKELY TO BE PRESENT

ITEM NO. 61 RECEPTACLES FOR USE IN BUILDINGS HOUSING LIVESTOCK OR POULTRY
Rule 22-108 Type of construction

Where the receptacle is, or is likely to be, exposed to corrosive vapours it shall be of the corrosive resistant type of construction

ITEM NO. 62 USE OF NON-METALLIC SHEATHED CABLES IN BUILDINGS HOUSING LIVESTOCK
Rule 22-204(5) Wiring Methods in Buildings Housing Livestock or Poultry

In order to comply with the requirements for protection from rodents specified in Subrule 22-204(5), nonmetallic sheathed cables will not be permitted to be installed in attic spaces or concealed wall cavities within barns unless sleeved with conduit or tubing.

ITEM NO. 63 LIGHTING EQUIPMENT IN BUILDINGS HOUSING POULTRY OR HORSES

The environment found in these applications is generally dry with some dust and minimal corrosion.

In recognition of this environment, standard fluorescent lighting fixtures will be permitted for use in poultry housing provided protection against dust layering is made by mounting the fixtures on the ceiling or, if suspended, provided with adequate dust shields to prevent the accumulation of dust.

ITEM NO. 64 TYPICAL L SEWAGE LIFT AND TREATMENT PLANTS
Typical installation drawings

DIAGRAM 11 - Rule 22-704 Classification of Areas
Typical Sewage Lift Station (Self-Contained)

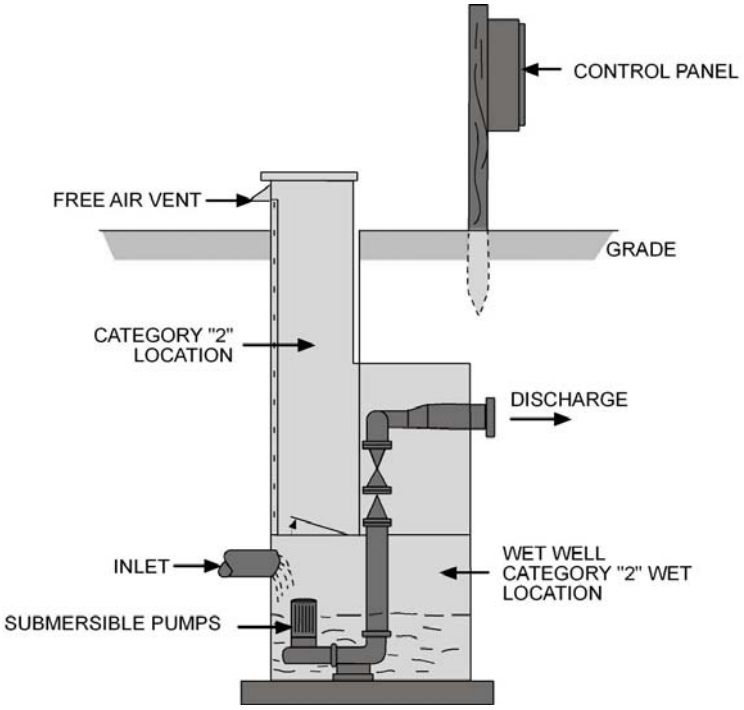


DIAGRAM 12 - Rule 22-704 Classification of Areas
Typical Sewage Lift Station (Control Building on top)

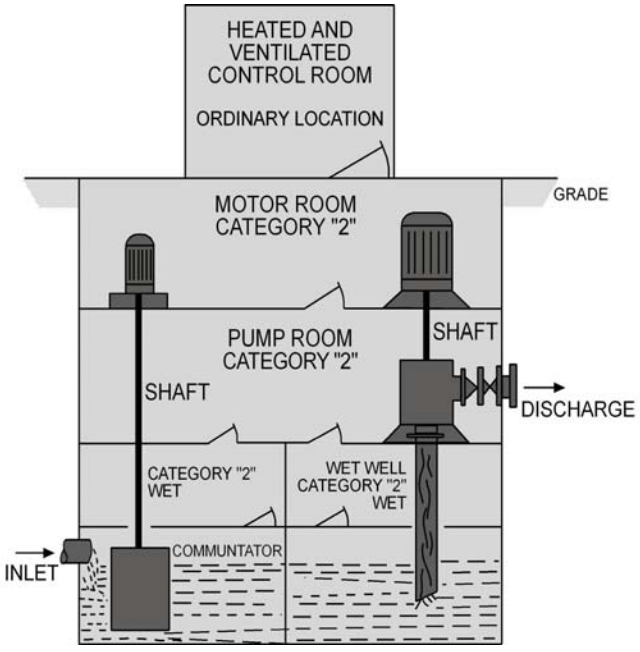


DIAGRAM 13 - Rule 22-704 Classification of Areas
Typical Sewage Lift Station (Side-by-Side)

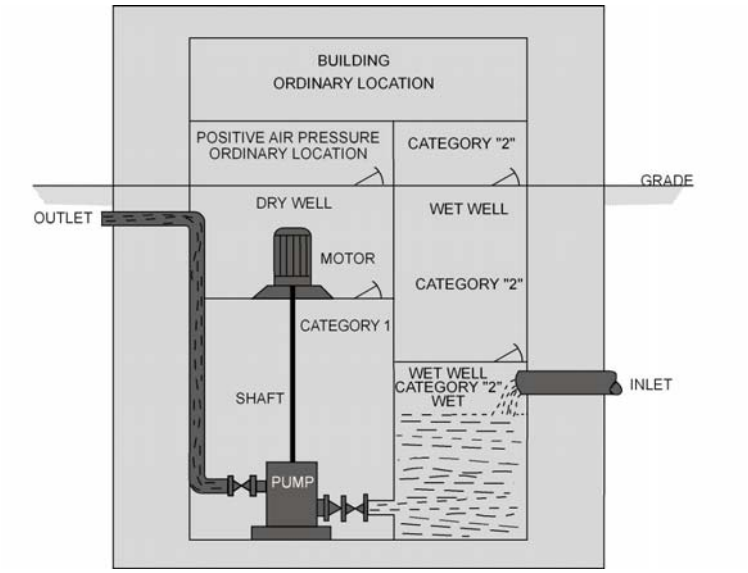
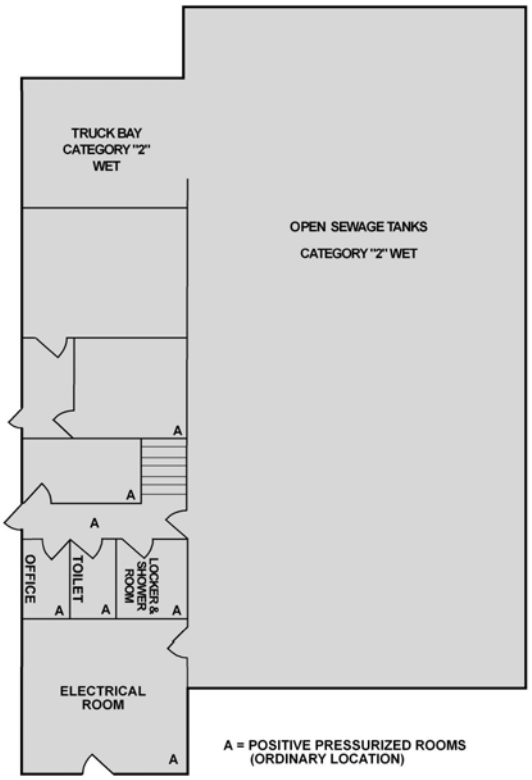


DIAGRAM 14 - Rule 22-704 Classification of Areas
Typical Sewage Treatment Plant



SECTION 26
INSTALLATION OF ELECTRICAL EQUIPMENT

ITEM NO. 65 "STEP-UP / STEP-DOWN" TRANSFORMER INSTALLATIONS
Rule 26-250 Disconnecting Means for Transformers

For the application of this Rule, a separate disconnecting means will be required in the primary circuit of each transformer in a "step-up/step-down" application.

ITEM NO. 66 CHOKING TRANSFORMERS
Rule 26-256 Overcurrent Protection for Dry-Type Transformer Circuits Rated 750V or Less

“Choking” of transformers smaller than 75 kVA shall not be permitted.

By special permission only, transformers 75 kVA or larger shall be permitted to be “choked” by a maximum of one transformer size.

Example: If primary overcurrent protection adequate for a 75 kVA 600 Volt transformer is installed (i.e.: 90 Amp or 100 Amp circuit breaker), the maximum larger size transformer permitted to be installed with that size of overcurrent device is 112½ kVA (one standard transformer size larger).

A transformer is considered as being “choked” if the primary protection is less than the rated primary current of the transformer. For example, a 75 kVA, 600 Volt transformer is considered as “choked” when protected by a 70 Amp primary breaker since the rated primary current of the transformer is 72.2 Amps.

When a “choked” transformer is installed, a mechanically secured (riveted) lamicoid label is required on the primary overcurrent device indicating the maximum allowable size of overcurrent protection.

ITEM NO. 67 PANELBOARD MOUNTING HEIGHTS AND HEADROOM CLEARANCES IN DWELLING UNITS
Rule 26-402 Locations of Panelboards

Subrule 26-402(2) requires that panelboards in dwelling units be installed as high as possible, with no overcurrent device operating handle being more than 1.7 m above the finished floor. Installers are advised that the 1.7 m restriction will not be applied to an overcurrent device located in the service box portion of a combination service entrance panelboard. Code users are also reminded that Rule 6-206 requires a minimum headroom clearance of not less than 2 m where service boxes, including combination service entrance panelboards, are located.

ITEM No. 68 RECEPTACLES ON PERMANENTLY FIXED ISLAND COUNTERS
Rule 26-712 Receptacles for Dwelling Units

Rule 26-712(d)(iv) requires that at least one receptacle (15A split or 20 A T-slot) shall be installed at each permanently fixed island counter space with a long dimension of 600 mm or greater and a short dimension of 300 mm or greater.

For the purpose of this Rule an island is considered to be permanently fixed unless mounted on wheels.

ITEM NO. 69 UNIT TYPE GAS FIRED HEATERS
Rule 26-806 Heating Equipment Rated 117 Kw and Less

Rule 26-806(1) requires a separate branch circuit for each gas fired unit heater. The grouping of unit heaters, utilizing fractional hp fan motors will be permitted on a single 15 ampere branch circuit provided the requirements of Rule 28-206(a) are met.

SECTION 28
MOTORS AND GENERATORS

ITEM NO. 70 OVERCURRENT PROTECTION MARKED ON HERMETIC REFRIGERANT MOTOR-COMPRESSORS
Rule 28-202 Overcurrent Protection Marked on Equipment and
Rule 28-702 Marking

For the application of these Rules, installations of overcurrent devices exceeding the marked nameplate ratings will not be accepted.

ITEM NO. 71 MOTORS CONTROLLED BY VFD's/ASD's
Rule 28-314 Overheating Protection Required

For motors controlled by Variable Frequency Drives (VFD's) or Adjustable Speed Drives (ASD's), refer to Appendix B notes for Rules 18-114 and 28-314.

ITEM NO.72 MOTOR DISCONNECTING MEANS
Rule 28-604 Location of Disconnecting Means

For the purpose of Rule 28-604(1)(b)(ii) "an acceptable locking device" will require the use of a tool for the removal of the device mechanism and will utilize a padlock for the lock-off facility.

SECTION 30
INSTALLATION OF LIGHTING EQUIPMENT

ITEM No. 73 FLUORESCENT LUMINAIRE BALLAST DISCONNECT DEVICES
Rule 30-308(4) Circuit Connections

Each fluorescent luminaire installed on branch circuits exceeding 150 volts-to-ground shall be

a) provided with a disconnecting means integral with the luminaire that simultaneously opens all circuit conductors between the branch circuit conductors and the conductors supplying the ballast(s); and

b) marked in a conspicuous, legible and permanent manner adjacent to the disconnecting means, identifying the specific purpose.

NOTES:

i) It is strongly advised to use the branch circuit protective device or the circuit switch to de-energize the circuit prior to opening the disconnecting means required by this Rule.

ii) A disconnecting means is required for each ballast, for luminaires with multiple ballasts; multiple disconnecting means shall be provided.

ITEM NO. 74 LAMPHOLDERS IN CATEGORY 1 LOCATIONS
Rule 30-606 Lampholders in Wet or Damp Locations

Where porcelain type keyless lampholders are installed in Category 1 Locations such as livestock housing, the lampholders shall be approved for outdoor use. These lampholders are fitted with pigtails and potted terminations and have the words “outdoor use” marked on the container.

ITEM NO. 75 INSTALLATION OF RECESSED LUMINAIRES IN INSULATED SPACES
Rule 30-900 Recessed Luminaires, General

Rule 30-900 requires that recessed luminaires, when blanketed with thermal insulation be identified as approved for such use. A number of approved luminaires are available in the market place.

Where the installation of a standard recessed luminaire in an insulated ceiling is desired, a box shall be constructed around the fixture to allow adequate heat dissipation. The capacity of the box in cubic cm shall be based on the maximum rated wattage of the luminaire multiplied by 800.

The installation shall comply with Rule 30-900.

Example:

Rating of luminaire	= 100 watts
100 X 800	= 80,000 cubic cm
Proposed box length and width	= 40 cm X 40 cm
Minimum depth	= 80,000/1,600
	= 50 cm deep
Box dimensions	= 40 X 40 X 50 cm

SECTION 32
FIRE ALARM SYSTEMS AND FIRE PUMPS

ITEM NO. 76 FIRE ALARM SYSTEMS
Rules 32-000 Scope

The intent of this Rule is that all installations of Fire Alarm Systems shall meet the requirements of Section 32.

TEM NO. 77 SUPPLY VOLTAGE FOR SMOKE ALARMS
Rule 32-110 Installation of Smoke Alarm Devices in Dwelling Units

To meet the requirements of Rule 32-110(a), 120V smoke alarms will be required.

ITEM NO. 78 TRANSFER SWITCHES USED FOR FIRE PUMPS
Rule 32-208 Transfer Switch

As required in Rule 32-208(1)(c), transfer switches used to provide emergency power to fire pump equipment shall be approved for fire pump service. All other transfer switches used solely to provide emergency power to building systems need only be approved by an accredited organization.

SECTION 36
HIGH-VOLTAGE INSTALLATIONS

ITEM NO. 79 OUTDOOR PADMOUNTED HIGH VOLTAGE SWITCHGEAR

The following conditions shall be met for all Outdoor Padmounted High Voltage Switchgear installations:

1. Outdoor Padmounted High Voltage Switchgear shall be provided with a suitable hasp for Manitoba Hydro to install a padlock on all compartments containing Manitoba Hydro terminations or metering facilities. An exception to this would be front doors of front operated switches where the customer shall have access to replace fuses etc. (In these cases the CSA standard requires a dead front over the line terminations).
2. Where Outdoor Padmounted High Voltage Switchgear is accessible to the public, all doors of "customer compartments" accessing live parts shall be locked or secured with acceptable tamperproof devices.

NOTES: - *Switchgear inside a locked station fence or suitable enclosure is not considered accessible to the public.*

- *Tamperproof devices should be other than those used by Manitoba Hydro on its own equipment.*

SECTION 46
EMERGENCY SYSTEMS, UNIT EQUIPMENT AND EXIT SIGNS

ITEM NO. 80 USE OF NON METALLIC RACEWAYS FOR EMERGENCY LIGHTING AND EXIT SIGNS
Rule 46-108 Method of Wiring

The present wording of Rule 46-108(1) permits the use of nonmetallic raceways such as Rigid PVC Conduit for emergency lighting and exit signs, but only where embedded in at least 50 mm of masonry or concrete, or installed underground.

In buildings that are permitted by the Manitoba Building Code to be of combustible construction as described in Subrules 46-108(2), the use of exposed nonmetallic raceway as a wiring method for emergency lighting, and exit signs will be permitted.

ITEM NO. 81 EMERGENCY LIGHTING SUPPLIES
Rule 46-304 Supply Connections

Where emergency lighting is required by the authority having jurisdiction the requirements of Rule 46-304(4) shall be met. The intent of this Rule is to ensure illumination in the area being served by the unit equipment is maintained when power to the normal lighting in the area fails.

NOTE: *Detailed information is available in the Canadian Electrical Code Handbook.*

ITEM NO. 82 EMERGENCY GENERATOR SETS

The Winnipeg Building By-law states that required emergency equipment, such as fire alarm systems, emergency lighting and fire pumps, be provided with emergency power.

Where the emergency power is supplied by a generator, it shall be installed in accordance with the CSA Standard C282-00, **"Emergency Electrical Power Supply for Buildings".**

Section 9 of CSA Standard C282-00, specifies a number of tests be performed on the completed installation, to ensure conformance to the standard.

Documentation supporting satisfactory performance of the installation during these tests shall be submitted to the Electrical Inspections Section prior to occupancy approval.

CSA Standard CAN/CSA C282-00, **"Emergency Electrical Power Supply For Buildings,"** is available from the Canadian Standards Association, Standard Sales, 5060 Spectrum Way, Mississauga, Ontario, L4W 5N6.

SECTION 62
FIXED ELECTRIC SPACE AND SURFACE HEATING SYSTEMS

ITEM NO. 83 TERMINATION KITS FOR HEAT TRACE CABLES

Installers are reminded that heating cable terminations shall be made only with the materials and methods specified in the heating cable manufacturer's instructions. Failure to use the specified materials and methods will void the heating cable approval.

SECTION 68
POOLS, TUBS, AND SPAS

ITEM NO. 84 GFCI REQUIREMENTS FOR SPAS AND HOT TUBS
Rule 68-068 Ground Fault Circuit Interrupters

Factory assembled units manufactured to CSA specifications are factory equipped with a G.F.C.I. as required. Electrical components which are electrically connected to a remote packaged unit and intended to be installed within 3 meters of a spa or hot tub shall be protected by a ground fault circuit interrupter of the Class A type as per Rule 68-068.

SECTION 72
MOBILE HOMES AND RECREATIONAL VEHICLE PARKS

ITEM NO 85 Recreation Vehicle Park Calculation for 50 amp Receptacles
Rule 72-102 Demand factors for service and feeder conductors

For the application of this rule, if the panelboard or switch is rated 200 amps or less and the receptacles installed are rated 50 amps, the demand load as calculated in accordance with sub-rules (2), (3) & (4) will not be considered to be a continuous load for the application of rule 8-104.

TABLE 19
CONDUCTORS AND CABLES - CONDITIONS OF USE

ITEM NO. 86 THE USE OF T90 NYLON CONDUCTORS AND DUAL RATED T90 NYLON/TWN75
Table 19

1. T90 Nylon may be used in raceways in dry or damp locations.

2. T90 Nylon shall not be used:
   a) For direct buried raceway installations (Refer to Rule 12-928),
   b) For installation at ambient temperatures below minus 10 degrees Celsius (Refer to Rule 12-102(1)), or
   c) As consumer's service conductors where exposed to the weather. (Refer to Rule 6-302(5)).
   d) For exposed wiring where flexing may be required in temperatures below minus 10 degrees Celsius.

3. Dual rated T90 Nylon / TWN75 may be used:
   a) In raceways in dry, damp or wet locations, and
   b) For direct buried raceway installations.