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2018

# COMMERCIAL, INDUSTRIAL, AND INSTITUTIONAL CONSTRUCTION HANDBOOK

COMPANION TO 2018 CANADIAN ELECTRICAL CODE



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# **Commercial, Industrial, and Institutional Construction Handbook**

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# Contents

|  |    |
|--|----|
| Preface  | 6  |
| <b>Canadian electrical safety system</b>                         | 7  |
| <b>Certification of electrical equipment</b>                     | 9  |
| Regulatory authorities (inspection departments)                  | 9  |
| Certification marks  | 15 |
| Field inspection/special inspection                              | 16 |
| <b>Metric Units</b>  | 18 |
| <b>Formulas</b>  | 23 |
| <b>Sizing of overcurrent devices and conductors</b>              | 25 |
| Allowable ampacities of wires and cables                         | 25 |
| Tap conductors   | 27 |
| Raceway/cable comparison chart                                   | 29 |
| <b>Rule 12-012 Underground installations</b>                     | 38 |
| <b>The maximum number of conductors and cables in a raceway</b>  | 42 |
| <b>Conduit bending</b>   | 44 |
| General rules  | 44 |
| Conduit benders  | 45 |
| 90° stub bends   | 46 |
| Back-to-back bends   | 47 |
| Offsets  | 48 |
| <b>Installation of underground conductors 1/0 AWG and larger</b> | 52 |
| <b>Single conductor cables</b>                                   | 53 |
| <b>Fuses and circuit breakers</b>                                | 55 |
| Terminology  | 55 |
| Nominal ratings of overcurrent devices                           | 56 |
| Standard ratings of fusible switches/disconnecting means         | 57 |
| Tandem breakers – Practice of double-lugging breakers            | 58 |
| Double lugging / double-tapping a circuit breaker                | 60 |
| <b>Lighting</b>  | 61 |
| Lighting type comparison chart                                   | 61 |

|  |            |
|--|------------|
| Maximum overcurrent protection for lighting circuits                   | 61         |
| <b>Motors</b>  | <b>63</b>  |
| DC motor types comparison chart  | 65         |
| Single-phase ac motors   | 66         |
| Three phase ac motor type comparison chart                             | 70         |
| Example for determining motor insulated conductors and protection      | 76         |
| Protection – Overload protection                                       | 77         |
| Overcurrent protection   | 77         |
| Feeders  | 78         |
| Feeder overcurrent protection group of motors                          | 79         |
| <b>Refrigerant motor-compressors</b>                                   | <b>82</b>  |
| Air conditioning and refrigeration equipment                           | 83         |
| <b>Transformers</b>  | <b>84</b>  |
| Sizing transformers  | 85         |
| Polarity markings  | 87         |
| Standard polarity test procedure                                       | 88         |
| Configurations   | 90         |
| Tap changing transformers  | 102        |
| Calculation for a low-voltage dry-type three-phase transformer         | 105        |
| Sample calculation for a low-voltage dry-type single-phase transformer | 106        |
| <b>Grounding electrodes</b>  | <b>107</b> |
| Grounding and bonding conductors                                       | 108        |
| <b>Grounding and bonding</b>   | <b>109</b> |
| Terminology  | 109        |
| Solidly grounded systems   | 110        |
| Ungrounded systems   | 112        |
| Manufactured grounding electrodes                                      | 115        |
| Field assembled grounding electrodes                                   | 117        |
| In-situ grounding electrodes   | 119        |
| Ground conductor connection to grounding electrodes — Rule 10-11       | 121        |
| Allowances due to local conditions                                     | 121        |
| <b>Electrical protective devices</b>                                   | <b>123</b> |
| Arc-fault protection   | 124        |

|   |            |
|---|------------|
| Neutral grounding devices (impedance grounded systems)                          | 125        |
| Temporary protective grounds  | 126        |
| <b>Troubleshooting electrical circuits and equipment</b>                        | <b>127</b> |
| <b>Suggested steps to follow in troubleshooting</b>                             | <b>128</b> |
| <b>CSA Z463 Maintenance of workplace electrical systems</b>                     | <b>129</b> |
| <b>Outlets in residential occupancies, dwelling units, and single dwellings</b> | <b>130</b> |
| Terminology   | 130        |
| Receptacle requirements at a glance   | 130        |
| Requirements for receptacles  | 131        |
| <b>Lighting requirements at a glance</b>  | <b>147</b> |
| <b>Smoke alarm requirements at a glance</b>                                     | <b>148</b> |
| Carbon monoxide (CO) alarm requirements at a glance                             | 149        |
| Panelboard requirements at a glance   | 151        |
| <b>Three- and four-way switching</b>  | <b>152</b> |
| Three-way switching   | 152        |
| Four-way switching  | 153        |
| Rule 4-022 – “Neutral” no longer used   | 155        |
| <b>Electric heating equipment</b>   | <b>156</b> |
| <b>Transformers arc welder – Section 42</b>                                     | <b>159</b> |
| Welder terminology  | 159        |
| Take note of Rule 2-001 – Receptacles and attachment plugs                      | 160        |
| Welder calculation  | 160        |
| Group of transformer arc welders  | 167        |
| Overcurrent protection  | 171        |
| Sizing for transformer arc welder equipment*                                    | 173        |
| <b>Capacitors and communication circuits</b>                                    | <b>175</b> |
| Capacitors  | 175        |
| Communication circuits  | 175        |
| Power over Ethernet POE technology  | 176        |
| <b>Electric vehicles</b>  | <b>179</b> |
| Section 8 – Circuit loading and demand factors                                  | 179        |

**Ladder safety tips** 181

**Hoisting hand signals** 182

**Slings** 183

**Electrical hazards** 184

Shock hazard 185

Arc Flash hazard 186

Safety-related work practices 186

Shock hazard PPE 187

Arc flash hazard PPE 188

Other safety-related work practices 188

Electrical testing devices 189

Identifying potential hazards 190

Rule 2-310 Entrance to, and exit from, working space 190

Section 18 – Hazardous locations 196

**Fire extinguisher classes, identification, and uses** 190

**Section 64 – Renewable energy systems** 200

Rule 64-202 5) 201

Excerpt from Appendix B on the interpretation of inaccessibility: 202

Rule 64-060 13) Disconnecting means 202

**General information tables** 203

Lead acid batteries – Specific gravity 203

Tap drill sizes (inches) – National coarse threads 204

Tap drill sizes (inches) – National fine threads 205

Taper pipe sizes (inches) – National pipe threads (NPT) 207

Taper drill sizes (mm) – Metric coarse threads 207

Tap drill sizes (mm) – Metric fine threads 209

Single-phase transformers – Ampere ratings and line-to-line voltages 210

Three-phase transformers – Ampere ratings and line-to-line voltages 211

Transformer kVA rating for motor horsepower 212

Motor starter sizing 212

Enclosure designations 214

**Ontario's top ten electrical defects** 218

**Commonly asked questions and concerns** 227

## Excerpts from Tables and Diagrams in the Canadian Electrical Code, Part

|                        |     |
|------------------------|-----|
| I                      | 229 |
| Extract from Table 1   | 229 |
| Table 2                | 230 |
| Extract from Table 3   | 231 |
| Extract from Table 4   | 232 |
| Table 5B               | 233 |
| Table 5C               | 233 |
| Table 5D               | 234 |
| Table 6A               | 235 |
| Table 6B               | 238 |
| Table 6C               | 241 |
| Table 6D               | 244 |
| Table 6E               | 247 |
| Table 6F               | 250 |
| Table 6G               | 253 |
| Table 6H               | 256 |
| Table 6I               | 259 |
| Table 6J               | 262 |
| Table 6K               | 265 |
| Extract from Table 11  | 267 |
| Table 12               | 270 |
| Table 13               | 273 |
| Table 16               | 274 |
| Extract from Table 18  | 277 |
| Extract from Table 23  | 279 |
| Extract from Table 29  | 280 |
| Table 39               | 281 |
| Table 41               | 281 |
| Table 43               | 282 |
| Extract from Table 44  | 283 |
| Extract from Table 45  | 285 |
| Table 53               | 286 |
| Table 60               | 287 |
| Extract from Table 61  | 289 |
| Table 68               | 289 |
| Table D3               | 290 |
| Table D4               | 295 |
| Table D6               | 296 |
| Table D7               | 300 |
| Extract from Diagram 1 | 303 |

## Preface

This is the first edition of CSA C22.1CIICHB, *Commercial, Industrial, and Institutional Construction Handbook*. It is intended to be used as a companion to the 2018 edition of the *Canadian Electrical Code, Part I*.

This Handbook directs the reader to some of the most frequently cited Rules of the Code and other information required by field personnel on a frequent basis. Much of this information is presented in tables that are designed for quick and easy reference. The content is focused towards the commercial, industrial, and institutional construction sector, and includes examples, photos, and calculations. It also provides useful background information related to electrical terminology and procedures. The final sections contain basic tables specifying trade sizes, standard ratings, and equivalents, followed by excerpts from the most commonly consulted Code Tables and Diagrams.

This Handbook is designed to be a quick and portable reference guide in the field. Since the material is not intended to be complete, the *Commercial, Industrial and Institutional Construction Handbook* is not under any circumstances to be used in place of the *Canadian Electrical Code, Part I*. CSA Group does not assume responsibility for any errors or omissions resulting from the information in this Handbook.

The Handbook is organized by topic with a table of contents at the beginning. Starting out with metric units and formulas, continuing to fuses and circuit breakers. Motors and transformers are then discussed in detail with examples and calculations. At the end is a list and pictures of the top ten defects found in Ontario, commonly asked questions, general information tables as well as excerpts from Tables in the *Canadian Electrical Code*.

**Note:** A note on Code Sections — The Code is divided into evenly -numbered Sections. Sections 0 to 16, and Section 26 are general Code Sections. The remaining Sections supplement or amend the general Sections, which means the general Sections of the Code are changed or added to, as a means to accommodate the specific requirements of electrical equipment addressed in that particular Section. See “General and Supplement” in the Preface of the Code for more detailed information on sections and numbering.

# Canadian electrical safety system

Author: Tim Pope, C.E.T. Senior Project Manager, CSA Group

Electrical safety is something many of us take for granted. When a consumer buys an appliance, they assume that it will operate correctly when they plug it into a receptacle and that it will not cause an electrical shock or fire. The fact that we take for granted our homes and appliances are safe from electrical hazards is primarily due to the Canadian electrical safety system. The three pillars of the Canadian electrical safety system are standardization, third-party certification, and regulation. How do they all fit together?

## Standardization : Better by design

Let's first take a look at Standardization. To be used in Canada, electric equipment must be designed and manufactured in accordance with the applicable Canadian electrical product safety standard. There are literally hundreds of CSA Group electrical product standards, including IEC standards adopted for use in Canada, as well as tri-national standards harmonized with the USA (UL) and Mexico (ANCE), such as the CSA C22.2 No. 60335 series of standards. Canadian electrical product standards cover everything from toasters to high voltage switchgear, from conductors to generators, and everything in between. Collectively, these standards are known as the "*Canadian Electrical Code, Part II*" (*CEC, Part II*). On the other side of the coin, the *Canadian Electrical Code, Part I*, "Safety Standard for Electrical Installations" (*CEC, Part I*) is a single Code that covers the installation of wiring systems and equipment. For those familiar with IEC standards, the requirements contained in the *CEC, Part I* address the fundamental principles of safety contained in Section 131 of IEC 60364-1, *Low-voltage electrical installations*. Together, the *CEC, Part I* and *Part II* series of standards lay down a foundation for an integrated set of requirements that form the backbone of the Canadian electrical safety system.

## Regulation : Leveling the playing field

The third pillar of the Canadian electrical safety system is regulation. Inspectors enforcing electrical safety regulations are at the front line of the Canadian electrical safety system as they are often the first to encounter unsafe installation practices or products. The fact that every single regulatory authority in Canada has a voting position on Canadian Electrical Code Committees means that they can immediately bring issues to the attention of the responsible code or standards committee. It also means that the resulting changes are coordinated and developed through a consensus process together with their fellow regulators and other industry stakeholders, the outcome of which is a set of electrical safety requirements that is largely consistent among Canadian Provinces and Territories. Consistent, nationally adopted, safety regulations remove barriers to inter-provincial labour mobility

and trade, and create a unified level national playing field for designers and contractors within all Provinces and Territories.

There are some common misconceptions associated with identifying who is responsible for regulating electrical safety in Canada. First of all, it should be understood that electrical safety is not regulated by CSA Group, by Standards Council Canada, or by the Federal Government of Canada. In Canada, electrical safety regulation is the responsibility of the Provinces and Territories. The one exception is for premises that are federally owned or regulated. This includes airports, post office buildings, federal buildings, military installations, and similar facilities. Although the Provinces and Territories do not have jurisdiction over federal installations, the Federal Government will often direct its contractors to comply with local codes and obtain permits and inspections from the local authority having jurisdiction. The *CEC, Part I* and its referenced series of *CEC, Part II* standards are adopted as regulation by all Provinces and Territories, and through bylaws enacted by municipalities having authority for electrical inspection such as the cities of Winnipeg, Victoria, and Calgary. *CEC, Part I* is also referenced by the Federal Government through the Canadian Labour Code. While standardization, certification, and regulation are the foundation of the Canadian electrical safety system, safety doesn't simply "happen". It also requires trained electricians, dedicated educators, skilled designers, diligent inspectors, knowledgeable manufacturers, worker safety organizations, and many other stakeholder groups. Understanding the connections between each pillar of the Canadian electrical safety system is the first step.