

# Recommendations to Consultants

## NUAL<sup>®</sup> ACM Conductor Installations



### 1.0 General

The recommendations herein are applicable to NUAL ACM conductors and their installation falling under the requirements of the Canadian Electrical Code Part I, and the provincial or territorial inspection authorities having jurisdiction. The recommendations provided are compatible with the recommended practices for copper conductor installations, in addition.

All cables shall be CSA certified and manufactured to the requirements of the applicable CSA Part II standards and the related amendments published in CSA bulletins, where applicable.

Conductors shall be comprised of CSA certified NUAL ACM (Aluminum Conductor Material) alloy.

### 2.0 Ampacities

2.1 The size and ampacities of all NUAL ACM conductors shall be based on the requirements of the project drawings and be in accordance with Table 3 or 4 of the Canadian Electrical Code Part I for general applications.

2.2 When the conditions of use and environmental factors of the installation are known precisely, the size and ampacity of NUAL ACM conductors may be determined from the aluminum conductor ampacity tables of the IEEE/ICEA publication S135-2. When ampacities are determined by means of the IEEE/ICEA tables, complete details of the installation shall be documented in accordance with the Appendix B notes to Rule 4-004 of the Canadian Electrical Code Part I.

2.3 Single conductor cables having ampacities based on the Canadian Electrical Code Part I shall be subject to the following conditions and such shall be acceptable to the provincial or territorial electrical inspection authority having jurisdiction.

Use Table 3 when:

- 1) - the cables are installed above ground at least one cable diameter apart and maintained that way throughout the run.

or, 2) - when the cables are installed underground use Appendix B configurations and Appendix D ampacities.

2.4 Ampacities of single conductor cables connected in parallel may be determined on the basis of equal current sharing between conductors of the same phase provided that:

- (1) each conductor of the same phase is of equal length.
- (2) phase configurations are maintained throughout the run as illustrated in Appendix B of the Canadian Electrical Code Part I, and the manufacturer's recommendation.

Note: When the size and ampacities of NUAL ACM conductors connected in parallel are based on the single conductor ratings of Table 3 of the code, or the IEEE/ICEA publication S135-2 phase configurations based on two or four conductors per phase are strongly recommended over other configurations.

2.5 In circuits rated in excess of 400 amps, where the conductor size and ampacities are based on Table 3 of the Canadian Electrical Code, Part I, or the IEEE/ICEA Publication S135-12 effective measures shall be taken to prevent the circulation of the currents in the metal sheath, metal armour and concentric ground conductors of single conductor cables where such are present, as described in Section 6, in order to avoid ampacity deratings. It must be ensured that alternative paths exist for through-fault currents to ground.

2.6 Where the requirements of 2.2, 2.3, 2.4 are not maintained in single conductor installations, ampacities shall be derated in accordance with the appropriate factor provided in Rules 4-004 and 12-2210 of the Canadian Electrical Code.

2.7 Where single point bonding is not maintained in single conductor circuits rated in excess of 400 amps, the ampacities of the cables shall be derated of the appropriate factor given in sub-rules 1(a) or 1(b) of Rule 4-008 of the Canadian Electrical Code, Part I.

### 3.0 Voltage drop

3.1 All conductors installed shall have a voltage drop not exceeding a total of 5% based on Rule 8-102 of the CE Code Part I (or 3% in any feeder or branch circuit).

### 4.0 Connections to NUAL ACM Conductors

4.1 The preparation and termination of NUAL ACM conductors shall be done in accordance with the Canadian Electrical Code Part I Rule 12-118 with reference to the Alcan "NUAL Conductor Handbook".

4.2 NUAL ACM conductors sized in accordance with Table 3, Canadian Electrical Code Part I, may be terminated with CSA certified compression type connectors or mechanical connectors marked "90°C CU-AL" or with abbreviated designations "AL9CU" or "CU9AL".

4.3 Where compression connectors cannot be installed into the equipment CSA certified adaptors shall be used in conjunction with the original equipment mechanical connectors.

4.4 Install compression connectors to the manufacturers' specification using the correct compression tools and dies. (See the Alcan publication "NUAL Conductor Handbook"). Compression connectors which, by design, do not release before the completion of the compression stroke, are recommended.

4.5 The tightening torques of mechanical connectors shall be in accordance with the manufacturers' specifications. When manufacturers' specifications are not available the connectors shall be tightened to the values specified in tables D6 and D7 of the Canadian Electrical Code Part I.

## 5.0 Service Entrance

5.1 Aluminum and NUAL conductor cables used for service entrance shall be as approved by the inspection authorities having jurisdiction and as listed in the most recent edition of the Canadian Electrical Code Part I, Section 6 with reference to Table 19 for application.

## 6.0 Installation of Types AC90, ACWU90 and Teck 90 Armoured Cables

6.1 Cables shall be mounted and clamped on racks, or ladder type cable trays, or to walls or ceilings by approved means with spacing between adjacent cables maintained as required by Canadian Electrical Code Part I. When installing single conductor AC90, ACWU90 and Teck 90 use only non-magnetic cable connectors and clips.

6.2 Single conductor armoured cables rated over 400 amps shall have bonding conductors insulated from grounded metal structural and support members by means of an insulated outer cable covering or other approved means. Where the line end of such cables enters the metal enclosures of electrical equipment the entry shall be made via a non-ferrous metal plate mounted on the enclosure. The entry plate and the bonding conductors and armours of the cables shall be bonded to ground at this end via connectors CSA certified for the purpose. The cables at the load end shall enter through an insulating plate mounted on the enclosure. This end of the cable armour and bonding conductors shall be insulated from grounded connections or enclosures, and from the sheath, armour, or bonding conductor of adjacent cables.

Note: It must be ensured that adequate alternative paths exist for through-fault currents to ground.

6.3 Single conductor cables rated up to and including 400 amps shall enter the enclosures of equipment located at both ends via a non-ferrous metal plate mounted on the enclosure. The connection of the cable to the non-ferrous plate shall be made with an approved non-magnetic connector, which shall bond the cable armour to the equipment. The concentric bonding conductor shall be connected to the grounding connector of the equipment at both ends.

## 7.0 Electrical Equipment

7.1 All electrical equipment shall carry the CU/AL or CO/ALR markings as identification of CSA certification for use with aluminum conductors.

