Subject: Traffic Signal Uninterruptible Power Supply Material Standards

Date: July 31, 2006
Author: Ross Casey

Bulletin Number: TE-2006-03
Bulletin Type: New Policy
Effective Date: Immediately

<table>
<thead>
<tr>
<th>Audience</th>
<th>Standards Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>All holders of the Electrical and Signing Materials Standards Manuals</td>
<td>Electrical and Signing Materials Standards Manual</td>
</tr>
</tbody>
</table>

Background:

Further to Technical Bulletin TE-2006-01 concerning traffic signal uninterruptible power supply (UPS) policy, the Ministry has revised the UPS and UPS cabinet materials standards to reflect current practices and requirements.

Policy:

Referring to the Electrical and Signing Materials Standards, Volume 2, the following Chapters are revised and replaced by the attached;

Chapter 1103 Uninterruptible Power Supply Cabinet c/w drawings MS1103.01A & MS1103.02A
Chapter 1314 Uninterruptible Power Supplies

See the following link to reference the Electrical and Signing Materials Standards;


Procedure:

All UPS units utilized on Ministry traffic signals shall be products currently listed in the Ministry Recognized Product Book. See the following link;

http://www.th.gov.bc.ca/publications/eng_publications/geotech/rpb.htm

Suppliers shall follow the procedures outlined on the above website and as documented in the pertinent sections of the Electrical and Signing Materials Standards when applying for product preapproval.
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1103 UNINTERRUPTIBLE POWER SUPPLY CABINET

1103.1 SCOPE OF WORK
.1 This specification shall apply to the supply of Uninterruptible Power Supply cabinets including all materials as noted in Materials Standard drawings MS1103.01 and MS1103.02.

.2 All items listed above and shown on the Material Standards drawings will be referred to as “product” in this specification.

1103.2 PRODUCT APPROVAL
.1 Only products listed on the Recognized Products List shall be accepted for Ministry of Transportation Projects. The supplier shall reference Chapter 102 for the product approval process.

.2 Current approved products can be found at the following link:

1103.3 MATERIAL STANDARD DRAWINGS
.1 All products shall be supplied in accordance with the Material Standard drawings listed in Table 7. Minor variations will be permitted and must be identified on the shop drawings.

<table>
<thead>
<tr>
<th>DRAWING NO.</th>
<th>DRAWING TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1103.01</td>
<td>Cabinet Details and General Layout</td>
</tr>
<tr>
<td>MS1103.02</td>
<td>Cabinet Mounting Details</td>
</tr>
</tbody>
</table>

Table 7: Material Standard Drawings for UPS Cabinets
.2 The supplier shall verify product hardware and all dimensions and sizes for proper fit prior to fabrication. The supplier shall report any drawing errors to the Ministry prior to fabrication. Errors or omissions on the drawings shall not relieve the supplier of its responsibility of delivering a complete working product.

1103.4 MANUFACTURER SHOP DRAWINGS

.1 The supplier shall provide detailed shop drawings of the cabinet for review by the Ministry Representative. The supplier shall submit four copies of detailed dimensioned layout shop drawings including plans, elevations, sections and details, prior to production.

.2 The Ministry will review the shop drawings to confirm compliance with the general design concept. The review by the Ministry does not relieve the supplier of their responsibility for errors or omissions in the shop drawings or of meeting all requirements of this specification.

.3 Fabrication of product shall not commence until the supplier has received final approved shop drawings and written consent to begin fabrication from the Ministry.

1103.5 PRODUCT OPERATING CONDITIONS

.1 The product will be mounted on Ministry Traffic Controller Assemblies (Sections 1201 and 1202).

.2 The product will be exposed to all prevailing climatic conditions throughout the province of British Columbia. The cabinet may be exposed to temperatures ranging from -40ºC to +74ºC.

1103.6 GENERAL REQUIREMENTS

.1 The UPS cabinet shall be capable of being mounted on a Ministry Type-S or Type-M traffic controller assembly (Sections 1201 and 1202 respectively).

.2 The UPS cabinet shall be capable of being attached to a concrete pad with anchor bolts.
.3 The cabinet and door shall be constructed to meet the NEMA 3R classification standards.

.4 The panel shall meet CSA Standards and shall bear approval from an organization accredited by the Standards Council of Canada.

1103.7 PRODUCT MATERIALS AND FINISH

.1 The cabinet shall be constructed using 5052-H32 3.2mm (0.125”) sheet aluminium unless otherwise specified.

.2 All materials shall be new and corrosion resistant for maximum life.

.3 The final product shall be free of dents, scratches, weld burns and abrasions detrimental to its strength and general appearance.

.4 All exterior corners shall be rounded to a minimum radius of 6.4mm.

.5 All sharp edges shall be de-burred to a minimum radius of 0.40mm in order to reduce hazards to service personnel.

.6 The cabinet and all assemblies shall be properly prepared prior to powdercoating. Proper preparation includes:

.1 Cleaning of all surfaces with an alkaline cleaner followed by rinsing.

.2 Brush blasting of all surfaces to 1.5-2.0mil profile.

.7 The cabinet and all painted components shall have a factory applied polyester powder coating (see Table 8).

.8 Coatings shall be applied to all cabinet surfaces, including inside walls, doors and ceiling.

.9 All coatings shall be smooth, substantially free of flow lines, paint washout, streaks, orange peel, sagging, runs, blisters and other defects that would in any way impair serviceability or detract from the general appearance.

.10 The finish shall have a minimum pencil lead hardness of HB, using an Eagle Turquoise pencil and conform to all test procedures listed in clause 1201.13.2.

.11 All exterior connecting hardware (screws, bolts, washers, nuts, etc.) shall be stainless steel. All bolts that are ¼”-20 or larger shall be of the hexagonal head type.
.12 All interior screws shall be of the plated steel pan-head machine type. No sheet metal or self-tapping screws shall be used.

1103.8 WELDING

.1 All welds shall be in accordance with CAN/CSA W59.

.2 All aluminium welds shall be done by the Gas Metal Arc Welding process or the Gas Tungsten Arc Welding process.

.3 All exterior seams shall be continuously welded and shall be dressed smooth without compromising the integrity of the weld.

.4 Welds shall not exhibit cracks, inadequate penetration, lack of fusion, slag or spatter.

.5 Welds shall be free from defects exceeding the limits in size and frequency of occurrence specified in CAN/CSA W59, Clause 12.

.6 Consumables shall be approved by the Canadian Welding Bureau and conform to the requirements of the American Welding Society (AWS) A5.10 for ER5356 aluminium alloy bare welding electrodes.

.7 All welding electrodes shall conform to CAN/CSA W48. The deposited weld metal shall provide strength, ductility, impact toughness and corrosion resistance equivalent to the base metal.

.8 Procedures and welding operators for welding aluminium shall be qualified in accordance with the requirements of CSA Standard Welding Qualifications Code W47.2-1987 as administered by the Canadian Welding Bureau.

1103.9 CABINET DIMENSIONS

.1 The cabinet dimensions shall be as specified in Material Standard drawing MS1103.01.

.2 The cabinet is composed of a main body, roof section and inner wall which are welded together to fit the door. The cabinet is completely sealed with the exception of the ventilation system.
1103.10 CABINET EXTERNAL FEATURES

1. The cabinet shall have a passive ventilation system as specified in 1103.13. The system may have an air intake and exhaust in the cabinet and/or door.

2. The door and door locking mechanism shall conform to 1103.12.

3. The roof of the cabinet shall slope down towards the front of the cabinet. Once the UPS cabinet is installed the slope will drain water away from the traffic controller cabinet face it is mounted on.

1103.11 CABINET INTERNAL FEATURES

1. The cabinet shall have three shelves as shown in Material Standard drawing MS1103.01.

2. The shelves shall be constructed of 3.2 mm aluminium.

3. The shelves shall be capable of supporting 120kg each.

4. The shelves shall be supported at a minimum of four points. The shelf supports shall utilize connecting hardware rather than welding the shelves to the enclosure.

5. The bottom shelf shall be designed to be easily removed and installed in the enclosure.

6. The shelving shall be finished with powder coating as per 1103.7.

7. The shelves shall be designed to maintain at least a 25mm gap between their front face and the cabinet door when it is closed. All wiring between the UPS on the upper shelf and the batteries on the lower shelves will pass through the gap.

1103.12 CABINET DOOR CONSTRUCTION

1103.12.1 Door Features

1. The cabinet door shall be constructed in accordance with Material Standard drawing MS1103.01.
.2 The cabinet door shall be constructed in such a way as to prevent any noticeable twisting and flexing in any position. Reinforcement may be used if required.

.3 The door shall utilize a three point draw roller latching mechanism and handle. The rollers shall be a commercially available roller with ball bearings. The centre catch and pushrods shall be zinc plated. A Teflon pad shall be installed on the inside of the door opening to ensure gasket compression and to reduce wear. The pad shall be located in the path of the centre locking latch.

.4 The latching handle shall be of zinc-plated steel construction with a 187.5mm handle and an 82mm steel shank. The handle assembly shall not be painted.

.5 The handle shank shall not protrude more than 10mm past the lock assembly into the cabinet.

.6 The handle shall have provision for padlocking in the closed position.

.7 All mounting hardware joining the door to the cabinet shall be plated steel machine screws. All door mounting hardware shall be installed to facilitate removal and re-attachment by service personnel.

.8 Hinges shall be installed to facilitate removal and re-attachment by service personnel. The hinge mounting shall not be accessible from the outside when the door is closed. Refer to Table 8 for approved hinge materials.

.9 The door hinges shall be attached to the cabinet so that the door opens to the right as per Material Standard drawing MS1103.01.

.10 The door shall be provided with a door stop assembly capable of holding the door open at 90 degrees. Caution must be exercised to ensure that the area is sufficiently reinforced.

.11 The door may include an air intake as part of the ventilation system specified in 1103.13.

.12 The door shall be provided with closed cell, neoprene gasket material as specified in 1103.12.2.

.13 The door shall be electrically bonded to the cabinet. The bonding conductor shall be connected to the door using a crimp-on connector affixed directly to bare metal (remove coating material).
1103.12.2 Door Gasket

.1 Closed cell neoprene gasket material shall be installed around the inside perimeter of the door. Refer to Table 8 for approved gasket materials.

.2 Gaskets shall be applied in such a manner as to maintain a dust and water tight seal and to allow for proper door operation.

.3 The gasket shall be installed in one continuous piece per side (i.e. four pieces total) and shall be permanently bonded to the metal. The top and bottom pieces of the gasket shall be applied such that the seams with the side pieces are horizontal. This will prevent any water that enters the top of the door from dripping down through a vertical gasket seam.

.4 The gasket shall be appropriately sized to eliminate gaps at all joints including any potential shrinkage. The outside surface of the gasket shall be covered with a silicon lubricant to prevent the gasket sticking to the mating surface of the cabinet.

1103.13 VENTILATION

1103.13.1 General

.1 The cabinet shall be provided with a passive convection ventilation system with an air intake vent at the bottom of the cabinet and an air exhaust vent at the top. The intake may be part of the cabinet or the door while the exhaust shall be in the uppermost part of the cabinet only.

.2 The vents shall be constructed to prevent rain, snow or slush driven by wind or passing vehicles into the cabinet interior. Vent holes shall be no larger than 3.2mm in diameter to reduce the entry of foreign particles.

.3 The bottom of the vent assemblies shall be formed into a waterproof sump with drain holes to the outside. The drain holes shall be de-burred such that water exiting the vents shall flow unimpeded.

.4 The exhaust hole openings shall exit near the cabinet ceiling.

.5 The purpose of the vent holes is to ensure adequate air flow through the cabinet. Vents shall be designed such that service personnel can easily clear the holes of obstructions.
1103.14 CABINET MOUNTING

.1 The UPS cabinet shall be supplied with all hardware necessary to mount and connect it to a Ministry of Transportation M or S type traffic controller cabinet as described in 1103.14.2 and Materials Standard drawing MS1103.02. All acceptable cabinet mounting equipment is listed in Table 8.

.2 When installed external to an existing Ministry Traffic Controller Assembly, the following requirements shall apply:

.1 The UPS cabinet shall be seated on angle aluminium attached to the side (S-type) or rear (M-type) of the traffic controller cabinet.

.2 The aluminium seat shall be attached to the traffic controller cabinet with four 1/4" flat head bolts, nuts and washers. The seat shall be capable of supporting the full load of the cabinet and the potential load of each shelf as specified in 1103.11.3.

.3 When seated the UPS cabinet will be attached to the traffic controller cabinet with six 5/16" bolts, nuts, washers and sealing washers as shown in MS1103.02.

.4 All electrical wiring between the two cabinets will pass through a 1" short nipple, installed with a locknut and a sealing washer as shown in MS1103.02.

.5 All mounting hardware shall be installed so as not to conflict with any equipment internal to the traffic controller cabinet during installation.
## 1103.15 APPROVED PRODUCTS FOR UPS CABINET CONSTRUCTION

.1 The approved mounting, environmental and miscellaneous hardware, as well as finishing products for UPS cabinet construction are listed in Table 8.

<table>
<thead>
<tr>
<th>LABEL (ID)</th>
<th>FUNCTION</th>
<th>APPROVED PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Hardware</td>
<td>Door Hinges</td>
<td>SOUTHCO In-line Hinges Screw size 10-32 Part # 96-10-500-50 (appropriate screw lengths)</td>
</tr>
<tr>
<td>Door Hardware</td>
<td>Door Handle</td>
<td>Padlockable “L” Handle FAUCHER #671-5051 Or EBERHARD #8055</td>
</tr>
<tr>
<td>Door Mechanism</td>
<td>Door Mechanism</td>
<td>FAUCHER Zinc Plated 3-point ball bearing draw roller latching mechanism with the centre case #700-5463, roller bearings and zinc plated pushrods (see MSI213.03) EBERHARD # 5647-2XX &amp; EBERHARD # 5559 latching point</td>
</tr>
<tr>
<td>Miscellaneous Hardware</td>
<td>Filler / Sealant</td>
<td>“DAP” brand (Alex Plus) latex sealant. (Grey) THERMOBOND 3 Dura Chem Inc</td>
</tr>
<tr>
<td>Miscellaneous Hardware</td>
<td>Gasket Material</td>
<td>SPAE-NAUR #892-485 or FAUCHER 623-2110 neoprene</td>
</tr>
<tr>
<td>Miscellaneous Hardware</td>
<td>Oxide Inhibitor</td>
<td>PENETROX A BURNDY Cat # P8A</td>
</tr>
<tr>
<td>Cabinet Finish</td>
<td>Powder Coating</td>
<td>PROTECH Powder # PS221A40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LABEL (ID)</th>
<th>FUNCTION</th>
<th>APPROVED PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinet Mounting Hardware</td>
<td>Cabinet seating bracket</td>
<td>1/4” x 1.75” x 1.75” aluminum angle 30” long</td>
</tr>
<tr>
<td>Cabinet Mounting Hardware</td>
<td>Bracket mounting hardware</td>
<td>Four 1/4”-20 x 1” flat head machine screws Four 1/4” plated flat washers Four 1/4”-20 plated nyloc nuts</td>
</tr>
<tr>
<td>Inter-cabinet electrical raceway</td>
<td>1” Short Nipple with locknut and sealing washer</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>and gasket</td>
<td>2.5” OD x 1.5” ID x 1/4” neoprene gasket with PSA backing</td>
<td></td>
</tr>
<tr>
<td>Cabinet-to-cabinet mounting hardware</td>
<td>Six 5/16”-18 x 1 1/2” hex head capscrews</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Twelve 5/16” plated flat washers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Twelve 1.5” OD x 3/8” ID x 1/8” fender washers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Six 1.5” OD x 1/2” ID x 1/4” neoprene gaskets with PSA backing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Six 5/16”-18 plated nyloc nuts</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: Approved Materials for UPS Cabinet Construction
BOLT DETAIL BETWEEN TRAFFIC CONTROLLER AND UPS CABINET
(TYPICAL OF 6)

M SERIES TRAFFIC CONTROLLER CABINET

UPS CABINET

1/2" x 1/2" x 0.060" Aluminum Angle

UPS ENCLOSURE INSTALLATION WITH AN S-SERIES CABINET

UPS ENCLOSURE MOUNTS TO S-CABINET SIDE

UPS ENCLOSURE INSTALLATION WITH AN M-SERIES CABINET

UPS ENCLOSURE MOUNTS TO M-CABINET REAR

Adhesive Gasket

3/16" Hex Nut

3/16" Hex Nut NLA

M Cabinet Rear or S Cabinet Side Wall

Weather (Typical of 2)
1314 UNINTERRUPTIBLE POWER SUPPLIES

1314.1 SCOPE OF WORK
.1 This specification shall apply to the supply of Uninterruptible Power Supply (UPS) equipment. UPS equipment shall refer to the following:
   .1 Uninterruptible Power Supply units.
   .2 UPS bypass and transfer equipment.
   .3 UPS batteries.
   .4 UPS system cabinets.
.2 All items listed above and shown on the Material Standard drawings will be referred to as “product” in this specification.
.3 All electrical equipment that the UPS provides battery backup power to shall be referred to as the “load” in this specification.
.4 The 120VAC line input to the UPS and its load shall be referred to as “utility power” in this specification.
.5 “Qualified” utility power refers to electrical power considered acceptable for direct application to the load. The parameters of qualified utility power and their accepted tolerances are detailed in 1314.5.4.

1314.2 PRODUCT APPROVAL
.1 Only products listed on the Recognized Products List shall be accepted for Ministry of Transportation Projects. The supplier shall reference Chapter 102 for the product approval process.
.2 Current approved products can be found at the following link: http://www.th.gov.bc.ca/publications/eng_publications/geotech/Recognized_Products_Book.pdf
1314.3 PRODUCT OPERATING CONDITIONS

.1 All UPS equipment, batteries and enclosures will be installed throughout British Columbia and are subject to a wide range of climates. All equipment shall operate in an ambient temperature range of -37 °C to +74°C.

.2 The UPS equipment, batteries and enclosures will be installed on the roadside where they are constantly exposed to dust, dirt and vehicle emissions.

1314.4 PRODUCT GENERAL REQUIREMENTS

.1 All product shall be fully enclosed and suitable for use in enclosed outdoor environments.

.2 All product must be CSA or ULC approved.

1314.5 UNINTERRUPTIBLE POWER SUPPLY UNITS

1314.5.1 General Requirements

.1 The UPS unit must accept 120VAC utility power at its input and provide 120VAC at its output.

.2 The UPS unit shall be capable of continuous in-line operation with the load.

.3 The UPS unit must have internal dry-contact Form C ‘alarm relays’ for external equipment control during UPS events.

.4 The UPS may have an output to control an external transfer switch which allows the UPS to operate in a standby configuration.

1314.5.2 UPS Unit Dimensions

.1 The UPS unit dimensions shall not exceed 381 x 508 x 191mm. The UPS will sit in a cabinet such that the visible dimensions shall be 381mm vertical and 508mm horizontal when viewed from the front.

.2 The UPS control panel shall be located such that it is accessible from the front of the unit when in installed in a cabinet.
1314.5.3 UPS General Operating Specifications

1 When qualified utility power is present at the UPS Line Input the UPS shall operate in its ‘Online’ mode. In the Online mode the load is powered by the AC utility power and the UPS charges its backup batteries.

2 When unqualified utility power is present at the UPS Line Input the UPS shall operate in its ‘Backup’ mode. In Backup mode the battery bank shall power the load via the UPS inverter.

3 The total transfer time between the loss of qualified utility power at the UPS Line Input and the switching of the UPS to Backup mode shall not exceed 150ms.

4 If utility power is restored while the UPS is in Backup mode, the UPS shall delay for a minimum of 15 seconds of continuous qualified utility power before switching to Online mode.

5 When the UPS batteries are fully discharged due to a prolonged Backup period the UPS shall turn itself off. When qualified utility power is restored the UPS shall automatically restart, power its load, and begin recharging the batteries.

6 The UPS shall have a thermostat regulated internal fan to cool the inverter in Backup mode.

7 The UPS shall utilize a temperature-compensated battery charger. The UPS shall have an external temperature probe to measure the battery temperature. The external probe shall be removable and be supplied with a minimum 1m cable. For safety reasons, the battery charger shall stop charging the batteries if ambient temperature exceeds 50°C.

8 A summary of the UPS general operating specifications is shown in Table 23.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPS Online to Backup Mode Transfer Time</td>
<td>&lt; 150ms</td>
</tr>
<tr>
<td>UPS Backup to Online Mode Transfer Time</td>
<td>&gt; 15s of continuous qualified utility power</td>
</tr>
</tbody>
</table>

Table 23: UPS General Operating Specifications
1314.5.4 **UPS Electrical Input Specifications**

.1 The UPS shall operate in its Online mode when supplied with qualified utility power as defined in *Table 24*.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>Single Phase</td>
</tr>
<tr>
<td>Voltage Range</td>
<td>120VAC ±10%</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>60Hz ± 5%</td>
</tr>
<tr>
<td>Power Factor</td>
<td>&gt; 0.95</td>
</tr>
</tbody>
</table>

*Table 24: Qualified Utility Power Parameters and Tolerances*

.2 The UPS shall utilize a three-position terminal block for input line, neutral and ground connections. The terminal blocks must be capable of accepting an AWG #10 conductor.

.3 The UPS shall have an AC input overcurrent protection device appropriately rated for the UPS under its specified maximum load. The overcurrent protection device shall be accessible from the front panel and allow easy isolation of the UPS from utility power.

.4 The UPS unit shall have a single receptacle for the backup battery bank input. The receptacle shall be keyed to prevent connection of the battery bank in the wrong polarity.

.5 The backup battery bank input shall have a battery input overcurrent protection device appropriately rated for the UPS under its specified maximum load. The overcurrent protection device shall be accessible from the front panel and allow easy isolation of the UPS from the batteries.

1314.5.5 **UPS Electrical Output Specifications**

.1 The UPS shall provide a continuous 120VAC, 60Hz supply at its output. The only exception to this condition shall be when the utility power is not qualified and the batteries have been exhausted. Acceptable UPS AC output power parameters and their tolerances are listed in *Table 25*. 
### Parameter Specification

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>Single Phase</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>120VAC ± 10%</td>
</tr>
<tr>
<td>Output Frequency</td>
<td>60Hz ± 1%</td>
</tr>
<tr>
<td>Voltage Distortion</td>
<td>&lt; 5% THD (Linear Load)</td>
</tr>
<tr>
<td>Efficiency</td>
<td>&gt; 80%</td>
</tr>
</tbody>
</table>

Table 25: UPS AC Output Specifications

.2 The UPS shall utilize a three-position terminal block for output line, neutral and ground connections. The terminal blocks must be capable of accepting an AWG #10 conductor.

.3 The load shall be connected to the UPS AC output through an appropriately sized overcurrent protection device. The overcurrent protection device shall be accessible from the front panel and allow easy isolation of the UPS from the load.

.4 If the UPS has an external transfer switch control output it must utilize a keyed connector to ensure the proper polarity of the transfer control signal.

.5 The UPS shall have a set of terminal blocks on the front panel which access all contacts of the internal dry-contact Form C alarm relays. The alarm relays shall be energized during the following events:

.1 When the UPS enters backup mode.

.2 When the UPS has been in backup mode for a programmed amount of time.

.3 When the backup battery charge level is depleted to a programmed percentage of its maximum charge.

.6 The alarm relay contacts and terminals shall be rated for 1A continuous at 120VAC.

#### 1314.5.6 User Interface

.1 The UPS front panel shall have the following controls and indicators:

.1 Controls for the overcurrent protection devices at the UPS Line Input, Battery Input, and Line Output.

.2 Visual indication of the current UPS operating mode.
.3 Visual indication of the current UPS output load.
.4 Visual indication of the current backup battery charge level.
.5 A fault indicator.

.2 The UPS shall utilize a computer-industry standard interface to facilitate direct communication between the UPS and a computer. Examples of standard interfaces include RS-232 serial ports, USB ports and RJ-45 network ports.

.3 Each UPS unit shall be capable of communicating with a PC running Microsoft Windows 2000 or Windows XP. The user shall be able to change the following UPS operating parameters through the communications link:

.1 Monitor and reset a count of how many times the UPS has entered backup mode.
.2 Program the amount of time that the delay-on relay will energize after the UPS has entered backup mode.
.3 Program the backup battery charge level at which the low-battery relay will energize.

1314.5.7 **Product Warranty**

.1 The manufacturer shall warranty the UPS equipment for any material and labour manufacturing defects for a period of 2 years after the date of supply.

1314.6 **UPS BYPASS AND TRANSFER EQUIPMENT**

.1 The UPS system may use an external bypass switch for the isolation of the UPS from utility power during maintenance.

.2 The UPS system may use an external automatic transfer switch, placing the UPS in a ‘standby’ configuration. When utility power is qualified the transfer switch:

.1 Connects utility power to the load.
.2 Connects utility power to the UPS for battery charging and monitoring.
.3 Isolates the UPS output from the load.

When utility power becomes unqualified the transfer switch:

.1 Disconnects the utility power from the load.
.2 Connects the UPS output to the load.

.3 A bypass switch may be combined with a transfer switch to form a single device.

### 1314.6.3 Bypass Switch Requirements

.1 The external bypass switch shall provide separate Line, Neutral and Ground terminal blocks for connection to utility power and the load. The terminal blocks must be capable of accepting an AWG #10 conductor.

.2 The bypass switch shall provide connection to the UPS AC inputs and outputs. The connection may be through terminal blocks or terminated cabling.

.3 In its non-bypass state the switch shall connect utility power to the UPS input, and the UPS output to the load.

.4 In its bypass state the switch shall connect utility power direct to the load and isolate all UPS connections from utility power. The bypass state is intended to allow maintenance personnel to service the UPS unit safely.

.5 The bypass switch shall be a “make-before-break” type or similar switch that ensures power to the load is not interrupted during switching.

.6 The bypass switch shall at a minimum be rated for currents equal to the rating of the UPS AC Input overcurrent protection device.

.7 The bypass switch shall be capable of being mounted to the interior wall of an enclosure.

### 1314.6.4 Transfer Switch Requirements

.1 The transfer switch shall provide separate Line, Neutral and Ground terminal blocks for connection to utility power and the load. The terminal blocks must be capable of accepting an AWG #10 conductor.

.2 The transfer switch shall provide connection to the UPS AC inputs and outputs. The connection may be through terminal blocks or terminated cabling.

.3 The transfer switch state may be controlled internally or through a connection to the UPS unit.
.4 The default state of the transfer switch shall keep utility power connected to the load. Therefore if there is a malfunction with the UPS or the transfer switch control wiring the utility power will be connected to the load.

.5 A UPS system utilizing an external transfer switch shall meet the UPS transfer time specifications in Table 23. Therefore the transfer switch must switch the UPS output to the load within 150ms of detecting unqualified utility power.

### 1314.7 UPS BATTERIES

#### 1314.7.1 General Battery Requirements

.1 General requirements for UPS batteries are listed in Table 26.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>&lt; 306 x 153 x 255mm</td>
</tr>
<tr>
<td>Type</td>
<td>Deep cycle sealed lead-acid</td>
</tr>
<tr>
<td>Capacity</td>
<td>75 A·h @ 12V minimum</td>
</tr>
<tr>
<td>Voltage</td>
<td>12VDC</td>
</tr>
</tbody>
</table>

**Table 26: UPS Battery General Specifications**

.2 Batteries shall utilize sealed lead-acid cells to minimize maintenance costs and shall be of a deep cycle type, typical for UPS applications.

.3 Batteries shall contain an immobilized electrolyte to avoid spillage and exhibit low gaseous emissions to prevent explosive gas build-up.

.4 Battery dimensions shall not exceed 306 x 153 x 255mm.

.5 Batteries shall provide the required string voltage for the UPS unit to which they connect. A maximum of 4 fully-charged batteries in series shall be used to provide the UPS with its required string voltage. When additional storage capacity is required, further battery strings may be connected in parallel with the primary string.
Batteries shall be supplied with all necessary wiring and connectors to create the battery string and connect it to the UPS. The wiring and connectors shall be colour coded for ease of installation. Battery post connectors shall be supplied with insulated colour-coded covers for safety.

The battery connection to the UPS shall have the following characteristics:

1. A single receptacle on the UPS shall be utilized for connection of all external batteries.
2. The receptacle shall be keyed to prevent the accidental connection of the batteries in the wrong polarity.
3. The corresponding battery connector shall be designed such that there is no risk of short circuit or danger to service personnel when disconnecting the batteries from the UPS.

### 1314.7.2 Battery Warranty

1. The manufacturer shall replace at their own cost any batteries which do not operate at a minimum of 80% of their stated capacity during their first 5 years of normal usage. Normal usage is defined as continuous use within the specified operating conditions as advertised by the manufacturer at the time of purchase.

### 1314.8 UNINTERRUPTIBLE POWER SUPPLY CABINET

1. Refer to Chapter 1103 Uninterruptible Power Supply Cabinet for all details.