



SC 17 – Switchgear & Controlgear

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Agenda

- Introduction
- Standards
- Examples of significant differences
- Next steps

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- Next steps



- Approximately 6.8 Billion people on Earth.
- All humans...many differences (for example... men and women)

SC 17 – Switchgear & Controlgear

- Divided into 2 primary aspects:
 - High Voltage
 - Components
 - Assemblies
 - Low Voltage
 - Components
 - Assemblies
- This presentation will address only the Low Voltage aspect.

SC 17 – Switchgear & Controlgear

- Examples of Low Voltage Components

Circuit Breakers

Switches

Contactors & motor starters



SC 17 – Switchgear & Controlgear

- Examples of Low Voltage Assemblies

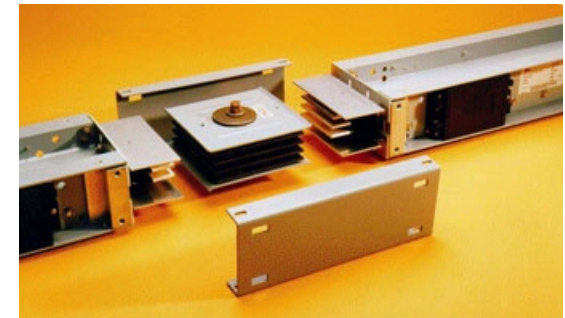
Panelboards

Switchboards

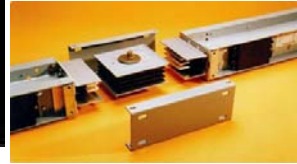
Switchgear

Motor Control Centers

Busbar Trunking (Busway)



SC 17 – Switchgear & Controlgear



- Products used globally...
...but there are differences.



Agenda

- Introduction
- **Standards**
- Examples of significant differences
- Next steps

SC 17 – IEC Standards for components

- IEC 60947-2: Circuit Breakers
- IEC 60947-3: Switches
- IEC 60947-4: Contactors & motor starters

INTERNATIONAL
STANDARD
NORME
INTERNATIONALE

IEC
CEI
60947-1
Fifth edition
Cinquième édition
2007-06

Low-voltage switchgear and controlgear –

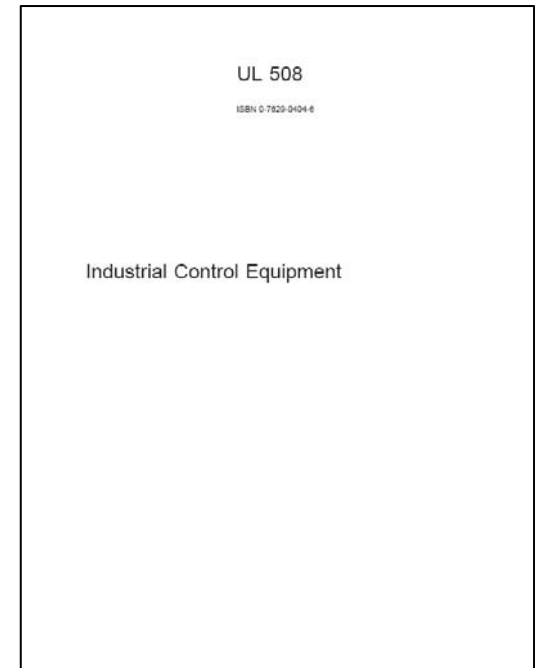
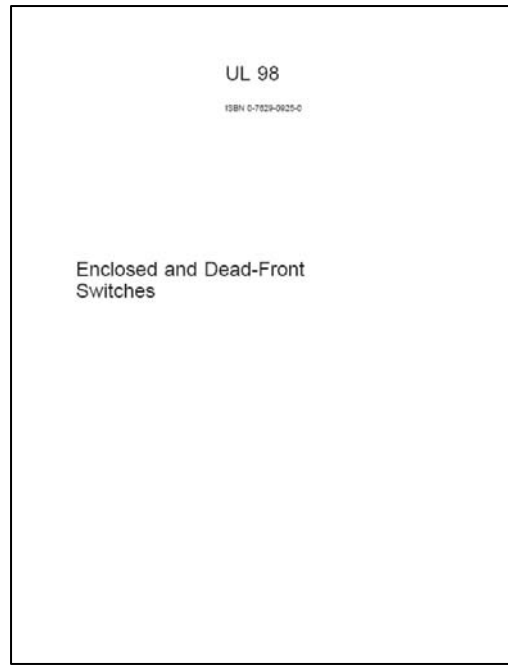
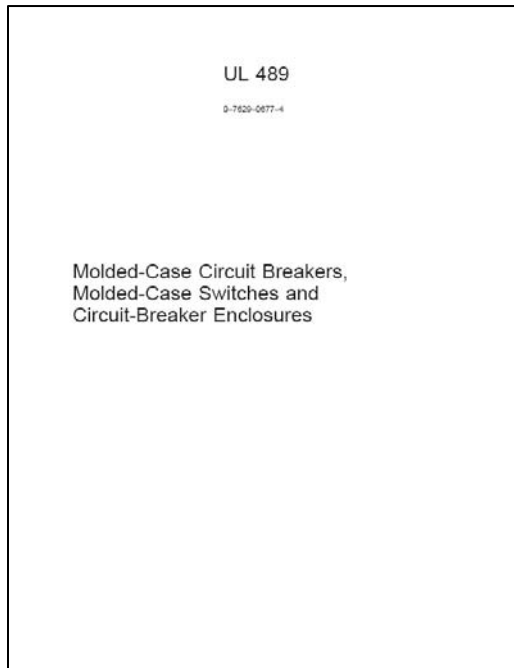
Part 1:
General rules

Appareillage à basse tension –

Partie 1:
Règles générales

SC 17 – UL Standards for components

- UL 489: Molded Case Circuit Breakers
- UL 98: Enclosed and Deadfront Switches
- UL 508: Industrial Control Equipment



SC 17 – IEC Standards for Assemblies

- IEC 60439-1: LV Switchgear and Controlgear Assemblies
- IEC 60439-2: Busbar Trunking Systems (Busways)
- IEC 60439-3: Distribution Boards (Access by unskilled persons)

NORME
INTERNATIONALE
INTERNATIONAL
STANDARD

CEI
IEC
60439-1
Edition 4.1
2004-04

Edition 4:1999 consolidée par l'amendement 1:2004
Edition 4:1999 consolidated with amendment 1:2004

Ensembles d'appareillage à basse tension –

Partie 1:
Ensembles de série et ensembles dérivés de série

Low-voltage switchgear and
controlgear assemblies –

Part 1:
Type-tested and partially type-tested assemblies

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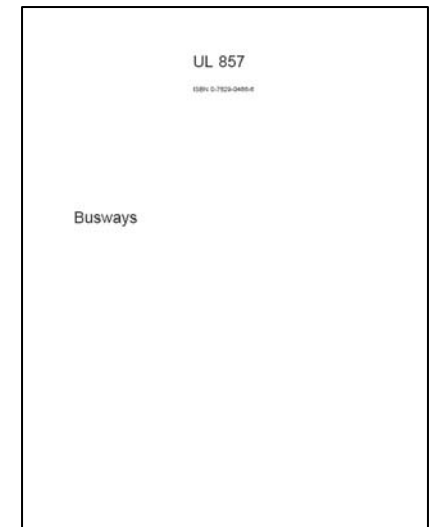
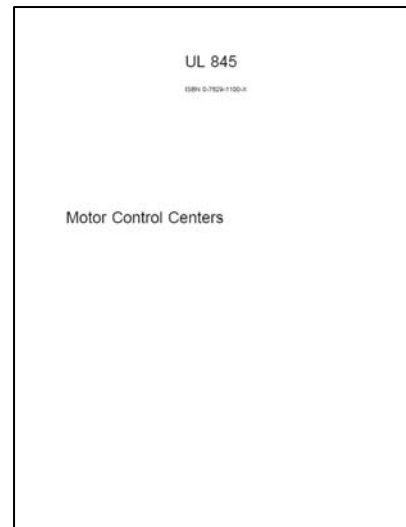
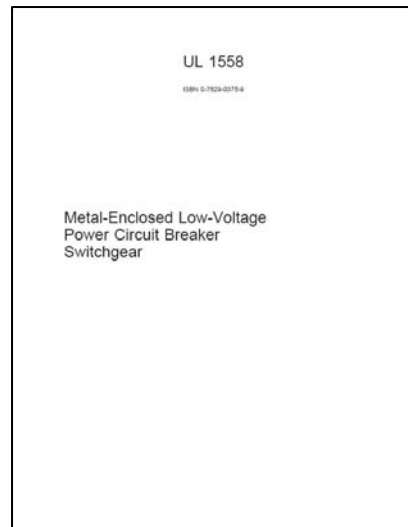
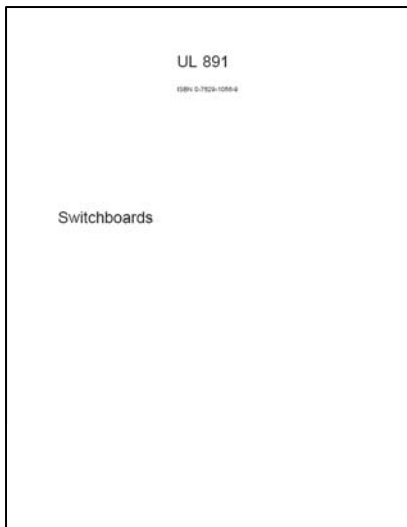
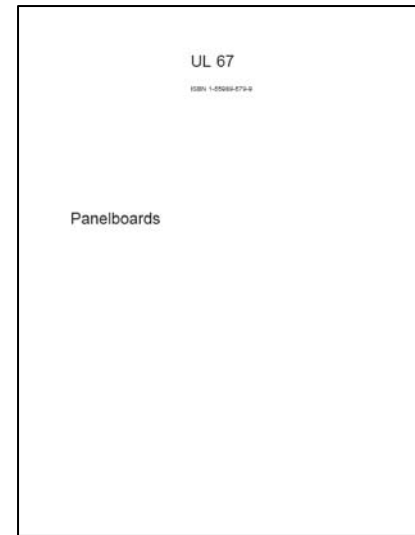
Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Организация Стандартов в области Электричества

CODE PRIX
PRICE CODE XD

Prix fixe, voir catalogue en ligne
Fix price, see current catalogue

SC 17 – UL Standards for Assemblies

- UL 67: Panelboards
- UL 891: Switchboards
- UL 1558: LV Switchgear
- UL 845: Motor Control Centers
- UL 857: Busway



Agenda

- Introduction
- Standards
- **Examples of significant differences**
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Examples of significant differences

- Size

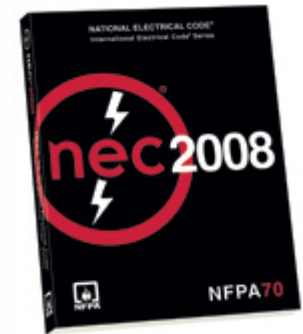
Creepage & Clearance Distances

Wire Bending Space

- Allowable Temperature Rises

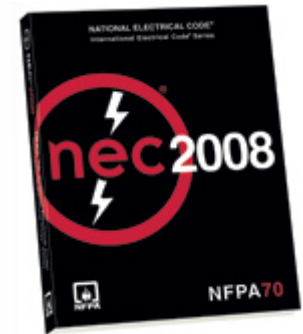
Conductor sizes and ampacities

National Electrical Code, NEC



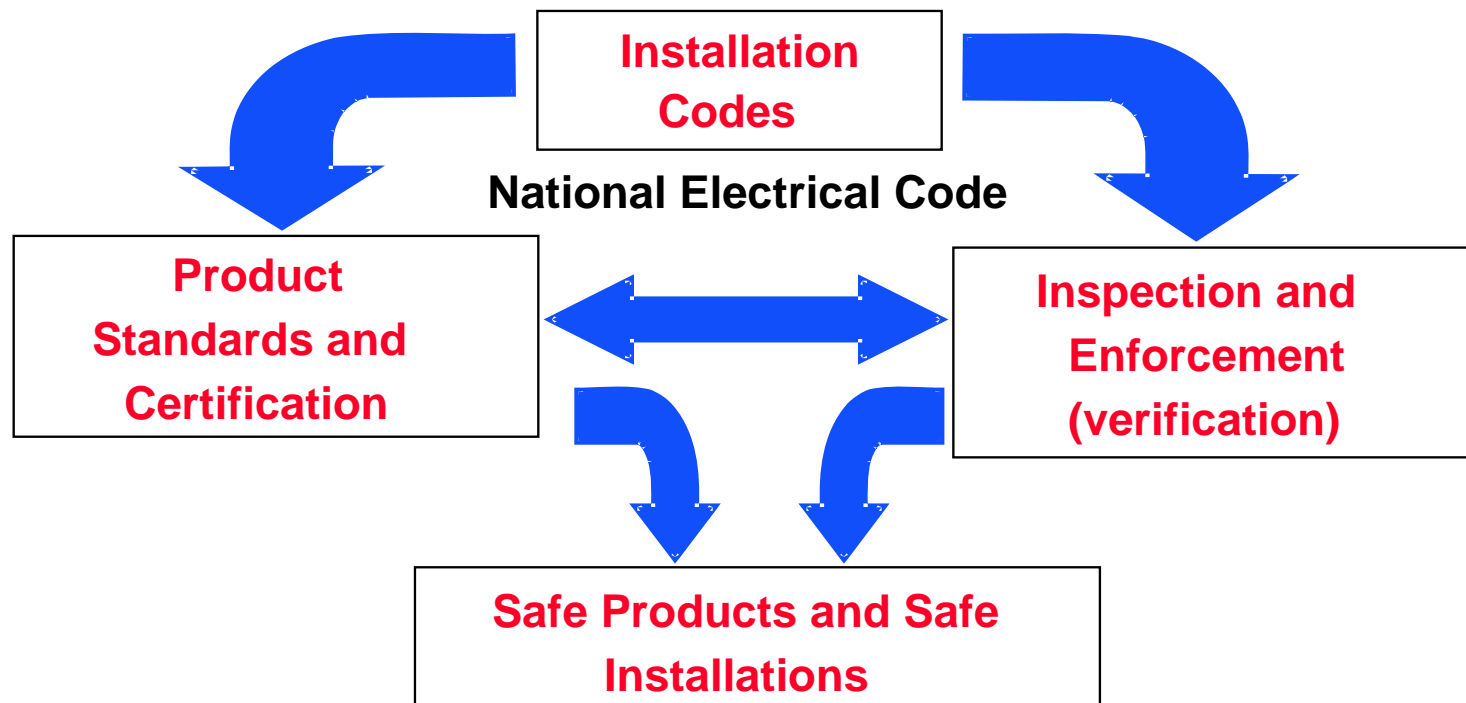
- NFPA 70, contains “installation” rules
- 2008 Edition has 882 Pages
- Created by 19 NEC Code-Making Panels (CMP)
 - Balanced Representation (Manufacturers, Electricians, Inspectors, UL, etc.)
 - Represent Groups/Associations (Directed Votes)
 - K. Lippert – Alternate NEMA Rep. On CMP 10
- 3-year revision cycle

National Electrical Code, NEC

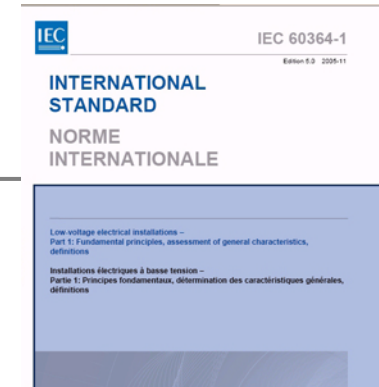


- Defines allowable conductor sizes and corresponding ampacities (Tables 310.16)
- Defines Wire Bending Spaces (Tables 312.6)
- Mentions “Listed” products
References “Product Safety Standards” (Annex A)

Relationship between NEC, Standards, Conformity Assessment and Inspection



IEC 60364-1



- Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions

“IEC 60364-1 gives the rules for the design, erection, and verification of electrical installations. The rules are intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of electrical installations and to provide for the proper functioning of those installations.”

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Standards Harmonized through CANENA

- Circuit Breakers
- Switches
- Busway
- Switchboards
- Motor control centers

Association of
Standardization and
Certification
NMX-J-266-ANCE-2006
Third Edition



Canadian Standards
Association
CAN/CSA C22.2 No. 5-02
First Edition



Underwriters Laboratories
Inc.
UL 489
Tenth Edition



**Molded-Case Circuit Breakers, Molded-Case
Switches, and Circuit-Breaker Enclosures**

April 26, 2002

(Title Page Reprinted: March 31, 2009)

Approved
by
Standards Council
of Canada



ANSI/UL 489-2006

Harmonization efforts with IEC

- **UL 60947-1**
(Contactors and control components)
- “Systematic” review of ALL requirements to assure safety
- Collaborate on IEC participation to obtain recognition of North American requirements
 - “Global Relevance”

UL 60947-1

ISBN 0-7629-0856-0

Low-Voltage Switchgear and
Controlgear – Part 1: General
Rules

Recognize “differences”

- Consider large installed base
- Regional Regulations

Installation Codes

Certifications

Inspections

Summary

- IEC and North American electrical safety systems are “different” - (Just as men are “different” from women)
- Neither is “good” nor “bad” but each is effective when implemented completely & properly
- Extreme caution should be taken if attempting to mix / max “pieces” of both systems



Questions And Comments

Thank You