NFPA 79 Technical Committee on Electrical Equipment of Industrial Machinery
First Draft Meeting Agenda (F2020)
March 4 – 8, 2019
Hampton Inn & Suites Savannah Historic District
Savannah, GA

1. Call to Order, Chair
2. Introductions
3. Approval of Previous Meeting Minutes (Attachment A)
4. Staff Updates, NFPA Staff
    - Committee membership update (Attachment B)
    - Fall 2020 revision cycle schedule (Attachment C)
    - Overview of NFPA Process
5. Review of Public Inputs (Attachment D)
6. Address the re-write of Chapter 5
7. Old Business
8. New Business
9. Schedule Second Draft Meeting
10. Adjourn.

Attachment A: Previous Meeting Minutes

NFPA 79

Technical Committee on Electrical Standard for Industrial Machinery

Second Draft Minutes
January 16 - 18, 2017
New Orleans Arts Hotel
New Orleans, Louisiana 70130

Minutes

Item 17-1-1, Call to Order

The meeting of the Technical Committee on Electrical Standard for Industrial Machinery was called to order by Chairman, Mark Hilbert at 1:00 PM on Monday, January 16, 2017 at the Renaissance New Orleans Arts Hotel located at 700 Tchoupitoulas St., New Orleans, LA 70130.

Item 17-1-2, NFPA staff review of fire alarm and exit procedures

Item 17-1-3, Introduction of Members and Guests

In addition to the Chair, the following Technical Committee members were present: *See the attached attendance sheet*

Guests in attendance during all or part of the meeting: *See the attached attendance sheet*

The Chair opened the meeting with welcoming remarks. Self-introductions of meeting attendees and guests were conducted.

Item 17-1-4, Review of Meeting Procedures and Revision Schedule

Staff liaison Mark Cloutier explained meeting procedures, new terminology, permitted actions the committee can take on public comments, reviewed Terra system and reviewed the revision schedule to the committee.

Item 17-1-5, Comments/Questions from Committee Members and/or Guests

Staff liaison Mark Cloutier and Brian O'Connor fielded questions in connection with agenda item 17-1-7 and 17-1-8.

Item 17-1-6, Approval of Prior Meeting Minutes
It was moved, seconded, and voted unanimously affirmative that the minutes of the First Draft Meeting held at the San Diego Marriott Mission Valley Hotel in San Diego, CA from February 29-March 4, 2016 be approved.

Item 17-1-7, Task Group Reports

Task Group chairs, presented updates on their task group activities:

1. Task Group 1, Chapter 5 Supply Circuit Disconnecting Means, James Maxfield, Chair
2. Task Group 2, Daniel Nesser, Chair- Motor Conductors
3. Task Group 3, Chapter 8, Bobby Gray, Chair
4. Task Group 4, Section 7.8.1, Daniel Nesser

Item 17-1-8, Processing of Public Comments

All public comments and committee revisions were acted on.

Item 17-1-9, Public Comments with Responses

17-1-10, Fire Protection Research Foundation Requests
The committee did not have any requests for the Foundation.

Item 17-1-11, Old Business

None reported

Item 17-1-12, New Business

Chairman Hilbert discussed the following four Task Groups:

1) Addressing all the disconnecting means requirements in Chapter 5.
2) Clarifying the interlocking requirements for control cabinets that have disconnects that are not the machine supply circuit disconnecting means.
3) Global review of the use 600v vs. 1000v
4) Global review of the term visible in NFPA 70 and NFPA 79.

The committee voted on potential locations and dates for the First Draft Meeting for the next edition. First Draft meeting locations voted in chronological order:

Summer location	Winter location
1. Portland, ME	1) Clearwater, FL
2. Seattle WA	2) Savanah, GA
3. Denver, CO	3) San Antonio, TX

The Technical Committee discussed dates for the first revision meeting. After some discussion and information provided by NFPA staff the committee will standby for 2021 revision cycle to be formulated. NFPA staff liaison Mark Clothier will verify other NFPA publication schedules.

Item 17-1-13, Adjournment
The Chairman declared the meeting adjourned on Wednesday, January, 18th, 2017 at 1:15 P.M.

NFPA 79 Second Draft Meeting
January 16-18, 2017
Renaissance New Orleans Arts Hotel, New Orleans, LA

CMP MEMBERS PRESENT

NAME	COMPANY
Mark Hilbert, Chair	MR Hilbert Electrical Inspections & Training/Representing International Association of Electrical Inspectors
James Maxfield, Secretary	City of Dover, NH Fire & Rescue/Representing International Association of Electrical Inspectors
Luis Bas	Intertek Testing Services
Barry Boggs	Toyota Motor Engineering & Manufacturing North America, Inc.
William Brungs	Intelligrated Systems
Jim Couch	Mazak Corporation/Representing The Association for Manufacturing Technology
Paul Dobrowsky	Innovative Technology Services
Drake Drobnick	Self
Matt Egloff	Montana Tech, University of Montana
Bobby Gray	Hoydar/Buck, Inc./Representing National Electrical Contractors Association
Robert Gruendel	Dematic
Palmer Hickman	Electrical Training Alliance/Representing International Brotherhood of Electrical Workers
John Kovacik	UL, LLC
Daniel Nesser	Eaton's Bussmann Division/Representing National Electrical Manufacturers Association
George Schreck	Komatsu America Industries, LLC
Mike Soter	SDK Engineering, LLC
Andras Szende	TUV Rheinland of North America, Inc.
Jay Tamblingson	Rockwell Automation
Richard Trainor	TUV SUD America Inc.
Ron Borowski	Eaton Corporation/Representing National Electrical Manufacturers Association
Glyn Garside	Pilz Automation Safety L.P.
Brett A. Imlah	Intertek Testing Services
Thi Nguyen	The Boeing Company
Mark Cloutier, Staff Liaison	NFPA

GUEST PRESENT

Brian O'Connor	NFPA Staff

Attachment B: Technical Committee Roster

Address List No Phone

01/24/2019
Mark Cloutier
EEI-AAA

Electrical Equipment of Industrial Machinery

National Electrical Code®

Mark R. Hilbert **E** 10/23/2003
Chair **EEI-AAA**
MR Hilbert Electrical Inspections & Training
14 Beach Pond Road
Wolfeboro, NH 03894
International Association of Electrical Inspectors
Alternate: James H. Maxfield

James H. Maxfield **E** 8/5/2009
Secretary (Alternate) **EEI-AAA**
City of Dover Fire & Rescue
Building Inspection Division
4 Danbury Lane
Dover, NH 03820
International Association of Electrical Inspectors
Principal: Mark R. Hilbert

Luis M. Bas **RT** 3/4/2009
Principal **EEI-AAA**
Intertek Testing Services
5522 Antler Trail
Lakeland, FL 33811
Alternate: Adam Gilbert

Daren A. Bateman **U** 11/2/2006
Principal **EEI-AAA**
The Boeing Company
PO Box 3707, MS 5T-26
Seattle, WA 98124
Alternate: Thi Nguyen

Barry Boggs **U** 10/29/2012
Principal **EEI-AAA**
Toyota Motor Engineering & Manufacturing North America, Inc.
1001 Cherry Blossom Way
(Mail code PESAF-NA/K)
Georgetown, KY 40324
Alternate: Douglas Johanneman

William Brungs **M** 12/08/2015
Principal **EEI-AAA**
Intelligrated Systems
10045 International Boulevard
Cincinnati, OH 45246-4845

David R. Carpenter **E** 10/4/2007
Principal **EEI-AAA**
City of Florence, Alabama
Chief Electrical Inspector
60 Evergreen Park
Florence, AL 35633

Jim Couch **M** 03/07/2013
Principal **EEI-AAA**
Mazak Corporation
8025 Production Drive
Florence, KY 41042
The Association for Manufacturing Technology

Frank C. DeFelice, Jr. **U** 4/4/1997
Principal **EEI-AAA**
Allnex, Inc.
528 South Cherry Street
Wallingford, CT 06492

Paul Dobrowsky **SE** 1/23/2004
Principal **EEI-AAA**
Innovative Technology Services
5701 South Holley Road
Holley, NY 14470-9754

Susanne Dormann **RT** 04/11/2018
Principal **EEI-AAA**
CSA Group
Weismueller Str 45
Frankfurt, DE 60314 Germany

Stephen W. Douglas **RT** 03/05/2012
Principal **EEI-AAA**
QPS Evaluation Services Inc.
81 Kelfield Street, Unit 8
Toronto, ON M9W 5A3 Canada
Alternate: Jim Morrison

Matt Egloff — **SE** 10/29/2012
Principal — **EEI-AAA**
Montana Tech, University of Montana
General Engineering Department
1300 West Park Street
Butte, MT 59701

Heath Garrison — **E** 12/06/2017
Principal — **EEI-AAA**
National Renewable Energy Laboratory
15013 Denver West Parkway
Golden, CO 80401

Bobby J. Gray — **IM** 10/29/2012
Principal — **EEI-AAA**
Hoydar/Buck, Inc.
PO Box 146
Selah, WA 98942
National Electrical Contractors Association

Robert Gruendel — **M** 8/2/2010
Principal — **EEI-AAA**
Dematic
10414 Marble Creek Drive
Lowell, MI 49331

James B. Hayes — **U** 10/27/2009
Principal — **EEI-AAA**
Florida Institute of Technology
150 West University Boulevard
Melbourne, FL 32901

Palmer L. Hickman — **L** 10/27/2009
Principal — **EEI-AAA**
Electrical Training Alliance
5001 Howerton Way, Suite N
Bowie, MD 20715-4459
International Brotherhood of Electrical Workers

John R. Kovacik — **RT** 10/28/2008
Principal — **EEI-AAA**
UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

Dino Mariuz — **M** 7/29/2005
Principal — **EEI-AAA**
Pilz Automation Safety L.P.
7150 Commerce Boulevard
Canton, MI 48187
Alternate: Glyn R. Garside

Terrance L. McKinch — **IM** 04/04/2017
Principal — **EEI-AAA**
Mortenson Construction
3278 South Duffield Road
Lennon, MI 48449-9407

Charles Meeker — **RT** 04/11/2018
Principal — **EEI-AAA**
Electrical Reliability Services Inc.
(eti Conformity Services)
4099 SE International Way, #201
Milwaukie, OR 97222

Daleep C. Mohla — **U** 10/29/2012
Principal — **EEI-AAA**
DCM Electrical Consulting Services, Inc.
4702 Summer Lakes
Missouri City, TX 77459-3958
Institute of Electrical & Electronics Engineers, Inc.

Sean Mulherrin — **U** 03/07/2013
Principal — **EEI-AAA**
EPLAN Software & Services LLC
37000 Grand River Avenue, Suite 380
Farmington Hills, MI 48335
Alternate: Paul Goleniak

Daniel R. Neeser — **M** 8/2/2010
Principal — **EEI-AAA**
Eaton's Bussmann Division
114 Old State Road
Ellisville, MO 63021-5915
National Electrical Manufacturers Association
Alternate: Ron Borowski

John A. Piller — **SE** 08/17/2017
Principal — **EEI-AAA**
Purdue University
1733 Northside Boulevard
South Bend, IN 46615

George M. Schreck **M** 9/30/2004
Principal **EEI-AAA**
Komatsu America Industries, LLC
1701 West Golf Road
Rolling Meadows, IL 60008
Alternate: Geof Price

Mike Soter **SE** 10/27/2005
Principal **EEI-AAA**
SDK Engineering, LLC
111 Golfcrest Drive
Dearborn, MI 48124

Andras Szende **RT** 10/27/2009
Principal **EEI-AAA**
TUV Rheinland of North America, Inc.
710 Resende Road, Bldg. 199
Webster, NY 14580
Alternate: Yoshihiro Sugita

Marco Tacchini **SE** 04/11/2018
Principal **EEI-AAA**
GT Engineering
Via Gutenberg 14
Poncarale, BS 25030 Italy

Jay Tamblingson **M** 10/27/2009
Principal **EEI-AAA**
Rockwell Automation
1201 South 2nd Street
Milwakee, WI 53204

Richard S. Trainor **RT** 03/07/2013
Principal **EEI-AAA**
TUV SUD America Inc.
865 Franklin Street
Wrentham, MA 02093

Stephen J. Ziegeweid **M** 10/29/2012
Principal **EEI-AAA**
Ashley Furniture Industries
1 Ashley Way
Arcadia, WI 54612
Woodworking Machinery Manufacturers of America

Ron Borowski **M** 08/09/2012
Alternate **EEI-AAA**
Eaton Corporation
W126N7250 Flint Drive
Menomonee Falls, WI 53051-4404
National Electrical Manufacturers Association
Principal: Daniel R. Neeser

Glyn R. Garside **M** 1/18/2001
Alternate **EEI-AAA**
Pilz Automation Safety L.P.
8701 108th Avenue
Pleasant Prairie, WI 53158-1400
Principal: Dino Mariuz

Adam Gilbert **RT** 04/11/2018
Alternate **EEI-AAA**
Intertek
1950 Evergreen Boulevard, Suite 100
Duluth, GA 30096
Principal: Luis M. Bas

Paul Goleniak **U** 07/29/2013
Alternate **EEI-AAA**
EPLAN Software & Services LLC
37000 Grand River Avenue
Farmington Hills, MI 48187
Principal: Sean Mulherrin

Douglas Johanneman **U** 12/07/2018
Alternate **EEI-AAA**
Toyota Motor Engineering & Manufacturing North America, Inc.
772 Emmett Creek Lane
Lexington, KY 40515
Principal: Barry Boggs

Jim Morrison **RT** 10/29/2012
Alternate **EEI-AAA**
QPS Evaluation Services Inc.
81 Kelfield Street, Unit 8
Toronto, ON M9W 5A3 Canada
Principal: Stephen W. Douglas

Thi Nguyen **U** 07/29/2013
Alternate **EEI-AAA**
The Boeing Company
5202 146th Place, SE
Everett, WA 98208
Principal: Daren A. Bateman

Geof Price **M** 03/03/2014

Alternate **EEI-AAA**
Komatsu America Industries Llc
1701 W. Golf Road
Rolling Meadows, IL 60008
Principal: George M. Schreck

Yoshihiro Sugita **RT** 3/2/2010

Alternate **EEI-AAA**
TUV Rheinland Japan Ltd.
Shin Yokohama Daini Center Bldg.
3-19-5 Shin Yokohama, Kohoku-ku
Yokohama, 222-0033 Japan
Principal: Andras Szende

Mark Cloutier 7/14/2010

Staff Liaison **EEI-AAA**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169-7471

Attachment C: F2020 Revision Cycle Schedule

Fall 2020 Master Schedule

Process Stage	Process Step	Dates for TC	Dates for TC with CC
Public Input Stage (First Draft)	Public Input Closing Date*	1/03/2019	1/03/2019
	Final Date for TC First Draft Meeting	6/13/2019	3/14/2019
	Posting of First Draft and TC Ballot	8/01/2019	4/25/2019
	Final date for Receipt of TC First Draft ballot	8/22/2019	5/16/2019
	Final date for Receipt of TC First Draft ballot - recirc	8/29/2019	5/23/2019
	Posting of First Draft for CC Meeting		5/30/2019
	Final date for CC First Draft Meeting		7/11/2019
	Posting of First Draft and CC Ballot		8/01/2019
	Final date for Receipt of CC First Draft ballot		8/22/2019
	Final date for Receipt of CC First Draft ballot - recirc		8/29/2019
	Post First Draft Report for Public Comment	9/05/2019	9/05/2019
Comment Stage (Second Draft)	Public Comment Closing Date*	11/14/2019	11/14/2019
	Notice Published on Consent Standards (Standards that received no Comments) Note: Date varies and determined via TC ballot.		
	Appeal Closing Date for Consent Standards (Standards that received no Comments)		
	Final date for TC Second Draft Meeting	5/14/2020	2/06/2020
	Posting of Second Draft and TC Ballot	6/25/2020	3/19/2020
	Final date for Receipt of TC Second Draft ballot	7/16/2020	4/09/2020
	Final date for receipt of TC Second Draft ballot - recirc	7/23/2020	4/16/2020
	Posting of Second Draft for CC Meeting		4/23/2020
	Final date for CC Second Draft Meeting		6/04/2020
	Posting of Second Draft for CC Ballot		6/25/2020
	Final date for Receipt of CC Second Draft ballot		7/16/2020
	Final date for Receipt of CC Second Draft ballot - recirc		7/23/2020
	Post Second Draft Report for NITMAM Review	7/30/2020	7/30/2020
Tech Session Preparation (& Issuance)	**Notice of Intent to Make a Motion (NITMAM) Closing Date**	8/27/2020	8/27/2020
	Posting of Certified Amending Motions (CAMs) and Consent Standards	10/08/2020	10/08/2020
	Appeal Closing Date for Consent Standards	10/23/2020	10/23/2020
	SC Issuance Date for Consent Standards	11/02/2020	11/02/2020
Tech Session	Association Meeting for Standards with CAMs		
Appeals and Issuance	Appeal Closing Date for Standards with CAMs		
	SC Issuance Date for Standards with CAMs		

TC = Technical Committee or Panel
CC = Correlating Committee

As of 12/13/2017

Attachment D: NFPA 79 Public Input Report

Public Input No. 102-NFPA 79-2019 [Global Input]

Chapter 5

Reorganize Chapter 5 in its entirety in accordance with the attached document and correlate the changes with the assoicated annex material and terms throughout the doucment.

Additional Proposed Changes

File Name	Description	Approved
Chapter_5_Global_PI_-_MH.docx	Reorganizes Chapter 5	

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted as a global input to reorganize Chapter 5 to recognize there are two types of disconnecting means, there are general requirements that apply to both types of disconnects and there are specific requirements for each. The PI continues the work of the 79 Committee from the last cycle with regard to use of the terms “machine supply circuit,” “machine supply circuit disconnecting” and “plainly and clearly visible.” The PI also clarifies how interlocking requirements apply to the enclosures containing the machine supply circuit disconnecting means by relocating the applicable interlocking requirements from 6.2.3.1 to a new 5.2.6.5.1 and adding new text referring users to the methods in 6.2.3.2 for enclosures containing isolating devices other than the machine supply circuit disconnecting means.

The PI reorganizes the Chapter into three basic sections. Section 5.1 provides the general requirements, 5.2 provides the requirements for the machine supply circuit disconnecting means and 5.3 provides the requirements for devices used to isolate electrical equipment to enable work to be performed in a deenergized state.

It is likely a task group will be needed to correlate the necessary changes in annex material and the use of terms throughout the document.

Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:14:30 EST 2019
Committee:

Public Input No. 15-NFPA 79-2018 [Global Input]

Where a device to be installed has specific circuit power requirements by its specification, and these circuit power requirements conflict with other parts of the electrical code, the device requirements must control. This is not to be used for defective devices.

Example: Ethernet devices require non-GFCE breakers due to the pulldown capacitors in the circuit to prevent the ethernet data line from floating dangerously high above ground.

Statement of Problem and Substantiation for Public Input

Minimizing disrespect for the electrical codes due to breaking too many devices.

Submitter Information Verification

Submitter Full Name: Joshua Hudson
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 19 16:47:43 EST 2018
Committee: EEI-AAA

Public Input No. 60-NFPA 79-2019 [Section No. 1.1.1]

1.1.1

The provisions of this standard shall apply to the electrical/electronic equipment, apparatus, or systems of industrial machines supplied from a nominal voltage of 1000 volts AC or less with nominal frequency not exceeding 200 Hz , or 1500 V DC or less, and commencing at the point of connection of the supply circuit conductors to the electrical equipment of the machine.

Statement of Problem and Substantiation for Public Input

1000 V as a supply voltage does not define clearly what the scope is. To clarify, both AC and DC voltages should be defined. Additionally, to align with IEC 60204-1, suggesting the range of supply frequencies in scope not to exceed 200 Hz.

Submitter Information Verification

Submitter Full Name: Andras Szende
Organization: TUV Rheinland of North America
Affiliation: Committee member
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 21:53:13 EST 2019
Committee: EEI-AAA

Public Input No. 12-NFPA 79-2018 [Chapter 2]

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 70®, National Electrical Code®, 2017 edition.

NFPA 70E®, Standard for Electrical Safety in the Workplace®, 2018 edition.

2.3 Other Publications.

2.3.1 ANSI Publications.

American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI Z535.4, *Product Safety Signs and Labels*, 2011**, Reaffirmed 2017** .

2.3.2 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM B8, *Standard Specification for Concentric-Lay–Stranded Copper Conductors, Hard, Medium-Hard, or Soft*, 2011**, Reapproved 2017** .

ASTM B174, *Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors*, ~~2010, reapproved 2015~~ **2017** .

ASTM B286, *Standard Specification for Copper Conductors for Use in Hookup Wire for Electronic Equipment*, 2007, reapproved ~~2012~~ 201**7** .

2.3.3 IEC Publications.

International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

IEC 60072–1, *Dimensions and output series for rotating electrical machines — Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080*, 1991.

IEC 60072–2, *Dimensions and output series for rotating electrical machines — Part 2: Frame numbers 355 to 1000 and flange numbers 1180 to 2360*, 1990.

2.3.4 IEEE Publications.

IEEE, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.

IEEE 315, *Graphical Symbols for Electrical and Electronics Diagrams (Including Reference Designation Letters)*, 1993.

2.3.5 NEMA Publications.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite 900, Arlington, VA 22209.

NEMA ICS 2, *Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts*, 2000, errata 2008.

NEMA MG-1, *Motors and Generators*, 2014**, Supplement 1, 2017** .

NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*, 2014.

2.3.6 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL50, *Standard for Enclosures for Electrical Equipment*, ~~2007, revised 2012~~ **2015** .

UL50E, *Standard for Electrical Equipment, Environment Considerations*, ~~2007, revised 2012~~ **2015** .

UL508, *Standard for Industrial Control Equipment*, ~~1999, revised 2013~~ **2018** .

UL508A, *Standard for Industrial Control Panels*, ~~2001~~ 20 **18** , revised ~~2014~~ 201 **8** .

UL870, *Standard for Wireways, Auxiliary Gutters and Associated Fittings*, ~~2008, revised 2013~~ **2016** .

UL1063, *Standard for Machine-Tool Wires and Cables*, ~~2006~~ 20 **17** , revised ~~2012~~ 201 **8** .

UL1581, *Reference Standard for Electrical Wires, Cables and Flexible Cords*, 2001, revised ~~2015~~ 201 **8** .

2.3.7 U.S. Government Publications.

U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 29, Code of Federal Regulations, Part 1910.331–335, “Safety-Related Work Practices.”

2.3.8 Other Publications.

Merriam-Webster’s Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 70®, National Electrical Code®, 2017 edition.

NFPA 70E®, Standard for Electrical Safety in the Workplace®, 2018 edition.

Statement of Problem and Substantiation for Public Input

Reference updated national consensus standard editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 13-NFPA 79-2018 [Chapter K]	

Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sun Sep 09 23:59:44 EDT 2018
Committee: EEI-AAA

Public Input No. 27-NFPA 79-2018 [Section No. 2.3.6]

2.3.6 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL50,~~Standard for~~ *Enclosures for Electrical Equipment*,~~2007, revised 2012~~ 2015 .

UL50E,~~Standard for~~ *Electrical Equipment, Environment Considerations*,~~2007, revised 2012~~ 2015 .

UL508,~~Standard for~~ *Industrial Control Equipment*,~~1999, revised 2013~~ 2018 .

UL508A,~~Standard for~~ *Industrial Control Panels*,~~2001, revised 2014~~ 2018 .

UL870,~~Standard for~~ *Wireways, Auxiliary Gutters and Associated Fittings*,~~2008, revised 2013~~ 2016 .

UL1063, ~~*Standard for*~~ *Machine-Tool Wires and Cables*, ~~2006~~ 2017 , revised ~~2012~~ 2018 .

UL1581,~~Reference Standard for~~ *Electrical Wires, Cables and Flexible Cords*, 2001, revised ~~2015~~ 2017 .

Statement of Problem and Substantiation for Public Input

Update standard revision dates and Remove "Standard for" from the UL standard. It is considered repetitive language and removed from the UL title.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 31-NFPA 79-2018 [Section No. K.1.2.8]	
Public Input No. 33-NFPA 79-2018 [Section No. 5.5.4]	

Submitter Information Verification

Submitter Full Name: Kelly Nicolello
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Wed Dec 26 12:14:25 EST 2018
Committee: EEI-AAA

Public Input No. 34-NFPA 79-2019 [Section No. 3.3.4]

3.3.4 Actuator, Machine.

A power mechanism used to effect motion of the machine (e .g. motor, solenoid, pneumatic or hydraulic cylinder).

Statement of Problem and Substantiation for Public Input

The examples help clarify the definition and align with the definition in IEC 60204-1 Ed. 6

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 35-NFPA 79-2019 [Section No. 3.3.79]	
Public Input No. 38-NFPA 79-2019 [Section No. A.3.3.79]	

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 06:49:44 EST 2019
Committee: EEI-AAA

Public Input No. 69-NFPA 79-2019 [New Section after 3.3.8]

Add the definition of Attachment Plug to Chapter 3 using the definition from Article 100 in the NEC.

Attachment Plug (Plug Cap) (Plug). A device that, by insertion in a receptacle, establishes a connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle. (70:100)

TITLE OF NEW CONTENT

Statement of Problem and Substantiation for Public Input

This term was incorrectly removed in the 2018 edition, only the parenthetical IEC term was intended to be removed. The term is used several times in NFPA 79 and needs to be defined in this standard.

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:44:49 EST 2019
Committee: EEI-AAA

Public Input No. 70-NFPA 79-2019 [Section No. 3.3.21]

~~**3.3.21** – Contact.~~

~~**3.3.21.1** – Direct Contact.~~

~~Contact of persons with live parts.~~

~~**3.3.21.2** – Indirect Contact.~~

~~Contact of persons with exposed conductive parts that have become live under fault conditions.~~

Statement of Problem and Substantiation for Public Input

Delete 3.3.21 including 3.3.21.1 and 3.3.21.2. It was my understanding that the terms Basic Protection and Fault Protection were added to the 2018 edition to replace these existing terms to harmonize with 60204-1 because they don't conflict with the NEC. Both previously used terms and the new terms should not be included in this standard. The previous terms seemed easier to understand and were clearer but having both is confusing. The terms "direct contact" should be replaced with "basic protection" and indirect contact" should be replaced with "fault protection" throughout the standard where they were apparently missed being changed for the 2018 edition.

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:49:52 EST 2019
Committee: EEI-AAA

Public Input No. 81-NFPA 79-2019 [New Section after 3.3.44]

Fault Current, Available (Available Fault Current).

The largest amount of current capable of being delivered at a point on the system during a short-circuit condition.

Informational Note: A short-circuit can occur during abnormal conditions such as a fault between circuit conductors or a ground fault.

Statement of Problem and Substantiation for Public Input

A definition of available fault current has been added to the 2020 NEC. This proposal adds this defintion and informational note that correlates with the 2020 NEC. There is also a figure in the 2020 NEC. Perhaps this would be suitable to add to Annex A.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 85-NFPA 79-2019 [Section No. 9.1.1.1]	
Public Input No. 86-NFPA 79-2019 [Section No. 9.1.1.3]	
Public Input No. 87-NFPA 79-2019 [Section No. A.3.3.75]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton's Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:04:45 EST 2019
Committee: EEI-AAA

Public Input No. 35-NFPA 79-2019 [Section No. 3.3.79]

3.3.79 * Programmable Electronic System (PES).

A system based on one or more central processing units (CPUs), connected to sensors or machine actuators, or both, for the purpose of control or monitoring.

Statement of Problem and Substantiation for Public Input

The revised text clarifies the definition.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 34-NFPA 79-2019 [Section No. 3.3.4]	
Public Input No. 38-NFPA 79-2019 [Section No. A.3.3.79]	

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 06:53:32 EST 2019
Committee: EEI-AAA

Public Input No. 71-NFPA 79-2019 [New Section after 3.3.81]

Add the definition of Receptacle to Chapter 3 using the definition from Article 100 in the NEC. This term might need to be revised during the second draft process pending a change in the 2020 NEC.

Receptacle. A contact device installed at the outlet for the connection of an attachment plug, or for the direct connection of electrical utilization equipment designed to mate with the corresponding contact device. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke. (70:100)

Statement of Problem and Substantiation for Public Input

This term was incorrectly removed in the 2018 edition, only the parenthetical IEC term was intended to be removed. The term is used several times in NFPA 79 and needs to be defined in this standard.

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:53:48 EST 2019
Committee: EEI-AAA

Public Input No. 88-NFPA 79-2019 [New Section after 3.3.88]

Safety Interlock
A device or circuit that supplies power or control to a safety-related function for the machine

Statement of Problem and Substantiation for Public Input

The standard currently references safety interlocks and safety interlock circuits, but they are not defined terms. This proposal adds a definition for safety interlock to assist the user with requirements for these devices or or circuits.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 89-NFPA 79-2019 [Section No. 7.8.1]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton's Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:31:48 EST 2019
Committee: EEI-AAA

Public Input No. 90-NFPA 79-2019 [New Section after 3.3.89]

TITLE OF NEW CONTENT

Add a new definition: **Safety Interlock Circuit.** A circuit containing one or more device(s) or equipment incorporating electronic components which is intended to mitigate hazards which could cause injury to personnel.

Statement of Problem and Substantiation for Public Input

A new definition for safety interlock circuit is needed to clarify the requirement in 7.8.1 relative to when an SPD is required.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 19:03:46 EST 2019
Committee: EEI-AAA

Public Input No. 80-NFPA 79-2019 [Section No. 3.3.93]

3.3.93 ~~Short-Circuit~~ Fault Current.

~~An overcurrent resulting from a short circuit due to a fault or an incorrect connection in an electric circuit.~~ The current delivered at a point on the system during a short- circuit condition

Statement of Problem and Substantiation for Public Input

The 2020 NEC will now use the term "fault current" in lieu of "short-circuit current". They have also added a definition for fault current. This proposal revises the term as well as the definition to correlate with the 2020 NEC. This term should be changed in the rest of the document as well.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 83-NFPA 79-2019 [Section No. 7.2.9]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton's Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 15:57:39 EST 2019
Committee: EEI-AAA

Public Input No. 63-NFPA 79-2019 [Section No. 4.4.2.7]

4.4.2.7 Voltage Dips.

The electrical equipment shall be designed to operate correctly where the supply voltage dips do not exceed 20 percent of the peak voltage of the supply for more than ~~one cycle~~ 20 milliseconds . The time interval between successive dips shall be more than 1 second.

Statement of Problem and Substantiation for Public Input

The reference to "cycle" in 4.4.2.7 is not consistent with the terms used in the document. Cycle in this case refers to Cycles/Sec. Not more than 20 milliseconds covers 50 & 60 HZ and is consistent with other text in the section.

Submitter Information Verification

Submitter Full Name: Mike Soter
Organization: SDK Engineering, LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 11:28:57 EST 2019
Committee: EEI-AAA

Public Input No. 116-NFPA 79-2019 [Section No. 4.4.2.8]

4.4.2.8 Circuits Supplied From Power Conversion Equipment.

Electrical conductors ~~and~~ for equipment supplied by power conversion equipment as part of adjustable speed drive systems and servo drive systems shall be listed flexible motor supply cable marked type RHH, RHW, RHW-2, XHH, XHHW, or XHHW-2 or selected based on the equipment manufacturer's instructions.

Statement of Problem and Substantiation for Public Input

The term "equipment" was incorrectly addressed in the context of this requirement when it was added. This requirement only applies to conductors.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jan 04 00:02:49 EST 2019
Committee: EEI-AAA

Public Input No. 37-NFPA 79-2019 [Section No. 4.4.2.8]

~~**4.4.2.8** – Circuits Supplied From Power Conversion Equipment.~~

~~Electrical conductors and equipment supplied by power conversion equipment as part of adjustable speed drive systems and servo drive systems shall be listed flexible motor supply cable marked type RHH, RHW, RHW-2, XHH, XHHW, or XHHW-2 or selected based on the equipment manufacturer's instructions.~~

Statement of Problem and Substantiation for Public Input

It is recommended to delete this requirement added in the 2018 cycle as it is confusing and overly restrictive. It incorrectly requires electrical equipment to be listed as flexible motor supply cable rather than the appropriate product standard. In addition, it is restrictive in that other types of conductors and cables produced by wire manufacturers are designed for use with power conversion equipment but now requires them to be specifically identified in the various equipment manufacturers instructions. See related public input on proposed explanatory material for 12.1.1

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 51-NFPA 79-2019 [Section No. A.12.1.1]	
Public Input No. 51-NFPA 79-2019 [Section No. A.12.1.1]	

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 07:10:46 EST 2019
Committee: EEI-AAA

Public Input No. 5-NFPA 79-2018 [Section No. 4.4.2.8]

4.4.2.8 Circuits Supplied From Power Conversion Equipment.

Electrical conductors and equipment supplied by power conversion equipment as part of adjustable speed drive systems and servo drive systems shall be listed flexible motor supply cable marked type RHH, RHW, RHW-2, XHH, XHHW, or XHHW-2 or selected based on the equipment manufacturer's instructions.

More details needed. This requirement is too narrow and ambiguous especially with the "OR" clause. The listed types are OK for static non-moving applications. However these conductor types are not conducive to constant flexing. More testing needs to be done on VFD applications and dielectric breakdown due to corona effect. PVC/Nylon may not be a viable option for "long" motor leads in a humid environment and the standard should guide users in these situations. However the greater majority of Variable frequency applications will not have this problem. There are other low capacitance insulation types other than RHH, RHW, RHW-2, XHH, XHHW, or XHHW-2 that can be used. There are also cables outside of the listed types above that are made for constant flexing VFD applications.

Thanks

Don Nester

Product Manager chainflex® cables

igus® Inc.

PO Box 14349

East Providence, RI 02914

Tel.: 800.521.2747 ext. 190

Mobile: 401.714.7621

Fax: 401.438.7270

E-mail: dnester@igus.com

Statement of Problem and Substantiation for Public Input

Clarify new requirement and allow for other cables made for variable frequency motor power and constant flexing.

Submitter Information Verification

Submitter Full Name: Don Nester
Organization: Igus Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 29 15:40:17 EDT 2018
Committee:

Public Input No. 39-NFPA 79-2019 [Section No. 4.5.2]

4.5.2 * Electromagnetic Compatibility (EMC).

Transient suppression, isolation, or other appropriate means shall be provided where ~~the equipment of an industrial machine generates~~ the expected level of electrical noise or transients ~~, which can~~ in the electrical supply or generated by the industrial machine would affect the operation of equipment that is on or part of the industrial machine.

Statement of Problem and Substantiation for Public Input

The revised text is intended to align requirements with 7.8 for use of surge protection devices to protect against EMC overvoltages on the electrical supply due to lightning or switching surges.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 54-NFPA 79-2019 [Section No. A.4.5.2]	
Public Input No. 54-NFPA 79-2019 [Section No. A.4.5.2]	

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 07:56:23 EST 2019
Committee: EEI-AAA

Public Input No. 1-NFPA 79-2018 [Section No. 4.5.8]

4.5.8– _ Seismic, Vibration, Shock, and Bump.

Machines shall be installed in compliance with applicable seismic restraint requirements. Undesirable effects of vibration, shock, and bump, including those generated by the machine and its associated equipment and those created by the physical environment, shall be avoided by the selection of suitable equipment, by mounting it away from the machine, or by the use of antivibration mountings.

Statement of Problem and Substantiation for Public Input

Seismic mounting requirements for machinery, piping, ducting, etc., vary by jurisdiction, but many building codes have provisions. The International Building Code (IBC) and American Society of Civil Engineers (ASCE) codes have seismic provisions. Restraint requirements in a location are often based on USGS data for likely ground motion and other considerations. NFPA does not have revision control over IBC or ASCE documents, USGS data, or local, state, or federal laws. Thus it will be difficult to provide requirements for a given area due to variations of both laws, codes, and local seismic conditions. Providing the seismic and structural specifics may be outside the scope of NFPA 79.

But requiring that seismic requirements be determined and adhered to should not be outside of our scope.

This section originally covered vibration, shock, and bump hazards either caused by the machine, or inflicted upon the machine by the "plant" environment, and their mitigation through proper mounting hardware. A seismic event falls into this category. By specifically adding seismic to this list, and requiring that local seismic codes are adhered to, the user is reminded of this requirement. And seismic restraint and mounting is added to mounting requirements. An industrial machine falling over during an earthquake, landing on people or other machines, ripping out its own electrical, plumbing, and ventilation connections, etc., is a hazard to be avoided.

Submitter Information Verification

Submitter Full Name: Matt Egloff
Organization: Montana Tech, University of Montana
Affiliation: Myself as a committee member and interested party
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 21 11:40:44 EDT 2018
Committee:

Public Input No. 2-NFPA 79-2018 [Section No. 4.8]

4.8 Installation and Operating Conditions.

The electrical equipment shall be installed and operated in accordance with the conditions outlined in the manufacturer's instructions. Any conditions that are outside the operating conditions specified in Chapter 4 shall be permitted where acceptable to both the manufacturer and the user. Equipment that is listed for use in a hazardous or classified location, but is installed and operated in manner that the installation and location is not hazardous or classified, shall not be required to meet the additional requirements of a hazardous or classified location.

Statement of Problem and Substantiation for Public Input

Recently we received equipment that was listed for Class I Division 2. The equipment was designed for production of material in such a classified area. However, it was installed in an unclassified location; a research and process development area. It was determined that the installation location and its nature, and the amount of hazardous material present, both to be processed by this equipment and in the surrounding area, made the area unclassified. There was some disagreement as to whether the equipment should still have to be installed and connected as it would have been in a Class I Division 2 area.

The intent is to clarify the existing statement regarding installation outside operating conditions specified that are acceptable to the manufacturer and user. This proposed additional language clarifies that in cases where equipment that is listed for hazardous locations, which is outside of NFPA 79's scope, is installed and used in unclassified locations, and in a manner that keeps it unclassified, the installation need only meet the requirements of an unclassified location. No conduit, seals, purging and pressurizing, etc. are needed.

While the situation motivating the change occurred at my current employer, they are not involved in nor do they have a stake in the proposed change. I have heard of similar situations elsewhere. The suggested change is mine alone.

Submitter Information Verification

Submitter Full Name: Matt Egloff
Organization: Montana Tech, University of Montana
Affiliation: Representing myself only
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 21 12:44:04 EDT 2018
Committee:

Public Input No. 40-NFPA 79-2019 [Section No. 4.9]

4.9 Available Fault Current.

The available fault current at each machine supply circuit disconnecting means shall not be greater than the corresponding short-circuit current rating marked on the machine industrial control panel nameplate.

Statement of Problem and Substantiation for Public Input

Clarifies that each supply circuit will have a corresponding SCCR rating.

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 08:22:19 EST 2019
Committee: EEI-AAA

Public Input No. 32-NFPA 79-2018 [New Section after 5.3.1.4]

TITLE OF NEW CONTENT

Exception No. 3: An interlock for the control enclosure shall not be required where all live parts, including those on the inside of doors are protected against direct contact to at least IP2X or IPXXB or are shielded so that an accidental contact is not possible. A safety sign shall be provided in accordance with Section 16.2.

Additional Proposed Changes

File Name	Description	Approved
IMG_6191.JPG	Example of shields that prevent accidental direct contacts	

Statement of Problem and Substantiation for Public Input

Electrical Maintenance persons need to work with the control panel energized.
To provide such interlock and then a "bypass" key is not very effective, i think.
A Control Panel in an industrial environment is normally opened by authorised/qualified persons.
I find it safer to provide shields inside than interlocking all doors and then provide a "bypass key" (6.2.3.1.1* Means shall be permitted to be provided for qualified persons, using appropriate work practices, to gain access without removing power).

Submitter Information Verification

Submitter Full Name: Marco Tacchini
Organization: GT Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 28 07:23:40 EST 2018
Committee: EEI-AAA


00-7K1
SIEMENS

Public Input No. 43-NFPA 79-2019 [Section No. 5.3.1.4]

5.3.1.4

Each supply circuit disconnecting means mounted within or adjacent to the control enclosure it supplies shall be interlocked with the control enclosure door or cover in accordance with 6.2.3.1.

Exception ~~No. 1 : An interlock for the control enclosure shall not be required where devices other than the handles of circuit breakers or switches are guarded by a dead-front cover and the use of a key or tool is necessary for opening the supply circuit disconnecting means enclosure to access exposed live parts. A safety sign shall be provided in accordance with Section 16.2 .Exception No. 2:~~ Where a supply circuit disconnecting means supplying machines totaling 2 hp or less is not located within or adjacent to the control enclosure it supplies, the control enclosure shall comply with 6.2.3.1 or 6.2.3.2. Where a supply disconnecting means is an attachment plug and receptacle, the control enclosure it supplies shall comply with 6.2.3.2. Where compliance with 6.2.3.2 is required, a safety sign shall be provided in accordance with Section 16.2.

Statement of Problem and Substantiation for Public Input

Exception 1 that was added in the 2018 edition but no substationation was provided on how it provides equivalent safety to interlocking. The proposed revision returns the requirements to 2015 text with minor editorial revisions to clarify what is being interlocked.

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 08:37:01 EST 2019
Committee: EEI-AAA

Public Input No. 101-NFPA 79-2019 [Section No. 5.3.4.2]

5.3.4.2

An operating handle of the supply circuit disconnecting means required by 5.3.3.1 shall meet the following criteria:

(1) Be readily accessible with doors in the open or closed position

(2) Maintain the environmental rating of the enclosure to the degree necessary for the application when installed through the control enclosure

~~Not be restricted by the enclosure door~~

(3)

(3) Can be operated when the door is in the open or closed position

Statement of Problem and Substantiation for Public Input

The substituted wording better describes the intent of the requirement in (3).

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:09:04 EST 2019
Committee: EEI-AAA

Public Input No. 33-NFPA 79-2018 [Section No. 5.5.4]

5.5.4

The following devices shall be permitted to fulfill the isolating function of 5.5.3:

(1) Devices described in 5.3.2

(2) A manual motor controller marked “suitable as motor disconnect” and in compliance with UL 508, ~~*Standard for*~~ *Industrial Control Equipment*, where located on the load side of the last short-circuit protective device (in the branch)

(3) System isolation equipment that incorporates control lockout stations and is listed for disconnection purposes where located on the load side of the main supply circuit disconnecting means and overcurrent protection

Statement of Problem and Substantiation for Public Input

Remove “Standard for” from the UL standard. It is considered repetitive language and is removed from the UL title.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 27-NFPA 79-2018 [Section No. 2.3.6]	
Public Input No. 31-NFPA 79-2018 [Section No. K.1.2.8]	

Submitter Information Verification

Submitter Full Name: Kelly Nicolello
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 28 09:15:35 EST 2018
Committee: EEI-AAA

Public Input No. 72-NFPA 79-2019 [New Section after 6.2.2.3]

Insert this as a new 6.2.2.3. Renumber existing 6.2.2.3 as 6.2.2.4

6.2.2.3 Single conductors as specified in 12.1 shall only be installed where part of a recognized wiring method of Chapter 13.

6.2.2.4 Paints, varnishes, lacquers, and similar products shall not be considered protection against electric shock under normal operating conditions.

Statement of Problem and Substantiation for Public Input

The language is taken and modified from NEC 300.3(A). Presently 6.2.2 literally permits conductors with basic insulation (e.g. THHN) to be used without being in an enclosure or raceway or part of a wiring method. Conductors that are not part of a cable assembly, or use double or reinforced insulation should not be permitted to be installed such they can easily be contacted by persons. They should not be considered suitably guarded or insulated based on the definition of exposed or based on typical wiring practices.

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:58:45 EST 2019
Committee: EEI-AAA

Public Input No. 73-NFPA 79-2019 [Section No. 6.2.2.3]

~~6.2.2.3~~ –

~~Paints, varnishes, lacquers, and similar products shall not be considered protection against electric shock under normal operating conditions.~~

Statement of Problem and Substantiation for Public Input

Renumber existing 6.2.2.3 as 6.2.2.4 as shown in PI 72 to place it in a more logical order based on acceptance of PI 72.

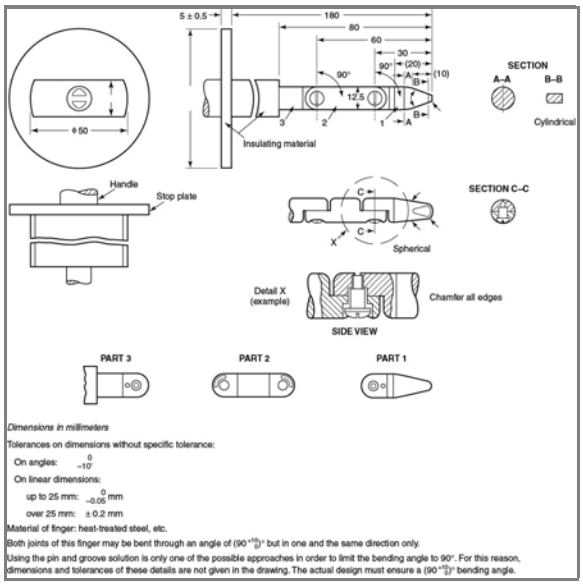
Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 13:06:13 EST 2019
Committee: EEI-AAA

Public Input No. 20-NFPA 79-2018 [Section No. 6.2.3 [Excluding any Sub-Sections]]

Equipment enclosures and enclosure openings shall meet the requirements of UL 508, UL 508A, UL 50, or NEMA 250. *(See Figure 6.2.3.)*

Figure 6.2.3 Jointed Test Finger.



Exception: In the absence of a rated enclosure, the determination of the suitability of an enclosure as protection from electrical shock shall be determined by using a test finger as described in Figure 6.2.3. The test finger shall be applied, with only minimal force, in every opening in the enclosure after removal of all parts of the enclosure that are capable of being removed without the use of a tool. The test finger shall not encounter live parts in any direction.

Additional Proposed Changes

File Name	Description	Approved
IEC_probe.jpg	IEC probe	

Statement of Problem and Substantiation for Public Input

The current Figure 6.2.3 is missing critical dimensions which permits a person to reproduce the probe. The attached image shows the probe with the missing data to be used to correct the figure.

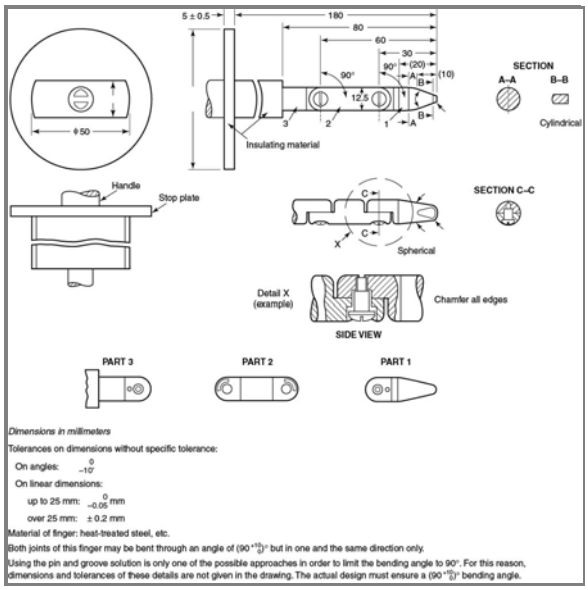
Submitter Information Verification

Submitter Full Name: Robert Gruendel
Organization: Dematic
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 21 07:04:38 EST 2018
Committee: EEI-AAA

Public Input No. 53-NFPA 79-2019 [Section No. 6.2.3 [Excluding any Sub-Sections]]

Equipment enclosures ~~and enclosure openings shall~~ , enclosure openings, and viewing windows shall meet the requirements of UL 508, UL 508A, UL 50, or NEMA 250. *(See Figure 6.2.3.)*

Figure 6.2.3 Jointed Test Finger.



Exception: In the absence of a rated enclosure, the determination of the suitability of an enclosure as protection from electrical shock shall be determined by using a test finger as described in Figure 6.2.3. The test finger shall be applied, with only minimal force, in every opening in the enclosure after removal of all parts of the enclosure that are capable of being removed without the use of a tool. The test finger shall not encounter live parts in any direction.

Statement of Problem and Substantiation for Public Input

UL 50 has the following:
6.2 Observation windows
6.2.3 A polymeric material used as an observation window shall comply with the requirements of Clause 6.6.
6.6.1.1 Other than as detailed in Clauses 6.6.1.3 and 6.6.1.4, a polymeric electrical enclosure or polymeric part (such as a plug or other closure) that is relied upon to complete and maintain the integrity of an electrical enclosure shall comply with the:
a) Flammability – 5 inch (127 mm) flame test specified in Annex B, Ref. No. 2;
b) Resistance to impact (both normal and cold) tests specified in Annex B, Ref. No. 3;
c) Crushing resistance test (see Clause 8.10);
d) Mold stress relief distortion test (see Clause 8.11); and
e) Additional requirements specified in Clause 8.6.

UL508A has the following:
23.3 A polymeric material covering an observation opening and forming a part of the enclosure shall be a polycarbonate material not less than 1/8 inch (3.2 mm) thick, having a flammability rating of 5VA at the use thickness, and having an area not more than 380 square inches (2452 cm2).

Submitter Information Verification

Submitter Full Name: Richard Trainor
Organization: Tuv Sud America Inc
Street Address:

City:
State:
Zip:
Submittal Date: Wed Jan 02 11:53:31 EST 2019
Committee: EEI-AAA

Public Input No. 105-NFPA 79-2019 [Section No. 6.2.3.1]

~~**6.2.3.1** – Enclosure Interlocking.~~

~~When required by 5.3.1.4 , each disconnecting means mounted within or adjacent to a control enclosure that contains live parts operating at 50 volts ac (rms value) or 60 volts dc or more shall be mechanically or electrically interlocked, or both, with the control enclosure doors so that none of the doors open unless the power is disconnected. Interlocking shall be reactivated automatically when all the doors are closed.~~

~~*Exception No. 1: A disconnecting means used only for maintenance lighting circuits within control enclosures shall not be required to be interlocked with the control enclosure. A safety sign shall be provided that meets the requirements of 16.2.4 .*~~

~~*Exception No. 2: A disconnecting means used for power supply circuits within control enclosures to memory elements and their support logic requiring power at all times to maintain information storage shall not be required to be interlocked with the control enclosure doors. A safety sign shall be provided that meets the requirements of 16.2.4 .*~~

~~**6.2.3.1.1** * –~~

~~Means shall be permitted to be provided for qualified persons, using appropriate work practices, to gain access without removing power.~~

~~**6.2.3.1.2** –~~

~~The interlocking means shall meet the following requirements:~~

(1) ~~Utilize a device or tool as specified by the manufacturer of the interlock to allow qualified persons to defeat the interlock~~

(2) ~~Be reactivated automatically when the door(s) is closed~~

(3) ~~Prevent closing of the disconnecting means while the door of the enclosure containing the disconnect is open, unless an interlock is operated by deliberate action~~

~~**6.2.3.1.3** –~~

~~Where provided with a defeat mechanism as permitted in 6.2.3.1.2(1) , live parts mounted on the inside of doors that are operating at over 50 volts shall be protected from unintentional direct contact by the inherent design of components or the application of barriers or obstacles such that a 50 mm (2 in.) sphere cannot contact any of the live parts in question.~~

Statement of Problem and Substantiation for Public Input

The text is relocated to Chapter 5 as part of a global PI to reorganize Chapter 5 and clarify the interlocking requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 102-NFPA 79-2019 [Global Input]	
Public Input No. 107-NFPA 79-2019 [Section No. 6.2.3.2]	

Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:

Submittal Date: Thu Jan 03 23:26:54 EST 2019
Committee: EEI-AAA

Public Input No. 74-NFPA 79-2019 [Section No. 6.2.3.1.3]

6.2.3.1.3

Where provided with a defeat mechanism as permitted in 6.2.3.1.2(1), live parts mounted on the inside of doors that are operating at over 50 volts ~~shall be protected from unintentional direct contact~~ shall have basic protection by the inherent design of components or the application of barriers or obstacles such that a 50 mm (2 in.) sphere cannot contact any of the live parts in question.

Statement of Problem and Substantiation for Public Input

It was my understanding that the terms Basic Protection and Fault Protection were added to the 2018 edition to replace these existing terms to harmonize with 60204-1 because they don't conflict with the NEC. Both previously used terms and the new terms should not be included in this standard. The previous terms seemed easier to understand and were clearer but having both is confusing. The terms "direct contact" should be replaced with "basic protection" and indirect contact" should be replaced with "fault protection" throughout the standard where they were apparently missed being changed for the 2018 edition.

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 13:09:44 EST 2019
Committee: EEI-AAA

Public Input No. 107-NFPA 79-2019 [Section No. 6.2.3.2]

6.2.3.2 Enclosure Access.

When a qualified person, using appropriate work practices, needs to enter an enclosure that does not have a machine supply circuit disconnect, one of the following conditions shall be met:

(1) The use of a key or tool shall be required for opening the enclosure.

(2) An enclosure door shall be permitted to be opened without the use of a key or a tool and without disconnection of live parts only when all live parts inside are separately enclosed or guarded such that there cannot be any direct contact with live parts.

Statement of Problem and Substantiation for Public Input

The added text correlates with a global PI to reorganize Chapter 5 and clarify the interlocking requirements. The added text clarifies the requirements in this section only applies to enclosures that do not contain the machine supply circuit disconnecting means.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 102-NFPA 79-2019 [Global Input]	
Public Input No. 105-NFPA 79-2019 [Section No. 6.2.3.1]	

Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections and Training
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:31:59 EST 2019
Committee: EEI-AAA

Public Input No. 97-NFPA 79-2019 [Section No. 6.2.3.2]

6.2.3.2 – * Enclosure Access.

When a qualified person, using appropriate work practices, needs to enter an enclosure that does not have a disconnect interlocked with the door ,one of the following conditions shall be met:

(1) The use of a key or dedicated tool shall be required for opening the enclosure. The use of the key and access to the enclosure shall be restricted to qualified persons.

(2) An enclosure door shall be permitted to be opened without the use of a key or a tool and without disconnection of live parts only when all live parts inside are separately enclosed or guarded such that there cannot be any direct contact with live parts.

Statement of Problem and Substantiation for Public Input

An enclosure with a disconnect switch that not interlocked with the enclosure door has the same safety issues being addressed in 6.2.3.2. The tool used to open enclosures addressed in 6.2.3.2 should not be a simple hand tool. This type of tool doesn't provide the same level of security as a lock and key. A companion PI is submitted to add an Annex note to this section providing guidance on a dedicated tool.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 98-NFPA 79-2019 [New Section after A.6.2.3.1.1]	
Public Input No. 98-NFPA 79-2019 [New Section after A.6.2.3.1.1]	

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 21:37:32 EST 2019
Committee: EEI-AAA

Public Input No. 103-NFPA 79-2019 [Section No. 6.5.3.1]

6.5.3.1 Time of Discharge.

The residual voltage of a capacitor shall be reduced to 50 volts, nominal, or less, within 1 minute after the capacitor is disconnected from the source of supply. [**70:**460.6(A)]

Exception: Where the requirement would interfere with the functioning of the equipment, a safety sign that draws attention to the hazard and states the delay required before entry to the enclosure shall be permitted to be displayed at a visible location on or immediately adjacent to the enclosure containing the capacitor(s).

Statement of Problem and Substantiation for Public Input

The added exception allows for an alternate mean of mitigating the shock hazard presented by charged capacitor(s) when the requirement in 6.5.3.1 cannot be met due to the design and operation of the machine.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:15:17 EST 2019
Committee: EEI-AAA

Public Input No. 104-NFPA 79-2019 [Section No. 6.5.3.2]

6.5.3.2 Means of Discharge.

The discharge circuit shall be either permanently connected to the terminals of the capacitor or capacitor bank, or provided with automatic means of connecting it to the terminals of the capacitor bank on removal of voltage from the line. Manual means of switching or connecting the discharge circuit shall not be used. [**70:**460.6(B)]

Exception: Where conductors in the main power circuit are protected against direct contact and where the capacitor is being used as a battery in accordance with the battery manufacturer's instructions, a manual means of switching or connecting the discharge circuit shall be permitted.

Statement of Problem and Substantiation for Public Input

In some machines the capacitor(s) are used as a battery (i.e. a super capacitor). In such cases it is not desirable to discharge the capacitor(s) each time the machine power is removed.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:23:59 EST 2019
Committee: EEI-AAA

Public Input No. 83-NFPA 79-2019 [Section No. 7.2.9]

7.2.9 * Short-Circuit Current Rating or Interrupting Rating.

The short-circuit current rating or interrupting rating shall be at least equal to the available fault current at the point of application. Where the ~~short-circuit~~ fault current to an overcurrent protective device includes additional currents other than from the supply (e.g., from motors, from power factor correction capacitors), these shall be taken into consideration.

Statement of Problem and Substantiation for Public Input

The proper term is fault current, not short-circuit current to correlate with my other proposed revised definition of short-circuit current.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 80-NFPA 79-2019 [Section No. 3.3.93]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton's Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:12:15 EST 2019
Committee: EEI-AAA

Public Input No. 44-NFPA 79-2019 [Section No. 7.8]

7.8 Protection Against Overvoltages Due to Lightning and Switching Surges on Incoming Supply .

7.8.1 Surge-Protective Devices (SPDs).

~~SPDs shall be provided for industrial~~ Industrial machinery with safety interlock circuits ~~to protect against~~ not effectively protected from the effects of overvoltages due to lightning or switching surges on the incoming supply circuit shall have surge protection installed .

7.8.2 Connections.

Where provided, SPDs shall be connected in accordance with product markings and installation instructions.

7.8.3 SPD Type and Circuit Location.

The type of SPD provided shall be suitable for the circuit location within the ~~installation location~~ electrical equipment of the industrial machinery. Type 1, Type 2, and Type 3 ~~SPDs shall be~~ SPDs intended to be field installed shall be listed devices.

7.8.3.1 Type 1 SPD.

Where the SPD is located on the line side of the service disconnect overcurrent protection, a Type 1 SPD shall be provided,

7.8.3.2 Type 2 SPD.

Where the SPD is located on the load side of the service disconnect overcurrent protection, feeder circuit, or separately derived system, a Type 1 or Type 2 SPD shall be provided. Where Type 2 SPDs are provided, the SPD shall be on the load side of an overcurrent protective device.

7.8.3.3 Type 3 SPD.

Where the SPD is located on the load side of the branch-circuit overcurrent protective device, a Type 1, Type 2, or Type 3 SPD shall be provided. Where Type 3 SPDs are provided and where included in the manufacturer's instructions, the Type 3 SPD connection shall be a minimum of 10 m (30 ft) of conductor distance from the service or separately derived system disconnect.

7.8.3.4 Type 4 or Component Type SPD.

Where a Type 4 SPD or other component type SPD is used within the industrial control panel of industrial machinery, it shall be identified for use in Type 1, Type 2, or Type 3 applications and be suitable for the circuit location within the electrical equipment of the industrial machinery.

7.8.4 Short-Circuit Current Rating.

The SPD shall be marked with a short-circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating.

Statement of Problem and Substantiation for Public Input

The proposed text revises 7.8.1 to align with pending changes to 670.6 for the 2020 edition of NFPA 70. The proposed changes to 7.8.3 are to clarify circuit location (vs. machinery location) and use of listed and component type SPDs.

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 09:29:15 EST 2019

Committee: EEI-AAA

Public Input No. 76-NFPA 79-2019 [Section No. 7.8.1]

7.8.1 – * __ Surge-Protective Devices (SPDs).

SPDs shall be provided for industrial machinery with safety interlock circuits to protect against the effects of overvoltages due to lightning or switching surges.

Statement of Problem and Substantiation for Public Input

7.8.1 insert a * to correspond with the new information added to Annex A if that concept in PI 75 is accepted. Action on that PI should be taken first.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 75-NFPA 79-2019 [New Section after A.7.7]	

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 13:16:30 EST 2019
Committee: EEI-AAA

Public Input No. 89-NFPA 79-2019 [Section No. 7.8.1]

7.8.1 Surge-Protective Devices (SPDs).

~~SPDs shall be provided for industrial machinery with safety interlock circuits to protect~~ Safety interlock devices and circuits in industrial machinery shall be protected against the effects ~~of overvoltages due~~ of due to lightning or switching surges with SPDs .

Statement of Problem and Substantiation for Public Input

There is confusion as to what is required to comply with protection of satety interlock circuits (or devices). This proposal makes it clear that the SPD must protect the safety interlock circuit (which may be a control circuit) or safety interlock device (which may be a safety contactor) from overvoltages. A proposal for safety interlocks has also been submitted.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 88-NFPA 79-2019 [New Section after 3.3.88]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton's Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:38:31 EST 2019
Committee: EEI-AAA

Public Input No. 99-NFPA 79-2019 [Section No. 7.8.1]

7.8.1 – * Surge-Protective Devices (SPDs).

SPDs shall be provided for industrial machinery with safety interlock circuits to protect against the effects of overvoltages due to lightning or switching surges.

Exception: SPDs shall not be required where the risks associated with the effects of overvoltages are mitigated such that the safety performance determined by a risk assessment is met.

Statement of Problem and Substantiation for Public Input

Safety interlock circuits that employ "safety" devices such as a safety programmable logic controller, a safety interlock or a safety switch generally do not need external protection against the effects of overvoltages. Such devices are either protected against improper operation due to overvoltages or designed for "fail safe" operation in the event they are damaged by overlvoltages. A risk assessment can determine if the safety interlock circuit meets the acceptable level of safety performance when these safety devices are used. An Annex note is proposed in PI 100 to reference safety devices as a means to provide the acceptable level of safety performance required.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 100-NFPA 79-2019 [New Section after A.7.7]	
Public Input No. 100-NFPA 79-2019 [New Section after A.7.7]	

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 22:28:40 EST 2019
Committee: EEI-AAA

Public Input No. 77-NFPA 79-2019 [Sections 8.1.2, 8.1.3]

Sections 8.1.2, 8.1.3

Insert a new 8.1.2

~~– Connections.~~
~~to read as follows:~~

~~8.1.2 Separately Derived Systems. Separately derived systems shall be installed in accordance with 250.30 of NFPA 70.~~

~~8.1.2 8.1.3 Connections. Except at either the source or first disconnecting means of a separately derived system, grounded conductors shall not be connected to the equipment grounding conductor.~~

~~8.1.3~~

~~–~~

~~8.1.4 Mounting.~~

~~Mounting hardware shall not be used for terminating conductors used for grounding or bonding.~~

Statement of Problem and Substantiation for Public Input

Presently there is no guidance for installing separately derived systems in NFPA 79. Some are incorrectly connecting transformer separately derived system secondaries to isolated ground rods. If modifications of 250.30 are desired they should be added in Chapter 8. Renumber existing 8.1.2 to 8.1.3, and existing 8.1.3 to 8.1.4 to place items in a more logical order.

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 13:23:19 EST 2019
Committee: EEI-AAA

Public Input No. 67-NFPA 79-2019 [Section No. 8.2.3.6]

8.2.3.6

Portable, pendant, and resilient-mounted equipment shall be bonded ~~by separate conductors~~ ; where multiconductor cable is used, ~~the bonding conductor shall be included as one conductor of the cable~~ a grounding conductor capable of safely carrying the maximum ground fault current of the equipment shall be included within the cable and all noncurrent carrying parts shall be bonded to that conductor at the utilization point .

Statement of Problem and Substantiation for Public Input

A ground loop is caused by the interconnection of electrical equipment that results in there being multiple paths to ground, so a closed conductive loop is formed. The text as written provided the opportunity to create a ground loop.

Submitter Information Verification

Submitter Full Name: Mike Soter
Organization: SDK Engineering, LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:15:55 EST 2019
Committee: EEI-AAA

Public Input No. 45-NFPA 79-2019 [Section No. 8.3]

8.3 Control Circuits.

Control circuits shall be permitted to be grounded or ungrounded.

Exception: Exposed control circuits as permitted by Section 6.4 shall be grounded.

8.3.1

Where grounding is provided, ~~that~~ the side of ~~the circuit common to the coils shall be grounded at the secondary~~ the secondary winding of the control transformer if alternating current or ~~at~~ the power ~~supply terminal~~ supply output if direct current that is connected to the circuit common to the control circuit devices shall be grounded .

Exception ~~No. 1 : Exposed control circuits as permitted by Section 6.4 shall be grounded.Exception No. 2:~~ Overload relay contacts shall be permitted to be connected between the coil and the grounded conductor where the conductors between such contacts and coils of magnetic devices do not extend beyond the control enclosure.

8.3.2

Ungrounded control circuits shall be provided with an insulation-monitoring device that either indicates a ground fault or interrupts the circuit automatically after a ground fault.

Exception: Class 2 low-voltage circuits in Article 725 of NFPA 70 shall not require insulation monitoring.

Statement of Problem and Substantiation for Public Input

The proposed revisions updates the grounding provisions for control circuits to account for control devices that are not coils and to address use of control transformers or power supplies with single connection terminals or use of plug/socket connections where direct grounding at the terminal is not practicable. In addition, it corrects an oversight that Exception 1 in 8.3.1 was intended to apply to 8.3.

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 09:33:39 EST 2019
Committee: EEI-AAA

Public Input No. 62-NFPA 79-2019 [Section No. 8.3.2]

8.3.2

Ungrounded control circuits shall be provided with an insulation-monitoring device that either indicates a ground fault or interrupts the circuit automatically after a ground fault.

~~*Exception: Class 2 low-voltage circuits in Article 725 of NFPA 70 shall not require insulation monitoring.*~~ *delete note*

Additional Proposed Changes

File Name	Description	Approved
Protection_of_cntrl_circuits.pdf	Reason why, even in case of class 2 circuits, the insulation monitoring is needed	

Statement of Problem and Substantiation for Public Input

The reason for the need of the insulation monitoring in case of an ungrounded control circuit is not the danger of an indirect contact but the risk of a malfunctioning of a control circuit (example : an emergency pushbutton)..
For that reason, even in case of a Class 2 low-voltage control circuit (safe in case of indirect contacts), the insulation monitoring is still needed, I think.

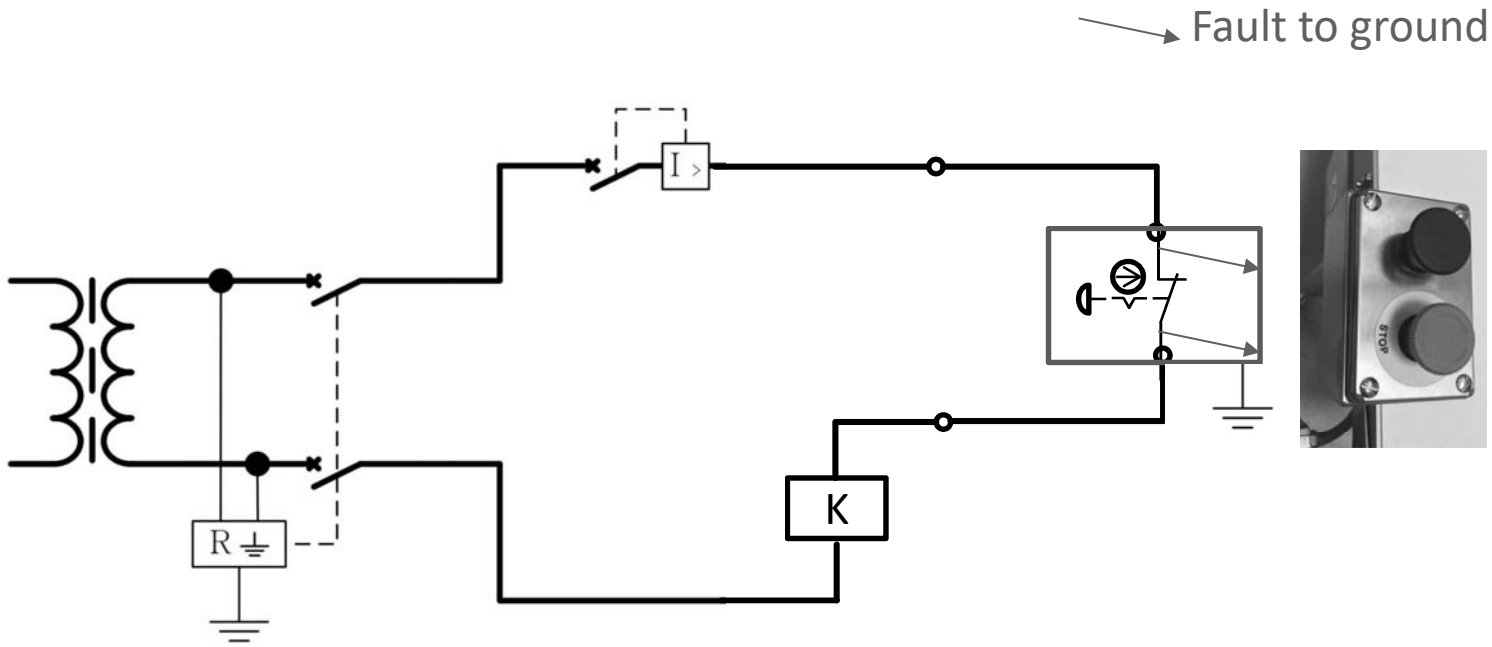
Submitter Information Verification

Submitter Full Name: Marco Tacchini
Organization: GT Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 07:42:09 EST 2019
Committee: EEI-AAA

Protection against ground fault of the control circuit

NFPA 79. article 8.3.2

In case of a double fault to ground inside the emergency box, the emergency pushbutton becomes inactive even in case it is activated.



In order to avoid that risc, an insulation monitoring is always needed

Public Input No. 46-NFPA 79-2019 [Section No. 9.1.1]

9.1.1 Control Circuit Supply.

9.1.1.1

Where control circuits are supplied from an ac source, control transformers shall be used for supplying the control circuits. Control circuits shall not be derived from autotransformers. Control circuits supplied from windings of multiwinding power transformers shall be permitted if the output voltage of the winding supplying the control circuit does not exceed 120 volts ac and the available short-circuit current does not exceed 1000 amperes rms.

9.1.1.2

Where dc control circuits are connected to the equipment grounding circuit, they shall be supplied from a separate winding of the ac control circuit transformer or by another control circuit transformer or a listed dc power supply.

9.1.1.3

Transformers shall not be required if the supply voltage does not exceed 120 volts ac and the available short-circuit current does not exceed 1000 amperes rms.

9.1.1.4

The source of supply for all control circuits shall be taken from the load side of the supply disconnecting means.

Exception: Control circuits meeting the requirements of excepted circuits in 5.3.5.1(4) shall be permitted to be taken from the line side of the supply disconnecting means or other power source.

~~9.1.1.5~~ –

The marking requirements of 16.2.4 shall apply.

Statement of Problem and Substantiation for Public Input

It appears that the requirement in 9.1.1.5 was intended to be a second sentence in the Exception in 9.1.1.4

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 09:49:37 EST 2019
Committee: EEI-AAA

Public Input No. 85-NFPA 79-2019 [Section No. 9.1.1.1]

9.1.1.1

Where control circuits are supplied from an ac source, control transformers shall be used for supplying the control circuits. Control circuits shall not be derived from autotransformers. Control circuits supplied from windings of multiwinding power transformers shall be permitted if the output voltage of the winding supplying the control circuit does not exceed 120 volts ac and the ~~available short-circuit~~ available fault current does not exceed 1000 amperes rms.

Statement of Problem and Substantiation for Public Input

This corrects the term available short-circuit current to available fautl current as now proposed as a defined term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 81-NFPA 79-2019 [New Section after 3.3.44]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton's Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:15:27 EST 2019
Committee: EEI-AAA

Public Input No. 86-NFPA 79-2019 [Section No. 9.1.1.3]

9.1.1.3

Transformers shall not be required if the supply voltage does not exceed 120 volts ac and the ~~available short-circuit current~~ available fault current does not exceed 1000 amperes rms.

Statement of Problem and Substantiation for Public Input

This proposal corrects the term available short-circuit current to available fault current. This correlates with the proposed added defintion.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 81-NFPA 79-2019 [New Section after 3.3.44]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton's Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:17:10 EST 2019
Committee: EEI-AAA

Public Input No. 95-NFPA 79-2019 [New Section after 9.2.3.4]

TITLE OF NEW CONTENT

Add new sections following 9.2.3.4

9.2.3.4.5 To reduce the risk of unintentional contact with a live or moving part, industrial machinery shall be provided with appropriate mechanical barriers or curtains.

Exception: Barriers or curtains shall not be required on locations of industrial machinery marked to warn of the risk of injury or electric shock related to unintentional contact with a live or moving part.

9.2.3.4.6 Factors to be considered in determining whether a barrier, curtain, or marking is appropriate to address a particular risk of injury or electric shock shall include:

a) The electrical potential of the live part;
b) The sharpness and speed of the moving part; and
c) The likelihood of unintentional contact.

Statement of Problem and Substantiation for Public Input

While electrical risks are clearly addressed via prescriptive requirements, mechanical and other hazards are not readily referenced. These sections will provide guidance in applying requirements for guards and interlocks for potential mechanical hazards.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 20:54:11 EST 2019
Committee: EEI-AAA

Public Input No. 64-NFPA 79-2019 [Section No. 9.2.5.3.1]

9.2.5.3.1 *

Category 0, Category 1, and/or Category 2 stops shall be provided ~~as determined~~ on each machine as required with the minimum of at least one stop function. The number of stop functions and their category of the stop shall be deterrmined by the risk assessment and the functional requirements of the machine. Category 0 and Category 1 stops shall be operational regardless of operating modes, and Category 0 shall take priority.

Statement of Problem and Substantiation for Public Input

The current wording in section 9.2.5.3.1 may be interpreted to permit a control system with a stop function if it can be justified by the risk assessment. I believe the original intent of the current wording was to require at least on stop function, but permit a selection of stop category of 0, 1, or 2 as justified by the risk assessment.

Submitter Information Verification

Submitter Full Name: Gil Dominguez
Organization: Pilz Automation Safety
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 11:29:12 EST 2019
Committee: EEI-AAA

Public Input No. 66-NFPA 79-2019 [Section No. 9.2.5.4 [Excluding any Sub-Sections]]

The machine shall be equipped with an emergency stop function when it is deemed an essential limiting harm to personnel in emergency situation. An emergency stop function is warranted when one or more or the following criteria exist.

(1) Hazards and hazardous situation may arise rapidly as in the case of fast moving equipment.

(2) The machine is large and the hazard zones extend beyond an area immediately accessible by one person, e.g. length exceeds 10 meters.

(3) The complexity of the machine involves multiple motions, actuators, motors, etc.

(4) The machine hazard zones are not completely within view from a single vantage point.

(5) There are motions accessible that are deemed low risk, but still have the potential for causing harm, e.g. product moving on roller conveyor.

(6) There are multiple workstations and/or multiple personnel involved in the normal production operation.

(7) The complexity of the stop function involves multiple complex electronic technologies and/or the coordination of multiple control functions where the potential failure of a normal stop function lowers the circuit performance below PLr=c.

Emergency operation requirements are as follows:

(1) This section specifies the requirements for the emergency stop and the emergency switching-off functions of the emergency operations, both of which are initiated by a single human action.

(2) Once active operation of an emergency stop *(see Section 10.7)* or emergency switching off *(see Section 10.8)* actuator has ceased following a command, the effect of this command shall be sustained until it is reset. This reset shall be possible only at that location where the command has been initiated. The reset of the command shall not restart the machinery but only permit restarting.

(3) It shall not be possible to restart the machinery until all emergency stop commands have been reset. It shall not be possible to reenergize the machinery until all emergency switching off commands have been reset.

Statement of Problem and Substantiation for Public Input

The NFPA 79 standard does not provide sufficient criteria to determine when the controls engineer should include an emergency stop function. By default, most complex systems do include it, but clear guidance is necessary.

Submitter Information Verification

Submitter Full Name: Gil Dominguez
Organization: Pilz Automation Safety
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 11:41:09 EST 2019
Committee: EEI-AAA

Public Input No. 19-NFPA 79-2018 [Section No. 9.2.5.4.1.3]

9.2.5.4.1.3

The emergency stop shall function as either a Category 0 or a Category 1 stop *(see 9.2.2)*. The choice of the category of the emergency stop shall be determined by the risk assessment of the machine.

Exception: In some cases, to avoid creating additional risks, it can be necessary to perform a controlled stop and maintain the power to machine actuators even after stopping is achieved. The stopped condition shall be monitored and upon detection of failure of the stopped condition, power shall be removedwithout creating a hazardous situation.

Statement of Problem and Substantiation for Public Input

Based on advancement of functional safety technology in the area of safe motion and braking, a category 2 stop may be appropriate. Also, the exception will align with IEC 60204.

Submitter Information Verification

Submitter Full Name: Robert Gruendel
Organization: Dematic
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 21 06:51:53 EST 2018
Committee: EEI-AAA

Public Input No. 48-NFPA 79-2019 [Section No. 9.2.5.4.1.3]

9.2.5.4.1.3

The emergency stop shall function as either a Category 0 or a Category 1 stop *(see 9.2.2)*. The choice of the category of the emergency stop shall be determined by the risk assessment of the machine.

Exception: In some cases, to avoid creating additional risks, it can be necessary to perform a controlled stop and maintain the power to machine actuators even after stopping is achieved (Category 2 stop). The stopped condition shall be monitored and upon detection of failure of the stopped condition, power shall be removed without creating a hazardous situation.

Statement of Problem and Substantiation for Public Input

The proposed exception aligns with changes in IEC 60204-1 Ed. 6 to address the need, in some cases, to maintain control after an emergency stop to avoid additional hazards.

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 09:54:41 EST 2019
Committee: EEI-AAA

Public Input No. 14-NFPA 79-2018 [Section No. 9.2.7.2.2]

9.2.7.2.2

~~Where necessary~~ When a machine has multiple control zones and/or operator stations , means shall be provided so that the machine can be controlled only from operator control station(s) in one or more predetermined zones or locations.

Statement of Problem and Substantiation for Public Input

It was unclear when 9.2.7.2.2 should be applied. In discussions with NFPA engineers (case 230388), it was determined that this section was to be applied to machines with multiple control zones, but there was no direct mention of this in the code or handbook.

Submitter Information Verification

Submitter Full Name: Michael Krum
Organization: Celestica
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 07 12:43:19 EST 2018
Committee: EEI-AAA

Public Input No. 106-NFPA 79-2019 [Section No. 10.2.3.1]

10.2.3.1

A legend shall be provided for each operator interface device to identify its function and shall be located so that it can be easily read by the machine operator from the normal operator position. The legends shall be durable and suitable for the operating environment.

Exception No.1 : ~~Emergency~~ Emergency stop devices require no legend if they meet the requirements of 10.7.3.

Exception No.2 : Operator interface devices require no legend if they are identified by a symbol in accordance with an International Standard, such as ISO 7000 or IEC60417.

Statement of Problem and Substantiation for Public Input

Section 10.2.3 does not permit an operator interface device to identify its function with a symbol. Following this requirement would result in multiple languages being needed on an HMI display for machines designed for global markets. The display of the HMI would be unnecessarily cluttered and confusing. The European Machinery Directive, 2006/42/EC, Clause 1.7.1 recommends information and warnings for users to be provided in the form of readily understandable symbols or Pictograms. Additionally, IEC 60204-1, Clause 16.3 permits the use of symbols. The added exception would provide an alternative means of identifying the function of an operator interface device.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:27:56 EST 2019
Committee: EEI-AAA

Public Input No. 78-NFPA 79-2019 [Section No. 10.3.3]

10.3.3 * Colors.

Indicator lights and icons of color graphic interface devices shall be color-coded with respect to the condition (status) of the machine in accordance with Table 10.3.3. Alternative purposes shall be permitted to indicate machine or process status.

Table 10.3.3 Machine Indicator Lights and Icons

	Purposes		
Color	**Safety of Persons or Environment**	**Condition of Process**	**State of Equipment**
RED			
~~Danger~~			
Safe	Emergency	Faulty	
YELLOW (AMBER)	Warning/ Caution	Abnormal	Abnormal
GREEN			
~~Safe~~			
Danger	Normal	Normal	
BLUE	Mandatory action		
CLEAR WHITE	No specific meaning assigned		
GRAY			
BLACK			

Statement of Problem and Substantiation for Public Input

I've worked around industrial automation equipment for the past 40 years. I've consulted others with the same background. While light colors are a highly debated topic amongst some, never in my or my colleagues history have any of us considered a Red indicator to be 'Danger' and Green to be 'Safe' in terms of Safety of Persons or environment. In fact it is quite the opposite. If an Estop is Red and is lit the machine is in a stopped state and therefore deemed 'safe' since EStops typically de-energize some type of safety relay, while a green light indicates a normal or running condition which is NOT a safe state. For example, a normal start/stop station for a motor would consist of a Green start pushbutton and a Red stop pushbutton. When the motor is started the green light comes on and when stopped the red light is on. You wouldn't consider a green light on being a safe state on a running motor would you? We were astounded by table 10.3.3 color green showing process condition as normal and state of equipment as normal with the safety of persons/environment being listed as 'Safe'? This is completely counter-intuitive and certainly not indicative of any machine or equipment I've ever been exposed to. While lights colors can be subjective and chosen to represent what they define, this table only serves to cause further confusion and, in my opinion, is a dangerous guide. I'm hoping that this was simply a typo. Even traffic lights follow a similar color code logic. Green means traffic is moving (going, running, in motion) while Red is stopped (not moving, not running) and no one can get hurt if traffic is stopped. Yellow, of course, is caution.

Submitter Information Verification

Submitter Full Name: Chip Stacy

Organization:	Abbvie
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jan 03 14:41:28 EST 2019
Committee:	EEI-AAA

Public Input No. 96-NFPA 79-2019 [New Section after 10.7.1.2]

TITLE OF NEW CONTENT

Add new section:

10.7.1.3 Emergency stop pushbuttons shall be Listed.

Statement of Problem and Substantiation for Public Input

Emergency stop pushbuttons perform a critical function in machine operation. They are evaluated for electrical performance like ordinary pushbuttons, but are additionally evaluated for mechanical performance using the requirements of UL 60947-5-5. Many pushbuttons are advertised as being suitable for emergency stop applications, but have not been subjected to the rigorous requirements of UL 60947-5-5. Requiring listed emergency stop pushbuttons would insure that these devices are able to provide a necessary critical function.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 21:15:51 EST 2019
Committee: EEI-AAA

Public Input No. 68-NFPA 79-2019 [Sections 12.3.2, 12.3.3]

~~**Sections 12.3.2, 12.3.3**~~

~~**12.3.2** –~~

~~The average and the minimum thickness of the insulation in constructions A and B shall be in accordance with Table 12.3.2 .~~

~~Table 12.3.2 Thickness of Single Conductor Insulation (mils)~~

~~A B Wire Size~~

~~(AWG or kcmil) Average/~~

~~Minimum Average/~~

~~Minimum~~

~~(Jacket) 22 AWG 30/27 15/13(4) 20 30/27 15/13(4) 18 30/27 15/13(4) 16 30/27 15/13(4) 14 30/27 15/13(4) 12 30/27 15/13(4) 10 30/27 20/18(4) 8 45/40 30/27(5) 6 60/54 30/27(5) 4–2 60/54 40/36(6) 1–4/0 80/72 50/45(7) 250–500 kcmil 95/86 60/54(8) 550–1000 110/99 70/63(9)~~

~~A: No outer covering. B: Nylon covering.~~

~~*Source:* UL 1063, Table 1.1, *NEC* Construction.~~

~~**12.3.3** –~~

~~Construction B shall have a nylon jacket applied directly over the insulation. The jacket shall be snug on the insulation and shall be at least as thick as indicated in Table 12.3.2 .~~

Statement of Problem and Substantiation for Public Input

There's no reference to Construction A or Construction B (or definition of) in this document outside 12.3.2, 12.3.3, Table 12.3.2 or 12.4.1. Where is it applicable?

Submitter Information Verification

Submitter Full Name: Mike Soter
Organization: SDK Engineering, LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:32:02 EST 2019
Committee: EEI-AAA

Public Input No. 3-NFPA 79-2018 [Section No. 12.4]

12.4 ~~Wire~~ _ Conductor Markings.

12.4.1

A durable legend printed on the outer surface of the insulation of construction A, on the outer surface of the nylon jacket of construction B, on the outer surface of the insulation under the jacket of construction B (only if readable through the nylon), or on the outer surface of the jacket of a multiconductor cable shall be repeated at intervals of no more than 610 mm (24 in.) throughout the length of the single-conductor or the multiconductor cable.

Exception: Sizes smaller than 16 AWG shall be permitted to be marked on the reel or on the smallest unit of the shipping carton.

12.4.2*

The legend shall include the manufacturer's name or trademark, wire type, voltage rating (where permitted by *NFPA 70*), and gauge or size.

12.4.3

Where the conductor is 16 through 10 AWG and the stranding is intended for flexing service, the legend shall include “flexing” or “Class K.”

12.4.4

~~Wire~~ Conductor insulation shall be identified and adequate for the voltage on that conductor.

Statement of Problem and Substantiation for Public Input

Change the term "wire" to "conductor."

Submitter Information Verification

Submitter Full Name: Matt Egloff
Organization: Montana Tech, University of Montana
Affiliation: Representing self.
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 21 13:10:19 EDT 2018
Committee:

Public Input No. 50-NFPA 79-2019 [Section No. 12.5.5]

12.5.5

Where ampacity correction for ambient temperature correction for other than 30°C (86°F) or adjustment for more than three current-carrying conductors in a raceway or cable is required, the factor(s) shall be taken from Table 12.5.5(a) and Table 12.5.5(b). Sizing of conductors within control enclosures in wiring harnesses or wiring channels shall be based on the ampacity in cable or raceway. These factors shall apply to Class 1 control conductors, Article 725 of *NFPA 70* only if their continuous load exceeds 10 percent of the conductor ampacity.

Exception: The provisions of 376.22 of NFPA 70 shall be permitted to be applied for conductors in metal wireways.

Table 12.5.5(a) Ambient Temperature Correction Factors

For ambient temperatures other than 30°C (86°F), multiply the allowable ampacity by the appropriate factor shown below.

Ambient Temperature (°C)	Correction Factor 60°C	Correction Factor 75°C	Correction Factor 90°C
21–25	1.08	1.05	1.04
26–30	1.00	1.00	1.00
31–35	0.91	0.94	0.96
36–40	0.82	0.88	0.91
41–45	0.71	0.82	0.87
46–50	0.58	0.75	0.82
51–55	0.41	0.67	0.76
56–60	—	0.58	0.71
61–70	—	0.33	0.58
71–80	—	—	0.41

Table 12.5.5(b) Adjustment Factors for More Than Three Current-Carrying Conductors in a Raceway or Cable

Number of Current-Carrying Conductors	Percent of Values in Table 12.5.5(a) as Adjusted for Ambient Temperature if Necessary
4–6	80
7–9	70
10–20	50
21–30	45
31–40	40
41 and above	35

Statement of Problem and Substantiation for Public Input

The proposed text adds an exception to permit use of the 376.22 of NFPA70 as an option for determining conductor ampacity adjustments when using metal wireways.

Although TerraView underlined the text in the tables, no proposed changes are part of this public input.

Submitter Information Verification

Submitter Full Name: Jay Tamblingson

Organization:	Rockwell Automation
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 02 10:33:15 EST 2019
Committee:	EEI-AAA

Public Input No. 93-NFPA 79-2019 [Section No. 13.1.2.2]

13.1.2.2

Mating molded ~~nylon~~ connectors using crimped terminations shall not be considered a splice or a joint when used or contained in an enclosure, machine compartment, or conduit body.

Statement of Problem and Substantiation for Public Input

Restricting this prohibition to only connectors incorporating nylon material seems unjustified. There are many materials having electrical and mechanical characteristics which are inferior to nylon. It would seem that the requirement, if justified, should apply to all molded connectors or, if no longer justified, be removed in its entirety. This PI proposes to delete "nylon" so that the requirement applies to all molded connectors.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 94-NFPA 79-2019 [Section No. 13.1.2.2]	
Public Input No. 94-NFPA 79-2019 [Section No. 13.1.2.2]	

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 19:52:14 EST 2019
Committee: EEI-AAA

Public Input No. 94-NFPA 79-2019 [Section No. 13.1.2.2]

~~13.1.2.2~~ –

~~Mating molded nylon connectors using crimped terminations shall not be considered a splice or a joint when used or contained in an enclosure, machine compartment, or conduit body.~~

Statement of Problem and Substantiation for Public Input

Restricting this prohibition to only connectors incorporating nylon material seems unjustified. There are many materials having electrical and mechanical characteristics which are inferior to nylon. It would seem that the requirement, if justified, should apply to all molded connectors or, if no longer justified, be removed in its entirety. This PI proposes to delete the requirement in its entirety.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 93-NFPA 79-2019 [Section No. 13.1.2.2]	
Public Input No. 93-NFPA 79-2019 [Section No. 13.1.2.2]	

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 20:31:48 EST 2019
Committee: EEI-AAA

Public Input No. 23-NFPA 79-2018 [Section No. 13.2.3.2]

13.2.3.2

The use of other colors for the following applications shall be as follows:

(1) WHITE with BLUE stripe for grounded (current-carrying) dc circuit conductor

(2) WHITE with ORANGE stripe for grounded (current-carrying) ~~ac circuit conductor~~ conductor , which remains energized when the main supply circuit disconnecting means is in the off position

(3) Whichever color stripe is selected, that color stripe shall be consistent with the ungrounded conductor of the excepted circuit described in 5.3.5.

Exception No. 1: Multiconductor cables shall be permitted to be permanently reidentified at the time of installation.

Exception No. 2: Where the identification of machine power and control wiring is such that compliance with the mandatory color codes is too restrictive for specific applications, it shall be permitted to use additional identification at selected locations as an alternative. This means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted on the inside of the main electrical control panel enclosure in a visible location.

Statement of Problem and Substantiation for Public Input

13.2.3.2 White with orange stripe should not be limited to AC,

Submitter Information Verification

Submitter Full Name: Robert Gruendel
Organization: Dematic
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 21 08:32:47 EST 2018
Committee: EEI-AAA

Public Input No. 21-NFPA 79-2018 [Section No. 13.2.4.1]

13.2.4.1*

The color ORANGE with RED stripe shall be used to identify ungrounded AC conductors and ORANGE with BLUE stripe shall be used to identify ungrounded DC conductors that remain energized when the main supply circuit disconnecting means is in the off position. This color identification shall be strictly reserved for this application only.

Exception No. 1: Internal wiring on individual devices purchased completely wired

Exception No. 2: Where the insulation used is not available in the colors required (e.g., high temperature insulation, chemically resistant insulation)

Statement of Problem and Substantiation for Public Input

13.2.4.1 Orange does not differentiate AC or DC.

I propose changing to orange with red stripe for AC and orange with blue stripe for DC.

Submitter Information Verification

Submitter Full Name: Robert Gruendel
Organization: Dematic
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 21 08:26:57 EST 2018
Committee: EEI-AAA

Public Input No. 22-NFPA 79-2018 [Section No. 13.2.4.1]

13.2.4.1*

The color ORANGE shall be used to identify ungrounded AC conductors, at 50V or greater, that remain energized when the main supply circuit disconnecting means is in the off position. This color identification shall be strictly reserved for this application only.

Exception No. 1: Internal wiring on individual devices purchased completely wired

Exception No. 2: Where the insulation used is not available in the colors required (e.g., high temperature insulation, chemically resistant insulation)

Statement of Problem and Substantiation for Public Input

13.2.4.1 Orange does not differentiate AC or DC nor that the voltage is hazardous.

I propose changing to orange for AC hazardous voltage.

Submitter Information Verification

Submitter Full Name: Robert Gruendel
Organization: Dematic
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 21 08:29:46 EST 2018
Committee: EEI-AAA

Public Input No. 61-NFPA 79-2019 [Section No. 13.5.1.1]

13.5.1.1

Raceways, factory elbows and couplings, and associated fittings shall meet the applicable requirements of section 13.5 or be listed, and shall be identified for the environment.

~~Exception: Raceways fabricated as part of the machine that comply with the requirements of 13.5.6 shall not be required to be listed.~~

Statement of Problem and Substantiation for Public Input

The requirement of 13.5.1.1 is overly restrictive by requiring listing for all raceways, with the only exception of wireways manufactured as part of the machine only. Raceways is a much wider category than wireways and it is not reasonable to set a listing requirement for all such machine parts. Additionally design requirements are listed in section 13.5 for those parts, which set sufficient rules for acceptance.

Submitter Information Verification

Submitter Full Name: Andras Szende
Organization: TUV Rheinland of North America
Affiliation: Committee member
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 22:39:42 EST 2019
Committee: EEI-AAA

Public Input No. 29-NFPA 79-2018 [Section No. 15.2.1.3]

15.2.1.3

The conductors to ~~stationary lights~~ stationary luminaires used as an integral part of the machine shall be Type MTW, and the conductors within ~~the fixtures~~ the luminaires shall be not smaller than 18 AWG.

Statement of Problem and Substantiation for Public Input

The term “luminaire” is used in the NEC (since the 2002 edition) and internationally to refer to lighting products. Replacing the term “Lights” and “fixtures” with “luminaire” will be consistent with other NFPA documents and industry terminology.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 30-NFPA 79-2018 [Section No. 15.2.4]	

Submitter Information Verification

Submitter Full Name: Kelly Nicolello
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Wed Dec 26 12:21:23 EST 2018
Committee: EEI-AAA

Public Input No. 115-NFPA 79-2019 [Section No. 15.2.2.1]

15.2.2.1

The lighting circuit voltage shall not exceed 150 volts between conductors.

Exception: Lighting systems designed for use at voltages greater 150 v shall be permitted where listed and installed according to the manufacturer's instructions.

Statement of Problem and Substantiation for Public Input

The exception would allow for installations of lighting where the supply is greater than 150 volts.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:50:05 EST 2019
Committee: EEI-AAA

Public Input No. 30-NFPA 79-2018 [Section No. 15.2.4]

15.2.4 Lighting ~~Fixtures~~ Luminaires .

15.2.4.1

~~Adjustable lighting fixtures~~ Adjustable luminaires shall be suitable for the physical environment.

15.2.4.2

The lampholders shall be as follows:

(1) Rated for the voltage and wattage of the lamp

(2) Constructed with an insulating material protecting the lamp so as to prevent unintentional contact

15.2.4.3

Reflectors and protectors shall be supported by a bracket and not the lampholder.

Statement of Problem and Substantiation for Public Input

The term “luminaire” is used in the NEC (since the 2002 edition) and internationally to refer to lighting products. Replacing the term “Lights” and “fixtures” with “luminaire” will be consistent with other NFPA documents and industry terminology.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 29-NFPA 79-2018 [Section No. 15.2.1.3]	

Submitter Information Verification

Submitter Full Name: Kelly Nicolello
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Wed Dec 26 12:23:37 EST 2018
Committee: EEI-AAA

Public Input No. 16-NFPA 79-2018 [New Section after 16.1.2]

TITLE OF NEW CONTENT

Where fuses are used, the replacement values shall be marked in a manner that is readily viewable to the user and is of sufficient durability to withstand the physical environment involved.

Statement of Problem and Substantiation for Public Input

All too often the information about the type and rating of fuses used in machinery is missing. Ensuring a durable marking is provided will help ensure that the proper size and rating of fuses are maintained. The required documentation in chapter 17 does not provide clear guidance on replacement of fuses.

Submitter Information Verification

Submitter Full Name: Christine Porter
Organization: Intertek Testing Services
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 28 18:00:10 EST 2018
Committee: EEI-AAA

Public Input No. 4-NFPA 79-2018 [New Section after 16.2.3.2]

16.2.3.3 Excessive Use of Safety Signs

The number of safety signs on equipment shall be limited to three unless otherwise required by the authority having jurisdiction.

Additional Proposed Changes

File Name	Description	Approved
too_many_safety_signs_example.pdf	This is a machine owned by MT Tech. I have obscured the name of the manufacturer. In consultation with our OSH department and others, there is general agreement that so many warnings are "information overload" and an operating will likely ignore them all!	

Statement of Problem and Substantiation for Public Input

I attached a picture of a machine that we own. It has almost as many safety warning stickers as a NASCAR car has advertising stickers! The picture is taken from a lecture presentation in a course that I teach, and the next slide in this presentation (not provided to NFPA) shows a picture of a NASCAR car for comparison.

With over 30 safety sign stickers (!!!) on this machine, there is, in my opinion and in the opinion of some of those in our Occupational Safety and Health department, and others, just too much information to process. An operator would likely be overwhelmed and ignore all of these stickers.

I propose a hard number of no more than three (3) safety warning stickers unless otherwise required. I believe that we need a hard limit, not an ambiguous suggestion of "avoid using too many." Put the most important safety stickers on and condense the hazards that the operator's attention is drawn to. The manual and training should cover the details. This machine may as well have the safety pages from its manual pasted to its exterior.

I have obscured the manufacturer's name and it is not my intent to single them out. This is just one of many overly safety stickered pieces of equipment that I have seen.

I have not found any "hard rule" on how many safety stickers constitutes information overload, nor any peer reviewed papers on the subject. Three (3) is an arbitrary proposed limit suggested by me.

Submitter Information Verification

Submitter Full Name: Matt Egloff
Organization: Montana Tech, University of Montana
Affiliation: Representing myself
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 21 13:15:18 EDT 2018
Committee:

Public Input No. 25-NFPA 79-2018 [Section No. 16.4.1]

16.4.1

Control equipment shall be legibly and durably marked in a way that is visible after the equipment is installed. A nameplate giving the following information shall be attached to the outside of the enclosure, or on the machine immediately adjacent to the enclosure:

(1) Name or trademark of supplier

(2) Model, serial number, or other designation

(3) * Rated voltage, number of phases and frequency (if ac), and full-load current for each supply

(4) Ampere rating of the largest motor or load

(5) Maximum ~~ampere~~ short circuit current rating of the main short-circuit and ground-fault protective device, where provided

(6) Short-circuit current rating of the industrial control panel

(7) Electrical diagram number(s) or the number of the index to the electrical drawings

Statement of Problem and Substantiation for Public Input

16.4.1 requirement (5) is not clear. The proposed change would clarify the requirement.

Submitter Information Verification

Submitter Full Name: Robert Gruendel
Organization: Dematic
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 21 08:53:40 EST 2018
Committee: EEI-AAA

Public Input No. 57-NFPA 79-2019 [Section No. 18.6]

18.6 Functional Tests.

The functions of electrical equipment, particularly those related to safety and safeguarding, shall be tested and documented .

Statement of Problem and Substantiation for Public Input

This wording will go inline with the ISO 13849 wording, it is known that the actions of validating are being done but they are not documenting it. This will ensure that this process is being done and proof is available.

Submitter Information Verification

Submitter Full Name: Dino Mariuz
Organization: Pilz Automation Safety L.P.
Affiliation: Pilz Automation Safety
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 21:05:34 EST 2019
Committee: EEI-AAA

Public Input No. 112-NFPA 79-2019 [Section No. 19.1 [Excluding any Sub-Sections]]

~~Overload~~ _ _ Overcurrent _ protection shall be provided for each motor.

Statement of Problem and Substantiation for Public Input

"Overcurrent" is the correct term in this clause.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:45:19 EST 2019
Committee: EEI-AAA

Public Input No. 82-NFPA 79-2019 [Section No. 19.1 [Excluding any Sub-Sections]]

~~Overload protection shall be provided for each motor.~~

Statement of Problem and Substantiation for Public Input

Delete text as the requirement is a duplicate of 19.1.2

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:09:02 EST 2019
Committee: EEI-AAA

Public Input No. 87-NFPA 79-2019 [Section No. A.3.3.75]

A.3.3.75 Overcurrent Protective Device, Supplementary.

Supplementary overcurrent protective devices are not general use devices, as are branch circuit devices, and must be evaluated for appropriate application in every instance where they are used. Supplementary overcurrent protective devices are extremely application oriented, and prior to applying the devices, the differences and limitations for these devices must be investigated. Such a device is allowed to be incomplete in construction or restricted in performance. Such a device is not suitable for branch circuit protection and is not used where branch circuit protection is required.

One example of differences and limitations is that a supplementary overcurrent protective device could have spacing, creepage, and clearance that are considerably less than those of a branch circuit overcurrent protective device.

Example: A supplemental protector, listed to UL 1077, has spacings that are 9.5 mm (0.375 in.) through air and 12.7 mm (0.5 in.) over surface. A branch circuit–rated UL 489 molded-case circuit breaker has spacings that are 19.1 mm (0.75 in.) through air and 31.8 mm (1.25 in.) over surface.

Another example of differences and limitations is that branch circuit overcurrent protective devices have standard overload characteristics to protect branch circuits and feeder conductors. Supplementary overcurrent protective devices do not have standard overload characteristics and could differ from the standard branch circuit overload characteristics. Also, supplementary overcurrent protective devices have interrupting ratings that can range from 32 amperes to 100,000 amperes. When supplementary overcurrent protective devices are considered for proper use, it is important to be sure that the device's interrupting rating equals or exceeds the available ~~short-circuit~~ fault current and that the device has the proper voltage rating for the installation (including compliance with slash voltage rating requirements, if applicable).

Examples of supplemental overcurrent protective devices include, but are not limited to, those listed to the following:

(1) UL 248-14

(2) UL 1077

Statement of Problem and Substantiation for Public Input

This proposal corrects the term available short-circuit current to available fault current. This correlates with the proposed added defintion.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 81-NFPA 79-2019 [New Section after 3.3.44]	

Submitter Information Verification

Submitter Full Name: Daniel Neeser
Organization: Eaton’s Bussmann Division
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 16:23:17 EST 2019
Committee: EEI-AAA

Public Input No. 38-NFPA 79-2019 [Section No. A.3.3.79]

A.3.3.79 Programmable Electronic System (PES).

This term includes all elements in the system extending from sensors to other input devices via ~~data highways~~ field bus or other communication paths to the machine actuators or other output devices.

Statement of Problem and Substantiation for Public Input

Updated note to reflect current field bus terminology and to align with the definition of machine actuator.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 34-NFPA 79-2019 [Section No. 3.3.4]	
Public Input No. 35-NFPA 79-2019 [Section No. 3.3.79]	

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 07:49:03 EST 2019
Committee: EEI-AAA

Public Input No. 54-NFPA 79-2019 [Section No. A.4.5.2]

A.4.5.2

The electrical interferences generated by the equipment itself should not exceed levels specified in the relevant equipment standards and others dealing with electromagnetic compatibility (EMC) levels. The levels allowed should be determined for the specific application.

Generated interference signals can be kept to a minimum by the following:

(1) Suppression at the source by using capacitors, inductors, diodes, Zener diodes, varistors, or active devices, or a combination of these

(2) Equipment screening in a bonded electrically conductive enclosure to provide segregation from other equipment

Undesirable effects of electrostatic discharge, radiated electromagnetic energy, and supply conductor (mains borne) interference should be avoided (e.g., use of appropriate filters and time delays, choice of certain power levels, suitable wiring types and practices).

The effects of interference on equipment can be reduced by the following:

(1) *Use of surge protective devices and filters.* The installation of surge protection devices and/or filters for equipment sensitive to electromagnetic influences is recommended to improve electromagnetic compatibility with regard to conducted electromagnetic phenomena

(2) *Reference potential circuit or common connections.* Each common connection treated as a single circuit and connected to one of several central reference points that are connected to ground (wired to earth) by insulated conductors of large cross-sectional area.

(3) *Frame connections.* In each piece of equipment all frame connections are to be taken to a common point with a conductor of large cross-sectional area (e.g., braided conductors, foil strips having a width much greater than the thickness) used between slides and enclosures. The connections to the frame are to be as short as possible.

(4) *Transmission of signals.* Electrostatic screens, electromagnetic shields, twisted conductors, and orientation (i.e., crossing cable runs at as near to 90 degrees as practicable) as necessary to ensure that the low level signal wiring is not affected by interference from control or power cables, or running the connections parallel to the ground plane as necessary.

(5) *Separation of equipment.* Separating and/or shielding sensitive equipment (e.g., units working with pulses and/or at low signal levels) from switching equipment (e.g., electromagnetic relays, thyristors); separation of low level signal wiring from control and power cables.

(6) *Electromagnetic disturbances.* Measures to limit the generation of electromagnetic disturbances — that is, conducted and radiated emissions — include the following:

(7) Power supply filtering

(8) Cable shielding

(9) Enclosures designed to minimize RF radiation

(10) RF suppression techniques.

(11) *Enhance immunity.* Measures to enhance the immunity of the equipment against conducted and radiated RF disturbance using the designs of a functional bonding system include the following:

(12) Connection of sensitive electrical circuits to the chassis. Such terminations should be marked or labeled with the IEC Symbol 5020 from IEC 60417-1. *[See Figure A.4.5.2(a) .]*

(13) Connection of the chassis to earth (PE) using a conductor with low RF impedance and as short as practicable.

(14) Connection of sensitive electrical equipment or circuits directly to the PE circuit or to a functional earthing conductor (FE), to minimize common mode disturbance. This latter terminal should be marked or labeled with the IEC Symbol 5018 from IEC 60417. *[See Figure A.4.5.2(b) .]*

(15) Separation of sensitive circuits from disturbance sources.

(16) Enclosures designed to minimize RF transmission.

(17) EMC wiring practices as follows:

(18) Using twisted conductors to reduce the effect of differential mode disturbances

(19) Keeping distance between conductors emitting disturbances and sensitive conductors

(20) Using cable orientation as close to 90°as possible when cables cross

(21) Running the conductors as close as possible to the ground plane

(22) Using electrostatic screens and/or electromagnetic shields with a low RF impedance termination

Figure A.4.5.2(a) Symbol that Represents Functional Equipotential Bonding — IEC Symbol Number 5020.

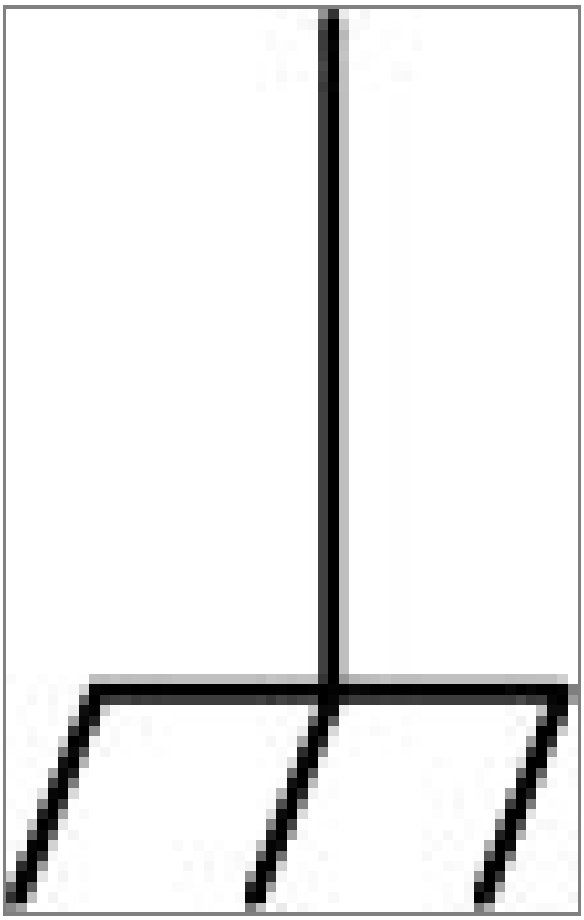
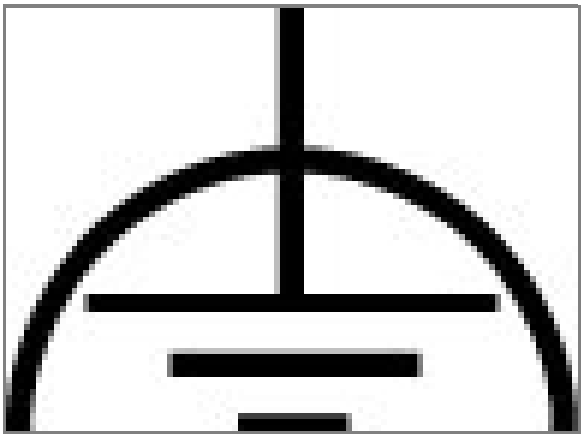


Figure A.4.5.2(b) Symbol that Represents Functional Earthing — IEC Symbol Number 5018.



Statement of Problem and Substantiation for Public Input

Proposed text adds specific reference to use of surge protection and filters to protect against electromagnetic interference. This text is adapted from similar language in IEC 60204-1 Ed. 6 Annex H.

Note that the only proposed change in this public input was to add a new item (1) to the second list regarding electromagnetic interference. Other underlined text not changed but underlined by TerraView editor.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 39-NFPA 79-2019 [Section No. 4.5.2]	
Public Input No. 39-NFPA 79-2019 [Section No. 4.5.2]	

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 15:28:04 EST 2019
Committee: EEI-AAA

Public Input No. 108-NFPA 79-2019 [Section No. A.5.1.1]

A.5.1~~.~~2.1

For large complex machinery comprising a number of widely spaced machines working together in a coordinated manner, more than one machine supply circuit might be needed, depending upon the site supply circuit arrangements *(see 5.3.1)*.

Statement of Problem and Substantiation for Public Input

This section is renumbered to correlate with a global PI to reorganize Chapter 5.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 102-NFPA 79-2019 [Global Input]	

Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:37:22 EST 2019
Committee: EEI-AAA

Chapter 5 Disconnecting Means	
5.1 **General**	
5.1.1 **Supply Circuit Conductor Terminations.** All terminals for each supply circuit shall be legibly marked and correspond with markings on the technical documentation.	Formally 5.1.4
5.1.2 **Wire Bending Space.** The wire bending space provided between the terminals of a machine supply circuit disconnecting means, the terminals described in 5.2.2 and the wall of the enclosure shall not be less than required by Section 430.10(B) of NFPA 70. Space shall be determined by the maximum wire size of the supply circuit conductors or not smaller than the conductors required by Section 670.4(A) of NFPA 70. When the wire bending space is based on more than one conductor per phase, the intended conductor size and number shall be so identified on interconnection diagrams as in 17.5.7.	Formally 5.1.5 Added a title
5.1.3* **Grounded Conductor.** Where a grounded conductor is used, it shall be clearly indicated in the technical documentation of the machine, such as in the installation diagram and in the circuit diagram. A separate insulated terminal shall be provided for the grounded conductor.	Stays as 5.1.3 Removed the term “clearly” before “indicated in the first sentence.
5.1.4. **Operating Handle.**	5.~~3~~1.4 Operating Handle Formally 5.3.4
5.1.4.1 The center of the grip of the operating handle of a supply circuit disconnecting means, when in its highest position, shall be not more than 2.0 m (6 ft 7 in.) above the servicing level. A permanent operating platform, readily accessible by means of a permanent stair or ladder, shall be considered the servicing level.	Formally 5.3.4.1 Removed “for the purpose of this requirement from the end of the second sentence.
5.1.4.2 The operating handle of a supply circuit disconnecting means shall meet the following criteria: 1) Be readily accessible with doors in the open or closed position (2) Maintain the environmental rating of the enclosure to the degree necessary for the application when installed through the control enclosure (3) Not be restricted by the enclosure door when the door is in the open position	Formally 5.3.4.2 Removed the reference to 5.3.3.1
5.1.5 **Means for Removal of Power for Prevention of Unexpected Start-Up.**	Formally 5.4 ~~5.4~~ 5.1.5 **Means for Removal of Power for Prevention of Unexpected Start-Up.**

5.1.5.1 Means for removal of power shall be provided when prevention of unexpected start-up is required (e.g., during maintenance where the unexpected start-up of a machine or part of the machine results in a hazardous situation). Such means shall be as follows: (1) Appropriate for the intended use (2) Conveniently located (3) Readily identifiable as to their function and purpose (4) Provided with permanent means for locking in the off position only	Formally 5.4.1
5.1.5.2 Removal of power shall be accomplished by of one of the following: (1) The machine supply circuit disconnecting means (2) Additional devices conforming to 5.2.7 or 5.3.4 (3) Other means (e.g., a contactor switched off by a control circuit) that meet the requirements of 5.1.5.3 and 5.1.5.4	Formally 5.4.2
5.1.5.3 Where other means of removal of power are used, a single failure of any of its components shall not result in an inadvertent or unexpected start-up.	Formally 5.4
5.1.5.4 Other means of removal of power shall be employed only for situations that include the following: (1) Routine exchange of work pieces, fixtures, and tools requiring no significant dismantling of the machine (2) Work on the electrical equipment where all of the following conditions exist: (a) There is no hazard arising from electric shock and burn. (b) The switching off means cannot be negated by the work. (c) The work is of a minor nature (e.g., replacement of plug-in devices without disturbing existing wiring). (d) There is no hazard arising from the unexpected energizing or de-energizing of circuits.	Formally 5.4.4
5.2 **Machine Supply Circuit and Disconnecting Means.**	~~5.1 Machine Supply Circuit Conductor Terminations.~~
5.2.1 **Machine Supply Circuit.** Where practicable, the electrical equipment of a machine shall be connected to a single power supply circuit. Where it is necessary to use another supply circuit for certain parts of the equipment (e.g., electronic circuits, electromagnetic clutches), that supply circuit shall, as far as is practicable, be derived from devices (e.g., transformers, converters) forming part of the electrical equipment of the machine.	Formally 5.1.1 Added title.
5.2.2 **Machine Supply Circuit Conductor Terminations.** The machine supply circuit conductors shall be terminated at the machine supply circuit disconnecting means, where practicable. Connections to terminal blocks ahead of the machine supply circuit disconnecting means shall be permitted for excepted circuits according to 5.2.9 or where the machine supply circuit conductors are other than those identified for the machine supply circuit disconnecting means. Terminals for more than one conductor shall be so identified.	Formally 5.1 Added the term “machine” in four locations and “machine supply circuit” in one location.

5.2.3 **Machine Supply Circuit Conductor Separation.** Each set of machine supply circuit conductors on the line side of the machine supply circuit disconnecting means shall be separated from all other internal conductors, including conductors of other circuits by either of the following: (1) Mounting the machine supply circuit disconnect as near as practicable to the top of the enclosure with dedicated wire bending space as in 5.1.5 (2) Mounting the machine supply circuit disconnect other than at the top of the enclosure and by separating the machine supply circuit conductors from other internal conductors by the use of a barrier	Formally 5.1.6 Added a title and the term “machine” in three locations and “machine supply circuit” in one location
5.2.4 **Protection of Line Side Live Parts.** All live parts on the line side of the machine supply circuit disconnecting means shall be protected from unintentional direct contact by use of insulation or obstacle(s) when the machine supply circuit disconnecting means is in the open (off) position and the enclosure door is open.	Formally 5.1.7 Added a title and the terms “machine” and “machine supply circuit” in one location.
5.2.5* **Machine Supply Circuit Grounding Terminal.** A grounding terminal shall be provided for each supply circuit.	Formally 5.2
5.2.6 **Machine Supply Circuit Disconnecting (Isolating) Means.** The requirements in 5.2.6.1 through 5.2.6.5.4 also apply to 5.2.7 through 5.2.9.	Formally 5.3.1 Removed “general” from the title and first sentence.
5.2.6.1 A machine supply circuit disconnecting means shall be provided for the following: (1) Each supply circuit connecting to a machine (2) Each supply circuit connecting to a feeder system using collector wires, collector bars, slip-ring assemblies, or flexible cable systems (reeled, festooned) to a machine or a number of machines (3) Each on-board power source (e.g., generators, uninterruptible power supplies) *Exception: Communication, remote control, and signaling circuits of less than 50 volts shall not be required to be provided with a machine supply circuit disconnecting means.*	Formally 5.3.1.1 Added the term “machine” in two places.
5.2.6.1* Each machine supply circuit disconnecting means shall be legibly marked to indicate the equipment it disconnects.	Formally 5.3.1.1.1 Added the term “machine” and removed the reference to 5.3.1.1.
5.2.6.2 A machine supply circuit disconnecting means shall be marked as “Machine Supply Circuit Disconnect” if additional disconnecting means are supplied from the supply circuit disconnecting means.	Formally 5.3.1.1.2 Added the term “machine.”

5.2.6.3 Where a machine is supplied by more than one machine supply circuit, a marking shall be installed at each supply circuit disconnect location denoting the location of all other machine supply circuit disconnects.	Formally 5.3.1.1.3
5.2.6.4 The machine supply circuit disconnecting means shall disconnect (isolate) the electrical equipment of the machine, including all control circuits, from the machine supply circuit when required (e.g., for work on the machine, including the electrical equipment). Circuits that are not required to be disconnected by the machine supply circuit disconnecting means shall comply with 5.2.9.	Formally 5.3.1.2 Added the term “machine” in three places.
5.2.6.5 Each machine supply circuit disconnecting means other than attachment plugs and receptacles shall be mounted within the control enclosure or immediately adjacent thereto. *Exception No. 1: Externally mounted machine supply circuit disconnecting means, whether interlocked or not interlocked with the control enclosure, supplying machines totaling 2 hp or less shall be permitted to be mounted up to 6 m (20 ft) away from the control enclosure, provided the control enclosure is marked to indicate the location of the machine supply circuit disconnecting means and the machine supply circuit disconnecting means complies with all the following:* *(1) Is in sight of the control enclosure it supplies* *(2) Is readily accessible* *(3) Is marked in accordance with 5.3.1.1.1* *Exception No. 2: A machine supply circuit disconnecting means mounted in a separate enclosure and interlocked in accordance with 6.2.3.1 with the control enclosure(s) it supplies shall be permitted to be mounted up to 6 m (20 ft) away from the control enclosure, provided the control enclosure is marked to indicate the location of the machine supply circuit disconnecting means and the machine supply circuit disconnecting means complies with all the following:* *(1) Is in sight of the control enclosure it supplies* *(2) Is readily accessible* *(3) Is marked in accordance with 5.2.6.1*	Formally 5.3.1.3 Added the term “machine” in seven places.
5.2.6.5 Each supply circuit disconnecting means mounted within or adjacent to the control enclosure shall be interlocked with the control enclosure. *Exception No. 1: A disconnecting means used only for maintenance lighting circuits within control enclosures shall not be required to be interlocked with the control enclosure. A safety sign shall be provided that meets the requirements of 16.2.4.* *Exception No. 2: A disconnecting means used for power supply circuits within control enclosures to memory elements and their support logic requiring power at all times to maintain information storage shall not be required to be interlocked with the control enclosure doors. A safety sign shall be provided that meets the requirements of 16.2.4.* *Exception No. 3: An interlock for the control enclosure shall not be required where devices other than the handles of circuit breakers or switches are guarded by a dead-front cover and the use of*	Formally 5.3.1.4 The Exceptions No. 1 & 2 were relocated from 6.2.3.1 and the existing exceptions were renumbered as 3 & 4. Added the term “machine” to Ex. No. 4.

a key or tool is necessary for opening the supply circuit disconnecting means enclosure to access exposed live parts. A safety sign shall be provided in accordance with Section 16.2. *Exception No. 4: Where a machine supply circuit disconnecting means supplying machines totaling 2 hp or less is not located within or adjacent to the control enclosure it supplies, the control enclosure shall comply with 6.2.3.1 or 6.2.3.2. Where a supply disconnecting means is an attachment plug and receptacle, the control enclosure it supplies shall comply with 6.2.3.2. Where compliance with 6.2.3.2 is required, a safety sign shall be provided in accordance with Section 16.2.*	
5.2.6.5.1 Each machine supply circuit disconnecting means mounted within or adjacent to a control enclosure that contains live parts operating at 50 volts ac (rms value) or 60 volts dc or more shall be mechanically or electrically interlocked, or both, with the control enclosure doors so that none of the doors open unless the power is disconnected. Interlocking shall be reactivated automatically when all the doors are closed.	Formally 6.2.3.1 Added the term “machine supply circuit”, removed the reference to 5.3.1.4 and relocated the exceptions to 5.2.6.5.
5.2.6.5.2* Means shall be permitted to be provided for qualified persons, using appropriate work practices, to gain access without removing power.	Formally 6.2.3.1.1
5.2.6.5.3 The interlocking means shall meet the following requirements: (1) Utilize a device or tool as specified by the manufacturer of the interlock to allow qualified persons to defeat the interlock (2) Be reactivated automatically when the door(s) is closed (3) Prevent closing of the machine supply circuit disconnecting means while the door of the enclosure containing the disconnect is open, unless an interlock is operated by deliberate action	Formally 6.2.3.1.2 Added the term “machine supply circuit.”
5.2.6.5.4 Where provided with a defeat mechanism as permitted in 5.2.6.5.3(1), live parts mounted on the inside of doors that are operating at over 50 volts shall be protected from unintentional direct contact by the inherent design of components or the application of barriers or obstacles such that a 50 mm (2 in.) sphere cannot contact any of the live parts in question.	Formally 6.2.3.1.3
5.2.6.5.5 Where two or more machine supply circuit disconnecting means are provided within the control enclosure for multiple machine supply circuits, they shall be grouped in one location where practicable. Protective interlocks for their correct operation shall be provided where a hazardous condition or damage to the machine or to the work in progress can occur.	Formally 5.3.1.5 Added the term “machine” in two places.
5.2.7 **Type.** The machine supply circuit disconnecting device shall be one of the following types: (1) A listed motor circuit switch rated in horsepower (2) A listed molded case circuit breaker (3) A listed molded case switch	Formally 5.3.2 Added the term “machine.”

(4) An instantaneous trip circuit breaker that is part of a listed combination motor controller limited to single motor applications (5) A listed self-protected combination controller limited to single motor applications (6) An attachment plug and receptacle for cord connection	
5.2.8 **Requirements**. 5.2.8.1* Where the machine supply circuit disconnecting device is one of the types in 5.2.7(1) through 5.2.7(5), the device shall fulfill all of the following requirements: (1) Isolate the electrical equipment from the supply circuit and have one off (open) and one on (closed) position only. Circuit breakers, instantaneous trip circuit breakers, molded-case switches, and self-protected combination motor controllers are permitted to have a reset (tripped) position between off (open) and on (closed). (2) Have an external operating means (e.g., handle) that complies with 5.1.4. *Exception: Power-operated switchgear need not be operable from outside the enclosure where there are other means to open it.* (3) Be provided with a permanent means permitting it to be locked in the off (open) position only (e.g., by padlocks), independent of the door or cover position. When so locked, remote as well as local closing into the on position shall be prevented. (4) Simultaneously disconnect all ungrounded conductors of the supply circuit. (5) Be operable by qualified persons independent of the door or cover position without the use of accessory tools or devices. (6) Be rated for the application as follows: (a) With an ampere rating at least 115 percent of the sum of the full-load currents required for all equipment that is in operation at the same time under normal conditions of use (b) Where rated in horsepower, with a horsepower rating at least equal to that which is defined by Table 430.251(B) of *NFPA 70* for a locked rotor current equal to the largest sum resulting from the locked rotor currents of any combination of motors that can be started simultaneously and the full-load currents of the remaining motor and non-motor loads that can be operated at that time (c) With a voltage rating at least equal to the nominal supply circuit voltage (7) Be of a type that indicates whether it is in the off (open) or on (closed) position.	Formally 5.2.8 Added the term “machine” and removed “plainly” from (7).
5.2.8.2* When the machine supply circuit disconnecting device is an attachment plug and receptacle, it shall fulfill all of the following requirements: (1) Have a load-break rating or be interlocked with a switching device that is load-break rated and complies with 5.3.3.1(6) (2) Be listed as a switch-rated plug and receptacle rated greater than 20 amperes or 2 hp (3) Be of such a type and be so installed as to prevent unintended contact with live parts at any time, even during insertion or removal of the connectors	Formally 5.3.3.2 Added the term “machine.”

(4) Have a first-make, last-break electrical grounding contact (5) Have a retaining means to prevent unintended or accidental disconnection where rated at more than 20 amperes (6) Be located within sight from the operator station and be readily accessible	
5.2.8.3 In addition to the requirements in 5.2.8.2, an additional switching device on the machine shall be provided for routine power switching operations of the machine on and off.	Formally 5.3.3.3
5.2.9 **Excepted Circuits**.	~~5.3.5~~5.2.9 Excepted Circuits.
5.2.9.1 The following circuits shall not be required to be disconnected by the machine supply circuit disconnecting means: (1) Lighting circuits for lighting needed during maintenance or repair (2) Attachment plugs and receptacles for the exclusive connection of repair or maintenance tools and equipment (e.g., hand drills, test equipment) (3) Undervoltage protection circuits that are only used for automatic tripping in the event of supply circuit failure (4) Circuits supplying equipment that need to remain energized for satisfactory operation [e.g., temperature-controlled measuring devices, product (work in progress) heaters, program storage devices, inputs, non-motion outputs, displays, and safety interlocks]	Formally 5.3.5.1
5.2.9.2 Excepted circuits shall be provided with all of the following: (1) A disconnecting means, isolating transformer, and overcurrent protection mounted in an enclosure adjacent to the main control enclosure or within the control enclosure, adjacent to the machine supply circuit disconnecting means (2) Line side (of the machine supply circuit disconnect) supply circuit conductors, when internal to the control enclosure, that are separate from and do not share a raceway with other conductors and that are encased in rigid or flexible conduit if longer than 460 mm (18 in.)	Formally 5.3.5.2 Added the term “machine” to (1).
5.2.9.3 The control interlocking circuits shall be capable of being disconnected at the control panel from which they are sourced.	Formally 5.3.5.3
5.2.9.4 Where the excepted circuits are not disconnected by the machine supply circuit disconnecting means, all of the following requirements shall be met: (1) Permanent safety sign(s) shall be placed adjacent to the machine supply circuit disconnecting operating handle(s), indicating that it does not de-energize all exposed live parts when it is in the open (off) (isolated) position as in 16.2.4. (2) A statement containing the information from 16.2.4 shall be included in the machine documentation. (3) A permanent safety sign shall be placed on a nonremovable part inside the control enclosure in proximity to each excepted circuit, or shall be identified by color as defined in 13.2.4.	Formally 5.3.5.4 Added the term “machine” in two places. (2) A statement containing the information from 16.2.4 shall be included in the machine documentation. (3) A permanent safety sign shall be placed on a nonremovable part inside the control enclosure in proximity to each excepted circuit, or shall be identified by color as defined in 13.2.4.

5.3 **Devices for Disconnecting (Isolating) Electrical Equipment**.	Formally5.5
5.3.1 Devices shall be provided for disconnecting (isolating) electrical equipment to enable work to be performed when it is de-energized and isolated.	Formally 5.5.1
5.3.2 The machine supply circuit disconnecting means *(see Section 5.3)* shall be permitted to fulfill this requirement where there is no need for disconnecting individual portions of the electrical circuit.	Formally 5.3.2
5.3.3 Where it is expected that it will be necessary to work on separately operable parts of a machine, a disconnecting means shall be permitted for the electrical equipment of each such part of the machine requiring separate disconnection.	Formally 5.5.3
5.3.4 The following devices shall be permitted to fulfill the isolating function of 5.3.3: (1) Devices described in 5.3.7 (2) A manual motor controller marked "suitable as motor disconnect" and in compliance with UL 508, *Standard for Industrial Control Equipment*, where located on the load side of the last short-circuit protective device (in the branch) (3) System isolation equipment that incorporates control lockout stations and is listed for disconnection purposes where located on the load side of the main supply circuit disconnecting means and overcurrent protection	Formally 5.5.4
5.3.5 Each operating means of the isolation devices in 5.3.4 shall be as follows: (1) Readily accessible and complies with 5.1.4 *Exception: Switches and circuit breakers installed adjacent to motors, appliances, or other equipment that they supply shall be permitted to be accessible by portable means.* (2) Within sight of the part of the machine requiring disconnection (3) Readily identifiable as an isolating means and marked to identify the equipment that is disconnected (4) For other than attachment plugs, provided with permanent means for locking in the off position only	Formally 5.5.5
5.3.6 Interlocking. Enclosures containing devices for isolating electrical equipment shall be interlocked.	Added to clarify that enclosures containing isolating devices must be interlocked.
5.3.6.1 Enclosures containing devices for isolating electrical equipment, other than the machine supply circuit disconnecting means, shall be permitted to interlocked by one of the methods permitted in 6.2.3.2.	Added to clarify the methods of interlocking permitted for enclosures containing isolating devices other than the machine supply circuit disconnecting means.

Public Input No. 109-NFPA 79-2019 [Section No. A.5.2]

A.5.2— .5

For additional information on the grounding terminal, see 8.2.1.3.

Statement of Problem and Substantiation for Public Input

This section is renumbered to correlate with a global PI to reorganize Chapter 5.

Related Public Inputs for This Document

Related Input	Relationship
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Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:40:09 EST 2019
Committee: EEI-AAA

Public Input No. 110-NFPA 79-2019 [Section No. A.5.3.1.1.1]

A.5.3 2 .1 6 .1.1 —

When a single disconnecting means is provided, a marking such as “main machine disconnect” is sufficient to convey the purpose. Where multiple supplies are present, a descriptive marking is necessary to clearly indicate the controlled supply voltage or equipment that is disconnected, such as “main disconnect — 480V, 3ph,” or “main disconnect — drive motors.”

Statement of Problem and Substantiation for Public Input

This section is renumbered to correlate with a global PI to reorganize Chapter 5.

Related Public Inputs for This Document

Related Input	Relationship
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Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:41:38 EST 2019
Committee: EEI-AAA

Public Input No. 113-NFPA 79-2019 [Section No. A.5.3.3.1]

A.5.3 2 .3 8 .1

For additional information, see IEC 61310-3 or 404.7 of *NFPA 70* for direction of operation of the disconnecting actuator.

Statement of Problem and Substantiation for Public Input

This section is renumbered to correlate with a global PI to reorganize Chapter 5.

Related Public Inputs for This Document

Related Input	Relationship
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Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:
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Committee: EEI-AAA

Public Input No. 114-NFPA 79-2019 [Section No. A.5.3.3.2]

A.5.3 2 .3 8 .2

A suitably rated attachment plug and receptacle listed to UL 498 or UL 1682 is a method of meeting the requirements of 5.3 2 .3 8 .2(2) and 5.3 2 .3 8 .2(3).

Statement of Problem and Substantiation for Public Input

This section is renumbered and stated references where changed to correlate with a global PI to reorganize Chapter 5.

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Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:
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Public Input No. 98-NFPA 79-2019 [New Section after A.6.2.3.1.1]

TITLE OF NEW CONTENT

Add new section A.6.2.3.2

A.6.2.3.2 A dedicated tool is one that is specifically designed and intended for opening an enclosure. It differs from a simple hand tool in that is has a unique design or specific geometry to mate with the enclosure locking means. An example is a tool with a triangular-shaped end.

Statement of Problem and Substantiation for Public Input

This Annex note provides guidance relative to the use of the term "dedicated tool" in PI 97.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 97-NFPA 79-2019 [Section No. 6.2.3.2]	
Public Input No. 97-NFPA 79-2019 [Section No. 6.2.3.2]	

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 22:02:12 EST 2019
Committee: EEI-AAA

Public Input No. 111-NFPA 79-2019 [Section No. A.6.2.3.1.1]

A.6 5 .2.3 6 .1 5 .1 — 2

See *NFPA 70E* for additional information on work practices.

Statement of Problem and Substantiation for Public Input

This section is renumbered to correlate with a global PI to reorganize Chapter 5.

Related Public Inputs for This Document

Related Input	Relationship
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Submitter Information Verification

Submitter Full Name: Mark Hilbert
Organization: MR Hilbert Electrical Inspections & Training
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 23:43:48 EST 2019
Committee: EEI-AAA

Public Input No. 100-NFPA 79-2019 [New Section after A.7.7]

TITLE OF NEW CONTENT

Add new Section A.7.8.1

A.7.8.1 Safety devices such as a safety programmable logic controller, a safety interlock or a safety switch generally do not need external protection against the effects of overvoltages. Such devices are either protected against improper operation due to overvoltages or designed for "fail safe" operation in the event they are damaged by overlvoltages. A risk assessment can determine if the safety interlock circuit meets the acceptable level of safety performance when these safety devices are used.

Statement of Problem and Substantiation for Public Input

This added Annex note for section 7.8.1 provides guidance when applying the added exception proposed in PI 99.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 99-NFPA 79-2019 [Section No. 7.8.1]	
Public Input No. 99-NFPA 79-2019 [Section No. 7.8.1]	

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 22:56:38 EST 2019
Committee: EEI-AAA

Public Input No. 75-NFPA 79-2019 [New Section after A.7.7]

Insert a new A 7.8.1 to Annex A to read as follows:

The manufacturer of the industrial machinery can determine what specific type of SPD is to be used to provide the needed protection based on the installation and equipment design.

Statement of Problem and Substantiation for Public Input

Presently it is unclear where the SPD needs to be installed if safety interlock circuits are used, such as in the power circuit or the control circuit. The wording is copied from the committee statement which provided the reason for adding the requirement in the 2018 edition in SR 58. It also seems the requirement in NEC 670.6 needs to be deleted as it is outside the scope of Article 670. NFPA 79 applies to the equipment of industrial machines starting at the supply circuit connection point in accordance with NFPA 79 1.1.1.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 76-NFPA 79-2019 [Section No. 7.8.1]	

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 13:14:05 EST 2019
Committee: EEI-AAA

Public Input No. 52-NFPA 79-2019 [Section No. A.11.4.6]

A.11.4.6

Windows provided for viewing internally mounted indicating devices

~~should be of a material suitable to withstand mechanical stress and chemical attack [e.g., toughened glass, polycarbonate sheet of 3 mm (1/8 in.) thickness].~~

or operations shall shall meet the requirements of UL 508, UL 508A, UL 50, or NEMA 250 (See Section 6.2.3)

Statement of Problem and Substantiation for Public Input

Section 6.2.3 shows the requirements for enclosure protection. However, the enclosure includes viewing windows as indicated by the standards listed. Most engineers
believe this this requirement only pertains to the enclosures of electrical components.

Submitter Information Verification

Submitter Full Name: Richard Trainor
Organization: Tuv Sud America Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 11:42:36 EST 2019
Committee: EEI-AAA

Public Input No. 51-NFPA 79-2019 [Section No. A.12.1.1]

A.12.1.1

Typical operating conditions include the following:

(1) Voltage and frequency

(2) Current

(3) Protection against electric shock

(4) Grouping of cables

(5) Characteristics associated with with power conversion equipment. Circuit conductors on the output of power conversion equipment are susceptible to breakdown under certain conditions due to the characteristics of the output waveform of the drive. Factors affecting the conductors include but are not limited to the output voltage, frequency, and current, the length of the conductors, the spacing between the conductors, and the dielectric strength of the conductor insulation. Methods to mitigate breakdown include consideration of one or more of these factors.

External influences include the following:

(1) Ambient temperature

(2) Presence of water, oil, or other fluid substances

(3) Radiation

(4) Ultraviolet light

(5) Corrosive substances

(6) Mechanical stresses

(7) Installation

(8) Fire hazards

Statement of Problem and Substantiation for Public Input

The proposed changes provide additional guidance on the proper selection of conductors when used with power conversion equipment. The text is taken from pending changes in the 430.122(A) in the 2020 NEC and replaces proposed deletion of 4.4.2.8

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 37-NFPA 79-2019 [Section No. 4.4.2.8]	
Public Input No. 37-NFPA 79-2019 [Section No. 4.4.2.8]	

Submitter Information Verification

Submitter Full Name: Jay Tamblingson
Organization: Rockwell Automation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 10:45:29 EST 2019
Committee: EEI-AAA

Public Input No. 91-NFPA 79-2019 [New Section after A.13.1.2.1]

TITLE OF NEW CONTENT

Add new section: **A. 13.1.2.3** For examples, see UL Subject 2237 and UL 2238.

Statement of Problem and Substantiation for Public Input

The current Annex A note for 13.1.2.4 should also apply to 13.1.2.3. The UL Standards cited in the note to 13.1.2.4 apply to both factory and field installed connectors.

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 19:23:55 EST 2019
Committee: EEI-AAA

Public Input No. 92-NFPA 79-2019 [Section No. A.13.1.7.1]

A.13.1.7.1

For additional information on flexible cords, refer to UL 62. For additional information on connectors and assemblies of connectors and cords, refer to UL Subject 2237 and UL 2238.

Statement of Problem and Substantiation for Public Input

Since this section references factory-applied molded connectors, the existing Annex A note should also reference the product standards for these connectors and assemblies..

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 19:37:51 EST 2019
Committee: EEI-AAA

Public Input No. 24-NFPA 79-2018 [Section No. F.5.5]

F.5.5

However, because the IP requirements can be interpreted to be inclusive to the type-rating requirements, a conservative IP-rating can be assigned to a type-rated enclosure as shown in Table F.5.5.

As a practical matter, many electrical enclosures are tested to both the IP and type requirements and carry both IP-rating and type-rating designations.

Table F.5.5 Assignment of IP-Ratings to Type-Rated Enclosures

A																	
		NEMA Enclosure Type															
IP First Character	1	2	3	3R	3S	4	4X	5	6	6P	12	12K	13	IP Second Character			
IP0_	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	IP_0			
IP1_	A	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	IP_1			
IP2_	A	B	AB	B	AB	AB	AB	AB	AB	AB	AB	AB	AB	IP_2			
IP3_					AB	B	AB	AB	AB	AB	AB	AB	AB	AB	AB	IP_3	
IP4_					AB	B	AB	AB	AB	AB	AB	AB	AB	AB	AB	IP_4	
IP5_					AB			AB	AB	AB	A	AB	AB	A	A	A	IP_5
IP6_					A			A	AB	AB			AB	AB			IP_6
									B	B							IP_7
																	B IP_8

A: The first IP character designation is the protection against access to hazardous parts and solid foreign objects. The respective NEMA enclosure type meets the requirements for the IEC 60529 IP first character designation.

B: The IP second character designation is the protection against ingress of water. The respective NEMA enclosure type meets the requirements for the IEC 60529 IP second character designation.

Notes:

(1) Type-rated enclosures for hazardous locations and potentially explosive areas have been excluded from the table. The additional and supplementary letters for IP-ratings have also been excluded from the table. *(See NEMA 250, UL 508, and IEC 60529.)*

(2) This table should be used only to assign an IP-rating to a type-rated enclosure, and not to assign a type-rating to an IP-rated enclosure. This table assists in specifying enclosure ratings and should not be used as a definitive guide. For example, if the conditions of installation require an IP 55, this table indicates that a Type 3, 3S, 4, 4X, 6, or 6P enclosure can be utilized. However, if the conditions of installation require a NEMA Type 4, an enclosure that is only IP-rated cannot be used as a substitute.

(3) Although the corresponding NEMA type-ratings meet or exceed the corresponding IP-ratings as indicated in the table, IEC does not currently accept these type-ratings without further IEC testing.

Statement of Problem and Substantiation for Public Input

Per UL50 type ratings, type 1 is meets the requirements of IP2x. The chart needs to be corrected to reflect this.

Submitter Information Verification

Submitter Full Name: Robert Gruendel
Organization: Dematic
Street Address:

City:
State:
Zip:
Submittal Date: Fri Dec 21 08:49:29 EST 2018
Committee: EEI-AAA

Public Input No. 13-NFPA 79-2018 [Chapter K]

Annex K Informational References

K.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

K.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 70®, *National Electrical Code®*, 2017 edition.

NFPA 70E®, *Standard for Electrical Safety in the Workplace®*, 2018 edition.

NFPA 77, *Recommended Practice on Static Electricity*, 2014 edition.

K.1.2 Other Publications.

K.1.2.1 ANSI Publications.

American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI B11.0, *Safety of Machinery*, 2015.

ANSI B11-TR4, *Selection of Programmable Electronic Systems (PES/PLC) for Machine Tools*, 2004**, Reapproved 2015** .

ANSI B11-TR6, *Safety Control Systems for Machine Tools*, 2010.

ANSI Z535.4, *Product Safety Signs and Labels*, 2011**, Reaffirmed 2017** .

K.1.2.2 CENELEC Publications.

CENELEC, European Committee for Electrotechnical Standardization, CENELEC Management Centre, Avenue Marnix 17, 4th floor, B - 1000 Brussels.

EN 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements,* 2017.

EN 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements,*2017.

K.1.2.3 IEC Publications.

International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

IEC 60034-1 Ed. ~~12~~ **13.0**, *Rotating electrical machines — Part 1: Rating and performance*, ~~2010~~ 201**7**.

IEC 60072-1 Ed. 6.0, *Dimensions and output series for rotating electrical machines — Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080*, 1991.

IEC 60204-1 Ed. 6.0, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*, 2016.

IEC 60332-1-1 Ed. 1.1, *Tests on electric and optical fibre cables under fire conditions — Part 1-1: Test for vertical flame propagation for a single insulated wire or cable apparatus*, 2015.

IEC 60364-4-41 Ed. 5.~~0~~ **1**, *Electrical installations of buildings — Part 4-41: Protection for safety — Protection against electric shock*, ~~2005~~ 20**17, Corrigendum 1, 2018**.

IEC 60364-5-53 Ed. 3.2, *Electrical Installations of buildings — Part 5-53: Selection and erection of electrical equipment — Isolation, switching and control*, 2015.

IEC 60417 DB *[Database], Graphical symbols for use on equipment — Part 1: Overview and application*, 2002.

IEC 60529 Ed. 2.2, *Degrees of protection provided by enclosures (IP Code)*, 2013, corrigendum 2, 2015.

IEC 60621-3 Ed. 1.0, *Electrical installations for outdoor sites under heavy conditions (including open-cast mines and quarries) — Part 3: General requirements for equipment and ancillaries*, 1979 (withdrawn).

IEC 60742 Ed. 1.0, *Isolating transformers and safety isolating transformers*, 1983 (superseded by IEC 61558-1).

IEC 60870-5-1 Ed. 1.0, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section One: Transmission frame formats*, 1990.

IEC 60947-4-1 Ed. 3.1, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters — Electromechanical contactors and motor-starters*, 2012.

IEC 60947-5-1 Ed. ~~3~~ **4.** ~~1~~ **0**, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices*, ~~2009~~ 20**16, Corrigendum, 2016**.

IEC 60947-7-1 Ed. 3.0, *Low-voltage switchgear and controlgear — Part 7-1: Ancillary equipment — Section 1: Terminal blocks for copper conductors*, 2009.

IEC 61010-1 Ed. 3.~~0~~ **1**, *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements*, ~~2010~~ 201**7**.

IEC 61310-1 Ed. 2.0, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals*, 2007.

IEC 61310-3 Ed. 2.0, *Safety of machinery — Indication, marking and actuation — Part 3: Requirements for the location and operation of actuators*, 2007.

IEC 61508 Ed. 2.0, *[Series] Functional safety of electrical/electronic/programmable electronic safety-related systems*, 2010.

IEC 61558-1 Ed. ~~2~~ **3.** ~~1~~ **0**, *Safety of power transformers, power supply units and similar — Part 1: General requirements and tests*, ~~2011~~ 201**7**.

IEC 61800-5-2 Ed. ~~1~~ **2**.0,*Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional,* ~~2007~~ 20**16**.

IEC 62061 Ed. 1.2, *Safety of machinery — Functional safety of electrical, electronic and programmable control systems*, 2015, corrigendum 1, 2015.

NOTE: The IEC publishes consolidated editions of its publications with all the amendments and corrigenda included with the base document. For example:

Edition 1.0 is a base document without any amendments.

Edition 1.1 is the base 1.0 edition consolidated with one amendment.

Edition 1.2 is the base 1.0 edition consolidated with two amendments.

Edition 2.0 is the second edition of a base document. This may include new information combined as well as amendments from edition 1.x.

Edition 2.1 is the second edition of a document consolidated with amendment 1 to that edition.

K.1.2.4 IEEE Publications.

IEEE, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.

IEEE 100 CD, *The Authoritative Dictionary of IEEE Standard Terms*, 2013.

ANSI Y32.2/IEEE 315, *IEEE Graphic Symbols for Electrical and Electronics Diagrams (Including Reference Designation Letters)*, 1993.

IEEE 841, *Petroleum and Chemical Industry — Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors — Up to and Including 370 kW (500 hp)*, 2009.

K.1.2.5 ISO Publications.

International Organization for Standardization, ISO Central Secretariat, BIBC II, 8, Chemin de Blandonnet, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*, 2014.

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*, 2010.

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*, 2006, corrigendum 1, 2009.

ISO 13849-2, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*, 2012.

ISO 13850, *Safety of machinery — Emergency stop function — Principles for design*, 2015.

K.1.2.6 NEMA Publications.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite 900, Arlington, VA 22209.

NEMA MG-1, *Motors and Generators*, 2014.

NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*, 2014.

K.1.2.7 SEMI Publications.

Semiconductor Equipment and Materials International, 3081 Zanker Road, San Jose, CA 95134.

SEMI S2, *Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment*, 2010.

SEMI S9, *Safety Guideline for Electrical Design Verification Tests for Semiconductor Manufacturing Equipment*, 2001 (withdrawn 2007).

SEMI S22, *Safety Guideline for the Electrical Design of Semiconductor Manufacturing Equipment*, 2010.

K.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 50, *Standard for Enclosures for Electrical Equipment*, 2007, revised 2015.

UL 62, *Standard for Flexible Cord and Fixture Wire*, ~~2010, revised 2014~~ **2018**.

UL 248-14, *Standard for Low-Voltage Fuses — Part 14: Supplemental Fuses*, 2000, revised 2015.

UL 489, *Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures,* ~~2009, revised 2014~~ **2016**.

UL 498, *Standard for Attachment Plugs and Receptacles*, ~~2012~~ 201 **7**, revised ~~2014~~ 201 **8**.

UL 508, *Standard for Industrial Control Equipment*, ~~1999, revised 2013~~ **2018**.

UL 508A, *Standard for Industrial Control Panels*, ~~2001~~ 20 **18**, revised ~~2014~~ 201 **8**.

UL 651, *Standard for Schedule 40 and 80, EB and A Rigid PVC Conduit and Fittings*, 2011, revised ~~2014~~ 201 **6**.

UL 758, *Appliance Wiring Material*, 2014, revised ~~2014~~ 201 **7**.

UL 1004-1, *Standard for Rotating Electrical Machines*, 2012, revised ~~2015~~ 201 **8**.

UL 1077, *Standard for Supplementary Protectors for Use in Electrical Equipment*, ~~2005~~ 20 **1** 5, revised ~~2015~~ 201 **6**.

UL 1682, *Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type,* ~~2013, revised 2013~~ **2017**.

UL 60950-1, *Information Technology Equipment — Part I: General Requirements*, 2007, revised 2014.

UL 2237, Outline, *Outline of Investigation for Multi-Point Interconnection Power Cable Assemblies for Industrial Machinery*, ~~2015~~ 201 **8**.

UL 2238, *Cable Assemblies and Fittings for Industrial Control and Signal Distribution*, 2011.

IEC/UL 61010A-1, *Electrical Equipment for Measurement, Control and Laboratory Use — Part 1: General Requirements*, 2014.

UL 61010-1, *UL Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use — Part 1: General Requirements*, ~~2004~~ 20 **12**, revised ~~2015~~ 201 **6**.

K.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

DOE-HDBK-1003-96, *Guide to Good Practices for Training and Qualification of Maintenance Personnel*, 1996.

IEC 81346-2, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 2: Classification of objects and codes for classes*, 2009 (supersedes IEC 61346-2).

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 V — Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers*, 2009.

ISO 5457, *Technical product documentation — Sizes and layout of drawing sheets*, 1999, amendment 1, 2010.

ISO 7200, *Technical product documentation — Data fields in title blocks and document headers*, 2004.

K.3 References for Extracts in Informational Sections.

NFPA 70®, National Electrical Code®, 2017 edition.

Statement of Problem and Substantiation for Public Input

Referenced updated consensus standard editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 12-NFPA 79-2018 [Chapter 2]	Referenced updated consensus standard editions.

Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 10 00:24:01 EDT 2018
Committee: EEI-AAA

Public Input No. 55-NFPA 79-2019 [Section No. K.1.2.4]

K.1.2.4 IEEE Publications.

IEEE, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.

IEEE 100 CD, *The Authoritative Dictionary of IEEE Standard Terms*, 2013.

ANSI Y32.2/IEEE 315, *IEEE Graphic Symbols for Electrical and Electronics Diagrams (Including Reference Designation Letters)*, 1993.

IEEE 841, *Petroleum and Chemical Industry — Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors — Up to and Including 370 kW (500 hp)*, 2009.

IEEE 3001.11 Recommended Practice for Application of Controllers and Automation to Industrial and Commercial Power Systems

IEEE 3004.8 Recommended Practice for Motor Protection in Industrial and Commercial Power Systems

IEEE 3006.3 Recommended Practice for Determining the Impact of Preventative Maintenance on the Reliability of Industrial and Commercial Power Systems

IEEE 3007.1 Recommended Practice for the Operation and Management of Industrial and Commercial Power Systems

IEEE 3007.2 Recommended Practice for the Maintenance of Industrial and Commercial Power Systems

IEEE 3007.3 Recommended Practice for Electrical Safety in Industrial and Commercial Power Systems

Statement of Problem and Substantiation for Public Input

The IEEE 3000-series of recommended practices replace the legacy "Color Books" widely reference in other NFPA documents. Here is the IEEE Standards Association page that lists the active standards:

https://ias.ieee.org/standards/ieee-ias-sponsored-active-standards.html

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan Group, LLC
Affiliation: www.standardsmichigan.com
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 15:41:28 EST 2019
Committee: EEI-AAA

Public Input No. 58-NFPA 79-2019 [Section No. K.1.2.5]

K.1.2.5 ISO Publications.

International Organization for Standardization, ISO Central Secretariat, BIBC II, 8, Chemin de Blandonnet, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*, 2014.

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*, 2010.

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*, ~~2006~~ 2015 ,~~ corrigendum 1, 2009.~~

ISO 13849-2, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*, 2012.

ISO 13850, *Safety of machinery — Emergency stop function — Principles for design*, 2015.

Statement of Problem and Substantiation for Public Input

Updated the date to the newer version

Submitter Information Verification

Submitter Full Name: Dino Mariuz
Organization: Pilz Automation Safety L.P.
Affiliation: Pilz Automation Safety
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 21:38:08 EST 2019
Committee: EEI-AAA

Public Input No. 31-NFPA 79-2018 [Section No. K.1.2.8]

K.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 50,~~Standard for~~ *Enclosures for Electrical Equipment*,~~ 2007, revised 2015~~ 2015 .

UL 62,~~Standard for~~ *Flexible Cord and Fixture Wire*,~~ 2010, revised 2014~~ 2018 .

UL 248-14,~~Standard for~~ *Low-Voltage Fuses — Part 14: Supplemental Fuses*, 2000, revised 2015.

UL 489,~~Standard for~~ *Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures,* ~~2009, revised 2014~~ *2016* .

UL 498,~~Standard for~~ *Attachment Plugs and Receptacles*, ~~2012~~ 2017 , revised ~~2014~~ 2018 .

UL 508,~~Standard for~~ *Industrial Control Equipment*,~~ 1999, revised 2013~~ 2018 .

UL 508A,~~Standard for~~ *Industrial Control Panels*,~~ 2001, revised 2014~~ 2018 .

UL 651,~~Standard for~~ *Schedule 40 and 80, EB and A Rigid PVC Conduit and Fittings*,~~ 2011, revised 2014~~ 2016 .

UL 758, *Appliance Wiring Material*, 2014, revised ~~2014~~ 2017 .

UL 1004-1,~~Standard for~~ *Rotating Electrical Machines*, 2012, revised ~~2015~~ 2018 .

UL 1077,~~Standard for~~ *Supplementary Protectors for Use in Electrical Equipment*, ~~2005~~ 2015 , revised ~~2015~~ 2016 .

UL 1682, *Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type*,~~ 2013, revised 2013~~ 2017 .

UL 60950-1, *Information Technology Equipment — Part I: General Requirements*, 2007, revised 2014.

UL 2237~~ Outline~~ , *Outline of Investigation for Multi-Point Interconnection Power Cable Assemblies for Industrial Machinery*, ~~2015~~ 2018 .

UL 2238, *Cable Assemblies and Fittings for Industrial Control and Signal Distribution*, ~~2011~~ 2018 .

~~IEC/UL 61010A-1, *Electrical Equipment for Measurement, Control and Laboratory Use — Part 1: General Requirements* , 2014.~~

UL 61010-1,~~UL Standard for~~ *Safety Electrical Equipment For Measurement, Control, and Laboratory Use — Part 1: General Requirements*, 2004, revised 2015.

Statement of Problem and Substantiation for Public Input

Update standard revision dates and Remove "Standard for" from the UL standard. "Standard for"It is considered repetitive language and has been removed from the UL title. This document change is going forth in all UL and NFPA documents.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 27-NFPA 79-2018 [Section No. 2.3.6]	
Public Input No. 33-NFPA 79-2018 [Section No. 5.5.4]	

Submitter Information Verification

Submitter Full Name: Kelly Nicolello
Organization: UL LLC
Street Address:
City:
State:

Zip:	
Submittal Date:	Wed Dec 26 12:26:38 EST 2018
Committee:	EEI-AAA

Public Input No. 59-NFPA 79-2019 [Section No. K.1.2.8]

K.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 50, *Standard for Enclosures for Electrical Equipment*, 2007, revised 2015.

UL 62, *Standard for Flexible Cord and Fixture Wire*, 2010, revised 2014.

UL 248-14, *Standard for Low-Voltage Fuses — Part 14: Supplemental Fuses*, 2000, revised 2015.

UL 489, *Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures,* 2009, revised 2014.

UL 498, *Standard for Attachment Plugs and Receptacles*, 2012, revised 2014.

UL 508, *Standard for Industrial Control Equipment*, 1999, revised 2013.

UL 508A, *Standard for Industrial Control Panels*, 2001, revised 2014.

UL 651, *Standard for Schedule 40 and 80, EB and A Rigid PVC Conduit and Fittings*, 2011, revised 2014.

UL 758, *Appliance Wiring Material*, 2014, revised 2014.

UL 1004-1, *Standard for Rotating Electrical Machines*, 2012, revised 2015.

UL 1077, *Standard for Supplementary Protectors for Use in Electrical Equipment*, 2005, revised 2015.

UL 1682,*Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type,* 2013, revised 2013.

UL 60950-1, *Information Technology Equipment — Part I: General Requirements*, 2007, revised 2014.

UL 2237 Outline, *Outline of Investigation for Multi-Point Interconnection Power Cable Assemblies for Industrial Machinery*, 2015.

UL 2238, *Cable Assemblies and Fittings for Industrial Control and Signal Distribution*, 2011.

IEC/UL 61010A-1, *Electrical Equipment for Measurement, Control and Laboratory Use — Part 1: General Requirements*, 2014.

UL 61010-1, *UL Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use — Part 1: General Requirements*, 2004, revised 2015.

UL 6420 Equipment Used for System Isolation and Rated as a Single Unit, 2012

Statement of Problem and Substantiation for Public Input

A new UL Isolation standard has been developed regarding power isolation it should be included and somehow mentioned in that section.

Submitter Information Verification

Submitter Full Name: Dino Mariuz
Organization: Pilz Automation Safety L.P.
Affiliation: Pilz Automation Safety
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 02 21:43:48 EST 2019
Committee: EEI-AAA