

# HellermannTyton

## Reducing Liability through Safety Labeling - Industrial Automation

Todd Fries



# Disclaimer

- HellermannTyton makes no representation or warranty regarding code compliance. The user is solely responsible to research all code requirements prior to installation of any labeling that can affect equipment or worker safety.
- Besides UL, there are several other NRTL's (Nationally Recognized Testing Laboratories) which include MET, ETL, TUV-R and CSA as examples.



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# Industry Codes

National Electrical Code (NEC)

National Fire Protection Association (NFPA)

Occupational Safety and Health Administration (OSHA)

American National Standards Institute (ANSI)

NEC 2014

NFPA 70E -2015

NFPA 70B – 2010

NFPA 77 – 2007

NFPA 79 - 2012

ANSI Z535 - 2011

ANSI Z535.1 American National Standard for Safety Colors

ANSI Z535.2 American National Standard for Environmental and Facility Safety Signs

ANSI Z535.3 American National Standard for Criteria for Safety Symbols

ANSI Z535.4 American National Standard for Product Safety Signs and Labels

ANSI Z535.5 American National Standard for Safety Tags and Barricade Tapes (for Temporary Hazards)

ANSI Z535.6 American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials

All OSHA 1910 - 2012 related regulations

Guide to application of the Machinery Directive 2006/42/IEC 2<sup>nd</sup> edition – June 2010

UL 508A – Second Edition – December 2013



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# Overview

- Codes and standards drive what should be labeled and how it should be labeled. Protecting workers and reducing liability are critical factors to consider when labeling Electrical Facilities, Industrial Automation and Industrial Control Panels



Identification



## Slide 4

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### MD1

Add information to these slides and place photos in presentation (or make notes on photo suggestions) as desired (please save any sister company or non-MarComm photos to the project folder on Y drive). Once complete, save presentation in the project folder and send (or send link) to [dmcginnis@htamericas.com](mailto:dmcginnis@htamericas.com).

If you are only using MarComm photos, just indicate what image files / part numbers you would like to use.

McGinnis, Donna, 6/17/2014

# Product Applications

- Labeling panels, breakers, Industrial Automation equipment, Industrial Control Panels by code specific directives.



# OSHA Greater Penalties

- It is estimated that there were 85,361 inspections in 2013.
- There were 183,604 violations in 2013 resulting in \$175,784,577 in fines.
- The US Bureau of Labor Statistics (BLS) reports that there were over **2.8 million workplace injury cases**<sup>1</sup> reported in the private sector around the nation in 2012, and nearly **4,400 fatal workplace injuries**.<sup>2</sup>
- Injury and loss of life on the job can also be examined from the financial impacts on a company. The Occupational Safety and Health Administration (OSHA) estimates the direct costs of workplace injuries and illness to US employers at over **\$ 1 billion each week**.<sup>3</sup> The total cost of injuries go far beyond compensation and care for the injury itself.



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# Litigation

- Case Study: An employee lost his leg in a conveyor accident. His Lawyers sued for \$2,000,000.
- They sued everyone involved.
  - The company that designed the facility
  - The conveyor manufacturing company
  - The company that installed the conveyor
  - The electrician who wired the conveyor
  - The university professor that advised in the design

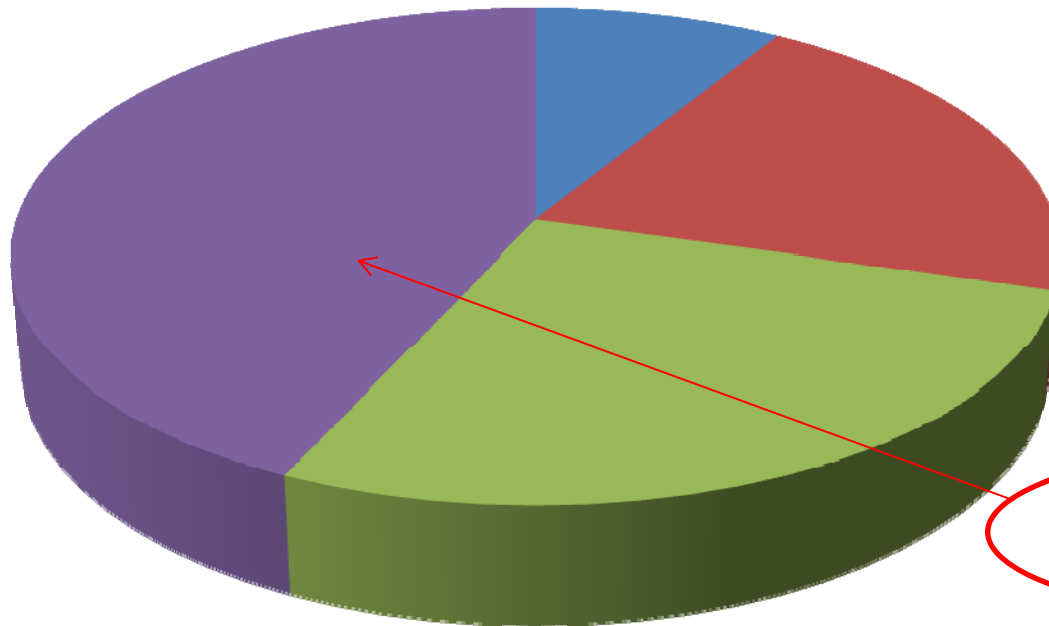


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# Company Liability Causes

## Breakdown



■ Product Defects 9%

■ Design Defects 21%

■ Inadequate Guarding 28%

■ Inadequate or non-Existent Warnings 44%



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# OSHA General Duty Clause

- **29 U.S.C. 654,5(a)1**: Each Employer shall furnish to each of his employees employment and place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.”
- This is used in inspections where there are no specific standards applicable to the particular hazard involved.



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# Safety Sign Example



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# Duty to Warn

- Manufacturer/Supplier MUST warn if:
- The product is dangerous without the warning
- The degree of Danger is or should be known to the manufacturer/supplier.
- The specific danger is not obvious, known to or readily discernible to the user.
- Danger arises during a foreseeable use (or misuse) of the product.



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# When to Design

- Should be designed during the product development process, not as an afterthought.
- Must be designed with all users in mind.
- Product design must have provision for affixing the Warning signs.



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# Whom to Warn

- The Warning must affect the behavior of:
- Foreseeable users of the product.
- Those endangered by a product's use
- Purchasers, installers, employees
- Advisors, trainers, supervisors



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# Signal Word Text and Colors

- Classic style **OSHA** signage was made obsolete by the incorporation of **ANSI Z535-4** in 2002.



Old Style Signage



New Style Signage



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# Signal Word Text and Colors

- **OSHA 1910.145 and ANSI Z535.4 (Article 7.2)** covers what level of hazard labels should identify.



**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury



**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury



**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury



**NOTICE** is used to address practices not related to physical injury



**Safety instruction (or equivalent) signs** indicate specific safety-related instructions or procedures



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# Danger Signage

These signs indicate a hazardous situation that, if not avoided, will result in death or serious injury. This is limited to the most extreme situations.

Per ANSI Z535.4-2011  
Article 7.2.1: Danger  
shall be safety white  
letters on a safety red  
background.



Osha 1910.145



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# Warning Signage

These signs indicate a hazardous situation that, if not avoided, **could** result in **death or serious injury**.

Per ANSI Z535.4-2011  
Article 7.2.3: Caution  
shall be safety black  
letters on a safety yellow  
background.



Osha 1910.145

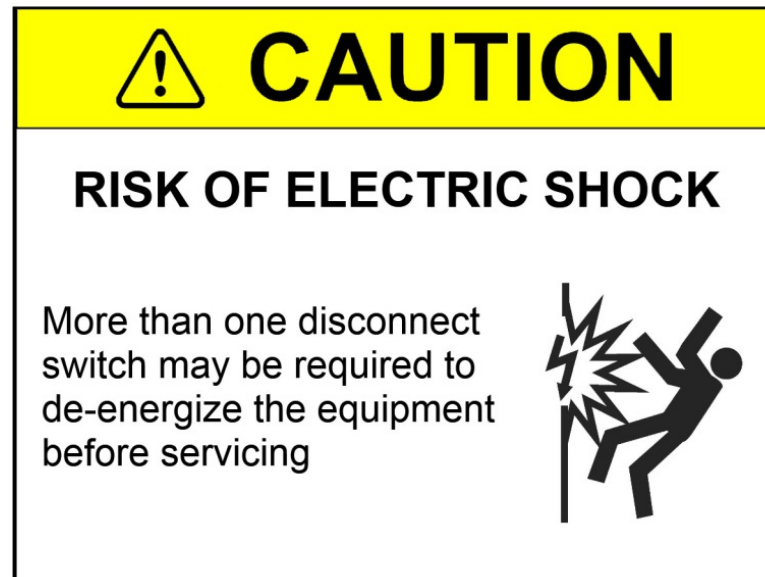


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# Caution Signage

These signs indicate a hazardous situation that, if not avoided, **could** result in **minor or moderate** injury

Per ANSI Z535.4-2011  
Article 7.2.3: Caution  
shall be safety black  
letters on a safety yellow  
background



Osha 1910.145



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# Notice Signage

These signs provide general information to a building, area or machine. They relate to anything not related to personal injury. The heading is printed with white text on a blue background. The body text can be blue or black lettering on a white background or white letters on a black background. These signs must NEVER include the “safety alert” symbol.

Per ANSI Z535.4-2011  
Article 7.2.4: The word  
NOTICE shall be in  
white letters on a safety  
blue background.



Osha 1910.145



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# Safety Signs

These signs identify specific safety related instructions or procedures. This type of sign may be used to supplement a hazard alerting sign by providing a place to convey lengthy safety related instructional information.

Per ANSI Z535.4-2011  
Article 7.2.5: The signal  
word shall be in safety  
white letters on a safety  
green background.



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# Basic Label Design

Per ANSI Z535.4-2011 6.3: A Safety Alert Symbol, when used with the Signal Word shall precede the signal word.

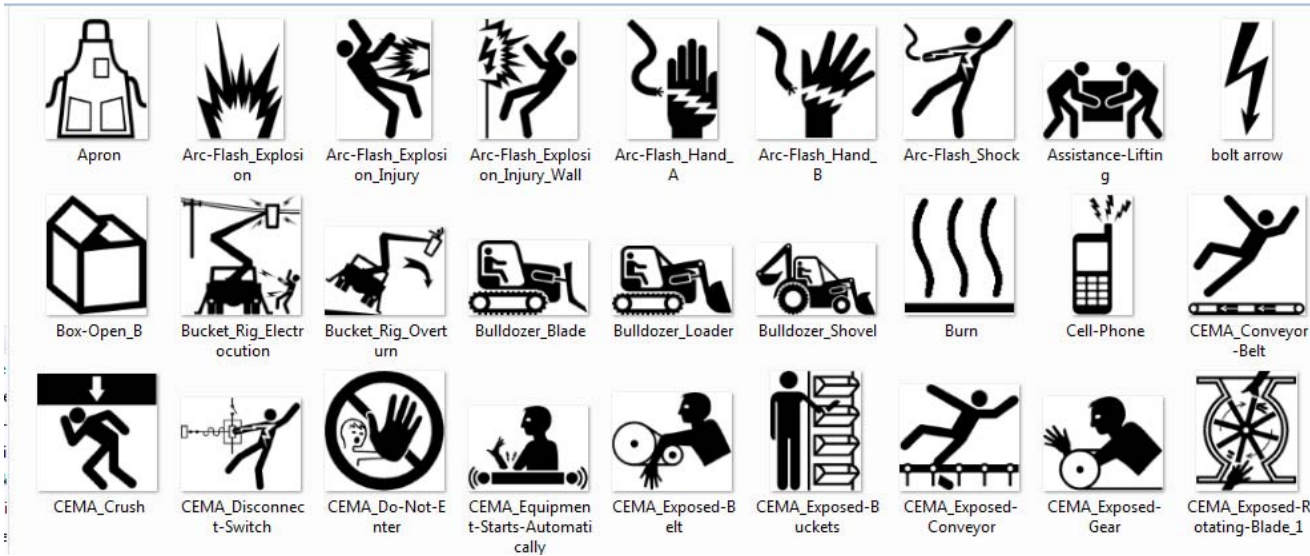
Per ANSI Z535.4-2011 6.4: A contrasting border “May” be used to achieve distinctiveness.

Per ANSIZ535.4-2011 8.1.1: Signal words shall be in sans serif letters in upper case only



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# Pictograms

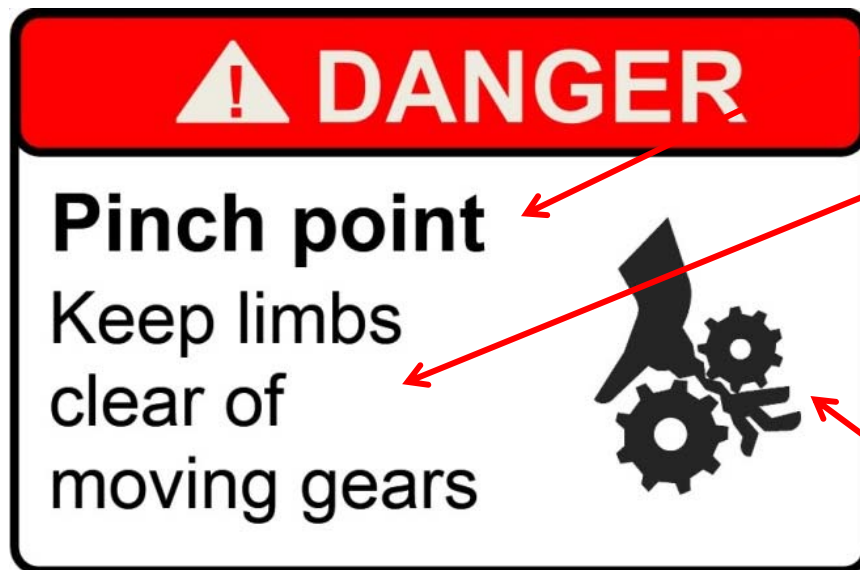


- Both OSHA and ANSI encourage the use of safety symbols called pictograms to portray actions, consequences, and effects of interaction with certain equipment, chemicals and machines. Tagprint Pro 3.0 has all applicable pictograms as standard. (ANSI Z535.3-2011)



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# ANSI Standard Label Design



- Identify the hazard
- How to avoid the hazard
- Consequence of not avoiding the hazard



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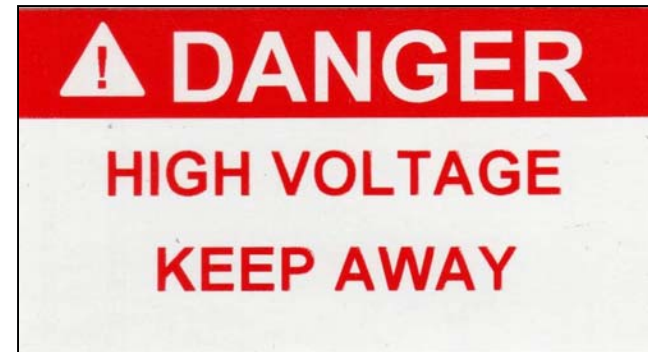


# Label Format ANSI Z535.4-2011 7.6.3

The colors assigned to the “signal word panel” may be used for the message and safety symbol panels provided the colors contrast with the background color of the product.



This label produced on a continuous orange stock with black ribbon.



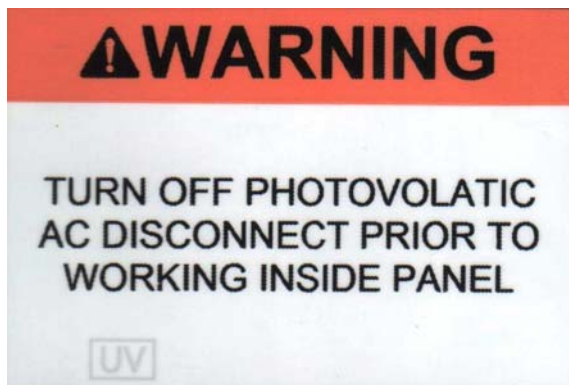
This label produced on a continuous white stock with red ribbon.



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# Label Format ANSI Z535.4 – 2011 7.6.3

Signs can be two colors (instead of 3) and do not have to have a border per 7.6.5.



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# Safety Sign Example



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# Safety Sign Example

Message does not outline how to avoid the hazard.

Old style caution discontinued in ANSI Z535.2 – 2002.

No safety alert symbol – Option discontinued in 2006

Pictogram too large and interferes with header word

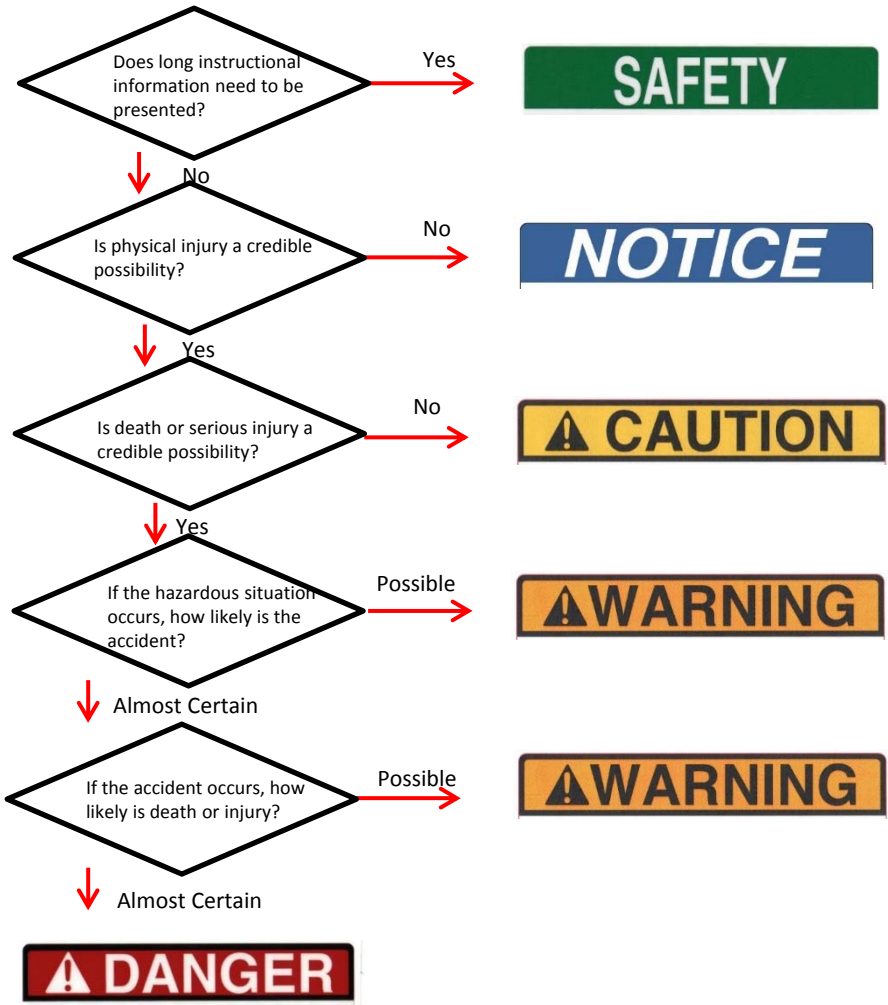
Pictogram is not sufficient to communicate the hazard

Pictogram does not meet the graphical representation requirements outlined in ANSI and ISO standards



Message text could be improved by making the message panel white with black text.





# Safety Sign Example



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# Safety Sign Example



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# Safety Sign Example

# SAFETY

**Wash face  
after  
receiving  
dog kisses**



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# Switchboards

Circuit Identifier  
558-00383

Foam Nameplate  
596-00504

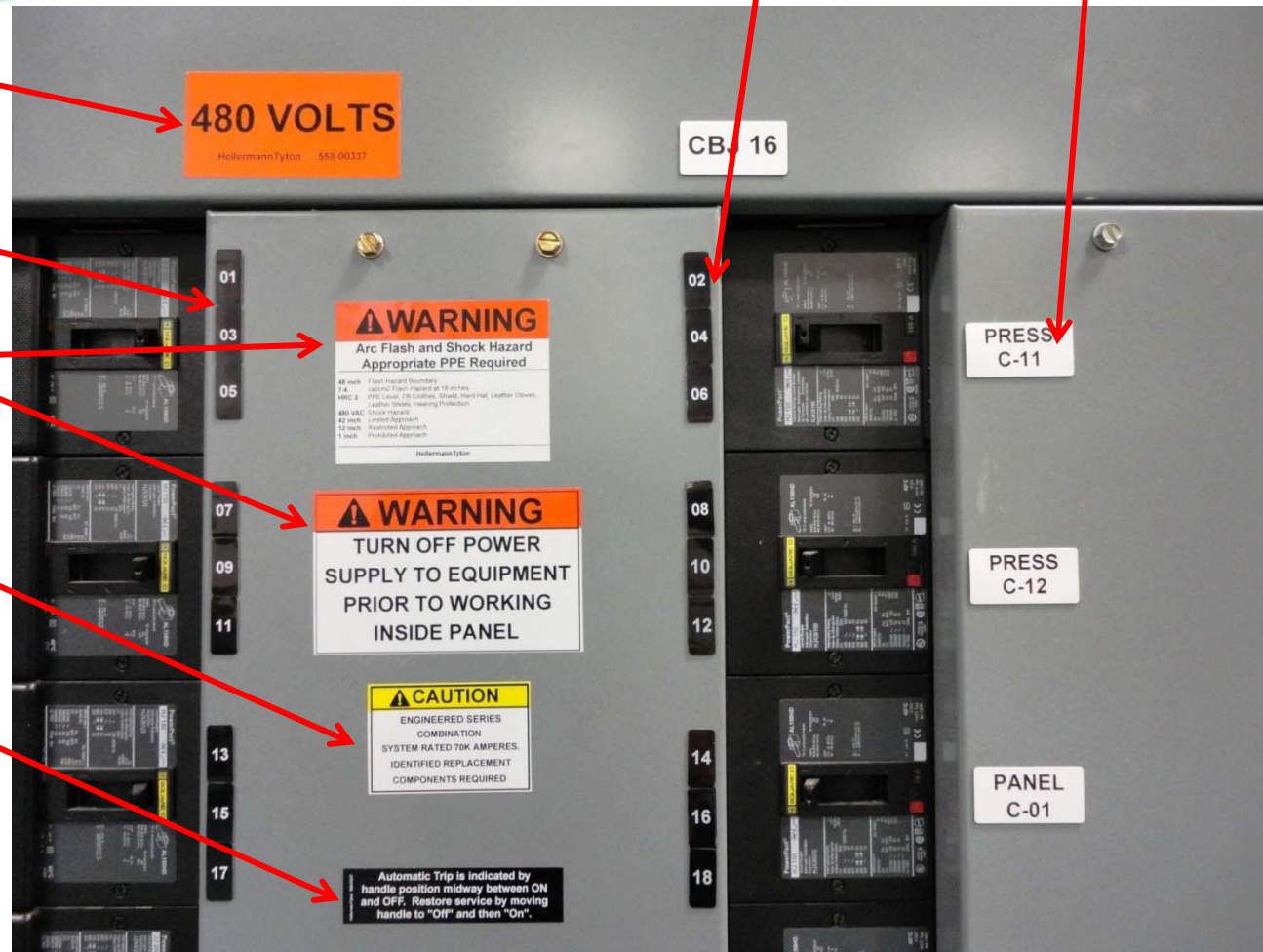
Continuous Vinyl 2"  
orange 558-00337

Foam Nameplate  
596-00503

Orange header label  
558-00330

Yellow header label  
558-00328

Continuous Vinyl 1"  
black 558-00307



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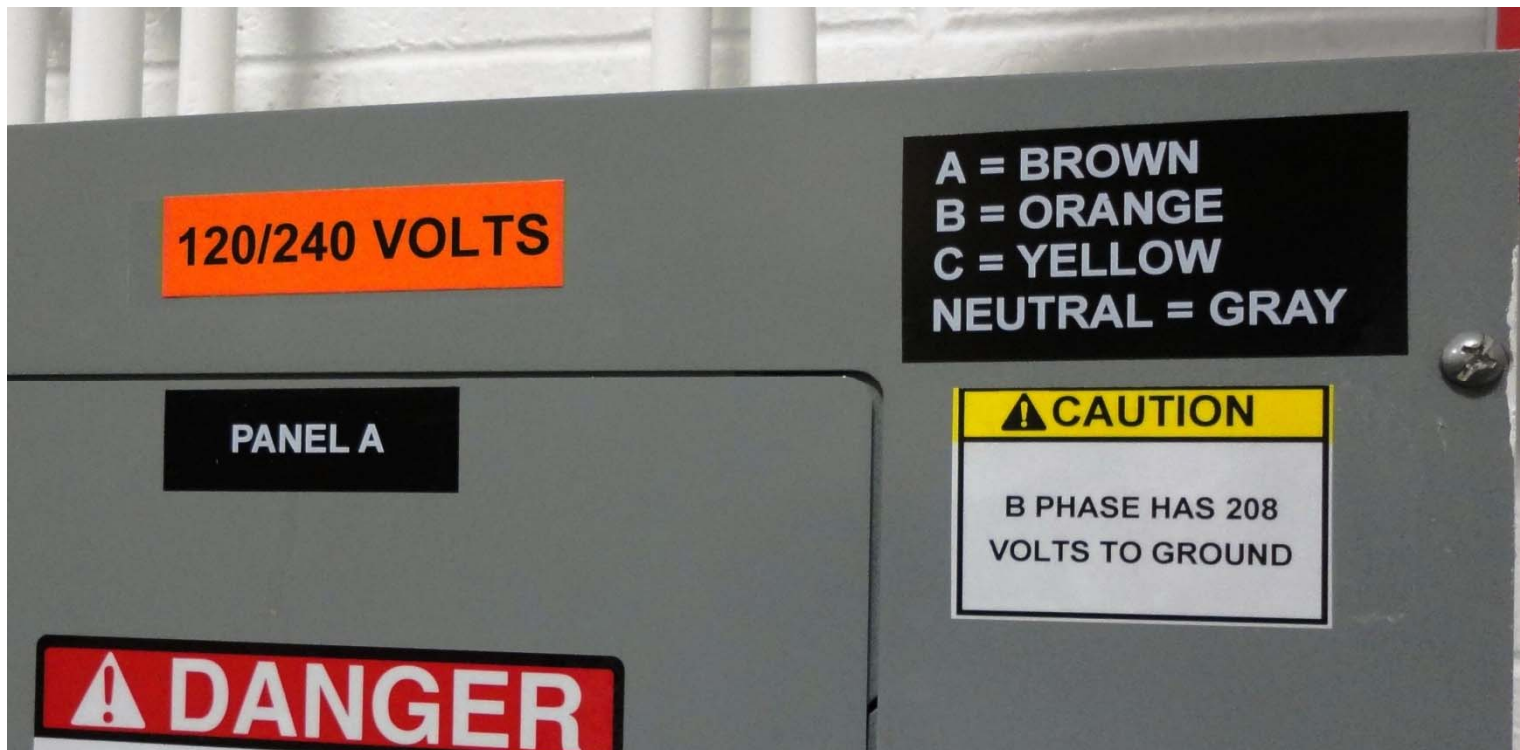
# NFPA 79 -2012: Article 16.2.2

- Safety Signs for Electrical Enclosures: Safety signs shall be plainly visible on the enclosure door or cover.



# NFPA 70E 2015 – 205.11

- **WARNING SIGNS:** Warning signs, where required, shall be visible, securely attached, and maintained in a legible condition.



# NEC 408.4(B) Switch Boards and Panel Boards

- **Source of Supply:** All switchboards and panel boards supplied by a feeder in other than one or two family dwellings shall be marked to indicate the device or equipment where the power supply originates.



# NEC 210.5 (C)(1)(b)

## Branch Circuits

- **POSTING OF IDENTIFICATION MEANS:** The method utilized for conductors originating within each branch circuit panel board or similar branch circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panel board or similar branch circuit distribution equipment. Also see OSHA 1910.304(b)(1)

**A = BLACK  
B = RED  
C = BLUE  
NEUTRAL = WHITE**

**A = BROWN  
B = ORANGE  
C = YELLOW  
NEUTRAL = GRAY**



# NEC 2014 110.22(A) NFPA 70e

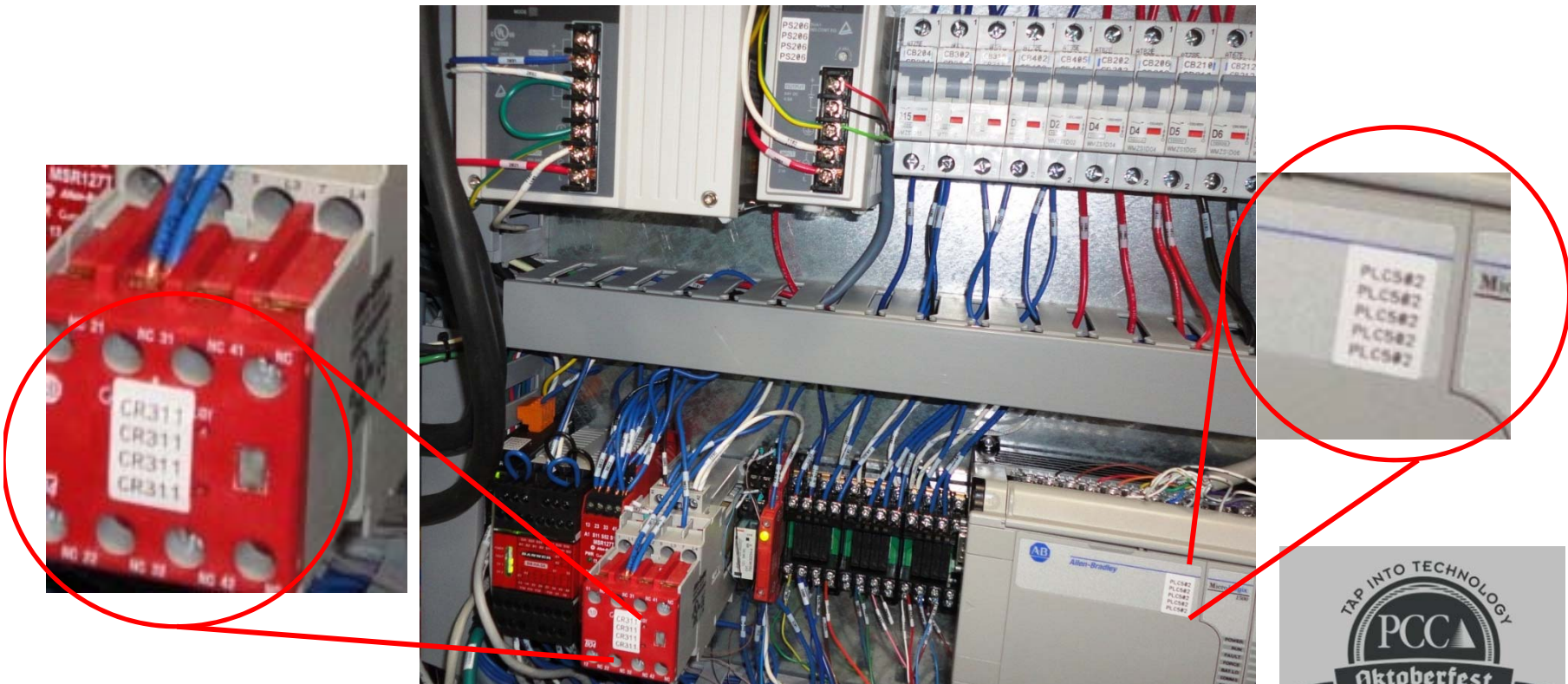
- Identification of Disconnecting Means Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved.



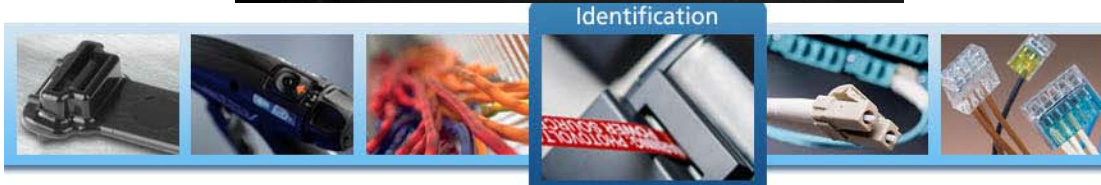
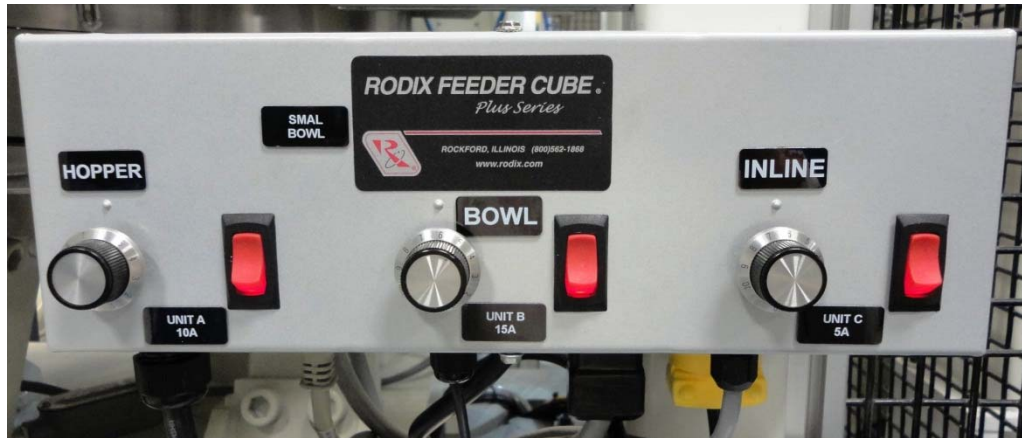
ALSO NEC  
230.2(E),  
230.70(B), 408.4  
And OSHA  
1910.303(f)(1-2)

# NFPA 79 – 2012 Article 16.5.4 & UL 508A Section 67.3.1

- **Identification of components:** All control panel devices and components shall be plainly identified with the same designation as shown on the machine drawings or diagram(s).



# Industrial Automation





# ANSI Z535.4 – 2011 Article 10.2.2

**Replacement:** Product safety signs or labels should be replaced by the product user when they no longer meet the legibility requirements as described in Section 8.2. In cases where products have an extensive expected life or where exposed to extreme conditions, ***the product user should contact either the product manufacturer or another source to determine means for obtaining replacement signs or labels.***



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# Existing Signs and Labels

- Are they consistent within the facility? *(ANSI Z535.4-2011 2.1)*
- Are they still legible? (damaged or worn signs need to be replaced per *(ANSI Z535.4-2011 section 10.2.1 and 10.2.2)*)
- Are they accurate? *(ANSI Z535.4-2011 section 11.2)*
- Do they meet current OSHA and ANSI standards? *(OSHA 2012/ANSI 2011)*
- Are they visible and readable at a safe distance? *(ANSI Z535.4-2011 Section 8.2.2)*
- Do they effectively communicate the message? *(ANSI Z535.3 -2011)*



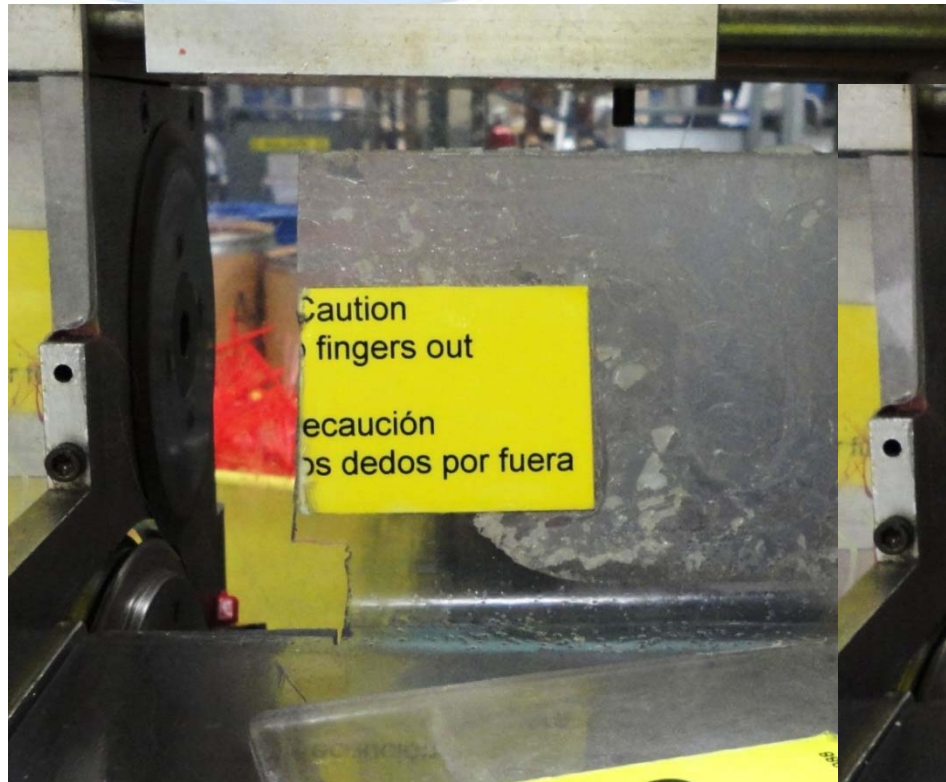
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# Actual Industrial Automation Example



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# Actual Code Compliant Solution



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# Actual Industrial Automation Example



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# Actual Code Solution



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# What is Wrong With These Labels?



# What is Wrong With These Labels?



No Safety Alert Symbol. Old style DANGER signal word header.



No Safety Alert Symbol, Warning not on an orange background. Warning underlined.



Improper Safety Alert Symbol. Does the pictogram communicate effectively?



No Safety Alert Symbol. Old Style CAUTION signal word.



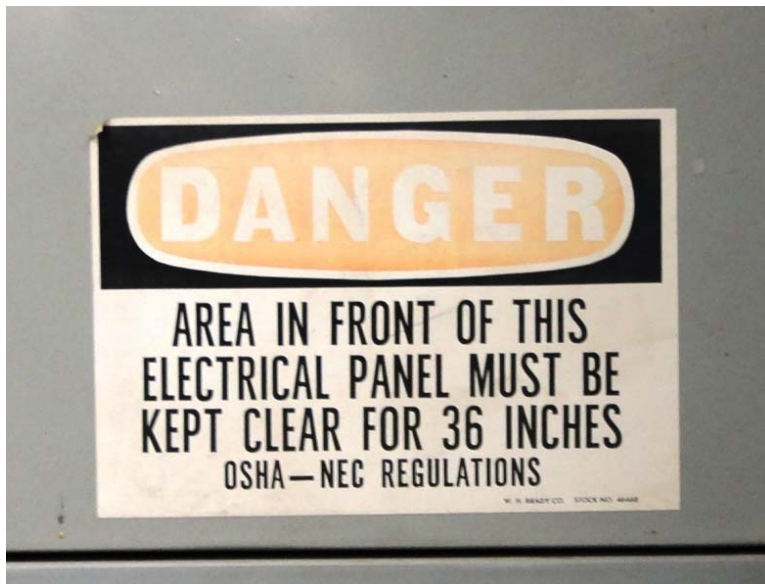


# Corrected Labels



# ANSI Z535.4-2011 Article 10.2.1

**Maintenance:** Product safety signs or labels should be periodically inspected and cleaned by the product user as necessary to maintain good legibility as described in section 8.2.



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# What is Wrong Here?



Identification





# ANSI Z535.4 B6.3

The base of the Safety alert symbol to be on the same horizontal line as the signal word. Symbol can exceed signal word letter height.

Word message segments should correspond to the order of the safety symbols reading left to right.

Too much information on the label.



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# ANSI Z535.4 B6.3



This label is simplified and shows the hazard text in order of the pictograms. Only relevant data (not servicing data) is included in this version of the label.



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# What is Wrong Here?



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# Safety Alert Symbol and Color

The safety alert symbol is not correct.

The word WARNING should be on a safety orange background.

A symbol panel with symbol only is acceptable.



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# What is Wrong Here?



Identification



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# Confusion

**Annex B6:** The signal word corresponding to the greatest seriousness level should be used. The word message and symbols should be prioritized by greatest importance.

This is also multi-lingual.

**Annex B5.1 Figure B23:** Allows this stacked format, but the signal words need to match and or correspond to Annex B6 above.

Danger in Spanish = PELIGRO  
Caution in Spanish = CUIDADO



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# Safety Signage

These signs relate to issues of general health, first aid, medical and housekeeping measures. Headers should be specific such as the word “Eyewash” as an example. The heading and text can be printed in green or black on a white background. The signs may also be printed in white on a green background. These signs must NEVER include the “safety alert” symbol.



Osha 1910.145(d)(6)

Osha 1910.145(c)(3)

Example:  
Eyewash = OSHA  
1910.151(c)  
First Aid =  
1910.252(f)(13)  
ANSI Z535.2-2007  
(4.11.5)



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# General Marking

Solid Colored Continuous vinyl rolls allow for a variety of signs using black or colored ribbons. Only one pass through the printer is necessary.

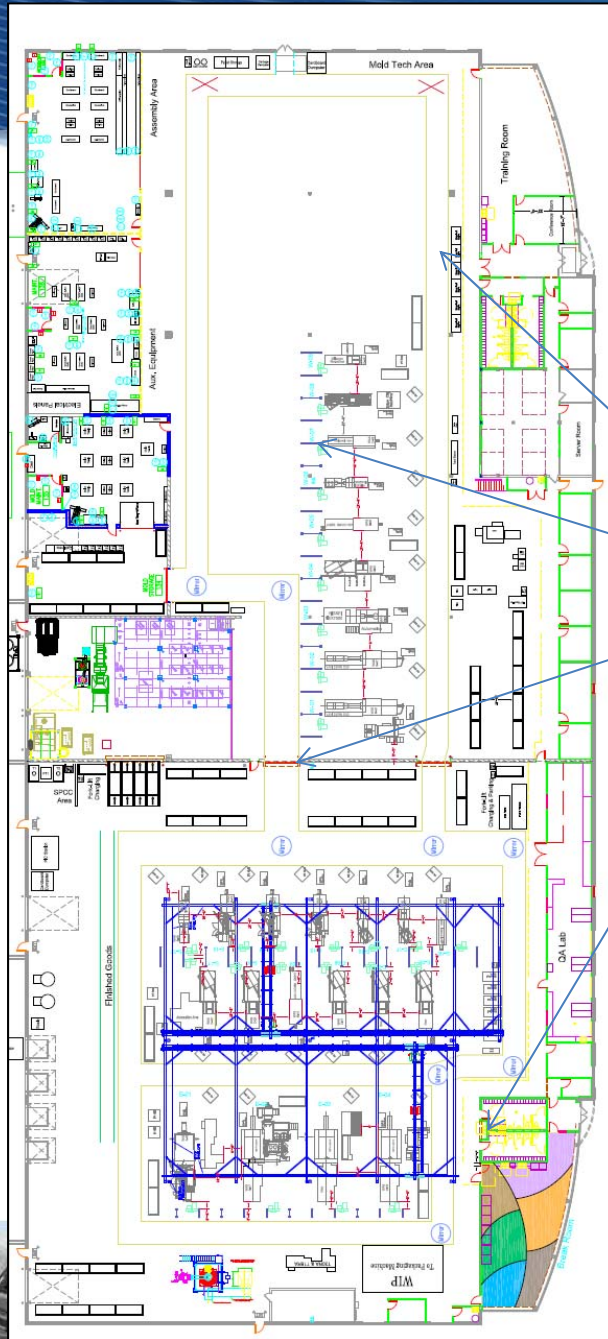


Identification



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# Lean

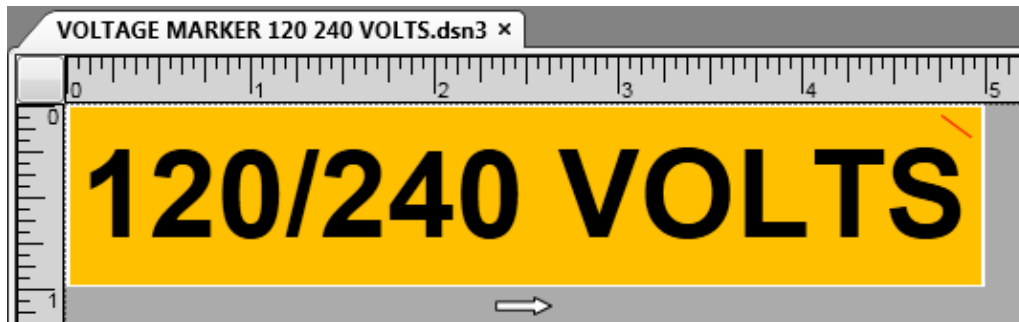
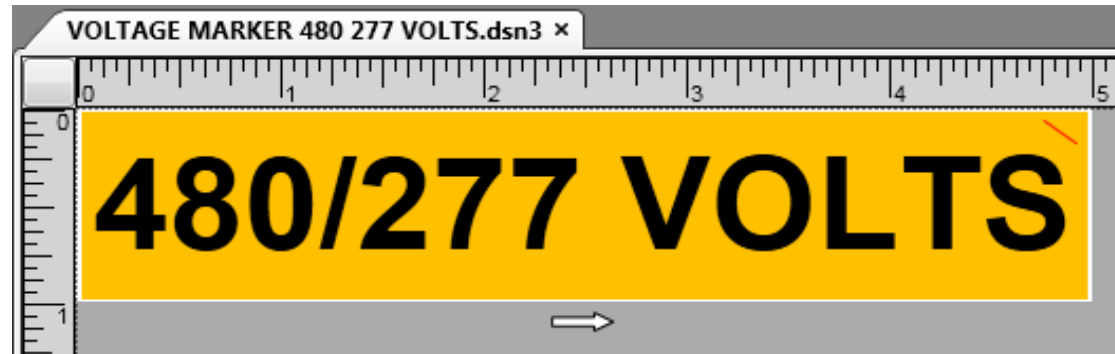


- Waste containers (landfill-yellow, garbage-gray, paper-green, plastic bags-red)
- Recycle containers, scrap or rework-Red
- Aux equipment storage (tumblers, conveyors, grinders, etc.)-Orange
- Ice blaster + Ice-Orange
- Tool boxes (Mold Tech work carts)-Orange
- Thermolators-Orange
- Raw material-Blue
- Finished Goods-Green
- Supplies-Black and White
- Material handling area Gaylord parking lot- Gaylord-Blue, Recycle2-Red, Other Material-Black
- Cleaning equipment-Orange
- Fork trucks + wave-Orange
- Pallet jacks-Orange
- Carts/trucks, etc.-Orange
- Mold tech supplies (hoses, heater cords, bolts etc.)- Black and White
- Work Center Red Bins(Red)
- Work Center Green Bins-WIP(White)



# VOLTAGE MARKERS NFPA 70E-2015

## Article 205.12



ANSI ZG3.22 Orange shall be used as the basic color for designating dangerous parts of machines or energized equipment.

Also see OSHA 1910.303(e)(1)(ii) and UL 508A Section 49.6

Circuit or VOLTAGE information shall be securely affixed and maintained in updated and legible condition. The orange solid colored vinyl rolls make printing Voltage markers labels easy and fast.

558-00336

# ARC FLASH LABELS



**WHAT IS ARC FLASH?** In layman's terms, arc flash is the passage of electricity between two grounds, such as the electrical "spark" you see when you plug or unplug an appliance. This passage of electrical current, depending on its size, combined with air can provide a deadly explosion.

Art. 110.16 requires arc-flash hazard labels for all electrical equipment such as switchboards, switchgear, panel boards, industrial control panels, meter socket enclosures, and motor control centers, that are in other than dwelling units. No voltage is stipulated, so it's everything except residential.

# ARC FLASH LABELS

- **ARTICLE 110.16 (NEC 2014) and 2015 NFPA 70E and NFPA 79 – 2012 16.2.3 and 16.2.7.**

*Flash Protection. Switchboards, panel boards, industrial control panels, meter socket enclosures, and motor control centers in other than dwelling occupancies, which are likely to require examination, adjustment, servicing, or maintenance while energized, shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.*

- Red warning for greater than 600V (DANGER)
- Orange warning header for less than 600V. (WARNING) The customer has the final decision on which words appear on the labels as long as consistency is maintained. Labels must withstand their environment.
- Article 116.10 in the NEC states that the electrical equipment “shall be field marked to warn qualified persons of potential electric arc flash hazards.” Other than that, the NEC leaves the content up to the employer.
- **No pictograms are specified, but common shock images are acceptable.**
- Meet requirements of the 2015 NFPA 70E (National Fire Protection Association) standard.
- Equipment installed prior to the 2002 NEC provision do not require a label. (unless updated)



# Arc Flash Labels NFPA 70E- 2015 130.5(D)

- Labels installed after September 30, 2011 are required to have all of the information specified in 130.5(D)(1),(2) and (3)

(1) Nominal System Voltage

(2) Arc Flash Boundary

(3) At least **one** of the following:

- a. Available incident energy and the corresponding working distance
- b. Minimum arc rating of clothing
- c. Site Specific level of PPE



**! WARNING**

**ARC FLASH HAZARD**  
**Appropriate PPE Required**

48 inch	Flash Hazard Boundary
7.4	cal/cm <sup>2</sup> Flash Hazard at 18 inches.
HRC 2	PPE Level FR Clothes, Shield, Hard Hat, Leather Gloves, Leather Shoes, Hearing Protection
480 VAC	Shock Hazard when cover is
42 Inch	Limited Approach
12 Inch	Restricted Approach
1 inch	Prohibited Approach

Equipment: Electrical Panel

Label Shown using 558-00330



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# THE SYSTEM



# SOLID COLORED CONTINUOUS ROLLS

558-00310 1" Wide  
558-00314 2" Wide  
558-00346 3" Wide

558-00307 1" Wide  
558-00311 2" Wide  
558-00374 3" Wide

558-00336 1" Wide  
558-00337 2" Wide  
558-00338 3" Wide

558-00309 1" Wide  
558-00313 2" Wide  
558-00345 3" Wide  
558-00350 4" Wide

558-00308 1" Wide  
558-00312 2" Wide  
558-00006 3" Wide  
558-00370 4" Wide

558-00339 1" Wide  
558-00341 2" Wide  
558-00343 3" Wide

558-00340 1" Wide  
558-00342 2" Wide  
558-00344 3" Wide  
558-00351 4" Wide

**600 VOLTS**



**SAFETY FIRST**

**DIAL 911  
IN CASE OF  
EMERGENCY**



**CO<sub>2</sub> FIRE SUPPRESSION  
IN THIS ZONE**



**EXPLOSIVE DUST ZONE  
BEYOND THIS POINT**

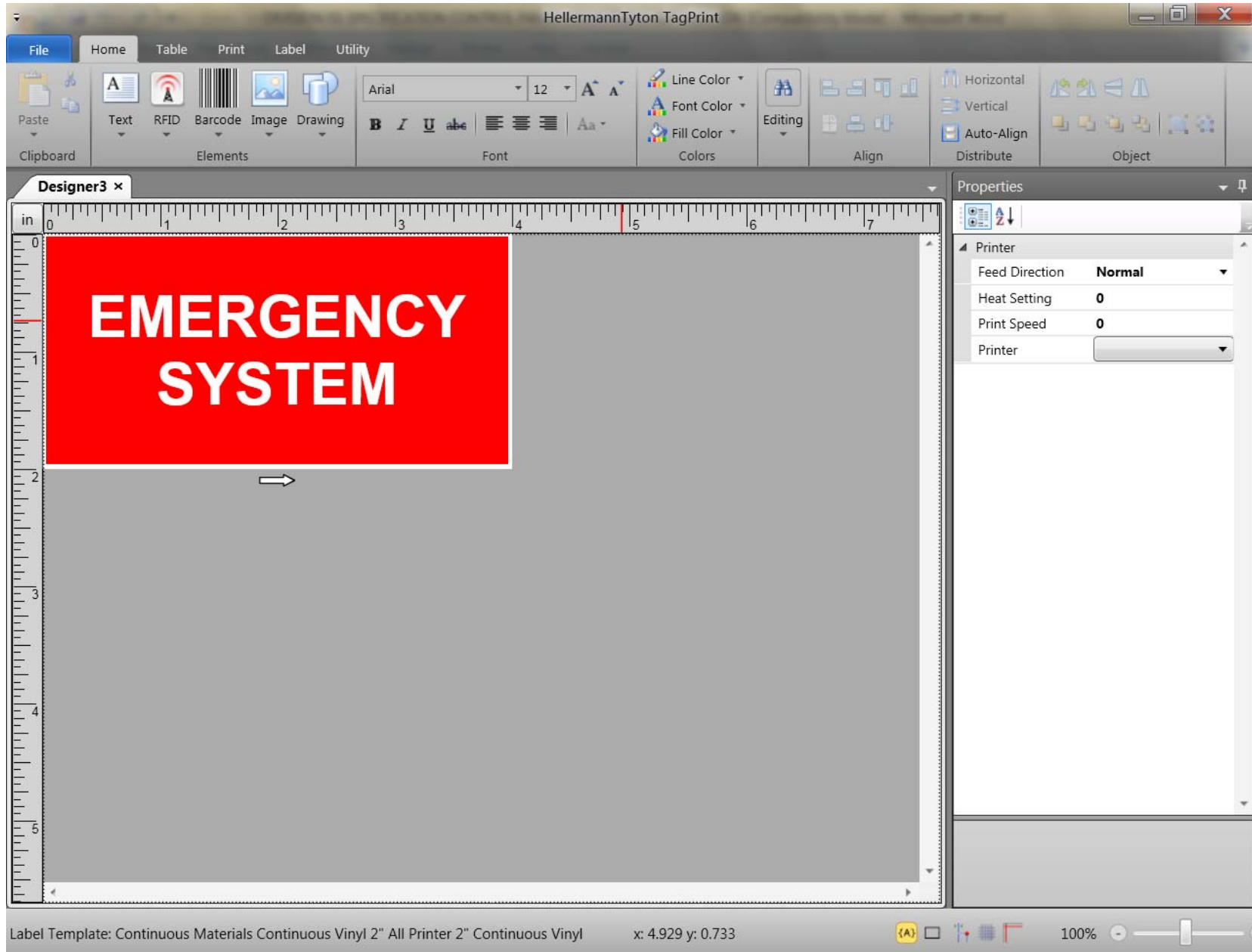


**NO LIQUIDS  
BEYOND THIS POINT**

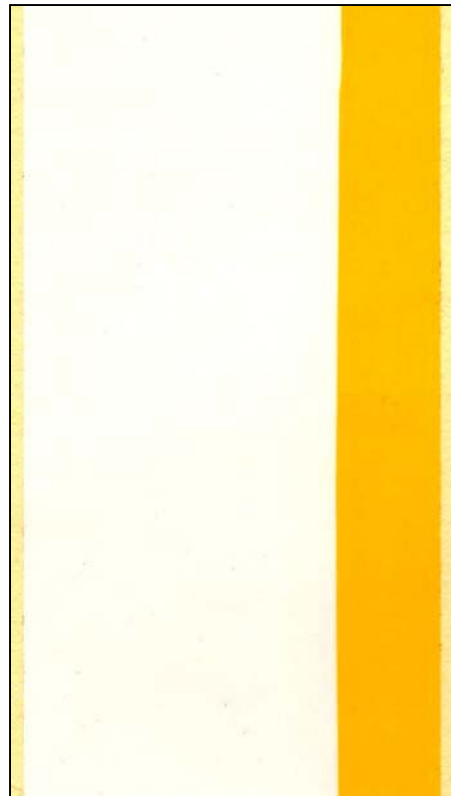
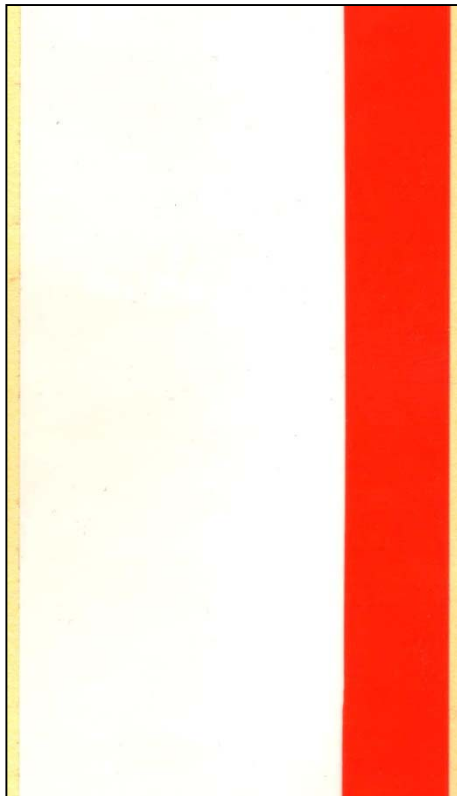


**NO OPEN SPARKS  
PAST THIS POINT**

# Tagprint Pro 3.0



# Banded Colored Continuous Rolls



**⚠ CAUTION**

**SERIES COMBINATION  
SYSTEM RATED 25K  
AMPERES  
IDENTIFIED REPLACEMENT  
COMPONENTS REQUIRED**

**⚠ WARNING**

**Arc Flash and Shock Hazard  
Appropriate PPE Required**

48 inch	Flash Hazard Boundary
7.4	cal/cm <sup>2</sup> Flash Hazard at 18 inches
HRC 2	PPE Level, FR Clothes, Shield, Hard Hat, Leather Gloves, Leather Shoes, Hearing Protection
480 VAC	Shock Hazard
42 inch	Limited Approach
12 inch	Restricted Approach
1 inch	Prohibited Approach

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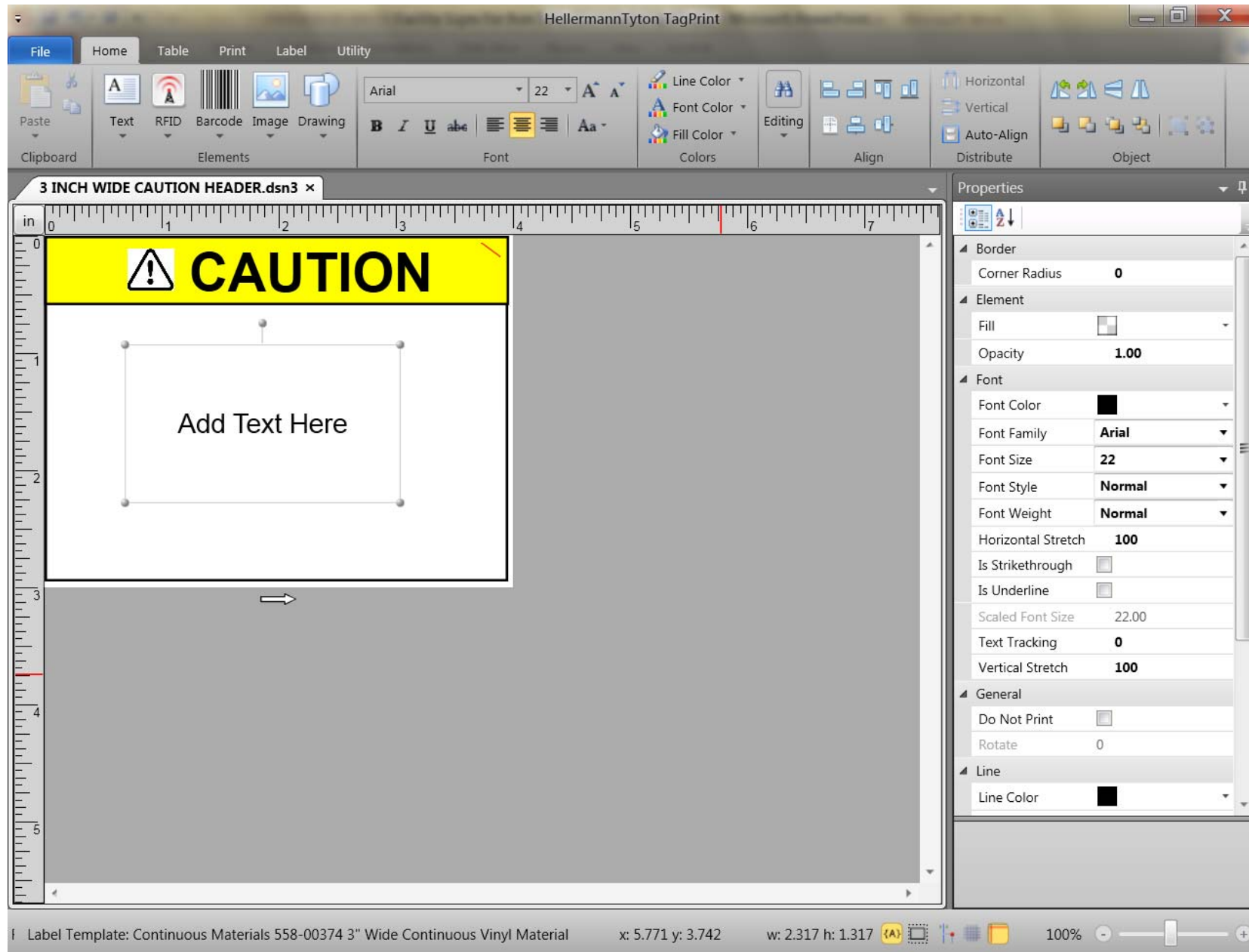
**⚠ PRECAUCION**

**EL LIMITE DE CARGA  
EN EL PISO NO DEBE  
EXCEDER 200 KG  
METROS CUADRADOS**

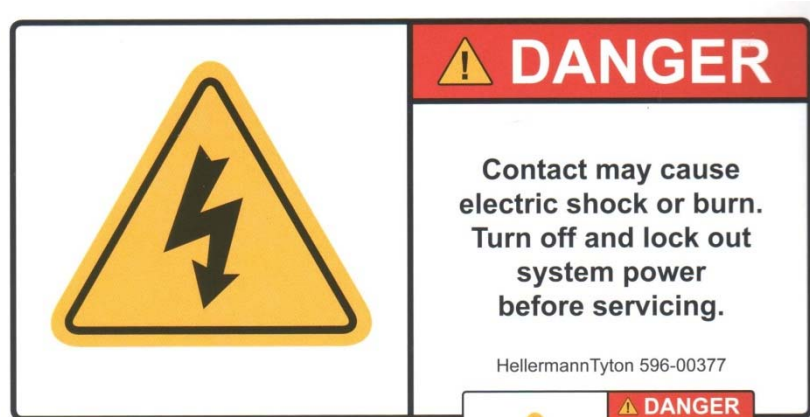
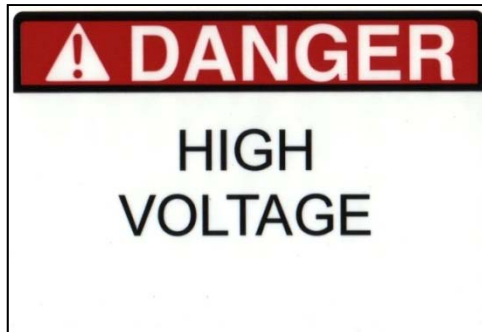
**⚠ WARNING**

**TURN OFF POWER  
SUPPLY TO EQUIPMENT  
PRIOR TO WORKING  
INSIDE PANEL**

# Tagprint Pro 3.0



# Pre-Printed Header Labels



596-00376 | 5.5" x 2.75"



596-00377 | 5.5" x 2.75"



# Tagprint Pro 3.0

The screenshot displays the Tagprint Pro 3.0 software interface. The main workspace shows a label design with a yellow triangular warning sign on the left and a yellow rectangular warning sign on the right containing the text "WARNING" and "ENTER TEXT HERE". A ruler is visible at the top and left of the workspace. The software has a ribbon menu with tabs for File, Home, Table, Print, Label, and Utility. The Home tab is active, showing various tool groups like Clipboard, Elements, Font, Colors, Editing, Align, Distribute, and Object. The Properties panel on the right shows settings for the selected text element, including Border, Element, Font (Arial, size 22, bold), General, and Line. The status bar at the bottom indicates the label template: "Label Template: TTM430 ONLY 596-00377 2.75\" X 5.5\" DANGER - 250/RL" and provides coordinates and dimensions.

596-00376.dsn3 x

in 0 1 2 3 4 5 6 7

0 1 2 3 4 5

**WARNING**

ENTER TEXT HERE

HellermannTyton 596-00376

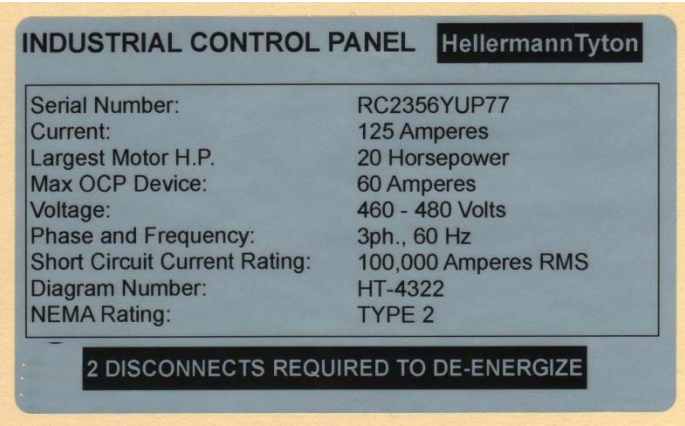
Properties

- Border
  - Corner Radius 0
- Element
  - Fill
  - Opacity 1.00
- Font
  - Font Color
  - Font Family Arial
  - Font Size 22
  - Font Style Normal
  - Font Weight Bold
  - Horizontal Stretch 100
  - Is Strikethrough
  - Is Underline
  - Scaled Font Size 21.60
  - Text Tracking 0
  - Vertical Stretch 100
- General
  - Do Not Print
  - Rotate 0
- Line
  - Line Color

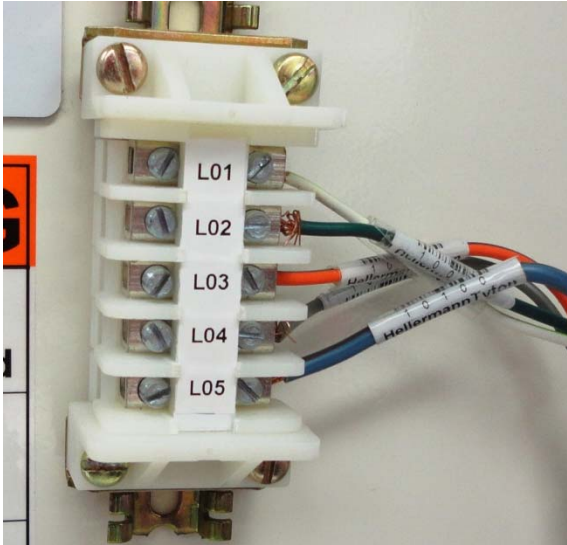
Ready Label Template: TTM430 ONLY 596-00377 2.75" X 5.5" DANGER - 250/RL x: 4.554 y: 3.267 w: 2.161 h: 0.825 100%



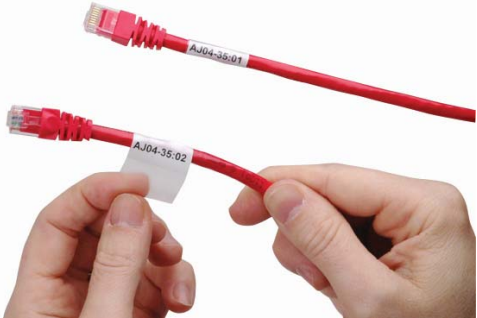
# Thermal Transfer Labels



Rating Labels



Terminal Block Labels



Wire Labels



Phase Labels

# Foam Nameplate Labels

