

Environmental, Health, & Safety

General Safety Standard for Industrial Equipment Summary

4/22/2015

General Safety Standard for Industrial Equipment



Current State – Many safety standards and requirements w/ no guidance on their use



AME Do's & Don't's

Canadian Standards Association (CSA)

US Department of Labor

ASME Classroom Standards

ME Powertrain Standards

International Standards Organization (ISO)

Occupational Safety and Health Administration (OSHA)

Environmental and Technical Instruction (ETI)

National Fire Protection Agency (NFPA)

American National Standards Institute (ANSI)

Underwriters Laboratories (UL)

Safety Manufacturing Instructions (SMI)

Rohr's Industries Association

International Electrotechnical Commission (IEC)

Ministry of Labor Ontario Health and Safety Act (OHSA)

Current State - Issues and Concerns



- Scope creep of the Do's and Don'ts Section 16 Safety written for assembly tools pushed into all manufacturing.
- Breeding ground for:
 - Unclear requirements.
 - Redundancy of requirements.
 - Conflicts between different applicable standards.
 - Incorrect interpretations of standards & requirements.
 - Inconsistent and misapplication.
 - Safety myths and resistance to change.
- Goal – Develop a NAFTA safety standard to replace the Do's and Don'ts Section 16 that meets safety requirements for use in all equipment and reduce the weaknesses above.

FCA – NAFTA Locations Affected

Problem

Form Team

Solution

Improvements

Key Changes

Feedback

(BVAP) Belvidere Stamping and Assembly Plant
(CAAP) Conner Avenue Assembly Plant
(JNAP) Jefferson North Assembly Plant
(SHAP) Sterling Heights Assembly Plant
(SSP) Sterling Stamping Plant
(TAC) Toledo Assembly Complex
(WTAP) Warren Truck Assembly Plant
(WSP) Warren Stamping Plant
(ATD) Autodie Tool and Die
(METD) Mt. Elliot Tool and Die
(WCMA) WCM Academy Warren
(CTC) Chrysler Technical Center Auburn Hills
Chrysler Florida Evaluation Center Naples
Baltimore Transformation Center Maryland

(BAP) Brampton Stamping and Assembly Plant
(WAP) Windsor Assembly Plant)
CPK Interior Products Guelph
CPK Interiors Port Hope

(STAP) Saltillo Truck Assembly Plant
(SASP) Saltillo Stamping Plant
(SSEP) Saltillo South Engine Plant
(TSP) Toluca Stamping Plant
Chrysler de Mexico
FCA Mexico Center for Research, Development & Testing

(DEP) Dundee Engine Plant
(ITP1) Indiana Transmission Plant 1
(ITP2) Indiana Transmission Plant 2
(KTP) Kokomo Transmission Plant
(KCP) Kokomo Casting Plant
(MEC) Mack Engine Complex
(TTP) Tipton Transmission Plant
(TEC) Trenton Engine Complex
(TMP) Toledo Machining Plant
(CPG) Chrysler Proving Grounds Chelsea
(APG) Arizona Proving Grounds Arizona
Chrysler Group Transport Detroit
Chrysler Group Transport Toledo

(ECP) Etobicoke Casting Plant
FCA Canada Windsor
CPK Interior Products Belleville
Chrysler Group Transport Windsor

SVAP) Saltillo Van Assembly Plant
(SNEP) Saltillo North Engine Plant
(TAP) Toluca Assembly Plant
Chrysler Group Transport Mexico
WCM Academy Saltillo

21 Mopar Parts Distribution and 12 Regional Business Centers across the United States, Canada, and Mexico.

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EHS Team Participants



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Scope



■ What it is.

- Describes machinery and equipment safety requirements for suppliers and FCA – NAFTA employees from acquisition and operation through disposal.
- Describes minimum requirements to meet government regulations, and accepted industry consensus standards (Standards).
- Highlights specific statements from Standards that are the most common occurrence.
- Identifies the source of the requirement for more information.
- Describes all hazards on the factory floor.
- Describes **what** is required for a safe workplace but not necessarily **how** it should be implemented.

■ What it is not.

- It is not an instruction manual on safe practices or methods.
- It is not all inclusive. It does not contain every safety practice or method.
- It is not an electrical standard.

Hazards and Safeguards



• 1.0 Scope

- Facilities Affected
- Risk Assessment
- Deviations
- Revisions
- Interpretations
- Supplemental Standards

• 2.0 Design for Safety

- Risk Assessment
- Pre-Start Health & Safety Review
- Design Reviews
- Planning
- Process
- Design
- Construction
- Installation
- Operation
- Disposal
- Component Approval

• 3.0 Hazards

- Construction
- Working surfaces/egress
- Compressed gas
- Dipping, coating, and spraying
- Confined space
- Lasers
- Overhead
- Pinch point
- Moving equipment
- Electrical
- Air quality/ventilation
- Hazardous Materials
- Fire
- Thermal
- Point of Operation
- Noise
- Ergonomic

Hazards and Safeguards



- **4.0 Safeguarding**

- Safe distance to hazards
- Fixed, adjustable, and movable guards
- Barriers and fence
- Gate access
- Blocking
- Brakes
- Presence sensing
- Awareness barriers

- **5.0 Electrical Safeguarding**

- Shock
- Arc flash
- Safety related control circuits & devices
- Wiring
- Alternative safeguarding

- **6.0 Marking**

- Colors
- Labeling
- Signs
- Beacons, horns, & alarms

- **7.0 Other Systems**

- Hydraulic
- Pneumatic

- **8.0 Specific Equipment**

- Assembly Systems
- Conveyors
- Cranes
- Metal Cutting
- Press Equipment
- Robots
- Facilities
- Industrial trucks and moving platforms

- **Appendix**

- A NAFTA Facilities
- B NAFTA Engineering Organizations
- C Regional Requirements
- D Balconies, Ladders, & Stairways
- E Safety Distance
- F-J Risk Assessment
- K/L Safety Labels and Colors
- M Equipment Layout

Result



Industry Standards & Governmental Regulations

Occupational Health and Safety Administration (OSHA)

Ministry of Labor – Ontario Health and Safety Act

American National Standards Institute (ANSI)

International Electrotechnical Committee (IEC)

International Standards Organization (ISO)

National Fire Protection Agency (NFPA)

Robotics Industries Association (RIA)

Underwriters Laboratories (UL)

Canadian Standards Association (CSA)

FCA – NAFTA General Safety Standard for Industrial Equipment

NAFTA EHS Approved Supplemental Safety Standards

Powertrain

Conveyors

Facilities

Stamping

BIW

Paint Operations

Mopar

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Key Changes & Improvements



- [Compliance with 87 standards and regulatory requirements.](#)
- [Identification of the source of statements for additional information.](#)
- [Identification of recognized supplemental requirements.](#)
- [Interpretation, deviation, supplement and revision process.](#)
- [Risk analysis requirements.](#)
- [Safety rated device approval process.](#)
- [Ladders and balcony standard.](#)
- [Adoption of international standards support global acquisitions.](#)
- [Consensus color and signage.](#)
- [Barrier Heights](#)
- [Stop category definitions.](#)
- [Lockout device clarification.](#)
- [Alternative Methods.](#)
- [Feedback.](#)

Improvement 1 - Compliance with Regulations



2.1.2 All equipment and facilities shall meet the applicable requirements of this standard and the:

- U.S. Department of Labor, or
- Canadian Ministry of Labor, or
- Mexico Secretaría del Trabajo y Previsión Social,
- any local governing requirements.

5.1.3 Any situation or point not described in this clause relies on the following standards as they apply:

- NFPA 70 National Electrical Code
- NFPA 70E Standard for Electrical Safety Requirements for Employee Workplaces
- NFPA 79 Electrical Standard for Industrial Machinery
- ANSI B11.19 Performance Criteria for Safeguarding

5.1.4 Industrial control panels shall meet the requirements of UL 508A.

Improvement 2 - Identification of Source



1.6.1 Referenced standards and regulations that are not part of a statement are enclosed in [brackets] and intended to identify the source of the requirement if more information is needed.

Sample

3.3.3 Guarding for floor and wall openings large enough for persons to walk into shall be guarded by standard 42 inch (1.1 m) high railing and midrail. [29 CFR 1910.23] Note that regional regulations in the province of Ontario Canada require railings to be a minimum of 36 inch (910 mm) to 42 inch (1070 mm). [O. Reg. 851, s. 11]

Improvement 3 - Defined supplemental engineering requirements approval process.



1.5.3 Engineering group supplemental requirements shall be reviewed and approved by EHS prior to implementation. See Appendix B FCA-NAFTA Engineering Organizations for a list of FCA organizations with supplemental requirements.

Appendix B FCA – NAFTA Engineering Organizations

Facility

Powertrain and Component Operations

Stamping Plant Operations

Assembly Plant Operations

Stamping and Assembly Conveyors

Mopar Parts Distribution Centers

All buildings and grounds

Assembly Plant Paint Operations

Engineering Authority

CTC Manufacturing Engineering Powertrain (ME-PT)

CTC Advance Stamping Manufacturing Engineering (ASME)

CTC Manufacturing Engineering – Body In White

CTC Manufacturing Engineering – General Assembly Conveyors

Centerline Mopar Facilities

CTC Manufacturing Engineering – Building Construction

CTC Manufacturing Engineering – Paint Operations

Improvement 4 - Revision, Interpretation, & Deviation Process



- 1.5.1 The requirements of this standard are considered mandatory for all equipment. Unless otherwise stated, deviations from the **requirements** of this standard shall require approval by FCA Environment, Health, & Safety (EHS).
- 1.5.2 **Revisions to** the requirements to this standard shall be referred to FCA EHS for consideration. Engineering group supplemental requirements shall be reviewed and approved by EHS prior to implementation. See Appendix B FCA-NAFTA Engineering Organizations for a list of FCA organizations with supplemental requirements.
- 1.5.3 **Interpretation** of referenced standards to a specific application is at the discretion of FCA EHS.
- 1.5.4 Where **conflicts** arise between the applicable governmental, industry consensus and this standard, the most stringent requirement shall apply.

Improvement 5 - Defined Risk Analysis application



2.2.1 Hazard identification methods may include any or all of the following:

- * Risk assessment(s) when required;
- * Process Concept Review;
- * Job Safety and Risk Assessments (JSRA);
- * Ergonomic assessment;

2.2.2 Analysis of duplicate equipment may not be required if an existing risk assessment for the same piece of equipment manufactured by the same equipment supplier is available.

2.2.3 Preliminary Hazard List (PHL) is an engineering tool to identify hazards. See Appendix H Preliminary Hazard List for a blank PHL.

2.2.4 Preliminary Hazard Analysis (PHA) form is an engineering tool to mitigate identified hazards. See Appendix J Preliminary Hazard Analysis for a blank PHA.

2.2.5 When a risk assessment of equipment is required under this standard, it shall follow the requirements of ANSI B11.0 Safety of Machinery; General Requirements and Risk Assessment. See Appendix K Risk Assessment for an example.

2.2.6 Selection of one or more of the methods in the hierarchy of safeguarding listed in prioritized order below provides the safest and most cost effective solution to hazard control.

- (1) Eliminate the hazard
- (2) Substitution
- (3) Provide engineered controls to mitigate the hazard
- (4) Provide administrative controls to educate employees and identify hazards
- (5) Provide employees with personal protective equipment (PPE) to safely work with the hazard.

Improvement 6 - Defined safety rated component approval process.



- 2.11.1 Components, materials, or devices that pose a shock or fire threat shall be listed, labeled, or identified by a qualified testing laboratory that performs product evaluations and maintains periodic inspection of production of the identified equipment or materials and by whose identification the manufacturer indicates compliance with appropriate standards or tested and found suitable for a specified use. [NFPA 70]
- 2.11.2 Components, materials, or devices that OSHA has designated as ‘requiring NRTL approval’, shall be tested and approved by a Nationally Recognized Testing Laboratory (NRTL) [29 CFR 1910.7]
- Informational Note: NFPA 70 requires a testing laboratory to be qualified, while OSHA requires a testing laboratory to be nationally recognized by them. Canadian Standards Association (CSA), Factory Mutual Approvals (FM), Intertek Testing Services NA (ETL), TUV, and Underwriters Laboratories (UL) are all acceptable NRTLs.
- 2.11.3 Safety rated control devices shall have a safety related parts of a control system (SRP/CS) rating as described in ISO 13849-1:2008 Safety of machinery – Safety-related parts of control system – General Principles for design. Additional information can be found in clause 5.0 Electrical Safeguarding.
- 2.11.4 Any safe guarding device used for personnel protection shall be approved by EHS. Approval shall be by one of the following:
- (1) listed on an approved list of materials, or
 - (2) have a written deviation approved by EHS.

Improvement 7 - Adoption of balcony and ladder standard across FCA – NAFTA.



3.3.2 Equipment platforms, balconies, ladders, stairways and walkways shall meet the requirements of 29 CFR 1910 Subpart D. Additional information may be found in Appendix D Balconies, Platforms, Ladders, and Stairways.

Appendix D Balconies, Platforms, Ladders, and Stairways

D.1.1 To identify the minimum requirements of the U.S. Department of Labor for industrial machinery and provide supplemental FCA requirements to them for the design and construction of permanent elevated balconies, platforms, catwalks, ladders, and stairways used with manufacturing equipment.

D.1.2 It is not the intent of this appendix to override the U.S. Department of Labor minimum safety requirements.

D.3.1 All balconies, platforms, catwalks, ladders, and stairways shall meet the appropriate requirements of the following U.S. Department of Labor standards:

- * 1910 Subpart D - Walking-Working Surfaces
- * 1910.21 - Definitions.
- * 1910.22 - General requirements.
- * 1910.23 - Guarding floor and wall openings and holes.
- * 1910.24 - Fixed industrial stairs.
- * 1910.27 - Fixed ladders.
- * 1910.30 - Other working surfaces.

Improvement 8 - Acceptance of international standards where possible.



9.6 INTERNATIONAL ELECTROTECHNICAL COMMITTEE, GENEVA, SWITZERLAND

- IEC[EN] 60825-1 clause 4.12 on Walk-in Workcells,

9.7 INTERNATIONAL STANDARDS ORGANIZATION, GENEVA, SWITZERLAND

- ISO 10218-2 Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
- ISO 13849-1:2008 Safety of machinery – Safety-related parts of control system – General Principles for design.
- ISO 13854 Safety of machinery -- Minimum gaps to avoid crushing of parts of the human body

Improvement 9 - Adoption of industry consensus warning color and sign/label usage.



6.2.1 Unless otherwise stated in this standard, the use of colors to identify hazards, and safeguards, shall follow ANSI Z535.1 Safety Color Code. (See Appendix G Safety Color Identification for color descriptions.)

Table G1 Safety Colors			
COLOR	RAL	ANSI	*NPVP
SAFETY RED	3020 Traffic Red	7.5R 4/14 Safety Red	7.5R 4/14
SAFETY ORANGE	2011 Deep Orange	5YR 6/15 Safety Orange (OSHA)	3.75YR 6/14
SAFETY YELLOW	1018 Zinc Yellow	5Y 8/12 Safety Yellow	3.75Y 8.5/12
SAFETY GREEN	6024 Traffic Green	7.5G 4/9 Safety Green	7.5G 4/8
SAFETY BLUE	5017 Traffic Blue	2.5PB 3.5/10 Safety Blue	2.5PB 3/10
FLAT BLACK	9005 Jet Black	N 1.5/ Safety Black	N 0.75/
MACHINE WHITE	9010 Pure White	N 9/ NEMA White	5Y 9/1

6.3.2 Warning labels shall conform to ANSI Z535.4 Product Safety Signs and Labels. (See Appendix F Warning Labels for more information.)



Prohibited



Hazard Identification



Mandatory Action



Information



Hot



Pinch



Sharp Edge



Fire

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Key Change 1 – Barrier Heights.



4.4.2 Unless otherwise allowed by this standard, barrier height from the working surface shall be no less than that shown in Table 4.2 Barrier Height, when a minimum of 900mm (36 in) of safety distance to the hazard is maintained.

Region	US / Mexico	Canada
Height	1600mm (63in)	1800mm (71in)
Standard	[ANSI B11.19]	[CSA Z432-04] [CSA Z434-03]

Exception: Shall require a risk assessment.

Exception: Robots and robot systems have alternate requirements. See sub clause 8.7.

4.4.3 Additional (strength, height, or width) guarding shall be required when either:

- the potential of a falling or flying hazard exist, or
- a pinch point is within 0.91m (36 in.) of the top of the guarding (reach over condition), or
- additional equipment or devices are attached to and supported by the barrier.

4.4.4 See Appendix E Safety Distance for additional barrier information.

4.4.5 Gaps or openings between the barrier and the adjacent walking surface shall be no greater than 180mm (7 in).

Key Change 2 – STOP categories.



5.7.1 Electrical stop categories are defined by NFPA 79 Electrical Standard for Industrial Machinery and included in the glossary. Unless otherwise stated, references to stop categories also apply to equipment motion.

- Category 0 Stop – an uncontrolled stop by immediate removal of power to the machine actuators.
- Category 1 Stop – A controlled stop with power to the machine actuators available to achieve the stop and removal of power when the stop is achieved.
- Category 2 Stop – A controlled stop with power left available to the machine actuators.

5.7.2 Equipment shall have at least one Category 0 stop (immediate) device. [NFPA 79]

5.7.3 Category 0 stops shall override all other stops. [NFPA 79]

5.7.4 Category 0 and Category 1 stops shall be operational in all equipment modes, disable the relevant circuit and override their related start functions. [NFPA 79]

5.7.5 Category 1 stops shall be allowed only where personnel are not exposed to the hazard caused by delays in stopping.

5.7.6 Category 2 stops shall be allowed only in the following applications:

- Where personnel are not exposed to the hazard, or
- Where power removal without additional safeguards in place that may cause a hazard.
- A risk analysis shall be required.

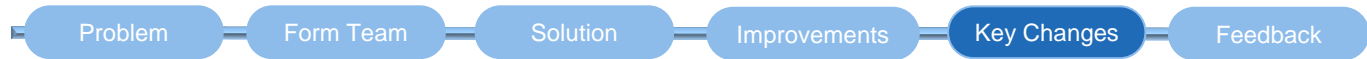
5.7.7 The emergency stop function shall perform a Category 0 stop. [NFPA 79]

Exception: Category 1 stop (drives off) may be permitted by an emergency stop button with a risk assessment of potential hazards. [NFPA 79]

5.7.8 Reset of an emergency stop device or circuit shall not initiate a restart. [NFPA 79]

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Key Change 3 – Lockout device clarification.



5.7.10 Barrier safety rated interlocks shall perform a Category 0 stop when deactivated.

Exception: A Category 1 (drives off) or Category 2 (drives on) may be allowed as determined by a risk analysis.

5.7.11 Interlocks that perform a Category 2 stop shall require an additional safeguarding device.

Informational Note: A enabling device is an example of an additional safeguarding device.

5.10.3 A control device that performs a Category 2 stop (drives on) shall not be lockable.

5.10.7 Operator controls for cycle stop or position stop should be yellow in color and may perform a controlled stop for their respective equipment.

5.10.8 Unless otherwise specified, push buttons that perform a cycle stop shall not be lockable.

5.10.14 Interlock devices used with moving barriers shall: [RIA 15.06] [ANSI B11.19 Explanatory] [CSA Z432.4]

- have a key, actuator or plug that is not easily duplicated
- be secure and tamper resistant
- have a minimum SRP/CS rating of Cat 3 as described in ISO 13849-1:2008 Safety of Machinery- Safety related parts of control system – General Principles for design.

Key Change 4 – Alternative Methods clarification.



5.14.1 Where access to the equipment may be necessary without lockout/tagout in place, the equipment shall be designed and constructed to enable alternative safeguarding methods as described here that provide equivalent and effective protection as required by 29 CFR 1910.147 and in detail in ANSI/ASSE Z244.1-2003 (R2008) Control of Hazardous Energy—Lockout/Tagout and Alternative Methods.

5.14.6 Control devices and circuits used to override safeguards as part of alternative methods shall provide an equivalent level of protection as the suspended safeguard and: [NFPA 79] [ANSI Z244.1]

Definitions

- Cycle – a complete movement of motion or equipment from the start position through the working position ending in the start position. [ANSI B11.11]
- Cycle Stop – a control system command to stop the continuous operation of the equipment at the end of its current cycle.

Feedback – Continuous Improvement



- Implement “Live” feedback system to enable user comments for consideration.
- Review and disposition all comments.
- Stay focused on needs – not wants.
- Review General Safety Standard on a schedule to ensure it is up to date.



Thank You.