North American Safety Standards

Application vs. Construction Standards

Light curtain standards fall into two categories: *application standards* and *construction standards*. **Application standards** reference how to use a light curtain for machine guarding, for example, how to calculate the safe mounting distance. Although some may give condensed construction information, often the main thrust of an application standard is how to apply a light curtain for the type of machine covered by the standard. For example, ANSI/RIA R15.06 discusses the use of presence-sensing devices (light curtains) for robot guarding. ANSI B11.1 provides information on how to use presence-sensing devices on mechanical power presses.

Construction standards provide design, construction and testing information on presence sensing devices. There are currently no construction standards developed in North America and IEC61496, an IEC standard entitled "Safety of Machinery - Electrosensitive Protective Equipment" is generally accepted as the default.

IEC61496 covers specific items such as the number of outputs required, the need for a key-operated switch, transformer construction, and failure conditions. Test specifications require that the equipment be subject to a battery of tests including moisture and dust intrusion, power supply transients, electrical interferences, electrostatic discharges, component failure mode analysis and object sensing capabilities.

Machine Guarding

In the United States, installation and use of machine guarding is regulated by the Occupational Safety and Health Administration (OSHA). Some states have their own safety organizations with regulations that must be at least as strict as the federal OSHA standards.

In addition to OSHA, other organizations provide information on proper machine guarding. The American National Standards Institute (ANSI) publishes the B11 standards to provide information on the construction, care and use of machine tools. Certain standards are developed for specific types of machine tools.

Standards in the B11 series include:

B11.1: Mechanical Power Presses
B11.2: Hydraulic Power Presses
B11.3: Power Press Brakes
B11.4: Shears
B11.5: Iron Workers
B11.6: Lathes
B11.7: Cold Headers and Cold Formers
B11.8: Drilling, Milling and Boring Machines
B11.9: Grinding Machines
B11.10: Metal Sawing Machines
B11.11: Gear Cutting Machines
B11.12: Roll Forming and Roll Bending Machines
B11.13: Single- and Multiple-Spindle Automatic Bar and Chucking Machines
B11.14: Coil-Slitting Machines
B11.15: Pipe, Tube and Shape Bending Machines
B11.16: Metal Powder Compacting Machines
B11.17: Horizontal Hydraulic Extrusion Presses
B11.18: Machinery and Machine Systems for Processing Strip, Sheet, or Plate from Coiled Configuration
B11.19: Perfomance Criteria for the Design, Construction, Care and Operation of Safeguarding When Referenced by other B11 Machine Tool Safety Standards. B11.19 is considered one of the best single sources of machine tool guarding information for the American market.
B11.20: Manufacturing Systems/Cells
B11.21: Machine Tools Using Lasers for Processing Material
B11.22: Turning Centers and Automatic, Numerically Controlled Turning Machines
B11.23: Machining Centers and Automatic, Numerically Controlled Milling, Drilling and Boring Machines
B11.24: Transfer Machines

Additionally, while not standards, the following technical reports add clarity to the understanding of their subject:

B11.TR1: Ergonomic Guidelines for the Design, Installation and Use of Machine Tools
B11.TR2: Mist Control Considerations for the Design, Installation and Use of Machine Tools Using Metalworking Fluids
B11.TR3: Risk Assessment and Risk Reduction – A Guide to Estimate, Evaluate and Reduce Risks Associated with Machine Tools

Integrated Manufacturing Systems/Cells

An integrated manufacturing system is defined as a group of two or more industrial machines working together in a coordinated manner normally interconnected with and operated by a supervisory controller or controllers capable of being reprogrammed for the manufacturing of discrete parts or assemblies. This definition is provided by ISO 11161, *Safety of*

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Integrated Manufacturing Systems, an international standard covering requirements for the safe installation, programming, operation, maintenance or repair of these systems. A similar standard is ANSI B11.20, entitled *Manufacturing Systems/Cells - Safety Requirements for Construction, Care and Use*.

Both of these standards cover the safety of multiple machines under some type of common control. When machines in an integrated system operate separately or individually, or the safeguards are muted or suspended, the safety standards for the individual machines should be used as a supplement.

Robots and Robot Systems

Safety guidelines for applications using industrial robots result from the joint effort of ANSI and the Robotics Industries Association (RIA). In standard ANSI/RIA R15.06, an industrial robot is defined as a reprogrammable multifunctional manipulator designed to move material, parts, tools, or other devices. This standard does not apply to numerically controlled machine tools.

Ontario Regulation 7

Each Canadian province has created, or is developing its own specific safety regulations. The province of Ontario may have the most complete set. Of particular interest to users of industrial machinery is Regulation 7 of the *Regulations for Industrial Establishments*.

Regulation 7 outlines the requirements for a *Pre-Start Health and Safety Review* (PHSR). The intent of a PHSR is three-fold:

1. Provide for a timely professional review to identify specific standards.

2. Ensure hazards are removed or controlled before start-up.

3. Ensure that worker protection as required under the applicable provisions of the *Regulations for Industrial Establishments* is provided.

What is a Pre-Start Health and Safety Review?

A PHSR is conducted upon the construction, addition or installation of a new machine, structure or protective element, or the modification of an existing installation.

The end result of a PHSR is a written report. This report details the actions, steps or engineering controls required to bring the subject application into compliance with the provisions of the *Regulations for Industrial Establishments.*

Benefits of a PHSR include:

- Prevention of hazardous incidents
- Assurance of uniform quality inspections
- Reduced cost of protection
- Assurance that high risk areas are addressed
- Raises standards for OEM manufacturers

Although specific to the Canadian province of Ontario, Regulation 7 and the resulting PHSR report incorporate the risk assessment principals found elsewhere in this engineering guide.

The Canadian Standards Association (CSA)

CSA is a Canadian laboratory that tests and certifies the electrical integrity and safety of products. CSA is accredited by OSHA as a Nationally Recognized Test Laboratory (NRTL) which covers testing of all products under OSHA's jurisdiction.

The NRTL/C mark (Canadian/US certification) on STI products indicates certification for Canada as well as the United States and is considered to comply with applicable CSA and UL requirements.

The NRTL/C mark is a counterpart to the Underwriter's Laboratory C-UL mark. Both marks indicate that a product is in compliance with both CSA and UL standards.

The NRTL/C mark on STI's products precludes the necessity of having both CSA and UL agency logos. All STI safety light curtains are CSA listed (file number LR90200).

Corporate Standards

In order to provide employees with a safe work environment, many corporations have authored their own standards for safety light curtains and personnel protection. These standards are frequently more stringent than those required by OSHA and can only be met by the most technically advanced products. STI listens closely to industry requirements and has responded with such patented features as the FlexSafe and Individual Beam Indicator lights. The MPCE and MTS feature were also originally engineered at the request of a customer.