



# 欧姆龙安全市场部

Omron Machine Service Division

## 部门介绍

Division introduction

## 提供服务

Services provided

- 风险评估与降低风险计划服务  
Assessment and Risk Production Planning Service
- 机器安全防护改造  
Machine Safe Guarding Remediation
- 培训及研讨会  
Training seminar

## 案例

Cases

## 标准

International Standards & China GB Standard

# 部门介绍

## Introduction

### 职能

Function

我们拥有超过30年的工业机器安全防护经验。我们提供先进的机器资源和流程安全防护服务。我们提供所有必要的机器安全防护服务。

对于大部分生产商来说，专注于安全防护过程中的每一个流程并不是核心竞争力。他们的设计和养护人员不可能顾及到每一个防护系统和安全接口所要求的细节。因此这个时候，一个这个方面的专家无疑就可以带来巨大的帮助。

欧姆龙活跃于20多个与机器安全防护议题相关的国内和国际标准委员。参与度和时间的投入确保了我们可以与当前最新的标准保持一致。这也使得我们有此资历可以来作为您的后备支持。

With over 30 years of experience in industrial machine safeguarding and is the leading resource for machine and process safeguarding services. We offer all the necessary machine safeguarding services.

The expertise required in all phases of the safeguarding process is not a core competency of most manufacturers. Their engineering and maintenance personnel are too busy to get involved with required details of guarding systems and safety interfaces. Hence, at this moment, an expert who excels in this aspect will undoubtedly bring helps and support the manufacturers.

Omron serve as active members on more than 20 domestic and international standards committees relating to machine safeguarding issues. This level of involvement and investment of time assures we keep current on all the latest updates to these standards , which makes us a qualified expert to support you.

宗旨：专注于 **机械安全**，铸造 **行业专家**

Tenet: An expertise to assist you in realizing your Machine Safety Goal

口号：用我们的工作，提高你们的 **安全**，创造 **更安心**的环境

Slogan: Improve your safety with our work to create more secure environment

# 提供服务

## Services Provided



### 风险评估与降低风险计划服务

Assessment and Risk Production Planning Service

#### 评估机器和流程：安全中最关键的一步

Assessing the Machine or Process: The Most Critical Step Toward Safety

为什么需要一个正式的评估？

以我们的经验来说，在工厂里超过90%的机器都没有根据相关的规则 and 标准安装防护装置。为了对一台机器正确的进行安全防护，以此确保现有的安全防护能使机器达到安全防护标准。一个恰当的评估可以帮助您确认机器在安装安全防护之后仍可以保持多产。

Why should I have a formal assessment?

In our experience over 90% of machines on the factory floor are not guarded in accordance with relevant regulations and standards. To safeguard a machine correctly and ensure the existing safeguards are adequate requires a documented machine safeguarding assessment. A proper assessment helps ensure that your machine remains productive after the guarding is installed.

#### 机器安全防护评估和降低风险流程

Machine guarding assessment and risk reduction process

什么是风险评估与降低风险？

风险评估：确认机器的用途，任务，风险，以及风险等级的过程。

降低风险：通过采取保护措施将风险降低到可接受的程度。

What is risk assessment and risk reduction?

Risk assessment: The process by which the intended use of the machine, the tasks and hazards, and the level of the risk are determined.

Risk reduction: the application of protective measures to reduce the risk to a tolerable level.



#### 介绍 | Introduction

在实施安全防护措施以减少机器风险之前，风险等级必须首先确定下来并且纸质化。一个有效识别和评估最初风险的方法是任何安全项目的重要组成部分。国际标准ISO和北美标准ANSI/ANSI/RIA R15.06-1999, 和CSA Z432-04都为这一流程提供了一个始发点。所有的这些标准都已被行业广泛接受。

在设备的风险等级识别之后，减少风险的流程应该符合文件化方法。许多标准的存在使得用来减少风险的安全防护的方式。

Before applying safeguarding measures to reduce the risk of a machine, the level of risk must first be determined and documented. A critical component of any safety program is an effective method of identifying and evaluating this initial risk exposure. The international standard ISO, as well as the North American standards ANSI, ANSI/RIA R15.06-1999, and CSA Z432-04 provide a great starting point for this process and all have widespread acceptance throughout industry. After the risk level of equipment is identified, the process of reducing that risk should follow a documented and proven method. Many standards exist which address appropriate safeguarding methods used to reduce risk.

这个流程的目标是通过合适的安全防护措施让设备或者流程安全多产。以安全为代价的产品是极度危险的，安全系统会导致伤害。这些伤害会导致机器减慢，员工时间损失，工人赔偿申诉，增加保险价格，可能是OSHA罚款或者是一个设备的取缔直到公司可以提供证明证实机器确已做过安全防护。

The goal of this process is to make the equipment or process safe and productive through appropriate safeguarding measures. Production at the expense of safety is extremely dangerous, while safety system which will result in injuries. These injuries lead to machine down time, loss time for the employee, workers compensation claims, increases insurance costs, possible OSHA fines and/or a complete removal of the equipment from production until it is proven to be safeguarded.

○ 风险评估和降低风险的目的 | Risk assessment and risk reduction objective

为员工创造一个更安全的工作环境(根据OSHA要求)。  
To create a safer working environment for employees (as required by OSHA).

为了减少成本，  
研究发现正确的安全防护有节约成本的好处，  
安全评估可以有助于进行合适的安全防护。

To reduce costs,  
Studies show that safeguarding correctly has a cost benefit.  
Liberty Mutual study: save \$3 for every \$1 invested in safety equipment or programs.  
OSHA claims save \$6 for every \$1.  
Performing an assessment will help to ensure proper safeguarding.

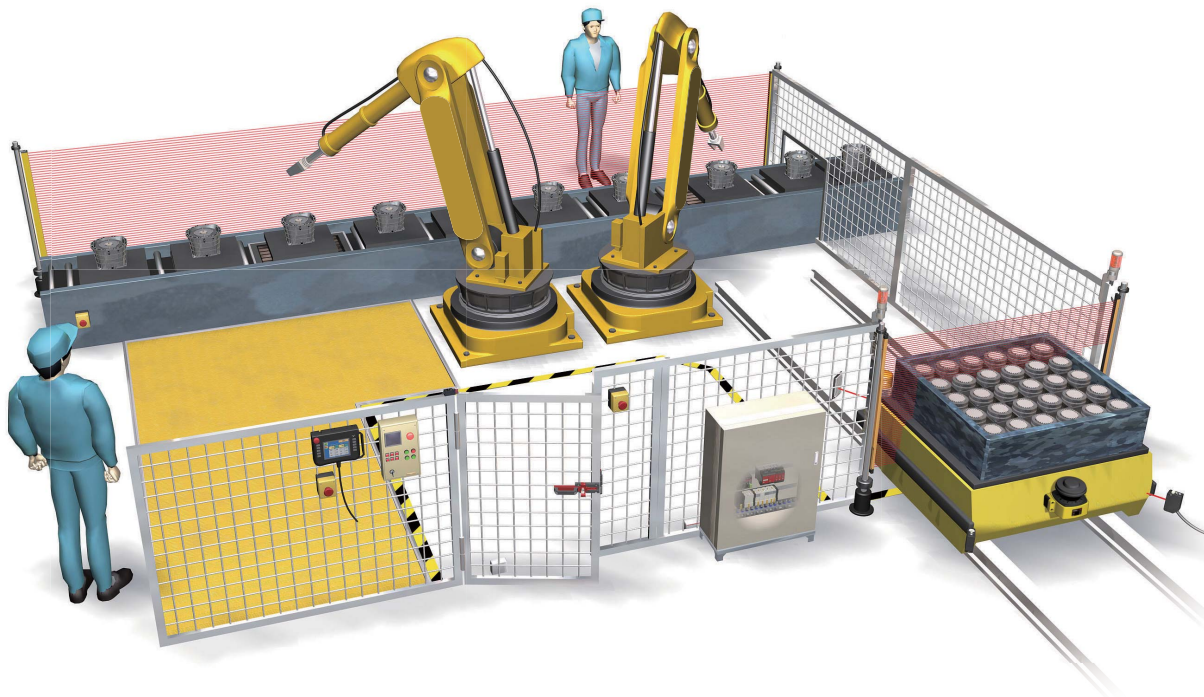
对于投放欧盟市场的机械产品必须进行风险评价。  
风险评价对于设计安全的机械产品和扩大出口都有重大意义。

Equipments that are supposed to be exported to the Europe market must conduct risk assessment procedure. Risk assessment is meaningful to the safety products designing and expansion of exports.

为了遵守国家和国际统一标准，包括：  
To comply with national and international consensus standards, including:

ANSI B11.0-2010 – 机械安全 - 常规要求和风险评估  
ANSI B11.TR3-2000 – 风险评估和降低风险 - 判断、评估以及降低机床相关风险的指南  
ANSI/RIA R15.06-1999 (R2009) – 适用于工业机器人和机器人系统 - 安全要求  
NFPA 79-2007 – 工业机械的电气标准  
ANSI/ASSE Z244.1-2003 (R2008) – 危险能量的控制 - 隔离 / 锁定以及备选方法  
ANSI/PMMI B155.1-2006 – 包装机械和包装相关的加工机械的适用标准  
建造、维护和使用的安全要求  
SEMI S10-0307 – 风险判断和评估过程的安全性指导原则  
MIL-STD-882D-2000 – 系统安全的基本标准惯例  
CSA Z432-04 – 机械安全防护 - 职业健康和安全  
CSA Z434-03 – 工业机器人和机器人系统 - 常规安全要求  
CSA Z460-05 – 危险能量的控制 - 锁定及其它方法  
NOM-004-STPS-1999 – 车间用机械设备的防护系统和安全装置  
ISO 12100:2010 – 机械安全 - 关于设计的基本原则 - 风险评估及降低风险  
EN 954-1:2000 / ISO 13849-1:1999 – 机械安全 - 控制系统的安全相关部件

第一部分：关于设计的基本原则  
ISO 13849-1:2006 – 机械安全 - 控制系统的安全相关部件 - 第一部分：关于设计的基本原则  
2006/42/EC – 欧盟机械指令



## 机器安全防护改造

### Machine Safe Guarding Remediation

#### ● 安全防护整合与安装 | Safeguard Integration Services

欧姆龙MSD精于多种工业安全防护系统安装及运用，包括工业制造设备，生产系统和为安全标准保持一致的机器人单元。我们的服务包括现场检测适量，确保安全措施都是当实施。专业安装人员装配定制的安全防护装置，我们训练有素的电工会确保所有的安全电路的要求的达成。整合团队会训练工厂人员如何养护和使用安全防护系统。

Omron MSD specializes in the installation of safeguarding systems in a wide variety of industries and applications including industrial fabrication equipment, manufacturing systems and robot cells for compliance with applicable safety standards. Our service includes an on-site project manager to monitor quality and ensure that the safety measures are applied properly. Expert installers fabricate custom guards and our trained electricians ensure that the requirements for safety circuitry are met. The integration team will train plant personnel on the care and use of the safeguarding systems.



#### ● 工程与设计 | Engineering and Design: Implementing Integrated Safety

欧姆龙MSD将根据我们的评估设计要求的的安全防护系统。我们的工程师将根据已识别的风险等级来设计控制回路和安全策略。

这包括可行的接口电路图和物料清单。这个工作最好是在将来要安装安全防护的养护人员已经培训好的情况下进行。

我们可以设计您要求的安全防护并附带必要的材料和零件供您自行完成项目。我们的工程师会按要求设计安全控制回路并且提供工程文件来满足您的需求。

Omron MSD will engineer the required safeguarding system based on our assessment. Our engineers will design control circuitry and a guarding strategy appropriate to the identified risk level.

This will include applicable interface schematics and a bill of materials. This offering works best when a facility has trained maintenance personnel that will be installing the safeguards. We can engineer and design the required safeguards and provide you with the materials and components necessary to complete the project yourself. Our engineers will design safety-rated control circuits as required and provide engineering documentation to meet your needs.



## ● 培训及研讨会 | Training seminar

### 培训你的公司

你是否在寻找帮助你提高设备安全的支持和帮助？欧姆龙MSD拥有强大的设备安全检测资源来帮助你创建一个更安全，更高效的工厂。这些课程是为工厂安全，保养和工程设计人员量身打造的，旨在为他们提供一个更好的平台来了解机器安全技术，要求以及合理的运用。

欧姆龙MSD的工程师会进行这类的培训。

欧姆龙MSD工程师全经过许多安全设备操作和运用的培训，他们对于运用规则和工业标准有着深厚的理解。

欧姆龙都受过专业培训才得以成为演讲嘉宾。这些演讲人旨在解决问题而非产品。欧姆龙深刻明白这是培训而非推销。

### Educating you Organization

Are you looking for support to help you improve machine safety? Omron MSD has a number of machine safeguarding resources to help you create a safer, more productive plant, including: The sessions are tailored for plant safety, maintenance and engineering personnel and provide a better understanding of available machine guarding technology, requirements, and proper application.

Omron MSD Safety Sales Engineer (ASE) will conduct the training. The Omron MSD is trained on the operation, and application of many safety devices and the interpretation of the applicable regulatory and industry standards.

Omron MSD has experienced personnel specifically-trained as guest speakers. These guest speaker appearances are aimed at compliance issues and not products. Omron STI understands that this is a training venue and not a sales presentation.



### Skill builder seminar

Skill Builders are 1 or 2-day training seminars that educate your personnel on the requirements and methods of machine and process safeguarding. This helps plant personnel to identify and sometimes correct, machine safeguarding discrepancies. It is conducted at your manufacturing plant.

## ● 安全技能培养 | Safety Skill Builder

目的：将机器改造以及安全防护流程展示给您，帮助你识别两者差异，避免错误的改造和防护。

Purpose – To help you identify and rectify machine and process safeguarding discrepancies, and show you a process to ensure that you are doing it right.

### 参与者

人员  
工厂维护人员  
工厂工程师  
产品经理  
所有关注工厂安全的人员

### Who should attend?

EH&S personnel EH&S  
Plant maintenance  
Plant engineering  
Production managers  
All managers concerned with the safety of plant personnel

### 为什么我们需要安全防护

We will cover:  
Why we need to safeguard

### 成功的安全防护的流程

The process for successful safeguarding

### 安全评估/减少风险的重要性

The importance of Risk Assessment / Risk Reduction

### 控制等级

Hierarchy of control

基于风险等级的安全相关的控制系统要求

Safety related control system requirements based on risk level

基于曝光率安全防护，设备要求和实施运用

Safeguard and device requirements and applications based on frequency of exposure

### 安全距离

Safe mounting distances

### 安全控制

Safety controls

### 急停

E-stops

当企业的EH&S经理和工厂级别的安全人员在一处工厂共同协作时，机器安全防护技能培养项目可以起到深远的影响。

The Machine Safeguarding Skill Builder program has the most impact when the corporate EH&S Manager along with the plant-level safety people meet at one plant location. Classes are small with no more than 20 in attendance.

### Your plant personnel are trained on:

识别机器危险  
Identifying machine hazards

机器危险的风险评估  
Machine hazard risk assessment

机器防护技术和最新安全防护技术  
Machine guarding techniques and the latest safeguarding technologies

按国家或国际设定标准的机器防护要求  
Machine guarding requirements as set by regulatory and consensus standards

基于风险等级的安全回路设计要求  
Safety circuit design requirements based on risk level

实际运用  
Practical application

# 案例 Case



改造前 | Before the reformation



改造后 | After the transformation



改造前 | Before the reformation



改造后 | After the transformation



改造前 | Before the reformation



改造后 | After the transformation

# 标准

## International Standards & China GB Standard

What is the relationship of these standards?  
这些标准有何联系？



### 背景 | Background



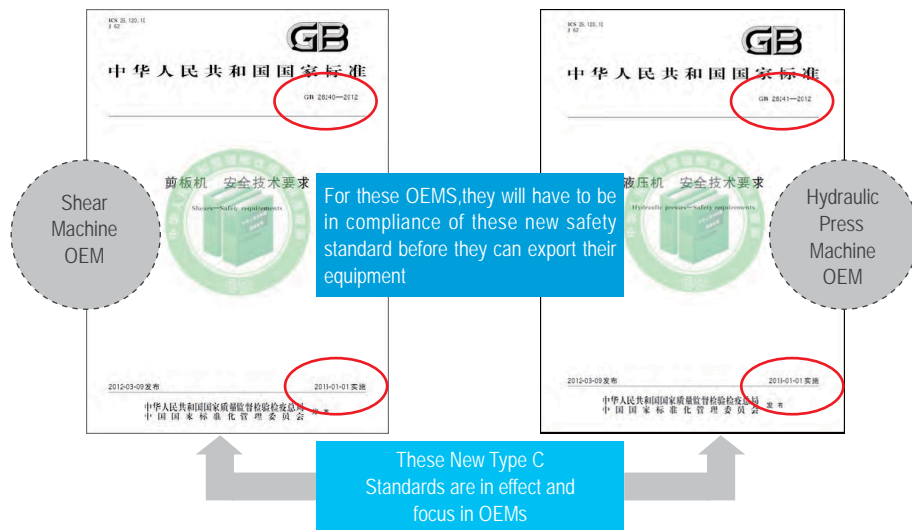


中国机械安全状况 - 要求与对策 | The status of Chinese Machinery Safety- requests and solutions



例子1 | Example 1

最新的安全标准会影响特定的行业。  
Latest Safety Standards that will affect the Specific Industries.



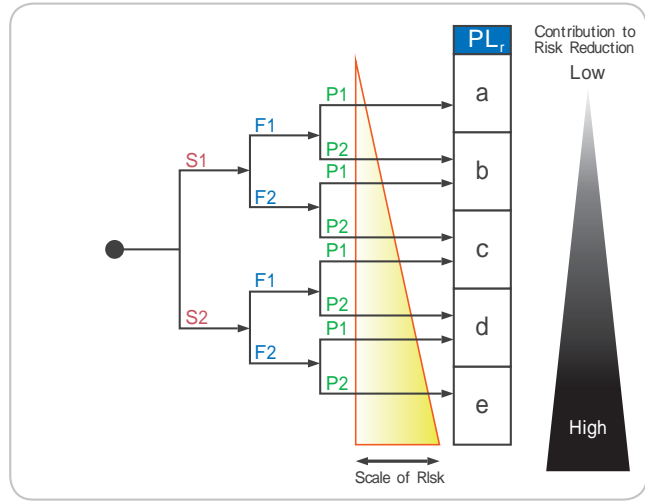
例子2 | Example 2

GB/T 16855.1 VS ISO 13849-1: 机械安全 — 控制系统有关安全部件 — 设计通则。  
GB/T 16855.1 VS ISO 13849-1: Safety of machinery – Safety – related parts of control systems – General principles for design.

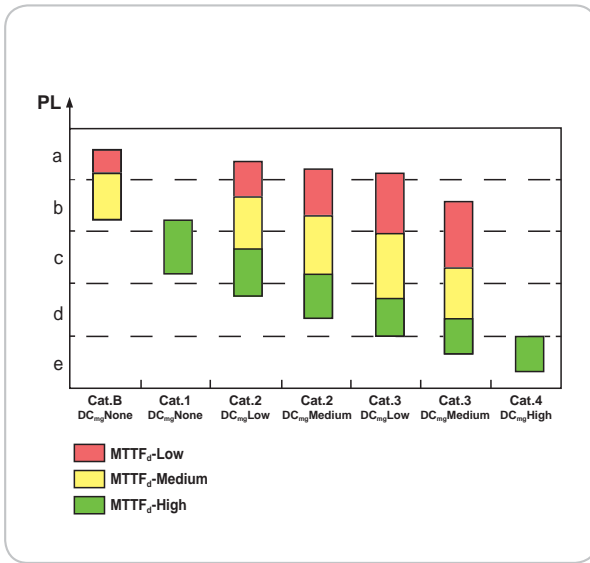


ISO 13849-1

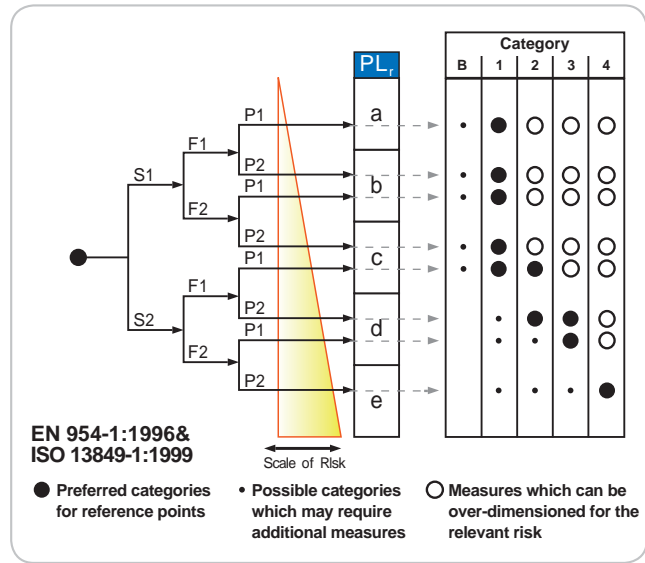
风险因素	值	定义
伤害的严重程度	S1	轻微(通常是可回复性伤害)
	S2	严重(通常是不可回复性伤害或者死亡)
暴露于危险中的频率和 / 或暴露时间	F1	很少-不经常, 并且 / 或者暴露时间短
	F2	经常-不间断, 并且 / 或者暴露时间长
避免有限破坏危险的可能性	P1	在特定条件下可能
	P2	可能性很小



不同类别、DCavg、各通道的MTTFd以及PL之间的关系



EN 954-1 & ISO 13849-1



我们的报告 | Our report

For reference purposes, Omron Industrial Automation China provides a theoretical secondary risk evaluation which assumes that the recommended safeguarding measures are implemented correctly. This secondary assessment represents the lowest possible residual risk level achievable if the recommended safeguarding solution is implemented in accordance with the appropriate standards. It is not a guarantee that every piece of equipment can be safeguarded to achieve a low level of risk and compliance with the applicable standards and IEC provide the level of protection necessary for each facility. The lowest goal when applying safeguarding measures is to achieve a low or negligible level of residual risk while achieving compliance with the relevant standards (Level A). The least acceptable, although possible, result is to apply reasonable safeguarding measures to reduce the risk, but not to a level that is low or negligible, while not achieving compliance (Level B). This may result due to special circumstances or uses of the equipment based on the production needs. Alternatively, there are also possibilities to reduce risk without achieving compliance (Level B) or to achieve compliance without reducing risk to a low or negligible level (Level C). Each facility should consider these scenarios compared to their overall goals and use this information to prioritize their safeguarding efforts. See Table 6 below for a suggested prioritization of the estimated residual risk levels.

**Table 6 - Residual Risk Levels and Suggested Acceptability Ranking**

COMPLIANT	Yes		No	
	A	B	C	D
LOW RISK	Yes	Yes	No	No
COLOR CODE	Favorable	Potentially Acceptable	Unfavorable	Unfavorable

It is important to note that an actual follow-up assessment should be simulated and documented upon that installation of the selected safeguarding system to confirm that a tolerable risk level has been attained. At this time, the safeguarding system should also be verified for effectiveness and compliance. When validating the related system, it is important to ensure that individuals are not placed at risk. This is accomplished by following the device and machine manufacturer's recommended set-up and try-out procedures.

Even after a thorough risk assessment and risk reduction process has been implemented, residual risks may potentially remain. Actions must be implemented at the plant/facility level to appropriately manage or reduce any residual risks that are present through appropriately applied administrative controls and/or personal protective equipment. Examples of tasks that may have potential residual risks are listed in Table 7 below.

In addition to the point system provided using the method described above, this report also utilizes the risk estimation process described in ISO 13849-1:2006 - Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design to determine the required performance level (PLr) for the necessary safety function to be carried out by the safety-related parts of the control system (SRP/CS) being considered, when applicable. The results of this assessment are based on the hazard(s) with the highest risk level associated with each safety function or zone of the equipment at the time of the assessment. The process used in this estimation process is represented in Figure 1 utilizing the definitions in Table 3.

**Figure 1 - Risk Estimation Process to Determine Required Performance Level (PLr)**

**Table 3 - Risk Parameter Definitions**

RISK FACTOR	VALUE	DEFINITION
Severity of Injury	S1	Slight (normally irreversible injury)
	S2	Serious (normally irreversible injury or death)
Frequency and/or Exposure to Hazard	F1	Subject to less-often and/or exposure time is short
	F2	Frequent to continuous and/or exposure time is long
Possibility of Avoiding Hazard or Limiting Harm	P1	Possible under specific conditions
	P2	Scarcely possible

**Risk Evaluation**  
Evaluating the resulting risk level of each safety function or zone of the equipment determines if further safeguarding methods should be applied to the equipment to make the equipment less hazardous. To determine if a hazard requires further safeguarding, the risk level should be at a tolerable level, meaning that it should be within a reasonable and acceptable level of risk that a person would normally expect to take. It is widely recognized that zero risk does not exist and cannot be attained. However, a good faith approach to risk evaluation and risk reduction should achieve a tolerable risk level.

If the level of risk after the first risk estimation is at a tolerable level, the residual risk should be documented to complete the process. If, however, the risk level is not tolerable, the team must continue with the risk reduction process to minimize the level of risk as much as possible until tolerable risk is achieved for each safety function of the equipment.

**Risk Reduction**  
If the initial risk level of each safety function of the equipment is not tolerable, or if the existing safeguarding measures do not provide an adequate level of risk reduction, protective measures need to be applied which will effectively reduce the risk of a hazard to an acceptable level. The selection and implementation of one or more of these measures is to be done in accordance with the hierarchy shown below in Table 4 until the associated risk is tolerable. This order of precedent is based on effectiveness and reliability. It is apparent from this hierarchy that the methods which rely more heavily on human behavior are at the bottom of the scale, as these methods are less reliable and more difficult to enforce.

**Table 4 - Hierarchy of Protective Measures**

Most Effective	Protective Measure	Examples
Elimination or Substitution	Engineering Controls (Devices - Safeguarding Technology / Protective Devices)	• Elimination of human interaction in the process • Safeguarding guard parts (designing measures) • Substitute material handling systems (conveyors, etc.)
	Administrative Measures	• Start-up controls • Interlocks • Presence sensing devices (light curtains, safety mats, area scan mats, etc.) • The third condition can also limit the duration of the hazard (e.g., time delay, etc.)
Training and Procedures (Administrative Controls)	Personal Protective Equipment (PPE)	• Safety glasses and earplugs • Safety harness and fall arrest • Safety helmets and hard hats • Safety gloves and footwear • Safety shoes and safety boots • Safety glasses and eye shields • Safety glasses and eye shields • Safety glasses and eye shields
	Least Effective	

# Customer introduction

## 客户引言

“创造安全的车间” EHS的Jim Wille如是说。

事实上，美铝公司，泰科公司和美国联合技术公司所作的评论都说明了安全是高于生产力和质量的。他们坚信没有一个安全的工作环境，生产率，质量和财务状况目标都不可能达成或者一直保持平稳。

“美铝公司想要它的员工和承包商都能安全工作，这种环境可以保护并促进个人健康，良好行为养成以及环境的推进。”美铝公司的安全及地区服务总裁Jeff Shockey如是说。

"Creating Safe Workplaces" by Jim Wille, excerpted from EHS Today

"Alcoa wants its employees and contractors to be able to work safely in a manner that protects and promotes the health and well-being of the individual and the environment," says Jeff Shockey, Alcoa's director of safety and regional services.





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