



THE 61508 ASSOCIATION
Guidance in Compliance

The SIL rated alarm - Can you really afford it?

A few key points for those considering having a SIL rated alarm under the IEC61508 group of standards

by The 61508 Association

**SAFETY INSTRUMENTED SYSTEMS
are too important to leave to chance!**

DISCLAIMER: Whilst every effort has been made to ensure the accuracy of the information contained in this document neither The 61508 Association nor its members will assume any liability for any use made thereof.

The use of a SIL rated alarm is more costly than you might think ...

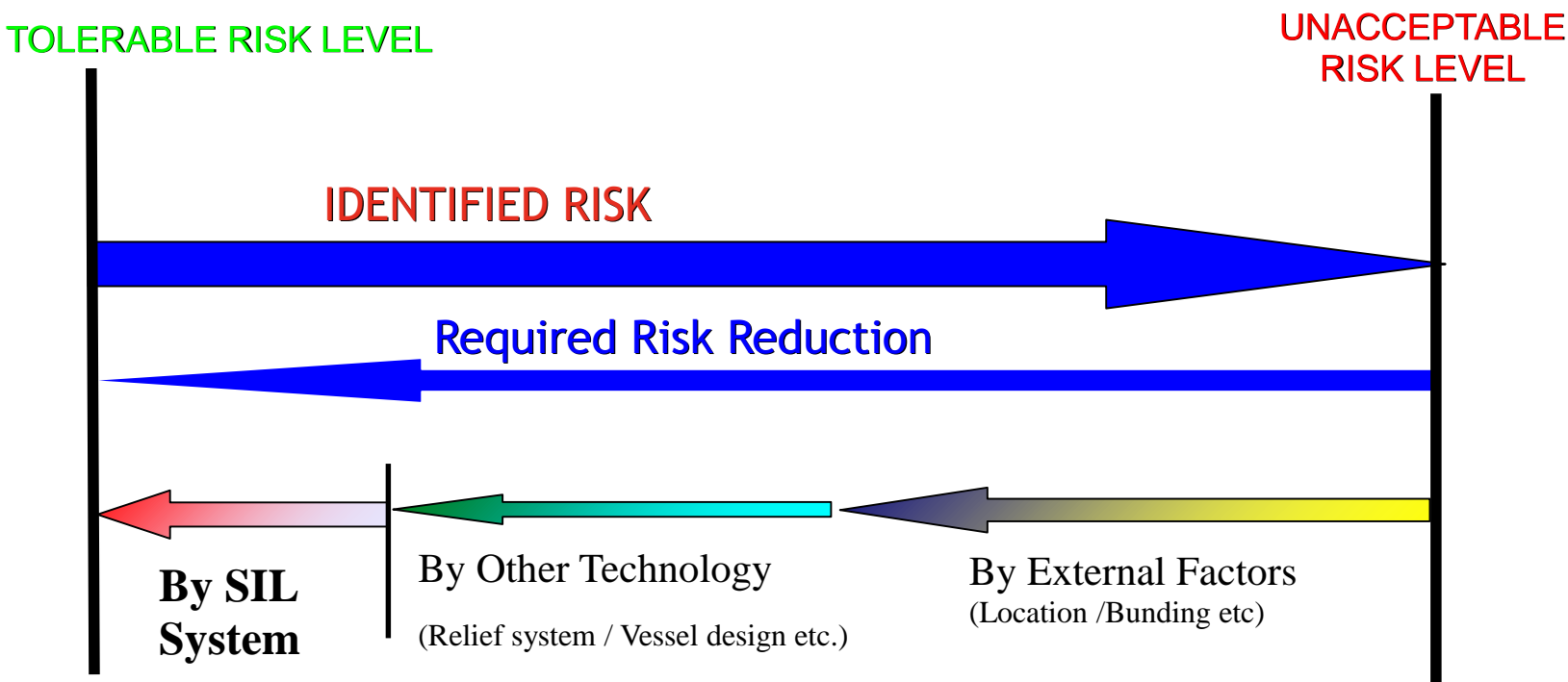
The following is based upon the IEC61508 group of standards, EEMUA guidance and the HSE requirements for using a SIL rated alarm

http://www.hse.gov.uk/foi/internalops/hid_circs/technical_general/spc-tech-gen-50.htm

The SIL rated safety system covers the gap

If “Risk Gap” > 10 then
a SIL is needed

Diagram courtesy of Rowan House Ltd



So you've decided there is a gap between the available layers of protection and what is tolerable. If the extra risk reduction needed is more than 10 then a high integrity SIL rated system applies

Your safety matters

If the SIL assessment says you need a SIL 1 safety loop then that means that without that one safety loop the actual risk of fatality* is more than 10 times the wrong side of your tolerable target

A SIL 2 loop means that without that one loop the actual risk of a fatal accident is more than 100 times the wrong side of your tolerable target

A SIL 3 ... actual risk is more than 1000 times the wrong side of tolerable without that safety loop being fully functional

A SIL 4 ... *it exists under the standard but does your company really want to admit that without that one safety loop you have a risk that large?*

*That is if the SIL loop has been provided for protection of people.
The SIL loop may have been provided for environmental or asset protection.

The SIL safety system must be an Independent Protective Layer

An Independent Protective Layer must be: (in simple language)

- ✓ SPECIFIC – The system acts directly to prevent the source of, or the consequence of, the hazard
- ✓ INDEPENDENT – If all the normal controls fail you can still depend on this to keep you safe
- ✓ DEPENDABLE – The system is highly reliable
- ✓ EFFECTIVE – The system must be capable of handling the full enormity of the hazard
- ✓ AUDITABLE – You must be able to check and prove that the safety system is in place

So you've decided there is a gap between the available layers of protection and what is tolerable. The gap is large enough to be SIL rated and you choose to use an alarm requiring an operator response as the safety system....

The SIL rated alarm must be an Independent Protective Layer

You can design an alarm that is:

- SPECIFIC – The alarm warns directly of the hazard ✓
- INDEPENDENT – The sensor for the alarm can be independent and it can use an alarm lamp, annunciator or sirens ✓
- DEPENDABLE – The presentation and delivery of the alarm can be highly dependable ... **BUT HOW DO WE PROVE THE OPERATOR DEPENDABILITY?** ?
- EFFECTIVE – We can give the operator highly dependable systems to make the plant safe but how do we **PROVE** that the Operator's response is within time to be **EFFECTIVE?** How do we identify ALL of the possible responses by the operator and **ENSURE** that **ALL of the equipment used by the operator is PART OF THE SIS** ?
- AUDITABLE ▶ The equipment generating the alarm can be audited ✓
 - ▶ The equipment used to make the plant safe can be audited ✓
 - ▶ **BUT** how do we **AUDIT** the Operator? ?

Not just the equipment

For a SIL rated alarm:

BOTH the equipment delivering the alarm

AND the operator response

AND ALL of the equipment needed for the
correct response

.... Are ALL part of the SIL rated safety system

Making the alarm SPECIFIC

- ✓ The sensors and detection equipment should monitor the specific hazard condition
- ✓ The detection system that generates the alarm must be fully RELIABLE
- ✓ The alarm produced must be “**LOUD and CLEAR**”
 - ✓ It could be a clear separate lamp
 - ✓ It could be a siren
- ✓ The text for the alarm must be **COMPLETELY CLEAR**

Making the alarm **INDEPENDENT**

A critical alarm must be independent of other systems

- If the DCS (or other control system fails) this alarm **MUST** still be visible
- A SIL rated alarm cannot rely on the same alarm display as all the other alarm and control messages (i.e. if the DCS fails the alarm must be independent of the entire DCS)
- You must be able to **PROVE** that it is **FULLY INDEPENDENT**
- The **RESPONSE** to the **ALARM** must also be SIL rated systems because it is part of the **SIF** (i.e. you can't use the DCS [BPCS])

Proving Operator DEPENDABILITY

- An operator must **ALWAYS** be **THERE** to respond
 - The alarm should be in location that is permanently manned
- The alarm message must be **CLEARLY IDENTIFIED**
- The Operator must have a **CLEAR**, written **PROCEDURE** for the response
- The Operator must be **TRAINED** in the response
- The Operators must regularly **PRACTICE** the emergency **DIAGNOSIS** and **RESPONSE** to the alarm

Making the SIL alarm AUDITABLE

- Prove constant manning with automated attendance recording and audit the measure
- Review and audit the procedure for diagnosis as well as for response to the alarm
- Maintain the training records and subject them to audit
- Maintain records of every practice drill and audit the records
- Undertake “surprise” practice drills with different scenarios to test DIAGNOSIS by the operator

So do you still want a SIL rated alarm?

The SIL rated alarm - Can really you afford it?

- ❖ Designing and building the alarm has a **cost**
- ❖ Proof testing the alarm equipment has a **cost**
- ❖ Undertaking regular practice drills has a **cost**
- ❖ The audit activity has a **cost**
- ❖ SIL rating, maintaining and proof testing ALL of the equipment used by the operator in response has a **cost**

SIL rated alarms are NOT a cheap option

*... and when you've got the SIL rated alarm, the maximum benefit that you can claim is just **SIL 1** (see EEMUA 191 3rd edition)*



*So do you still want a
SIL rated alarm?*

**The SIL rated alarm
- Can really you afford it?**

*The Public Inquiry into the Texaco Pembroke Disaster stated:
“**Ultimate safety must not depend on operator response to an alarm**”*

Your safety depends on the alarm

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