TrackSAFE Foundation - National Level
Crossing Safety Forum | 8-9 August 2022

# Next Generation Rail Crossing Safety Systems


**Rail Safety Systems**
*Safe Active Protection*

## Innovative Low Cost Solution for Rural & Remote Level Crossings

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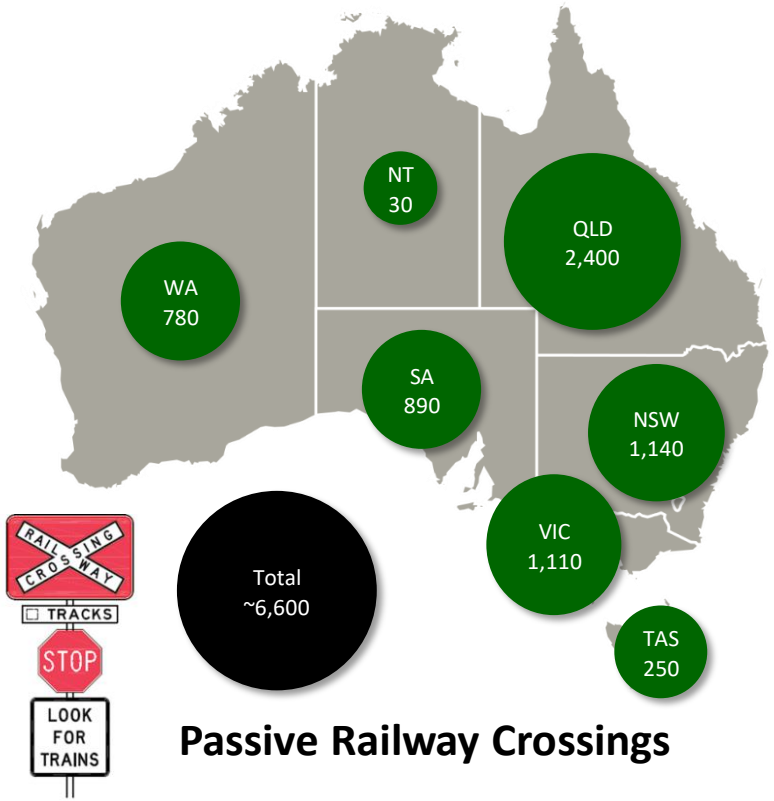
# Rural Level Crossings…




- Very large number of rural crossings with only passive protection
- Active protection (Flashing Lights) is much safer!
- But active solutions are traditionally:
  - Expensive to install and maintain
  - Mains powered
  - If they FAIL they can leave a crossing dangerously exposed…
- An innovative solution is needed…

  that is both: LOW COST and SAFE (SIL 3 or 4)

# Rail Active Crossing Safety System (RAXS)


ATRS

TDN

Fail to Safe, frangible, high visibility Active Sign

Approved Official Traffic Sign

Single, dual track, early warning sign functionality

Independently solar powered (including 10 day no sun operation)

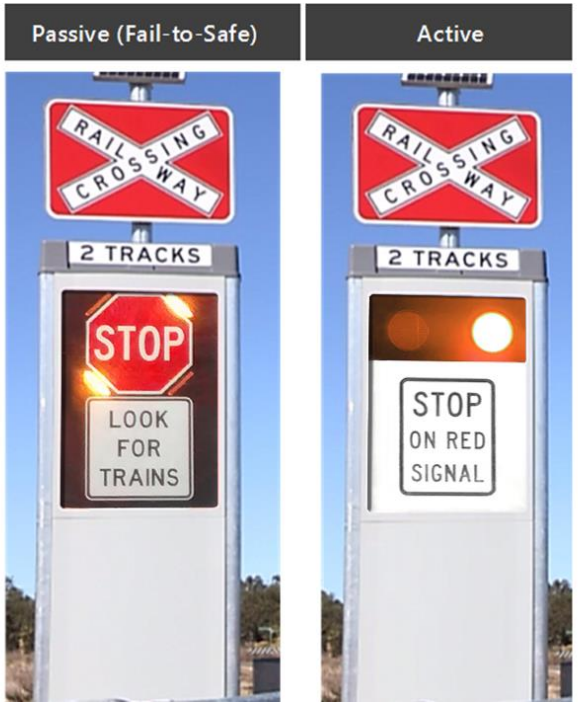
Remote monitoring & autonomous control software and sensors

Encrypted wireless comms

High level SIL3/SIL4 Safety Standard

No trenching, cabling or mains power required

# Innovation: True Fail-to-Safe signage




- Highly **available** and **reliable** (SIL3/SIL4) – but like all solutions the risk of failure still exists…
- Maintenance issues - compounded by **distance**…
- RAXS incorporates a unique **Fail-to-Safe** technology
- Presents a traditional **STOP** sign if a critical failure is detected or the system loses all power
- Extensive **human factors** testing resulted in the incorporation of **flashing LED bars** around the passive sign to heighten driver awareness

**Benefits:**

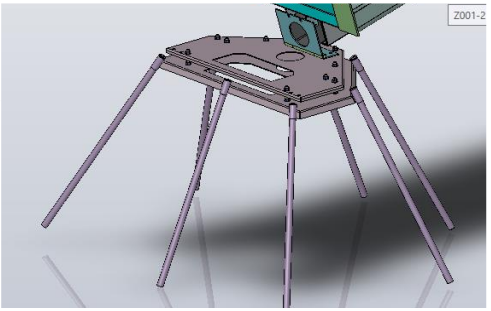
- Enables a flashing light (RX5) solution to be **safely** deployed in **remote locations** where the time to get to site **may be long**

# Innovation: Frangible Signage…

<u>Benefits:</u>

- Further **reduces** the **risk** to **road users**
- Further **reduces** the **cost** of deployment by reducing the need for secondary crash barriers

- **Primary** objective: protect users from impact with trains
  **Secondary** objective: reduce risk of impact with the crossing itself…
- All signage (track side and early warning) extensively designed to reduce the risk to road users
- **Light weight** and **energy absorbing** to reduce or remove the need for roadside **crash protection barriers** while offering **cyclone rated** integrity
- Utilises innovative **Surefoot** footings (<u>no concrete</u> and <u>no excavation</u>)
- Crash testing in a **registered crash test facility** has confirmed product performance and compliance



# Safety Assurance Requirements

EUROPEAN STANDARD **EN 50129**
NORME EUROPÉENNE
EUROPÄISCHE NORM February 2003

ICS 93.100

Supersedes ENV 50129:1998
**Incorporates corrigendum May 2010**

English version

**Railway applications –**
**Communication, signalling and processing systems –**
**Safety related electronic systems for signalling**

Applications ferroviaires –
Systèmes de signalisation,
de télécommunications et de traitement -
Systèmes électroniques de sécurité
pour la signalisation

Bahnanwendungen -
Telekommunikationstechnik,
Signaltechnik und
Datenverarbeitungssysteme -
Sicherheitsrelevante elektronische
Systeme für Signaltechnik

This European Standard was approved by CENELEC on 2002-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**



Ref. No. EN 50129:2003 E

BS EN 50128:2011

EUROPEAN STANDARD **EN 50128**
NORME EUROPÉENNE
EUROPÄISCHE NORM June 2011

ICS 35.240.60; 45.020; 93.100

Supersedes EN 50128:2001

English version

**Railway applications -**
**Communication, signalling and processing systems -**
**Software for railway control and protection systems**

Applications ferroviaires -
Systèmes de signalisation, de
télécommunication et de traitement -
Logiciels pour systèmes de commande et
de protection ferroviaire

Bahnanwendungen -
Telekommunikationstechnik,
Signaltechnik und
Datenverarbeitungssysteme -
Software für Eisenbahnsteuerungs- und
Überwachungssysteme

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

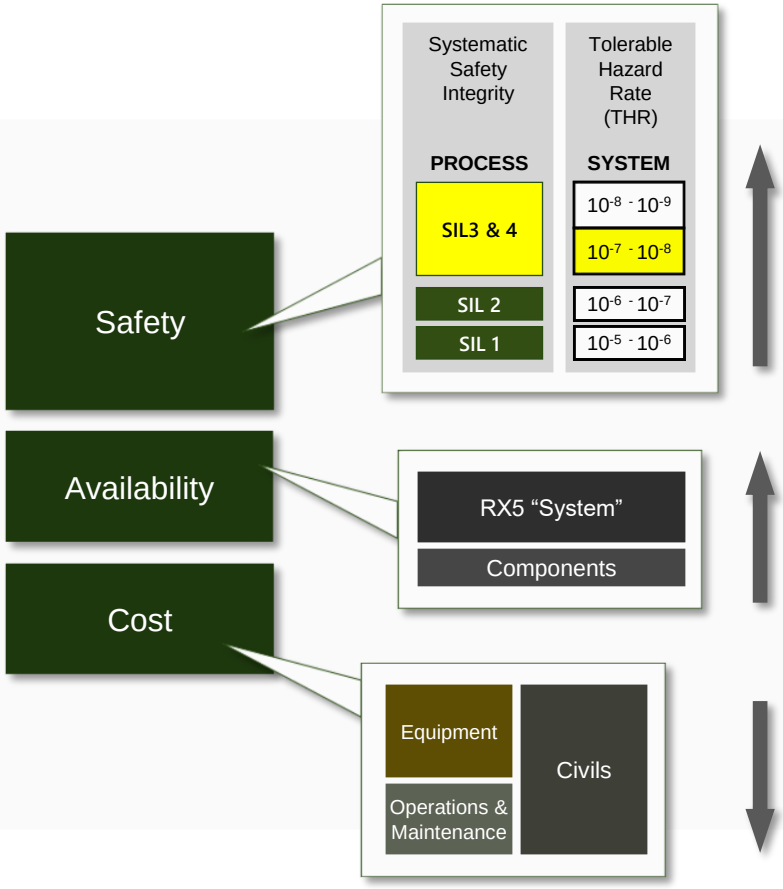
**Management Centre: Avenue Marnix 17, B - 1000 Brussels**



Ref. No. EN 50128:2011 E

1. EN 50129
   1. Safety Case
   2. Hardware Design
   3. References other standards
2. EN 50128 - Software
3. EN 50159 - Communications

# Achieving high integrity SIL3/SIL4




- Each Node has **duplicated** processors
- SIL4 Train Detection
- All SIL3 safety functions in a node executed on **both** processors
- On the **System Controller** the **main crossing algorithm** is executed **independently** on **both** processers
- All **communications** between processors is protected E2E by EN50159 Cat 3 safety codes & cryptographic techniques.
- No **SPOF** for SIL3 functions
- In a node: CONTROLS are applied by **CPU-M** (e.g. activate lights, power wheel detectors, activate fail-to-safe etc.)
- **Both** processors MONITOR the control has been **effected**.
- CPU-M and CPU-S in the System Controller **VOTE** every second on the **correct** state of the crossing – by exchanging their calculated values.
- If **exchanged** values **do not agree** – either processor can activate **Fail-To-Safe**