



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

YOUNG COUNCIL
MEDICAL SOCIETY OF SOUTH AFRICA



SC 2023

INTERNATIONAL RAILWAY
SAFETY COUNCIL

"Reshaping Railways in an Uncertain World"

CAPE TOWN, OCTOBER 1 - 6, 2023



IRSO
INTERNATIONAL RAIL SAFETY
COUNCIL



IR
INTERNATIONAL

HOSTED BY  RAILWAY SAFETY
HOSTED BY  REGULATORY
RAIL SAFETY ON THE RIGHT TRACK



Dr. Willem Sprong, Dr. Cornel Malan, Prof. Hannes Grabe
Chair for Railway Safety, University of Pretoria

Reducing risk at level crossings through digitalized assessment

19 February 1896 Braamfontein (80)

22 April 1911 Blaauwkrantz Bridge (28)

9 June 1926 Saltriver (17)

30 March 1902 Baberton (47)

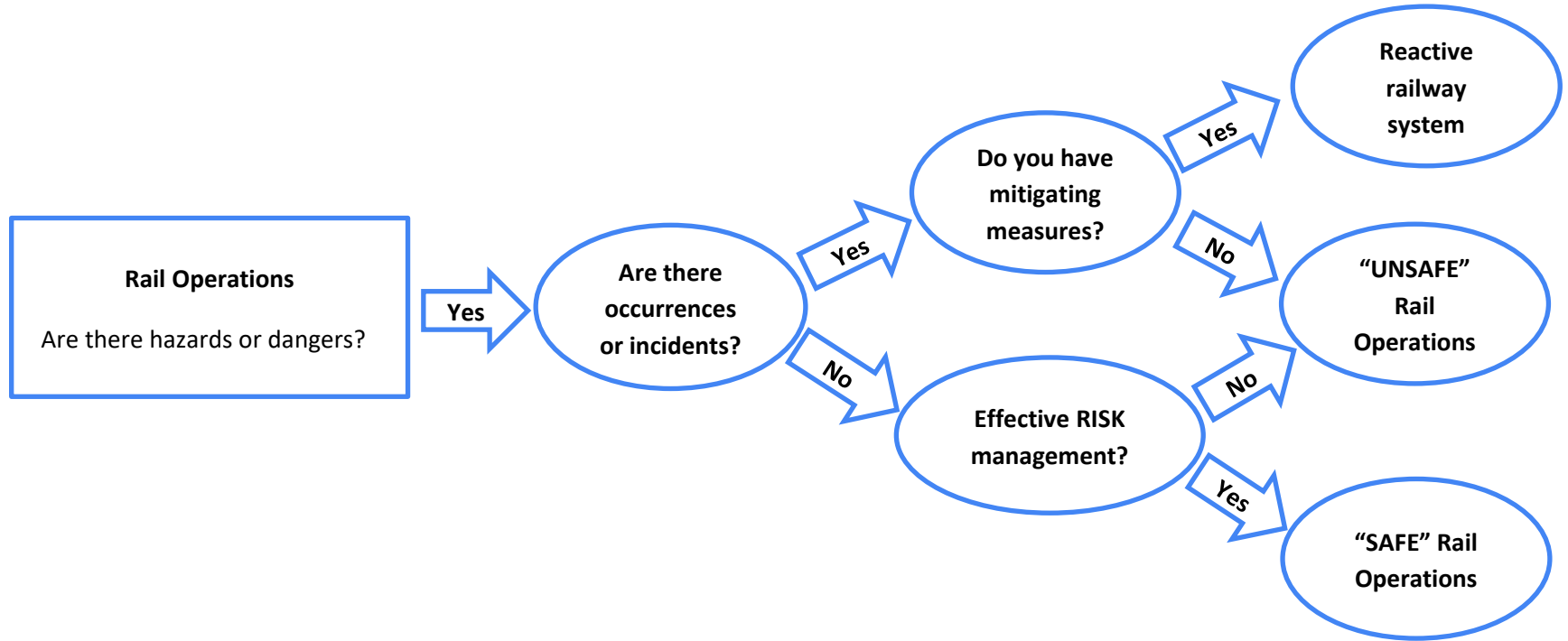
13 July 2012 Malelane (26)

4 January 2018 Geneva (24)



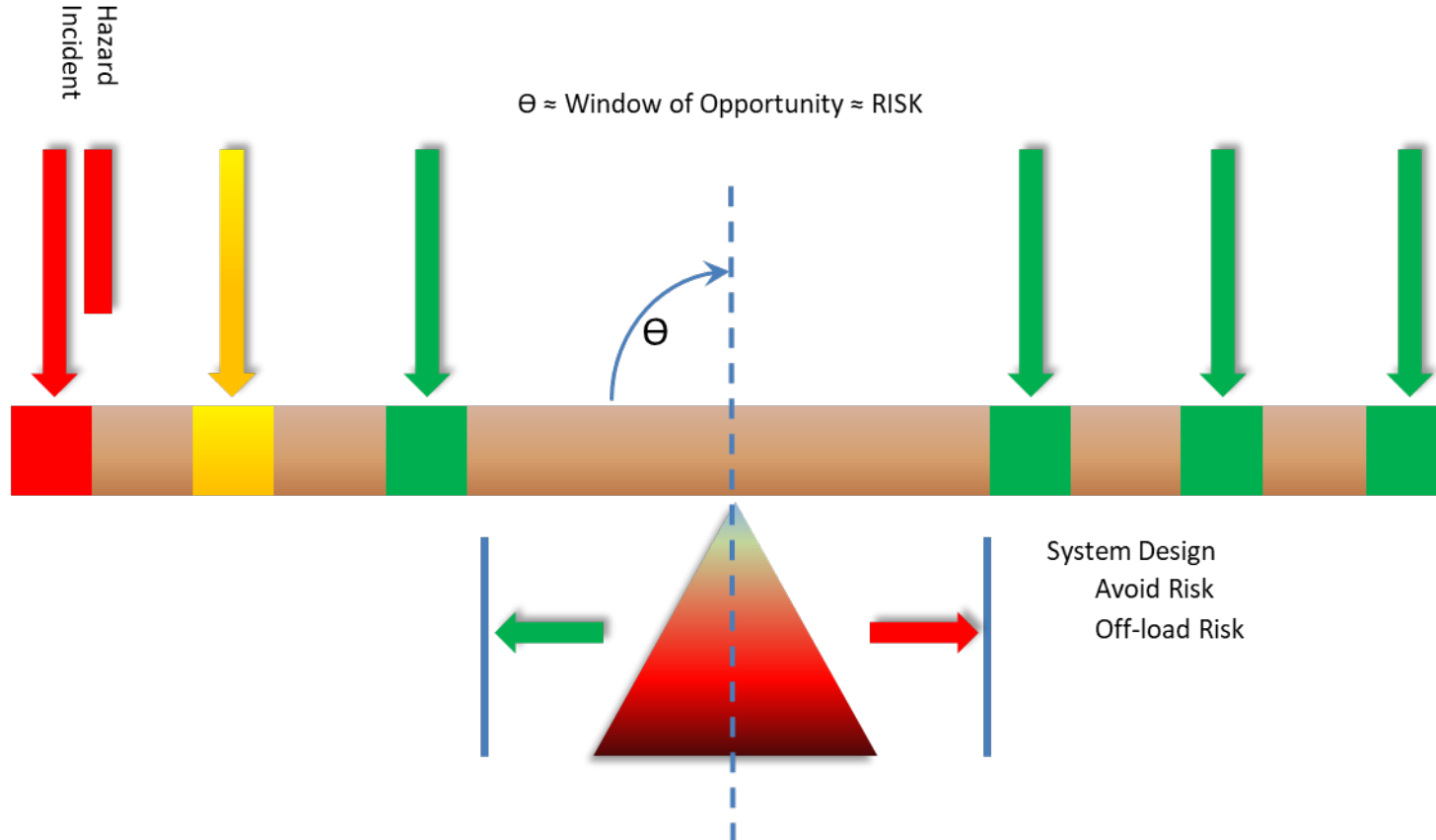
Sub-theme: Improving safety performance through digitalisation

Risk Management



Sub-theme: Improving safety performance through digitalisation

Risk Management



Sub-theme: Improving safety performance through digitalisation

Field sheets

No.	Description (SANS 3000 2-2-1:2021)
Sheet 1	Level crossing: Description
Sheet 2	Level crossing: Scene photographs
Sheet 3	Level crossing: Scene Sketch template
Sheet 4.1	General information
Sheet 4.2	Design vehicle
Sheet 5	Location of grade crossing
Sheet 6	Level crossing surface
Sheet 7	Road geometry
Sheet 8	Line of sight

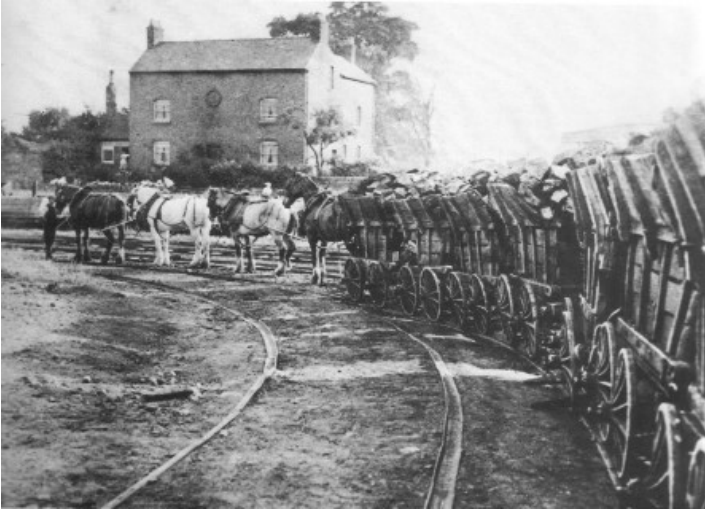
No.	Description (SANS 3000 2-2-1:2021)
Sheet 9	Class 1 level crossing protection
Sheet 9.1	Class 2 level crossing protection
Sheet 9.2	W314-gate-ahead warning sign
Sheet 9.3	R1 stop sign and R2 yield sign
Sheet 9.4	W318 railway crossing
Sheet 9.5	W302 traffic control stop ahead
Sheet 9.6	W361 electrical shock warning sign
Sheet 9.7	W403/W404 railway crossing
Sheet 9.8	IN11 supplementary plates
Sheet 9.9	GS901 diagrammatic sign
Sheet 9.10	Other warning and regulatory signs

No.	Description (SANS 3000 2-2-1:2021)
Sheet 10	WM1 road surface sign
Sheet 10.1	WM5/GM7 road surface stop ahead warning
Sheet 11	Flashing red disk signals
Sheet 11.1	Booms or barricade (gates)
Sheet 11.2	Flashing yellow warning lights
Sheet 11.3	Bells
Sheet 11.4	Traffic signal
Sheet 12	Whistle board

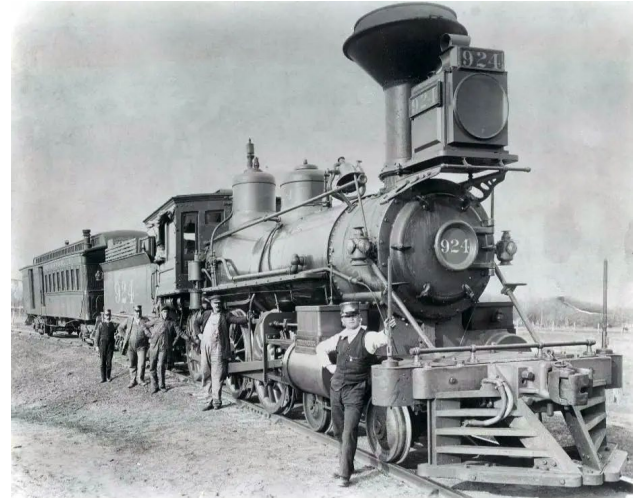
No.	Description (SANS 3000 2-2-1:2021)
Sheet 13	Overhead lines and protection
Sheet 14	Train illumination
Sheet 15	Monitoring and Maintenance
Sheet 16	Exclusion criteria

Sub-theme: Improving safety performance through digitalisation

First Industrial Revolution

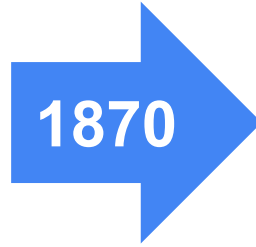


1780



Sub-theme: Improving safety performance through digitalisation

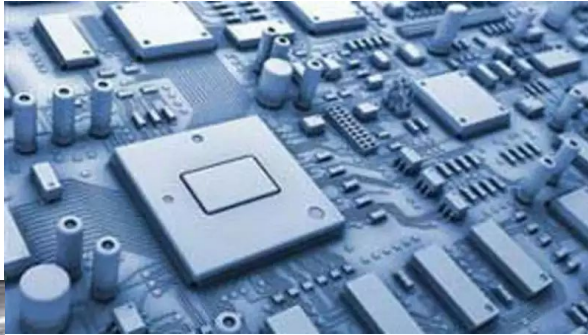
Second Industrial Revolution



Sub-theme: Improving safety performance through digitalisation

Third Industrial Revolution

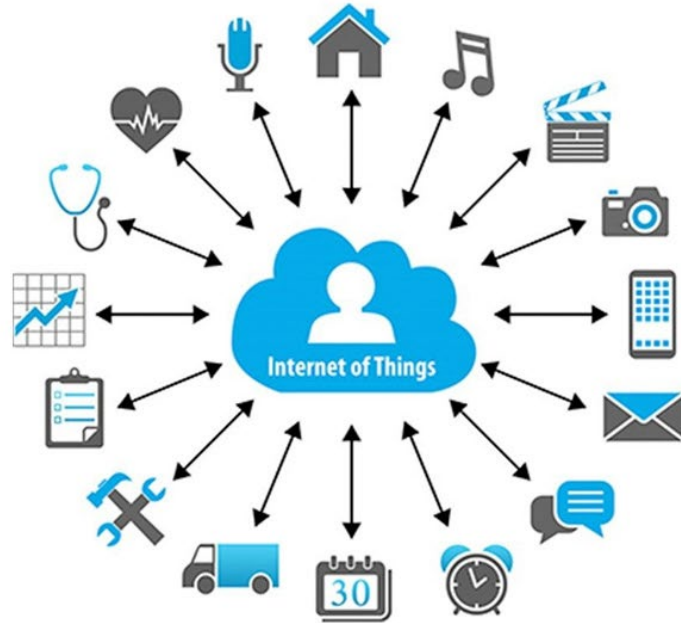
1970



1970

Sub-theme: Improving safety performance through digitalisation

Fourth Industrial Revolution



Sub-theme: Improving safety performance through digitalisation

Digitalized Assessment



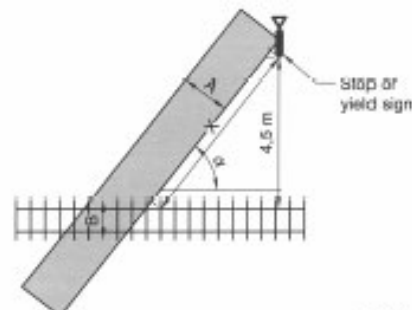
- Manual Field Sheets
- Field sheets on digital platform
- Web-based modified field Sheets
- Microsoft Forms (Tablet/Cellphone)
- Measurement Technology

Sub-theme: Improving safety performance through digitalisation

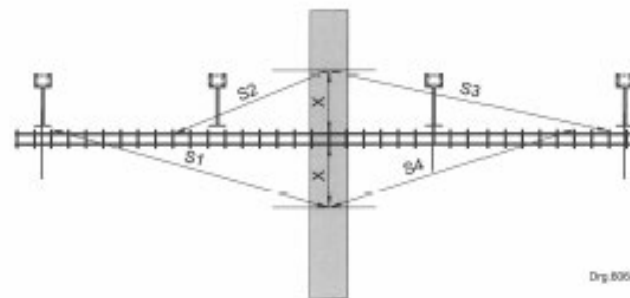
Manual Field Sheets

Sheet 7 — Road geometry

Source	Item	Response	
		Road approach 1	Road approach 2
	Approaches 1 and 2 are as defined in the scene sketch of sheet 3		
Sheet 4.2	Safe stopping distance (SSD), in metres (m)		
Observation	Are horizontal and vertical alignments smooth and continuous throughout the SSD? [Y/N]		
Measure	For what distance, in metres (m), is the horizontal alignment straight beyond the rails?		
Sheet 4.2	Design vehicle length, in metres (m)		
Measure	What is the width of the road dimension A in metres (m)?		
Measure	What is the width of the rail level crossing itself, dimension B in metres (m)?		
Grades			
Measure	Slope within 5 m of outer rail, as a percentage (%) (Limits are 1 % in urban areas, 2 % for cyclists/pedestrians)		
Measure	A ratio of 1:50 (2 %) for the length of the design vehicle of the outer rail and 1:20 (5 %) for 10 m beyond		
Measure	A ratio of 1:50 (2 %) within 5 m of the outer rail at level crossings for pedestrian or cyclist use only		
Observation	Is the level crossing unprotected (no signage/no flagman/no gates)? [Y/N]		
Observation	Is the level crossing used only by cyclists and pedestrians? [Y/N]		
Deducted	General approach grade, as a percentage (%) (max. = ± 5%)		
Observation	Are rail tracks super-elevated? [Y/N]		
Measure	Super-elevation in millimetres (mm)		
Select	Track gauge in millimetres (mm)		
Deducted	Super-elevation in degrees		
Observation	Does the level crossing have warning systems? [Y/N]		
Measure	What is the angle between the crossing and the roadway? In degrees (see sketch)		
Measure	What is the distance from the outer rail to the stop/yield sign, in metres (m)?		
Condition of road approaches			
Observation	For example anything that might affect stopping or acceleration [Y/N]		
Observation	Is there any evidence that 'low-bed' trucks have difficulty negotiating the crossing (i.e. might they bottom-out or get stuck)? [Y/N]		
Visibility along rail line			
Deducted	Train speed		
Observation	Type of area urban/rural		
Observation	Type of control yield/stop		
Deducted	Vehicle speed		
Deducted	Distance from outer rail along roadway [X]		
Measure	Standing at X (see sketch), what is the visibility distance along rail line in metres (m) dimension S1 S4		
Measure	Standing at X (see sketch), what is the visibility distance along rail line in metres (m) dimension S2 S3		
Limits	Standing at X the visibility distance along rail line in metres (m) shall be		
Comments			



Drg 808f



Drg 808e

Field Sheets on digital platform

Sheet View | Workbook Views | Show | Zoom

Back

RAILWAY SAFETY REGULATOR
SANS 3000-2-2-1:2021
Sheet7 - Road Geometry

ITEM				
Source	Information Required	Response		
		Road Approach	Road Approach	
	Approach 1 and 2 is as defined in the scene sketch of sheet 3			
Sheet 4.2	Safe stopping Distance (SSD) in meters [m]	#N/A	#N/A	
Observation	Are horizontal and vertical alignments smooth and continuous throughout SSD? [Y/N]			
Measure	For what distance in meters [m] is the horizontal alignment straight beyond the rails?			
Sheet 4.2	Design vehicle length in meters [m]	#N/A	#N/A	
Measure	What is the width of the road dimension A in meters [m]		0	
Measure	What is the width of the rail level crossing itself, dimension B in meters [m]			
Grades				
Measure	Slope within 5m of outer rail as a percentage [%] (Limits are 1% in urban area, 2% for cyclists/pedestrians)			
Measure	A ratio of 1:50 (2%) for the length of the design vehicle of the outer rail and 1:20 (5%) for 10m beyond			
Measure	A ratio of 1:50 (2%) within 5m of the outer rail at level crossing for pedestrian or cyclist use only			
Observation	Is the level crossing unprotected (no signage/ no flag men/ no gates) [Y/N]			
Observation	Is the level crossing used only by cyclists & pedestrians [Y/N]			

Drg.606f

Sheet1 | Sheet2 | Sheet3 | Sheet4.1 | Sheet4.2 | Sheet5 | Sheet6 | **Sheet7** | Sheet8 | ... | + | : | ◀

Sub-theme: Improving safety performance through digitalisation

Digitalized Assessment



Sub-theme: Improving safety performance through digitalisation

Aerial UAV (Drone)



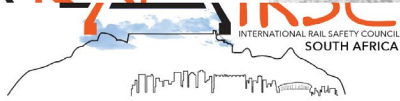
Sub-theme: Improving safety performance through digitalisation



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