

Industry update: New DMPR guideline for the compilation of a mandatory Code of Practice to mitigate geotechnical risk in civil tunnels and underground spaces

by

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Background

With a mining industry focus shift to “zero harm” in the late 1990s, a Mining Regulations Advisory Committee (MRAC) task team was established and produced four guidelines for the compilation of mandatory code of practice (COP) to combat rock-related accidents in the following four different types of mining environment:

- Tabular metalliferous mines (1996, revised in 2002);
- Underground coal mines (2003);
- Surface mines (2004); and
- Underground massive mining operations (2006).

Background (continued)

Following that, an investigation under the Safety in Mines Research Advisory Committee (SIMRAC) Project SIM060201 (Rockfall Elimination) (Joughin et al., 2011), recommended changes to geotechnical engineering practices and geotechnical legislation at mines (and by extension, in civil tunnelling and underground space development projects) and as a result, MRAC was requested to:

- Review fall of ground regulations in the Mine Health and Safety Act (MHSA); and
- Update these COP guidelines accordingly.

Background (continued)

Work on updating the guidelines commenced in 2015, with various drafts of the guidelines going through several cycles of internal and legal review, public participation and regulatory approval processes since then, and more recently under the auspices of a Mine Occupational Safety Advisory Committee (MOSAC) Task Group.

At the same time, work to update MHSA fall of ground regulations and associated incident and accident reporting frameworks and forms, are continuing.

Background (continued)

That said, in an earlier iteration of updating the COP guidelines, the four historical guidelines were combined into a single generic guideline covering geotechnical risk mitigation in mines and in civil engineering tunnelling. However, in mid-2025, the task group was instructed to split up the one generic guideline into separate guidelines again as before and, at that point, a fifth guideline, for the compilation of a mandatory COP to mitigate geotechnical risk in civil tunnelling and underground space development, was introduced as a standalone, fifth guideline.

Background (continued)

Why is civil tunnelling covered by a DMPR guideline?

Under 102 Definitions in the MHSA:

*'mine' means, when- (a) used as a noun- ... (iii) a **works***

'works' means any place, excluding a mine, where any person carries out- ... (c) the making, repairing, re-opening or closing of any subterranean tunnel; or (d) any operations necessary or in connection with any of the operations listed in this paragraph.

Final Review & Promulgation of Civil Tunnelling COP Guideline expected in 2026

DEPARTMENT OF MINERAL AND PETROLEUM RESOURCES

MINE HEALTH AND SAFETY INSPECTORATE

GUIDELINE FOR THE COMPILATION OF A MANDATORY CODE OF PRACTICE TO

MITIGATE GEOTECHNICAL RISK IN CIVIL TUNNELLING & UNDERGROUND SPACE DEVELOPMENT

Structure of DMPR Guideline for Civil Tunnelling

The civil tunnelling guideline follows a similar document structure to that of the other guidelines, namely:

- Part A: Introduction to the guideline;
- Part B: Author's Guide for compiling the COP;
- Part C: Sets out the structure of the COP to be compiled, and the content to be covered; and
- Part D: Guides COP implementation and compliance therewith.

Focus of this presentation

- Key changes introduced to earlier mining COP guideline requirements
- Additions and specific requirements introduced in the new civil tunnelling COP guideline

Key changes introduced to earlier mining GOP guideline requirements

- General sections and requirements is more generic; however, the sections dealing with mining method covered by a particular COP guideline, are now updated and more detailed;
- New clause introduced under ‘Support design methodology’ which states:

Any unsupported excavations mined prior to the promulgation of this guideline which are used by personnel to perform their duties on the mine (e.g. travelling ways through old mining levels, second escape ways, etc.), must be defined and geotechnically risk assessed, with appropriate controls implemented (incl. installation of systematic support where required, as well as replacement of any old support units that have failed, which are compromised by severe corrosion, etc.) to prevent exposure of personnel to uncontrolled falls of ground and to any other significant geotechnical hazards in such areas.

Key changes introduced to earlier mining GOP guideline requirements (continued)

- ‘Special Areas’ now ‘Areas of elevated geotechnical risk’, and requirements re. associated mitigation strategies and controls improved;
- Geotechnical aspects of mine closure in a mine’s operational plans are now to be incorporated in the COP;
- Specific requirements included re. mine dewatering strategies and flood controls, and the design thereof;
- Geotechnical roles and responsibilities are better defined, in line with current practice on mines:
 - ☐ Strata Control Observer (e.g. geotech assistant/technician)
 - ☐ Strata Control Practitioner (e.g. graduate engineer/geologist)
 - ☐ Geotechnical Engineering Practitioner MHSA 14.1(8)
 - ☐ Geotechnical Engineering Manager (e.g. design manager)

Key changes introduced to earlier mining GOP guideline requirements (continued)

- The COP must set out a resolution process in case of a geotechnically-related dispute between the employer, mine management, and/or the competent person appointed in terms of MHSA Regulation 14.1(8) (as amended) or his / her representative or subordinate; and
- The COP must describe review processes to be followed and review cycles adopted in finalisation and approval of geotechnical designs and recommendations, layouts, the COP, procedures and / or programmes, etc., adopted at the mine.

Key changes introduced to earlier mining GOP guideline requirements (continued)

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Additions and specific requirements introduced in the new civil tunnelling COP guideline

Specific risk management strategies required:

- During construction and commissioning of a project;
- Post-construction, during scheme operation & maintenance;
- Unlined, unsupported tunnels & underground excavations constructed prior to the promulgation of this COP guideline – see new clause introduced under mining on earlier slide; and
- Unused, abandoned tunnels.

Post-construction, during operation & maintenance: Types of civil tunnels & underground spaces

Type of Tunnel	Examples
Water tunnels for water transfer, or for power generation, tunnels exposed to large surge loads	Water transfer, e.g. Orange-Fish Transfer Tunnel, LHWP Delivery Tunnel North, etc. Water supply, e.g. Northdene Tunnel in the Shongweni area in KwaZulu-Natal, etc. Pumped storage, e.g. Drakensberg Pumped Storage Scheme (PSS), Ingula PSS, etc.
Tunnels and shafts providing access to underground infrastructure	Access tunnels, declines and escapeways, e.g. at Gautrain, Drakensberg PSS, Ingula PSS, etc.
Rail tunnels	Critical infrastructure, e.g. Gautrain tunnels, shafts and station caverns, tunnels on the Richards Bay Coal Line, and on the Sishen-Saldanha Railway Line, the Hex River Tunnels, etc. Tunnels on other railway lines e.g. the Lindokuhle Tunnel in the eThekweni area, etc.
Road tunnels	Critical infrastructure / tunnels with high traffic volumes, e.g. Huguenot Tunnel, Strydom Tunnels, Waterval Boven Road Tunnel, etc. Other tunnels on roads with lower traffic volumes e.g. Daspoort Tunnel on R55 in Pretoria, etc.
Pedestrian tunnels	Excluding cut & cover surface structures.
Underground tourist attractions	Examples include: ☐ Gold Reef City Underground Mine Tours; ☐ Cullinan Underground Mine Tours; ☐ Cape Town Underground Water Tunnel Tours; ☐ Waterval Boven Cogwheeled Railway Tunnel; ☐ The Bothongo Wondercave in the Cradle of Humankind, where access is provided via a steep decline stairwell followed by vertical shaft; ☐ Other project sites (or portions thereof) where visitors are taken on underground tours e.g. Drakensberg PSS, Ingula PSS, walking tours through Durban Harbour Tunnel, etc.; and ☐ Operational tunnels that are open to the public e.g. Northdene Tunnel in the Shongweni area in KwaZulu-Natal, etc.
Underground bunkers, for storage or military purposes	Underground bunkers for strategic fuel storage, military use, etc.
Sewer tunnels	E.g., Durban Harbour Tunnel, sewer tunnels in Johannesburg and Cape Town – but excluding micro-tunnels.
Utility tunnels	Stormwater, electrical, telecoms and HVAC tunnels in urban areas but excluding micro-tunnels and cut & cover surface structures, e.g. stormwater tunnels in Durban and surrounding suburbs, the Glenwood Services Tunnel in Berea Ridge in Durban, etc.
Emergency escape tunnels and shafts	Associated with rail, road, underground power stations / bunkers, or with high-risk industrial tunnels.
Abandoned tunnels	E.g., Waterval Boven Cogwheeled Railway Tunnel, Lang's Nek Railway Tunnel, De Doorns Railway Tunnel, old postal tunnels in Johannesburg, etc.



Post-construction, during operation & maintenance: Suggested minimum inspection intervals

Type of Tunnel	Suggested Minimum Inspection Interval (years)					Comments
	Unlined & Unsupported ²	Brick / Stone Masonry Lined	Bolted & Shotcrete Lining	Cast-In-Situ Concrete / Precast Segmental Lining ³	Steel Lining ³	
Water tunnels for water transfer, or for power generation (i.e. pumped storage)	Ad hoc / as required e.g. because of a blockage, etc.	2–5		5–10	5–10	Aligned with international hydropower inspection protocols (e.g. ICOLD, EPRI); however, schedule more frequent inspections if there are known geotechnical concerns, if tunnels start leaking, etc.
Tunnels & shafts providing underground access	1–3	3–5		5–10	N / A	5 years if regularly used or critical; 10 years for rarely accessed stable structures.
Rail tunnels:				5–10	N / A	Adopt shorter intervals (2–3 years) for high-speed rail or for rail tunnels with high traffic volumes, the US standard is typically 2 years.
Critical infrastructure	1–2	2–5				
Other tunnels on smaller rail lines	1–3	3–5				
Road tunnels:		2–5		5–10	N / A	International guidelines (e.g. PIARC, FHWA) recommend 2–5 years, depending on usage and tunnel condition.
Critical infrastructure / high-traffic tunnels	1–2					
Other tunnels on lower-traffic routes	1–3					
Pedestrian tunnels	1–2	2–5		5–10	N / A	Use shorter intervals for tunnels with high pedestrian traffic volumes or in urban locations.
Underground tourist attractions	0.5–1	1–2		2–3	N / A	Higher frequency of inspections warranted due to public exposure.
Underground bunkers, for storage or military purposes	1–2	2–5		5–10	N / A	Where actively used: 5 years minimum. Where unused: Facility-dependent but still at least every 10 years to manage long-term geotechnical risk.
Sewer tunnels	Ad hoc, as required because of a tunnel blockage, etc.					Practical limits to specifying regular inspection intervals given environmental and health-related risks when working in sewer tunnels.
Utility tunnels	1–2	2–5		5–10	N / A	Service continuity critical; inspections to be coordinated with service providers.
Emergency escape tunnels	1–2	0.5–1		5–10	N / A	High safety relevance, often subject to additional regulatory requirements.
Unused, abandoned tunnels	As for 'Underground tourist attractions' above – and if not implemented, then such abandoned tunnels must be permanently sealed and closed off to prevent public access.					Higher frequency warranted due to public exposure.



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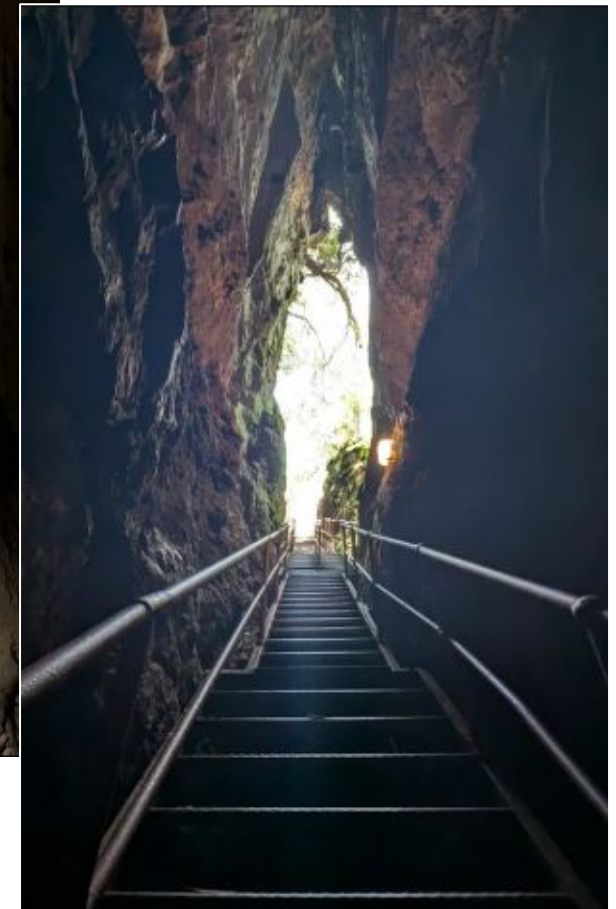
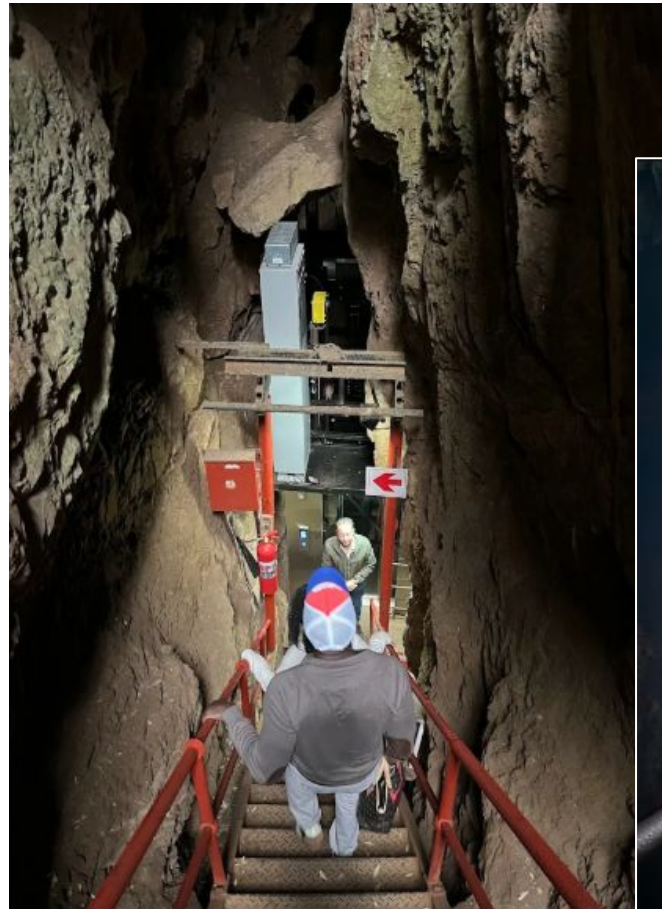
Post-construction, during operation & maintenance: Suggested minimum inspection intervals (continued)

Actual inspection interval of a civil tunnel or underground space to be based on a detailed geotechnical risk assessment of that tunnel/underground space, considering factors such as tunnel and underground space usage, public exposure, risk to critical infrastructure, infrastructure age, geotechnical setting, historical performance, etc.

Unlined, unsupported tunnels still in operation – Example

Woodhead Tunnel,
Table Mountain

Bothongo Wondercave access decline,
Cradle of Humankind

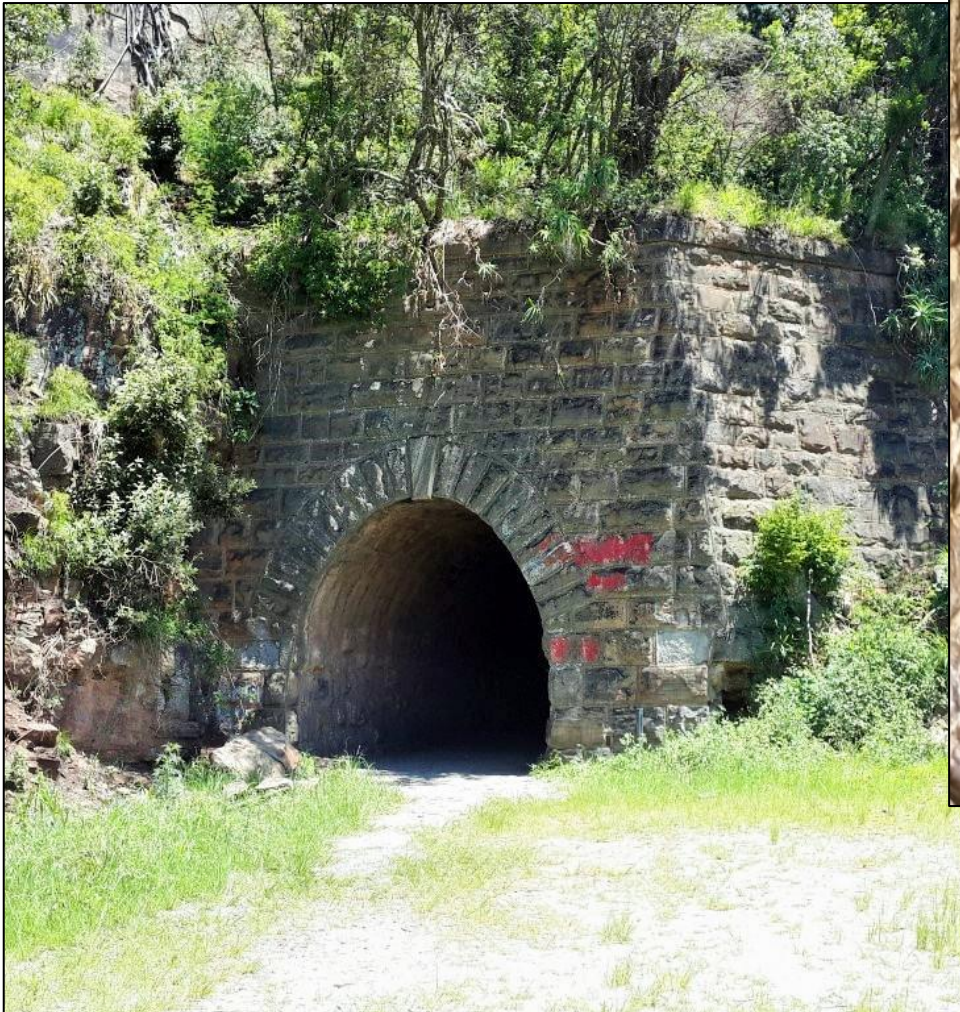


Unused, abandoned tunnels

- Inspections by a competent person at minimum intervals as prescribed for 'Underground tourist attractions';
- Necessary repairs and maintenance identified must be carried out diligently and expeditiously;
- Public access must be prevented until the required repairs and maintenance have been completed; and
- Most importantly, should these requirements not be complied with, such unused, abandoned tunnel / underground excavation must be permanently sealed and closed off to prevent public access.

Unused, abandoned tunnels - Example (continued)

Waternal Boven Tunnel



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Implementation of new civil tunnelling COP guideline

- Collaboration between Design Engineer and Contractor to satisfy all requirements of the new COP guideline;
- Owners/operators:
 - ☐ Geotechnical risk management & mitigation during project phases;
 - ☐ Setting appropriate inspection intervals during operation;
 - ☐ Timely maintenance & repair of tunnels and underground spaces;
 - ☐ Maintain unused, abandoned tunnels in a stable and safe condition if left open to the public – OR prevent public access by securely closing off unused and abandoned tunnels that are not being maintained; and
 - ☐ Keep the DMPR informed of any civil tunnelling construction and underground space development works (including extensions to existing project schemes), and of any major repairs or upgrades required during the operation of such a project scheme.

Implementation of new civil tunnelling COP guideline (continued)

- DMPR oversight:
 - ☐ Set up and maintain a register of civil tunnels and underground spaces which includes the names and contact details of the owners and operators of such civil tunnels and underground spaces;
 - ☐ As is done for operating mines in South Africa, fulfil the normal DMPR oversight functions - e.g., in-person site audits, COP reviews, accident investigations, etc. during initial project construction & commissioning, as well as during any later extension of the project scheme and / or when major repairs or upgrades are being carried out;
 - ☐ Participate in inspections of civil tunnels and underground spaces where appropriate; and
 - ☐ Ensure unused, abandoned tunnels are maintained in a stable and safe condition where an owner or operator chooses to leave it open to the public – OR ensure that such unused and abandoned tunnels which are not maintained, are securely closed off to prevent public access.

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Thank You

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