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CSA M424 and M421 Standards Update

Vaishnavi Somasundaram

Project Manager, Worker and Public Safety

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We are a **leader in standards research, development, education, and advocacy**. The technical and management standards developed by our **11,000+ members** improve **safety, health, the environment, and economic efficiency** in Canada and beyond.



Standards developed by expert members through a consensus-based, transparent and accredited process

IMPROVING HEALTH, SAFETY, THE ENVIRONMENT, AND TRADE IN CANADA AND BEYOND.

100+

Years of experience

14

Areas of focus

11,000+

Dedicated members

3,000+

Standards

1,000+

Committees



Standards Development

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CSA’s standards solutions span a breadth of critical economic sectors:



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Health & Safety**



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Natural Gas**



Public Safety



Transit



Supporting Canada's economic infrastructure

Energy

Safely powering Canada's energy sector

Workplace safety

Protecting the engine of our economy

Trade

Breaking down interprovincial trade barriers



80%

of standards adopted
by industry

60%

of standards referenced in
legislation and regulations

CSA Group Current OHS Mining Portfolio of Standards

- **Technical Committee on Use of Electricity in Mines**
 - **CSA M421:23**, *Use of electricity in mines*
- **Technical Committee on Fire-Resistant Conveyor Belting**
 - **CSA M422:23**, *Fire-performance and antistatic requirements for conveyor belting*
- **Technical Committee on Underground Mining Mobile Equipment**
 - **CSA M424.0:22**, *Underground mining mobile equipment — General requirements*
 - **CSA M424.1:22**, *Flameproof non-rail-bound diesel-powered machines for use in gassy underground coal mines*
 - **CSA M424.2:22**, *Diesel-powered machines for use in non-gassy underground mines*
 - **CSA M424.3:22**, *Braking performance-rubber tired, self propelled underground mining machines*
 - **CSA M424.4:22**, *Self-propelled, electrically driven, non-railbound mobile machines for use in non-gassy underground mines*
- **Technical Committee on Fire-performance and antistatic requirements for ventilation materials**
 - **CSA M427-M91 (R2025)**, *Fire-performance and antistatic requirements for ventilation materials*
- **Technical Committee on Rock Bolts**
 - **CSA M430-90 (R2025)**, *Roof and rock bolts, and accessories*
- **Technical Committee on Wire Rope**
 - **CSA G4-15 (R2025)**, *Steel wire rope for general purpose and for mine hoisting and mine haulage*

Standards update:

CSA M424 Series on Underground Mining Mobile Equipment

CSA M424 Series - Topic Map

Core Safety	M424.0 General	Machine Design Principles Materials Performance Steering Braking Lighting	Operator Safety Ergonomics Noise Visibility Vibration	Labeling Standards Applicability
	M424.3 Braking	Performance Test Procedures Test apparatus	Conventional SAHR/Wet Regenerative	
Diesel Engines	M424.1 Diesel	Design Materials Applications Fuel Test Procedures	Flame Propagation Surface Temperature Test Procedures	Shutdown Systems Alarms Hazard Analysis
	M424.2 Diesel Non - Gassy	Emissions Control Ventilation Markings	Emissions Standards Aftertreatment Test Procedures	Pass/Fail Criteria Ventilation Prescription
BEV/FCEV/Hybrid	M424.4 Electric Powertrains	Design Applications Performance Machine Types Test Procedures	Energy Storage Battery Safety Hydrogen Storage Fuel Cells Refuel/Recharge	Interlocks Motor and generator Markings and documentation Protection against
	M424.5 Hydrogen			

CSA M424.0

- 1st Edition published March 2022
- Amendment in progress – linked to M424.3
- Expected publication: Mar 2027 (EN/FR)

CSA M424.3

- 2nd Edition published March 2022
- 3rd Edition under development
- Expected publication: Mar 2027 (EN/FR)

CSA M424.1

- 3rd Edition published March 2022
- Currently in maintenance

CSA M424.2

- 3rd Edition published March 2022
- Currently in maintenance

CSA M424.4

- 1st Edition published March 2022
- 2nd Edition under development
- Expected publication: April 2027 (EN/FR)

CSA M424.5

- New Standard
- 1st Edition under development
- Expected publication: June 2027 (EN, FR to follow)

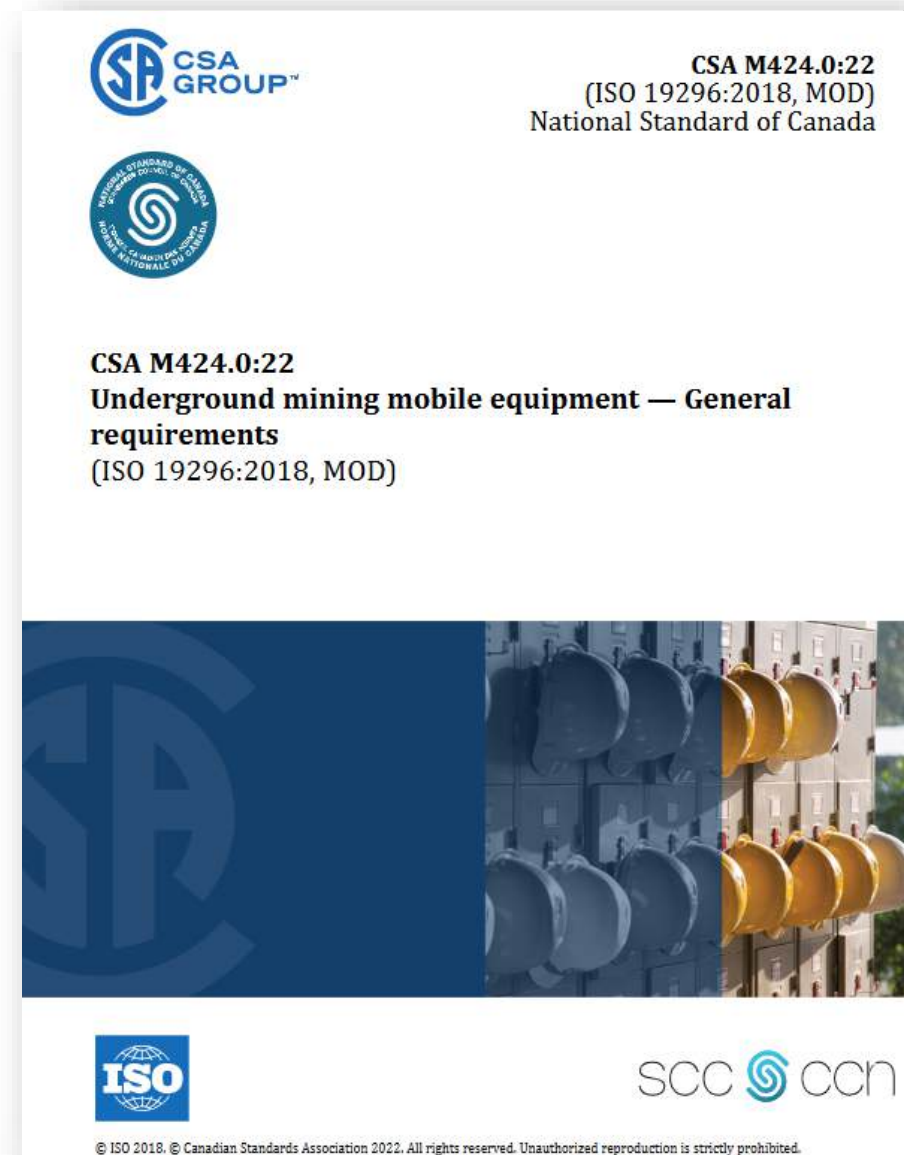
CSA M424 Series on Underground Mining Mobile Equipment

Revision 2025/2027



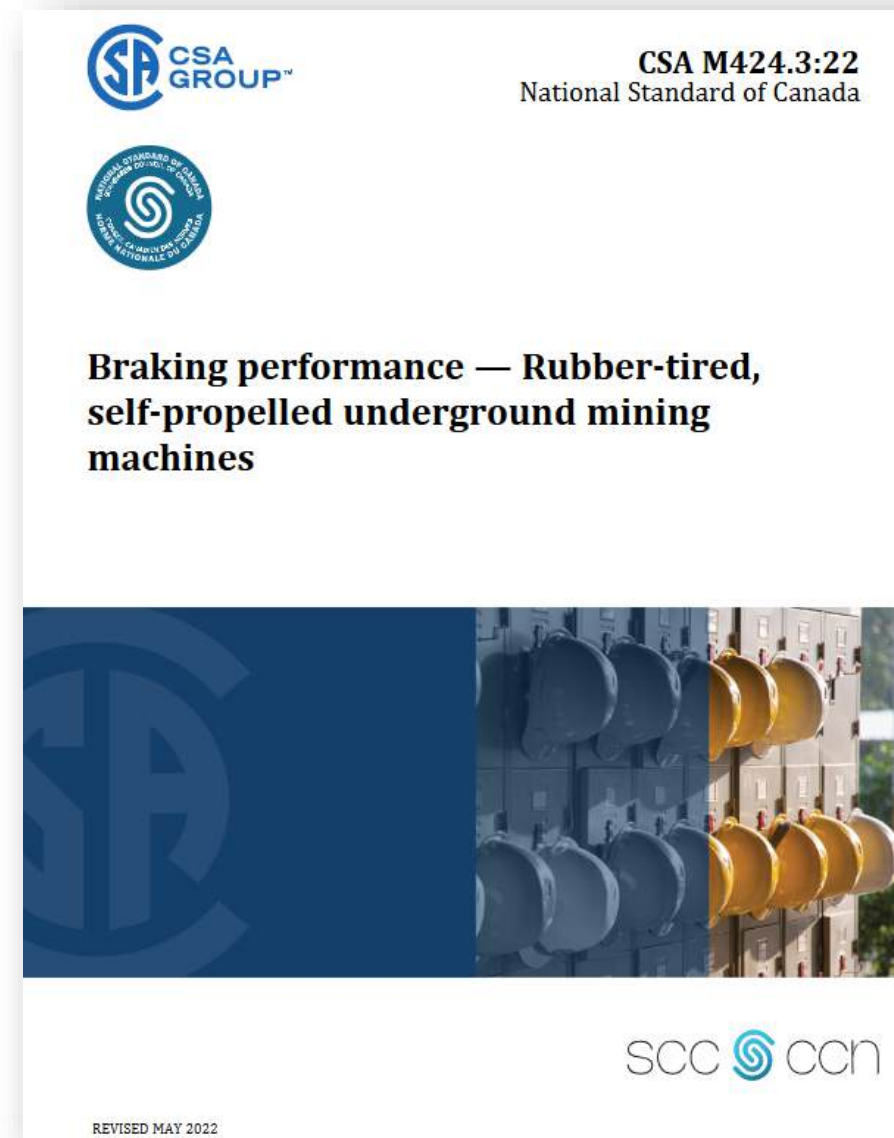
CSA M424.0 – Overview of Proposed Changes

- Alignment of brake testing references with CSA M424.3.
- Introduction of a Stability Index, allowing brake testing on level ground if specific criteria are met, or defaulting to M424.3 for testing on a 20% grade.
- Addition of a new annex outlining Stability Index calculation criteria.



CSA M424.3 – Overview of Proposed Changes

- Revisions to align with the broader CSA M424 series, with core brake testing criteria now centralized in CSA M424.0.
- New provisions addressing braking performance on 20% grades covering test conditions, instrumentation requirements and documentation.
- Clarified definitions and terminology to support consistent interpretation and application.



CSA M424.4 – Overview of Proposed Changes

- Adoption of ISO 14990-1 *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 1: General requirements* with Canadian deviations.
- Expanded requirements for battery-electric and diesel-electric hybrid equipment.
- Addition of battery safety, monitoring, charging, and thermal protection requirements.
- Introduction of dynamic and regenerative braking requirements.
- Introduction of machine identification and marking requirements.
- Addition of battery lifecycle management guidance, including storage, handling, transportation, and risk assessment.



CSA M424.5 – New Standard

- New, dedicated standard M424.5 addressing hydrogen fuel powered machines recently allocated to the M424 family
- Migration of hydrogen-related content from CSA M424.4 into a standalone M424.5
- Review and validation of existing material
- Definition of scope and reference updates
- Development of new content for hydrogen handling and risk assessment.
- Provisions for fire suppression systems
- Coverage of hydrogen applications including fuel cells

CSA M424.X, Autonomous and Remote-controlled Machines in Underground Mines



Research Study (Anticipated Completion): July 2027



Objectives

Assess current regulations, standards, and technologies for autonomous and remote-controlled underground mining.

Identify gaps in Canadian standards and propose updates to CSA M424 series / develop new standards.



Methodology

Environmental scan & regulatory Review

Key informant interviews

Research report & recommendations

Presentation to CSA M424 technical committee

Standards update:

CSA M421 Electricity in Mines

CSA M421 Status Update

CSA M421:

- 6th Edition published July 2023
- Currently in maintenance
- Next revision cycle: 2028

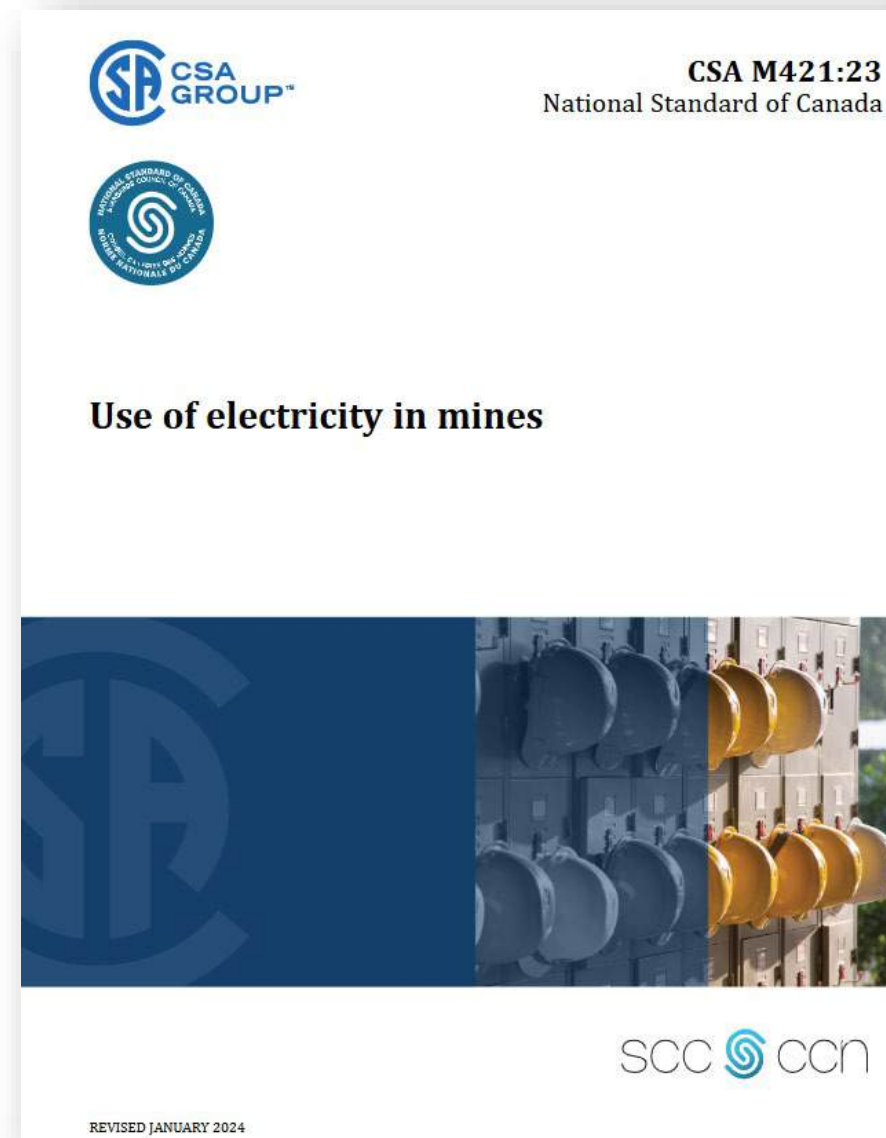


CSA M421 Electricity in Mines

Next Revision

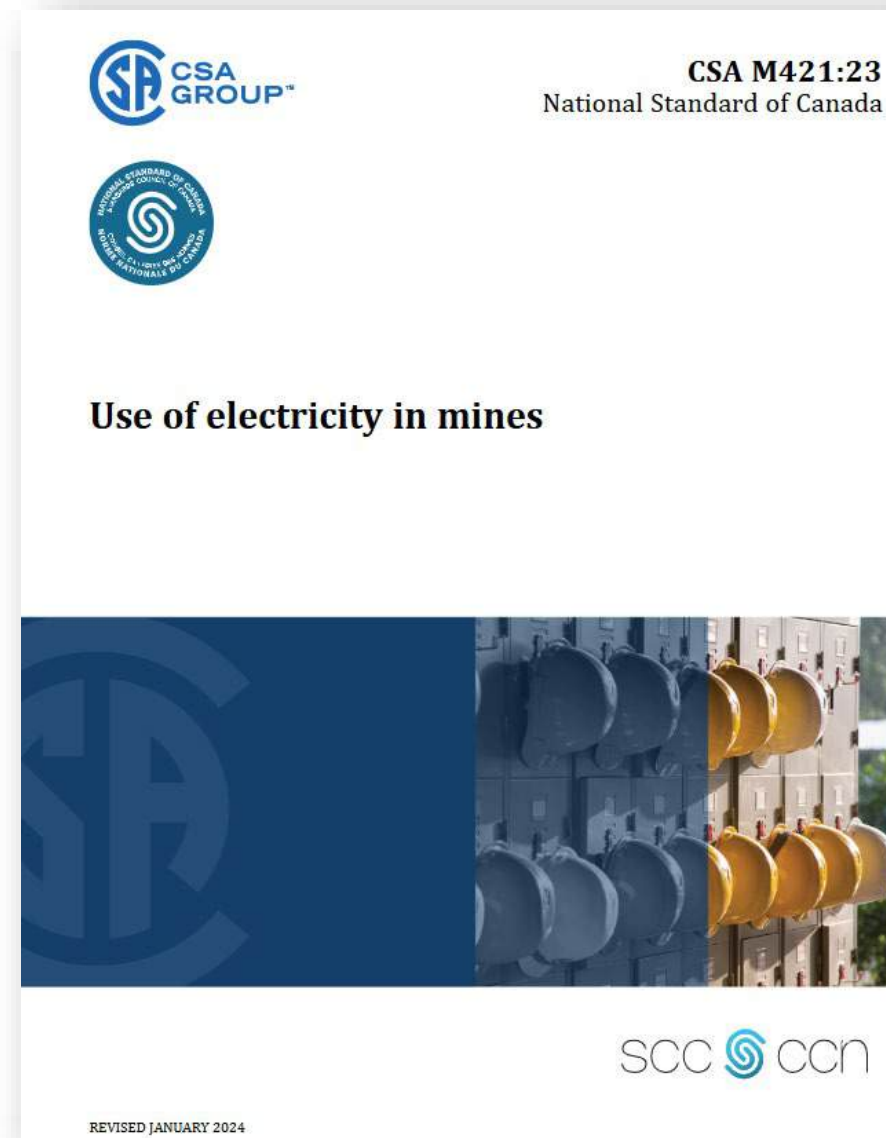
CSA M421 – Overview of Proposed Changes

- Broader acceptance of explosion-protected equipment, not limited to coal-specific designs.
- Implementation of mine-wide monitoring systems for enhanced safety and oversight.
- Introduction of risk-based zoning to classify areas by explosion risk.
- Support for alternative mobile equipment designs with equivalent safety.
- Revisions to align with requirements in the CE Code.



CSA M421 – Overview of Proposed Changes

- Clarification and reorganization of substation and station-grounding requirements.
- Updated guidance for mobile and movable generators.
- Expanded cable protection rules, including grade-level installations.
- Expanded guidance on ground-fault voltage and ground-potential rise.
- New annexes for grounding system segregation and rule interpretation (similar to Appendix B of CE Code Part 1).



Other Relevant Standards

Standard	Standard	Content
CSA Z1002	Hazard Identification and Risk Assessment	Addresses the identification, assessment, and management of workplace hazards and risks
CSA Z1005	Incident Investigation	Provides guidance for serious incident, near-miss, and fatality investigations and identifying corrective actions.
CSA Z460	Control of Hazardous Energy (Lockout)	Establishes requirements for controlling hazardous energy during servicing, maintenance, and operational activities.
CSA Z462	Workplace Electrical Safety	Provides guidance for managing electrical hazards and protecting workers performing electrical work.
CSA Z1006	Management of Work in Confined Spaces	Supports the safe management of work involving confined spaces and restricted-access environments.
CSA Z1010	Management of Work in Extreme Conditions	Addresses the management of work performed in challenging environmental and operational conditions. Increasingly important due to heat stress, smoke, cold stress, remote operations, and climate resilience.
CSA Z432	Safeguarding of Machinery	Supports the safe operation and maintenance of machinery through guarding and other protective measures.
CSA Z94.4	Respiratory Protection	Supports respiratory protection programs for airborne hazards such as silica dust, diesel particulate matter, fumes, and other contaminants.
CSA Z94	PPE Standards (Z94 Series and Related PPE Standards)	Supports selection, use, inspection, maintenance, and management of personal protective equipment including head, eye, face, foot, hearing, and fall protection.
CSA Z1003	Psychological Health and Safety in the Workplace	Supports worker well-being, mental health risk management, and psychologically safe workplaces, applicable in remote and high-risk environments.
CSA Z1001	OHS Training	Provides guidance for developing and maintaining workplace competency and training program development, applicable across mining operations.
CSA Z150	Safety Code on Mobile Cranes	Establishes safety requirements for the use, operation, and maintenance of mobile cranes.
CSA B354 Series	Mobile Elevating Work Platforms	Provides requirements for the safe design, operation, and use of mobile elevating work platforms.

Contact

Email: vaishnavi.somasundaram@csagroup.org



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Participation • Training & Resources



Thank you.

Vaishnavi Somasundaram

Project Manager, Worker and Public Safety

178 Rexdale Boulevard
Toronto ON, M9W 1R3, Canada