COSTHA | J. J. Keller Center for Market Insights

FOCUS ON SAFETY:
Benchmarking the State of the Hazmat/Dangerous Goods Industry

2026 – A Collaborative Benchmarking Study

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Benchmarking the State of the Hazmat/Dangerous Goods Industry

A Collaborative Benchmarking Study by **COSTHA** and the **J. J. Keller Center for Market Insights**

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Foreword

The safe transportation of hazardous materials (hazmat) is fundamental to protecting people, property, and the environment.

Yet as regulations evolve, supply chains grow more complex, and operational pressures increase, even well-established organizations face challenges. Understanding those challenges and encouraging informed conversation about them is essential to advancing safety across the industry.

That is the purpose of *Focus on Safety: Benchmarking the State of the Hazmat/Dangerous Goods Industry*, a collaborative benchmarking study conducted by the J. J. Keller Center for Market Insights and COSTHA. This research provides an objective, real-world view of hazmat transportation practices today. It is not intended to grade performance or promote specific solutions, but to establish a credible baseline for understanding current conditions and shared risks.

Why did we collaborate on this study? COSTHA brings decades of experience supporting organizations responsible for shipping hazmat globally, with a strong emphasis on collaboration and continuous improvement. The J. J. Keller Center for Market Insights contributes deep regulatory expertise and a long history of translating complex requirements into practical guidance that supports safer operations. Together, these perspectives ground the research in both operational reality and regulatory rigor.

The findings highlight a consistent theme: **many of today's most significant risks stem not from a lack of commitment, but from everyday realities, including human error, training complexity, and process gaps**. Routine tasks such as documentation, labeling, and classification remain challenging under time pressure and across modes. Training is widely valued, yet it is difficult to keep it current, role specific, and consistently reinforced. Undeclared hazmat, particularly in inbound shipments, and the complexity of air transport and lithium battery requirements add further complexity.

At the same time, the study reveals a strong desire to improve. Organizations are actively seeking ways to reduce preventable errors, strengthen training effectiveness, and apply technology in practical, responsible ways. Respondents emphasized the importance of tools that support informed decision making without replacing human judgment, and the need for shared accountability across the transportation chain.

This report is intended to serve as a trusted benchmark and a catalyst for productive conversation. By clearly identifying where challenges persist and where progress is being made, it provides a common starting point for shippers, carriers, forwarders, regulators, and other stakeholders, with a simple, shared goal: a safer environment for the industry and the people it serves.

COSTHA and the J. J. Keller Center for Market Insights are proud to present this study and grateful to the professionals who contributed their time and perspectives.

Sincerely,

Council on Safe Transportation of Hazardous Articles (COSTHA)
Tom Ferguson
Administrator & Chief Regulatory Compliance Officer
COSTHA

J. J. Keller Center for Market Insights
Steve Murray
Executive VP of Professional Services
J. J. Keller & Associates, Inc.

About This Study

Focus on Safety: Benchmarking the State of the Hazmat/Dangerous Goods Industry **launched in late 2025 with an online survey collecting feedback from November 24 to December 8, 2025.**

The Collaboration Partners

J. J. Keller & Associates, Inc.®
Since 1953

The J. J. Keller Center for Market Insights

The J. J. Keller Center for Market Insights is the collaborative research arm of J. J. Keller & Associates, Inc. The center originated in 2019 with a focus on sharing, with the public, trends and insights from an abundance of safety and compliance data gathered by J. J. Keller over decades serving more than 500,000 customers across the United States. Through historical data, new proprietary studies, and partnerships with reputable, research-focused third-party organizations, the center publishes ongoing reports to spur discussion and advancements in safe, respectful workplaces, job sites and highways. Contact the J. J. Keller Center for Market Insights at media@jjkeller.com.

COSTHA
Council on Safe Transportation of Hazardous Articles

COSTHA

COSTHA, founded in 1972, is a not-for-profit industry association representing more than 165 companies involved in the global dangerous goods supply chain, including shippers, carriers, manufacturers, and service providers. The organization advocates for the safe, secure, and efficient transport of dangerous goods across all modes and serves as a trusted industry voice through active engagement with domestic and international regulators. COSTHA solicits and submits member feedback to open regulatory dockets, provides comments on proposed rulemakings, and petitions PHMSA for updates to the Hazardous Materials Regulations to improve clarity, consistency, and safety. As an accredited NGO, COSTHA participates in key forums such as the UN Sub-Committee of Experts and the ADR/RID/ADN Joint Meeting, contributing proposals and technical expertise. COSTHA also supports its members through regulatory updates, technical guidance, training, and collaborative working groups. A current list of member companies is available at www.costha.com. To contact COSTHA, mail@costha.com

Respondent Demographics

The study *TFocus on Safety: Benchmarking the State of the Hazmat/Dangerous Goods Industry* was conducted via an online survey from November 24 to December 8, 2025. The survey was open to shippers, carriers, manufacturers, and others involved in transporting hazmat. The survey link was provided to COSTHA members and customers of J. J. Keller & Associates, Inc. In addition, we partnered with a third party to recruit non-J. J. Keller-affiliated industry professionals, and the survey link was published in several industry publications. Of those responding to the survey, 253 worked for companies transporting and/or shipping hazmat and had some level of impact on hazmat safety. All others were exited from the survey.

TRANSPORT MODE COMPARISON

Highway transportation was used by **83% of respondent companies**.

Multimodal was the least common mode of transportation used by respondent companies.

Respondents' Modes of Transporting Hazmat

83%	38%	35%	31%	25%
Highway	**Aircraft**	**Rail**	**Vessel**	**Multimodal**

TOP 5 KEY INSIGHTS

While the study provided a wealth of insights into the challenges of transporting hazmat, five key insights stood out to the experts at COSTHA and J. J. Keller & Associates, Inc.

1 **Preventable Errors**

2 **Training Complexity**

3 **Undeclared Hazmat Risk**

4 **Lithium + Air Transport Challenges**

5 **Technology-Driven Future**

1. Preventable errors are a major compliance pain point.

- From a list of potential hazmat compliance failures, respondents indicated that errors with documentation/ shipping papers, marking, labeling, placarding, packaging, misclassification and improper load securement were most common over the past 12 months. *See data on page 17.*
- These are routine operational mistakes tied to human error and process gaps.
- Respondents repeatedly described difficulty getting paperwork, labels, and regulatory references right, especially under time pressure and across modes.

Companies are looking for ways to reduce everyday mistakes, not just interpret regulations.

J. J. Keller **INSIGHTS**

Most hazmat compliance issues aren't caused by a lack of regulatory knowledge. They tend to show up when routine tasks are rushed, repeated, or handled a little differently each time. Documentation, marking, labeling, packaging, and classification all intersect, and when one thing's off, it often creates problems elsewhere. When you add tight timelines or mode changes into the mix, it's easy for small, everyday mistakes to slip through, even when the rules are familiar.

Instead of focusing only on interpreting regulations, companies usually see better results by reinforcing consistent, repeatable processes. Things like standard checklists, clear job aids, and simple verification steps before a shipment goes out can catch issues early, when they're easiest to correct. Taking a short pause to match the paperwork to the package and markings can go a long way in preventing disconnects.

MICHAEL ATKINSON
Compliance Expert – Hazmat Transportation

2. Training is complex and needs improvement.

- Training is widely used, but companies struggle most with:
  - Keeping training current with regulatory changes
  - Tracking recurrent training and renewals
  - Identifying employees who need hazmat training and at what level

- While most employees apply safety practices after training, significant barriers such as turnover and time constraints limit training effectiveness.

See data on page 18.

Respondents value training but need it to be easier to manage, easier to maintain, and more role specific.

COSTHA INSIGHTS

When Hazmat Training Misses the Mark, Risk Increases

Hazmat training resources are readily available. But it's important for companies transporting hazmat to choose an approach that considers:

- What is being shipped
- Who needs to be trained
- Relevancy of the training for each employee's job function
- Appropriate level of training for each employee's job function
- How the training engages employees with the subject matter, because knowledge is gained through both listening and doing, not only one or the other

Insufficient or inappropriate training leads to safety risks, including:

- Undeclared hazmat
- Spills and leaks
- Improper packaging of hazmat

All employees involved in the transportation chain must have, at a minimum, basic hazmat awareness, including:

- Understanding hazmat fundamentals
- Ability to recognize hazmat, markings, and labels
- Awareness of packaging requirements

TOM FERGUSON
Administrator & Chief Regulatory Compliance Officer - COSTHA

3. Undeclared hazmat is a concern, requiring enhanced monitoring and communication with suppliers and customers.

- Undeclared hazmat issues occur more frequently in inbound shipments than outbound.
- Respondents specifically referenced “hidden dangerous goods” and upstream shipper/third-party logistics (3PL) errors.

Risk isn’t limited to shipping departments. Receiving, procurement, and supplier management are exposed as well. *See data on page 16.*

J. J. Keller **INSIGHTS**

Resolving undeclared hazmat issues starts well before a shipment shows up at the dock. Since most of these problems originate upstream, companies need to be intentional about setting expectations with suppliers and 3PLs. That means clearly communicating what information is required, asking the right questions during procurement, and not assuming that a supplier understands hazmat rules just because they ship product. Simple things like standardized shipment questionnaires or requiring SDS reviews for new materials can uncover risks that would otherwise stay hidden.

On the receiving end, training and awareness matter just as much as formal shipping controls. Employees in receiving, purchasing, and supplier management should know what red flags to watch for, such as vague descriptions, inconsistent paperwork, or packages that don’t match what was ordered. Establishing a clear process for escalating concerns and stopping questionable shipments before they move further into operations can prevent bigger issues later. Undeclared hazmat isn’t solved by one department alone. It’s reduced when everyone involved knows their role, communicates openly, and treats inbound shipments with the same level of scrutiny as outbound ones.

MICHAEL ATKINSON
Compliance Expert – Hazmat Transportation

4. Lithium batteries and air transportation are complex.

While concerns about lithium batteries were not a broad concern by respondents, the potential impact of lithium batteries is high and growing, especially related to air transportation. For this reason, our experts are keeping an eye on this emerging risk.

- A minority of respondents use aircraft to ship, but aircraft shipments are consistently cited as the most challenging mode when it comes to regulatory compliance.
- Key drivers include:
  - Lithium battery requirements
  - Carrier and operator variations
  - Inconsistent interpretation by forwarders and 3PLs
- Many respondents called for better baseline Dangerous Goods (DG) awareness across intermediaries.

There seems to be a desire for specialized, premium training and guidance focused on air acceptance realities.

COSTHA INSIGHTS

Shipping dangerous goods by air is a privilege, not a right.

With this in mind, companies seeking to ship materials by air should approach the interaction as a partnership with the airline, not a service transaction. Remember, by air, the shipper has the responsibility to prepare and offer the shipment correctly. But the airline also has a responsibility to inspect every package and document to confirm compliance. Thus, both the shipper and the airline must agree that the consignment is acceptable.

When a third party is involved, such as a forwarder, there is potential for messages to be confused or distorted unintentionally. Be sure to work closely with the airline acceptance personnel to address concerns or rejected shipments.

TOM FERGUSON
Administrator & Chief Regulatory Compliance Officer - COSTHA

5. Future hazmat operations will be shaped by practical technology integration.

- Many companies already use shipping software and digital documentation.
- Barriers to broader adoption are cost and integration, not resistance to technology itself.
- AI is widely expected to reshape hazmat operations, but respondents express concern about over-reliance and loss of human competence.

Respondents want technology that supports decision making, not replaces judgment.

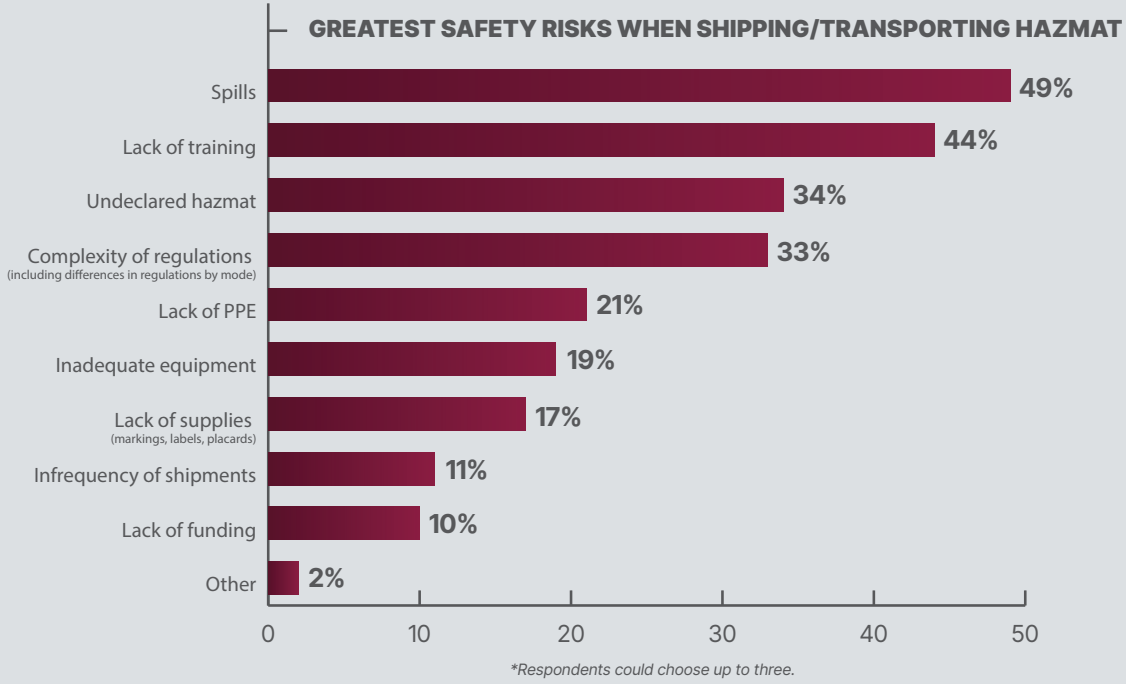
See data on page 19.

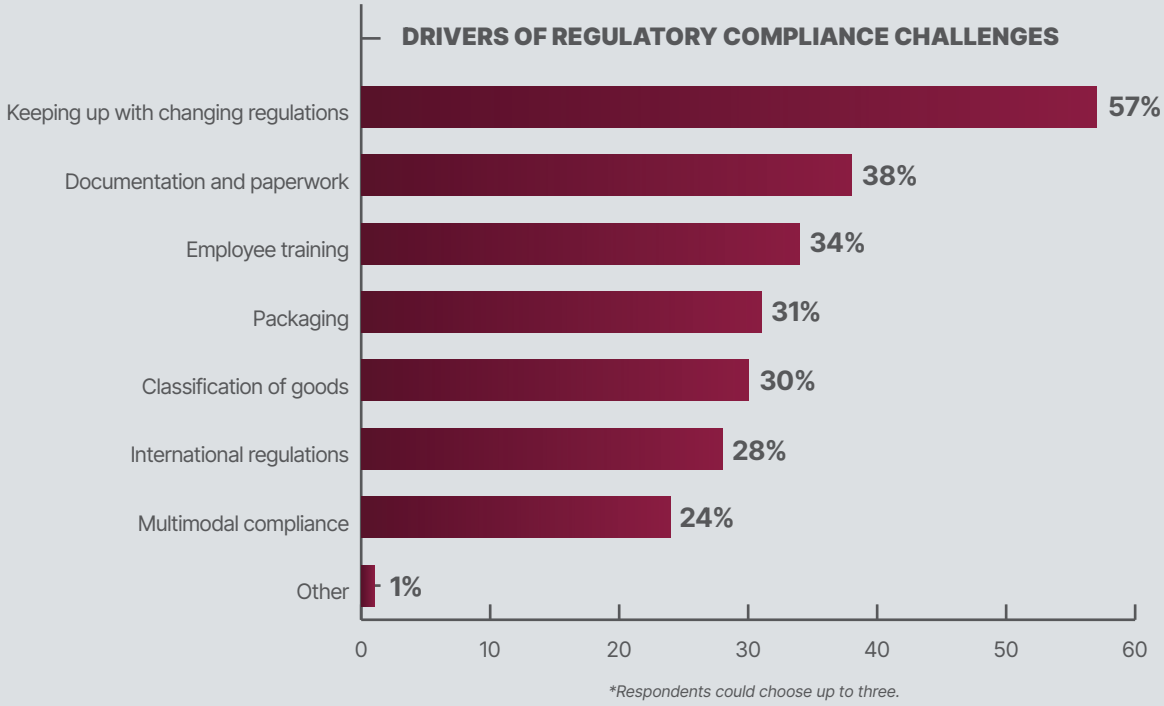
STUDY DATA

Safety Focus & Risks

In the survey data, **safety concerns overshadow all other respondent concerns**, with a focus on preventing accidents, spills, leaks and exposure, and protecting employees, the public, and the environment. Safety as a concern is closely followed by adequate compliance and training. Cost pressures and paperwork complexity are significant but secondary challenges.

The top risks when shipping or transporting hazmat include spills, gaps in training, undeclared hazmat, and regulatory complexity. Compliance challenges are driven by evolving regulations and documentation, as well as paperwork requirements.





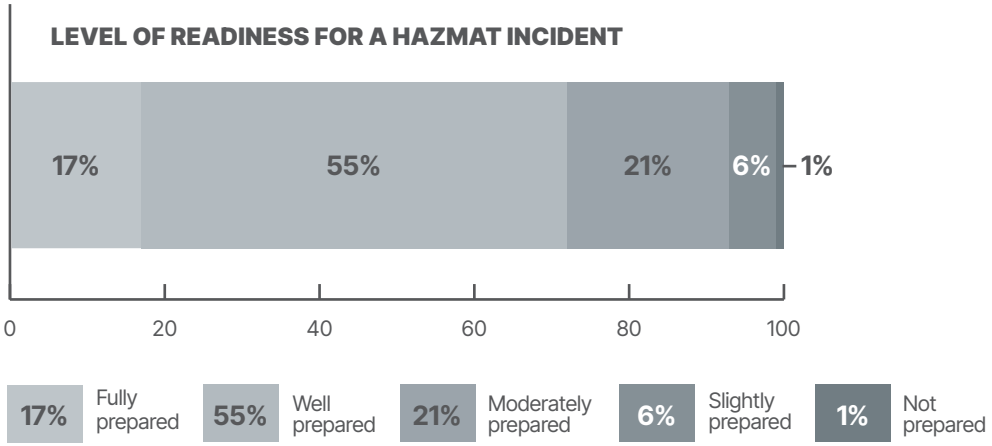
Hazmat Incident Preparedness

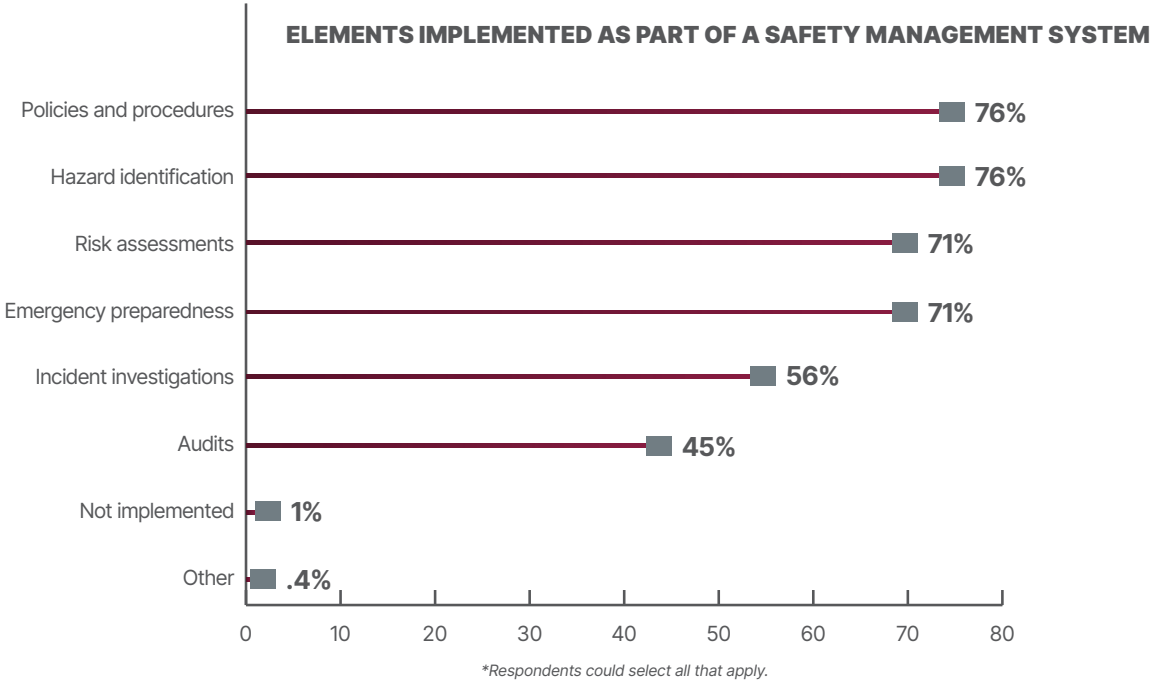
In the survey data, **72 percent of respondents feel fully or well-prepared for a hazmat incident.** This seems to be supported by their widespread adoption of a safety management system that incorporates policies and procedures, hazard identification, risk assessments, and emergency preparedness.

But this means that more than a quarter of shippers and transporters surveyed do ***not*** feel prepared.

Companies that are best prepared for hazmat incidents invest in continuous learning, and have strong management support, clear procedures, effective communication, reliable equipment, engaged employees, and ongoing process improvement.

1%
Have not implemented a safety management system





**Respondents could select all that apply.*

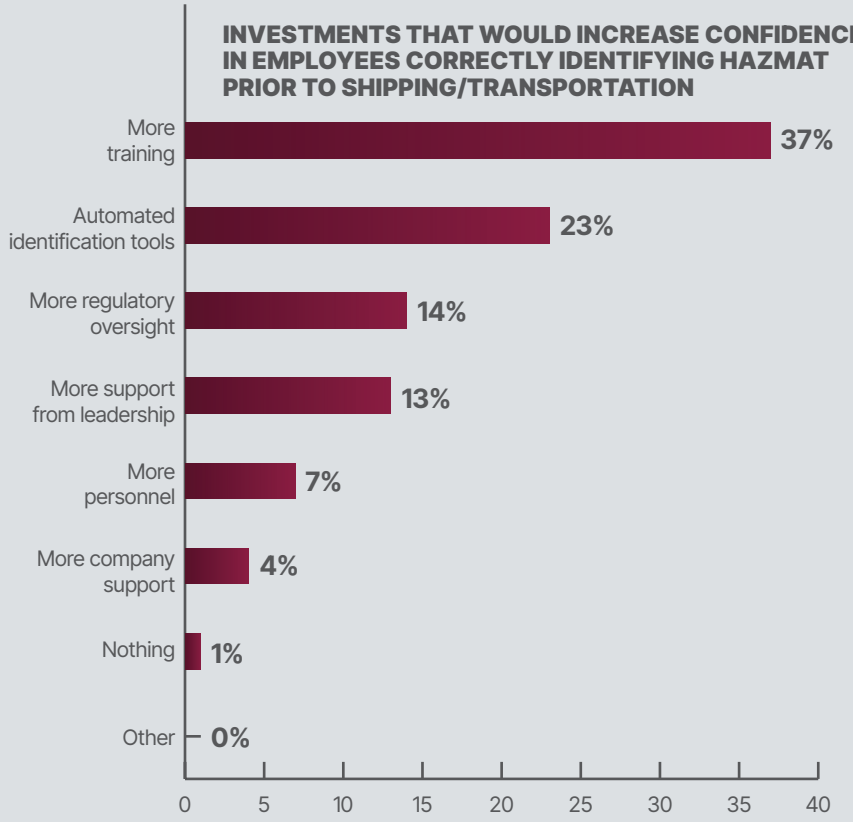
Identifying & Declaring Hazmat

In the survey, **respondents stated they most often rely on hazmat regulations (76%) and safety data sheets (74%) to determine what qualifies as a hazardous material.** The majority (69%) are very confident that employees are correctly identifying hazmat prior to shipping or transportation. That said, some targeted investments in training and automation could boost their confidence and further reduce risk and improve compliance.

RESOURCES USED TO DETERMINE WHAT QUALIFIES AS HAZMAT

- **76%** Hazmat regulations
- **74%** Safety data sheets
- **53%** Company database or warehouse management system
- **52%** Material test reports
- **3%** Other
- **0%** None

**Respondents could choose more than one.*

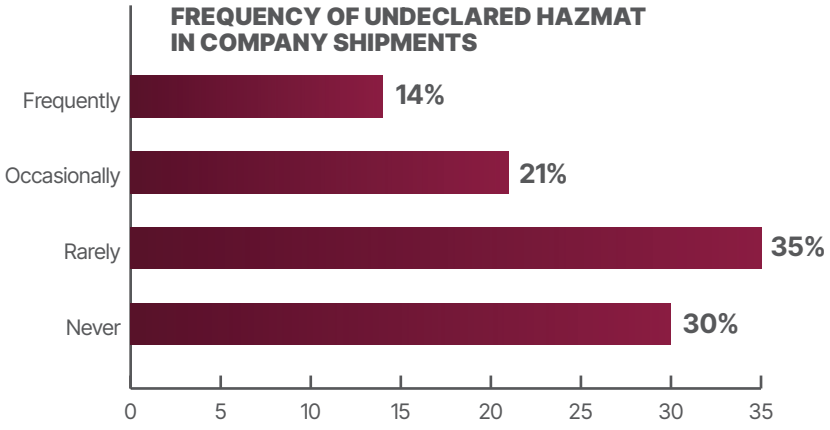


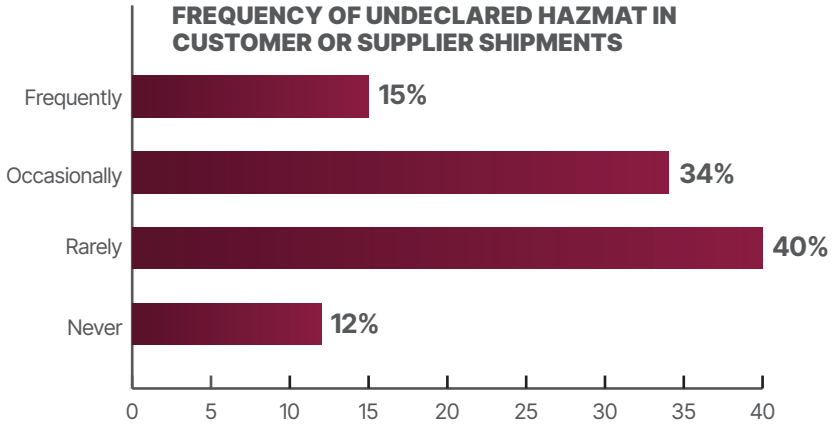
Identifying & Declaring Hazmat

What leads to improperly identified or declared hazmat? Respondents indicated that **issues are more common with inbound shipments from customers and suppliers than with outbound shipments from their company**. This underscores the need for enhanced monitoring and communication with customers and suppliers to mitigate inbound hazmat risks.

Frequency of Undeclared Hazmat in Shipments

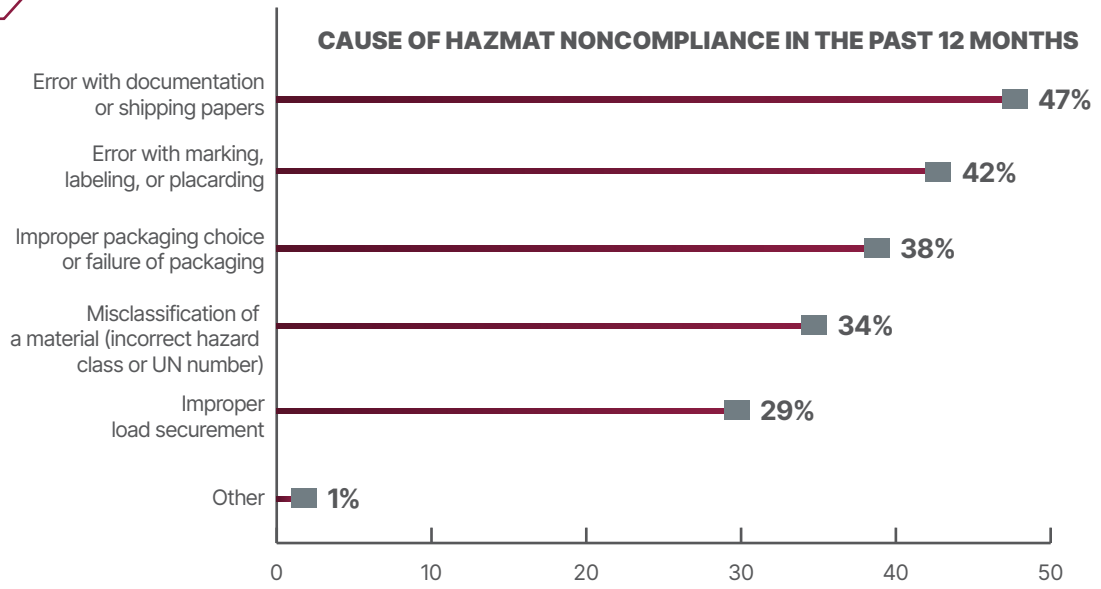
**Respondents could choose more than one.*



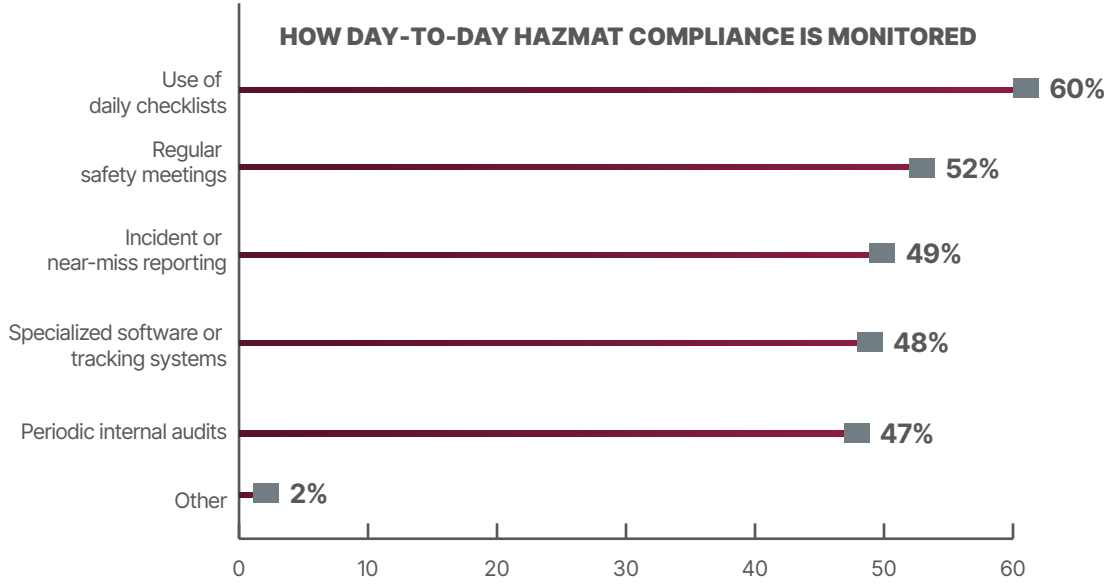


Causes of Hazmat Noncompliance

Using a structured list of potential issues, with the option to select 'no issues,' respondents most commonly **identified five events as contributors to hazmat noncompliance** in the past 12 months. The most common practices for monitoring day-to-day compliance with hazmat handling procedures are primarily structured, routine processes, especially checklists and meetings.



*Respondents could choose more than one.



*Respondents could choose more than one.

Hazmat Training Methods & Challenges

The respondents' hazmat training relies heavily on traditional methods, such as classroom instruction and online self-paced learning. Advanced training technologies such as virtual reality training and augmented reality training remain largely untapped.

Training challenges are driven primarily by the need to keep the training content aligned with evolving regulations and manage recurring training requirements.

Methods Used for Training

**Respondents could choose more than one.*

- 65% **Classroom sessions (in-person, instructor-led)**
- 60% **Online e-learning (self-paced)**
- 54% **Hands-on practical training or drills**
- 54% **On-the-job shadowing or mentoring**
- 50% **Work instructions or shipping guides**
- 36% **Webinars (instructor-led)**
- 9% **Virtual reality or augmented reality**

MOST CHALLENGING ASPECTS OF HAZMAT TRAINING COMPLIANCE

- 54% **Keeping training content accurate with the latest regulations and updates**
- 40% **Tracking when employees' training is due for renewal**
- 38% **Identifying all employees who require hazmat training based on their job functions**
- 34% **Addressing differing requirements for different transportation modes**
- 23% **Maintaining proper documentation and training records**
- 10% **No major challenges**
- 1% **Other**

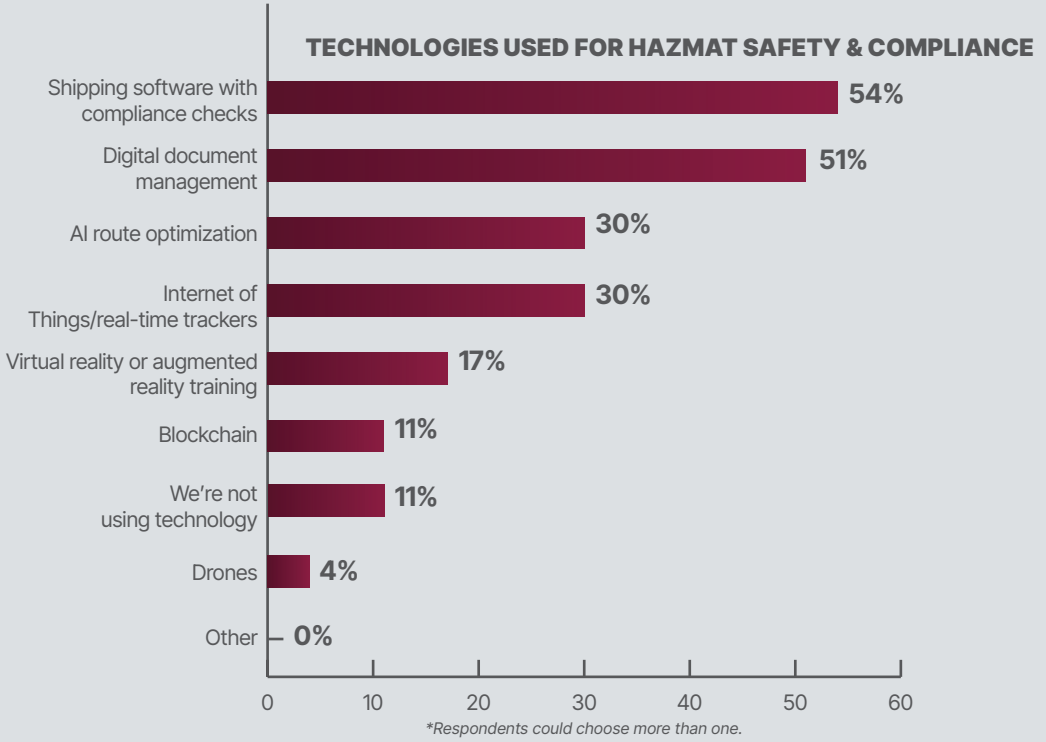
**Respondents could choose more than one.*

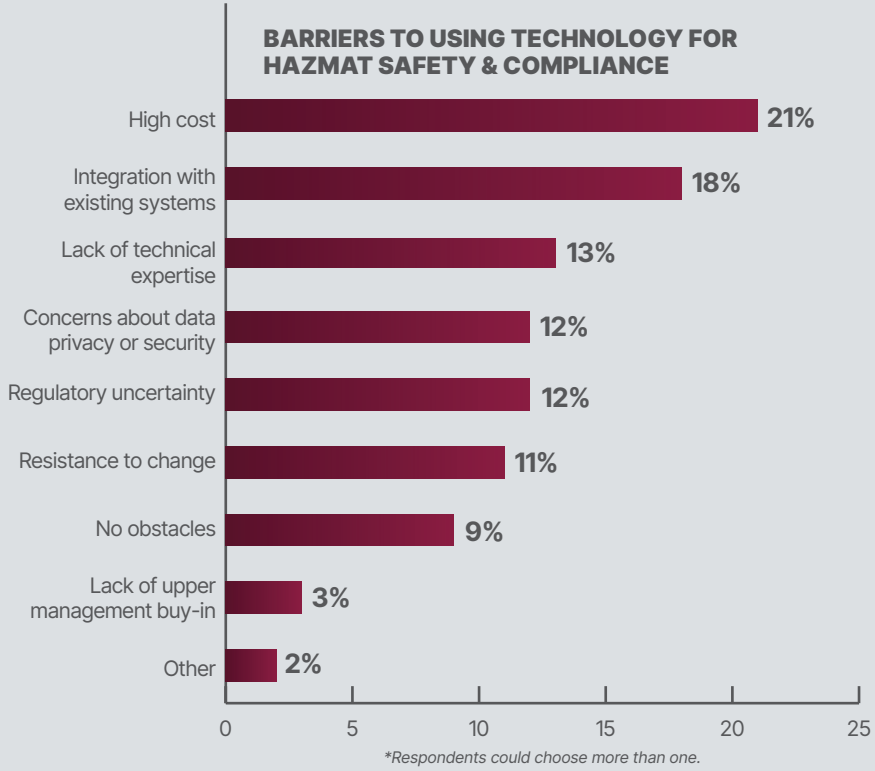
While most employees apply safety practices after training, significant barriers, led by employee turnover and time constraints, limit training effectiveness.

Technology Adoption in Hazmat Shipping & Transportation Operations

Today, **hazmat shipping software with compliance checks (54%) and digital document management (51%) are the most widely adopted technologies used by respondents** for hazmat safety and compliance. Emerging technologies, including AI route optimization and Internet of Things or real-time trackers show moderate use (30% each).

Key barriers to adoptions are high cost (21%) and integration with existing systems (18%).





The Future of Hazmat Transportation

Respondents in the study indicated future hazmat shipping and transportation operations will be shaped by technology integration, such as AI, robotics, and automation. This will assist companies in responding to anticipated stricter regulatory requirements, emerging risks from new energy storage technologies, and sustainability pressures.

ARTIFICIAL INTELLIGENCE & AUTOMATION	STRICTER REGULATORY REQUIREMENTS	COST PRESSURES	EMERGING RISKS	SUSTAINABILITY
Respondents repeatedly mentioned AI as the biggest future influence on their operations.	Some respondents predict increasingly stringent environmental and safety regulations.	Some respondents are experiencing cost pressures, and they expect this to continue.	Respondents mentioned several emerging risks.	Some respondents predict a push for greater sustainability initiatives.
ANTICIPATED IMPACT: • Automating paperwork and compliance documentation • Real-time monitoring and predictive analytics • AI-based scanning and identification of hazmat • Route optimization and logistics planning	**ANTICIPATED IMPACT:** • Digital reporting and real-time tracking • Competency-based training and certification • Harmonization of international standards (UN Model Regulations, GHS)	**ANTICIPATED IMPACT:** • Inflation • Tariffs • Fuel prices • Insurance rates	**ANTICIPATED IMPACT:** • New battery chemistries, such as sodium batteries and large-format lithium-ion batteries for uninterruptible power supply (UPS) systems	**ANTICIPATED IMPACT:** • Greener packaging • Recyclable materials • Carbon reduction
RESPONDENTS' CONCERN: The industry could develop an over-reliance on AI, leading to reduced human interaction.	**RESPONDENTS' CONCERN:** Stricter regulatory requirements could mean higher compliance costs, more audits, and a need for advanced technology integration.	**RESPONDENTS' CONCERN:** This could lead to increased operational costs and the potential for consolidation of hazmat handling among some companies.	**RESPONDENTS' CONCERN:** More use of lithium batteries, frequently cited as a major concern due to fire risks and evolving regulations.	**RESPONDENTS' CONCERN:** This could lead to more investment in sustainable practices and alternative energy sources.

For questions or additional information on construction safety & compliance, see our websites or contact us.

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