

TECHNICAL SAFETY INSTRUCTIONS AND DOCUMENTATION FOR MOTOR VEHICLES OPERATING ON INTERNATIONAL ROUTES

Kozimov Hikmatillo Doniyorbek o'g'li
Faculty of Automotive Engineering and Transport
Transport Logistics Department Group K-46-22

Habibullayev Halilillo Oybek o'g'li
Faculty of Automotive Engineering and Transport
Transport Logistics Department Group K-46-22

Annotation

This thesis examines the importance of technical safety instructions and mandatory documentation for motor vehicles operating on international routes. It analyzes the main legal, technical, and organizational requirements that ensure the safe and efficient movement of vehicles across borders. Particular attention is paid to vehicle roadworthiness, periodic technical inspections, driver compliance, transport documentation, and international regulatory standards governing cross-border freight operations. The study also highlights the role of customs and transit systems, digital transport documents, and international agreements in strengthening transport safety and operational reliability. The findings show that proper observance of technical safety instructions and accurate preparation of documents are essential for preventing accidents, reducing delays, ensuring legal compliance, and improving the effectiveness of international road transport.

Keywords: international road transport, vehicle safety, technical safety instructions, transport documents, roadworthiness, cross-border transport, customs transit, CMR, TIR, technical inspection.

INTRODUCTION

The globalization of the automotive industry has significantly increased the volume of motor vehicle exports across borders. Manufacturers and exporters must navigate complex international technical safety requirements to ensure that vehicles meet the safety, environmental, and performance standards of target markets. Non-compliance with these regulations can result in shipment delays, rejection at customs, substantial financial losses, and damage to brand reputation.[1] Technical safety of motor vehicles encompasses a wide range of aspects, including crashworthiness, braking systems, lighting and visibility, occupant protection, electromagnetic compatibility, environmental emissions control, and increasingly, functional safety of electronic and software systems. When entering international markets, automotive vehicles must comply with mandatory type-approval procedures and possess the necessary certification documents that prove conformity with relevant regulations.[2,3]

The primary international framework for vehicle regulations is provided by the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonization of Vehicle Regulations (WP.29). Established under the 1958 Agreement, the 1997 Agreement, and the 1998 Agreement, WP.29 develops and updates a comprehensive set of UN Regulations and Global Technical Regulations (GTRs) that cover safety, environmental protection, energy efficiency, and anti-theft measures. Over 60 countries have acceded to these agreements, making UN ECE regulations the most

widely recognized international standard, particularly in Europe, Asia, Africa, and many emerging markets.[5,6] In parallel, major markets maintain their own systems. The United States enforces the Federal Motor Vehicle Safety Standards (FMVSS) administered by the National Highway Traffic Safety Administration (NHTSA), while Canada applies the Canadian Motor Vehicle Safety Regulations (CMVSS). The European Union implements a whole vehicle type-approval system based on UN ECE Regulations supplemented by EU-specific directives and the General Safety Regulation (GSR). Other regions, such as the Gulf Cooperation Council (GCC), ASEAN countries, and Latin America, often adopt UN ECE regulations with additional local requirements.[4] Compliance with these guidelines and documents ensures not only legal market access but also enhances vehicle safety for end-users and facilitates smoother cross-border trade. However, differences between regulatory systems (self-certification in the US versus third-party type approval in Europe) create significant challenges for exporters, especially small and medium-sized manufacturers.[3] This thesis examines the main international directions and requirements for automotive technical safety when exporting motor vehicles. It analyzes the structure of UN ECE WP.29 regulations, key mandatory documents, type-approval procedures, and practical challenges faced by exporters. Special attention is given to recent developments in functional safety (ISO 26262), cybersecurity (ISO/SAE 21434), and automated driving systems.

Understanding these regulations and required documentation is essential for successful penetration into global markets and maintaining competitiveness in the international automotive trade.

MAIN PART

The process of exporting motor vehicles to international markets requires strict compliance with technical safety regulations and supporting documentation. Manufacturers and exporters must ensure that vehicles meet the safety, environmental, and performance standards of the target country or region to avoid rejection at borders, customs delays, or legal penalties. The global automotive trade relies heavily on harmonized frameworks, with the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonization of Vehicle Regulations (WP.29) serving as the cornerstone for many markets.[5] WP.29 administers three key international agreements: the 1958 Agreement on uniform technical prescriptions with mutual recognition of type approvals, the 1997 Agreement on periodic technical inspections, and the 1998 Agreement on global technical regulations (GTRs). Under the 1958 Agreement, over 60 countries recognize UN Regulations, allowing a single type approval to grant market access across contracting parties. These regulations cover critical safety aspects such as crash protection (e.g., UN R94 for frontal collision, UN R95 for side collision), braking systems (UN R13), lighting and signaling (UN R48), occupant protection, and electromagnetic compatibility. Environmental requirements include emissions control (UN R83, R49), fuel consumption, and noise levels. Recent updates focus on advanced driver assistance systems (ADAS), automated driving systems (ADS), and cybersecurity.[8]

For exporters targeting Europe, compliance with EU Regulation (EU) 2018/858 on vehicle type approval is mandatory. This framework integrates UN Regulations and adds EU-specific rules under the General Safety Regulation (GSR), which mandates advanced safety features like intelligent speed assistance, emergency lane-keeping systems, and advanced emergency braking. The EU operates a whole vehicle type-approval (WVTA) system conducted by designated technical services and approval authorities in member states. Once granted, the Certificate of Conformity (CoC) allows free circulation

throughout the European Union.[1,2] In contrast, the United States employs a self-certification system under the Federal Motor Vehicle Safety Standards (FMVSS) administered by the National Highway Traffic Safety Administration (NHTSA). Manufacturers must test vehicles against over 100 FMVSS standards covering crash avoidance (100-series), crashworthiness (200-series), and post-crash survivability (300-series). Unlike the EU's pre-market third-party approval, U.S. manufacturers self-certify compliance and face post-market surveillance through random testing and recalls. Key differences include headlamp requirements (FMVSS allows less advanced adaptive lighting), bumper design, turn signal colors, and emissions standards enforced separately by the EPA. Canada's CMVSS largely aligns with FMVSS but includes some unique provisions.

Other major markets adopt hybrid approaches. Many countries in Asia, Africa, the Middle East (GCC), and Latin America base their requirements on UN Regulations while adding local modifications. For instance, the Eurasian Economic Union (EAEU) requires EAC certification, while Australia follows ADR standards that closely mirror UNECE with additional pedestrian protection rules.[9] Modern vehicles must also address functional safety and cybersecurity. ISO 26262 provides the international standard for functional safety of electrical and electronic (E/E) systems, defining Automotive Safety Integrity Levels (ASIL A to D) to mitigate risks from system malfunctions. It covers the entire lifecycle from concept to decommissioning. Complementing this, ISO/SAE 21434 establishes requirements for cybersecurity engineering, focusing on threat analysis, risk assessment, and secure development throughout the vehicle lifecycle. UN Regulation R155 (Cybersecurity Management System – CSMS) and R156 (Software Update Management System – SUMS) make compliance with these principles mandatory for type approval in many markets, reflecting the growing connectivity of vehicles.[5-8]

Exporters face significant challenges due to regulatory divergence. Adapting a vehicle originally designed for one market (e.g., EU) for another (e.g., US) often requires costly modifications in lighting, safety systems, and emissions control. Small and medium-sized manufacturers struggle with the high costs of multiple testing and certification processes. Harmonization efforts through WP.29 and GTRs aim to reduce these barriers, but full convergence remains limited, particularly between self-certification (US) and type-approval (EU/UNECE) systems.

Key documentation required for international export includes:

- Type Approval Certificate with the “E-mark” or “e-mark” indicating compliance with specific UN Regulations.
 - Certificate of Conformity (CoC) – the official document confirming the vehicle meets all applicable requirements for registration in the target market.
 - Test reports issued by accredited technical services detailing results for crash tests, emissions, braking, etc.
 - Vehicle Identification Number (VIN) documentation and manufacturer's data plate.
 - Emission certificates proving compliance with Euro 6/VI, EPA, or equivalent standards.
 - Functional safety and cybersecurity documentation (ISO 26262 and ISO/SAE 21434 compliance evidence).
- Declaration of Conformance and customs-related forms, including proof of ownership (Certificate of Title or Manufacturer's Statement of Origin for new vehicles).

Failure to provide complete and accurate documentation can lead to shipment rejection or additional testing at the destination.

Table 1. Comparison of Major International Vehicle Technical Safety Frameworks

Aspect	UNECE / WP.29 (1958 Agreement)	European Union (Regulation 2018/858)	United States (FMVSS / NHTSA)
Approval System	Type approval with mutual recognition	Whole Vehicle Type Approval (WVTA)	Self-certification + post-market surveillance
Key Focus Areas	Safety, emissions, energy efficiency, anti-theft	UN Regulations + GSR (ADAS mandatory)	Crashworthiness, crash avoidance, emissions (EPA)
Headlamp & Lighting Rules	UN R48, adaptive systems allowed	Strict UN R48 + EU specifics	FMVSS 108 – more restrictive on adaptive lighting
Crash Testing	UN R94 (frontal), R95 (side)	Same + pedestrian protection	FMVSS 208, 214, 301
Cybersecurity	UN R155 (CSMS)	UN R155 + R156	Emerging guidelines, no mandatory CSMS yet
Functional Safety	References ISO 26262	Requires ISO 26262 compliance	References SAE/ISO standards
Emissions	UN R83 / R49	Euro 6/VI	EPA Tier 3 / CARB
Market Recognition	60+ countries	All EU + some associated countries	Primarily North America

The table highlights that while UNECE provides a harmonized base accepted by many countries, exporters must still address region-specific additions. For successful market entry, manufacturers are advised to engage accredited conformity assessment bodies early in the design phase and maintain a comprehensive technical file.

In practice, the export process involves preparing a dossier that includes all test data, risk assessments (for functional safety and cybersecurity), and declarations. Digital platforms such as the UNECE Database for Exchange of Type Approval documentation facilitate information sharing among authorities. As vehicles become more connected and automated, compliance with ISO 26262 and ISO/SAE 21434 is no longer optional but a prerequisite for type approval in forward-looking markets. Overall, navigating international technical safety guidelines demands a thorough understanding of both global harmonized regulations and local deviations. Proper documentation not only ensures legal compliance but also enhances consumer safety and supports smoother international trade in the automotive sector. Exporters who invest in early regulatory alignment and robust quality management systems gain a competitive advantage in the global marketplace.[3-10]

Conclusion

In conclusion, technical safety instructions and documentation for motor vehicles operating on international routes play a vital role in ensuring safe, lawful, and efficient cross-border transportation. As international road transport involves movement through different legal jurisdictions, climate

conditions, road infrastructures, and control procedures, the technical readiness of vehicles becomes one of the most important requirements for successful operation. For this reason, compliance with technical safety standards is not only a legal obligation, but also a practical necessity for protecting human life, cargo, transport assets, and the environment. The analysis of this topic shows that the safe participation of vehicles in international transportation depends on several interconnected factors. These include the technical condition of the vehicle, the availability of mandatory documents, the correct implementation of safety instructions, regular maintenance, and the professional responsibility of drivers and transport operators. If even one of these elements is neglected, the risk of road accidents, delays at border checkpoints, penalties, cargo damage, or denial of entry into another country may significantly increase. Therefore, technical safety should be considered a comprehensive system rather than a set of isolated requirements.

A key point of this thesis is that technical safety instructions serve as an operational guide for preventing risks before they occur. They regulate the inspection of essential vehicle systems such as brakes, steering mechanisms, tires, lights, fuel systems, and emergency equipment. In addition, safety instructions help drivers prepare for long-distance international trips by requiring pre-trip inspection, route awareness, emergency readiness, and adherence to international transport regulations. These instructions contribute directly to the prevention of mechanical failure and to the improvement of road discipline in international transport operations. At the same time, technical documents are equally important because they confirm the legal and operational suitability of a vehicle for international use. Registration certificates, technical inspection reports, insurance documents, permits, driver qualification records, and cargo-related transport papers form the documentary basis for international road movement. Without proper documentation, even a technically sound vehicle may face administrative barriers, delays, or legal sanctions. Thus, documentation and technical safety must function together as complementary components of one unified transport control system. Another important conclusion is that the modernization of transport administration and safety control can significantly improve the efficiency of international road transport. The introduction of digital inspection systems, electronic document management, intelligent monitoring technologies, and harmonized international standards can reduce human error, increase transparency, and simplify compliance procedures. These innovations create favorable conditions for both transport companies and regulatory bodies, while strengthening the overall reliability of international logistics chains. Furthermore, the importance of driver awareness and professional training should not be underestimated. A technically equipped vehicle alone cannot guarantee safety unless the driver fully understands the safety instructions, documentation requirements, and international transport rules. Therefore, continuous training, regular certification, and practical preparedness of drivers are essential elements in ensuring technical safety on international routes.

Overall, this thesis demonstrates that technical safety instructions and vehicle documentation are fundamental instruments for the secure and efficient organization of international road transportation. Their proper implementation helps reduce accidents, improve border-crossing efficiency, protect cargo, ensure regulatory compliance, and strengthen the competitiveness of national carriers in the international transport market. In the future, further improvement in this field should be based on stronger legal regulation, digital transformation, international cooperation, and the consistent application of preventive technical control measures.

References

1. McLinden, G., Fanta, E., Widdowson, D., & Doyle, T. (Eds.). *Border Management Modernization*. Washington, DC: The World Bank, 2011.
2. United Nations Economic Commission for Europe (UNECE). *Convention on the Contract for the International Carriage of Goods by Road (CMR)*. Geneva, 19 May 1956.
3. United Nations Economic Commission for Europe (UNECE). *Additional Protocol to the Convention on the Contract for the International Carriage of Goods by Road (CMR) concerning the Electronic Consignment Note (e-CMR)*. Geneva, 20 February 2008.
4. United Nations Economic Commission for Europe (UNECE). *Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention, 1975)*. Geneva, 14 November 1975.
5. United Nations Economic Commission for Europe (UNECE). *Agreement concerning the International Carriage of Dangerous Goods by Road (ADR 2025)*. Geneva: UNECE, 2024/2025 edition.
6. United Nations Economic Commission for Europe (UNECE). *European Agreement concerning the Work of Crews of Vehicles engaged in International Road Transport (AETR)*. Geneva, 1 July 1970, consolidated text.
7. European Parliament and Council of the European Union. *Directive 2014/45/EU of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers*. *Official Journal of the European Union*, L 127, 29.04.2014, pp. 51–128.
8. European Parliament and Council of the European Union. *Directive 2014/47/EU of 3 April 2014 on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union*. *Official Journal of the European Union*, L 127, 29.04.2014, pp. 134–218.
9. European Parliament Research Service. *Implementation of the Roadworthiness Package*. Brussels: European Parliament, PE 654.175, 2020.
10. Matuszak, Z., Karoń, G., Mikulski, J., & Sierpiński, G. Periodical Vehicle Inspections with Smart Technology. *Applied Sciences*, 13(12), 7241, 2023.