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PIARC Special Project

Bridges and tunnels strikes by oversize vehicles

CALL FOR PROPOSALS

Deadline for submission of proposals: 25 January, 2021

1 PURPOSE AND STRATEGIC SIGNIFICANCE

1.1 Introduction

The World Road Association (PIARC) has established a Special Projects mechanism to enable it to respond outside the usual four years Technical Committee cycle to emerging issues and priorities identified by its members. This paper is a Call for Proposals to conduct the “Bridges and tunnels strikes by oversize vehicles” Special Project.

1.2 Definition of bridges and tunnels strikes by oversize vehicles in the context of this project

Bridges, tunnels and other similar structures are key elements of the road networks. Its structural characteristics and its usually key importance in the network traffic make them very valuable assets for the road network.

Oversize vehicles are defined as vehicles beyond standard size limitations. However, they can also be standard size vehicles that are beyond a local size limitation of a specific area, road, bridge, or tunnel. These oversize vehicles can be over-height, over-wide or over-dimension vehicles. Finally, it should also be considered the oversize vehicles with a permit to circulate in a certain itinerary and that leave that authorized route. Some of these vehicles are required to also be accompanied by pilot vehicles.

Bridges and tunnels strikes by oversize vehicles are defined as collisions of these vehicles with bridges or tunnels structures or equipment.

Preventing bridge and tunnels strikes provides benefits through reducing damage to road infrastructure and vehicles, injuries and fatalities, and secondary crashes with other vehicles. Preventing bridge and tunnels strikes protects critical bridge and tunnel assets that are costly to repair. Operational benefits may include elimination of the delays and negative economic direct and indirect impacts associated with bridge and tunnels strikes and repairs, such as rerouting of traffic, pollution, decrease of road safety, etc.

1.3 Purpose of the project

Bridge and tunnel strikes by oversize vehicles are a threat to road user’s safety, and highway infrastructure. These incidents cause significant damage to infrastructure, injuries and fatalities, secondary crashes, traffic delays, emergency response, rerouting of traffic to remove the truck and repair the damage, and economic costs related to response and recovery efforts. At their worst, bridges can fail, resulting in serious injuries or fatalities and costly economic and quality of life impacts until the roadway can be reopened to traffic. In the United States, bridge strikes and overloads are the number two and three causes of bridge failures, while this is also an important issue in other HIC and LMIC. The causes are myriad, such as driver error, routing error, signage issues, or other factors.

The purpose of this study is to examine proven countermeasures, practices, and technologies used to reduce the incidence of oversize vehicles striking bridges and tunnels along with effective processes for accurately reporting and tracking bridge strike occurrences. Some of these practices for truck routing and permitting may also be useful in preventing bridge overloads.

The study will identify successful technologies, approaches, and mitigation strategies to address bridge and tunnel strikes, allowing information transfer to other countries. This will include lessons learned from around the world on deploying and operating various countermeasures, practices, and technologies. This project must also specifically identify practices and technologies that can be utilized in low and middle income countries.

1.4 Out of the scope

The project should not focus on bridge overloading. Measures to avoid bridges strikes might have a secondary benefit of preventing bridge overloading, and as such, this secondary aspect should be mentioned. However, the study should not focus on measures preventing solely bridge overloading.

Nor is it the subject of the project to examine in more detail the financial resources of the measures required to remedy the damage. In some countries, repairs are carried out at the expense of the person's liability insurance (if the person causing the damage is known), but in most cases the operator finances the repairs from his own budget – or under the terms of a contract with his own insurance company.

2 METHODOLOGY AND APPROACH

2.1 Analysis on current situation regarding bridges and tunnels strikes by oversize vehicles

- Inventory of events (based on data collected by operators, literature review and survey), their frequency, their typology, the data and its management regarding clearance and feedback from bridge and tunnel operators.
- Analysis of the context upstream the bridge or tunnel: detection methods for oversize vehicles, whether or not there is an exit close to the bridge or tunnel to enable oversize vehicles to change route, existence of an alternative route accessible to oversized vehicles, length of diversion route.
- Configuration of the location (space available), link section, ramp, etc. in the case of the bridges wheatear the vehicle was taking the bridge or going under it.
- Operational, human factors and safety characteristics of the bridge or tunnel
- Analysis of contributing factors by typology.
- Summary of the related issues.

2.2 Regulatory and operational approaches

Draw up an inventory of regulatory and operational provisions: regulations, construction provisions, operating rules, permitting processes and solution (IT-tools) for oversized/overweight vehicles, routing requirements for vehicles, research, and analysis of legal precedents, etc. Including the identification and analysis of case studies, implemented projects and research projects in final phases before implementation (with TRL 7 or above).

2.3 Proven countermeasures

Draw up an inventory of the various possible solutions (traffic management measures, operational measures, detection, prevention and protection devices for equipment and users, response and recovery measures) for the proper management of oversized vehicles in the vicinity of road bridges and tunnels from a technical and regulatory point of view.

- Are there alternatives: diversion routes upstream, exit before the bridge or tunnel, associated signage, etc.?
- User information at the various points of choice upstream or immediately before the bridge or tunnel, associated signage, etc.
- Improved global positioning system (GPS) navigation for truck routing that includes accurate bridge and tunnel clearance information and warnings for the drivers and the infrastructure operators.
- Pre-detection systems: technical characteristics, installation, maintenance, ...
- Detection systems: technical characteristics, installation constraints, impact on maintenance, associated signage, etc.
- Preventive measures (closure, automatic barriers, etc.): technical characteristics, installation constraints, impact on maintenance, etc.
- If the oversized vehicle has already reached the bridge or tunnel, can it pull down/stop without disturbing the traffic? Is there sufficient space on site to form a stop bay or bench of adequate length and width?
- Equipment and user protection systems: technical characteristics, installation constraints, analysis of the impact on user safety, impact on maintenance, etc.
- Vehicle-based technology to provide warnings on bridge and tunnels clearance to the drivers and infrastructure operators.
- The associated regulatory and technical specifications (during the installation phase: heights of the various elements, calibration of detectors...; and during the life of the structure: necessary adjustments, maintenance, service life...)
- Permitting processes for oversized vehicles and routing compliance by vehicles.
- Personnel training and hazard mitigation plans.
- Recovery assessment approaches and methodologies, minimum safety level for a (limited) operation, availability of temporary bridges.

For each countermeasure, carry out an analysis including feedback from the operator, detailing the advantages and disadvantages:

- Efficiency, reliability and availability of the complete device (pre-detection/information, detection/prevention, vehicle stopping device/equipment protection)
- Ease of care and maintenance
- Recording of incidents and or accidents since the system was put into service
- Erroneously detected and undetected events
- Advantages and disadvantages of each main component of the system (including: robustness against collisions with oversized vehicles, bad weather, ease and cost of replacement, etc.).

2.4 Cost-benefit analysis from Road Administration and road operators

perspectives

Resilience assessment (prepare, prevent, protect, respond, and recover), including risk assessment, of the bridges and tunnels strikes by oversize vehicles including costs associated to damage to road infrastructure and vehicles, injuries and fatalities, and secondary crashes with other vehicles, as well as delays and negative economic impacts associated to traffic closure or limitation, and including as well quantification of the benefits of avoiding a strike and measure of effectiveness of the countermeasures.

Assessment of the cost of the countermeasures facilities:

- The cost of operating measures
- The cost of a renovation project and what civil engineering needs/costs are involved
- The cost of a new construction
- The cost of maintenance, including major repairs
- Technical and human resources required for implementation and maintenance (including whether or not subcontracting is necessary)

2.5 Approach

Proposals in response to this Call should use the template “Answer to the Call for Proposals for the Bridge and tunnels strikes by oversize vehicles PIARC Special Project”. The answer should include a description of the approach to be taken to collect and compile the information being requested. The proposal should answer the following questions about the tenderer’s approach:

1. How will the study collect international information regarding bridge and tunnels strikes by oversize vehicles?
2. How will the study collect world-wide state-of-the-art sources, applications and business cases that deal with bridge and tunnels strikes by oversize vehicles?
3. How will the study identify challenges and opportunities for countermeasures to bridge and tunnels strikes by oversize vehicles?
4. How the study will analyze a CBA from road administrations and infrastructure operators perspective?
5. How the study will take into account LMIC reality to provide specific recommendations to them regarding bridge and tunnels strikes by oversize vehicles?
6. What will be the study milestones in terms of deliverables? What will be the approach for monitoring the progress and to include the inputs from the Project Oversight Team (POT)? It is recommended to organize monthly videoconference, and to share with the POT regularly intermediate deliverables asking for feedback.
7. How the management of the project will be organized including quality assurance and quality control without taking significant resources from the project.

2.6 Options

The proposal can be structured as a core proposal plus additional options.

The bid would then include a core proposal within the proposed budget, and then some options which would be described in detail as well as priced.

If the bid is selected, PIARC would place the order for the core proposal and maybe as well for some of the options. This would be done at PIARC's discretion.

In any case, the core proposal has to answer all the expectations which are presented in this call for proposals document.

2.7 Key areas

Please describe the key areas for consideration in the framework:

1. What will be the study's means of collecting information from different areas of road administration, transport regulators and operators, other public administrations, academia and relevant industry (i.e. planning, financing, asset management, design, construction, operations, and maintenance) from international road sector including successful and unsuccessful case studies?
2. LMIC represent an important share of PIARC membership and it is crucial that their needs, opportunities and challenges are addressed within PIARC activities. How will case studies from LMIC be gathered and how their needs will be taken into account? How some of the findings of the project will be identified as particularly suitable for LMIC?

3 FINAL DELIVERABLES

The final deliverables will comprise:

3.1 Report

A **report** including a state-of-the-art on successful countermeasures, practices, and technologies to reduce bridge and tunnel strikes, as well as lessons learned from member countries.

The report will provide information on:

- a) Inventory of events (based on data collected by operators, literature review and survey), their frequency, their typology, the data and its management regarding clearance and feedback from bridge and tunnel operators.
- b) Passive bridge and tunnels protection systems (crash beam, hanging chains, signs, cushion or energy absorbing devices),
- c) Detection systems and Intelligent Transportation System (ITS) technology (sensors, cameras, in-vehicle notifications, signage systems) used for driver warning at low-clearance bridges and tunnels,
- d) Training of operators, vulnerability assessment, design for vehicles strikes, assessment methodologies and incident database including lessons learned.
- e) Vehicle to infrastructure connectivity for oversized loads to provide warnings on bridge and tunnels clearance to divers and infrastructure operators, including vehicle-based technology to obtain structure profile measurements,
- f) Upstream pre-detection systems and driver information at points of choice for alternative diversion routes,
- g) The value of human factors consideration in reducing bridge and tunnel strikes.
- h) Permitting processes for oversized/overweight vehicles,

- i) Routing compliance by vehicles,
- j) GPS navigation enhancements to include bridge information,
- k) Detection of noncompliant vehicles prior to any bridge or tunnel strike,
- l) Strategies for rapid response and incident management when strikes occur, and
- m) Bridge and tunnels strike reporting and tracking to assess effectiveness of mitigation measures.
- n) Resilience management (prepare, prevent, protect, respond, and recover), risk management for bridges and tunnels strikes by oversize vehicles. Including multifactor situation such as fire and collision, and others.
- o) Cost-benefit analysis including direct and indirect costs of bridges and tunnels strikes.

The general structure of the report should be as follows (adjustments with the agreement of the POT are acceptable):

Executive Summary

1. Introduction: project background, objectives and scope.
2. Methodology and approach.
3. Description of bridges and tunnels strikes by oversize vehicles and its impacts on road safety and road infrastructure.
5. Proven countermeasures, practices, and technologies to reduce bridge and tunnel strikes.
6. Description of potentials and challenges in this field.
7. Cost-benefit analysis for road administrations.
8. Conclusions of the study.
9. Recommendations, for road administrations, LMIC and PIARC.
10. References
11. Appendices

- Taking into consideration the LMIC in the study: each chapter of the report should make reference to LMIC when relevant. A chapter inside the report's conclusions with possible **specific recommendations for LMIC** should also be considered.

- The specific recommendations for road administrations and transport regulators are a key element of the report. They should be relevant for high decision makers and operators.

- The specific recommendations for PIARC could include recommendations to liaise with specific industries, take part in existing conferences and/or create a new technical committee / task force on the subject.

3.2 Dissemination material

Presentation material to present the results of the Special Project at PIARC Council meeting in October 2021 in Dakar, Senegal (final date will be defined first semester 2021).

The selected tenderer will also be invited to join the meeting physically or via videoconference. The retained option should be specified in the proposal.

3.3 Voluntary contribution to the next PIARC Congress

Voluntary contribution to the Session on the Special Projects inside the World Winter Service and

Road Resilience Congress in Calgary, 8-11 February 2022. Retained consultant will be invited to join the Session (participation is optional) and to provide inputs to the Session program. This contribution will be requested after finalizing the project and out of the project budget. So, this point is provided as information.

3.4 Intellectual property and formats

The final products will be submitted in electronic form in English, using PIARC template for Technical Report and PIARC template for PowerPoint presentations.

The report will be owned by PIARC and it will acknowledge the contribution of the external consultant.

PIARC will ensure translation into French and Spanish. In addition, they will make it available free of charge in the World Road Association's Virtual Library to ensure a large world outreach for the report.

4 KEY DATES

The proposal should also include a proposed draft of a work schedule. The schedule should identify dates or timeframes for accomplishing major milestones in the project. The work schedule will include monthly videoconference meetings and dates or timeframe for an interim product or products that allows adequate time for review and feedback prior to the final deliverable. The schedule must be completed, and final report should be delivered by September 17th, 2021, so PIARC can proceed to translation and dissemination of document in advance to participants to PIARC Council meeting.

These are some of the milestone to be included in the offer:

- 1st half of February: Kick-off videoconference meeting.
- Intermediate milestones to be proposed by the tenderer.
- 17th of September 2021: Finalization of the report in English.
- 1st of October 2021: Finalization of Council presentation.
- October 2021, Presentation at PIARC Council meeting.
- 8-11th February 2022, Voluntary presentation at the World Winter Service and Road Resilience Congress.

5 PROPOSED BUDGET

Please provide a general budget for the project. The funding requested from PIARC should not exceed 40.000 Euros all taxes included. The budget should include a general itemization of the costs of the major work elements of the project and provisional schedule of invoicing.

Invoices will be processed only for completed and approved items, with 10% of each invoice

payment to be held back until final deliverables have been accepted by the Project Oversight Team and approved by PIARC.

In line with EU regulations, the payment will take place 60 days after the acceptance of the invoice by the POT.

Since a timing delivery of the outputs is at the essence of the Special Projects mechanism, late penalties could be applied if the external consultant fails to deliver the outputs in the proposed milestones. In line with French regulations, if the delay is the contractor's responsibility, the penalties will be 1% of the budget per week of delay, with a grace period of 15 days, and up to a maximum of 5% of the budget.

6 PROPOSED EXPERTS AND INTERNATIONAL NETWORK

The proposal should also include a description of the relevant expertise that qualifies the contractor to undertake the project. Specifically:

- Please describe any past or current work projects that relate to the subject of this proposal.
- Please also identify the person or persons who will be working on this project, describing their roles and estimated contribution to the project, and providing information on their backgrounds, experience and expertise.
- Please provide information about any other international network, other than the World Road Association, from which tenderer could receive inputs.

7 PROJECT OVERSIGHT AND PROPOSALS EVALUATION

The project will be overseen by a project evaluation and steering committee called "Project Oversight Team" (POT) to select the preferred tenderer and assist in the development of the project. These experts will be drawn from PIARC membership and will include representatives from Technical Committees TC 3.1 Road Safety, TC 3.3 Asset management, TC 4.2 Bridges, TC 4.4 Tunnels, PIARC Strategic Planning Commission, some experts nominated by member countries and PIARC General Secretariat staff.

The POT will assess proposals and select the preferred tenderer on the basis of its assessment of:

- a) Technical approach and methodology (up to 35 points): how well tenderer address the project objectives and deliverables and how effective and resilient is the proposed approach and methodology including collecting case studies internationally and addressing the needs of different PIARC member countries, such as LMIC;
- b) Proposed work plan including intermediate milestones (up to 15 points).
- c) Value for money offered by the tenderer (up to 20 points): including the time offered by different contributors of the tenderer's team.
- d) Experience of the proposed team on the holistic vision of the road sector (up to 10 points)
- e) Experience of the proposed team on the bridge, tunnels and oversize vehicles (up to 10

points)

- f) International experience and network of the proposed team (up to 10 points)

The POT will oversee progress of the Project, including participating in periodic calls, reviewing interim and final products. The POT will also provide any relevant information from the PIARC work to the selected tenderer (e.g., information obtained from surveys) for use in the project. In addition to review and oversight by the POT, input may also be sought from the other members of Technical Committees and the PIARC Executive Committee and Strategic Planning Commission.

8 PROPOSAL SUBMISSION

Proposals should include the elements identified in this Call for Proposals.

Answers should use the Word template “Answer to the Call for Proposals for the Road Related Data and how to use it PIARC Special Project”.

Proposals should be submitted electronically in English to the World Road Association General Secretariat at:

info@piarc.org

no later than:

January 25, 2021

For any questions, please send E-mail to info@piarc.org