

Term of Reference (TOR)

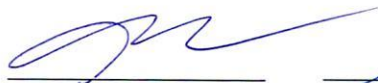
Engaging Consultants to Design Railway Engineering Systems, Specify Technical Requirements, and Develop Certified Rail Manufacturing Processes in Compliance with European Standards, to Advance the Railway Manufacturing Industry in Thailand

Background and Importance

- 1.1. From the 20-Year National Strategy (2018-2037) on competitiveness, the goal is to make Thailand a developed country with stable and sustainable economic growth, and to enhance its competitiveness in both industry and transportation and logistics services. This will be achieved by utilizing Thailand's geographic location to promote transportation and logistics, making it a regional production base for export to global markets and a regional tourism hub. The strategy aims to reduce transportation and logistics costs while increasing value through its geographic centrality, promoting related industries and services, and encouraging investment focused on research and development. One of the key focuses is the development of the rail transport system as the main transportation mode in the country to enhance economic competitiveness and improve the quality of life for the people.
- 1.2. The Ministry of Transport has expedited the development of the rail system continuously. As a result, the State Railway of Thailand (SRT) plays a crucial role in national development through improving rail infrastructure in line with the country's development policies and strategies.
- 1.3. The SRT has strategic plans to become a rail transport hub in Thailand and Southeast Asia (Rail Network and Connectivity), expanding and developing networks and stations at strategic points, including the construction and expansion of over 3,157 kilometers of double-track rail lines covering 61 provinces across the country. New rail lines, suburban trains, and high-speed rail are also being developed (Department of Rail Transport, 2023). To expand the rail system



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

and increase service frequency, more train carriages are required to effectively support the development of the rail transport system.

- 1.4. The Rail Technology Research and Development Institute (Public Organization), or RTRDA, is the primary institution for rail technology research and development. It integrates expertise and resources from various sectors to enhance the technological capabilities and establish the rail industry in Thailand. The Institute recognizes the importance of developing the country's rail manufacturing capacity to enable Thailand to produce railcars domestically, in accordance with European standards. The Institute works with both public and private entities, both domestically and internationally, to receive, exchange, transfer, and develop the rail manufacturing industry. It also supports the use of local materials and strengthens the competitiveness of the country's rail industry.
- 1.5. In advancing the development of the rail system in Thailand, particularly in the rail manufacturing industry, it is crucial to develop and transfer knowledge on train carriage design from rail design experts. This knowledge will be integrated to design railcars for production and use within Thailand. The project requires consulting services for railcar design, including pilot production to reduce imports and enhance self-sufficiency. The design and evaluation process will ensure it meets European engineering standards and specifications, making it feasible for real-world use and addressing Thailand's operational needs.

2. Objectives

- 2.1. To study the feasibility of the train design concept according to European standards, which includes the layout of the concept and the proposed series of trains to be produced domestically. The study will cover comprehensive aspects, but not limited to, such as design feasibility, ergonomics, accessibility design, visibility design, interior and exterior volumetric design, subsystem and component design, and the development of C-Class surface design for both interior and exterior.



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

- 2.2. To study the style, specifications, appearance, and identity in train design by using technologies and components that can be produced domestically, in order to reduce imports and develop rail industry in Thailand.
- 2.3. To develop the concept engineering, necessary for establishment of engineering requirements, such as improvement of general design, rail gauge analysis, study of visibility and ergonomics in the driver's cabin, initial weight evaluation, development of the Reliability, Availability, Maintainability, and Safety (RAMS) guidelines for the rail system, electrical architecture design, quality development guideline, and 3D design of train including cars, driver's cabin, front mask, train bogie, etc. to meet European standards.
- 2.4. To evaluate the supply chain establish guidelines and criteria for assessing the readiness and capabilities of Thai entrepreneurs and manufacturing facilities involved in the railway system. This includes analyzing industrial processes in engineering, procurement, transportation, testing, production, and quality control, as well as formulating strategies for industrial structure development good practices in order to align with European standards.

3. Consultant Qualifications

- 3.1. The consultant must meet the following basic qualifications:
 - 3.1.1. Legally capable.
 - 3.1.2. Not a bankrupt individual.
 - 3.1.3. Not in the process of dissolving a business.
 - 3.1.4. Not a person who is temporarily suspended from submitting proposals or entering into contracts with government agencies due to failing to meet the performance evaluation criteria of the operator as prescribed by the Minister of Finance, as published in the information network system of the Comptroller General's Department.



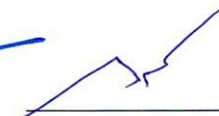
(Mr. Ratcharnon Apinyayanyong)
Committee Chair



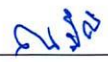
(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

3.1.5. Not a legal entity listed on the blacklist of contractors who have abandoned their work and have notified the Comptroller General's Department's information network of their status as a work abandoner, including legal entities where the work abandoner is a partner, managing director, executive, or person in charge of operations in that entity.

3.1.6. Meets the qualifications and does not have disqualifying characteristics as specified by the Public Procurement and Government Property Management Policy Committee in the Royal Gazette.

3.1.7. Be a legal entity engaging in the profession of providing such services.

3.1.8. Not be a person granted immunity or privilege that may refuse to appear before a Thai court, unless the government of the proposer has issued an order to waive such immunity and privilege.

3.2. Due to the complexity of the project's operational requirements, the consultant must also meet the following specific qualifications:

3.2.1. Possess the ability and experience in tasks related to the objectives and scope of the consulting project.

3.2.2. Railway design works that comply with European standards (EU Directive 2016/79) which have been produced and are in operation for revenue service abroad. It must be demonstrated that the company owns the technical and technological expertise for design, production, and development of the related components. Additionally, the company must be ready to transfer and deliver the technology and intellectual property rights as agreed.

3.2.3. Experience in manufacturing process design, assembly design, and engineering design of rolling stock for international markets.



(Mr. Ratchanon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

3.3. The consultant must provide details of key personnel and supporting staff for the following positions, with qualifications in terms of education and work experience at least as specified.

3.3.1 Key Staffs		
Positions	Qualification	Experience (years)
1) Project Manager	Master of Engineering	≥ 21 years
2) Deputy Project Manager	Master of Engineering	≥ 11 years
3) Engineering Specialist 1 (Mechanical)	Master of Engineering (Mechanical Engineer or related field)	≥ 11 years
4) Engineering Specialist 2 (Electrical Power)	Master of Engineering (Electrical Power Engineer or related field)	≥ 11 years
5) Engineering Specialist 3 (Structure and Safety)	Master of Engineering (Structure and Safety or related field)	≥ 11 years
6) Engineering Specialist 4 (Controlled)	Master of Engineering (Controlled or related field)	≥ 11 years
7) Engineering Specialist 5 (Railway System)	Master of Engineering (Railway System or related field)	≥ 11 years
8) Engineering Specialist 6 (Simulation)	Master of Engineering (in related field)	≥ 11 years
9) Design Specialist	Master of Architecture (interior design or related field)	≥ 11 years
10) Material Specialist	Master's degree (in related field)	≥ 11 years
11) Manufacturing Specialist	Master's degree (in related field)	≥ 11 years
12) Industrial Development Specialist	Master's degree (in related field)	≥ 11 years
13) Business Development Specialist	Master of Economics (Business Development or related field)	≥ 11 years
14) Feasibility Study Analyze Specialist	Master's degree (in related field)	≥ 11 years
15) Branding and Marketing Specialist	Master's degree (in related field)	≥ 11 years

3.3.2 Support Staff		
Positions	Qualification	Experience (years)
1) Analyze 1	Bachelor's degree (in related field)	≥ 2 years
2) Analyze 2	Bachelor's degree (in related field)	≥ 2 years
3) Analyze 3	Bachelor's degree (in related field)	≥ 2 years
4) Analyze 4	Bachelor's degree (in related field)	≥ 2 years

(Mr. Ratcharnon Apinyayanyong)
Committee Chair

(Assoc. Prof. Wichai Siwakosit)
Committee

(Mr. Kitiphan Nutayakul)
Committee

(Mr. Kantapon Wannawat)
Committee

(Mr. Na-thiti Loahavilai)
Committee

5) Draft man 1	Bachelor's degree (in related field)	≥ 2 years
6) Draft man 2	Bachelor's degree (in related field)	≥ 2 years
7) Site Staff	Bachelor's degree (in related field)	≥ 2 years

4. Proposal Submission Evidence

4.1. The consultant shall submit the proposal by placing it in a sealed envelope/box, with a total of 3 envelopes/boxes as follows:

Envelope/Box 1: Qualification Proposal – 1 original set and 4 copies with the following details:

4.2. In the case where the consultant is a legal entity:

4.2.1. For a partnership or limited partnership, submit the following documents:

4.2.1.1. A copy of the certificate of registration of the legal entity.

4.2.1.2. A copy of the list of managing partners.

4.2.1.3. A copy of the list of authorized persons (if any).

4.2.1.4. All document copies must be signed and certified as true copies.

4.2.2. For a limited company or public limited company, submit the following documents:

4.2.2.1. A copy of the certificate of registration of the legal entity.

4.2.2.2. A copy of the list of directors.


4.2.2.3. A copy of the list of authorized persons (if any) and a copy of the list of major shareholders (if any).

4.2.2.4. All document copies must be signed and certified as true copies.


4.3. In the case where the consultant is a group of individuals who are not a legal entity, submit copies of the national ID cards of all consultants, certified as true copies.

4.4. In the case where the consultants submit a joint proposal as a joint venture, submit a copy of the joint venture agreement, a copy of the national ID cards of


 (Mr. Ratcharnon Apinyayanyong)
 Committee Chair


 (Assoc. Prof. Wichai Siwakosit)
 Committee


 (Mr. Kitiphan Nutayakul)
 Committee


 (Mr. Kantapon Wannawat)
 Committee


 (Mr. Na-thiti Loahavilai)
 Committee

the joint venture members. If any joint venture member is a foreign national, submit a copy of the passport. If any joint venture member is a legal entity, submit the documents as specified in Clause 4.2.


- 4.5. A power of attorney with a legally required stamp duty, in case the consultant authorizes someone else to submit the proposal on their behalf.
- 4.6. A copy of the invitation letter for proposal submission issued by the Office of the Rail Technology Research and Development Agency (RTRDA).
- 4.7. Certification documents of experience as specified in Clause 3.2, showing projects with a value of at least 40,000,000 THB (Forty Million Thai Bath Only) under a single contract and/or projects conducted jointly with a government agency or an international organization, with at least 2 projects.

Envelope/Box 2: Technical Proposal – 1 original set and 4 copies with the following details:


- 4.8. The project proposal (Project Proposal) that demonstrates an understanding of the work scope in each item and includes the methodology for completing each deliverable and the overall operation plan for the entire project. The details should include at least the following:
 - 4.8.1. Understanding the work's objectives and reviewing the client's requirements.
 - 4.8.2. Methodology, theoretical framework, and operational framework.
 - 4.8.3. The operation plan, which includes a calendar of key activities, the relationships between each activity, and the plan for delivering the deliverables.
 - 4.8.4. A comprehensive risk analysis for the project and specifying the risk management measures.
 - 4.8.5. The human resource management plan, including the responsibility framework and working hours for key personnel and supporting staff.




(Mr. Ratchanon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

Envelope/Box 3: Financial Proposal – 1 original set and 4 copies with the following details:

- 4.9. The consultant must prepare a price proposal that details the project expenses, divided into two parts:
- 4.9.1. Personnel expenses, man-month units.
 - 4.9.2. Operational expenses, which include direct expenses, operating costs, service fees, and all other expenses.
- 4.10. The consultant must provide details about the key personnel as specified in Clause 3.3 to support the calculation of personnel expenses. The required documents include:
- 4.10.1. In the case of a consulting company:
 - 4.10.1.1. A list of all experts, along with their resumes showing educational qualifications and experience related to the consulting project.
 - 4.10.1.2. Proof of employment or affiliation.
 - 4.10.1.3. A letter showing the salary rate that can be used to calculate the basic salary rate.
 - 4.11. All proposal documents must be signed by the authorized signatory on each page and stamped with the corporate seal (if available).

5. Scope of Work

5.1. Data Collection and Analysis

In this section, the consultant is responsible for collecting data, assessing, and preparing an analytical report. The analysis will include an academic review, a business analysis, and an industry development review related to the overall vision for the development of Thai trains that reflect the unique identity of Thailand. At the same time, the design must be suitable for specific conditions in Thailand and facilitate manufacturing and assembly by the Thai industry. This work will focus on the design aspects of branding for the locomotives and train carriages,




(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

maintaining a balance between Thai identity, contemporary comfort and aesthetics, practicality, production feasibility, and alignment with European standards. The analysis and design direction for this work will cover the following areas:

5.1.1. Benchmarking Study: A study and comparison of the supply chain, standards, and quality of train manufacturers in Thailand with global manufacturers in the rail industry. This includes an analysis of the competitiveness in terms of quality and efficiency of Thai manufacturers in designing and producing trains that meet European standards. The analysis will cover the quality of materials used, resource management, and the adoption of technology in production.

5.1.2. Design DNA and Brand Identity: Establishing design identity, such as the exterior appearance, materials used, strength, and safety, with considerations based on design factors that reflect Thai characteristics while maintaining practicality. This aims to create a distinctive identity for train design, which serves as a key element in differentiating the product in the global market.

5.1.3. Themes Explorations and Design Language Development: Explore and develop the design language for the appearance of trains to be manufactured in Thailand. taking into account the identity of Thai culture. The design must cover aspects such as the selection of colors, shapes, and materials with special properties, in accordance with the detailed design concepts. These include the use of advanced manufacturing technologies that support futuristic designs and offer high flexibility in adapting to various forms.

5.1.4. Concept Design of New Thai Native Railway: The conceptual design of the trains to be manufactured in Thailand must be developed according to European standards, considering the suitability for Thailand's environment. The design should also integrate Thai cultural identity into its considerations.

5.1.5. All analysis must be referenced with credible sources that are accepted and certified by national or international agencies.



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

5.1.6. The consultant must prepare and deliver a report that includes the following:

5.1.6.1. A comprehensive report analyzing items 5.1.1 – 5.1.5 with proper academic references and/or expert opinions supporting the analysis.

5.1.6.2. An executive summary in the form of a short report and/or presentation according to the format specified by the Rail Technology Research and Development Agency (RTRDA).

5.2. Evaluate Supply Chain Risks and Assess Potential of Operators in Thailand

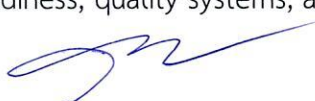
The scope of this consulting work requires gathering, analyzing, and assessing the current supply chain risks within the manufacturing and railway rolling stock industries in Thailand. This includes an overarching analysis of components, potentials, and roles of stakeholders in the supply chain from upstream to downstream. The analysis includes identifying opportunities, constraints, and overall potential of operators in Thailand, both individually and as companies. It aims to analyze opportunities, constraints, and possibilities for enhancing capabilities, including the perspectives and interests of major operators in Thailand entering the rail industry sector. The outcomes will provide an overview of the structure of the railway supply chain industry and the key roles within the system, linking with other manufacturing or service industries related to Thailand. Additionally, it will address gaps and propose strategies to reduce these gaps in the development of Thailand's railway industry, through assessing supply chain risks and evaluating the potential of operators in Thailand, including conducting analysis in the following dimensions:

5.2.1. Development of Evaluation Criteria for Assessing Thai Entrepreneurs


Establish guidelines and criteria for assessing the readiness, capabilities and of Thai entrepreneurs and manufacturing facilities involved in the railway system. These criteria must comprehensively address factors influencing product quality, such as technological capacity, industrial production process management, manufacturing readiness, quality systems, and adaptability to changes or advancements.



(Mr. Ratcharnon Apinyayanyong)
Committee Chair




(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

5.2.2. Supply Chain Assessment of the Railway Industry in Thailand

Evaluate the feasibility and potential of local manufacturers in Thailand's railway industry. The assessment should cover various stakeholders, such as raw material suppliers, component manufacturers, railway assembly facilities, testing services, marketing, and maintenance providers. Identify gaps and opportunities for Thailand to position itself as a hub for designing and manufacturing railway systems that meet European standards.

5.2.3. Assessment of Railway Assembly and Maintenance Facilities

Evaluate the capability and readiness of railway assembly and maintenance facilities in Thailand to meet production quality standards aligned with European benchmarks. Assess the existing manufacturing facilities in the country. Collaborate with RTRDA to shortlist at least three potential facilities for on-site visits and evaluations.

5.2.4. Assessment of Component Manufacturers

Evaluate the capability of component manufacturers to meet technical specifications, such as electrical systems, braking systems, and suspension systems. Ensure that the produced components meet the required quality and performance standards. Collaborate with RTRDA to select at least 8 potential manufacturers for on-site inspections and readiness evaluations.

5.2.5. Selection and Remote Interviews of Key Companies

Work with RTRDA to select at least 15 key manufacturers for remote interviews to assess their readiness. The next phase will involve on-site visits to verify the findings.

5.2.6. Reporting and Documentation

The consultant must prepare and deliver comprehensive study reports, including:



(Mr. Ratchanon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

5.2.6.1. A complete and academically grounded report analyzing points 5.2.1 through 5.2.5, supported by relevant expert opinions and references.

5.2.6.2. A concise executive summary report and/or presentation document in the format specified by RTRDA.

5.2.6.3. A handbook on evaluating the potential and readiness of each component group, including clear criteria and methodologies.

5.2.6.4. Supply chain evaluation data and the supply chain assessment of entrepreneurs in Thailand, used to prepare the study results in Section 5.2.6.1, include interview results, survey results, and findings from relevant focus group discussions.

5.3 The preparation of entrepreneurs with potential to enter the railway industry supply chain.

The scope of work in this section requires the consultant to gather in-depth data through field surveys regarding the potential and capabilities of target entrepreneurs to enter the supply chain. Data will be collected from the production, assembly, and maintenance lines to analyze success factors, limitations, and areas for improvement to bridge gaps and develop the capabilities of the target entrepreneurs. The field survey framework should include at least the following:

5.3.1. Arrange meetings and collaborate with selected entrepreneurs through remote communication systems to collect in-depth data regarding their capabilities and operations in each company.

5.3.2. Conduct field visits to inspect and assess maintenance or manufacturer, visiting no fewer than 20 selected entrepreneurs from item 5.3.1 across 6 rounds.

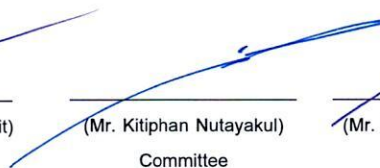
5.3.3. The consultant is required to prepare and deliver a report with relevant findings, including:



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

5.3.3.1. A comprehensive report on the analysis of sections 5.3.1 – 5.3.2, with references to valid academic principles and/or expert opinions in the relevant fields.

5.3.3.2. An executive summary in a short report format and/or a presentation document as specified by RTRDA.

5.3.3.3. A document containing the data from the field surveys used for preparing the study findings in item 5.3.3.1.

5.4 Study of the Concept Engineering

The scope of work in this section requires the consultant to analyze engineering concepts, which are crucial in framing the design and development of the train vehicles. This includes the structure, engineering principles related to strength, durability, safety, and operational capabilities of the vehicle under various conditions, including the interior and exterior design. The focus is on ensuring the arrangement of seats suitable for the services of the State Railway of Thailand, ensuring they are beautiful, functional, and reflect the positive image of domestically produced trains, meeting European standards.

The consultant must analyze the engineering concepts of both the main and subsystems that enable the train to operate normally, safely, and in accordance with European standards, such as the engine, generator, mechanical systems, pneumatic systems, electrical systems, doors, wheelsets, braking systems, electric traction, and control systems, while considering the suitability for the railway system of the State Railway of Thailand and potential expansion for large-scale production in the domestic parts manufacturing, assembly, and maintenance industries.

This part forms the foundation for engineering design in subsequent tasks. The detailed topics of the study should include at least the following:

5.4.1 Initial concept and layout planning (Concept Layout and Preliminary Packaging)

related to planning and placing various components of the train in the initial stage,



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



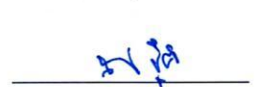
(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

in line with engineering requirements and European standards, while addressing the needs of the State Railway of Thailand for efficient operation and identifying potential production challenges. The planning should ensure smooth development and production of the trains and should cover key topics such as:

- 5.4.1.1 Placement of the driving cab
- 5.4.1.2 Determining the internal space for train use
- 5.4.1.3 Designation of the electrical system area and positioning of the electrical control panels
- 5.4.1.4 Arrangement of the air conditioning and ventilation systems
- 5.4.1.5 Defining the compressed air system areas
- 5.4.1.6 Planning of controlled emission toilets and waste tanks
- 5.4.1.7 Door placements
- 5.4.1.8 Gangway or connection between trains
- 5.4.1.9 Seating arrangements
- 5.4.1.10 Positioning the passenger information system
- 5.4.1.11 Placement of engine, generator, and fuel tanks
- 5.4.1.12 Axle configuration in the bogie and train body (Wheel Arrangement) as per UIC Classification
- 5.4.1.13 Train formation for operational services

5.4.2 Design studies for the train's exterior and interior (Style Studies): This involves evaluating and analyzing the design of the exterior and interior aesthetics of the train to ensure that they are visually appealing, modern, and practical for real-world use. It should cover key topics including:

- 5.4.2.1 Aesthetic considerations
- 5.4.2.2 Representation of the country's identity
- 5.4.2.3 Practical usability
- 5.4.2.4 Proposal of train design styles



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

5.4.2.5 Incorporation of domestic parts

5.4.2.6 Production costs

5.4.2.7 Maintenance considerations

5.4.3 Ergonomics, accessibility, and visibility studies to ensure that the train design accommodates ease of use for all passengers, including those with mobility impairments, and provides clear visibility for the driver. This includes arranging windows, mirrors, and displays to reduce blind spots and enhance safety. Key topics include:

5.4.3.1 General passenger use

5.4.3.2 Assistance for passengers with reduced mobility

5.4.3.3 Appropriate train control panel arrangements for the driver

5.4.3.4 Train boarding and alighting considerations

5.4.3.5 Signage

5.4.3.6 Passenger information displays

5.4.4 This involves ongoing support for the design and improvement of both the exterior and interior of trains. CAS is utilized as a 3D modeling tool to comprehensively develop the appearance of train cars and various components. The process ensures alignment with and responsiveness to aesthetic and functional requirements efficiently.


5.4.5 This entails utilizing CAS to create 3D models of the train's exterior appearance, focusing on volumetric design to provide an overall visualization of the shape and structure of the train's exterior. The volumetric design process allows for precise adjustments and customization of the exterior appearance to achieve designs that align with technical specifications and practical functionality. Key areas to be addressed include:




(Mr. Ratchanon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

5.4.5.1 The design of the trains must align with the Structural Gauge and Loading Gauge standards set by the State Railway of Thailand.

5.4.5.2 The train design must include a three-dimensional representation of the exterior that showcases the identity and cultural characteristics of Thailand.

5.4.6 This involves utilizing CAS to create 3D models of the interior spaces of the train's cab and passenger cars, focusing on volumetric design to provide an overall visualization of space layout and functionality. The volumetric design approach supports precise adjustments and refinements of interior details, ensuring optimized use of space and alignment with functional requirements. Key areas to be addressed include:

5.4.6.1 A 3D Models representation of the interior layout of the train

5.4.6.2 A 3D Models representation of the interior design that reflects the identity and cultural characteristics of Thailand.

5.4.7 This involves using CAS to evaluate and plan the placement of components within the train, enabling precise analysis of the design suitability for subsystems and various parts. The process ensures feasibility in the arrangement and integration of all components

5.4.7.1 Diesel Engine

5.4.7.2 Generator

5.4.7.3 Electric Traction Power System

5.4.7.4 Low Voltage Electrical System

5.4.7.5 Compressed Air System

5.4.7.6 Brake System

5.4.7.7 Air Conditioning System

5.4.7.8 Sanitary System



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

- 5.4.7.9 Car Doors
- 5.4.7.10 Bogie
- 5.4.7.11 Air Suspension System
- 5.4.7.12 Traction Motor
- 5.4.7.13 Coupler
- 5.4.7.14 Gang Way

5.4.8 C-Class surface design for interior and exterior of the train to evaluate the feasibility and aesthetic suitability of the final design for both functionality and beauty.

5.4.9 The consultant must prepare and submit relevant reports, including:

- 5.4.9.1 A comprehensive report analyzing sections 5.4.1 – 5.4.8 with academic references and/or expert opinions.
- 5.4.9.2 Executive summary in a short report and/or presentation format as required by RTRDA.
- 5.4.9.3 Engineering drawings and related documents, following design principles and European standards, including all relevant components of the project.
- 5.4.9.4 Designed components and/or related 3D models created using computer software.

5.5 Creating Style Renderings of Thai Trains that Clearly Communicate the Design Concept

In this section, the consultant is responsible for synthesizing the requirements and design guidelines outlined in section 5.1 into visual renderings of both the exterior and interior designs of the train. These renderings should be clear and effectively communicate the design of Thai train cars through 3D models and appropriate information technology that is



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



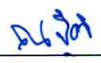
(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

easy to understand by policymakers, relevant agencies, and the public. The tasks include design work according to the following items:

5.5.1 Visual renderings of the exterior design of the train.

5.5.2 Visual renderings of the interior design of the train.

5.5.3 The consultant must prepare and deliver the related renderings, including:

5.5.3.1 Renderings for items 5.5.1 – 5.5.2 that are complete, based on accurate and reliable academic references, and/or supported by expert opinions in the relevant fields.

5.5.3.2 A summary document for management in the form of a brief report and/or presentation document as specified by the RTRDA.

5.5.3.3 Design work and/or 3D models related to the project.

5.6 Engineering Studies

This section involves further developing the analysis conducted in sections 5.1 to 5.5 through detailed engineering studies. The consultant must address the technical necessities of practical use in each engineering domain, specifying technical requirements, parameters, performance standards, quality indicators, production quality control plans, and 3D design models, covering structural, safety, appearance, and operational aspects.


The work here will lay the groundwork for expanding the train car design into production specifications, assembly lines, and the manufacturing industry for European standard components, benefiting the country's industry development. The engineering study details include:

5.6.1 Clarification of Main Technical Specifications to Ensure Consistency with the Performance Specifications for the Services of the State Railway of Thailand.

5.6.2 Refining the general layout.



(Mr. Ratcharnon Apinyayanyong)
Committee Chair




(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

- 5.6.3 Identification of Key Technical Parameters/Requirements, which must cover the following key topics:
- 5.6.3.1 Compliance with the performance specifications for services provided by the State Railway of Thailand.
 - 5.6.3.2 Compliance with relevant European standards (European Norms).
 - 5.6.3.3 Compliance with the applicable Technical Specifications for Interoperability (TSI) of Europe.
 - 5.6.3.4 Compliance with the use of locally produced materials and components (Local Content).
- 5.6.4 Gauge Analysis of Railway Cars, which must cover the following key topics:
- 5.6.4.1 The size of the structural gauge of the State Railway of Thailand.
 - 5.6.4.2 The size of the loading gauge of the State Railway of Thailand.
- 5.6.5 Cab Visibility and Ergonomics Studies to Ensure Consistency with the Operational Requirements of Train Drivers and Technicians in Accordance with the State Railway of Thailand's Operational Standards.
- 5.6.6 Mission Profile Study to Ensure Consistency with the State Railway of Thailand's Train Operations.
- 5.6.7 Concept Weight Estimation to Ensure Consistency with the State Railway of Thailand's Train Operations.
- 5.6.8 Fire Classification Standard Definition to Ensure Consistency with European Norms.
- 5.6.9 Reliability, Availability, Maintainability, and Safety (RAMS) Guideline Development to Ensure Consistency with European Norms.



(Mr. Ratchanon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

- 5.6.10 Concept Electrical Architecture Study to Ensure Consistency with European Norms.
- 5.6.11 Power Balance – Concept Power Pack Management to Ensure Consistency with the State Railway of Thailand's Train Operations.
- 5.6.12 EMC Design Approach Definition to Ensure Consistency with European Norms.
- 5.6.13 Identification of Applicable Norms to Ensure Consistency with the State Railway of Thailand's Train Operations.
- 5.6.14 Quality Plan Drafting to Ensure Consistency with European Norms.
- 5.6.15 Safety Integrity Level (SIL) Definition to Ensure Consistency with European Norms.
- 5.6.16 3D Design of Car Body Concept.
- 5.6.17 3D Design of Driver Cab Concept.
- 5.6.18 3D Design of Front Mask Concept.
- 5.6.19 Design of Bogie Concept.
- 5.6.20 The Consultant must prepare and deliver the relevant study report documents, which should include:
- 5.6.20.1 A complete analysis report for the topics 5.6.1) – 5.6.19), with proper academic references that are accurate and reliable, and/or supported by expert opinions in the relevant fields.
- 5.6.20.2 A summary document for management in the form of a brief report and/or presentation document as specified by RTRDA.
- 5.6.20.3 Engineering drawings and related documents that are prepared according to design and engineering principles, as specified by RTRDA.



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

5.6.20.4 Design work and/or 3D models created using computer software, as relevant.

6. Project Duration

6.1. Duration of Operations: 300 days

7. Consultant Selection Criteria

7.1. The procurement committee will consider the proposals of the candidates who have been invited to submit proposals by the RTRDA only.

7.2. The procurement committee will evaluate the technical proposals based on the following scoring criteria (total 100 points):

7.2.1. Consultant's work experience and achievements – 10 points

7.2.2. Proposed methodology, work plan, and technology to be used in development – 10 points

7.2.3. Clarity of methodology and related academic principles – 50 points

7.2.4. Personnel qualifications, education, and experience – 30 points

7.3. The procurement committee will only evaluate price proposals once the technical proposal has scored at least 80% of the total possible technical points, with the proposed price not exceeding the budget set by RTRDA.

7.4. The candidate with the highest technical score and whose price proposal does not exceed the set budget will be selected as the consultant.

7.5. The decision of the procurement committee regarding the selection of proposals is final and binding.

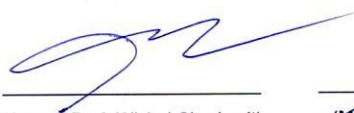
8. Budget

8.1. The budget is 85,000,000 THB (eighty-five million Thai Baht Only).

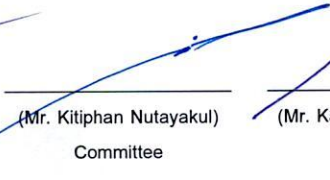
9. Work Delivery and Payment



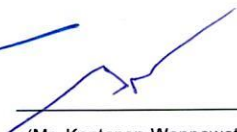
(Mr. Ratchanon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee

9.1. For the delivery of each work installment, the consultant must submit the report documents, presentation materials, and other deliverables as specified, and carry out the activities defined for each installment. These should be presented to the review committee appointed by RTRDA within the specified timeframe. The work must be complete and in accordance with the scope outlined in section 5 of the work scope.


9.2. The payment for each work installment will be made once the review committee has approved the work. In the event that revisions are required, the consultant must make the necessary corrections to ensure that the deliverables are accurate and align with the feedback provided by the review committee.

9.3. For each work installment, the consultant must deliver the work that includes at least the details as specified, and submit it within the time frame set for each installment as follows:

Key Date	Deliverable Details	Delivery Deadline*
KD 1	<p>Inception Report</p> <p>Details include:</p> <ol style="list-style-type: none"> 1. Deliver the work plan (Work Plan) as specified in Section 5 of the scope of work. 2. Deliver a presentation summarizing the work plan as specified in Section 5 of the scope of work. 3. Organize a kick-off meeting with the representative of RTRDA. 	Within 30 days
KD 2	<p>Progress Report 1</p> <p>Details include:</p> <ol style="list-style-type: none"> 1. Submit a progress report on the implementation of the work as specified in Sections 5.1-5.6 of the scope of work. 2. Prepare a presentation for the executives regarding the Design DNA, brand identity, and deliverables as outlined in Section 5.1, ensuring completeness. 3. Deliver the results of the study on engineering concepts (Concept Engineering). 4. Present to relevant executives of Thailand on the theme and style of the new national train design. 5. Present to relevant executives of Thailand the preliminary outline of the new train model. 	Within 180 days


 (Mr. Ratcharnon Apinyayanyong)
 Committee Chair


 (Assoc. Prof. Wichai Siwakosit)
 Committee



 (Mr. Kitiphan Nutayakul)
 Committee


 (Mr. Kantapon Wannawat)
 Committee


 (Mr. Na-thiti Loahavilai)
 Committee

Key Date	Deliverable Details	Delivery Deadline*
	<p>6 Present to relevant executives of Thailand the preliminary technical specifications of the new train model.</p> <p>7 Submit the draft for Sections 5.2, 5.3 and 5.4 of the scope of work.</p>	
KD 3	<p>Progress Report 2</p> <p>Details include:</p> <ol style="list-style-type: none"> 1. Prepare a progress report on the implementation of the work as specified in Sections 5.1-5.6 of the scope of work. 2. Submit the deliverables for Sections 5.2 and 5.3 of the scope of work, ensuring completeness. 3. Submit the deliverables for Section 5.4 of the scope of work, ensuring completeness, including renderings of the exterior and interior design of the new train model. 4. Submit the draft for Sections 5.5 of the scope of work. 	Within 240 days
KD 4	<p>Draft Final Report</p> <p>Details include:</p> <ol style="list-style-type: none"> 1. Prepare a progress report on the implementation of the work as specified in Sections 5.1-5.6 of the scope of work. 2. Submit the deliverables for Section 5.5 of the scope of work, ensuring completeness. 3. Submit the draft for Sections 5.6 of the scope of work 4. Present to the relevant management of Thailand regarding the concept engineering of the following: driver cab (Driver Cab Concept Engineering), front mask (Front Mask Concept Engineering), car body (Car Body Concept Engineering), and bogies (Bogies Concept Engineering). 	Within 270 days
KD 5	<p>Final Report</p> <p>Details include:</p> <ol style="list-style-type: none"> 1. Submit the deliverables for Section 5.6 of the scope of work, ensuring completeness. 2. Prepare a comprehensive report covering the scope of work as outlined in Sections 5.1-5.6. 3. Submit engineering drawings (computer models, 3D CAD design files, or related models), such as for the design concepts of the new driver cab (New Driver Cab Concept Design), the front mask (Front Mask Concept Design), new bogies (New Bogies Concept Design), and other deliverables as specified in Sections 5.1-5.6 of the scope of work, ensuring completeness. 	Within 300 days


 (Mr. Ratcharnon Apinyayanyong)
 Committee Chair


 (Assoc. Prof. Wichai Siwakosit)
 Committee


 (Mr. Kitiphan Nutayakul)
 Committee


 (Mr. Kantapon Wannawat)
 Committee


 (Mr. Na-thiti Loahavilai)
 Committee

Key Date	Deliverable Details	Delivery Deadline*
	4. Present a project progress summary to the relevant management of Thailand.	

*from NTP

9.4 The consultant must submit the deliverables for each work phase as outlined in Section 9.3 in both printed document form (5 copies) and electronic file formats (Microsoft Word and PDF) stored on a USB flash drive. Additionally, the consultant must prepare a transmittal letter addressed to the Chairman of the Acceptance Committee.

10. Term of Payment

RTRDA will make payments when the consultant delivers the work to RTRDA and RTRDA accepts the work without any significant issues within the specified timeframe. The work must be complete and in accordance with the scope defined in section 5 and section 9 on deliverables. Payment will be divided into five installments based on the following conditions:

Installment 1: Payment of 10% of the contract amount will be made after delivery and successful acceptance of the work in accordance with the first installment of the contract.

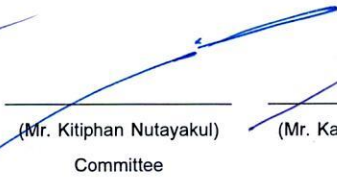
Installment 2: Payment of 30% of the contract amount will be made after delivery and successful acceptance of the work in accordance with the second installment of the contract.


Installment 3: Payment of 25% of the contract amount will be made after delivery and successful acceptance of the work in accordance with the third installment of the contract.


Installment 4: Payment of 25% of the contract amount will be made after delivery and successful acceptance of the work in accordance with the fourth installment of the contract.


 (Mr. Ratchanon Apinyayanyong)
 Committee Chair


 (Assoc. Prof. Wichai Siwakosit)
 Committee


 (Mr. Kitiphan Nutayakul)
 Committee


 (Mr. Kantapon Wannawat)
 Committee


 (Mr. Na-thiti Loahavilai)
 Committee

Installment 5: Payment of 10% of the contract amount will be made after delivery and successful acceptance of the work in accordance with the fifth installment of the contract.

11. Penalty

11.1 In the event that the consultant delivers the deliverables late, the consultant must pay a daily penalty at a rate of 0.10% of *the value of the installment corresponding to the delayed deliverable*. This will apply from the due date for each deliverable until the consultant has delivered the deliverables with the contract and the inspection committee has accepted the work.

12. Conditions and Copyright

12.1 Prior to signing the contract, RTRDA reserves the right to cancel this hiring at any stage if RTRDA does not receive the allocated budget for the consultancy or if the allocated budget is insufficient to continue the hiring. The bidder for the canceled contract will not be entitled to any claims for damages from RTRDA.

12.2 RTRDA reserves the right to prevent the consultant from distributing or selling any deliverable of this project or project work *pertaining to the scope of work*, without prior authorization.

12.3 The Intellectual Property of all documents and project works created by the consultant under this contract shall belong to RTRDA. All documents created by the consultant related to this contract are confidential and shall be the property of RTRDA. The consultant must deliver all such documents to RTRDA at the end of the contract. The consultant may keep copies of the documents but must not use any content from those documents for purposes unrelated to this work without prior consent from RTRDA.

13. Reference Price




(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee




(Mr. Kantapon Wannawat)
Committee




(Mr. Na-thiti Loahavilai)
Committee

Positions	Qualification	Experience (years)	Reference Price per unit	Units	Total
1) Key Staffs					
1.1) Project Manager	Master of Engineering	≥ 21 years	450,000	10	4,500,000
1.2 Deputy Project Manager	Master of Engineering	≥ 11 years	400,000	10	4,000,000
1.3) Engineering Specialist 1 (Mechanical)	Master of Engineering (Mechanical Engineer or related field)	≥ 11 years	350,000	10	3,500,000
1.4) Engineering Specialist 2 (Electrical Power)	Master of Engineering (Electrical Power Engineer or related field)	≥ 11 years	350,000	10	3,500,000
1.5) Engineering Specialist 3 (Structure and Safety)	Master of Engineering (Structure and Safety or related field)	≥ 11 years	350,000	10	3,500,000
1.6)) Engineering Specialist 4 (Controlled)	Master of Engineering (Controlled or related field)	≥ 11 years	350,000	10	3,500,000
1.7) Engineering Specialist 5 ด้านระบบราง	Master of Engineering (Railway System or related field)	≥ 11 years	350,000	10	3,500,000
1.8) Engineering Specialist 6 (Simulation)	Master of Engineering	≥ 11 years	350,000	10	3,500,000
1.9) Design Specialist	Master of Architecture (interior design or related field)	≥ 11 years	350,000	10	3,500,000
1.10) Material Specialist	Master's degree (in related field)	≥ 11 years	350,000	10	3,500,000
1.11) Manufacturing Specialist	Master's degree (in related field)	≥ 11 years	350,000	10	3,500,000
1.12) Industrial Development Specialist	Master's degree (in related field)	≥ 11 years	350,000	10	3,500,000


 (Mr. Ratcharnon Apinyayanyong)
 Committee Chair


 (Assoc. Prof. Wichai Siwakosit)
 Committee



 (Mr. Kitiphan Nutayakul)
 Committee



 (Mr. Kantapon Wannawat)
 Committee



 (Mr. Na-thiti Loahavilai)
 Committee


Positions	Qualification	Experience (years)	Reference Price per unit	Units	Total
1.13) Business Development Specialist	Master of Economics (Business Development or related field)	≥ 11 years	350,000	10	3,500,000
1.14) Feasibility Study Specialist	Master's degree (in related field)	≥ 11 years	350,000	10	3,500,000
1.15) Branding and Marketing Specialist	Master's degree (in related field)	≥ 11 years	350,000	10	3,500,000
Total Budget for Key Staffs (1)					54,000,000
2) Support Staffs					
Positions	Qualification	Experience (years)	Reference Price per unit	Units	total
2.1) Analyze 1	Bachelor's degree (in related field)	≥ 2 years	23,000	10	230,000
2.2) Analyze 2	Bachelor's degree (in related field)	≥ 2 years	23,000	10	230,000
2.3) Analyze 3	Bachelor's degree (in related field)	≥ 2 years	23,000	10	230,000
2.4) Analyze 4	Bachelor's degree (in related field)	≥ 2 years	23,000	10	230,000
2.5) Draft man 1	Bachelor's degree (in related field)	≥ 2 years	23,000	10	230,000
2.6) Draft man 2	Bachelor's degree (in related field)	≥ 2 years	23,000	10	230,000
2.7) Site Staff	Bachelor's degree (in related field)	≥ 2 years	23,000	10	230,000
Total Budget for Support Staffs (2)					1,610,000
Total Budget for Staffs (1) + (2)					55,610,000
3) Direct Cost					
Item			Rate /Unit	Unit	Total
3.1) Travel expenses for international coordination			4,000,000	L.S.	4,000,000
3.2) Expenses for organizing meetings			1,000,000	L.S.	1,000,000
3.3) Expenses for preparing reports, presentation materials, and supporting documents			1,000,000	L.S.	1,000,000
3.4) Expenses for coordination and data collection			2,000,000	L.S.	2,000,000
3.5) Expenses for conducting six field surveys			200,000	6	1,200,000
3.6) Expenses for creating 3D CAD engineering designs and other electronic media			2,000,000	L.S.	2,000,000


 (Mr. Ratcharnon Apinyayanyong)
 Committee Chair


 (Assoc. Prof. Wichai Siwakosit)
 Committee


 (Mr. Kitiphan Nutayakul)
 Committee


 (Mr. Kantapon Wannawat)
 Committee


 (Mr. Na-thiti Loahavilai)
 Committee

Positions	Qualification	Experience (years)	Reference Price per unit	Units	Total
3.7) Software			1,000,000	L.S.	1,000,000
3.8) Miscellaneous expenses			17,000,000	L.S.	17,000,000
Direct Costs					29,200,000
Total (1) + (2) + (3)					84,810,000



(Mr. Ratcharnon Apinyayanyong)
Committee Chair



(Assoc. Prof. Wichai Siwakosit)
Committee



(Mr. Kitiphan Nutayakul)
Committee



(Mr. Kantapon Wannawat)
Committee



(Mr. Na-thiti Loahavilai)
Committee