STATE RAILWAY OF THAILAND
MINISTRY OF TRANSPORT

กรุงเทพฯ
Bangkok
ฉะเชิงเทรา
Chachoengsao
ชลบุรี
Chon Buri
ระยอง
Rayong

THE HIGH-SPEED RAIL LINKING THREE AIRPORTS PROJECT

REQUEST FOR PROPOSAL

VOLUME 2 : SRT'S REQUIREMENTS

VOLUME 2/1 : THE RAIL-RELATED WORKS OF THE PROJECT

PHASE 1 : DESIGN-BUILD

AEC Sasin

Asian Engineering Consultants Corp., Ltd.
TEAM Consulting Engineering and Management Co., Ltd.
Sasin Graduate Institute of Business Administration of Chulalongkorn University

JUNE 2018

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APPENDICES

LIST OF GENERAL ABBREVIATIONS

Note: International metric measurement units are not listed.
Some additional specialist abbreviations are defined in the relevant section of the documents.

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ACI	American Concrete Institute
AFC	Automatic Fare Collection
ANSI	American National Standards Institute
API	American Petroleum Industry
AREA	American Railway Engineering Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATO	Automatic Train Operation
ATP	Automatic Train Protection
ATS	Automatic Train Supervisory System
BARRTS	Bangkok Advice on Rationalization of Rapid Transit Systems
BBRS	Broadband Radio System
BMA	Bangkok Metropolitan Administration
BMS	Building Management System
BS	British Standard
BSS	Bulk Substation
BTN	Backbone Transmission Network
CAD	Computer Aided Dispatcher
CASS	Controlled Access Security System
CAT	Communications Authority of Thailand
CBR	California Bearing Ratio
CCITT	International Telephone and Telegraph Consultative Committee
CCS	Central Computer System
CCTV	Closed Circuit Television
CIP	Co-ordinated Installation Plan
CMS	Control and Monitoring System
CPM	Critical Path Method
CSC	Construction Supervision Consultant
CSD	Combined Serviced Drawings

DC	Direct Current
DFIS	Diagnostic and Fault Indicating System
DIN	Deutsche Industrie Normen
DOH	Department of Highways
DRACAS	Data Reporting, Analysis & Corrective Action System
DSD	Drivers Safety Device
E&M	Electrical and Mechanical (Railway Systems)
ECS	Environmental Control System
EGAT	Electricity Generating Authority of Thailand
EMU	Electric Multiple Unit
EN	Euronorm Standard
EOT	Electric Overhead Traveling (crane)
FAP	Fire Alarm Panel
GPS	Global Positioning System
GUI	Graphical User Interface
HV	High Voltage
HSR	High Speed Rail
ID	Identification
ICE	Independent Certification Engineer
IEC	International Electrotechnical Commission
IEE	Institution of Electrical Engineers
IEEE	Institute of Electrical and Electronic Engineers
IES	Illumination Engineering Society (UK)
ISO	International Standards Organization
ISP	Initial System Project
IT	Information Technology
JIS	Japanese Industrial Standards
LAN	Local Area Network
LV	Low Voltage
M&E	Mechanical and Electrical (Building Services)
MCS	Master Clock System

MEA	Metropolitan Electricity Authority
MPR	Monthly Progress Report
MRTA	Metropolitan Rapid Transit Authority
MSL	Mean Sea Level
MWWA	Metropolitan Water Works Authority
NC	Noise Criterion
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
No.	Number
O&M	Operations and Maintenance
OCC	Operations Control Centre
OCMLT	Office of the Commission for the Management of Land Traffic
PA	Public Address
PABX	Private Automatic Branch Exchange
PEA	Provincial Electricity Authority
PIDS	Passenger Information Display System
PIS	Passenger Information System
PDM	Precedence Diagramming Method
PID	Passenger Information Display
PPTA	The High Speed Rail Linked Three Airports Project
PSD	Platform Screen Door
PTO	Public Telecommunications Operator
RAMS	Reliability, Availability, Maintainability, Safety
RCS	Radio Communications System
RASTI	Rapid Speech Transmission Index
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SCR	Station Control Room
SE	System Earth
SI	International System
SOR	Station Operations Room
SRT	State Railway of Thailand
SSS	Service Substations

TIS	Thai Industrial Standard
TOT	Telephone Organization of Thailand
TSP	Thai Standards on Pollution
TSS	Traction Substation
TVM	Ticket Vending Machine
UIC	International Union of Railways
UPS	Uninterruptible Power Supply
VDE	Verband Deutsche Elektrotechinke
VDU	Visual Display Unit
WTMD	Walk-Through Metal Detector

SRT'S REQUIREMENTS - GENERAL

1. INTRODUCTION

These SRT's Requirements for Phase 1 are divided into four sections as follows:

(1) General: these apply throughout the Phase 1.

(2) Functional: these include the specific core requirements for the design and performance of the Works.

(3) Design: these apply in respect of duties relating to the design of the Permanent Works and Temporary Works.

(4) Execution: these apply in respect of duties and other requirements relating to the construction, manufacture and installation of the Works.

2. DEFINITIONS

The following words and expressions shall have the meaning assigned to them except where the context otherwise requires, these definitions shall apply as well to Volume III – Outline Specifications.

"As Built Drawings" means those drawings produced by the Private Party and endorsed by it as true records of construction, manufacture and installation of the Permanent Works and which have been agreed with the SRT's Representative.

"Combined Services Drawings" means drawings showing the locations, layouts and sizes of all services.

"Construction Specifications" means those parts of the Outline Specifications which relate to construction.

"Detailed Design" means the detailed design work required to complete the design submission identified in SRT's Requirements - Design Clause 5.

"Detailed Design Drawings" means those drawings referred to in Clause 5(2) (a) of the SRT's Requirements - Design in respect of which a Notice has been issued.

"Detailed Design Drawings Submission" means the submission of Detailed Design Drawings representing elements of the Permanent Works and for which the Private Party seeks a Notice.

"Design Manual" means the manual to be prepared and submitted as part of the Detailed Design and as described in the SRT's Requirements - Design.

"Design Package" has the meaning identified in Clause 2.6 of the SRT's Requirements - Design.

"Design Phase" means the first stage in Phase I, which the Private Party shall design

the Works in accordance with these SRT's Requirements and the Outline Specifications.

"Design Specifications" means those parts of the Outline Specifications which relate to design.

"E&M" means the railway systems such as the Rolling Stock, Signalling Systems, Power Supply Systems, Communications Systems, Automatic Fare Collection System, Depot Workshop Equipment and Platform Screen Doors.

"SRT" means the State Railway of Thailand which is the Public Investor defined in the Contract Documents.

"SRT's Representative" means a person or a group of persons which appointed by the SRT included the Independent Certification Engineer (ICE) and/or the SRT's Consultant as defined in Appendices 11 and 12 respectively.

"M&E" means the building services such as Electrical System, Plumbing System, Fire Fighting System, Mechanical Ventilation, Air Conditioning System, Lift and Escalator.

"Notice" means a Notice of No Objection given by the SRT's Representative.

"Notice of No Objection" means the SRT's Representative has reviewed the Private Party's proposal, design or construction/manufacture/installation documents or proposed construction/manufacture/installation method, and has no objection within the specific time frame after the submission or resubmission date otherwise these documents shall be deemed to have been no-objection. Such event does not relieve the Private Party of his obligations and liabilities under the Contract for the final end product.

"Execution Phase" means the second stage of Phase I, which the Private Party shall construct, install, manufacture, test and commission the Works in accordance with the Specifications and the Detailed Design.

"Outline Construction Specifications" means those parts of the Specifications included with the Tender Proposal relating to construction.

"Outline Design Specifications" mean those parts of the Specifications included with the Tender Proposal relating to design.

"Outline Specification" means those parts of the SRT's Tender Documents that specifies requirements for functionality, technical properties, design, manufacture and installation of the Works "Permanent Works" means the permanent works constructed, installed, manufactured and completed in accordance with the Contract.

"Private Party" means the Private Investor defined in the Contract Documents.

"Railway Envelope" means the zone or zones within the Works containing the trackwork and equipment necessary for the operation of the railway.

"Specifications" have the meaning identified in Clause 14 of the SRT's Requirements - General.

"Structure Gauge" means the profile related to the designed normal co-ordinated axis of the track into which no part of any structures or fixed equipment may penetrate.

"Temporary Works" means all temporary works of every kind required for the execution and completion of the Works which shall not form part in the Permanent Works.

"Working Drawings" comprise the Construction/Manufacture/Installation Drawings and documents, such as bar bending schedules, shop drawings and manufacturing drawings, as are necessary to amplify the Detailed Drawings for Execution of the Works and endorsed as required by the SRT's Representative.

"Working Drawings Submission" means the submission of Working Drawings representing elements of the Permanent Works and for which the Private Party seeks a Notice or as requested by the SRT's Representative.

3. PROJECT PHASING

The Private Party shall execute the Works in two phases namely; Phase 1 is for the Design, Build, Procurement, Supply, Installation, Testing and Commissioning, and Trial Running Phase 2 is for the Operation and Maintenance Services.

3.1 Phase1 – Design, Build, Procurement, Supply, Installation, Testing and Commissioning, and Trial Running

During Phase 1, the Private Party shall be responsible for and obligated in Design and Build, Procurement, Supply, Installation, Testing and Commissioning of Civil Works, E&M Systems and other related systems, and Trial Running to provide general public services under the terms and conditions specified in the Contract.

3.2 Phase 2 – Operation and Maintenance Services

The Operation and Maintenance Phase shall commence upon the issue of the Substantial Commissioning or Commissioning Certificate or Partial Commissioning Certificate by SRT to provide commercial operation services until the end of the Contract.

3.3 Access and Inspection Right of SRT

Throughout Phase 1 and Phase 2, the designated SRT's staff shall have the right of physical access at any reasonable time and with reasonable notice to any part or parts of The High Speed Rail Linked Three Airports Project to audit the operational activities of the Private Party, including all required maintenance, in order to ensure that the System is always safe, properly operated and well maintained in compliance with the system operating plan and all applicable standards for public use.

4. LAND HANDOVER (Not Use)

5. WORKS PROGRAM

(1) The Private Party shall prepare and submit its Works Program and three month rolling programs in accordance with the detailed requirements contained in Appendix 1.

(2) In compiling its Works Program and in all subsequent updating and reporting, the Private Party shall make provision for the time required for coordinating and completing the design of the Works, including, inter alias, design co-ordination, the review procedures, determining and complying with the requirements of all Government Departments and all others whose consent, permissions, authority or license is required prior to the execution of any work.

(3) The Works Program shall take full account of the Design Submission and review Program.

6. REPORTS

6.1 Monthly Progress Report

(1) The Private Party shall submit to the SRT's Representative twenty (20) copies of a Monthly Progress Report (MPR), as more particularly described in Appendix 2 to these the SRT's Requirements, describing the progress and current status of the Works.

(2) The MPR shall be submitted by the end of each calendar month. It shall account for all works actually performed up to and including the twentieth day of the month and all works forecast to be accomplished through to the end of the month.

(3) The MPR shall be divided into two sections. The first section shall cover progress and current status relating to design. The second section shall cover progress and current status relating to construction/manufacture/installation. In addition, there shall be a summary of areas of concern and proposed (or current) actions for mitigation of delayed progress or late start of new activities.

6.2 Preparation of SRT Reports

Whenever SRT needs to submit project reports/documents to any agencies/authorities; the Private Party shall prepare and submit such reports/documents to SRT, for such submission.

7. QUALITY ASSURANCE SYSTEM

The Private Party shall establish and maintain a Quality Assurance System in accordance with Appendix 3 to these SRT's Requirements for design and construction/manufacture/installation procedures. This Quality Assurance System shall be applied without prejudice to, or without in any way limiting, any Quality Assurance Systems that the Private Party already maintains. The Quality Plan shall be a Contract specific document, not a generic company plan/document.

8. LIAISON WITH OTHERS

(1) The Private Party shall make all necessary arrangements with and obtain all necessary approval from Government Departments, utility undertakings, and other relevant authorities.

(2) The Private Party shall arrange and attend meetings as required by the Contract. The Private Party shall use its best endeavors to ensure that its subcontractors, Government Departments and utility undertakings attend meetings when so required by the SRT's Representative.

(3) When the Private Party arranges meetings with Government Departments or utility undertakings, it shall inform the SRT's Representative at least four (4) days of official working day (excluding Public Holidays), or such shorter period permitted by the SRT's Representative, before they are to be held and shall give the SRT's Representative and the SRT opportunity to attend such meetings.

(4) Copies of correspondence and minutes of meetings received from or dispatched to Government Departments or utility undertakings shall be submitted to the SRT's Representative for information within two (2) days of the receipt or dispatch.

9. UNITS SPECIFICATIONS IN METRIC AND IMPERIAL UNITS

(1) The Contract shall utilize the International System of Units (SI) as specified in ISO 80000-1:2009. Codes and Standards in imperial units shall not be used unless approved by the SRT's Representative.

(2) Conversion between metric units and imperial units shall be in accordance with BS 350:2004.

10. SURVEY AND SITE INVESTIGATIONS

(1) Mean Sea Level (MSL) shall be used as survey reference for leveling Datum, which is that generally used.

(2) The zero datum used for the Contract shall be set at 100 meters below MSL.

(3) The Private Party shall carry out all further surveys and site investigations necessary for the design of the Permanent Works and the determination of the methods of construction/installation and the design of the Temporary Works.

(4) The Private Party shall establish and maintain its own survey monuments. All dimensions and levels, shown on the Conceptual drawings of topographical features are approximate and indicative only.

11. PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)

The Private Party shall devise and utilize a PMIS such that all documents generated by the Private Party can be transmitted to the SRT's Representative by electronic means (and vice versa) and that all documents generated by either party are electronically captured at the point of origin and can be reproduced later, electronically and in hard copy.

12. PROJECT CALENDAR

(1) A Project Calendar shall be drawn up by the SRT's Representative and shall apply throughout the Contract and works associated with the Project. The Project Calendar shall commence at Week one (1) and progress in seven (7) days week number consecutively throughout the duration of the Project. Week numbers shall be used when completing all programs.

(2) The Project Week shall commence on Monday at 00:01 hour and ends on Sunday at 24:00 hour. Where a "day" is referred in the tender documents, it is a calendar day equivalent to 24 hours.

13. CONCEPTUAL DESIGN DRAWINGS

(1) General

The Conceptual Drawings of the RFP are for information only.

The design shown on the Conceptual Drawings represents possible solutions which are not mandatory. The Private Party is allowed to select his preferred designs in accordance with the SRT's Requirements, the Outline Design Specifications and the Outline Construction Specifications to be included in the Technical Proposal. The accuracy of the information shown on the Conceptual Drawings cannot be guaranteed and shall therefore be treated accordingly.

Should the Private Party wish to use any of the information shown on the Conceptual Drawings, he will do so at his own risk.

(2) Stations

The stations layout has been developed based on the principles contained in the Outline Specifications with regard to the requirements of NFPA 130.

Access from the street level to the concourse level has been provided to meet the forecast passenger flows, and the lifts and escalators have been included. The Private Party may propose alternative station location if the conceptual design is not physically feasible for the intended purpose, subject to the approval of the SRT. In addition, the Private Party has the liberty to develop and amend the station layout in accordance with the Outline Design Specification and subject to the SRT's approval. However, any additional land if required shall be the responsibility of the Private Party to acquire on his expenses and the Private Party shall carry out the Environmental Impact Assessment (EIA).

(3) Alignment

The horizontal and vertical alignments have been developed and the Right of Way has been defined accordingly. Alterations to the horizontal and vertical alignments will be allowed subject to the approval of the SRT. However, any additional land if required shall be the responsibility of the Private Party to acquire on his expenses and the Private Party shall carry out the Environmental Impact Assessment (EIA).

(4) Depot

Layout and details of structures are shown on the Conceptual Drawings. The accuracy of the preliminary details shown on the Conceptual Drawings cannot be guaranteed and shall therefore be treated accordingly. However, the Private Party may be allowed to modify and /or change the location and layout of the Depot subject to the approval of the SRT. However, any additional land if required shall be the responsibility of the Private Party to acquire on his expenses and the Private Party shall carry out the Environmental Impact Assessment (EIA).

(5) Park & Ride

Not applicable.

14. SPECIFICATIONS

The Outline Design Specifications and the Outline Construction Specifications contained in the Contract shall be further elaborated in details during the design stage and submitted as part of the Detailed Design Submission.

15. INTERFACING PROJECT

The Private Party shall ensure that all adjacent structures, or other parts of the other SRT's projects shall be fully taken into account in the design of this Project. The Private Party shall use its best endeavours to assist the SRT throughout the construction and the interfacing of relevant projects.

The Private Party shall take all necessary precautions to protect the structures or works being carried out for other SRT's projects adjacent to and, for the time being, within the Site from the effects of vibrations, undermining and any other earth movements or the diversion of water flow arising from this Project at the cost of the Private Party.

SRT'S REQUIREMENTS – FUNCTIONAL

1. GENERAL

(1) The design and performance of the Permanent Works shall comply with the specific core requirements contained in the SRT's Requirements - Functional.

(2) The design of the Permanent Works shall be developed in accordance with these SRT's Requirements - Functional, the Private Party's Technical Proposals and the other requirements of the Contract.

(3) The Permanent Works shall be designed and constructed using proven up-to-date good practice and to the international acceptable codes and standards available. The Specification in any case shall not specify codes and standards which, in the SRT's Representative's opinion, are less than or inferior to those described in the Outline Design Specification, Outline Construction Specification and Outline Design Specifications for Railway Systems contained in the RFP Documents.

2. SCOPE OF WORKS

The Private Party shall carry out the Design and Build of Civil Works, E&M Systems and Operation and Maintaining (O&M) Services including other related systems to provide services to the public as well as financing the Project. The duration of the Project will be divided into two phases. The duties of the Private Party shall be as follows:

(1) Phase 1: Design and Build for approximately 220 kilometers of elevated, at-grade and tunnel structures with 9 stations, 2 depots workshop facility and utilities relocation/re-construction or construction. Procurement, Supply, Installation, Testing and Commissioning including High Speed Rolling Stock procurement as required by the Contract.

The Private Party shall be responsible for and obligated in Design and Build, Procurement, Supply, Installation, Testing and Commissioning of Civil Works, E&M Systems and other related systems, and Trial Running to provide general public services under the terms and conditions specified in the RFP Documents. E&M Systems shall consist of a number of High Speed Rolling Stock which shall be ready for commercial operation, Signaling Systems, Power Supply Systems, Communications Systems, Automatic Fare Collection System, Depot Workshop Equipment and Platform Screen Doors as specified in the RFP Documents. Including the modification of existing Airport Rail Link (ARL) which shall be ready for commercial operation and compatible with the new constructed system.

The Private Party shall transfer the ownership of the property acquired under the Contract to the SRT upon the issue of Substantial Commissioning or Commissioning Certificate or Partial Commissioning Certificate and the SRT will give the right to use them to the Private Party for the operation under the Contract.

The Private Party shall be responsible for all expenses related in Design and Build of Civil Works, E&M Systems and O&M Services.

(2) Phase 2: Operation and Maintenance Services

The Private Party shall be responsible for and obligated to provide proper and effective services and safety as specified in the Contract, including providing the maintenance and improvement of equipment and materials related in both Civil Works and E&M Systems. The Private Party shall also provide staffs with knowledge and expertise that are sufficient to comply with the O&M General Performance Requirements throughout the Phase 2 Period.

(3) During the entire Contract Period, the Private Party shall provide knowledge by Technology Transfer processes, including support for the SRT in terms of data, knowledge and particular expertise, train the SRT staff, attend the seminar and be a speaker in the activities of various operations by the Private Party's expenses. The objective is to support the establishment of railway training center, research and technology development center for the SRT.

(4) During the implementation of the Project, the Private Party shall employ Thai national in various positions as many as possible, including technical positions. However, for any work that is of a specialized technology, in which the Private Party cannot employ Thai national, the Private Party may employ foreign experts for such works. The Private Party shall also provide Technology Transfer to Thai staff/engineers to replace such foreign experts within 10 years from the Commencement Date.

(5) The Private Party shall be liable for all taxes, stamp duties and fees that the Private Party is obligated or imposed under the relevant laws and regulations.

3. ALIGNMENTS, WIDTHS AND DISPOSITION OF RAILWAYS

(1) The alignments, widths and disposition of the railways shall be as shown in the Preliminary drawings.

(2) Cable routes shall be developed by the Private Party.

4. CLEARANCES

(1) The Permanent Works shall not infringe the Structure Gauge as shown on the Preliminary drawings.

(2) Railway clearance:

Clearance from the platform edge in stations to the train shall conform to the requirements of the train manufacturer.

(3) Construction limits:

The limits of land to be acquired for the Works are shown on the Right of Way Drawings or otherwise approved by the SRT. The Private Party shall design the Works to be contained totally within these limits, including a provision for clearance from the permanent structures to the property line of a minimum of 3.0 meters. In the event that the Private Party, having used its best endeavors, is unable to design the permanent works and utilities to be contained totally within these limits, then the SRT will obtain the necessary additional land sufficient for the permanent works at the cost of the Private Party.

5. DESIGN LIFE

The design life of the Permanent Works shall be:

(a)	for civil engineering structures	100 years
(b)	for building structures	100 years
(c)	for road pavements	20 years
(d)	for architectural finishes	20 years
(e)	for building services including lifts and escalators	20 years
(f)	underground structure	120 years
(g)	painting for steelworks	15 years
(h)	trackwork components	30 years

6. DURABILITY AND MAINTENANCE

(1) The Permanent Works shall be designed and constructed such that, if maintained reasonably and in accordance with the Private Party's statement of maintainability contained in the Contract, they shall endure in a serviceable condition throughout their minimum lives as described under Clauses 5 above.

(2) The Permanent Works shall be designed and constructed to minimize the costs of maintenance whilst not compromising the performance characteristics and ride quality of the railway.

(3) Systems shall be designed to maximize their availability during traffic hours.

(4) Systems architecture and technology shall be such as to minimize the cost of maintenance required and to facilitate rapid fault rectification. To this end, designs shall, in general, permit and confine these activities to three levels only, namely:

(a) First level, with all main sub-systems exchangeable on a unit or modular replacement basis.

(b) Second level, at the Workshop for overhaul or repair of non-exchangeable items.

(c) Third level, component repair. However, in general, equipment shall be modularized to the level where it is more economical to dispose of a faulty module than to repair it.

(5) Bearings shall be replaceable with minimum disruption to rail or road traffic, as appropriate.

(6) Movement joints shall be of a design which can be maintained and replaced with the minimum of disruption to rail or road traffic, as appropriate.

(7) Mechanical and electrical (M&E) equipment shall be of a quality and durability fully to meet the operational requirements described in various relevant international codes and standards defined in Outline Design Specifications.

7. OPERATIONAL REQUIREMENTS

(1) The Permanent Works shall be designed to permit the railway to operate satisfactorily at a maximum design speed of 280 km/hr for Suvarnabhumi – U-Tapao main line and Don Mueang – Phayathai main line shall be conformed with the existing system.

(2) The design of drainage will include positive drainage measures to lead the run-off to the surface water drainage system at ground level.

(3) Drainage shall be of a capacity capable of collecting and removing run-off from storms with return periods as follows:

(a)	land	200 years
(b)	pavement	50 years
(c)	slope protection	200 years
(d)	bridges, viaducts	50 years

(4) Particular attention shall be paid to locations:

(a) Surface water drainage systems in the vicinity of traction substations shall be routed to avoid any risk of flooding of electrical equipment areas.

(b) Permanent protection against flooding shall be provided, to a level above the 200 years return period flood.

(5) During construction the Private Party shall be responsible for providing and maintaining adequate flood protection to ensure protection of the works.

(6) In the design and construction of the Works, the Private Party shall, as a fundamental objective and as a priority, ensure that passengers, railway employees and the public will, throughout the operational period of the Project and within the confines thereof, be provided with as safe an environment as is reasonably possible. The Private Party's attention is directed to Clause 11(2) of these SRT's Requirements - Functional, concerning the appointment of a Railway Inspectorate.

(7) The design of the Works shall be such that the Forecast Passenger Flows as described in Appendix 6 of these SRT's Requirements can be met without congestion occurring and without risk to the safety of passengers or railway employees.

8. AESTHETICS

(1) The Permanent Works shall be designed to achieve a high and uniform aesthetic standard.

(2) The requirements given under Section 7.1.1.1 of the Outline Design Specifications shall be taken into account in the design of the Permanent Works.

9. ENVIRONMENTAL CONSIDERATIONS

The design of the Permanent Works shall conform to the Thai Government environmental standards, codes and regulations by the Office of Natural Resources and Environmental Policy and Planning.

10. SECURITY

The design of the Permanent Works shall incorporate security requirements described in the relevant international codes and standards defined in Outline Design Specifications.

11. MISCELLANEOUS

(1) The Private Party shall carry out the Works so as to minimize disruption to road and pedestrian traffic. The Private Party shall design the works so that disruption to the traffic flows is kept to a minimum. The design and construction method shall provide for a temporary lane or detour road which will permit the existing number of traffic lanes to be maintained for the full duration of the works.

(2) The Private Party shall note that it is likely that the ICE will inspect the Works from time to time for the purpose of determining whether the Project complies in terms of operational safety with recognized current international standards. Notwithstanding other provisions of the Contract, the Private Party shall ensure that the Works comply with the reasonable requirements of the Railway Inspectorate.

12. STANDARDS

(1) Equipment, materials and systems shall be designed, manufactured and tested in accordance with the latest issue of international codes and standards at the time of proposal submission.

(2) The Private Party may propose alternative standard materials, or equipment which shall be equal to or better than those specified. If the Private Party for any reason proposes alternatives to or deviations from the specified standards, or desires to use materials or equipment not covered by the specified standards, the Private Party shall state the exact nature of the change, the reason for making the change, and shall submit, for the approval of the SRT, relevant specifications of the materials and equipment in the English language including a test report from the certified laboratory which is recognized internationally and is acceptable to the SRT. The decision of the SRT in the matter of quality shall be final.

13. RAILWAY SYSTEMS

The function requirements for E&M shall be in accordance with **the Outline Design Specifications of Railway Systems, Volume III – Part 3**.

14. LIST OF ROLLING STOCK SUPPLIERS HIGH SPEED TRAIN

The High Speed Train Rolling Stock Supplier shall be at least one of the suppliers as shown in following list.

No.	Suppliers*	Country
1	Alstom	France
2	Bombardier Transportation	Germany
3	Bombardier Sifang (Qindao) Transportation Ltd. (BST)	China
4	British Rail Engineering Limited (BREL)	UK
5	CAF	Spain
6	Changchun Bombardier Railway Vehicles Company Ltd. (CBRC)	China
7	China Northern Locomotive & Rolling Stock Industry (Group) Corporation - CNR-Tanshang	China
8	CRRC Group Corporation Limited	China
9	CSR-Bombardier	China
10	CSR Puzhen Bombardier Transportation Systems Limited.	China
11	Hitachi Ltd.	Japan
12	Hitachi Rail Europe (HRE)	Japan
13	Hitachi Rail Italy (HRI)	Japan
14	Hyundai Rotem Company	Korea (South)
15	J-TREC : Japan Engineering Company	Japan
16	Kawasaki Heavy Industries Ltd.	Japan
17	Kinki Sharyo Co. Ltd.	Japan
18	Nippon Sharyo	Japan
19	Patentes Talgo SL	Spain
20	Rigas Vagonbuves Rupnica AS (RVR)	Latvia
21	SIEMENS Mobility	Germany
22	Stadler Rail AG	Switzerland

SRT'S REQUIREMENTS – DESIGN

1. INTRODUCTION

(1) The SRT's Requirements - Design, specifies the procedural requirements for the preparation of the design of the Permanent Works. These requirements are subdivided into those which occur during the Design Phase, those which occur during the Execution Phase, and those which shall be general application.

(2) In addition to the stated requirements herein, the Private Party shall, whenever the SRT's Representative so requests, provide information and participate in discussions which relate to design matters.

(3) The Private Party shall engage the Designer who shall undertake and prepare the design of the Permanent Works.

(4) The Private Party shall ensure that his Designer continues at all times by staff whose experience is to the satisfaction of the SRT.

(5) The Private Party shall submit a Staff Organization Plan to the SRT's Representative for consent. This plan shall be updated and resubmitted whenever there are changes to Key Staff shall be consented by the SRT. The plan shall show the management structure and state clearly duties, responsibilities and authority of each Key Staff member.

2. REQUIREMENTS DURING DESIGN PHASE

(1) The principal requirements of the Design Phase are the preparation, confirmation/validation and submission of the Preliminary Design and the preparation and submission of the Detailed Design.

(2) Detailed Design shall comply with the SRT's Requirements - Functional, shall accord with and incorporate the Private Party's Technical Proposals and shall be the design developed to the stage at which all elements of the Civil Works, Building Services and E&M are fully defined/designed and specified and in particular:

(a) detailed calculation and analysis are completed;

(b) all major elements are elaborately delineated;

(c) all tests and trials and all selected materials and equipment (with the exception, if necessary, of those relating to Mechanical and Electrical equipment) are completed;

(d) all other work, including studies and reporting, as noted in Clause 5 of the SRT's Requirements - Design, is complete; and

(e) full account of the effect on the Permanent Works of the proposed methods of construction/manufacture/installation and of the Temporary Works are considered.

(f) Architectural Design concepts of High Speed Station inspired by culture, people and identity.

(3) The Private Party shall undertake the design during this phase in two stages:

(a) the preparation/confirmation/validation and submission of the Preliminary Design and;

(b) the preparation and submission of the Detailed Design which shall conform to the Preliminary Design.

(4) The Computational Fluid Dynamic (CFD) shall be used to conduct the fire simulation analysis at stations and tunnels to determine the effect of evacuation and Safety. The report of the result of the analysis include recommendation shall be prepared by the Private Party and submitted to the SRT's Representative within 3 months after commencement date of the Contract. The analysis shall be revised in case of major change of the stations and tunnels from the original shall be consented by the SRT.

(5) During the preparation and the confirmation/validation of the Preliminary Design, the Private Party shall complete all surveys, investigations and testing as well as the coordination with the relevant authorities for the confirmation/validation of the existing utilities including the unforeseen one, necessary to complete the confirmation/validation of the Preliminary Design of the Permanent Works.

(6) The Private Party shall sub-divide the confirmation/validation of the Preliminary Design and Detailed Design into Design Packages to be submitted in advance of the confirmation/validation of the Preliminary Design/Detailed Design Submission and to be identified in the Design Submission Program. The Design Packages shall relate to the significant and clearly identifiable parts of the confirmation/validation of the Preliminary Design and Detailed Design and shall address the design requirements as described herein. The Design Packages shall facilitate the review and understanding of the Preliminary Design/Detailed Design as a whole and shall be produced and submitted in an orderly, sequential and progressive manner. The Design Packages covering the global analysis and illustrating the global behavior of the principal structures shall be submitted at the earliest possible time.

(7) Separate Detailed Design Submissions may be prepared for those major elements to be procured by subcontract and which subcontracts include design. Where such work is to be procured by the Private Party on the basis of detailed design, such documents may be submitted as Detailed Design Submissions.

(8) Preparation of the confirmation/validation of the Preliminary Design shall commence on the Date of Commencement and shall continue until the Private Party's receipt of the Notice in respect of the comprehensive and complete confirmation/validation of the Preliminary Design Submission under Clause 4 herein.

(9) Upon issue of the Notice in respect of the confirmation/validation of the Preliminary Design Submission as defined in Clause 9.1 herein, the Private Party shall complete the Detailed Design in all respects and produce the Detailed Design Drawings, the purpose of which is to illustrate all the Permanent Works.

(10) Detailed Design Drawings shall fully delineate the final details of the construction/manufacture/installation and shall show overall works to be executed.

(11) The Private Party shall expedite the preparation and production of the Detailed Design Drawings such that they are submitted at the earliest possible time.

(12) The Private Party shall submit each Preliminary Design Submission and each Detailed Design Submission to the SRT's Representative for review. The procedure for such submissions shall be in accordance with:

(a) the SRT's Requirements;

(b) the Design Submission Program (Clause 8) and

(c) the Design Procedure Approval (Clause 9)

3. REQUIREMENTS DURING EXECUTION PHASE

(1) The principal requirements relating to design during the Execution Phase are the production of Working Drawings, the preparation of technical submissions as required under the Contract, the compilation of the Final Design and the production of the As Built Drawings.

(2) Working Drawings shall be prepared as required under the Contract. They shall be either prepared or checked by the Designer who shall endorse them to the SRT's Representative as conforming to the Detailed Design Drawings. Requirements relating to their submission, review and issue for onstruction/manufacture/installation are given under Clause 6 of these SRT's Requirements - Design.

(3) Where submissions are required by the SRT's Requirements - Execution, the Outline Construction Specifications or drawings relate to, or have an effect on the design of, the Permanent Works, such submissions shall be checked as having no adverse effects and so endorsed by the Designer prior to submission to the SRT's Representative. Such submissions shall include, without limitation the following:

(a) Temporary Works (see Clause 2 of SRT's Requirements - Execution);

(b) incorporation of proprietary items, e.g. bearings, pre-stressing components, expansion joints;

(c) finalization of Combined Services Drawings;

(d) E&M submissions; and

(e) Lifts and Escalators submission.

(4) At least 3 months but not more than 6 months prior to the date of Substantial Commissioning or Commissioning or Partial Commissioning of the Works for Phase 1, the Private Party shall compile and submit to the SRT's Representative for recording purposes all those documents which constitute the Final Design at the time of submission as required by the SRT's Representative.

(5) The Final Design is the design of the Permanent Works embodied in:

(a) The approved documents comprised in the Detailed Design, taking account of comments in the schedules appended to Notices of No Objection;

(b) The approved Working Drawings;

(c) The calculations (see Clause 11 herein); and

(d) Such other documents as may be submitted by the Private Party at the request of the SRT's Representative to illustrate and describe the Permanent Works and for which a Notice has been issued.

(6) The Private Party shall maintain all records necessary for the preparation of the As Built Drawings. Upon completion of the Works for Phase 1 or at such time as agreed to or required by the SRT's Representative, the Private Party, with the assistance of the Designer, shall prepare drawings which, subject to the SRT's Representative's agreement, shall become the As Built Drawings. All such drawings shall be endorsed by the Designer and Private Party as true records of the construction/manufacture/installation of the Permanent Works. The Private Party shall also show the locations of utilities exposed, retained or diverted as directed (SRT's Requirements – Execution, Clause 8.2 (5) refers).

4. DESIGN SUBMISSIONS – PRELIMINARY DESIGN

The Preliminary Design Submission shall be a complete set of documents, fully describe:

(1) confirmation/validation of the Preliminary Design's parameters, location, geometry and setting-out of all main elements and features, dimensions of all major features, structural elements and members;

(2) confirmation/validation of the location of existing utilities as well as exploring unforeseen one;

(3) confirmation/validation of the Civil Work design criteria;

(4) confirmation/validation of the E&M design criteria;

(5) confirmation/validation of the Architectural criteria;

(6) confirmation/validation of the Building Services criteria;

(7) confirmation/validation of the Conceptual Design's Drawings and Specifications;

(8) interaction of E&M, architectural, building services with the civil work;

(7) confirm structure gauge;

(8) confirm route alignment and boundaries;

(9) confirm details of the High-speed Rolling Stock;

(10) confirm details of civil work, building services, architectural, E&M;

(11) confirm viaduct structure/at-grade levels and dimensions; and

(12) confirm tunnel structure including the underground station;

(13) submission to the SRT's Representative.

5. DESIGN SUBMISSIONS – DETAILED DESIGN

(1) The Detailed Design Submission shall be a coherent and complete set of documents, properly consolidated and indexed and shall fully describe the proposed Detailed Design, in particular, and where appropriate, it shall define at least:

(a) the dimensions of all major features, structural elements and members;

(b) all materials;

(c) potential forces and movements due to all possible loadings and actions on the structures, and their accommodation;

(d) all second order effects;

(e) the layout and typical details of reinforcement in structural concrete members;

(f) the location and nature of all relevant joints and connections;

(g) standard details;

(h) location, geometry and setting – out of all main elements and features;

(i) E&M, equipment and their interaction with the structures;

(j) erection and connection methods;

(k) utilities to be diverted and relocated; and

(l) proposed methods of predicting the ground movements due to tunnelling and settlement adjacent to the excavations,

(m) other necessary details which fulfill the completeness of the Detailed Design.

(2) The Detailed Design Submission shall include, where appropriate and without limitation, the following documents:

(a) Drawings

The drawings shall illustrate the proposed Detailed Design and in particular shall include, without limitation:

(i) general arrangements;

(ii) architectural Drawings;

(iii) Civil Work Drawings;

(iv) E&M Drawings;

(v) Building Services Drawings;

(vi) tunnel structures;

(b) Specifications

The Specifications included in the Private Party's Technical Proposals shall be amplified and further developed so as comprehensively to specify the design and the execution of the Permanent Works.

(c) Design Manual

The Design Manual shall incorporate all design requirements, standards, codes, loading cases, permissible movements and deflections, limit states, design stresses and strains, material properties and all other documents or matters which are relevant to and govern the design. The Design Manual shall refer to all materials, codes and standards used, making clear their specific applications. The Design Manual shall be produced so that it can be used by those involved in the preparation or review of the design of

the Permanent Works as a comprehensive reference text and efficient working document.

(d) Fire Safety Strategy Report

(e) Lifts and Escalators Documents Outline designs, performance specifications, and all technical requirements.

(f) Electrical and Mechanical (E&M) Documents Outline designs, performance specifications, and all technical requirements relating to the Permanent Works, for all electrical and mechanical equipment as stated below.

(i) Hazard and Operation Analysis (HAZOP to EN50126 Standard or equivalent)

(ii) System Quality Assurance Plan (including RAMS to EN50126 Standard or equivalent)

(iii) Software Quality Assurance Plan (to EN50128 or equivalent)

(iv) Power System Plan and Schematics

(v) SCADA Plan

(vi) Earthing and Bonding Plan and Simulations/Calculations for Fault Levels

(vii) EMI/EMC Plan

(viii) Interfacing Plan

(ix) Train Operation Plan

(x) System Operation & Safety Plan

(xi) Radio Plan

(xii) All Equipment Room Layout Plans

(xiii) All Station Operations Room Layout Plans

(xiv) OCC Layout Plan

(xv) CTC Room Layout Plan

(xvi) Depot Track Layouts

(xvii) Depot Equipment Layouts

(xviii) OCC Ergonomics Report

(xix) Detailed Power Study (including Earthing and Bonding Simulations)

(xx) Architectural Plans for Bulk Power Supply Point Building

(xxi) Signaling Principles

(xxii) Rolling Stock Concept Designs and Performance Specifications

(xxiii) All Systems Architecture Diagrams

(xxiv) Design Standards List

(xxv) All equipment and materials, including cables Manufacturers and Suppliers List

(xxvi) Detailed description of all Systems, Equipment and Materials

(xxvii) Installation Plan

(xxviii) Testing, Commissioning & Trial Running plan

(xxix) Temporary ATC Test Track Plan

(xxx) Training Plan

(xxxi) Recommended Warranty Spares and Special Tools List

(xxxii) Special Tools description and manufacturers specifications.

(g) Tunnel and Elevated Structure Analysis

Details of the design of tunnel and elevated structures and the behavior of the structures under static and dynamic loadings imparted by the High Speed train including interaction between viaduct girder and the structure, vibration analysis and component characteristics.

Where the tunnels are adjacent to buildings or other structures, analysis shall be provided in this case to ensure that no loss of support can occur which endangers the stability of the buildings and structures above ground.

(h) Testing and Commissioning Report

Details of proposals for testing and commissioning procedures for all relevant elements and equipment contained in the Permanent Works.

(i) Maintenance Report

A report updating the Statement of Maintainability in the Private Party's Technical Proposals and detailing maintenance routines necessary for the achievement of the required lives of the various elements of the Works.

(j) Aesthetic Report

This report shall take account of the aesthetic requirements as set out under Clause 8 of the SRT's Requirements - Functional, and shall contain:

(i) a general description of the aesthetic aspects of the structures identifying design objectives, parameters and constraints and explaining the method by which the stated objectives are achieved;

(ii) suitable material to illustrate fully the design of the Permanent Works including general arrangement drawings, perspectives, photomontages or models as required generally and to highlight important design features and details;

(iii) information on proposed finishes and treatments; and

(iv) any other relevant information necessary to allow comprehensive and informed evaluation of the aesthetic aspects of a Detailed Design Submission.

(k) Simulation and Analysis of Passenger Movement including Computer Model

The Private Party shall undertake the computer simulation and analysis of passenger movement (Multi-way System) during emergency evacuation including computer fluid dynamics (CFD) model for various scenarios as agreed with the SRT's Representative in order to justify his design and submit the reports for Consent.

(l) Interface Report

This report shall elaborate in detailed all types of interfacing works in Civil, Architectural, Mechanical and Electrical including the Railway Systems to fully harmonize the detailed design.

(m) Project Management Plan

The overall management of the Works shall be the Private Party's responsibility. The organization of the resources for the engineering, procurement, manufacture, delivery, installation, testing and commissioning, and setting to work, is to be developed into a Project Management Plan. Each section of this plan shall fully describe the Private Party's understanding of the Works and management skills and structure required to achieve the same.

(3) The Detailed Design Submission to the SRT's Representative in respect of the whole of the Works shall be accompanied by the following documents, but not limited to, which will be considered by the SRT's Representative in his review of the Detailed Design Submission. Where relevant or required, these documents shall be accompanied by a design note stating clearly how information has been used in the design of the Permanent Works.

(a) Geotechnical Interpretative Report

A report including site investigation results and covering the geotechnical interpretation of site investigation work including that undertaken by the Private Party in sufficient detail to confirm and justify parameters used in the tunnel structure design, foundations, abutments, embankments, super structures and geotechnical designs. The report shall include the full logs and descriptions of confirmatory boreholes and tests drilled by the Private Party.

(b) Survey Report

A report on all survey works undertaken by the Private Party, including checks on mapping, survey stations, co-ordinates and setting-out. Updated topographical and survey drawings shall be included.

(c) Utilities Report

A report giving details of arrangements and working methods in respect of the existing utilities, including protection measures, diversions, reinstatements, relocation and program allowances.

(d) Temporary Works Design Report

A report which provides sufficient information on the design of the Temporary Works to allow the SRT's Representative to assess their effects on the Permanent Works and to enable these to be taken into account in the review of the Detailed Design.

(e) Erection Analysis Report

A report containing a stage-by-stage erection sequence for all elevated structures as well in the tunnel sections.

(f) Construction Method Statement

A report which provides sufficient information on the methods of construction and the Private Party's Equipment to allow the SRT's Representative to assess their effects on the Permanent Works and to enable these to be taken into account in the review of the Detailed Design.

(g) Manufacture and Installation Method of Statement

A statement which provides comprehensive information on the Private Party's proposals for manufacture and installation of E&M equipment/works.

(h) Works Program

(i) The Private Party shall, prior to submitting the Detailed Design Submission, review the Works Program against the current version of the Design Submission Program.

(ii) In the event that the SRT's Representative considers there are any discrepancies or inconsistencies between the Design Submission Program and the Works Program, the Private Party shall submit with the Detailed Design Submission and proposed revisions to the Works Program such that the discrepancies or inconsistencies are removed.

(iii) The Private Party shall provide details of submissions of the proposed Working Drawings and their anticipated timing during the Execution Phase and shall identify information required from or actions to be undertaken by the SRT or others and which are necessary to permit the completion of the design of the Permanent Works and the Working Drawings. Dates of the receipt by the Private Party of such information or for the completion of such actions shall be included with appropriate justification.

(i) Report on the Use of the Site

A report updating the proposals from those contained in the Private Party's Technical Proposals for the use of the Site and other areas to be used by the Private Party for storage, staging and other activities to support performance of the Works and their reinstatement, detailing accesses and access facilities.

(j) Report on the relevant project

A report updating the ongoing or proposed infrastructure project that intersect or has a relevant to route alignment or the project in general that has a major impact relative to the detailed design.

(4) The Private Party shall perform Detailed Design Submission and seek separate Notices in respect of:

(a) The temporary works for construction of the tunnel and elevated structures works.

(b) All works related to the open cut, cut and cover tunnels and length or sequence of lengths of bored tunnel which will be driven from one location together with any intervening cut & cover works and sequence of viaduct sections.

(c) All works related to sub-structures.

(d) All works related to each of the elevated stations as well as the underground station.

(e) All works related to the utilities relocation.

(f) Major elements as identified under Clause 2(7) herein.

The issue of such separate Notices under (a), (b), (c), (d) and (e) above shall be conditional upon the Private Party having demonstrated, to the satisfaction of the SRT's Representative, that the effect of each structure on the others and on other structures, utilities, etc., has been fully accommodated in the design.

6. DESIGN SUBMISSIONS - WORKING DRAWINGS

(1) On the issue of a Notice in respect of the Detailed Design Drawings as herein defined in Clause 9.2, the Private Party shall produce the proposed Working Drawings. These shall be further elaborated details in accordance with the Detailed Design Drawings such as site sketches, bar bending schedules, bar reference drawings, fabrication and shop drawings, construction erection sequences, installation drawings and the like. All such drawings shall comply with the requirements of the Contract.

(2) The SRT's Representative shall, if he has no objection to the contents of the Working Drawings submission, further endorse the original copies as "Good for Execution". On the endorsement by the SRT's Representative, the original copies will forthwith be returned to the Private Party as the Working Drawings.

(3) Only the Working Drawings endorsed by the SRT's Representative shall be issued to the Site. Thereafter, the Private Party shall commence the execution of works in strictly accordance with the approved Working Drawings.

(4) Submissions which relate to the design of the Permanent Works and which are made during the Execution Phase shall be subject to the review procedures described under Clause 7 herein.

(5) The Private Party shall finalize details of the proposed method of construction/manufacture/installation and submit such final details to the SRT's Representative for review. The proposed method shall have no adverse effects on the partially completed Permanent Works and shall ensure the Works are statically and, if appropriate, aerodynamically stable.

(6) The Private Party shall undertake and submit a stage by stage construction/manufacture/installation sequence and the effect of any Temporary Works and the Private Party's Equipment. This analysis shall be in sufficient detail to demonstrate that the Private Party's proposals are safe and have no adverse effects upon any parts of the Permanent Works. The analysis shall also determine any deflection profile in the structures and any other significant construction/manufacture/installation events and shall establish the fabrication requirements to achieve the final alignment.

(7) As Built Drawings, endorsed by the Designer and the Private Party as required under Clause 3 of these SRT's Requirements - Design, shall be submitted to the SRT's Representative for agreement. The Private Party shall supply the SRT's Representative with ten hard copies, PDF files and CAD files of each of the completed and endorsed the As Built Drawings.

(8) To ensure the As Built Drawings prepared by the Private Party and checked by the SRT's Representative as the work proceeds, the Private Party shall submit his "As Built Drawings" not later than ninety (90) days after each section or structure is completed.

7. DESIGN SUBMISSIONS - REVIEW PROCEDURES

(1) Submissions of Design Data shall be made and reviewed by the SRT's Representative. The form and detail of the review shall be as determined by the SRT's Representative. If analytical review is undertaken, it will be independent of the design work carried out by the Designer. The Review will proceed concurrently with the design as far as practicable.

(2) The issue of a Notice shall be without prejudice to the issue of any future Notices.

(3) The Private Party shall, prior to the submission of the Design Data, obtain all required and/or statutory approvals which relate to that submission including, where appropriate, the approval of all affected agencies and organizations such as the Bangkok Metropolitan Administration (BMA), Metropolitan Electricity Authority (MEA), Provincial Electricity Authority (PEA), Metropolitan Waterworks Authority (MWA), Provincial Waterworks Authority (PWA), Telephone Organization of Thailand (TOT), Office of Transport and Traffic Policies and Planning (OTP), Department of Highways (DOH), Department of the Rural Roads (DRR), National Broadcasting and Telecommunication Commission (NBTC) Relevant Provincial Authorities and utility undertakings, and demonstrate that all required approvals have been obtained.

8. DESIGN SUBMISSION PROGRAM

(1) The Private Party shall prepare the Design Submission Program which is to set out fully the Private Party's anticipated program for the preparation, submission and review of the Design Packages, the Preliminary Design Submission and the Detailed Design Submission and for the issue of Notices in relation thereto.

(2) The Design Submission Program shall:

(a) be consistent with and its principal features integrated into the Works Program shall be presented;

(b) be in accordance with Appendix 1 to these SRT's Requirements;

(c) make adequate allowance for periods of time for review by the SRT's Representative and other agencies concerned;

(d) make adequate allowance for the design and development of specialist works;

(e) include a schedule identifying, describing, cross-referencing and explaining the Design Packages into which the Private Party intends to divide the Preliminary Design and Detailed Design; and

(f) indicate Design Interface and co-ordination periods for each component of the Works .

(3) The Private Party shall submit the Design Submission Program to the SRT's Representative within seven (7) days after Commencement Date, and thereafter up-dated versions thereof at intervals of not more than one (1) month throughout the Design Phase shall be attached as part of the Monthly Progress Report.

9. DESIGN PROCEDURE APPROVAL

9.1 Preliminary Design

(1) Submission

The Private Party shall as soon as reasonably practicable after the preparation, confirmation/validation of the Preliminary Design thereof, or any variation, amendment, modification or alteration thereto, be submitted to SRT's Representative for his review. SRT's Representative shall be required to review the Preliminary Design and confirm in writing to SRT and to Private Party its Notice of No objection thereto as soon as practicable and in any event within twenty-eight (28) days following the submission thereof.

If the SRT's Representative objects to the submitted Preliminary Design, which he may only do on the grounds of their non-compliance with the SRT's

Requirements and the Outline Design Specifications or on reasonable grounds of public safety or protection of the environment, he shall notify the SRT and the Private Party accordingly as soon as practicable and in any event within twenty-eight (28) days following the submission thereof, stating the reasons for his objection and giving such further explanation as SRT may reasonably require to establish the grounds of his objection.

(2) Resubmission

In the event that the SRT's Representative objects, in whole or in part, to the submitted Preliminary Design, on grounds which the Private Party accepts to be reasonable, Private Party shall promptly cause the same to be modified or amended so as to meet his objection, and as soon as reasonably practicable thereafter, procure the resubmission of such modified or amended submitted Preliminary Design to SRT's Representative for his further review. The SRT's Representative shall review such modified or amended Preliminary Design only to determine whether the relevant modifications or amendments are reasonably sufficient to meet the objections notified by him as aforesaid, and shall as soon as practicable and in any event within fourteen (14) days following the resubmission thereof, notify the SRT and the Private Party whether or not this is the case. For the avoidance of doubt, it is agreed that the objection by the SRT's Representative to any part of the submitted Preliminary Design shall not prejudice or affect his No Objection of the remainder thereof not specifically objected to.

(3) Deemed No Objection

The submitted Preliminary Design (and any parts thereof modified or amended pursuant to Clause 9.1(2) above), shall be deemed to have No Objection by the SRT's Representative when he has not objected to the same within the twenty-eight (28) days following the submission referred to in Clause 9.1(1) above, or within the fourteen (14) days following the resubmission of the modified or amended parts thereof referred to in Clause 9.1(2) above. Such event does not relieve the Private Party of his obligations and liabilities under the Contract for the final end product.

9.2 Detailed Design

(1) Submission

The Private Party shall procure that such of the Detailed Design as will be sufficient to enable the SRT's Representative to confirm that they have been prepared

(a) in accordance with the SRT's Requirements;

(b) in accordance with the Outline Design Specifications for Civil Works and Railway Systems; and

(c) in accordance with the submitted Preliminary Design approved pursuant to Clause 9.1 above, shall as soon as reasonably practicable after the preparation thereof, or any variation, amendment or alteration thereto, be submitted to the SRT's Representative for his No Objection. The SRT's Representative shall, as soon as practicable and in any event within twenty-eight (28) days following the submission thereof, review the Detailed Design thus submitted in sufficient detail to confirm that they have been prepared as provided in (a), (b) and (c) above. If the SRT's Representative objects to the submitted Detailed Design, which he may only do on the grounds that they have not been prepared as provided in (a), (b) and (c) above or on reasonable grounds of public safety, he shall notify the SRT and the Private Party accordingly as soon as practicable and in any event within twenty-eight (28) days following the submission thereof, stating the reasons for his objection and giving such further explanation as SRT may reasonably require to establish the grounds of his objection.

(2) Resubmission

In the event that the SRT's Representative objects, in whole or in part, to the submitted Detailed Design, on grounds which the Private Party accepts to be reasonable, Private Party shall promptly cause the same to be modified or amended so as to meet the SRT's Representative's objection, and as soon as reasonably practicable thereafter, procure the resubmission of such modified or amended submitted Detailed Design to SRT's Representative for his further review. The SRT's Representative shall review such modified or amended Detailed Design only to determine whether the relevant modifications or amendments are reasonably sufficient to meet the objections notified by him as aforesaid, and shall as soon as practicable and in any event within fourteen (14) days following the resubmission thereof, notify the SRT and the Private Party whether or not this is the case. For the avoidance of doubt, it is agreed that the objection by the SRT's Representative to any part of the submitted Detailed Design shall not prejudice or affect his approval of the remainder thereof not specifically objected to.

(3) Deemed No - Objection

The submitted Detailed Design (and any parts thereof modified or amended pursuant to Clause 9.2(2) above), shall be deemed to have No Objection by the SRT's Representative when he has not objected to the same within the twenty-eight (28) days following the submission referred to in Clause 9.2(1) above, or within the fourteen (14) days following the resubmission of the modified or amended parts thereof referred to in Clause 9.2(2) above. Such event does not relieve the Private Party of his obligations and liabilities under the Contract for the final end product.

9.3 Working Drawings

(1) Submission

The Private Party shall procure that such of the Working Drawings as will be sufficient to enable the SRT's Representative to confirm that they have been prepared

(a) in accordance with the SRT's Requirements,

(b) in accordance with the Outline Design Specifications for Civil Works and Railway Systems; and

(c) in accordance with the submitted Detailed Design approved pursuant to Clause 9.2 above

shall as soon as reasonably practicable after the preparation thereof, or any variation, amendment or alteration thereto, be submitted to the SRT's Representative for his No-Objection. The SRT's Representative shall, as soon as practicable and in any event within twenty eight (28) days following the submission thereof, review the Working Drawings thus submitted in final details for the execution of the Permanent Works to confirm that they have been prepared as provided in (a), (b) and (c) above. If the SRT's Representative objects to the submitted Working Drawings, which he may only do on the grounds that they have not been prepared as provided in (a), (b) and (c) above or on reasonable grounds of public safety, he shall notify the SRT and the Private Party accordingly as soon as practicable and in any event within twenty eight (28) days following the submission thereof, stating the reasons for his objection and giving such further explanation as SRT may reasonably require to establish the grounds of his objection.

(2) Resubmission

In the event that the SRT's Representative objects, in whole or in part, to the submitted Working Drawings, on grounds which the Private Party accepts to be reasonable, Private Party shall promptly cause the same to be modified or amended so as to meet the SRT's Representative's objection, and as soon as reasonably practicable thereafter, procure the resubmission of such modified or amended submitted Working Drawings to SRT's Representative for his further review. The SRT's Representative shall review such modified or amended Working Drawings only to determine whether the relevant modifications or amendments are reasonably sufficient to meet the objections notified by him as aforesaid, and shall as soon as practicable and in any event within fourteen (14) days following the resubmission thereof, notify the SRT and the Private Party whether or not this is the case. For the avoidance of doubt, it is agreed that the objection by the SRT's Representative to any part of the submitted Working Drawings shall not prejudice or affect his approval of the remainder thereof not specifically objected to.

(3) Deemed No-Objections

The submitted Working Drawings (and any parts thereof modified or amended pursuant to Clause 9.3(2) above), shall be deemed to have been approved by the SRT's Representative when he has not objected to the same within the twenty eight (28) days following the submission referred to in Clause 9.3(1) above, or within the fourteen (14) days following the resubmission of the modified or amended parts thereof referred to in Clause 9.3(2) above. Such event does not relieve the Private Party of his obligations and liabilities under the Contract for the final end product.

10. PROGRAM FOR SUBMISSIONS DURING THE EXECUTION PHASE

In accordance with Clause 5 of the SRT's Requirements - General, the Private Party shall identify submissions required during the Execution Phase in the Works Program.

11. CALCULATIONS

(1) The Private Party shall prepare and submit a comprehensive set of calculations relevant to the Preliminary Design (if applicable) and to the Detailed Design in a form acceptable to the SRT's Representative for review with the respective Design Packages or Submissions. In addition, the SRT's Representative may require the submission of applicable software, computer input and program logic for its review prior to the acceptance of the computer output.

(2) Similarly, the Private Party shall submit such further calculations as have been prepared in connection with the Detailed Design Drawings within sixty (60) days following the Notice in respect of the final Detailed Design Drawings Submission.

(3) Calculations to be included as part of the submission under Clause 3(5) herein shall comprise the up-to-date calculations in respect of the Detailed Design and such further calculations which the Private Party has prepared during the carrying out of the Working Drawings.

(4) The Private Party shall submit all calculations necessary to support the construction/manufacture/installation methods proposals.

12. MISCELLANEOUS REQUIREMENTS

(1) Drawings shall be prepared generally to proper size where appropriate or otherwise required by the SRT's Representative.

(2) All drawings shall be accurate, to scale and be fully dimensioned. The Private Party shall not rely on scaling for any dimension. Drawing style and presentation shall be standardized and shall be followed by all organizations and/or teams involved in the design of the Permanent Works. A logical drawing numbering and reference system shall be devised and used for all drawings. Drawings shall be in ink with lettering sizes and line thicknesses compatible with microfilming requirements. Title blocks for the drawings shall be those contained in Appendix 4 to the SRT's Requirements, and shall be followed by all organizations and/or teams involved in the design of the Permanent Works.

(3) The Private Party shall submit five (5) prints of all drawings at reduced ISO A3 size. All documents submitted to the SRT's Representative shall upon receipt become the property of the SRT.

(4) Preparation, control and submittal of drawings using CAD software shall be in accordance with the Drawing Management System Specifications in Appendix 4 to these SRT's Requirements.

(5) Electronic transfer of drawings shall be in accordance with the Drawing Transfer Standards in Appendix 4 to these SRT's Requirements.

(6) During the designing phase the Private Party shall bear in mind about the functional harmonization of their specified E&M and M&E equipment. Such that the Private Party could be able to select functionally harmonized equipment which would be optimal for the preparation of spare part and maintenance in the future.

SRT'S REQUIREMENTS – EXECUTION

1. PRIVATE PARTY'S SUPERINTENDENCE

(1) The Private Party shall submit a Staff Organization Plan. This plan shall be updated and resubmitted whenever there are changes to the staff. The plan shall expose the management structure and state clearly the duties, responsibilities and authority of each staff member.

(2) The site agent and his assistants shall have appropriate experience in carrying out the type and magnitude of the Works and shall possess a recognized university degree or equivalent qualification in a branch of appropriate of their individual duties. In addition, the Private Party's staff shall include, but not limited to the following, each of whom shall be employed full time on the Contract and shall have appropriate qualifications and experience.

(a) Project Director

(b) Design Manager

(c) Construction Manager

(d) Signalling Specialist

(e) Telecommunication Specialist

(f) Power Supply Specialist

(g) Automatic Fare Collection System Specialist

(h) Trackwork Specialist

(i) Maintenance Specialist

(j) Operation Specialist

(k) Rolling Stock Specialist

(l) QC/QA Manager

(m) Security/Safety Manager

Full details of the qualifications experience and Professional Licence (or any other as requested by the SRT's Representative for clarifications) of all staff, listed above shall be submitted to the SRT's Representative for consent.

2. CHECKING OF THE PRIVATE PARTY'S TEMPORARY WORKS DESIGN

The Private Party's Designer shall check the effect of the Temporary Works on the Permanent Works. The Private Party shall, prior to commencing the construction of the Temporary Works, submit a certificate to the SRT's Representative signed by the Private Party certifying that the Temporary Works have been properly and safely designed and checked and that the Designer has checked the effect of the Temporary Works on the Permanent Works and has found this to be satisfactory. In the design and construction of the Temporary Works the Private Party shall adopt standards which are commensurate with the importance of the Works and generally in accordance with Specification.

3. THE SITE

3.1 Use of the Site

The Site or Private Party's Equipment, committed to the Project, shall not be used by the Private Party for any purposes other than for carrying out the Works, except that, with the permission in writing of the SRT's Representative.

3.2 Access to the Site

(1) The Private Party shall make its own arrangements, subject to the consent of the SRT's Representative, for any further access required to the Site.

(2) In addition, the Private Party shall ensure that access to every portion of the Site is continually available to the SRT's Representative.

3.3 Access Outside the Site

The Private Party shall be responsible for ensuring that any access or egress through the Site boundary are controlled such that no disturbance to residents or damage to public or private property occur as a result of the use of such access or egress by its employees or others.

3.4 Survey of the Site

A survey shall be carried out of the Site to establish its precise boundaries and the existing ground levels within it. This survey shall include a photographic survey sufficient to provide a full record of the state of the Site before commencing the work, with particular attention paid to those areas where reinstatement will be carried out later on. The survey shall be carried out before the Site clearance wherever possible and in any case prior to the commencement of work. The survey shall be carried out by the Private Party and agreed with the SRT's Representative.

3.5 Fencing and Signboards

(1) The Private Party shall erect hoardings, fences and gates around its areas of operations to prevent entry by unauthorized persons to his work areas. The Private Party shall submit its proposals fencing to the SRT's Representative. No work shall be commenced until the SRT's Representative has been satisfied that the fencing installed by the Private Party is sufficient to prevent, within reason, unauthorized entry.

(2) Project signboards shall be erected not more than four (4) weeks, or such other period permitted by the SRT's Representative, after the date of commencement of the Works. The types, sizes and locations of Project signboards shall be agreed with the SRT's Representative before manufacture and erection. Other advertising signs shall not be erected on the Site unless permitted by the SRT's Representative.

(3) Hoardings, fences, gates and signs shall be maintained in good order by the Private Party until the completion of the Works.

(4) All hoardings, fences, gates and signs installed by the Private Party shall be removed by the Private Party upon the completion of the Works, unless otherwise directed by the SRT's Representative.

3.6 Clearance of the Site

All Temporary Works which are not to remain on the Site after the completion of the Works shall be removed prior to completion of the Works or at other times instructed by the SRT's Representative. The Site shall be cleared and reinstated to the lines and levels and to the same as existing condition before the Works started except as otherwise stated in this Contract.

4. SURVEY

Before the Private Party commences the setting out of the Works, the SRT's Representative will provide a drawing showing the position of each survey reference point and bench mark, together with the co-ordinates and/or level assigned to each point.

5. ENVIRONMENTAL REQUIREMENTS

Particular requirement applicable to this Contract for the Protection of the environment during the execution of the Works are defined in Appendix 5 to these SRT's Requirements.

The Private Party shall comply with all respects to the Acts and regulations issued by the Government of Thailand and its authorized agents in respect of the protection of the environment.

6. SAFETY MEASURES

(1) The Private Party shall, as a priority, in all its activities, undertakings and endeavors, ensure the continued and continuous safety measures of the public and all persons directly or indirectly associated with the Works.

(2) The Private Party shall comply with all safety and industrial health legislation including, without limitation, the Rules and Regulation of the National Safety Council of Thailand (NSCT) and the Announcement of the Ministry of Interior entitled "Working Safety".

(3) The Private Party shall comply with the SRT's Representative's requirements insofar as displaying in each of its site offices, workshops and canteens a copy of such safety and industrial health posters and keeping on the Site copies of safety and industrial health regulations and documents in Thai and English languages.

(4) The Private Party shall prepare and submit to the SRT's Representative a Site Safety Plan which shall contain, without limitation, details of the following:

(a) safety staff organizational structure, which shall identify the personnel to be engaged solely for site safety assurance, the responsibilities of the participants and the subdivision of the site safety assurance tasks into elements which can be effectively controlled, technically and managerially. Names, addresses, telephone and facsimile numbers of all participants shall be listed where known (Supplements to the Site Safety Plan will update and complete this information);

(b) criteria for appointment of principal safety staff;

(c) proposed interaction and communication procedures between the Private Party's personnel and safety staff, including proposals for radio communication facilities. In particular, the establishment of a regular communication and reporting system between the Safety Officer and the Project Director responsible for the Contract and the site agent shall be demonstrated;

(d) the statutory and contractual obligations regarding safety, rescue and industrial health imposed on the Private Party; and the means by which the Private Party will supervise, monitor and audit his site safety assurance system to ensure due compliance with these obligations;

(e) an undertaking signed by the Project Director of the Private Party, or the Managing Directors of companies of the consortium or joint venture comprising the Private Party, to the effect that the Private Party will ensure that safety and industrial health are given highest priority in all aspects of the Works and in discharging his contractual obligations;

(f) frequency, coverage and intent of site safety meetings together with the rationale for attendance;

(g) frequency, coverage and intent of regular site safety reports;

(h) methods of promoting an awareness of site safety and site rescue procedures, and industrial health amongst all persons directly or indirectly associated with the Works. This shall include proposals for onsite publicity, training courses for all workmen on the Site and at all levels of supervision and management, incentive schemes for the promotion of compliance with safety measures, etc. The frequency, coverage and application of training courses shall be included together with the means of attaining the objective that all workmen shall be required to attend a safety induction course within their first week on Site and thereafter at times appropriate to their prospective duties;

(i) understanding of and means of ensuring due compliance with the statutory regulations relating to construction work in Thailand;

(j) the powers vested in the safety staff which would enable them to take urgent and appropriate action to make safe the Site and prevent unsafe working practices or other infringements of the Site Safety Plan or statutory regulations;

(k) the means by which safety, rescue and industrial health matters and requirements will be communicated to sub-contractors of all tiers and their due compliance with the Site Safety Plan and all relevant statutory regulations is ensured;

(l) method by which the safety procedures and practices proposed by sub-contractors will be reviewed for compliance with the Site Safety Plan and statutory regulations;

(m) the safety equipment, rescue apparatus and protective clothing which will be required for the Works, including the quantity, sourcing, standards of manufacture, storage provisions and means of ensuring proper utilization by all workmen and staff employed directly or indirectly by the Private Party and repair to or replacement of damaged equipment. Such equipment shall include, but not be limited to, site helmets, goggles and other eye protectors, hearing protectors, safety harnesses, safety equipment for working in the confined spaces (e.g. sewers, drains etc.), rescue equipment;

(n) the means by which safety equipment, scaffolds, guard-rails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment shall be inspected, tested and maintained and the standards below which such items will be removed from the Site and replaced;

(o) operation of the specified first aid base;

(p) emergency and rescue procedures and associated equipment;

(q) protection of authorized and unauthorized visitors to the site;

(r) the means by which the site safety assurance system will be supervised, monitored and audited by the Safety Officer to ensure due compliance with the principles and objectives of the Site Safety Plan at all levels of construction. Procedures for updating the Site Safety Plan and associated assurance system shall be given;

(s) records to be prepared and maintained by the Safety Officer and safety staff and communication procedures to be adopted by the Safety Officer such that the SRT's Representative and others associated with the Works (e.g. sub-contractors) are kept fully informed on matters relating to site safety and industrial health regulations throughout the period of the Contract;

(t) proposals for statistical measurement and monitoring of the safety and health performance of the Private Party and sub-contractors of all tiers and how such proposals reflect responsible practice in the construction and manufacture industry. The means by which the site safety and industrial health performance of the Private Party and sub-contractors of all tiers can be compared with local and international norms shall be given together with the suggested rationale for establishing such norms;

(u) aspects of the Temporary Works design which should be communicated to the SRT's Representative and others directly or indirectly associated with the Works if the installation of the associated works has a particular significance on the site safety of the Works;

(v) an appreciation of the industrial health hazards likely to be associated with the Works and proposals for minimization of the risks associated with such hazards. The means of minimization of the effects of climatic exposure (heat, wind and moisture) and an exposure to noxious substances;

(w) proposals to ensure that construction/manufacture/installation methods do not compromise the Private Party's commitment to the Site Safety Plan or its compliance with the statutory regulations.

(5) The Private Party shall appoint a Safety Officer whose duties throughout the period of the Contract shall be entirely connected with the safety and industrial health aspects of the Private Party's activities on the Site. The Safety Officer shall be a suitably qualified and experienced person who shall supervise and monitor compliance with the Site Safety Plan and shall, in particular but without limitation, carry out auditing of the operation of the Site Safety Plan in accordance with a rolling program to be submitted, from time to time, to the SRT's Representative for its consent. The Safety Officer's appointment shall be within twenty eight (28) days of the date of acceptance of Tender and shall be subject to the SRT's Representative's consent.

(6) The Private Party shall not undertake any works on the Site until the Safety Officer has commenced duties on site unless specifically agreed in writing by the SRT's Representative.

(7) The Private Party shall not remove the Safety Officer from the site without the express permission of the SRT's Representative. Within fourteen (14) days of any such removal or notice of intent of removal, the Private Party shall nominate a replacement Safety Officer for the SRT's Representative's consent.

(8) The Private Party shall provide the Safety Officer with supporting staff in accordance with the staffing levels set out in the Site Safety Plan. The supporting staff shall include a number of Deputy Safety Officers whose appointments shall be subject to the SRT's Representative's consent under similar criteria to those contained under Clause 6(5) above. The Deputy Safety Officers shall be capable of assuming the duties and functions of the Safety Officers as contained in the Site Safety Plan whenever necessary.

(9) The Private Party shall empower the Safety Officers and safety staff to instruct employees of the Private Party or of its sub-contractors of any tiers to cease operations and take urgent and appropriate action to make safe the Site and prevent unsafe working practices or other infringements of the Site Safety Plan or the statutory regulations.

(10) The Private Party's Staff Organization Plan shall show direct lines of communication and reporting between the Safety Officer and the site agent and between the Safety Officer and the Project Director responsible for the Contract. The Private Party shall instruct and require the site agent and the Project Director responsible to be directly accountable in all matters concerning site safety.

(11) The Private Party shall submit regular site safety reports to the SRT's Representative in accordance with the Site Safety Plan. Such reports shall be submitted as part of the Monthly Progress Report (MPR) to be submitted in accordance with the Contract. Prior to submission, the site safety report shall be endorsed by the Project Director responsible for the Contract and the site agent. Site safety reports shall comprehensively address all relevant aspects of site safety and industrial health regulation and, in particular, report on all site safety audits undertaken during the period covered by the report.

(12) Any breaches of the Site Safety Plan or the statutory regulations or others disregard for the safety of any persons may be the reason for the SRT's Representative to exercise his authority to require the site agent's removal from the Site.

(13) The Private Party shall provide its sub-contractors with copies of the Site Safety Plan and shall incorporate into all sub-contract documentation provisions to ensure the compliance with such plan at all tiers of the sub-contracting.

(14) The Private Party shall, unless the SRT's Representative's consent in writing is given, require all sub-contractors to appoint a safety representative who shall be available on the Site throughout the execution period of the respective sub-contract. In the event of the SRT's Representative's consent being given, the Safety Officer or safety staff, without prejudice to their other duties and responsibilities, shall ensure, as far as is practically possible, that employees of sub-contractors of all tiers are conversant with appropriate parts of the Site Safety Plan and the statutory regulations.

(15) The Private Party shall convene regular safety meetings in accordance with the Safety Plan and shall require attendance by the Safety Officer and safety representatives of sub-contractors unless otherwise agreed by the SRT's Representative. All safety meetings shall be notified in advance to the SRT's Representative who may attend in person or by representative at his discretion. The minutes of all safety meetings shall be taken and sent to the SRT's Representative within seven (7) days of the meeting.

(16) The Private Party shall ensure that safety equipment and protective clothing as described in the Safety Plan is available on the site at all times and that measures for the effective enforcement of proper utilization and necessary replacement of such equipment and clothing are incorporated into the Site Safety Plan.

(17) The Private Party shall regularly inspect, test and maintain all safety equipment, scaffolds, guard-rails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs shall be kept clear of obstructions and legible to read. Equipment which is damaged, dirty, incorrectly positioned or not in working order shall be repaired or replaced immediately.

(18) The Private Party shall provide a suitable first aid base at each major work location, including Stations and Depot and at the front-end of railway construction. Trained workforce personnel shall at all times be designated as the responsible first-aid within each work location.

(19) The Private Party shall ensure that safety, rescue and industrial health matters are given a high degree of publicity to all persons regularly or occasionally on the Site. Posters, in both Thai and English, drawing attention to site safety, rescue and industrial health regulation shall be made or obtained from the appropriate sources and shall be displayed prominently in relevant areas of the Site.

(20) The Private Party shall conduct regular safety training and rescue training courses, the frequency, coverage and application of which shall be in accordance with the Site Safety Plan. The Private Party shall require that all sub-contractor's employees participate in relevant training courses appropriate to the nature, scale and duration of the sub-contract works.

(21) Any employees of the Private Party or sub-contractors of any tiers who commit a serious breach of the safety regulations shall be liable to summary dismissal and shall not be re-employed on this Contract or allowed on the Site. The due notice of this sanction shall be prominently displayed on the Site.

(22) All plant and equipment used on or around the Site shall be fitted with appropriate safety devices. These shall include but not be limited to :

(i) effective safety catches for crane hooks and other lifting devices.

(ii) functioning automatic warning devices and, where applicable, an up-to-date test certificate, for cranes and hoists.

(23) The Private Party shall be responsible to provide temporary electric supplies for construction site. The temporary electric supplies shall comprise the basic safety requirements in accordance with EIT Standard 2001-56 but not limited to the followings:

(a) feeder cables and branch circuits shall be designed and installed in accordance with the EIT 2001-56.

(b) short circuit and overload protection device shall be provide with appropriate sizes to match with the protected cables and their appliance.

(c) earthing shall be designed and installed in accordance with the EIT 2001-56 to provide safety to the workers and equipment.

(d) power outlets shall be provided throughout the construction site as the temporary power supply to the construction equipment and devices via the power sockets. The power sockets and outlets shall be grounded type.

(e) lighting shall be provided throughout the construction site with appropriate illumination in accordance with the local regulations. In case metal luminaries are used, they shall be grounded with appropriate size ground conductor.

(f) the exposed live parts of temporary electrical supplies shall be grounded.

(24) All plants and equipment used on or around the Site shall be operated by suitably qualified personnel.

(25) The SRT's Representative shall be notified by the Private Party immediately any accidents occur whether on-site or off-site in which the Private Party, its personnel or plants, or those of its sub-contractors are directly or indirectly involved and which results in any injuries to any persons. Such initial notification may be verbal and shall be followed by a written comprehensive report within 24 hours of the accident.

Additionally the Private Party shall notify the SRT's Representative in writing within twenty four (24) hours of any incident occurring whether on-site or off-site at which the Private Party or any sub-contractors are involved and could have resulted in serious injuries to persons or significant damaged the Works.

(26) The Private Party shall provide full co-operation and assistance in all safety surveillance carried out by the SRT's Representative or the SRT.

(27) The Private Party shall ensure that the Safety Officer maintains a daily site safety diary, such diary comprehensively recording all relevant matters concerning site safety, safety inspections and audits, safety related incidents and the like. The site safety diary shall be available at all times for inspection by the SRT's Representative.

7. CARE OF THE WORKS

(1) Unless otherwise permitted by the SRT's Representative all work shall be carried out in dry conditions.

(2) The Works, including materials for use in the Works, shall be protected from damage due to water. Water on the Site and water entering the Site shall be disposed of by temporary drainage or pumping systems or by other methods capable of keeping the Works free of water. Silt and debris shall be removed by traps before the water is discharged and shall be disposed of at a location or locations consented to by the SRT's Representative.

(3) The discharge points of the temporary systems shall be as approved by the SRT's Representative. The Private Party shall make all arrangements with and obtain the necessary approval from the relevant authorities for discharging water to drains, watercourses. The relevant work shall not be commenced until the approved arrangements for disposal of the water have been implemented.

(4) The method used for keeping the Works free of water shall be such that settlement of, or damages to, the new and existing structures does not occur.

(5) Measures shall be taken to prevent floating of the new and existing structures.

7.1 Protection of the Works from Weather

(1) Work shall not be carried out in weather conditions which may adversely affect the Works unless proper protection is provided to the satisfaction of the SRT's Representative.

(2) Permanent Works, including materials for such Works, shall be protected from exposures of weather conditions which may adversely affect such Permanent Works or materials.

(3) During execution of the Works, storm restraint systems shall be provided where appropriate. These systems shall ensure the security of the partially completed Works at all stages of construction or installation and in all weather conditions. Such storm restraint systems shall be installed as soon as practicable and shall be compatible with the right of way, or other access around or through- out the Site.

(4) The Private Party shall at all times program and order the work and make all arrangements such that the Works can be made safe in the event of storms.

7.2 Protection of the Works

(1) The finished works shall be protected from any damages which could arise from the adjacent works.

(2) The Private Party shall provide, install and operate adequate wheel washing and inspection facilities adjacent to any access to any completed carriageway surfacing, and shall ensure that all vehicles are cleaned and in proper condition and properly loaded and secured prior to running on any public road.

8. DAMAGE AND INTERFERENCE

(1) Work shall be carried out in such a manner that there is no damage to or interference with:

(a) water courses or drainage systems;

(b) utilities;

(c) structures (including foundations), roads, including street furniture, or other properties;

(d) public or private vehicular or pedestrian access; and

(e) trees, graves or burial urns.

Other than to the extent that are necessary for them to be removed or diverted to permit the execution of the Works. The Private Party shall inform the SRT's Representative as soon as practicable of any items which are not stated in the Contract to be removed or diverted but which the Private Party considers need to be removed or diverted to enable the Works to be carried out; such items shall not be removed or diverted until the consent of the SRT's Representative to such removal or diversion has been obtained.

(2) Items which are damaged or interfered with as a result of the Works and items which are removed to enable work to be carried out shall be reinstated to the satisfaction of the SRT's Representative and to at least the same condition as existed before the work started.

8.1 Watercourses and Drainage System

(1) If the existing watercourses and drainage systems required to be permanently or temporarily diverted to enable the Works to be carried out, approval for such diversions shall first be obtained from the concerned authority and the SRT's Representative. Temporary diversions shall be maintained while the work is being carried out and shall be reinstated, including the removal of any obstructions to flow, as soon as practicable after the work is complete, all to the satisfaction of the SRT's Representative.

(2) Measures shall be taken to prevent the excavated material, silt or debris from being deposited in the existing drainage systems or watercourses. The proposed measures shall be submitted to the SRT's Representative for consent.

8.2 Utilities

(1) The details of existing utilities given by the SRT are for information only and the accuracy of the details is not warranted. The Private Party shall make his own enquiries and investigations, including excavating trial holes, to ascertain the existence, nature, location and size of utilities. The Private Party shall be responsible for all costs and charges in connection with the temporary and/or permanent relocation of all affected utilities.

(2) Temporary supports and protection by methods proposed by the Private Party and agreed by the utility owner shall be provided to the utilities; permanent supports and protection shall be provided if required for the safety and security of the utility service.

(3) The Private Party shall immediately inform the SRT's Representative and the utility undertakings of:

(a) damage to utilities;

(b) leakage of utilities;

(c) discovery of utilities not previously identified; and

(d) diversion, removal, repositioning or re-erection of utilities which is required to enable the work to be carried out.

(4) The Private Party shall inform the SRT's Representative of the agreed program of all work to be carried out by the utility undertakings and shall take all steps to enable the utility undertakings to proceed in accordance with the program. The Private Party shall maintain close liaison with the utility undertakings and shall allow in its Works Program for all works to be undertaken by the utility undertakings.

(5) Records of the existing utilities encountered shall be kept by the Private Party on the Site and a copy provided for the SRT's Representative. The records shall contain the following details:

(a) location of utility;

(b) date on which the utilities were encountered;

(c) nature and sizes of the utilities;

(d) condition of utility; and

(e) temporary or permanent supports provided.

The Private Party shall include the details (plan, location, ownership, size and material) of all such utilities on the As Built Drawings.

8.3 Structures, Roads and Other Properties

The Private Party shall immediately inform the SRT's Representative of any damages to structures, roads or other properties.

8.4 Access

Alternative access shall be provided if necessary concerning the interference with the existing public or private vehicular or pedestrian access to enable the Works to be carried out. The arrangements for the alternative access shall be as agreed by the SRT's Representative. Unless agreed otherwise, the permanent access shall be reinstated as soon as practicable after the work is complete and the alternative access shall be removed immediately as it is no longer required, and the ground surfaces reinstated to the satisfaction of the SRT's Representative.

8.5 Tree

Materials, including excavated materials, shall not be banked around trees. Trees shall be protected from damages at all times by the methods consented to by the SRT's Representative. Unless consented to by the SRT's Representative, trees shall not be trimmed or cut.

8.6 Removal of Tree, Graves and Other Obstructions

If any trees, graves and other obstructions are required to be removed in order to execute the Works and such removal have not yet been arranged for, the Private Party shall draw the SRT's Representative's attention to them in appropriate time to allow all necessary arrangements and authorizations for such removal, and they shall not be removed unless so instructed by the SRT's Representative.

8.7 Protection of the Adjacent Structures Works

The Private Party shall take all necessary precautions to protect the structures or works being carried out by others, adjacent to and, for the time being, within the Site from the effects of vibrations, undermining and any other earth movements or the diversion of water flow arising from his work.

9. WORK ON ROADS

9.1 Restrictions on the use of Highways and Public Right of Way

The Private Party shall not make use of public or private right of way for depositing or storing plants or materials, other than such plant, materials, tools or implements as shall from time to time be required for immediate use on several sections of the Works. Plants, materials and Temporary Works shall be placed in such a way as to cause minimum interference with the use of any right of way by the public and the Private Party shall maintain those parts of the right of way as without temporarily occupied by the Works in a clear, passable and safe condition at all times.

9.2 Approval for Temporary Traffic Arrangements and Control

(1) In addition to any other requirements stated in the Contract, temporary traffic arrangements on public roads shall be in accordance with conditions and restrictions imposed by the Bangkok Metropolitan Administration (BMA), the Department of Highways (DOH), the Department of Rural Road (DRR), the Public Works Department (PWD) and the Police Department. Temporary lighting, signing, guarding and traffic control arrangements shall be in accordance with conditions and restrictions imposed by the DRR, the BMA, the DOH and the Police Department and shall conform with the standards and regulations of the National Safety Council of Thailand. Traffic signs which are not of the type prescribed by the National Safety Council shall be in accordance with conditions and restrictions imposed by the DRR, the BMA, the DOH, the PWD, the Police Department and other relevant authorities.

(2) The Private Party shall make all arrangements with and obtain the necessary approval from the DRR, the BMA, the DOH, the Police Department and other relevant authorities for temporary traffic arrangements and control on public roads. In the event that the Private Party, having used its best endeavours, fails to secure the necessary approval from these authorities for temporary traffic arrangements and control on public roads, then the SRT will assist the Private Party to secure such approval but the responsibility still be on the part of the Private Party.

9.3 Temporary Traffic Arrangements and Control

(1) Temporary traffic diversions and pedestrian routes shall be provided where work on roads or footways obstruct the existing vehicular or pedestrian access. The relevant work shall not be commenced until the approved temporary traffic arrangements and control have been implemented.

(2) Temporary traffic arrangements and control for work on public roads and footways shall comply with the requirements of the BMA, the DOH, the Police Department and other relevant authorities. Copies of documents containing such requirements shall be kept on the Site at all times.

(3) Temporary traffic signs, including road marking, posts, backing plates and faces, shall comply with the requirements of the BMA, the DOH, the Police Department and other relevant authorities.

(4) The thickness of backing plates for temporary traffic signs may not be less than 1.5 mm; the posts for the signs may be constructed of timber or other materials provided that in the opinion of the Private Party the traffic signs will be stable and safe.

(5) The arrangement of information contained on the sign faces for temporary traffic directional signs shall be designed by the Private Party. The details of the background, borders and legends, including letters, numerals, characters and symbols, shall comply with the requirements of the BMA, the DOH and the Police Department.

(6) Temporary traffic arrangements and control shall be inspected and maintained regularly, both by day and night. Lights and signs shall be kept clean and legible to read. Equipment which are damaged, dirty, incorrectly positioned or not in working order shall be repaired or replaced immediately.

9.4 Particulars of Temporary Traffic Arrangements and Control

The following particulars of the proposed temporary traffic arrangements and control plan and layout on public roads shall be submitted to the SRT's Representative for approval at least 28 days before the implementing:

(1) details of traffic diversions and pedestrian routes;

(2) details of lighting, signing, guarding and traffic control arrangements and equipment; and

(3) any conditions or restrictions imposed by the DRR, the BMA, the DOH and the Police Department or any other relevant authorities, including copies of applications, correspondence and approval.

9.5 Use of Roads and Footways

(1) Public roads and footways on the Site in which the work is not being carried out shall be maintained in a clean and passable condition;

(2) Measures shall be taken to prevent the excavated materials, silt or debris from entering gullies on roads and footways; entry of water to the gullies shall not be obstructed;

(3) Surfaced roads on the Site and leading to the Site shall not be used by tracked vehicles unless protection against damage is provided; and

(4) The Private Party's Equipment and other vehicles leaving the Site shall be loaded in such a manner that the excavated material, mud or debris will not be deposited on roads. All such loads shall be covered or protected to prevent dust being emitted. The wheels of all vehicles shall be washed when necessary before leaving the Site to avoid the deposition of mud and debris on the roads.

9.6 Reinstatement of Public Roads and Footways

Temporary diversions, pedestrian access and lighting, signing, guarding and traffic control equipment shall be removed immediately when they are no longer required. Roads, footways and other items affected by temporary traffic arrangements and control shall be reinstated to the same condition as existed before the work started or as permitted by the SRT's Representative immediately after the relevant work is complete or at other times permitted by the SRT's Representative.

10. SITE ESTABLISHMENT

10.1 SRT and SRT's Representative Main Site and Site Accommodation

(1) The Private Party shall provide, erect, maintain and remove the main Site and the Site accommodation for the use of the SRT and the SRT's Representative. Detailed requirements are set out in Appendix 7 of the SRT's Requirements. The office equipment and furniture shall be handed over back to the Private Party after the completion of Phase I

(2) Offices shall be at locations agreed by the SRT's Representative. The office accommodation shall be retained until the Works of Phrase 1 have completed unless otherwise instructed to the contrary by the SRT's Representative.

(3) Prior to commencing the erection of the SRT's accommodation the Private Party shall obtain the consent of the SRT's Representative to the accommodation, including layout, equipping and furnishings proposed by the Private Party. The Private Party shall make such reasonable amendments to the layout and furnishings as the SRT's Representative may request.

(4) Unless otherwise permitted by the SRT's Representative, the Private Party shall complete the accommodation and provide all equipment and furnishing in sufficient time to allow the SRT and/or his Representative to occupy the offices prior to the commencement of excavation or any Permanent Works. From the date of commencement of the Works until such time as the SRT's offices have been completed and accepted by the SRT's Representative, the Private Party shall provide such temporary offices and equipment and furnishings at such location or locations as the SRT's Representative may require.

(5) The accommodation shall be maintained in a clean, stable and secure condition and shall be cleaned at least daily. The services of a full-time security guard and attendant shall be provided at each building for the SRT.

(6) Equipment provided for the use of the SRT and/or his Representative shall be maintained in a clean and serviceable condition and all consumables shall be replenished when required. Measuring and testing equipment shall be calibrated before they are used and at regular intervals as approved to by the SRT's Representative. Survey equipment shall be maintained by the service agent and shall be regularly checked. Equivalent replacements shall be provided for equipment which are not in working order or otherwise are not in a serviceable condition or are being repaired or serviced.

(7) The permission of the SRT's Representative shall be obtained before accommodation or equipment are removed. Portable accommodation shall be moved at the times instructed by the SRT's Representative. Accommodation or equipment which are to be left in position or becomes the property of the SRT after completion of the Works shall be repaired, repainted and serviced as instructed by the SRT's Representative.

10.2 SRT's Accommodation of Off-Site Work

(1) Where any portion of the Works is prepared or fabricated off-site or at any fabrication facilities remote from the Site, whether by the Private Party or one of his sub-contractors or suppliers, the Private Party shall provide and maintain office accommodation, furnishings, and equipment for the use of the SRT and/or his Representative and its staff at each such location for the duration of such work.

(2) The accommodation furnishings and equipment shall be suitable and sufficient for the purposes of the SRT's Representative and shall be according to the SRT's Representative's approval.

10.3 Site Laboratories

The Private Party shall provide, erect and maintain in a clean, stable and secure condition a laboratory, equipped for the routine testing of concrete, soil and rock samples and for the storage and curing of concrete cubes or cylinders only. This laboratory shall be located at the Private Party's principal work site or at a location agreed to by the SRT's Representative. Detailed requirements for this laboratory are set out in Appendix 8 to these SRT's Requirements.

10.4 Site Utilities and Access

(1) The Private Party shall be responsible for providing water, electricity, telephone, sewerage and drainage facilities for all site accommodation buildings in accordance with Appendix 7 to these SRT's Requirements and for all site laboratories in accordance with Appendix 8 to these SRT's Requirements and all such services that are necessary for the performance of the Works. The Private Party shall make all arrangements with and obtain the necessary approval from the relevant authorities for the facilities.

(2) Access roads and parking areas shall be provided within the Site as required and shall be maintained in a clean, acceptable and stable condition.

10.5 Transport for the SRT

The Private Party shall provide transport as described in Appendix 10 to these SRT's Requirements for the exclusive use of the SRT for any purpose in connection with the Works.

10.6 Mobile Phone Communication

The Private Party shall provide, test and maintain a mobile phone communication system for the exclusive use of the SRT and the SRT's Representative. The Private Party shall be responsible for obtaining and making all payments in respect of all permits licenses and charges involved in the provision and use of the mobile telephone system for domestic call. The minimum equipment to be available for the exclusive use of the SRT and/or his Representative are listed in Appendices 10 to these SRT's Requirements.

10.7 Assistance to the SRT and SRT's Representative

(1) The Private Party shall provide for the exclusive use of the SRT's Representative at all times during the Contract all such experienced chainmen, staff-men, field and office attendants, drivers, servants, watchmen, instruments, apparatus and protective clothing as the SRT's Representative may deem to be necessary for the execution of their duties in connection with the Contract.

(2) All instruments and apparatus shall be maintained in good working order to the approval of the SRT's Representative. The minimum equipment to be available for the exclusive use of the SRT and/or his Representative are listed in Appendices 7, 8, 9 and 10 to these SRT's Requirements.

(3) The Private Party shall be solely responsible for all such instruments and apparatus and shall ensure that they are at all times in good repair and adjustment and shall replace items if necessary to meet this requirement. All equipment other than expendable items shall revert to the Private Party after all works of Phrase 1 have been completed.

10.8 Submission of Particulars

(1) The following particulars shall be submitted to the SRT's Representative for his consent not more than twenty eight (28) days after the date of commencement of the Works:

(a) Drawings showing the formation works and the layout within the Site of the SRT and SRT's Representative's accommodation, the Private Party's offices, Project signboards, principal access and other major facilities required early in the Contract, together with all service utilities;

(b) Drawings showing the layout and the construction details of the SRT and SRT's Representative's accommodation; and

(c) Drawings showing the details to be included on the Project signboards.

(2) Drawings showing location of stores, storage areas, concrete batching plants and other major facilities shall be submitted to the SRT's Representative for his consent as early as possible but in any case not less than twenty eight (28) days prior to when such facilities are intended to be constructed on the Site.

11. SECURITY

(1) The Private Party shall be responsible for the security of the Site for the whole time the Site is in its possession. It shall set up and operate a system whereby only those persons entitled to be on the Site can enter the Site. To this end, the Private Party shall provide the specific points only at which entry through the security fence can be effected, and shall provide gates and barriers at such points of entry and whereby maintain a twenty four (24) hours security guard, and such other security personnel and patrols elsewhere as may be necessary to maintain security.

(2) In order to operate such a security system it will be necessary to instigate the issue of unique passes to personnel and vehicles entitled to be on the Site, which may need to be separately identifiable according to the shifts being worked on Site. The Private Party shall at the outset determine, together with the SRT's Representative, a system and the design of passes to suit the requirements of the foregoing and to suit the methods of work to be adopted by the Private Party.

12. TESTING AND COMMISSIONING

12.1 General

(1) The Private Party shall provide and perform all forms of testing procedures applicable to the Works and shall conduct factory, site and acceptance tests.

(2) The commissioning activity shall include a period of the Integrated System testing followed by a period of Trial Running for staff training and familiarization and timetable proving purposes.

(3) The testing procedures shall be submitted, as required, by the Private Party during the duration of Phase I to reflect changes in system design or the identification of additional testing requirements.

(4) All testing procedures shall be submitted at least twenty eight (28) days prior to conducting any Test. The Testing procedures shall show unambiguously the extent of testing covered by each submission, the method of testing, the Acceptance Criteria, the relevant drawing (or modification) status and the location.

(5) The SRT's Representative shall have the facilities for monitoring all tests and have access to all testing records. Ample time shall be allowed within the testing programs for necessary alterations to equipment, systems and designs to be undertaken, together with re-testing prior to final commissioning.

(6) All testing equipment shall carry an appropriate and valid calibration labels.

12.2 Testing of Civil and Architectural Works

12.2.1 Batches, Samples and Specimens

(1) A batch of material is a specified quantity of the material which satisfies the specified conditions. If one of the specified conditions is that the material is delivered to the Site at the same time, the material delivered to the Site over a period of a few days may be considered as part of the same batch if in the opinion of the SRT's Representative there is sufficient proof that the other specified conditions applying to the batch apply to all of the material delivered over the period.

(2) A sample is a specified quantity of material which is taken from a batch for testing and which consists of a specified amount, or a specified number of pieces or units, of the material.

(3) A specimen is the portion of a sample which is to be tested.

12.2.2 Samples for Testing

(1) Samples shall be of sufficient size to carry out all specified tests.

(2) Samples taken on the Site shall be selected by, and taken in the presence of the SRT's Representative and shall be marked for their identification.

(3) Samples shall be protected, handled and stored in such a manner that they are not damaged or contaminated and such that the properties of the sample do not change.

(4) Samples shall be delivered by the Private Party, under the supervision of the SRT's Representative, to the specified place of testing. Samples on which non-destructive tests have been carried out shall be collected from the place of testing after testing and delivered to the Site or other locations instructed by the SRT's Representative.

(5) Additional samples shall be provided for testing if in the opinion of the SRT's Representative :

(a) material previously tested no longer complies with the specified requirements; or

(b) material has been handled or stored in such a manner that it may not comply with the specified requirements.

12.2.3 Testing

(1) The Private Party shall be responsible for all on-site and off-site testing and for all in-situ testing. All appropriate laboratory tests shall be carried out in the Private Party's laboratory (see Clause 10.3), unless otherwise permitted by the SRT's Representative. Where the laboratory is not appropriately equipped and/or staffed, or if agreed to by the SRT's Representative, tests may be carried out in other laboratories provided that :

(a) they are accredited for the relevant work to a standard acceptable to the SRT's Representative ; and

(b) particulars of the proposed laboratory are submitted to, and approved by, the SRT's Representative.

(2) Equipment, apparatus and materials for in-situ tests and laboratory compliance tests carried out by the Private Party shall be provided by the Private Party. The equipment and apparatus shall be maintained by the Private Party and shall be calibrated before the testing starts and at regular intervals as permitted by the SRT's Representative. The equipment, apparatus and materials for in-the situ tests shall be removed by the Private Party as soon as practicable after the testing is complete.

12.2.4 Compliance of Batch

(1) The results of tests on samples or specimens shall be considered to represent the whole batch from which the sample was taken.

(2) A batch shall be considered as complying with the specified requirements for a material if the results of specific tests for of the specified properties comply with the specified requirements for the properties.

(3) If additional tests are permitted but separate compliance criteria for the additional tests are not stated in the Contract, the SRT's Representative shall determine if the batch complies with the specified requirements for the material on the basis of the results of all tests, including the additional tests, for every property.

12.2.5 Records of Tests

(1) Records of in-situ tests and laboratory compliance tests carried out by the Private Party shall be kept on the Site and a report shall be submitted to the SRT's Representative within seven (7) days, or such other time as agreed by the SRT's Representative, after completion of each test. In addition to any other requirements, the report shall contain the following details :

(a) material or part of the Works tested;

(b) location of the batch from which the samples were taken or location of the part of the Works;

(c) place of testing;

(d) date and time of tests;

(e) weather conditions in the case of in-situ tests;

(f) technical personnel supervising or carrying out the tests;

(g) size and description of samples and specimens;

(h) method of sampling;

(i) properties tested;

(j) method of testing;

(k) readings and measurements taken during the tests;

(l) test results, including any calculations and graphs; and

(m) other details stated in the Contract.

(2) Reports of tests shall be signed by the site agent or his assistant, or by another representative authorized by the Private Party.

12.3 Acceptance Tests

(1) The Private Party shall prepare and organize a comprehensive program of acceptance Tests to demonstrate to the SRT's Representative that all systems, sub-systems and apparatus defined under the Contract meet the specified performance requirements in all respects.

(2) These Tests shall be conducted by the Private Party in the presence of the SRT's Representative.

12.4 Integrated System Tests

The Private Party shall submit to the SRT's Representative requirements and procedures, in respect of the Private Party's scope of work to demonstrate that the complete system provided under the Contract is fully operational and meets the specified performance criteria. The conducting of these Integrated System Tests, by the Private Party, shall include a period of Test running.

12.5 Trial Running

Following satisfactory completion of the acceptance Tests and the Integrated System Test, the SRT will commence an extended period of trial running to prove all technical systems in time table operation, to allow all technical systems to settle.

13. RECORDS

13.1 Drawings Produced by the Private Party

Drawings produced by the Private Party including drawings of site layouts, Temporary Works, etc. for submission to the SRT's Representative shall generally be ISO A1 size. They shall display a title block with the information as detailed in Appendix 4 to these SRT's Requirements. The number of copies to be submitted to the SRT's Representative shall be as stated in the Contract, or as required by him.

13.2 Progress Photographs

(1) The Private Party shall provide monthly record progress photographs which are properly recorded to the SRT's Representative's satisfaction of the progress of the Works. The photographs shall be taken on locations agreed with the SRT's Representative to record the exact progress of the Works. Two sets of slides and 175 mm x 125 mm colour prints of each photograph shall be provided, together with an electronic file. The Private Party shall, unless otherwise agreed in writing by the SRT's Representative, arrange for eight (8) of each month's progress photographs to be aerial photographs taken at an agreed height.

(2) The Private Party shall mount each set of each month's progress photographs in a separate album of a type approved by the SRT's Representative, and shall provide for each photograph two typed self-adhesive labels, one of which shall be mounted immediately below the photograph and one on the back of the photograph. Each label shall record the location, a brief description of the progress recorded and the date on which the photograph was taken.

(3) All photographs shall be taken by a skilled photographer approved by the SRT's Representative. Processing shall be carried out by a competent processing firm to the satisfaction of the SRT's Representative.

(4) The Private Party shall ensure that no photography is permitted on the Site without the agreement of the SRT's Representative.

13.3 Record Video

The Private Party shall provide the SRT and SRT's Representative digital recorded Video showing progress of the Works at each stage.

The Private Party shall at least once every month make interim submissions to the SRT and SRT's Representative as a progress record of the Works one copy of all digital recorded video clips taken since the last submission.

The Private Party shall at least once in every six months make an aerial recorded video through a radio controlled aerial photography using Unmanned Aerial Vehicle (AUV) or commonly known as drone showing progress of the Works.

14. MATERIALS

Materials, equipment and goods for inclusion in the Permanent Works shall be new unless otherwise approved by the SRT's Representative. Preference shall be given to local materials and equipment as much as possible. The proposed materials and equipment shall comply with the relevant standards stated in the Specification and be consented to by the SRT's Representative.

14.1 Provision and Disposal of Earthworks Material

(1) The Private Party shall be responsible for the provision of all classes of earthworks material required for the Works, whether sourced from the excavations within the Contract or obtained from any other sources, consented to by the SRT's Representative, which are located outside the Site.

(2) The Private Party shall be responsible for the disposal, in a manner and at a location approved by the SRT's Representative at the expense of the Private Party, which approval shall not unreasonably be withheld, of all unsuitable or surplus excavated material.

14.2 Ownership of Fossil and Earthworks Material

(1) Fossil and Earthworks materials within Right of Way shall remain the property of the SRT. The Private Party shall be responsible for storage of fossil and earthworks materials at the location consented to by the SRT's Representative.

(2) All fossils, coins, articles of value or antique and other remains or things of geological or archaeological interest discovered on the site during excavation of earthworks material shall be the property of the SRT.

15. BUILDING SERVICES AND LIFTS & ESCALATORS

The Private Party shall design, procure, install and commission building services (mechanical and electrical) including lifts & escalators in accordance with the requirements stipulated in the Volume III Part 1: Outline Design Specifications and Volume III Part 2, Book 2 Outline Construction Specifications.

16. SYSTEM ASSURANCE

16.1 General

The Private Party shall carry out system assurance to demonstrate and ensure that the requirements of safety, design verification, ergonomics including human machine interfaces, Electromagnetic Compatibility (EMC) and noise for the Works are adequately considered and any modification resulting from these considerations are included in the design of the Works.

The Private Party shall plan and implement the system assurance in a systematic and logical manner that will demonstrate to the SRT's Representative that the requirements for safety and other issues identified in the SRT's Requirements have been adequately addressed.

System assurance shall be applied throughout the design, procurement, manufacture, construction, installation, on-site testing, integrated system testing and trail running stages of the Works.

Prior to commencement of Revenue Service, the Private Party shall provide the SRT's Representative with all system assurance documentation, software and procedures to enable the SRT's Representative.

The System Assurance Plan shall demonstrate that the organization, resources and procedures exist to manage all system assurance activities within the Scope of Works.

The System Assurance Plan shall take account of :

(1) The design of the Railway;

(2) Testing and inspection procedure associated with the Works; and

(3) Commissioning,

The subjects to be covered in the "System Assurance Plan shall include, but not be limited to, the following;

(1) The scope and purpose of the "System Safety Plan"

(2) The scope and purpose of the "System Reliability Availability and Maintainability (RAM) Plan";

(3) The method of dealing with interfaces between the "System Safety Plan" and the "System RAM Plan";

(4) The scope and purpose of the "Fire Engineering Plan";

(5) A Summary of all system assurance procedures proposed to be used by the Private Party including those that are proposes to apply that may differ from or complement the requirements of the Contract.

(6) The Private Party's proposals for internal and Sub-contractor system assurance and safety audits; and

(7) A program showing in detail the timing of each activity described in the "System Assurance Plan".

16.2 Safety

The Private Party shall prepare a System Safety Plan as part of the overall system assurance activity which shall set down the policy and procedures for ensuring that the Works are designed and implemented to reduce the risks of injury in public service to as low a level as reasonably practicable.

Safety Risk Management

Safety Risk Management shall include those risks related to the prevention of death, injury and material loss (i.e. property and/or environmental damage).

The Private Party shall carry out pro-active identification of hazards relating to the Railway and whenever reasonably practical, hazards associated with the Works shall

be eliminated during the design stage. Where it is not reasonably practical to eliminate such hazards at the design stage, risk assessment shall be carried out to ensure that the risks associated with residual hazards are in the following order of procedure:

(1) Minimized at the design stage;

(2) Mitigated whenever possible; and;

(3) Are able to be subsequently managed.

The basis of safety risk management shall follow the "as low as reasonably practicable" (ALARP) principle as stipulated in EN50126.

In order to ensure a seamless approach to safety management of all aspects of the Railway, the Private Party shall also assist the SRT's Representative to identify all risks arising from the Works, and the Operation and Maintenance of the Railway and shall bring all such risks to the attention of the SRT's Representative.

The Private Party shall ensure compliance with and shall cross reference in the Hazard Log all Statutory Requirements relating to the safety of operation and maintenance of the Railway.

All codes of practice, standards and specifications contained within or required by the Private Party shall also be complied with and cross referenced in the Hazard Log.

The Private Party shall develop and maintain a Hazard Log for all identified hazards and this Hazard Log shall from part of the Proof of Safety documentation.

16.3 Reliability, Availability and Maintainability

The Private Party shall prepare a RAM Plan as part of the overall system assurance activity which shall set down the policy and procedures for ensuring that the Works are designed and implemented to maximize the intrinsic reliability, available and maintainability of all elements of the Works.

System assurance activities shall include system safety and RAM activities and the preparation of all supporting documentation. System assurance activities shall comply with the requirements of EN50126.

16.4 Hazard Analysis

The purpose of the Hazard Analysis is to identify and record all reasonably foreseeable hazards in the operation of the Railway and assesses the risk that each hazard represents to this operation.

The Private Party shall manage the process of hazard identification and initial risk assessment with input from all involved parties.

The results of the Hazard Analysis shall be recorded by the Private Party in a Hazard Log in the form of a relational database that can be used to track progress in the implementation of mitigating actions and provide an easily accessible reference for the future Operator of all actions taken with respect to any hazard of any type in an any location for any area of activity.

The Private Party shall maintain the Hazard Log and identify and record actions proposed to mitigate hazards against all involved parties.

The Private Party shall expedite and record in the Hazard Log the responses to all identified mitigating actions from all involved parties and report progress to the SRT's Representative on a regular basis.

The Private Party shall prepare a Hazard Review Procedure that shall cover all the processes application to the establishment, development and maintenance during Revenue Service of the Hazard Log including the process of identifying and adding a new hazard and new mitigating measures.

The Hazard Review Procedure shall be submitted for the SRT's Representative's consent.

The final risk assessment, acceptance of mitigation and close out of hazards shall conform to the approved safety and risk acceptance criteria.

The Hazard Log shall be substantially complete prior to commencement of Trial Running and shall be handed over to the SRT's Representative complete in all respects prior to the commencement of Revenue Service. Hanover shall include a fully functional soft copy of the database together with all passwords, supporting software and instructions on its use and further development during Revenue Service.

16.5 Proof of Safety

The "Proof of Safety" shall demonstrate that the Railway is fit for the purpose of commencing Revenue Service.

The "Proof of Safety" shall make traceable reference to system documentation that shall demonstrate as a minimum the following:

(1) That the Works have been manufactured, installed and tested up to and including integrated System Testing in a manner to ensure that the Railway can be operated and maintained within the parameters of risk as approved in the "Design Systems Safety Report" and that there are no safety issues outstanding;

(2) That the organization and management structure, which is recommended to be implemented to undertake the safe operation and maintenance of the Railway (including supporting persons), is in place;

(3) That the recommended safety performance criteria and safety thresholds for the safe operation and maintenance of the Railway have been set.

(4) That the standards and specifications upon which the safe operation and maintenance of the Railway have been set;

(5) That the safe systems of work, rules and procedures required to operate and maintain the Railway within the defined parameters of risk as approved in the "Design/Systems Safety Report" have been verified.

(6) That adequate co-operation and co-ordination measures have been established with all parties who may interface with or be affected by the operation and maintenance of the Railway.

(7) That control measures have been implemented for any activities of Private Party and sub-contractors which may have an effect on the safety of the Railway.

(8) That security systems and procedures have been implemented for the Railway.

(9) That procedures to monitor safety performance have been Implemented in respect of the operation and maintenance of the Railway.

(10) That procedures to record, report and investigate accidents and incidents have been implemented, together with the systems necessary to formulate and implement measures to prevent reoccurrence;

(11) That measures have been implemented to operate the Railway within the parameters of risk approved in the "Design/System Safety Validation"

(12) That the "Emergency Preparedness Plan" measures have been agreed and established involving, where necessary, co-operation with the relevant Authorities;

(13) That recommended levels and periodicity of internal and external safety audit procedures have been established; and

(14) That, in the event that part of the Railway commences partial Revenue Service prior to completion of all installation and testing activities, measures have been proposed to safeguard the integrity of that part of the Railway in operation from the remaining activities.

16.6 Design Safety Studies

The purpose of the "Design Safety Studies" is to document the process of design to ensure that it incorporates the general principle of minimizing risk in design as a first priority.

"Design Safety Studies" shall be prepared for system and sub-system elements that are considered to be safety critical and that require hazard analysis to a greater level of detail and with a greater level of knowledge of the Detailed Design of the hardware and software components that may affect the safety of the system and sub-system designs.

The overall system level hazard analysis process and the Hazard Log shall form a baseline for the "Design Safety Studies". The "Design Safety Studies" shall be commissioned using recognized quantitative and qualitative techniques which may be expected to include according to specific requirements;

- System and subsystem hazard analysis;
- Operation and Support Hazard Analysis;
- Hazard and Operability Studies;
- Fault Tree Analysis;
- Event Tree Analysis;
- Failure Mode Analysis;
- Failure Mode Effects Criticality Analysis;
- Interface Hazard Analysis;
- Quantified Risk Analysis

The "Design Safety Studies" shall specifically refer to hazards arising from:

- Normal operations including maintenance;
- Degraded modes of operation;
- Emergency situations; and
- The effectiveness or otherwise of mitigation proposed for natural catastrophes.

The "Design Safety Studies" shall take account of:

- Methods of operation;
- RAM considerations;
- Anticipated likely maintenance regimes and their sustainability in Revenue Services;

- Anticipated competence levels of personnel in Revenue Service; and
- Other human factors including the ergonomic studies specified in this document.

The format of the "Design Safety Studies" shall be agreed with the SRT's Representative and applied consistently to all systems and sub-systems.

The scope of the "Design Safety Studies" for each sub-system shall be agreed with the SRT's Representative case by case.

The Private Party shall submit a "Design Safety Studies" at the system level with respect to hazards arising from the alignment.

Prior to completion of the design stage, the Private Party shall provide a list of key safety issues to the SRT's Representatives for review and approval.

16.7 Fire Engineering Plan

The Private Party shall submit a "Fire Engineering Plan" (FEP), which shall be developed into a program indicating the criteria and predicted timings for the choice of materials (including paints), submission of test certifications and tests for materials and assemblies associated with the Works.

The content of the FEP shall be consistent with and complement the overall requirements of the "System Assurance Plan" and the "Design Safety Studies".

16.8 Design/Systems Safety Report

The "Design/System Report" shall be submitted at the completion of the Detailed Design period to confirm that all safety related aspects of design have been property addressed and comprehensively validated.

The Core Safety Management Section of the "Design/Systems Safety Report shall demonstrate, as a minimum, the following:

- That the overall risk criteria for the Railway have been addressed satisfactorily at the Detailed Design stage and that the Detailed Design proposals are mutually compatible with such risk criteria;
- That all Safety Critical systems have been identified at the Detailed Design stage and the apportionment of risk factors between the major systems and sub-systems support the overall safety criteria approved in the "System Safety Plan".
- that the results of the design safety studies have been incorporated into the design, and shall be carried forward into the final design, manufacturing and installation processes;

- that where management by operating and/or maintenance procedure or other management control measures have been identified during the "design safety studies", auditable methods by which such measures shall be introduced into operating/maintenance provisions have been established;
- that robust processes have been implemented to validate the safety critical aspects of software design; and
- that processes for assessing the potential safety impact of design changes exist.

The Private Party shall submit a RAM report at the end of the Preliminary Design stage, summarizing the activities which have been carried out. The reports shall provide recommendations for additional RAM analyses activities to be included in the subsequent design and later stages of the Works.

The Private Party shall undertake reliability testing of individual components and sub-assembles of the Works, as deemed appropriate to establish whether they are likely to be able to achieve the overall safety and RAM targets. Particular emphasis shall be given to the demonstration of systems, equipment or components that are 'new' or 'custom built' and thereby have a limited history in the field. Procedures incorporating proposed testing methods shall be submitted for the approval of the SRT's Representative. Testing methods shall include, but not be limited to:

- Environmental stress (pre-production) – to identify early failures due to weak parts, workmanship defects and other non-conformities; and
- Reliability acceptance testing (production) – to assess equipment performance and where necessary implement corrective action before commencement of Revenue Service.

The results of the RAM reports shall be fully coordinated with the maintenance plan.

The Private Party shall make system assurance design submissions, for the approval of the SRT's Representative, for each system/sub-system. The Private Party may, in addition to his declared System Assurance Plan submission program, male any other submissions as may assist the system assurance design approval process.

The Private Party shall update the RAM analyses during the Detailed Design stage, once sub-system and component RAM information has been determined. Projections of reliability growth shall also be undertaken. The Private Party shall submit a definitive RAM report at the end of the Detailed Design stage, summarizing the activities which have been carried out. The report shall provide recommendations for additional RAM analyses activities to be included in later stages of the Works.

The Private Party shall further develop and refine the Maintenance Plan, which shall be taken into account the findings of the definitive RAM Report, to ensure that the

RAM criteria can be satisfied. The refinements to the maintenance plan shall include, but not be limited to, the followings:

- Extent and frequency of preventative maintenance actions;
- Techniques to be employed to monitor the maintainability aspects to ensure that the SRT requirements can be satisfied; and
- A list of maintenance items or systems/subsystems that can be defined as Line Replaceable Units.

The Private Party shall propose for the SRT's Representative's review and acceptance a program of maintainability demonstrations to be carried out during the Trial Running period to indicate that the SRT requirements have been satisfied.

During the Defects Correction Period, day to day monitoring of the Railway RAM performance shall be carried out and the findings shall be used to enable systematic means of data analysis and recording of the RAM performance. In the event that a defect/failure shall arise, the Private Party shall provide full technical support in failure investigation and rectification. The Private Party shall employ suitable mechanisms and develop a suitable organization structure in conjunction with the SRT's Representative to support ongoing RAM activities.

The Private Party shall provide support to ensure that the documentation and processes defined in the Ongoing Management of Safety document have been fully assimilated into the Operator's Safety Management System and organization.

16.9 Data Reporting and Corrective Action System (DRACAS)

DRACAS shall be established by the Private Party to provide a documented history of problems and failures that occur during manufacture, construction and installation. It shall indicate how and why each problem arose and present corrective action options.

DRACAS shall be implemented by the Private Party for monitoring the safety and RAM performance of the equipment, during manufacture, installation, testing and commissioning into operation and also the maintenance of the Works to provide feedback to the design of this equipment.

In addition, DRACAS shall be used:

- To promote reliability growth of equipment beyond achievement of the target values;
- To consolidate failure data of equipment for reference of design review; and

- To verify the capacity and possible decline of equipment capacity during the verification testing and revenue operation in order to ensure the reliability level of equipment is sustainable.

17. RESTORATION OF AREAS DISTURBED BY CONSTRUCTION

Unless otherwise directed by the SRT's Representative, any areas disturbed by the construction activity, either inside or outside the Project Right of Way, shall be reinstated as follows:

(a) All areas affected by the construction work shall be reinstated to their original condition, with new materials, including but not necessarily limited to, sidewalks, parking lots, access roads, adjacent properties and landscaping.

(b) Areas expropriated for or used as a Worksite shall be restored in accordance with 19(a) above, except that no fencing will required unless directed by the SRT's Representative on a case-by-case basis.

18. MAINTENANCE

(1) The Private Party shall provide a maintenance support plan which shall include, but are not limited to, the following:

(a) procedures for maintaining each item, including overhaul;

(b) technical manuals;

(c) initial provision of spares, facilities, test equipment and tools;

(d) training requirements; and

(e) procedures for removal and replacement of components.

(2) Prior to issue of the Substantial Commissioning or Commissioning Certificate, the Private Party shall deliver to the SRT's Representative copies of all manufacturing drawings, schedules and software for all components, as well as all AS Built Drawings.

19. MANUALS

(1) The Private Party shall produce manuals for all equipment and systems supplied.

(2) The Private Party shall maintain all Manuals in an up-to-date condition throughout the Operation Period.

(3) The Private Party shall submit all Manuals for review by the SRT's Representative prior to Factory Acceptance Tests.

20. SPARES PARTS, SPECIAL TOOLS AND TEST EQUIPMENT

The Private Party shall keep sufficient stocks of spare parts, special tools and test equipment throughout the Concession Period to enable rapid replacement of any item in the Permanent Way Works found to require replacement.

Two years prior to the expiration of the Contract, the Private Party shall submit his recommendation to the SRT for review, a list of spares parts, special tools and test equipment sufficient for at least one year Operation and Maintenance after the expiration of Contract, required to be kept on hand by the SRT in order to perform Operation and Maintenance of all infrastructure and systems. The Private Party shall provide these spare parts, special tools and test equipment to the SRT upon approval, which is essential for day to day use in both corrective and preventative maintenance and for workshop use in the overhaul of all modules and units likely to be required.

21. EQUIPMENT IDENTIFICATION

All equipment and materials supplied shall be indelibly labelled or otherwise identified to show its identity, type, version, function, location, rating or limitation as appropriate. The Private Party shall prepare a list of all equipment stating these details and submit to the SRT's Representative for record.

22. TRAINING AND TECHNOLOGY TRANSFERS

(1) The Private Party shall implement the approved technical approach and methodology of Technology Transfer in due time with the consent of the SRT's Representative, which has been proposed during tendering stage as mentioned below.

(a) Transfer of Technology, knowledge and skills:

i) Collaboration in generating or improving existing knowledge to produce patents and Intellectual Property Rights (IPR).

ii) Development in industrial training syllabus for human capital development, build and expand the expertise in the related industry.

iii) Training activities required for the operation of the equipment supplied under the Contract or developing competencies for the implementation scope under the Contract.

(b) Research and Development (R&D): The Private Party is required to propose a program structure which the purpose is to carry out R&D program contributing to the local Education Institute in Engineering Program, the local Research Institute or the Industry Development.

(2) The Private Party shall be required to arrange for and to conduct the technology transferring/training to **the SRT's selected Staff, related Authority and Education Institute in Engineering Program**, hereinafter referred to as "**Trainee**", in respect of design, construction, manufacture, installation, maintenance and management of the System and of the Project, in all aspects related to the design, construction, manufacture, installation, maintenance of Civil Works, E&M and Rolling Stock. The technology transferring/training shall be in sufficient detail to appreciate, comprehend and monitor all aspects of

(a) Conceptual Design

(b) Preliminary and detailed Design

(c) Engineering, design standards, design criteria and parameters;

(d) Project planning

(e) Development of Construction Methodology

(f) Maintenance Concept and Procedure

(g) Level of maintenance

(h) Project Management Principle and Tools

(i) Maintenance Management Documentation

(j) Maintenance Quality Control and Monitoring Systems

(k) Manufacturing, Assembling, Testing & Installation

On-the-job Technology Transfer shall be undertaking to enrich their experience and knowledge such that these Participants can be able to appreciate, comprehend, monitor and perform all aspects of design, construction, maintenance, operation and management of the System and of the Project, in all aspects.

(3) Scope

Technology Transfer shall be based upon a 'two-stage' concept as follow:

- Stage one; Theoretical
- Stage two, on–the–job training

The Private Party shall provide technology transferring on all various Systems of

- Design
- Construction,
- E&M,

- Operation and Maintenance, and
- Management

(4) The Transferring/Training

(a) The transferring/training instructors provided by the Private Party shall be fully qualified and experienced personnel (SRTs and technician as required) of good and competent technical knowledge with technology transferring/ training experience.

(b) These transferring/training instructors to be assigned will be subjected to the approval of the Employer.

(c) All transferring/training courses will be conducted in Thai or English (with necessary interpreter).

(5) Detailed Plan

The Private Party are free to develop and plan his own outline technology transferring/ training plan as per Appendix 5 of Instructions to Tenderer (which is a part of his Proposal to be evaluated in Tender Proposal Evaluation). But after the Commencement Date, details training plans shall be submitted to the Employer within six (6) months.

(6) Monitoring Progress

(a) Throughout the technology transferring/training plan, the Employer shall have free access to all training sessions for monitoring.

(b) Methods for monitoring progress shall include; but will not necessarily be limited to:

- Theoretical tests;
- Practical tests

(c) Evaluation of technology transferring/training shall be required at regular intervals to monitor the progress and suitability of the technology transferring/training plan. If after being discussed and agree upon the technology transferring/training plan must be appended as soon as possible.

(d) Monthly progress reports, recording progress of the Trainee shall be kept up to date and shall be made available to the Employer when required.

(7) Location and Facilities

(a) The technology transferring/training shall be carried out at such timing and locations where the greatest benefit for the Trainee may be gained.

(b) During the technology transferring/training the Private Party shall be responsible for the safety (special or protective clothing), health, welfare, suitable allowances and accommodation of such the Trainee; as of their official position.

(8) Syllabus

Syllabus shall be appropriate to each level or category of the Trainee.

(9) Local Content

(a) The Private Party shall be required to use domestically manufactured goods or domestically supplied services accordingly;

- Civil Work shall be used the local content at least 90%.
- E&M shall be used the local content at least 20%.
- Operation and Maintenance shall be used the local content at least 30%.

(b) The Private Party shall employ local staff to operate and maintenance the High Speed Train at least 90% of the Organisation within 5 years after the Operation Phase.

23. PUBLIC AND COMMUNITY RELATIONS

(1) The Private Party shall provide the SRT at each site office with office and audio – visual equipment. This facility will serve as a One – Stop Public Relations and Community Relations Office where the public can obtain Project news and information or file any complaints. It will also be a coordination centre with other government agencies or the private sector and briefings can be held. The details of the facility including location and size shall be determined and agreed with the SRT.

(2) The Private Party shall prepare plans for regular public and community relations activities throughout the Contract period and submit the same for the SRT's approval within 3 (three) months after the date of the Contract signing.

24. MANAGEMENT OF CONFIDENTIAL INFORMATION

Systems suppliers, providing software, shall ensure that the programs have built-in security procedures and systems to permit management to restrict access to specific portions of the programs or operation thereof, and/or to appropriate staff levels or departments. Any attempted unauthorized access shall be alarmed and identified.

25. EXECUTION DATABASE MANAGEMENT SYSTEM

In order to organize the Project, execution data and related information shall be systematically collected and managed. The Private Party shall provide the SRT and

SRT's Representative a computerized database management system to manage, to integrate, and to interpret all available execution data. The computerized database shall include the following:

(1) Project background

(2) Geological conditions

(3) Geotechnical data

(4) Surveying and alignment records

(5) Instrumentation and monitoring database for tunnelling

(6) Construction drawings

(7) Installation and manufacturing drawings for E&M

(8) Construction parameters such as piling data, and etc.

(9) History of execution activities

(10) Pictures and recorded video clips

(11) Other execution information

26. INSPECTION DURING MANUFACTURE AND ASSEMBLE

The SRT and the SRT's Representative shall have the right and facility to attend inspections of any of the equipment during the manufacture and assembly period. Adequate notice shall be given and access shall not be unreasonably refused.

27. INSTRUMENTATION FOR TUNNELING

The Private Party shall implement and use throughout the duration of the execution period for Phase I, an instrumentation monitoring system that provides an integration of all instrumentation readings and data interpretation with related information in the tunnel construction. The instrumentation monitoring system shall also allow the SRT and SRT's Representative to conduct the decision making at certain concerned area to guarantee public safety during the tunnel construction.

Instrumentation specifications are indicated in the Outline Construction Specifications. All display data, error status, and alarm status shall be automatically informed to the SRT and SRT's Representative in an on-screen prompted message.

The Private Party shall submit his detailed proposal to comply with the requirements stated above to the SRT's Representative for review and consent.

28. MOBILIZATION AND DEMOBILIZATION

28.1 Mobilization

Mobilization shall commence no later than the date given as the Date of Commencement for the Works in the "Notice to Proceed". It shall consist of preparatory work and operations, including but not necessarily limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the Site; for the establishment of all offices, buildings and other facilities necessary to commence work on Project; and for all other work and operations which must be performed prior to beginning work on the various items under the Contract.

Mobilization shall be completed when the Private Party can satisfactorily demonstrate to the SRT's Representative the compliance with the respective requirements under the Contract, and the arrival on Site of sufficient plant and equipment to commence the Work in accordance with the construction schedule.

Mobilization shall include providing prerequisite submittals prior to starting work, including but not necessarily limited to the following:

(a) Submittal Schedule;

(b) Organization Chart;

(c) Construction Schedule;

(d) Safety Programme;

(e) Quality Control Programme;

(f) Copies of Insurance Policies and Premium receipts;

(g) Signed Agreement with Sub-contractors for Works to be Sub-contracted.

28.2 Demobilization

Demobilization will be considered as complete when all of the Private Party's equipment, materials, personnel, construction plant or otherwise belonging to the Private Party not required for the Phase II - Maintenance and Operation Period have been removed from the Site.

28.2.1 Demobilizations shall include providing required submittals prior to close out of the work, including but not limited to the following:

(a) Spare Parts, tools and equipment as required;

(b) Equipment Operating and Maintenance Data as required;

(c) As-Built Drawings as required;

(d) Schedule of Plant installed at each location; and

(e) Private Party's completion report.

28.2.2 Written notice submitted by the Private Party requesting any total or partial Completion Inspection shall mean that the work is considered by the Private Party as being substantially complete and the Private Party has:

(a) Inspected and checked that all work has been installed, tested and commissioned;

(b) Compared all work with the Drawings, Specifications, and submittals as approved;

(c) Confirmed that all conditions, provisions and requirements of the Contract have been fulfilled, other than any maintenance and incidental work and procedures necessary to follow;

(d) Clean-up and cleaning operations complete;

(e) Temporary facilities and utilities properly disconnected and removed;

(f) Systems, sub-systems and equipment and devices properly adjusted, serviced, tested and fully operable;

(g) Systems, sub-systems and equipment instructions and identification labelling complete;

(h) Materials and finishes neat, clean and undamaged, accessory parts and items securely attached;

(i) Broken or damaged work repaired or replaced as required;

(j) Spare parts delivered and stored as required.

29. ELECTRO-MAGNETIC COMPATIBILITY (EMC)

The Private Party shall prepare and submit for review by the SRT's Representative, an EMC Management Plan which shall be based upon a top-down approach. A top down approach shall allow for high level plans to be developed based upon specified performance goals without precluding the submission of subsequent detail plans as required or directed by the SRT's Representative. The EMC management Plan shall define the EMC philosophy, activities, and means of control for the Engineering processes and EMC submissions, to be supplied to demonstrate compliance with the Specifications for Railway System.

30. EARTHING AND BONDING

The Private Party shall design the earthing and bonding system to protect the E&M Systems, the staff and the passengers from the dangers of Traction power, lightning and Traction Power fault conditions and the falling of the OCS contact wire on to the Tracks. It shall be designed and constructed in accordance with Outline Design Specification and Outline Construction Specifications.

SRT'S REQUIREMENTS

PHASE I – DESIGN AND BUILD

APPENDIX 1 - PROGRAM REQUIREMENTS

(Refer to SRT's Requirements - General Clause 5(1))

1. GENERAL

(1) The Private Party shall submit his proposed initial Works Program including an outline Narrative Statement within seven (7) days of the Notice to Proceed and its more detailed version within sixty (60) days of approval of the initial Works Program. The first Three Month Rolling Program shall be submitted within fourteen (14) days of the Notice to Proceed and all subsequent editions shall accompany the Monthly Progress Report. The Monthly Progress Reports shall also include a Program Update as described below. These programs shall subsequently be updated as described below. The Works Program shall, in each submission, be accompanied by an Activity Report and Narrative Statement as described below.

(2) The Private Party shall program his work at all times and shall during the progress of the Works constantly monitor his progress against the programs described below.

(3) The Private Party shall include in all programs his work obligations towards the Site.

(4) The Works Program, and all more detailed or revised versions, shall be submitted to the SRT's Representative for his approval.

2. WORKS PROGRAM

(1) The Works Program shall show the Private Party's plan for organizing and carrying out the whole of the Works.

(2) The Works Program shall be a computerized Critical Path Method (CPM) network developed using the Precedence Diagramming Method (PDM) and shall be presented in bar chart and time-scaled network diagram format to a weekly or monthly time scale on A1 size reproducible media.

(3) Tasks in the Works Program shall be sufficiently detailed to describe activities and events that include, but are not limited to, the following:

(a) start and finish dates and duration (in weeks) of all major physical work to be undertaken in the performance of the Contract obligations, including Temporary Works;

(b) the requested date for issue of any programs, quality plans, safety plans, drawings, method of statements or other information requested by the SRT's Representative;

(c) incorporation of principal aspects of the Design Submission Program;

(d) Private Party's designs units including dates for submission to and acceptance by the SRT's Representative (i.e. the Design unit schedule and Submission Program);

(e) dates for submission and acceptance of Preliminary Design, Detailed Design and Working drawings including reasonable review periods and time for modifying after comments are received;

(f) procurement of major materials and the delivery and/or partial delivery date on-Site of principal items of the Private Party's Equipment;

(g) any off-Site work such as production or pre-fabrication of components and off-shore manufacture and/or procurement of major equipment such as Rolling Stock, Automatic Fare System, Depot equipment, etc.;

(h) installation of temporary construction facilities;

(i) design and/or construction and installation activities of sub-contractors; and

(j) any outside influence which will or may affect the Works.

(4) Activity descriptions shall be unique, describing discrete elements of work or chainages of linear activities. Any activity creating an imposed time or other constraint shall be fully defined by the Private Party.

(5) The Works Program shall be organized in a logical work-breakdown-structure (WBS) including work stages and phases, and shall clearly indicate the critical path(s).

Each activity in the Works Program shall be coded to indicate:

(a) works description, section or groups and /or major plant employed for the activity including production rates assumed and identification of the Private Party or Sub-contractor, where applicable;

(b) area, facility or location; and

(c) bar chart in their original form shall be colour coded, but the information shall be reasonable in monochrome (black and white) photo copies.

(6) Activity duration shall not exceed ninety (90) days except as approved by the SRT's Representative and shall be expressed in Work Days. The Private Party shall submit a Program/Project Calendar cross reference clearly indicating the

allowance for holidays.

(7) The Works Program shall be accompanied by an Activity Report and a Narrative Statement in both electronic format (compact discs) and hard copy (time scale logic diagrams in A1 size, reports in A4 size).

For linear activities such as tunnel works and underground stations the Works Program shall be supported by detailed Time-Chainage Charts to demonstrate planned and actual progress (and interface with the stations and shafts).

(8) The Activity Report shall list all activities, and events in the Works Program, sorted by activity identification number.

The Activity Report shall include the following for each activity and event:

(a) activity identification number and description;

(b) duration expressed in Work Weeks;

(c) early and late start and early and late finish dates. Planned start and finish dates;

(d) calculated total float and free float;

(e) predecessor(s) and successor(s), accompanying relationships and lead/lag duration;

(f) imposed time or date constraints; and

(g) calendar.

(9) The Narrative Statement shall be a comprehensive statement of the Private Party's plan and approach for the execution of the Works and intermediate dates. It shall incorporate outline method statements in respect of major items of work including construction sequences and primary items of plant, Temporary Works and the like. It shall fully explain the reasons for the main logic links in the Works Program and include particulars of how activity durations are established.

(10) The Program will assume a seven (7) day working week unless stated otherwise by the Private Party. If the Private Party proposes to work extended hours, or night shift working, then this shall be stated clearly against each relevant activity.

3. INITIAL WORKS PROGRAM

(1) The initial Works Program submitted as under Clause 1(1) need not include the full details given under Clause 2 above. It should be a condensed version with combined activities of longer duration but shall show clearly how the

requirements of the Contract are to be achieved. The outline Narrative Statement shall be in sufficient detail to clearly show the Private Party's intention and the assumed production rates of Key resources.

(2) Within sixty (60) days of approval of the initial Works Program, the Private Party shall submit to the SRT's Representative an expanded and fully detailed version of the initial Works Program containing all of the information and detail required under Clause 2 above.

4. WORKS PROGRAM REVISIONS

(1) The Private Party shall immediately notify the SRT's Representative in writing of the need for any changes in the Works Program, whether due to a change of intention or of circumstances or for any other reason. Where such proposed change affects timely completion of the Works, the Private Party shall within fourteen (14) days of the date of notifying the SRT's Representative submit for the SRT's Representative's approval its proposed revised Works Program and accompanying Narrative Statement. The proposed revised Works Program shall show the sequence of operations of any and all works related to the change and the impact of changed work or changed conditions.

(2) If at any time the SRT's Representative considers the actual or anticipated progress of the work reflects a significant deviation from the Works Program, he may request the Private Party to submit a proposed revised Program which together with an accompanying Activity Report and Narrative Statement, shall be submitted by the Private Party within fourteen (14) days after the SRT's Representative's instruction. The proposed revised Works Program shall show the sequence of operations of any and all work related to the change and the impact of changed work or changed conditions.

(3) All activities that have negative float shall be analyzed (for introduction of mitigating actions) by the Private Party to identify the impact on the timely completion of the Works.

5. THREE MONTH ROLLING PROGRAM

(1) The Three Month Rolling Program shall be an expansion of the current Works Program, covering sequential periods of three months. The Three Month Rolling Program shall provide more detail of the Private Party's plan, organization and execution of the work within these periods. In particular, the Private Party shall expand any critical activity planned to occur during the three (3) month period, if necessary to a weekly or daily level of detail.

(2) The Three Month Rolling Programmme shall be developed as a Critical Path

Method (CPM) network, and shall be presented in bar chart and time-scaled network diagram format. Bar charts shall be presented on an A4 or A3 and time-scaled networks diagrams on an A1 size reproducible media and on CD or DVD. Tasks in the program shall be derivatives of and directly related to, tasks in the approved Works Program.

(3) The Private Party shall describe the discrete work elements and work element inter-relationships necessary to complete all works and any separable parts thereof including work assigned to Sub-contractors.

(4) Activity duration shall not exceed two (2) weeks unless consented to in advance by the SRT's Representative.

(5) Each activity in the Three Month Rolling Program shall be coded, or described so as clearly to indicate the corresponding activity in the Works Program.

6. THREE MONTH ROLLING PROGRAM REVISIONS AND UPDATE

(1) The Three Month Rolling Program shall be extended forward each month as described under Clause 5(1) above. Each submission of the Three Month Rolling Program shall be accompanied by a Program Analysis Report, describing actual progress to date, and the forecast for activities occurring over the three-month period.

(2) If the Three Month Rolling Program is at variance with the Works Program, the Program Analysis Report shall be accompanied by a supporting Narrative Statement describing the Private Party's plan for the execution of the activities to be undertaken over the three month period, including program assumptions and methods to be employed in achieving timely completion.

(3) The Private Party shall revise the Three Month Rolling Program or propose revisions of the Works Program, or both, from time to time as may be appropriate to ensure consistency between them.

7. PROGRAM MANAGEMENT SOFTWARE

(1) The Private Party shall implement and use throughout the duration of the Contract, a computerized system to plan, execute, maintain and manage the planning, design, design coordination, design review, utility diversions, pre-construction, construction, and Subcontracts in executing the CPM scheduling by PDM. The reports, documents and data provided shall be an accurate representation of the current status of the Works and of the work remaining to be accomplished; shall provide a sound basis for identifying problems, deviations from the planned works, and for making decisions; and shall enable timely preparation of the same for presentation to the SRT's Representative.

(2) CPM scheduling software shall be as determined by the SRT's Representative. Scheduling software and relevant instruction manuals, licensed for use in connection with the Project, shall be provided by the Private Party according to the SRT's specifications.

Software shall be recognized internationally accepted planning/programming software as acknowledged by the SRT's Representative.

8. PROGRAMMING PERSONNEL

The Private Party shall submit, as part of its Staff Organization Plan, the names and required information for the staff to be employed on works programming. The principal works programming personnel shall hold reputable professional qualifications acceptable to the SRT's Representative including at least five (5) years experiences in similar works with major railway projects and significant E&M content. Others in the group (at least 5-person) shall have at least three (3) years experience in such work including design management on major project of Design and Build type. The programming personnel shall be employed by the Private Party full time on the Contract until the completion of the works or such earlier time as accepted by the SRT's Representative.

SRT'S REQUIREMENTS

APPENDIX 2 - MONTHLY PROGRESS REPORTS

(Refer to SRT's Requirements – General Clause 6(1))

1. GENERAL

The Private Party shall submit to the SRT's Representative, a Monthly Progress Report. This Report shall be submitted by the twenty-fifth (25th) day of each calendar month and shall account for all work actually performed up to and including the twentieth (20th) day of the month of the submission. The term "work" shall include design work and preparation of method of statement, procurement, document submittals, etc, as programed. It shall be submitted in a format to which the SRT's Representative shall have given his notice and shall contain sections/sub-sections for, but not be limited to the details listed in sections 2 to 8 below.

2. PROGRESS

(1) The report shall describe the status of work performed, significant accomplishments, including critical items and problem areas, corrective actions taken or planned and other pertinent activities, and shall in particular address interface issues, problems and resolutions.

(2) The report shall include a simplified representation of progress measured in percentage terms compared with percentage planned derived from the Works Program. It shall also identify lateness against planned progress in terms of days behind program, including items not yet stated.

(3) The report shall be divided into two sections which are the design progress report that occurs during the Design Phase and the construction and installation progress report that occurs during the Execution phase.

For design progress report, the Private Party shall update the development for the design phase by providing all relevant works progress defined in SRT's Requirements – Design Clause 4 and 5.

On the other hand, for construction and installation progress report, the Private Party shall update the development for the Execution phase by providing all relevant works progress related to the construction, installation and manufacture operation at site and offsite as well as the submittals defined in SRT's Requirements – Design Clause 6.

3. PROGRAM UPDATE

Program updating shall include:

(1) The monthly Program Update which shall be prepared by recording actual activity completion dates and percentage of activities completed up to the twentieth (20th) of the month together with estimates of remaining duration and expected activity completion based on current progress. The Program Update shall be accompanied by an Activity Report and a Narrative Statement.

(2) the Program Status which shall:

(i) show Works Program status up to and including the current report period, display Cumulative progress to date and a forecast of remaining work; and

(ii) be presented as a bar-chart size A3 or A4 and as a time-related logic network diagram on an A1 media, including activity listings.

(3) the Activity Variance Analysis which shall analyze activities planned to start prior to or during the report period but not started at the end of the report period as well as activities started and/or completed in advance of the Works Program.

4. THREE MONTH ROLLING PROGRAM

The monthly issue of the Three Month Rolling Program.

(1) The Three Month Rolling Program shall be an expansion of the current Works Program, covering the next sequential period of three months. The Three Month Rolling Program shall provide more details of the Private Party's plan, organization and execution of the work within these periods. In particular, the Private Party shall expand any critical activity planned to occur during the three (3) months period, if necessary to a weekly or daily level of detail.

(2) The Three Month Rolling Program shall be developed as a Critical Path Method (CPM) network, and shall be presented on electronic media (CD-ROM) in bar chart and time-scaled network diagram format Bar charts shall be presented on an A4 or A3 and time-scaled networks diagrams on an A1 size media. Tasks in the Program shall be derivatives of, and directly related to, tasks in the approved Works Program

(3) The Private Party shall describe the discrete work elements and work element interrelationships necessary to complete all works and any separable parts.

(4) Activity duration shall not exceed two (2) weeks unless approved in advance by the SRT's Representative.

(5) Each activity in the Three Month Rolling Program shall be coded, or described so as clearly to indicate the corresponding activity in the Works Program.

5. PLANNING AND COORDINATION

(1) A summary of all planning/co-ordination activities during the month and details of outstanding actions.

(2) A schedule of all submissions and consents/approvals obtained/outstanding.

6. PROCUREMENT REPORT

(1) A summary of all significant procurement activities during the month, including action taken to overcome problems.

(2) A report listing major items of plant and materials which will be incorporated into the Works. The items shall be segregated by type as listed in the Specifications and the report should show as a minimum the following activities:

(a) purchase order date - scheduled/actual;

(b) manufacturer/supplier and origin;

(c) Letter of Credit issued date;

(d) manufacturer/supplier ship date - scheduled/actual;

(e) method of shipment; and

(f) arrival date in Thailand - scheduled/actual.

7. PRODUCTION

(1) A review of all production and manufacturing activities during the month.

(2) Summaries of all production and manufacturing outputs during the month together with forecasts for the next month.

8. SAFETY

A review of all safety aspects during the month including reports on all accidents and actions proposed to prevent further occurrence.

SRT'S REQUIREMENTS

APPENDIX 3 - QUALITY ASSURANCE

(Refer to SRT's Requirements - General Clause 7)

1. GENERAL REQUIREMENTS

(1) The Quality Plan to be prepared by the Private Party and submitted to the SRT's Representative shall follow the requirements of ISO 9001 and address each clause therein.

(2) Registration of the Private Party's Organization or Sub-contractors is not required for the Project but the Quality Plan as submitted shall meet the intent of the ISO 9001 requirement in that there is a comprehensive and documented approach to achieving the project quality requirements.

2. QUALITY PLAN SUBMISSION

(1) The Project Quality Management System shall be based on the current edition of ISO 9001, as of the date of the Tender.

(2) The Project Quality Management Plan shall completely address Quality Management System and the Quality Management System clauses of ISO 9001, dealing with Management Responsibility and Quality System and shall also include the identification of type of procedures to be prepared and utilized on the Project.

(3) The Project Quality Management Plan shall as a minimum address the Quality Management System clauses as required by ISO 9001, generally noting the applicability to the Private Party's Works Program for the Project. Procedures or Quality Plans to be prepared by others (Suppliers, Sub-contractors) shall be identified.

(4) The Private Party, in submission of the Quality Plan for the Project shall completely address each clause of ISO 9001 and identify all procedures required to implement the plan during the Contract. The structure and responsibility for all procedures shall be identified in the Project Quality Management Plan. The detailed procedures as identified in the Quality Plan shall provide detailed instructions or describe how processes are to be carried out and state which records are to be maintained.

(5) The Private Party's Manager of the Quality Assurance System shall be identified and shall approve all Quality Plan submittals. The said Manager shall have the sole authority for assessing and approving quality assurance documentation of

all Sub-contractors, and shall carry out a comprehensive audit program of all the Private Party's activities for the entire Contract duration.

All procedures or Quality Plans shall be produced with the construction/installation input of the relevant sections manager to which it applies. The section manager shall sign the Quality Plan or Procedure to show that he understands and endorses it. If, in due cause, the section manager/department deviates from the Procedure he shall be required to explain why and then re-write the Procedure as necessary.

3. PLAN IMPLEMENTATION AND VERIFICATION

(1) The Private Party's Quality Audit Schedule shall be submitted to the SRT's Representative for consent every three months or more frequently as required.

(2) The results of Quality Audits shall be summarized in the Private Party's monthly reports.

(3) The Private Party shall provide all necessary access, assistance and facilities to enable the SRT's Representative to carry out on-site and off-site Quality Assurance Audits of surveillance to verify that the consented quality system is being properly and fully implemented.

SRT'S REQUIREMENTS

APPENDIX 4 - DRAWING STANDARDS

(Refer to SRT's Requirements – Design Clauses, 12(2), 12(4), 12(5) and

SRT's Requirements – Execution, Clauses 13(1))

1. DRAWING STANDARDS

The Private Party shall produce all drawings in compliance with the Standards, Attachment 1 to this Appendix.

2. DRAWING MANAGEMENT SYSTEM (DMS) SPECIFICATIONS

The Private Party shall develop or employ a computerised Drawing Management System (DMS) with suitable access for the SRT and the SRT's Representative. The following features are required from the DMS:

(1) Minimum Information Level

The drawing register shall contain the following minimum information for each drawing:

(i) originating organisation and contact name/position with contact address;

(ii) full drawing title and originating date;

(iii) full revision details for each revision to include date, revision level and description;

(iv) all issue dates for each drawing with revision level, reason for transmittal, destination(s) and any response with associated date and comments; and

(v) current status of drawings.

(2) Drawings Issue History

The DMS shall provide the SRT and the SRT's Representative with the necessary information in order to be able to track the issuance of a single drawing or a group of drawings. This should include the date of issue, the persons or organisations to whom it was issued, the action requested and any responses with their respective dates. This functionality should be available either as a brief report, full report or a screen inquiry.

(3) Drawing Revision History

The DMS shall allow the SRT and the SRT's Representative to track the history of all revisions made to a group or single drawing. An indication of the current status and location of every drawing will be afforded by this facility. This

functionality should be available either as a brief report, full report or a screen inquiry.

(4) Current Drawings Copy

A request for a copy of a particular drawings should be possible via the drawing register.

(5) Document Transmittal Notes

All drawing transmittals shall be recorded by using a formal Document Transmittal Note (DTN) procedure. Each transmittal should be logged with an unique number and entered into the drawing database. One DTN may cover a single drawing or several dependent upon the nature of the transfer. A complete series of drawings can also be included but a mechanism shall be provided so that an individual drawing in that series can still be tracked.

(6) Access To The DMS

The system should be compatible with Window 10 users or better via a modem for remote access. Adequate security should allow different levels of users to review and/or add information remotely. The SRT and the SRT's Representative shall have the capability to review the database only. As the system develops, it should also be possible to have access across a Wide Area Network (WAN) based on the current standard network operating system in use by the SRT and the SRT's Representative.

(7) Data Transfer

All remote enquriers shall have the facility to download the requested information into an Excel spread sheet for further analysis if required.

3. DRAWING TRANSFER STANDARDS

This section specifies the mechanism and modes for electronic data transfer of drawings between all parties concerned in the Project. The following drawings submittal specifications shall be used unless directed by the SRT's Representative.

(1) Drawing Standards For Interim Submittals

All drawings submitted for formal review submittals shall be provided in The Portable Document Format (PDF) generated at A3 size on catalogued Intel based PC readable CD ROMS. These drawings will be considered as the reference Contract set and shall be used to produce all copies of the contained drawings. These CDs shall:

(i) contain an on-line catalogue (index) allowing the user to quickly access and review any drawing;

(ii) be hardware compatible with CD ROM drives available in Intel based Windows 10 computer systems; and

(iii) include the Portable Document Format (PDF) Viewer software.

(2) Other Drawing Transmittal Standards

During the course of the Contract it will be necessary to transfer data for use by the SRT, the SRT's Representative, Approved Sub-contractors and/or other parties. The following standards shall apply:

(i) all CAD files shall be translated to an acceptable version of AutoCad DWG or DXF format, along with any font, line style, block or other necessary definition;

(ii) each transfer shall be fully documented to detail items such as layer use, cross referenced files, necessary directory structure etc.;

(iii) full details of the programs used to generate the DWG or DXF format file should also be attached for reference;

(iv) transfer shall be readable by the equipment currently employed by the SRT and the SRT's Representative. For small transfers, this may take the form of cc:Mail attachments, however, for large transfers, e.g. model file at Manufacturing and Installation Phase completion, this may be on CD format;

(v) generally, the current version of all standard application software listed by the SRT and the SRT's Representative, available for the operating environment as used by the SRT's Representative. Data generated by the latest version or the immediately previous version shall also be acceptable; and

(vi) requirement for any formats outside of this published list shall be submitted to the SRT's Representative for approval. Any information received by the SRT or the SRT's Representative in a format not on the approved list and/or not on a media supported shall be deemed to have not been submitted.

(3) As Built Drawing Model

(i) At completion of the Execution Phase, it is necessary to provide a complete CAD generated model of the Project 'As-Built Drawing'. This model shall be a two dimensional plan which details the layout and

location of all aspects of construction and installation at a 1:1 scale on a true co-ordinate base. Differing categories of information shall be separated by the use of colour, linestyle, layer etc. The Private Party shall also provide a complete and comprehensive listing of all groups and categories of information and their relevant symbology. A data file containing Northing, Easting and Elevation, i.e. the location of all items of plant and machninery together with a feature code shall also be provided. It should be noted that all lines of similar symbology i.e. walls, pipes, shall not be formed by segmented portions that are derived from lines contained on the original sheet layout. Lines of similar symbology shall be continuous.

(ii) This deliverable shall be in a format as specified by the SRT's Representative at the time of requirement. It can be assumed that the format shall be a development from the current version of AutoCAD, or an internationally accepted transfer format such as DXF, IGES or similar which can be read by the current, at that time, Version of AutoCAD or employed CADD/GIS product. Only one submittal shall be required and hence only one translation produce by the Designer unless the final product does not meet these and other required specifications.

(4) Final Record Drawing Format

At completion of the Execution Phase, As-Built Drawings shall be submitted in a 'Published Data' format such as Adobe Acrobats Portable Document Format (PDF). This format shall be defined by the SRT's Representative when required but shall be a development of PDF at the time of requirement. These drawings shall be fully indexed with the reader software included on a media which is current at the time and as detailed by the SRT's Representative.

ATTACHMENT 1

DRAWINGS STANDARDS

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CHAPTER 1

INTRODUCTION

The purpose of these Drawing Standards (hereinafter called the Standard) is to provide for the uniform presentation of the drawings prepared by all the parties under contract to the SRT.

All drawings shall be produced using CAD (Computer Aided Design) software. The Contract drawings shall not be produced manually. The intent of the Drawing Standards is that all drawings be legible at the A3 size.

All drawings shall be prepared so that they are capable of being reproduced to both the original size and to A3 size without loss of information. This Standard does not cover those aspects deemed to be covered by good drawing office practice, concerning the clarity of presentation and layout of the drawings.

The Standard and the revisions to the Standard issued on behalf of the SRT shall be effective immediately upon issue and the recipient shall take all necessary action to ensure that all mandatory requirements are incorporated in any drawings prepared or revised thereafter.

Revisions to the Standard shall not of themselves require the revision of any drawing that has been accepted in accordance with the previous versions of the Standard.

CHAPTER 2

MATERIALS

2.1 Material Requirement

The minimum weight of the paper for the reproduction of the drawings for issue shall be 80g/m^2 and that for the record drawing purposes (e.g. As Build drawings) shall be 112 g/m^2.

The minimum thickness of the paper for drafting or reproduction of drawings for issue shall be 0.05 mm.

CHAPTER 3

STANDARD DRAWING FORMAT

3.1 Introduction

All the drawings, excluding the report drawings, shall be prepared on sheets of ISO A1 size. Drawings shall be prepared in a CAD System so that drawings can be plotted on standard sheets complying with the material requirements, with a frame of standard dimensions, line thickness, title block and the height of letters in title block, all as shown in (Figure 3.2.1).

All the engineering descriptions shall be in English.

3.2 Title Block

The format shown in Figure 3.1.1 shall be adopted for sheet size A1.

The title block shall contain the following; (the letters in parentheses referring to the boxes in Figure 3.1.1).

(a) the name and logo of the SRT as shown;

(b) the name and logo of Private Party as shown;

(c) the name and logo of the ICE as shown;

(d) the name and logo of the SRT's Consultant as shown;

(e) the person who prepared the design on which the drawing is based;

(f) the person who draw the design;

(g) the person, other than the designer, within the team who checked the drawing or the design;

(h) the Project Manager or Project Director responsible for the drawing;

(i) the date when the drawing is submitted;

(j) Revision to drawing (see Chapter 4)(4). The revision code letter (see Chapter 4)(3). The date of revision (3). The descriptions of revisions 4(4).

(k) the date of the revision;

(l) the brief descritption of the revision;

(m) the status of the revision;

(n) the SRT logo as shown;

(o) the scale in ratio;

(p) the drawing number (see Chapter 4);

(q) the sheet number (see Chapter 4);

(r) Project title as shown; and

(s) drawing title up to three (3) lines;

3.3 Drawing Orientation

Drawings, if possible, shall be so oriented that the North arrow generally points to the top or to the right of the drawing.

The graphic convention for the North arrow is shown in figure 6.1.1.

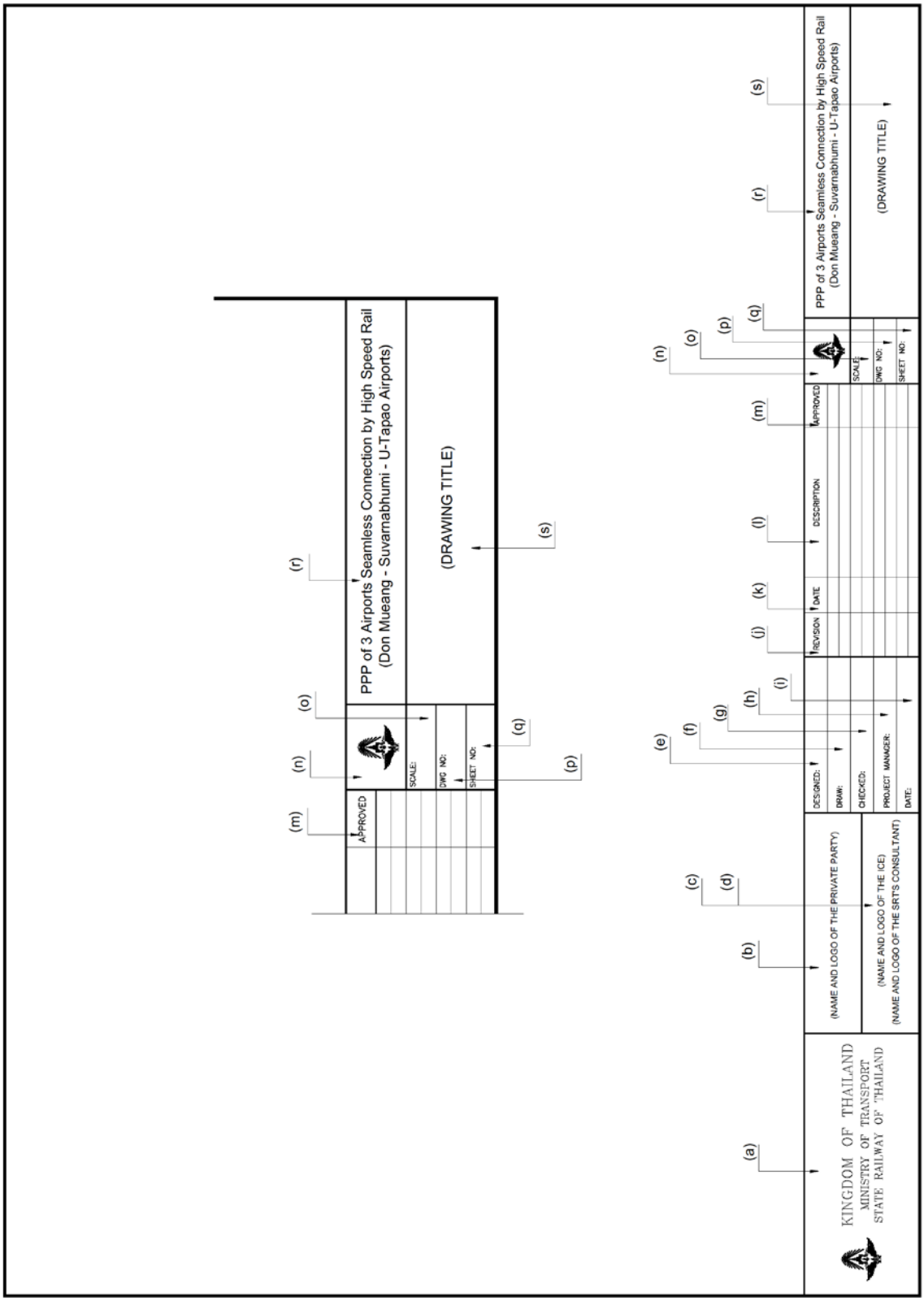

FIGURE 3.1.1 STANDARD TITLE BLOCK

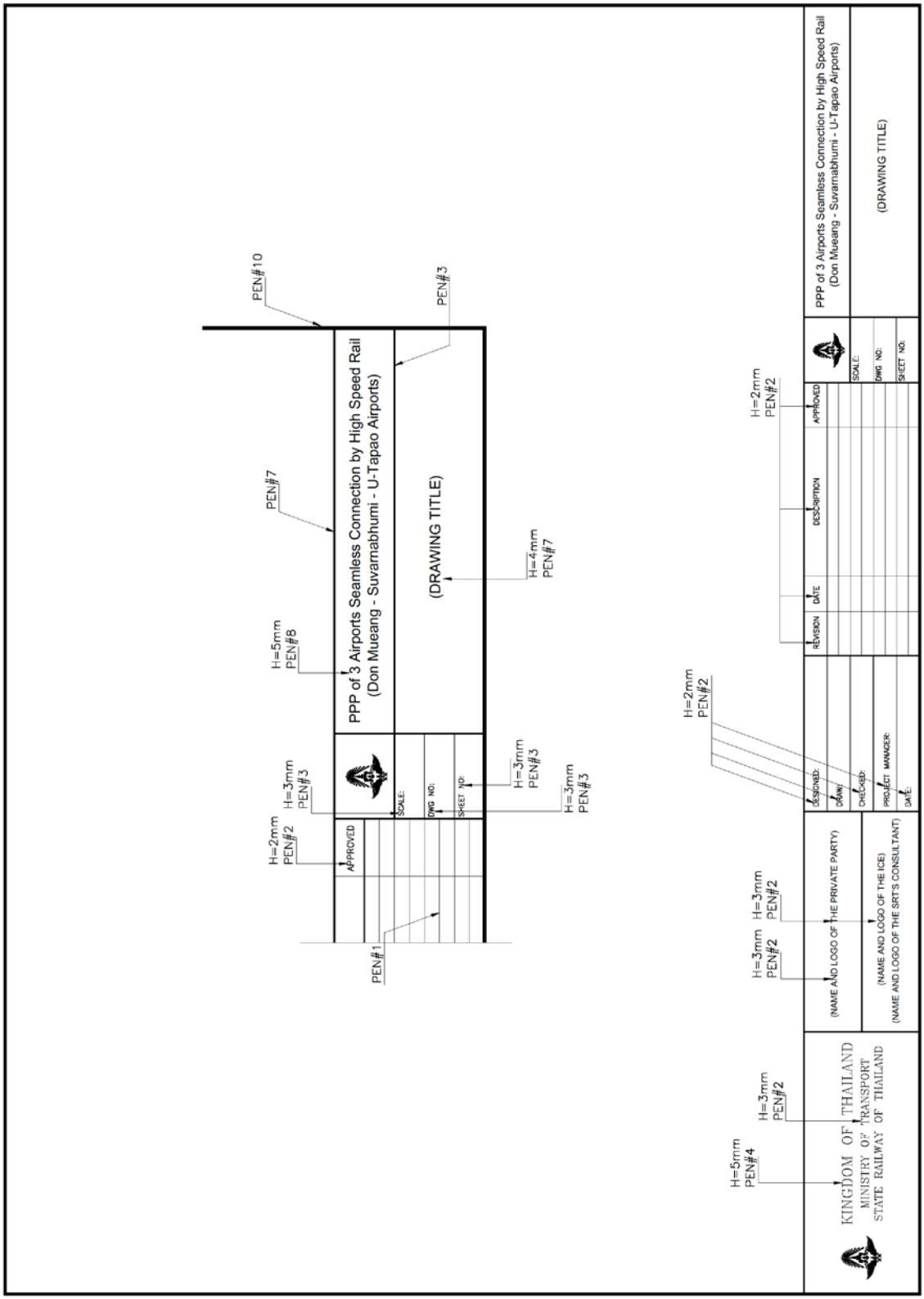

FIGURE 3.2.1 STANDARD DRAWING FORMAT

CHAPTER 4

DRAWING NUMBERING SYSTEM

4.1 General Requirements

The Private Party shall adopt the title block and form as described in Chapter 3 for all drawings prepared under the Contract.

Each drawing shall be uniquely referenced by a drawing number, revision and issue status of the drawing.

4.2 Drawing Status

The current status of each drawing shall be clearly defined by the use of a single letter code as follows:

P - Preliminary Design Drawings

D - Detailed Design Drawings

W - Working Drawings

A - As Built Drawings

4.3 Drawing Numbering

The drawing number shall comprise six (6) letters/digits and a revision letter in the following format:

Drawing Status	Drawing No :	Revision :
x	xx / xxxx	x
A	B C	D

(Note: This format, permits the use of a full 8 - character computer reference, combining the Drawing status, Drawing No. and Revision)

A - Single letter denoting the Drawing Status refer to Clause 4.2 above

B - A two (2) letter code denoting the type of works, e.g. :

AL Alignment

AR Architecture

BS Building Services

CE Civil Engineering (earth work, survey, drainage, etc.)

CM Communications

CS Combined Service Drawing

DR Drainage

EE Electrical Engineering (low voltage)

EQ Maintenance Equipment

FC Automatic Fare Collection

GE Geotechnical Engineering
(Instrumentation, ground treatment, de-watering, etc.)

GS Graphics & Signage

GW General Works

LE Lifts & Escalators

LS Landscape

ME Mechanical Engineering (ventilation, fire fighting, plumbing)

PD Platform Screen Doors

PS Power Supply (M&E)

RW Right-of-Way

RS Rolling Stock

SB Substructures

SC SCADA

SE Structural Engineering(structural steel, reinforced concrete etc.)

SG Signalling

SO Structural Opening Drawing

SP Superstructures

SY System

TU Tunnel

TW Track Works

UT Utilities

VD Viaduct

C - A unique four (4) digit number (from 0001 to 9999), determined by the Private Party, indentifying each drawing.

D - A single letter (A to Z except I and O) denoting the sequence of

revision to the drawing. The initial drawing issue will carry the revision letter "A".

Example :

Drawing Title Block :

Drawing Status	Drawing No:	Revision:
D	SE / 0235	B

(Note: The comparable computer reference is "D-SE/0235-B")

Denotes :

D: Detailed Design Drawing

SE: Structural Engineering

Drawing number 0235

Rev. B

4.4 Revisions To Drawings

The first issue of a drawing shall be without any revisions on the drawing, but shall carry the revision letter "A" in box (j) as shown in Figure 3.1.1. For the first revision to the drawing, the revision letter "B" shall be shown in the revision box (j).

Descriptions of the revisions in the revisions boxes (l) shall be brief but shall be a definite record of the changes. Words such as 'generally revised', 'minor revisions' 'as shown' or any other broad descriptions shall be avoided except where the revisions are numerous and varied. Reasons for the revisions shall not be included.

Revisions on the body of the drawings shall be clearly indicated. Each area of the drawing in which a revision occurs shall be enclosed by bubble in CAD. A 10 mm equilateral triangle containing the current revision number shall be drawn touching the bubble. When each new revision is issued, previous bubbles and triangles shall be removed but the descriptions shall remain.

4.5 Drawing Sequence Number

The drawing sequence or sheet number(s) shall be separated from the other codes and shall relate to the position of the drawing in the bound volume in a submission package. The sequence number shall be added to the drawings immediately before the printing and binding. The cover sheet shall have the sequence number 1 in each set of the submission.

CHAPTER 5

LETTERING USAGE

5.1 Lettering

Lettering shall be performed using upright letters by CAD.

Lower case lettering shall not be used on the body of any drawing except on A4 size drawings which will be bound in a report form and the abbreviations for the units which require the lower case (e.g. km, m, mm, kN).

Lettering shall be placed in such a way that it may be viewed from the bottom or the right-hand side of the drawing. General lettering on maps or the like shall be placed parallel to the base grid lines which run most closely parallel to the bottom of the drawing. Street names shall be placed parallel to the centre line of the street.

5.2 Standard Letter Sizes

Generally the height of capital letters and numbers shall be ten times the thickness of the lines used to form them. The standard letter and pen sizes adopted shall be such that they satisfy the degree of detail required in full size and they are legible in the reduced size e.g. from A1 to A3. The following letter heights are to be used on A1 size sheets as a guide except where, for a specific purpose, a higher degree of legibility is required on reduction in the drawing size:

General Titles in the body of drawing	5 mm
Section & Elevation	5 mm
Detail	5 mm
Match Line	4 mm
Dimensions	3 mm
Notes	3 mm

CHAPTER 6

LINEWORK AND GRAPHIC CONVENTIONS

6.1 Lines

The types and the thicknesses of lines (Figure 6.1.1) which shall be used for A1 size drawings are shown below.

Type of Line	Pen No.	Equivalent Line Thickness (mm)	Pattern
Primary outline	# 5	0.5	solid
Secondary outline	# 3	0.3	solid
Hidden Line	# 2 ~ # 4	0.2 - 0.4	dashed
Dimension & Grid Line	# 1	0.1	solid
Centre line	# 2	0.2	chain-dotted
Match line	# 5	0.5	chain-dashed-dashed
Section & Elevation	# 5	0.5	see Figure 6.1.1
Detail	# 5 & # 2	0.5 & 0.2	see Figure 6.1.1

6.2 General Conventions for Dimensions and Levels

6.2.1 Dimensions

The units adopted on the drawings shall be stated in the title blocks or otherwise shown specifically.

For the general building purposes, the dimensional unit shall be millimetres (mm). In the case of large dimensions, having five or more digits, the unit should be changed to metre.

e.g. : 12345 mm can be written as 12.345 m.

6.2.2 Levels and Elevations

All levels shall be quoted in metres correct to three decimal places and shall be to Datum which is 100 metres below Mean Sea Level at Bangkok.

Where levels refer to different situations, if necessary, the differentiation shall be made by prefixing the number by an abbreviation for the situation. The following standard abbreviations shall be used.

EGL existing ground level

FFL finished floor level

FGL finished ground level

IL invert level

SFL structural floor level

TTL top of track level

6.3 General Graphic Conventions

Graphic conventions shown in Figure 6.1.1 shall be adopted on the drawings. All dimensions are in millimetres (mm) on A1 size sheet except where noted otherwise.

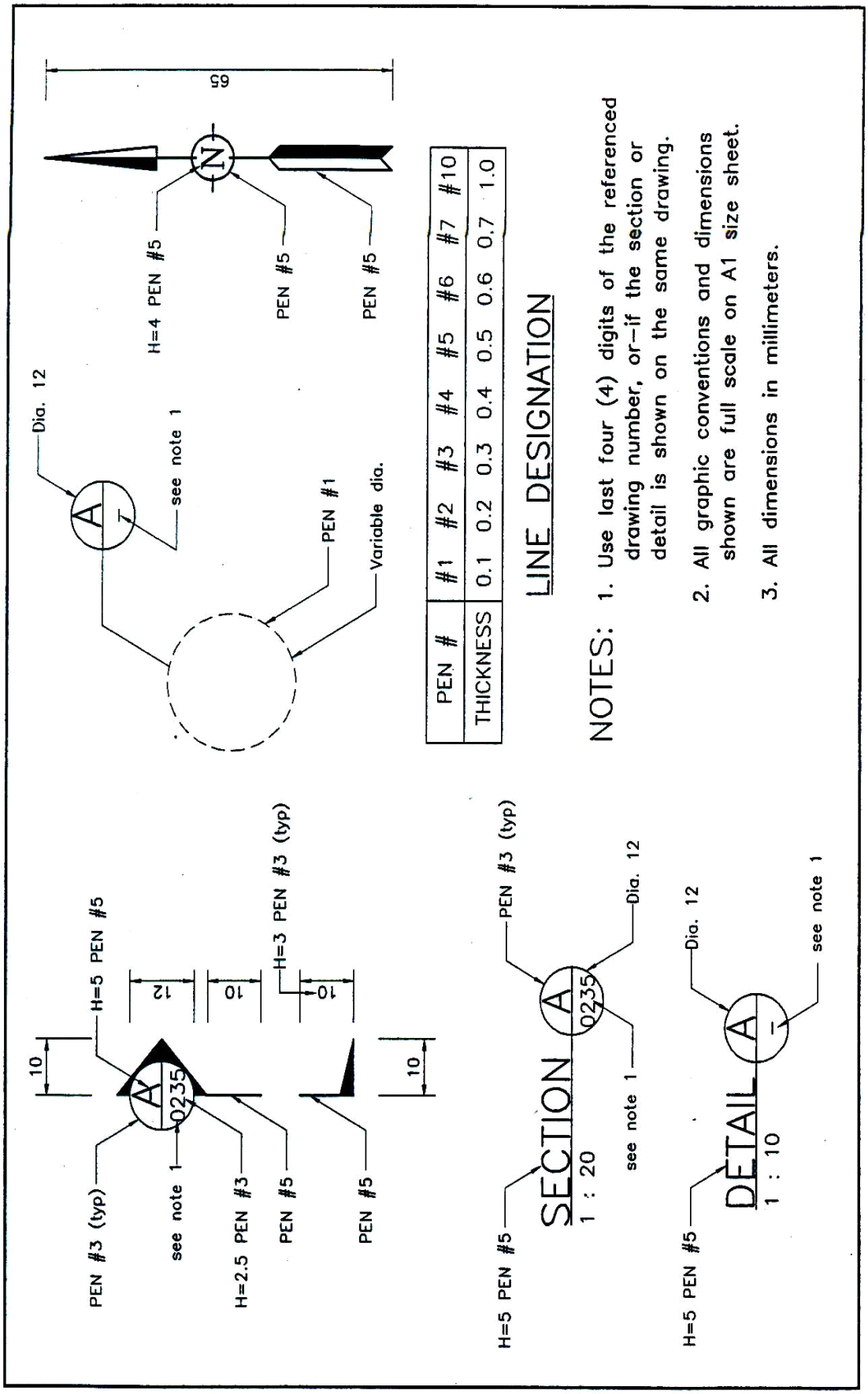

FIGURE 6.1.1 GRAPHIC CONVENTIONS

CHAPTER 7

LIST OF STANDARD ABBREVIATIONS

7.1 General

For abbreviations that do not appear in this section refer to the rest of the sections in this chapter and vice versa.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFC	Automatic Fare Collection
A/G	At Grade
AISC	American Institute of Steel Construction
ALT	Alternative
APPROX	Approximate
ARCH	Architecture, -al
AREA	American Railway Engineering and Maintenance of Way Association
ASTM	American Society for Testing and Materials
AVG	Average
AWS	American Welding Society
BMA	Bangkok Metropolitan Administration
BS	British Standard
BSI	British Standards Institution
BSCP	British Standard Code of Practice
CAD	Computer Aided Design
CADD	Computer Aided Design and Drafting
C/C	Centre to Centre
CCTV	Closed Circuit Television
cm	Centimeter
CWR	Continuously Welded Rail
D	Depth
DIN	Deutsche Industrie Normen

DIA	Diameter
DIM	Dimension
DIR	Directive, Direction
DWG	Drawing
E	East
EB	East Bound
ECS	Environmental Control System
EGAT	Electricity Generating Authority of Thailand
EGL	Existing Ground Level
EL	Elevation
ELEC	Electrical
ELVR	Elevator
EN	Euronorm Standard
ENTR	Entrance
EQ	Equal
ESCR	Escalator
EXAT	Expressway Authority of Thailand
EXIST	Existing
E&M	Electrical and Mechanical
FFL	Finished Floor Level
FGL	Finished Grade level
FIN	Finished
FL	Floor
GEN	General
GEOT	Geotechnical
GL	Ground Level
GWL	Ground Water Level
H	Height, High
HDPE	High Density Polyethylene
HOR	Horizontal

ICE	Independent Certification Engineer
ID	Internal Diameter/Dimension
IEC	International Electrical Commission
IES	Illuminating Engineering Society
IL	Invert Level
INFO	Information
ISD	Initial System Project Datum
ISO	International Standards Organisation
ISP	Initial System Project
JIS	Japanese Industrial Standards
kg	Kilogram
kN	Kilo Newton
kPa	Kilo Pascal
L	Length, Long
L&E	Lifts and Escalators
LONGIT	Longitudinalm Metre
MATL	Material
MAX	Maximum
MEA	Metropolitan Electricity Authority (of Bangkok)
MECH	Mechanical
MH	Manhole
MID	Middle
MIN	Minimum
MIS	Management Information System
MISC	Miscellaneous
mm	Millimetre
MRTA	Mass Rapid Transit Authority of Thailand
MSL	Mean Sea Level
MWA	Metropolitan Waterworks Authority
N	North, Newton

NB	North Bound
NEB	National Environment Board
NEC	National Electrical Code (USA)
NFPA	National Fire Protection Association (USA)
NIC	Not in Contract
No.	Number
NSCT	National Safety Council of Thailand
NTP	Notice to Proceed
NTS	Not to Scale
OC	On Centre
OCMLT	Office of the Commission for the Management of Land Traffic
OD	Outside Diameter/Dimension
OTP	Office of Transport and Traffic Policy and Planning
PVC	Polyvinyl chloride
QA	Quality Assurance
QTY	Quantity
R	Radius, Riser
RD	Road
REF	Reference
REV	Revision, Revised
RM	Room
ROW	Right of Way
RT	Right
RTG	Royal Thai Government
S	South
SB	South Bound
SECT	Section
SHT	Sheet
SI	International System
SPEC	Specifications, Specify, Specified

SQ	Square
SRT	State Railway of Thailand
SS	Stainless Steel
ST	Street
STA	Station
STD	Standard
STL	Steel
STRS	Stairs
T	Top, Tonne
TEL	Telephone
TIS	Thai Industrial Standard
TOT	Telephone Organization of Thailand
TRL	Top of Rail
TSP	Thai Standards on Pollution
TPS	Traction Power Substation
TYP	Typical
UG	Underground
VENT	Ventilation
VERT	Vertical
W	West, Width, Wide
WB	West Bound
W/	With
W/O	Without

7.2 Alignment

AZ	Azimuth
BM	Bench Mark
CC	Point of Curve to Curve (Point of Compound)
CH	Chainage
CS	Point of Circular to Spiral (Transition) Curve
CT	Point of Curve to Tangent

LC	Length of Circular Curve (Horizontal)
LH	Left Hand (Turnout)
LS	Length of Spiral curve (Length of Transition curve)
LVC	Length of Vertical Curve
PC	Point of Curve
PCVC	Point of Compound Vertical Curve
PI	Point of Intersection
PITO	Point of Intersection TurnoutPS Point of Switch
PT	Point of Tangent
PVI	Point of Vertical Intersection
RH	Right Hand (Turnout)
SC	Point of Spiral (Transition) to Circular Curve
SS	Point of Spiral to Spiral (Transition to Transition)
ST	Point of Spiral (transition) to Tangent
TC	Point of Tangent to Curve
TS	Point of Tangent to Spiral (transition) Curve
VPC	Point Vertical Curve Commences
VPT	Point Vertical Curve Terminates

7.3 Utility Identification

Material

CIP	Cast Iron Pipe
DIP	Ductile Iron Pipe
FRP	Fibre Reinforced Plastic
PEP	Polyethylene Pipe
PSCP	Prestressed Concrete Pipe
PVCP	Polyvinyl Chloride Pipe
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe

7.4 Architecture

ACOUS	Acoustical
ALUM	Aluminium, (Aluminum)
AUTO	Automatic
BLDG	Building
BSMT	Basement
CAB	Cabinet
CCTV	Closed Circuit Television
CI	Cast Iron
CMU	Concrete Masonry Unit
DEPT	Department
DR	Door
EOP	End of Platform
ESCR	Escalator
FD	Floor Drain
FF	Face of Finish
GYP	Gypsum
HB	Hose Bibb
H/C	Handicapped
INT	Interior
JT	Joint
LAV	Lavatory
LT	Light
RO	Rough Opening
TEL	Telephone
TVM	Ticket Vending Machine
WC	Water Closet
WP	Working Point
WT	Weight

7.5 Structural Engineering

ABUT	Abutment
BKF	Backfill
CG	Center of Gravity
CIP	Cast in Place
CJ	Construction Joint
CL	Clearance, Clear
COL	Column
CONC	Concrete
C&C	Cut and Cover
DET	Detail
DIAPH	Diaphragm
DL	Dead Load
E	Young's Modulus
EA	Each
EJ	Expansion Joint
EW	Each Way
FDN	Foundation
FRC	Fiber Reinforced Concrete
FTG	Footing
GALV	Galvanized
ID	Inside Diameter
INT	Internal, Interior
INV	Invert
JT	Joint
LIN	Linear, Lineal
LL	Live Load
MS	Mild Steel
O/O	Out to Out
PL	Plate

PRC	Precast Reinforced Concrete
PREFAB	Prefabricated
PSC	Prestressed Concrete
RC	Reinforced Concrete
REINF	Reinforce, -ed, -ing, -ment
REQD	Required
SFL	Structural Floor Level
STRUCT	Structure, -al
SUPP	Support
SYM	Symmetry, Symmetrical
THK	Thick, Thickness
TRANS	Transverse
T&B	Top and Bottom
UNIF	Uniform, -ly
WF	Wide Flange (Beam)
WL	Wind Load
WWF	Welded Wire Fabric

7.6 Geotechnical Engineering

BH	Borehole
C'	Cohesion (drained)
CBR	California Bearing Ratio
CD	Consolidated Drained Test
CL	Clay
CPT	Cone Penetration Test
CU	Consolidated Undrained Triaxial Test
Cu	Consolidated Undrained Shear Strength
DMT	Dialatometer
DS	Direct Shear Test
EP	Electronic Piezometer
EPBM	Earth Pressure Balanced Machine

FI	Fracture Index
GSD	Grain Size Distribution
ML	Sandy Silt or Clayey Silt
OW	Observation Well
PP	Pneumatic Piezometer
RQD	Rock Quality Designation
SM	Silty Sand
SPT	Standard Penetration Test
TBM	Tunnel Boring Machine
TPT	Triaxial Permeability Test
U	Porewater Pressure
UC	Unconfined Compression Test
UU	Unconsolidated Undrained Triaxial Test

7.7 Electrical / Mechanical Engineering

A	Ampere
ac	Alternating Current
AC	Air Conditioning
AHU	Air Handling Unit
AP	Access Panel
ARF	Automatic Roll Filter
AUX	Auxiliary
BATT	Battery, -ies
CB	Circuit Breaker
CC	Control Centre
CD	Ceiling Diffuser
COAX	Coaxial
COMP	Compressor/Receiver
CPU	Central Processor Unit
CSD	Combined Services Drawing
CT	Current Transformer

DB	Distribution Board
dc	Direct Current
DIFF	Diffuser
DP	Discharge Pipe
ECS	Environmental Control System
EE	Electrical Engineering
EVAP	Evaporator
FA	Fire Alarm
FAP	Fire Alarm Panel
FCU	Fan Coil Unit
FCP	Fireman's Control Panel
FD	Fire Damper
FH	Fire Hydrant
FHC	Fire Hose Cabinet
FM	Fire Main
FP	Fire Pump
HP	Horse Power
HV	High Voltage
IAF	Impulse Air Fan
IEC	International Electrotechnical Commission
JF	Jet Fan
JB	Junction Box
kA	KiloAmpere
kV	KiloVolt
kVA	Kilovolt-Ampere
kW	KiloWatt
LA	Lightning Arrester
LCU	Local Control Unit
LV	Low Voltage
MV	Medium Voltage
MVA	MegaVolt-Ampere

NFPA	National Fire Protection Association,
OCR	Overcurrent Relay
PF	Power Factor
PH, ϕ	Phase
PNL	Panel
PWR	Power
PSD	Platform Screen Doors
RECT	Rectifier
RTU	Remote Terminal Unit
rpm	revolution per minute
SCADA	Supervisory Control and Data Acquisition
SCP	Station Control Panel
SEJ	Sewage Ejector
SP	Sump Pump, Static Pressure, Single Phase
SW	Switch
TELECOMM	Telecommunications
TVA	Tunnel Ventilation Attenuator
TVD	Tunnel Ventilation Damper
TVF	Tunnel Ventilation Fan
UPS	Uninterruptible Power Supply
UPE	Under Platform Exhaust
UV	Undervoltage
V	Volt
VDU	Visual Display Unit

7.8 Operations

AFC	Automatic Fare Collection
ATO	Automatic Train Operation
ATP	Automatic Train Protection
ATS	Automatic Train Supervision
OCC	Operations Control Center
O&M	Operations and Maintenance

SRT'S REQUIREMENTS

APPENDIX 5 - ENVIRONMENTAL PROTECTION REQUIREMENTS

(Refer to SRT's Requirements – Execution - Clause 5)

The Private Party shall develop a detailed Environmental Protection Requirements Plan for the work under the Contract and as described hereinafter, need to be approved by SRT.

1 AVOIDANCE OF NUISANCE

The general environmental requirements are as follows:

(1) The Private Party shall conform to the National Environmental Quality Act. The Private Party shall at all times carry out all operation necessary for the execution of the Works in such a way that disturbances from construction such as dust, noises, vibrations, etc. are kept within the minimum requirements of the concerning governmental agencies.

(2) The Private Party shall conform in all respects with the provisions of any National or State Statue, Ordinance, Decree or other law or any regulation or by-law of any local or other duly constituted authority pertaining to environmental protection which may by applicable to the Works.

(3) Particular attention shall be made to the present and future Notifications and Regulations pertaining to public convenience and environment with regard to the execution of the Works of the Private Party which the Private Party shall observe and comply with.

(4) The Private Party shall conform to the Office of Transport and Traffic Policy and Planning (OTP) or previously known as the Commission for the Management of Land Traffic (CMLT) 'Guidelines in Mitigation of the Environmental Impact from the Construction of Land Transportation Projects'. (Issued by the CMLT on 12 July 1996 - Reference NR 0802 /V 0270)

(5) The Private Party shall be responsible for ensuring that no earth, rock or debris is deposited on public or private right of way as a result of its operations, including any deposits arising from the movement of plant or vehicles. The Private Party shall provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the Site when excavated material is hauled, to the approval of the SRT or the Engineer's Representative.

(6) The Private Party shall at all times ensure that all existing stream courses and drains within, and adjacent to, the Site are kept safe and free from any debris and any excavated materials arising from the Works. The Private Party shall ensure that chemicals and concrete agitator washings are not deposited in the watercourses.

(7) All water and waste products arising on the Site shall be collected, removed from the Site via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that will cause neither pollution nor nuisance.

(8) The Private Party shall construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage by flooding and silt washed down from the Works. It shall also provide adequate precautions to ensure that no spoil or debris of any kind are allowed to be pushed, washed down, fallen or be deposited on land adjacent to the Site.

(9) In the event of any spoil or debris from construction works being deposited on adjacent land or seabed or any silt washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land or seabed and areas restored to their natural state by the Private Party to the satisfaction of the Engineer's Representative.

(10) The driving or boring of piles shall not generate vibration and noise levels outside the permitted limits of the Office of Environmental Policy and Planning (OEPP) and shall be carried out during daylight hours only unless agreed by the Engineer's Representative and the local authorities. Equipment with low noise emission shall generally be used. Separate noise barriers shall be used around pile driving works if required to satisfy the noise level requirements.

(11) Operatives working in dusty environments shall be given breathing masks and those working in excessive noise shall be provided with ear protectors.

(12) Complaints received from the local community shall be speedily resolved to the satisfaction of the SRT or Engineer's Representative.

(13) Monitoring points and Baseline Conditions shall be established by the Private Party to monitor the air quality, water quality, noise and vibration emanating from the Works in accordance with the requirements of the OEPP and the results sent to the OEPP.

(14) The Private Party shall conform with the requirements of the National Environment Board (NEB), Ministry of Natural Resources and Environment for Solving the air Pollution in Bangkok and Communities in Thailand.

2. AIR QUALITY

General Requirements

(1) The Private Party shall not install any furnaces, boilers or other similar plants or equipment using any fuel that may produce air pollutants without prior written consent of the Ministry of Industry pursuant to the National Environmental Quality Act.

(2) The Private Party shall not burn debris or other materials on the Site.

(3) The Private Party shall implement dust suppression measures which shall include, but not be limited to the following:

(a) Stockpiles of sand and aggregate greater than 20 m^3 for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and two (2) meters beyond the front of the pile.

(b) Effective water sprays shall be used during the delivery and handling of all raw sand and aggregate, and other similar materials, when dust is likely to be created and to dampen all stored materials during dry and windy weather.

(c) Areas within the Site where there is a regular movement of vehicles shall have an approved hard surface and be kept clear of loose surface material.

(d) Conveyor belts shall be fitted with wind boards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission. All conveyors carrying materials which have the potential to create dust shall be totally enclosed and fitted with belt cleaners.

(e) Cement and other such fine grained materials delivered in bulk shall be stored in closed silos fitted with a high level alarm indicator. The high level alarm indicators shall be interlocked with the filling line such that in the event of the hopper approaching an overfill condition, an audible alarm will operate, and the pneumatic line to the filling tanker will close.

(f) All air vents on cement silos shall be fitted with suitable fabric filters provided with either shaking or pulse-air cleaning mechanisms. The fabric filter area shall be determined using an air-cloth ratio (filtering velocity) of 0.01 - 0.03 m/s.

(g) Weigh hoppers shall be vented to a suitable filter.

(h) The filter bags in the cement silo dust collector must be thoroughly shaken after cement is blown into the silo to ensure adequate dust collection for subsequent loading.

(j) The provision of adequate dust suppression plant including water browsers with spray bars.

(k) Areas of reclamation shall be completed, including final compaction, as quickly as possible consistent with good practice to limit the creation of wind blown dust.

(l) Unless otherwise approved by the Engineer's Representative, the Private Party shall restrict all motorized vehicles on the Site to a maximum speed of 15 kilometers per hour and confine haulage and delivery vehicles to the designated roadways inside the Site.

(m) At each construction site, the Private Party shall provide storage facilities for dust generating materials.

(n) The storage facilities for dust generating materials shall be:

(i) closed containers or;

(ii) wind protected shelters or;

(iii) mat covering or;

(iv) walled.

Or any combination of the above to the satisfaction of the Engineer's Representative.

(o) Dust generating materials shall be:

(i) transported in closed containers or covered trucks;

(ii) loaded and unloaded in closed systems or wind protected areas;

(iii) watered as appropriate.

(p) The Private Party shall provide paved roadways in construction sites and ensure that all vehicles are adequately cleaned before leaving the site.

(4) At any concrete batching plant or crushing plant being operated on the Site, the following additional conditions shall be complied with:

(a) The Private Party shall undertake at all times to prevent dust nuisance as a result of its activities. An air pollution control system shall be installed and shall be operated whenever the plant is in operation.

(b) Where dusty materials are being discharged to vehicles from a conveying system at a fixed transfer point, a three-sided roofed enclosure with a flexible curtain across the entry shall be provided. Exhaust fans shall be provided for this enclosure and vented to a suitable fabric filter system.

(c) Any vehicles with an open load carrying area used for moving potentially dust producing materials shall have properly fitting side and tail boards. Materials having the potential to create dust shall not be loaded to a level

higher than the side and tail boards, and shall be covered by a clean tarpaulin in good condition. The tarpaulin shall be properly secured and shall extend at least 300 millimeters over the edges of the side and tail boards.

(d) The Private Party shall frequently clean and water the concrete batching plant and crushing plant sites and ancillary areas to minimize any dust emissions.

(e) Dry mix batching shall be carried out in a totally enclosed area with exhaust to suitable fabric filters.

Monitoring of Dust (TSP) Levels

(5) The Private Party will carry out dust impact monitoring at the principal and secondary Works Areas throughout the construction period.

(6) Within three weeks of the Date of Notice to Proceed, the Private Party shall provide :

(a) Two high volume air samplers and associated equipment and shelters in accordance with the publication entitled "Laws and Standards on Pollution Control in Thailand" published by the Environmental Quality Standards Division of the National Environment Board July 1989 (hereinafter referred to as "Laws and Standards") The samplers, equipment and shelters shall be constructed so as to be transferable between monitoring stations;

(b) A direct reading dust meter capable of reading 1 hour TSP in the range 0.1 - 100mg/m3.

(7) The Private Party shall construct suitable access, hard standing and a galvanized wire fence and gate at each monitoring station at locations on the Site boundaries. Alternative locations may be necessary if difficulties arise in obtaining access, or if the locations become unsuitable. The exact location and direction of the monitoring equipment at each monitoring station shall be agreed with the Engineer's Representative. Monitoring stations shall be free from local obstructions or sheltering. The estimated total number of monitoring stations shall be determined by the Engineer's Representative.

(8) The dust (TSP) levels will be measured by the "High Volume Method for total suspended particulates" as described by the Laws and Standards.

(9) The Private Party will carry out baseline monitoring, as soon after the Date of Notice to Proceed as is practicable, to determine and agree with the Engineer's Representative ambient dust (TSP) levels at each specified monitoring station. The baseline monitoring will be carried out for a period of at least two weeks, with measurements to be taken every day at each monitoring station.

(10) Impact monitoring during the course of the Works will normally be undertaken at any one or more of the monitoring stations as determined by the Engineer's Representative on up to three (3) days per week.

(11) Should the impact monitoring record dust levels which are indicative of a deteriorating situation such that closer monitoring is reasonably indicated, then the Engineer's Representative may require the Private Party to undertake daily impact monitoring at any one or more of the monitoring stations until the results indicate an improving and acceptable level of air quality.

Action on Construction Dust (TSP) Levels

(12) Where the Engineer's Representative determines that the recorded dust (TSP) level is significantly greater than the levels established in the baseline survey, the Engineer's Representative may direct the Private Party to take effective remedial measures including, but not limited to, reviewing dust sources and modifying working procedures.

(13) The Private Party shall inform the Engineer's Representative of all steps taken. Written reports and proposals for action shall be passed to the Engineer's Representative by the Private Party whenever the Engineer's Representative determines that air quality monitoring shows that the recorded dust (TSP) level is significantly greater than the levels established in the baseline survey.

(14) The Private Party shall aware that the location of dust producing plant or facilities, either fixed or mobile, shall be subject to the approval of the Engineer's Representative.

3. WATER POLLUTION CONTROL AND WATER QUALITY MONITORING

General Requirements

The Private Party shall comply with the Thai legislation and other regulations in existence in Thailand insofar as they relate to water pollution control and monitoring.

(1) All water and waste products (surface runoff and wastewater) arising on the site shall be collected and removed from the site via a suitable and properly designed temporary drainage system and disposed off at a location and in a manner that will cause neither pollution nor nuisance. The Private Party is not allowed to discharge water from the site without the approval of the Engineer's Representative.

(2) The Private Party shall at all times ensure that all existing stream courses and drains within, and adjacent to the Site are kept safe and free from any debris and any excavated materials arising from the Works. The Private Party shall ensure that earth, bentonite, chemicals and concrete agitator washings etc. are not deposited in the watercourses but are suitably treated and effluents and residue disposed off in a manner approved by local authorities.

(3) The Private Party shall provide adequate precautions to ensure that no spoil or debris of any kind is pushed, washed, falls or deposited on land adjacent to the Site perimeter.

(4) In the event of any spoil or debris from construction works being deposited on adjacent land any silt washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state by the Private Party to the satisfaction of the Engineer's Representative.

(5) The Private Party shall prevent soil particles and debris from entering the wells or water discharge points by use of filters and sedimentation basins as required.

(6) The Private Party shall discharge wastewater arising out of site office, canteen or toilet facilities constructed by him into sewers after obtaining prior approval of agency controlling the system. A wastewater drainage system shall be provided to drain wastewater into the sewerage system.

(7) The Private Party shall take measures to prevent discharge of oil and grease or contaminated water from reaching any drainage system or body or water.

4. Noise Control

(1) The Private Party's attention is drawn to the National Environmental Quality Act which contains the Noise Limits.

(2) The Private Party shall consider noise as an environmental constraint in its planning and execution of the Works.

(3) (a) The Private Party shall at its own expense take all appropriate measures to ensure that work carried out by the Private Party and by its sub-contractors, whether on or off the Site, will not cause any unnecessary or excessive noise which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise.

(b) Without prejudice to the generality of the foregoing, noise level reduction measures shall include the following:

(i) the Private Party shall ensure that all powered mechanical equipment used in the Works shall be effectively sound reduced using the most modern techniques available; and

(ii) the Private Party shall construct acoustic screens or enclosures around any parts of the Works from which excessive noise may be generated.

(4) The Private Party shall submit to the Engineer's Representative a noise statement including full and comprehensive details of all powered mechanical equipment which it proposes to use during any hours of darkness and of its proposed working

methods and noise level reduction measures. The noise statement shall include detailed noise calculations to demonstrate the anticipated noise generation by the Private Party. The noise statement shall be submitted at least fourteen (14) days before the planned start of any work to be undertaken during hours of darkness. No work shall be carried out during the hours of darkness until the Engineer's Representative has notified the Private Party in writing of his consent based on the noise statement submitted in relation to such work. Such consent of the Engineer's Representative shall not in any event relieve the Private Party of its obligations under the Contract, nor fetter, limit or restrict, the power of the Engineer's Representative to give instructions in accordance with the Contract.

(5) The Private Party shall ensure that noise generated by work carried out by the Private Party and its sub-contractors during the restricted periods shall not exceed the Noise Limits, whether continuously or intermittently. In the event of a breach of this requirement, the Private Party shall immediately re-deploy or adjust the relevant equipment or take other appropriate measures to reduce the noise levels and thereafter maintain them at levels which do not exceed the Noise Limits. Such measures may include, without limitation the temporary or permanent cessation of use of certain items of equipment.

The Private Party will carry out noise monitoring at such points on a daily basis within the Site or outside the Site and at times as shall be determined by the Engineer's Representative from time to time.

5. REFRIGERANTS AND FIRE EXTINGUISHERS

Refrigerants and fire extinguishers shall be in accordance with the Montreal Protocol and/or regulations imposed by relevant Statutory Undertakers.

SRT'S REQUIREMENTS

APPENDIX 6 - FORECAST PASSENGER FLOWS

(Refer to SRT's Requirements – Functional – Part 1, Clause 7(7))

The Private Party shall design the High Speed Rail Linking Three Airports Project (Don Muang – Suvarnabhumi – U - Tapao) to the latest available data on Passenger Forecasts.

The Passenger Forecast is defined in Volume IV, Part 3, Section 1 – Overall Systems Requirements, Appendix B.

SRT'S REQUIREMENTS

APPENDIX 7 - ACCOMMODATION FOR SRT AND SRT'S REPRESENTATIVE

(Refer to SRT's Requirements - Execution Clause 10.1(1), 10.4(1) & 10.7(2))

1. ACCOMMODATION FOR THE SRT'S MAIN OFFICE BUILDING

The Private Party shall provide, erect and equip one fully air conditioned SRT's Main Office for the sole use of the SRT for the duration of the Works. The offices shall be in the location and position as instructed by the SRT, accessible by motor vehicles from adjacent public roads along a temporary all weather access road, and with adequate paved yard and ten (10) cm. thick concrete parking area, free from flooding, with roof for at least 100 vehicles and parking area without roof for at least 40 vehicles.

The office running costs, all services, drinking water, coffee and tea, including all consumables in reasonable quantities as requested by the SRT shall be borne by the Private Party throughout the PPP Contract for Phase I.

The SRT's main Project Site Office shall at least comprise one office space of nine hundred (900) sq.m. (exclusive of parking area) with the following facilities:

- Manager rooms, SRT rooms, technician rooms, secretary room, kitchenette, store room and WCs, with the total area not less than 460 sq.m.
- One convention room for 60 persons with the area not less than 200 sq.m.
- Two meeting room for 20 persons with the area not less than 40 sq.m.
- Partition walls as required
- Storeroom
- Kitchens
- Changing room
- Male toilets and washroom
- Female toilets and washroom
- Showers
- Water heaters
- All necessary power and lighting
- Portable water supply and plumbing
- Air conditioners
- Ventilation fans

- Covered verandahs
- Covered car port for at least fifteen cars
- Guard hut
- Fences and gates
- Sun shades to windows
- Guard Hut

2. ACCOMMODATION FOR THE SRT'S REPRESENTATIVE MAIN OFFICE BUILDING

The Private Party shall provide, erect and equip one fully air conditioned SRT's Representative Main Office for the sole use of the SRT's Representative staff for the duration of the Works. This main office is intended to be used by both the ICE and SRT's Consultant. The office shall be in a location and position as required by SRT's Representative, accessible by motor vehicles from adjacent public roads along a temporary all weather access road, and with adequate paved yard and ten (10) cm. thick concrete parking area, free from flooding, with roof for at least 30 vehicles and parking area without roof for at least 15 vehicles.

The office running costs, all services drinking water, coffee and tea, including all consumables in reasonable quantities as requested by the SRT's Representative shall be borne by the Private Party throughout the Contract.

The SRT's Representative's Main Office shall at least comprise one office space of one thousand (1,000) sq.m. with the following facilities.

- Manager rooms, specialist rooms, SRT rooms, inspector rooms, secretary room, kitchenette, store room and WCs, with the total area not less than 600 sq.m.
- One meeting room for 40 persons with the area not less than 80 sq.m.
- One meeting room for 20 persons with the area not less than 40 sq.m.
- Partition walls as required
- Storeroom
- Kitchens
- Changing room
- Male toilets and washroom
- Female toilets and washroom
- Showers
- Water heaters

- All necessary power and lighting
- Portable water supply and plumbing
- Air conditioners
- Ventilation fans
- Covered verandahs
- Covered car port for at least fifteen cars
- Guard hut
- Fences and gates
- Sun shades to windows

3. GENERAL REQUIREMENTS

(1) The buildings for the SRT and SRT's Representative' Main Offices shall be designed and constructed as the permanent structure suitable for the climatic conditions prevailing. The location of the SRT and SRT's Representative' Main Offices shall be constructed under the approval of the SRT. Materials used for the construction of the offices shall be new and of good qualities. The buildings shall be properly insulated and proof against the weather and insects, with secure door and windows to prevent burglary. The eaves shall project at least one and half (1.5) m beyond the walls and the space between the ceiling and roof shall be property ventilated.

All rooms shall have ceilings and the minimum ceiling height of all rooms shall be two and half (2.5) m.

The floor covering shall be two (2) mm thick vinyl floor tiles, or equivalent. The floors of the wet areas shall be waterproofed. The walls shall be painted and the windows glazed.

Fire fighting equipment shall be provided in accordance with the local regulations.

(2) The Private Party shall provide, erect and maintain appropriate name boards as specified for each of the offices. The wording on each name board and its location shall be agreed by the SRT's Representative before it is erected.

(3) Within seven (7) days of the Notice to Proceed the Private Party shall submit to the SRT and SRT's Representative for consent scaled drawings of the office complex showing its location, access route, constructional details, floor plans and room layouts internal finishes, and services.

(4) The Private Party shall provide the offices ready for occupation and use, complete with all furniture and facilities as described in Appendix 9 to these SRT's Requirements including lockable devices, as soon as practically possible, but in any case not later than sixty (60) days after the Date of Commencement.

(5) Until the specified SRT and SRT's Representative's Offices and telephone facilities are provided the Private Party shall provide at his expense within 1 week after the date of the Notice to Proceed reasonable alternative office accommodation with telephone in a suitable location.

(6) Upon issuance of the Commissioning or Substantial Commissioning Certificate, the SRT and SRT's Representative's Main Offices shall be removed and the site shall be reinstated.

4. SRT AND SRT'S REPRESENTATIVE'S STATION OFFICES

(1) The Private Party shall provide, erect and equip fully air conditioned offices with toilet, shower, fax and telephones at every station for the sole use of the SRT and SRT's Representative for the duration of the Works. The offices running costs including all consumables, expenses shall be borne by the Private Party throughout the PPP Contract for Phase I.

(2) The SRT and SRT's Representative's office at selected Stations shall consist of an office space of at least 200 sq.m.

(3) The Private Party shall provide the offices complete with all furniture and facilities as described in Appendix 9 to the SRT and the SRT's Representative ready for occupation and use, as soon as practically possible, but in any case not later than sixty (60) days after the Date of Commencement.

(4) Upon issuance of the Commissioning or Substantial Commissioning Certificate, the station site offices shall be removed and the site shall be reinstated.

(5) Station offices shall be installed in selected 6 specific locations in Makkasan, Chachoengsao, Chonburi, Si Racha, Pattaya and U-Tapao.

5. TESTING LABORATORY

The Private Party shall provide, erect, staff and maintain a Testing Laboratory with testing equipment throughout the period of Phase I as specified in Appendix 8.

6. EQUIPMENT AND TRANSPORTATION FOR THE SRT AND SRT'S REPRESENTATIVE

Office equipment and survey equipment to be provided and maintained for the SRT and SRT's Representative are specified in Appendix 9, and vehicles are specified in Appendix 10.

7. STAFF

(1) The following staffs are to be provided and employed by the Private Party continuously from the Date of Commencement until each of the SRT and SRT's Representative's site station offices are closed. The staff will be required to attend the office during all hours that the office is in operation. All salary and expense and overtime shall be borne by the Private Party.

(2) The Private Party shall provide 5 experienced secretaries for the SRT's Office who are fluent in English (speaking, writing, and comprehension), and competent in the use of Microsoft Office.

(3) Two messengers for the SRT's Main Office; three messengers for ICE Main Office; three messengers for SRT's Consultant Main Office; two messengers for each Station Site Office, each with a motorbike addition to Appendix 10).

(4) Daily office cleaning services shall be provided during the time that the SRT's Main Office, the SRT's Representative Site Office and the Station Site Offices are in use.

(5) The Private Party shall provide an experienced driver for each vehicle listed in Appendix 10 for the full period until the vehicles are handed over back to the Private Party. Drivers shall have held a driving licence for at least three years, have good eyesight and be in good health. Drivers will be in attendance on the SRT Site staff and the SRT's Representative site and site supervision staff for 10 hours per day 6 days a week plus reasonable overtime hours necessary to supervise the Works. The Private Party shall provide his employed drivers suitable dresses.

(6) The Private Party shall establish security system including emergency communication network and provide a 24 hour security service, approved by the SRT and SRT's Representative, for the offices during the time that the offices are in use.

(7) The Private Party shall provide 10 Laboratory Assistants for each of the SRT's Representative's Testing Laboratory.

(8) The Private Party shall provide 5 labourers for each survey party of the SRT's Representative.

SRT'S REQUIREMENTS

APPENDIX 8 - SITE LABORATORIES

(Refer to SRT's Requirements - Execution Clauses 10.3, 10.4(1) and 10.7(2))

1. SITE LABORATORY

(1) The Site Laboratory shall be approximately two hundred (200) m^2 in area with testing equipment throughout the period of Phase 1. There are four (4) total site laboratories spread across the project, to be identified by the SRT's Representative, particularly positioned adjacent to the Station Site Offices. It shall consist of the following accommodation for each laboratory:

1 testing laboratory	30 m^2 floor area
1 office	15 m^2 floor area
1 store room	30 m^2 floor area
1 kitchen	10 m^2 floor area

male and female toilets, changing room & shower and lockers sufficient for 6 persons for each.

(2) The remainder of the two hundred (200) m2 shall consist of storage area for concrete cube/cylinder curing tanks and open space with shed for testing. The laboratory, office etc. shall be in one building; the curing tank storage building may be in a separate building, but if so it shall be adjacent to the laboratory building & connected to it by a level, weatherproof passageway. In addition, an area of covered hardstanding of thirty (30) m2 for motor vehicles shall be provided adjacent to the laboratory.

(3) The laboratories shall be of a construction and design suitable for the climatic conditions prevailing, be provided with power and running water, sinks, drains and all other facilities required for a laboratory and shall be used exclusively for the purpose. Ceiling height shall be minimum three (3.0) meters.

2. STANDARD OF CONSTRUCTION

(1) The laboratories shall be constructed to the same standard as the SRT's Main Office as specified in Appendix 7 to the SRT's Requirements. Two independent telephone lines with two extensions for each shall be provided for each laboratory. Telephones shall be located in areas as agreed with the SRT's Representative.

(2) A water tank with minimum capacity of two thousand (2000) litres for each shall be installed, as a source of constant water pressure (15 kPa minimum) for each laboratory.

(3) In the case of sinks used for washing samples, adequate trapping and/or separating devices shall be provided to ensure the proper functioning of the facility.

3. FURNISHINGS AND FIXTURES

The furnishings and fixtures to be provided by the Private Party shall be new and to the consent of the SRT's Representative. The Private Party shall maintain and replace when out of order more than 24 hours including provide all consumables items throughout the period of Phase I. They shall include the following:

- sink, kitchen type, stainless steel with drainer and splash back, 4 Nos.
  fitted with bench level and complete with hot, cold and drinking water
- racking, 3 shelf x 1.0 m deep x 2.5 m high x 12.0 m run 1 Nos.
- benching, heavy duty about 0.80 m deep x about 1.0 m high 1 Nos.
  with 18 Nos. 0.4 m x 0.2 m drawers under and 10 Nos. 1.0 m cupboards, remainder shelved as required
- bench tops, galvanized iron mounted on 25 mm blockboard 2 Nos.
- belling electric cooker with oven and 4 hot plates 2 Nos.
- domestic refrigerator approximately 5.0 cu. ft. 2 Nos.
- shelves, heavy duty, 0.3 m x 30.0 m run, high level 2 Nos.
- roller towel dispensers "Towel Flow" type with laundering 2 Nos.
- service and soap dispenser 4 Nos.
- padded chairs swivel & wheel 4 Nos.
- desk, steel with glass top and lockable drawers 0.6 m x 1.2 m 2 Nos.
- desk, wooden 1.0 m x 1.8 m with lockable drawers 2 Nos.
- steel file cabinet, 4 drawers lockable legal size 2 Nos.
- steel vertical plan storage cabinet with lockable doors 2 Nos.
- calculator, scientific type 4 Nos.
- small plain paper copier, A4 and A3 size, with supply of 5000 sheets of paper per month 2 Nos.

- bookshelf 2 Nos.
- rubber boots, plastic waterproof overcoat and safety helmet and reflective jacket (set) 10 Sets
- stool, adjustable height 4 Nos.
- chair, steel, padded 4 Nos.
- large plastic rubbish bins 6 Nos.
- desk top In/Out box set 4 Nos.
- clip board, wooden, legal size 12 Nos.
- cloak rack 2 Nos.
- bulletin board 1.0 m x 2.0 m, cork 2 Nos.
- white board, markers and eraser 2 Nos.
- fire extinguisher - Standard Type* 2 Nos.
- fire extinguisher - Foam Type* 2 Nos.
- fire extinguisher - Carbon Dioxide Type* 2 Nos.
- water cooler & supply of drinking water drinking cups, tea run etc. 2 Sets
- garden hose, 20.0 m. long and fittings 2 Nos.
- electrical extension cord and fittings, 10.0 m long 2 Nos.
- adapters 6 Nos.

* plus maintenance during Contract period

4. LABORATORY EQUIPMENT

(1) The laboratory equipment, as listed below, shall be consented to by the SRT's Representative. Manufacturers' catalogue numbers are given against each item for the Private Party's reference only. The Private Party shall submit for the SRT's Representative's consent within two (2) weeks of the order to commence work of the name of the supplier he intends to use for each piece of apparatus together with the relevant catalogue number.

(2) The layout of the equipment in the testing laboratory shall be instructed by the SRT's Representative. The equipment shall be maintained in good condition to accuracies appropriate to the required testing methods with routine calibration by an accredited organization as recommended by the appropriate Authority. Equipment shall also be calibrated after maintenance or relocation.

(3) The Private Party's site laboratory shall be equipped with the following material testing equipment as a minimum for each laboratory. The nature and quantity of equipment required for testing may be varied by the SRT's Representative depending on the detail of the Private Party's Design and Construction methods or for any other reason which he deems to be valid and necessary for the proper control of quality:

(a) Atterberg Limit / Liquid Limit and Natural Water Content: AASHTO-T 89

1 set - Liquid Limit Set, each consisting of :

1	Standard Liquid Limit Device with ASTM Tool
1	Mixing Dish
1	Flexible Spatula
1	100 cc Graduated Cylinder
2	Dozen Moisture Content Cans
1	Moisture Content Container 65 mm and 90 mm Diameter. (5 sets)

(b) Plastic Limit & Plasticity Index of Soil : AASHTO-T 90

1 set - Plastic Limit Set, consisting of :

1	Plastic Limit Plate
1	Mixing Dish
1	Flexible Spatula
1	25 ml. Glass Graduate
1	Dozen 2-ounce Moisture Cans

(c) Slump Test of Concrete Compression: AASHTO-T 119

8 Sets, each comprising of:

1	Slump Test Set
1	Galvanised Steel Slump Cone
1	Machine Steel and Cadmium Plated Tamping Rod
1	Galvanised Steel Metal Cement Pan, 24" x 24" x 3"
1	Stiff Brass wire bristled brush
1	All Steel trowel with wooden handle

(d) Method for Determination of Flow : DIN 1048:Part1

2 sets, each comprising of:

1	Flow Table 70 x 70 cm.
1	Stainless Steel Cone 13x20x20 cm.
1	All Steel trowel with wooden handle
1	Steel Tamping Rod 40 x 40 mm.

(e) Compression Test of Concrete Cylinders: AASHTO-T 23 & 22 AASHTO-T 22

1 set – Compressive strength of Concrete Cylinder

18	Cylinder Moulds, 6" Heavy Duty
1	Basic Concrete Tester, 120,000 kgs capacity, with a Electric Pump attachment (220v/50Hz/1 ph) and a 12-inch Gauge mounted in a console.

(f) Making & Curing of Concrete Specimens: AASHTO-T 23

2 sets of Vertical Capping Set, each consisting of:

1	Vertical Cylinder Capper and Capping Ladle, 6" by 12" cylinder
1	Capping Compound Warmer, 4 qt capacity
1	Capping Ladle
1	50 lb Concrete Capping Compound
1	Cylinder Carrier for 6" by 12" Cylinder

(4) All equipment shall be retained by the Private Party after the completion for Phase I.

SRT'S REQUIREMENTS

APPENDIX 9

EQUIPMENT FOR USE OF THE SRT AND THE SRT'S REPRESENTATIVE

(Refer to SRT's Requirements - Execution Clause 10.7(2))

1. GENERAL

The Private Party shall provide new equipment listed in this Appendix and maintain it for the exclusive use of the SRT and the SRT's Representative.

2. FURNITURE

The Private Party shall provide, maintain and replace for the duration of the PPP Contract, Phase I, and shall be retained by the Private Party after the issuance of the Commissioning Certificate.

SRT and SRT's Representative's Offices shall contain at least size of the following furnishings:

Item	SRT office	ICE office	SRT's Consultant office	Station Offices	Lab.
	Qty.	Qty.	Qty.	Qty.	Qty.
Steel desk 1.80 m. x 0.85 m. with 7 drawers, glass top, and managerial style chairs	3	4	4	-	-
Steel desk 1.50 m. x 0.75 m. with 7 drawers, glass top, and managerial style chairs	10	10	10	18	4
Steel desk 1.20 m. x 0.65 m. with 4 drawers and armchair	30	40	40	126	16
Set of sofa and table for visitors	1	1		-	-
Table 2.4 m. x 0.6 m. for convention room (U-Shape style - 60 person)	15	-	-	-	-
Table 2.4 m. x 0.6 m. as conference table (Hollow square style)	20	15		10	-
Meeting table for 8 person seating capacity	-	-	-	6	-
Upright chairs for conference table	100	60		48	-
Steel folding chairs for conference room	70	45		24	-
Lockers sliding glass 1.2 m x 0.5 m 1.1 m	20	7	7	-	-
A0 size vertical plan chests	1	1	1	-	-

Item	SRT office	ICE office	SRT's Consultant office	Station Offices	Lab.
	Qty.	Qty.	Qty.	Qty.	Qty.
Lockable 4-drawer filing cabinets	10	8	8	18	4
Lockable 2-drawer filing cabinets	5	4	4	18	4
Cupboard 1.2 m. wide x 0.6 m deep x 2.0 m. high with shelves (lockable)	10	7	7	6	4
Safe 75 litres	1	1	1	-	-
Waste paper baskets	20	20	20	30	16
White board 1.2 m x 2.4 m	4	2		6	4
Softboard 1.2 m x 2.4 m	2	2		6	4
Charts for Conference Room (As required)	1	-		-	-
A0 size Drawing Rack	2	2	2	-	-
Cupboard with sink for kitchen	1	1		6	-

3. OFFICE EQUIPMENT

(1) The Private Party shall provide as approved in writing by the SRT and SRT's Representative, maintain and replace and all consumable for office equipment through the Contract period. All office equipment shall be new with instruction manual, maintained and replaced when out of order more than 24 hours, the equipment described below.

Item	Description	SRT office	ICE office	SRT's Consultant office	6 Station Offices	4 Lab.
		Qty.	Qty.	Qty.	Qty.	Qty.
a)	*Projector with screen:* Projector with Brightness at least 3,500 ANSI Lumen, Digital Signal Processing, Display resolution 1024 x 768.,Wireless Remote Control, with mobile screen 7x7 sq.ft., approved by the SRT.	3	2		-	-
b)	*Digital Camera:* Digital Camera, at least 20 million pixels, LCD Display at least 3 inch., 4x Digital Zoom, 12x Optical Zoom, USB Port, 32GB Memory Card, approved by the SRT.	2	2	2	6	4

Item	Description	SRT office	ICE office	SRT's Consultant office	6 Station Offices	4 Lab.
		Qty.	Qty.	Qty.	Qty.	Qty.
c)	*One complete set of Audio System for Convention Room*	1	-	-	-	-
d)	*Overhead Projector: (as required)* Overhead Projector approved by the SRT.	1	1		-	-
e) e.1) e.2)	*Refrigerator:* Refrigerator, at least 9 cubic feet capacity each, approved by the SRT. Refrigerator, at least 6 cubic feet capacity each, approved by the SRT.	2 -	2 -	2 -	- 6	- 4
f) f.1) f.2)	*Electric Kettle:* Electric Kettle, at least 3 litres capacity each, approved by the SRT. Coffee set, 12 cups, 12 glasses, 12 teaspoons, tray and coffee pot.	2 2	2 2	2 2	6 6	4 4
g)	Microwave oven, capacity of 22 litre	2	2	2	6	4
h)	*Facsimile Machine:* Facsimile Machine, at least 6 pages per minute, normal paper, approved by the SRT.	2	2	2	6	4
i)	*Copy Machine:* Digital Color Multifunction (Network printer, scanner, Copy Machine, Store Data) the combined capacity of at least 50,000 sheets per month, Speed at least 50 sheets per minute scan, Minimum capacity A3 size paper, approved by the SRT.	1	1	1	-	-
j) j.1)	*Telephone System:* Set of Telephone System, comprise of 1 PABX which support at least	1	1	1	-	-

Item	Description	SRT office	ICE office	SRT's Consultant office	6 Station Offices	4 Lab.
		Qty.	Qty.	Qty.	Qty.	Qty.
j.2)	10 external lines and extend to at least 32 internal lines, 32 handsets with 1 controlled handset, approved by the SRT. External lines External lines	-	-	-	6	4
k)	*VDO – Visualizes:* VDO – Visualizes, completed with accessories, approved by the SRT.	1	-	-	-	-
l)	*Wireless Microphone:* Set of wireless Microphone with Tuner, approved by the SRT.	2	-	-	-	-
m)	*Table Microphone System:* Sets of Table Microphone System with Amplifier for Conference room, approved by the SRT.	50	30		-	-
n)	*Fire Extinguisher:* CO_2 Fire Extinguisher, 10 kilograms capacity each, approved by the SRT.	5	6		12	8
o)	*Water Cooler:* Set of Bottled Water Cooler, approved by the SRT.	2	2	2	6	4

The Office Equipment shall be handed over back to the Private Party after the completion of Phase I.

(2) The Private Party shall provide in the SRT and SRT's Representative's Offices as and when required by the SRT and Engineer's Representative.

The Private Party shall propose all equipment to the SRT and SRT's Representative for approval before supply that equipment.

All office equipment and all consumables shall be new with instruction manual, maintained and replaced when out of order more than 24 hours until the issuance of the Commissioning Certificate and handed over back to the Private Party.

Item	Description	Em-ployer office	ICE office	Em-ployer's Con-sultant office	6 Station Offices	4 Lab.
		Qty.	Qty.	Qty.	Qty.	Qty.
(1)	Office Computer: At least the following specifications CPU Intel Core i7 3.4 GHz. or better DDR RAM 4 GB 1 TB SATA HDD (7200 RPM) DVD±RW 16X VGA 1 GB Integrated Audio Integrated 10/100/1000 Ethernet,USB 2.0, Monitor 20" LED Keyboard USB Optical Mouse USB, Mouse Pad, Speaker 220 Watt. Multi Reader Card 3 Years On-site Service Approved by the SRT.	5	15	15	18	-
(2)	CAD Computer: At least the following specifications CPU Intel Core i7 GEN8 3.7 GHz. or better DDR RAM 8 GB 1 TB SSD DVD±RW 16X VGA 4 GB Integrated Audio Integrated 10/100/1000 Ethernet,USB3.0, Monitor 24" LED Keyboard USB Optical Mouse USB,Mouse Pad Speaker 220 Watt.	33	34	34	108	20

Item	Description	Em-ployer office	ICE office	Em-ployer's Con-sultant office	6 Station Offices	4 Lab.
		Qty.	Qty.	Qty.	Qty.	Qty.
	Multi Reader Card 3 Years On-site Service Approved by the SRT.					
(3)	Notebook Computer: At least the following specifications CPU Intel Core i7 GEN8 3.4 GHz. or better DDR RAM 8 GB, HDD 1 TB DVD writer, Optical Mouse , 15" LED Full HD Monitor, Multi Reader Card 10/100/1000 LAN Ethernet 2xUSB 2.0, IEEE 1394, PCMCIA, Parallel,WLAN Approved by the SRT	5	5	5	18	-
(4)	Printer: 10/100 Lan Ethernet interface (All Printer) Color Laser printer for Size A4 64 MB Memory Color Laser printer for Size A3 128 MB Memory Approved by the SRT	8 4	2 2	4 4	6 6	4 -
(5)	Color Plotter, for Size A0:Minimum 256 MB Memory With 10/100 LAN Ethernet interface 36 inch printing area, approved by the SRT	1	1	1	-	-
(6)	Software Licensed: At least the following specifications or better Operation System Windows 10 Professional or better Office suit Ms Office 2016 or better Server Operation System	43 43 1	54 54 1	54 54 1	144 144 6	20 20 -

Item	Description	Em-ployer office	ICE office	Em-ployer's Con-sultant office	6 Station Offices	4 Lab.
		Qty.	Qty.	Qty.	Qty.	Qty.
	Computer Aid Drawing (CAD)	5	15	15	18	-
	Structural Analysis and Design	1	1	1	-	-
	Project Planner	1	1	1	-	-
	Antivirus and Antispyware	43	54	54	144	20
	Computational Fluid Dynamic	1	1	1	-	-
	Premavera P6 Approved by the SRT	4	2	10	6	
(7)	Lan System: Each unit include					
	Rack for Server	2	2	2	6	-
	Switch 10/100/1000 24 Port	2	2	2	6	-
	Cableling System	60 points	60 points	60 points	30 points	-
	Wireless Lan System for Notebook 8 Port/Unit Approved by the SRT	2	2	2	1	-
(8)	Color scanner, for Size A3: ADF,2400 dpi-16.0 msec/line,16 bit / pixel, USB.2.0 hi-speed, approved by the SRT	2	2	2	-	-
(9)	Server for SRT/SRT Representative's Office: CPU Intel Core i5 GEN8 3.4 GHz. or better DDR RAM 4 GB. HOT –Swap Hard disk 500 GB,10000 RPM 4 Unit Support RAID 0,1,5 DVD±RW 16X ,Floppy Disk Drive 1.44 Tape Drive DAT72 10/100/1000 LAN Ethernet VGA 512 MB	1	1	1	6	-

Item	Description	Em-ployer office	ICE office	Em-ployer's Con-sultant office	6 Station Offices	4 Lab.
		Qty.	Qty.	Qty.	Qty.	Qty.
	17 " LCD Monitor Optical Mouse , Mouse Pad ,Keyboard USB Redundant Power Supply 2 unit Warranty 3 Years on – site Service approved by the SRT					
(10)	UPS 600 VA for CAD and Office computer UPS 3 KVA for Server Approved by the Engineer	38 1	49 1	49 1	126 -	20 -
(11)	MP3 Player with Audio Recorder 8 GB, approved by the SRT	2	2	2	6	-

4. **PROTECTIVE CLOTHING**

The Private Party shall provide at least 100 sets of protective clothing for the use of the SRT and SRT's Representative and his staff, plus such other persons as the SRT and SRT's Representative authorises. A set of protective clothing shall include items such as gumboots, safety shoes, hard hats, waterproof top-coats, and other safety equipment as required by the SRT and SRT's Representative in connection with the Contract. After the issuance of the Commissioning Certificate, the protective clothing shall be handed over back to the Private Party.

5. OFFICE CONSUMABLES AND UTILITY SUPPLY

The Private Party shall supply office consumables, all bills, fee and ADSL hi-speed internet (speed at least 50 Mbps download) monthly charge on a reasonable quantity as monthly basis, solely for use in the SRT and SRT's Representative's Offices from the date of commencement until 3 months after the issuance of the Commissioning Certificate for the whole of the Works.

6. SITE MOBILE COMMUNICATION

The Private Party shall provide, test and maintain a mobile phone communication system for the exclusive use of the SRT and the SRT's Representative.

7. SURVEY EQUIPMENT

(1) Equipment

The Private Party shall provide the survey equipment, approved by the SRT's Representative, prior to supply for the exclusive use of the SRT and SRT's Representative. The equipment shall be new, maintained and replaced when out of order more than 24 hours.

Item	Description	SRT	SRT's Representative
a)	Total Station with direct readings to 1 second of arc, 1 second accuracy and giving the distance readings to an accuracy of at least 2 mm. + 2 ppm. Over 1 km., complete with tripod. Electronic distance measuring device of Total Station suitable for measuring with both reflectors and none reflector.	1	1
b)	Precise automatic level with at least 32X magnification, complete with tripod.	1	1
c)	4 m long metric staffs graduated to 1 cm.	2	2
d)	Target reflectors set for above Total Station distance measuring device, complete with tripods and poles.	2	2
e)	50 m. long graduated steel measuring tapes.	1	1
f)	30 m. long graduated steel measuring tapes.	2	2
g)	Survey umbrella.	2	2
h)	3 kg. hammer.	1	1
i)	Tablet 7" with Wi-Fi and Cellular, compatible with 4G sim-card (at least 3 GB/month) and 16 GB Micro SD card	4	4
j)	Camera with GPS Function and Wi-Fi, High Definition and Suitcase, compatible with 16 GB SD or Micro SD card	1	1

Survey Equipment Set shall be retained by the Private Party after the issuance of the Commissioning Certificate.

(2) Consumables

The Private Party shall provide consumable items as required during the period of Phase I, including wooden survey pegs, steel survey pins, marking chalk, paint, paint brushes, steel bolts, nails and concrete nails.

SRT'S REQUIREMENTS

APPENDIX 10

TRANSPORT FOR THE SRT AND THE SRT'S REPRESENTATIVE

(Refer to SRT's Requirements - Execution Clause 10.5 & 10.7(2))

1. GENERAL

The Private Party shall provide new vehicles, register, insure with an approved of brand and first class insurance, and make available to the SRT and the SRT's Representative within 7 days of the Notice to Proceed.

2. ROAD TRANSPORT

(1) The vehicles shall be new and shall be delivered, and maintained in good roadworthy condition. All vehicles shall be suitable for use during the full 24 hour day, seven days per week.

(2) The vehicles shall be licensed and insured for use on the public highway and shall have comprehensive insurance cover for any qualified driver authorized by the SRT together with any authorized passengers and the carriage of goods or samples.

(3) The Private Party shall provide fuel, oil and maintenance in conformity with the vehicle manufacturer's recommendations and all relevant toll and parking charges incurred in connection with the Works. The Private Party shall clean the vehicles inside and outside as required during the currency of the Contract.

(4) A suitable replacement shall be provided for any vehicle out of service for more than 24 hours.

(5) The Private Party shall employ and make available competent drivers to drive the vehicles as and when required by the SRT and the SRT's Representative.

(6) The Following vehicles shall be provided:

Item	Description	SRT	ICE	SRT's Consultant	Station Office	Lab.
1	Sedan, air-conditioned, not less than 1,900 cc. petrol engine (or equivalent as approved by SRT), with power steering, automatic gears, radio/CD player –Toyota, Honda, Nissan or equal.	2	1	1	-	-

Item	Description	SRT	ICE	SRT's Consultant	Station Office	Lab.
2	SUV or PPV fully air-conditioned, not less than 2,300 cc. diesel engine (or equivalent as approved by SRT), with power steering, automatic gears, radio/CD player – Isuzu, Toyota, Chevloret or equal.	4	2	6		
3	Sedan, air-conditioned, not less than 1,400 cc. petrol engine (or equivalent as approved by SRT), with power steering, automatic gears, radio/CD player –Toyota, Honda, Nissan or equal.	3	2	4	-	-
4	Pick-up (Double Cab) truck with fiberglass roof, fully air-conditioned, not less than 2,300 cc. diesel engine (or equivalent as approved by SRT), with power steering, automatic gears, radio/CD player – Isuzu, Toyota, Nissan or equal.	7	2	2		
5	Pick-up (Space Cab) truck with fiberglass roof, fully air-conditioned, not less than 2,300 cc. diesel engine (or equivalent as approved by SRT), with power steering, automatic gears, radio/CD player – Isuzu, Toyota, Nissan or equal.	2	3	3	6	4

6	Commuter Van, 12 seats, comfortable interior, air-conditioned, not less than 2,900 cc. diesel engine (or equivalent as approved by SRT), with power steering, automatic gears, radio/CD player – Toyota, Nissan, Isuzu or equal.	4	2	6	6	-
7	Motorcycle, not less than 110 cc. (or equivalent as approved by SRT), Honda, Yamaha, Kawasaki, Suzuki or equal.	2	2	2	20	20

3. TRANSPORT REQUIREMENTS

Transport for the SRT and the SRT's Representative shall be provided from the date for commencement of the Works until the issue by the SRT's Representative of the Commissioning Certificate and shall be handed over back to the Private Party.

4. RECORDS

Records of journeys shall be kept in log books provided by the SRT. Record shall include details of the times and purpose of journeys with appropriate odometer readings and distances traveled. The person using the transport or authorizing the journey shall sign against the log book entries. Log books shall be presented for inspection when required by the SRT and all completed log books shall be handed over to the SRT. The Private Party shall ensure that routine maintenance has been performed within 5,000 km., and that the vehicles are clean, tidy, in good repair and in working order.

SRT'S REQUIREMENTS

APPENDIX 11 – INDEPENDENT CERTIFICATION ENGINEER (ICE)

(Refer to SRT's Requirements - General Clause 2)

1. ICE APPOINTMENT

The Independent Certification Engineer (ICE) shall be selected and appointed by the SRT, under a contract to be executed and signed by the SRT. The terms and conditions of engagement (including the terms of payment) of the Independent Certification Engineer shall be defined by the SRT. The Private Party shall be responsible for the payment of all sums related to the Independent Certification Engineer scope of services under and in accordance with his terms and conditions of engagement, provided that :-

(a) the Independent Certification Engineer shall be obliged to act fairly and impartially as between the SRT and the Private Party and at all times in accordance with the terms of the Agreement; and

(b) any and all instructions to be issued to the Independent Certification Engineer shall be in writing and signed by SRT.

The Independent Certification Engineer shall report to the SRT.

2. PRIVATE PARTY'S RESPONSIBILITIES

The Private Party shall ensure that the Independent Certification Engineer:

(a) is provided with such unhindered access to the Site and any other places where the Works are being carried on;

(b) is advised of all such tests and examinations of materials, plants and equipment (a reasonable period of time in advance of the same); and

(c) is supplied with such information concerning the Works as may be necessary for the proper performance by the Independent Certification Engineer of its responsibilities.

3. SUMMARY SCOPE OF SERVICES

3.1 Scope of Basic Services

(a) The Independent Certification Engineer shall carry out and complete the Basic Services upon the terms and conditions set out in his Agreement and in accordance with all instructions and directions given by the SRT;

(b) The Independent Certification Engineer shall carry out and complete Additional Services if so instructed by the SRT.

3.2. Review of Design Documentation

(a) Audit the Preliminary Design and any amendments in the aspects of safety thereto for compliance with all the standards and specifications specified in the PPP Contract applicable to the Preliminary Design and make recommendations to the SRT for the compliance of the Preliminary Design or provide the SRT with details of the non-compliance within twenty-eight (28) days of receipt of the Preliminary Design.

(b) Audit the Detailed Design and any amendments in the aspects of safety thereto for compliance with all the applicable standards and specifications specified in the PPP Contract applicable to the Detailed Design and notify the Private Party and the SRT as to whether the Detailed Design complies with the standards specifications and, if not, provide details of the non-compliance and suggest improvements to the Detailed Design to the SRT within 28 days of receipt of such Detailed Design.

3.3. Checking and Certifying and Issuing Substantial Commissioning or Commissioning Certificate

Upon the completion of the Phase 1, the Independent Certification Engineer (ICE) shall carry out Testing, Commissioning, checking and certifying the Works and issue a Substantial Commissioning or Commissioning Certificate as per the request of the Private Party. The Independent Certification Engineer (ICE) shall recommend SRT to issue Final Acceptance Certificate for the Private Party to start the Phase 2.

3.4 Confirm to the SRT that PPP of the High Speed Rail Linking Three Airports Project, either in parts or in whole, is safe for use and/or ready for commencement of Revenue Service. At an appropriate time, the Independent Certification Engineer shall appoint a person with sufficient knowledge and experience and experience to undertake this service;

3.5 Review and recommend to the SRT for the compliance of Detailed Design in the aspects of safety.

3.6 Testing and commissioning the system safety plan proposed by the Private Party.

3.7 The ICE shall ensure that the Operator has the sufficient knowledge to operate and maintain the whole of the High Speed Rail Linking Three Airports Project (Don Mueang - Suvarnabhumi - U-Tapao Airports).

SRT'S REQUIREMENTS

APPENDIX 12 – SRT'S CONSULTANT

(Refer to SRT's Requirements - General Clause 2)

1. APPOINTMENT

The SRT shall appoint as its consultant (SRT's Consultant) a consulting engineer or engineers of international reputation. The SRT's Consultant shall be selected by the SRT, under a contract to be executed and signed by the SRT. The terms and conditions of engagement (including the terms of payment) of the SRT's Consultant shall be defined by the SRT. The Private Party shall be responsible for the payment of all sums related to the SRT Consultant scope of services under and in accordance with his terms and conditions of engagement, provided that :-

(a) the SRT's Consultant shall be obliged to act fairly and impartially as between the SRT and the Private Party and at all times in accordance with the terms of the Agreement; and

(b) any and all instructions to be issued to the SRT's Consultant shall be in writing and signed by SRT.

The SRT's Consultant shall report to the SRT.

2. Scope of Services

For the purposed of this Appendix 12, the services to be provided by SRT's Consultant shall consist of:-

(a) liaising and communicating generally (and as the SRT may direct) on SRT's behalf with the Private Party in relation to the Works;

(b) receiving and requesting such reports, documentation, design work and other information as SRT's Consultant and/or the SRT is entitled to receive or request from the Private Party in connection with the Works, and explaining, commenting on and discussing the same to or with the SRT as necessary;

(c) review and recommend to SRT for the compliance with requirement and specifications of the Preliminary Designs submissions;

(d) review and recommend to SRT for the compliance with requirement and specifications of the Detailed Designs submissions;

(e) review and recommend to SRT for the compliance with requirement and specifications of the Working Drawings submissions;

(f) audit the initial Construction Program and the Private Party's Works Program for compliance with the completion requirements as specified in the SRT's Requirements, if necessary, recommend to the SRT any amendment to the Program which may be necessary to achieve the construction completion as required;

(g) monitoring the progress of the Construction Works against the Initial Construction Program and report to the SRT any variance from the Initial Works Program;

(h) attending monthly review meetings, meetings of the Coordinating Committee and such other meetings as may be necessary from time to time for the purpose of reviewing progress and discussing and resolving particular issues and difficulties in relation to the Works;

(i) from time to time entering any part of Site where the Works are being or have been carried out

  (i) to ascertain whether the same are or liable to become unsafe or dangerous and

  (ii) to observe tests of materials, equipment or plant carried out under the supervision of the authorized Private Party's Representative;

(j) consulting with the Independent Certification Engineer in relation to the safety of and part of the High Speed Rail Linking Three Airports Project(Don Mueang - Suvarnabhumi - U-Tapao Airports) in advance of the commencement of Revenue Service;

(k) generally advising and assisting the SRT as may be reasonably necessary from time to time in relation to the design, construction, manufacturing, installation, testing and commissioning of the Works and SRT's responsibilities under this Agreement in respect of the same;

(l) supervision of the Works.

  (i) carry out appropriate inspections of the construction of Civil Works and manufacturing, supply, installation, testing and commissioning of the E&M Equipment as it proceeds to confirm that it complies with the Design;

  (ii) confirm that proper quality-control procedures are being implemented;

  (iii) witness such tests and examinations of materials, plants and equipment appropriate from time to time for the proper performance of its responsibilities;

(iv) convene monthly review meeting to be attended by representatives of the SRT and the Private Party for the purpose of discussing and examining particular issues and difficulties concerning the Works; and

(v) submit to SRT monthly progress report (and such other report and information as SRT may reasonably request) concerning the matters referred to in (i)-(iv) above (with copies to the Private Party).

3. AGENT

For the purpose of this Appendix 12, SRT's Consultant, after written approval from the SRT, shall be deemed to be acting as agent on behalf of the SRT only for construction and installation supervision on the Execution Phase of the High Speed Rail Linking Three Airports Project (Don Mueang - Suvarnabhumi - U-Tapao Airports). Any decision, action or inaction of SRT's Consultant shall accordingly be deemed to be a secession, action or inaction of the SRT itself.