

Term of Reference (TOR) and Specifications
for the procurement of equipment for Satellite Assembly,
Integration and Testing facility
Geo-Informatics and Space Technology Development Agency
(Public Organization)
Ministry of Science and Technology

 1 / 83

WJ

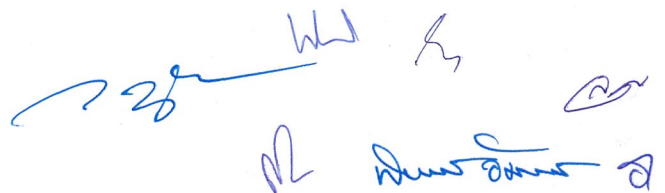
12





Table of Contents

1. Background.....	5
2. Objectives.....	6
3. Eligibility of Bidders.	7
4. Selection Criteria.....	8
5. Bid Requirement.....	8
6. Training and Technology Transfer.....	14
7. Milestones.....	15
8. Contract Period.....	17
9. Deliverables.....	18
10. Place of delivery.....	18
11. Contract value.....	18
12. Warranty.....	18
13. Terms of Payment.....	18
14. Penalty.....	20
15. Price Confirmation.....	20
16. Other terms and conditions.....	20
17. Bid documents.....	20
18. Bid security.....	21
Appendix A - Technical Specifications – Satellite Assembly, Integration and Test equipment.	23
Appendix B - Technical Specifications – Facility and laboratory tools.....	32
Appendix C - Technical Specifications – Hand tools.....	52
Appendix D. Technical Specifications – Security and Electrical Systems.....	63
Appendix D.- Technical Specifications – Security and Electrical Systems.....	64
Appendix E - Scoring Rubric for proposal consideration.....	71
List of Deliverables.....	78



Tables of Figures

Figure 1: Example of Vibration Test equipment installation.....	25
Figure 2: Example of Vacuum Test Chamber Installation.....	26
Figure 3 Test standard IEC 60068-3-5.....	27
Figure 4: Layout of clean room and air shower.....	32
Figure 5: Example of shutter door.....	33
Figure 6: Diagram showing the control of Fire safety system	34
Figure 7: Example of Eyewashes and Showers	35
Figure 8: Example of an installation of Foundation Isolator.....	36
Figure 9: Example of stainless steel working table for clean room.....	37
Figure 10: Example of table for holding satellite	38
Figure 11: Example of Chair with ESD safe standards.....	39
Figure 12: Example of Parts storage cabinets with drawers	40
Figure 13: Example of ESD-Safe standard tool storage cupboard	41
Figure 14: Example of Corrosive Safety cabinet	41
Figure 15: Example of ESD-Safe Trays.....	42
Figure 16: Example of Steel Mobile shelf	43
Figure 17: Example of Two-tier Stainless-Steel Trolley.....	43
Figure 18: Example of mobile instruments cart.....	44
Figure 19: Example of Utility Cart	44
Figure 20: Example of single-tier stainless steel cart.....	45
Figure 21: Example of Plastic Pallet that can be used on all four sides.....	45
Figure 22: Example of bin with foot pedal	46
Figure 23: Example of A-shape Aluminum Ladder with 1100 mm height	46
Figure 24: Example of A-shape Aluminum Ladder with 2075 mm height	47
Figure 25: Example of Mobile Stainless-Steel ladder	47
Figure 26: Example of Anti-static adjustable wrist strap	48
Figure 27: Example of Forklift.....	48
Figure 28: Tool cart with toolbox	56

[Handwritten signatures and initials in blue ink]

Figure 29: Layout and location of equipment that must be connected to the Uninterrupted
Power Supply 69

Tables of Tables

Table 1: Sample Random Vibration Test 24

Table 2: Scoring Rubric for technical evaluation..... 71

[Handwritten signatures and initials in blue ink]

**Term of Reference (TOR) and Specifications
for the procurement of equipment for Satellite Assembly, Integration
and Testing facility**

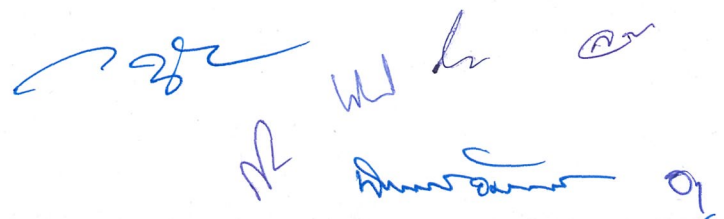
**Geo-Informatics and Space Technology Development Agency
(Public Organization)**

Ministry of Science and Technology

1. Background

According to the Cabinet of ministries meeting dated March 14, 2017, the Cabinet Resolution approved the implementation of the Earth Observation Satellite System for national development or THEOS-2 and assigned the Geo-informatics and Space Technology Development Agency (Public Organization): GISTDA as the responsible entity for the project. One of the mission of the project is to develop the infrastructure in preparation for the project which consists of a satellite assembly, integration and testing (AIT) building and the equipment for satellite assembly and testing in order to support the development of components, assembly, integration and testing of the satellite especially for small satellites in Thailand.

Hence, GISTDA wishes to procure equipment for satellite assembly and testing to be used for the design, assembly and testing of satellite systems including research and development of components used in satellite systems as well as using the facility for advanced research and development in the area of aeronautics and astronautics. Therefore, GISTDA is proceeding to procure the equipment for satellite assembly and testing to improve the capability and efficiency in research, development and innovation and the development of human resources in aerospace research and development sector into the aerospace and aerospace market at the national and international level.



Definition

GEVS	refers to <i>General Environmental Verification Specification</i>
CE	refers to <i>Conformité Européene</i>
CSA	refers to <i>Canadian Standards Association</i>
IEC	refers to <i>International Electrotechnical Commission</i>
ISO	refers to <i>International Organization for Standardization</i>
FS	refers to <i>Federal Standard for Cleanliness Classification Levels</i>
ASTM	refers to <i>American Society for Testing and Materials</i>
ANSI	refers to <i>American National Standards Institute</i>
IEEE	refers to <i>Institute of Electrical and Electronics Engineers</i>
TISI	refers to <i>Thai Industrial Standards Institute</i>
Clean room	refers to a room with controlled amount and size of particle, temperature and air pressure

2. Objectives

In order to ensure that the development of satellite systems to be effective meet international standards, GISTDA needs to possess the equipment and the laboratory which can support the development, assembly, integration and testing of satellite systems. Hence, GISTDA has defined the following objectives for the procurement of the satellite AIT equipment as follows:

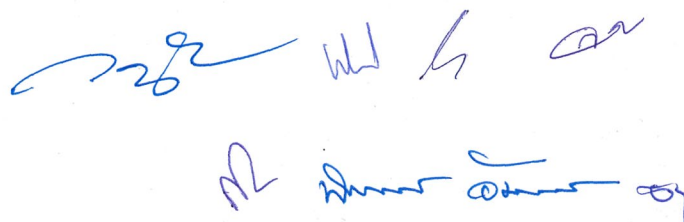
- 2.1 Procurement and installation of equipment for assembly, integration, and testing of satellite systems.
- 2.2 Procurement and installation of equipment for research and development of components and parts for satellite systems and ground operations system



- 2.3 Procurement and installation of equipment and tools in support of the operations and security of the laboratory.

3. Eligibility of Bidders.

- 3.1 Bidders must have a profession relating to the trade of items as specified in this e-bidding.
- 3.2 Bidders may proceed in the e-bidding process as one of the following:
- 3.2.1 Bidders may be a single legal entity.
- 3.2.2 Bidders is a joint venture and must demonstrate the purpose of the joint venture and the obligation to share responsibility in the work as required by GISTDA and must submit the joint venture agreement with the proposal.
- 3.3 Bidders shall not be enlisted in the abandoners' list of the Thai Government Agencies and the State Enterprises.
- 3.4 Bidders shall not be juristic persons who have the special privilege or immunity with which to refuse being taken to Thai court, or if they have, such privilege or immunity must be waived by the order of such Bidders' Government. The government of the bidder has the right to waive such immunity.
- 3.5 Bidders shall not be a jointly interested bidder with other bidders, Service Provider / Facilitator or shall not be a person who undertakes and acts as a "Obstruction of Fair Price Competition" in this bid invitation.
- 3.6 Entity entering into the agreement must not be an entity that does not provide income-expense accounting or have provided an incorrect income-expense accounting
- 3.7 Bidders who enter the contract in e- Government Procurement: e-GP shall register themselves for e-GP in the Thai Government Procurement Center's Website of the Comptroller General's Department.



- 3.8 Bidders must receive/provide payment via bank account, except if the total amount of each payment does not exceed THB 30,000.00 (Thirty Thousand Baht Only), which, then, can be paid in cash.
- 3.9 Bidders must qualify for the preliminary qualifications of bidders as defined by Geo-Informatics and Space Technology Development Agency (Public Organization)

4. Selection Criteria

The procurement committee shall consider the bid according to the following criteria:

- | | |
|---|-----|
| - Bid Consideration based on technical proposal | 70% |
| - Bid Consideration based on financial proposal | 30% |

Details of the bid consideration and scoring are given in Appendix E.

5. Bid Requirement

5.1 General requirements

5.1.1 The bidder must submit a technical proposal consisting of:

- 5.1.1.1 The bidder must set up a Compliance Table showing the compliance between the requirements of GISTDA and the bidder's proposal clearly stating which items fulfill which requirement.
- 5.1.1.2 The bidder must submit a technical proposal, documents providing catalog or brochure with detailed technical specifications including the origin of the proposed equipment. The information must be marked clearly and refer to the specific bid requirement for the consideration of the committee.
- 5.1.1.3 The bidder must submit an Implementation Plan which is in line with the delivery period.
- 5.1.1.4 The bidder must submit an Installation Procedure with detailed steps in the implementation of the clean room system, the Air Shower

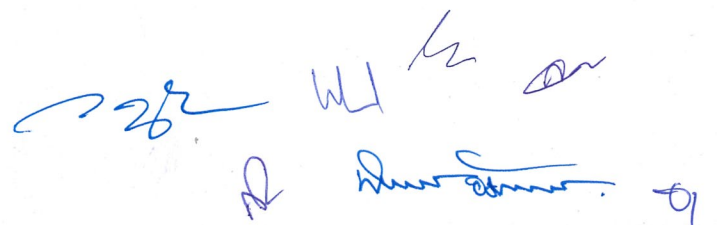
system, Vibration test, Thermal Vacuum Chamber Foundation Isolator and Mass Properties Measurement Device at the least

- 5.1.1.5 The bidder must estimate the electricity consumption of each assembly integration and test equipment, measuring devices, clean room systems, etc. that shall be delivered and installed.
- 5.1.1.6 The bidder shall submit a single line diagram for the electrical work and the design of the electrical installation to support electrical load for all the equipment. The electrical system design must be done by an electrical engineer who has been certified by the council of engineers, with the minimum qualification of Professional Engineer
- 5.1.1.7 The bidder must submit a training plan for the operations and maintenances of each equipment at the place of delivery (Onsite Training). The training for each equipment must be given to no less than 5 employees.
- 5.1.1.8 The bidders must have delivered a clean room installation work or vibration test equipment or Thermal Vacuum Chamber or Mass Properties Measurement equipment or similar work, whose contract must be not less than 10,000,000 baht (ten million baht) directly (not sub-contract) with a government or private entity and at least 1 contract must have been fully executed. Bidders must provide a certified copy of the completed said contract and a certified copy of the certificate of completion along with the bid documents.
- 5.1.1.9 The bidder must have at least 1 electrical engineer, 1 Mechanical engineer and 1 civil engineer who has been certified by the council of engineers by the Engineer Act 1999, with the minimum qualification of Professional Engineer They shall be the supervising engineers for the installation and testing of all the systems. Bidders must submit all

certified copies of the certification engineering license as part of the technical proposal.

5.1.1.10 The bidder must sign and seal/stamp (if any) all bid documents including the technical proposal, bid support documents, term of reference, etc. which shall be legally binding.

- 5.1.2 All delivered equipment and accessories must be new, never used. If GISTDA request of additional documents, the contractor must be able to show the documentation that can verify the origin and unused condition of the equipment.
- 5.1.3 The items delivered to GISTDA, if copyrighted, must be a legal product and have the license needed for GISTDA to use forever without additional cost.
- 5.1.4 The contractor is responsible for all cost with respect to the import and export of all equipment as well as all other costs associated with the work.
- 5.1.5 In the event that any equipment requires a permission or license or registration to import, utilize or possess from any agency, the contractor is responsible in ensuring that all items and processes are in accordance with legal regulations.
- 5.1.6 In case the contractor wishes to store equipment and other tools within GISTDA's premise during the installation period, GISTDA shall not be liable for all loss or damage.
- 5.1.7 The contractor must coordinate with the Site Management officer for site inspection and installation. The equipment and installation must comply with relevant standards and must be installed in the way as specified by the manufacturer of the equipment. the contractor must have qualified technicians and engineers who are specialized in the installation and have the relevant engineering license as supervisor. the contractor is responsible for all installation and related expenses.
- 5.1.8 The contractor shall be liable for all damages incurred in the case the contractor, its employee, representatives or sub-bidder's executed with negligence or intention or lack of expertise or lack of action in the implementation of various

Handwritten signatures and initials in blue ink at the bottom of the page. There are several distinct marks, including what appears to be a large signature on the left, and several sets of initials or smaller signatures on the right.

procedures under the contract which causes the system or equipment or property to be damaged or not in good condition.

- 5.1.9 In case of any change other than those approved by GISTDA, the contractor must notify and received approval from GISTDA before proceeding at least 30 days in advance. If the contractor installs any equipment which has not been approved or does not follow the specifications that has been pre-approved, GISTDA reserves the right to temporarily suspend work and to perform correction immediately at the expense of the contractor. Any delay due to such a correction cannot be used as a request for extension of the contract execution or an excuse for the incompleteness of the entire project.
- 5.1.10 The contractor must study the detail and the scope of the Term of Reference including any potential problem, vagueness, discrepancy prior to starting the work. When the contractor starts the work, if there is any conflicts or discrepancies in the production, installation or assembly, and the equipment or system cannot function according to the design specification, the contractor must take corrective action as soon as possible and cannot appeal for any additional time and expenses for the execution of the contract.
- 5.1.11 The contractor can proceed to install, test, deliver deliverables as per the contract during normal working days and time which is Monday to Friday (except public holidays) from 08.00 - 17.00 hrs. In the event that the bidder requires to work beyond the specified days and time, the contractor must present a request in writing, indicating the reasons for the request and the list of employees or subcontractors who shall be performing the work and shall submit the list to the Chairman of the Acceptance Committee for temporary permission.
- 5.1.12 GISTDA does not allow the employees or subcontractors of the contractor to stay overnight in the installation site or in the GISTDA's area. In the event that bidder's employees or subcontractors need to work at night or stay on site to guard any property, the contractor must request so in writing stating the reason and the list

of employees or subcontractors to the Chairman of the Acceptance Committee for temporary permission.

5.1.13 The contractor shall supervise the contractor's employees or subcontractors to work only in the work area as agreed under the contract. The contractor must ensure that there is no consumption of narcotics, alcohols. or gambling or drunken behavior or fighting or any actions which is against the rules and regulations of GISTDA including any action or lack any action that may be defamatory to GISTDA. If such an event occurs, the contractor is responsible and liable for all damages.

5.1.14 The contractor is responsible for the cost of the security, fuel for electrical generator for the period of testing and so on during installation and testing of the deliverable as per the rules and regulations of GISTDA.

5.2 Technical requirements

The Technical Specifications of equipment specified in the TOR is the minimum requirement. The bidder may offer better equipment than specified in the TOR. However, GISTDA reserves the right to deliberate the bidder's proposal and GISTDA's decision is considered final.

5.2.1 The minimum technical specifications of the equipment for satellite assembly and integration are as described in Appendix A.

5.2.2 The minimum technical specifications of the room design, operational equipment and support tools are as described in Appendix B.

5.2.3 The minimum technical specifications of the tools and hand tools are as described in Appendix C.

5.2.4 The minimum technical specifications of the security and electrical systems are as described in Appendix D.

5.3 Equipment Installation

In order to ensure that equipment and tools as other facilities as described in 5.2 can be used effectively and in accordance to international standards, the bidder must propose an implementation plan, especially for the following equipment:

- 5.3.1 Vibration test as specified in Appendix A must be installed in the AIT high bay as specified in Appendix B, which shall support 5,000 kilograms per square meter in an area of 10 meters wide, 10 meters long and 2.7 meters deep and there must be a mechanism, equipment or material that can insulate the vibration from the vibration test equipment to the building.
- 5.3.2 The Thermal Vacuum Chamber as specified in Appendix A shall be installed in the AIT high bay area in an area approximately 15 meters wide and 15 meters long.
- 5.3.3 Mass Properties Measurement as specified in Appendix A shall be installed in the AIT high bay area as specified in Appendix B, which shall support 5,000 kilograms per square meter in an area of 8 meters wide, 8 meters long and 1.5 meters deep.
- 5.3.4 The Foundation Isolator as specified in Appendix B shall be installed in the AIT high bay area of 10 meters wide, 10 meters long and 3 meters deep.
- 5.3.5 Transformers capable of not less than 2,000 KVA, as specified in Appendix D, must be installed outdoors including wiring cable from transformer to MDB and must meet engineering standards and the Provincial Electricity Authority's standard or its equivalent. GISTDA will be responsible for the fees related to the implementation with the Provincial Electricity Authority.
- 5.3.6 Uninterruptible Power Supply (UPS), as specified in Appendix D, must be installed including wiring cable to branch MDB or equipment.
- 5.3.7 The contractor must have the engineers and experts for the installation of the following test equipment according to section 5.1.1.9:
 - (1) class 100000 and class 100 Clean room
 - (2) Vibration test

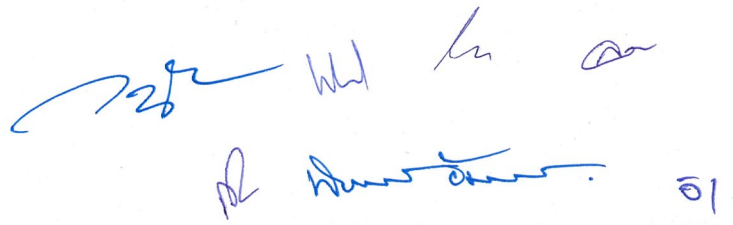
- (3) Thermal Vacuum Chamber
- (4) Mass Properties measurement
- (5) Foundation Isolator

The contractor also must have electricians for indoor and building work who have received the certification under the Skill Development Promotion Act. B.E. 2545 and its amendment and must submit the list of engineers and their certification from the office of skill standard and test development.

6. Training and Technology Transfer

The contractor must present a training and technology transfer plan with the details as follows

- 6.1 The contractor must prepare a training plan including with training material, test and examinations for the at least the following equipment.
 - 6.1.1 Vibration Test
 - 6.1.2 Thermal Vacuum Chamber
 - 6.1.3 Thermal Cycling
 - 6.1.4 Mass Properties Measurement
 - 6.1.5 Theodolite, Forklift, IR Thermometer, UPS, CCTV etc.
 - 6.1.6 Clean room for both class 100000 and class 100
- 6.2 The teaching materials must be carefully prepared and must include a manual for the trainees or recipients of the training to assist them to understand the purpose of using the equipment, understand the operation of the equipment, understand the parameter settings and read the parameters of the equipment including understanding the display and reporting of equipment and understand the maintenance procedure.
- 6.3 The maintenance manual must be described in detail, including Preventive maintenance and Corrective maintenance. The Handbook documents should, at least, include the daily, weekly, monthly, yearly maintenance templates along with maintenance procedures.



- 6.4 The trainer must train and explain all the procedures carefully thoroughly and teach the operators to operate and maintain the equipment by themselves.
- 6.5 The trainers must conduct tests to measure the understanding of the trainees.

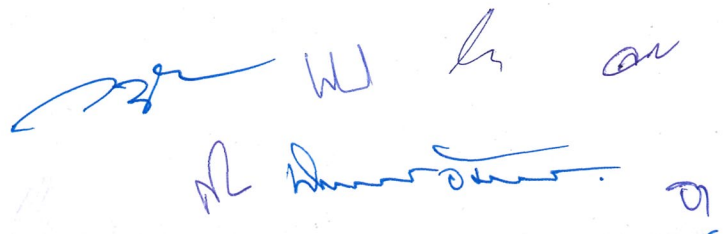
7. Milestones

The contractor must comply with the term of reference and specifications and must deliver all deliverables within 600 days following the date of signing the contract. The deliverables are divided into 8 milestones as follows:

7.1 Milestone 1: The contractor must deliver 10 copies of the following report in hard copy (printed on paper) and in electronic copy (Digital File) within 60 days after signing the contract.

- 7.1.1 System Design Review and Implementation Plan.
- 7.1.2 Technical Proposal, Catalog or Brochure that include all technical specifications including features, brands, models, quantity, etc.
- 7.1.3 Electrical load details of both equipment and clean room.
- 7.1.4 Test plan and Acceptance Test procedures for the Factory Test and Onsite Test which must provide test plans and results of the test at the level of unit test, functional test and end-to-end test for at least the following test equipment:
 - (1) Vibration Test
 - (2) Thermal Vacuum Chamber
 - (3) Thermal Cycling
 - (4) Mass Properties Measurement

If GISTDA wishes to send a representative to observe the test at the manufacturer's premises (FAT), the contractor shall facilitate the test observation including all liaison, permission, authorization with the manufacturer of the equipment. (GISTDA shall cover the expense of its representatives visiting the site of the manufacturer)



- 7.1.5 Training plans include training topics, summary of each topic and the training schedule.
- 7.2 Milestone 2: The contractor must submit deliver, install, test the following items including providing the related manual and training within 150 days following the date of signing the contract:
 - 7.2.1 Hand Tools as specified in Appendix C.
 - 7.2.2 Theodolite as specified in Appendix A
 - 7.2.3 Factory Acceptance Test (FAT) for Vibration Test as specified in Appendix A
- 7.3 Milestone 3: The contractor must submit deliver, install, test the following items including providing the related manual and training within 230 days following the date of signing the contract:
 - 7.3.1 Thermal cycling equipment as specified in Appendix A
 - 7.3.2 Electrical Transformer as specified in Appendix D.
 - 7.3.3 Factory Acceptance Test (FAT) of the Thermal Vacuum Chamber as specified in Appendix A
 - 7.3.4 Factory Acceptance Test (FAT) of the Mass Properties Measurement equipment as specified in Appendix A.
- 7.4 Milestone 4: The contractor must submit deliver, install, test the following items including providing the related manual and training within 300 days following the date of signing the contract:
 - 7.4.1 Foundation Isolator as specified in Appendix B
 - 7.4.2 Furniture, materials/equipment for transportation and storage as specified in Appendix B
 - 7.4.3 UPS as specified in Appendix D
- 7.5 Milestone 5: The contractor must submit deliver, install, test the following items including providing the related manual and training within 360 days following the date of signing the contract:

- 7.5.1 On-Site Acceptance Test (OSAT) of the Vibration Test equipment as specified in Appendix A
- 7.5.2 Installation of CCTV as specified in Appendix D
- 7.6 Milestone 6: The contractor must submit deliver, install, test the following items including providing the related manual and training within 430 days following the date of signing the contract:
 - 7.6.1 On-Site Acceptance Test (OSAT) of the Mass Properties Measurement equipment as specified in Appendix A
- 7.7 Milestone 7: The contractor must submit deliver, install, test the following items including providing the related manual and training within 500 days following the date of signing the contract:
 - 7.7.1 On-Site Acceptance Test (OSAT) of the Thermal Vacuum Chamber as specified in Appendix A
- 7.8 Milestone 8: The contractor must submit deliver, install, test the following items including providing the related manual and training within 600 days following the date of signing the contract:
 - 7.8.1 Clean room and its accessories as specified in Appendix B
 - 7.8.2 Any other remaining work according to the TOR such that the delivery is complete, accurate, in full and can be used effectively in all respects with respect to the contract

8. Contract Period

The contractor must deliver all deliverables including the Installation and testing of all the equipment and system such that the delivery is complete, accurate, in full and can be used effectively in all respects with respect to the contract as well as complete all the training within 600 days following the date of signing the contract.

The delivery of the deliverables may be delivered across the milestone. However, this is at the approval of the acceptance committee taking into consideration compliance with engineering standards.

9. Deliverables

The contractor must deliver and install the deliverables in accordance with List of Deliverables.

10. Place of delivery

Geo-Informatics and Space Technology Development Agency (Public Organization) 88 Moo 9, Thungsukhla, Sriracha, Chonburi.

11. Contract value

The contract value for the procurement of equipment Satellite Assembly, Integration and Testing facility is Baht 216,000,000 (Two hundred and sixteen million Baht only).

12. Warranty

The contractor must guarantee the equipment to be free from defect as well as provide after sales service for at least 1 year after the date of delivery of the final milestone as per the contract. During this period, if any item is found to be damaged or defective or none operational because of normal use, the contractor must repair the item to be in full working condition within 10 working days after the day of reporting the defect without any expense to GISTDA. In the case that the contractor does not comply or does not complete the repair within the stipulated time, GISTDA shall have the right to take any corrective action as deemed appropriate, or contract another party to do it and the contractor shall be responsible for all the cost incurred.

13. Terms of Payment

GISTDA will make the payment in 8 installments according to the following milestones:

- 13.1 The 1st installment is equivalent to 2% of the contract value and shall be paid when the contractor delivers all the document correctly as specified in section 7.1 within 60 days following the date of signing the contract and the acceptance committee has accepted the deliverables.
- 13.2 The 2nd installment is equivalent to 4% of the contract value and shall be paid when the contractor delivers all the work correctly and in full as specified in section 7.2 within 150 days following the date of signing the contract and the acceptance committee has accepted the deliverables.
- 13.3 The 3rd installment is equivalent to 7% of the contract value and shall be paid when the contractor delivers all the work correctly and in full as specified in section 7.3 within 230 days following the date of signing the contract and the acceptance committee has accepted the deliverables.
- 13.4 The 4th installment is equivalent to 7% of the contract value and shall be paid when the contractor delivers all the work correctly and in full as specified in section 7.4 within 300 days following the date of signing the contract and the acceptance committee has accepted the deliverables.
- 13.5 The 5th installment is equivalent to 20% of the contract value and shall be paid when the contractor delivers all the work correctly and in full as specified in section 7.5 within 360 days following the date of signing the contract and the acceptance committee has accepted the deliverables.
- 13.6 The 6th installment is equivalent to 20% of the contract value and shall be paid when the contractor delivers all the work correctly and in full as specified in section 7.6 within 430 days following the date of signing the contract and the acceptance committee has accepted the deliverables.
- 13.7 The 7th installment is equivalent to 20% of the contract value and shall be paid when the contractor delivers all the work correctly and in full as specified in section 7.7 within 500 days following the date of signing the contract and the acceptance committee has accepted the deliverables.

13.8 The 8th installment is equivalent to 20% of the contract value and shall be paid when the contractor delivers all the work correctly and in full as specified in section 7.8 within 600 days following the date of signing the contract and the acceptance committee has accepted the deliverables.

14. Penalty

If the contractor is unable to deliver the deliverables, including installations and test, within the time specified in the contract, the contractor shall pay a fine to GISTDA equivalent to is 0.20% (zero point two zero percent) per day of the value of undelivered deliverables.

15. Price Confirmation

The bidder must provide a price validity no less than 60 days from the day of final price proposal.

16. Other terms and conditions

- 16.1 If any device, tool, software or deliverables delivered by the contractor violates copyrights or intellectual property of any entity, the contractor shall be responsible for all damages incurred.
- 16.2 All equipment, tools and software delivered must have a lifetime license.
- 16.3 If there is any Software Patch or software update for the equipment delivered within 1 year after the day of the final milestone, the contractor shall update the software/system to the latest version as per the request of GISTDA without any additional cost.

17. Bid documents

Bid documents are available through the Thai Government Procurement System for Baht 3,000 (Three Thousand Baht only) and must be paid at the bank before the bid document can be downloaded from the Thai Government Procurement system in the process of e-bidding

18. Bid security

The bidder must submit bid security equal of 5% of bidding price at the time of submission of the proposal through Thai Government Procurement system.

Handwritten signature and initials in blue ink.

Appendix A.

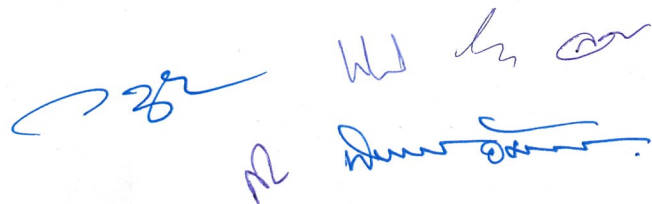
Technical Specifications – Satellite Assembly, Integration and Test equipment.

36 W1 L1 on
12 12/12/2012

Appendix A - Technical Specifications – Satellite Assembly, Integration and Test equipment.

1. Vibration Test equipment (1 set)

- 1.1 Must be able to produce Sine vibration force greater than or equal to 160 kN with an amplitude error not exceeding $\pm 10\%$ and frequency error not exceeding $\pm 2\%$ with reference to the GEVS documentation.
- 1.2 Must be able to produce Random vibration force greater than or equal to 160 kN with RMS error not exceeding $\pm 10\%$ and Acceleration Spectral Density not exceeding $\pm 2\%$ with reference to the GEVS documentation.
- 1.3 Random vibration force delivery must be in accordance with ISO 5344 standard or equivalent.
- 1.4 Shock vibration force must be greater than or equal to 300 kN
- 1.5 Must supports both Vertical and Horizontal Testing
- 1.6 The Maximum Displacement must be greater than or equal to 30 mm (peak-to-peak)
- 1.7 The Maximum load capacity specified for Equipment Under Test (EUT) must greater than or equal to 500 kg.
- 1.8 The equipment must support test with the minimum vibration frequency less than or equal to 5 Hz and maximum vibration frequency more than or equal to 2,000 Hz
- 1.9 The Base plate must be no less than 1.2 meters wide and no less than 1.2 meters long.
Vertical and Horizontal testing performance is as follows.
 - Vertical table vibration frequency must be more than or equal to 1,500 Hz.
 - Horizontal table vibration frequency must be more than or equal to 1,000 Hz.
- 1.10 There must be a control and monitoring system as part of the deliverables. The controller system should be able to configured at least 12 channels.
- 1.11 Sensors for data acquisition must be accelerometer, piezo or better sensors which are suitable for use with vibration test equipment. The number of channels must be no



less or equal to 64 channels and must have sensors which support 3-axis measurement at least 12 channels at no less than 51 kHz sampling rate.

1.12 The system must be able to support test profile at least according to Table 1 for Random Vibration with reference to the GEVS documentation.

1.13 The Vibration Test equipment must be manufactured from an ISO 9001 certified factory.

Table 1: Sample Random Vibration Test

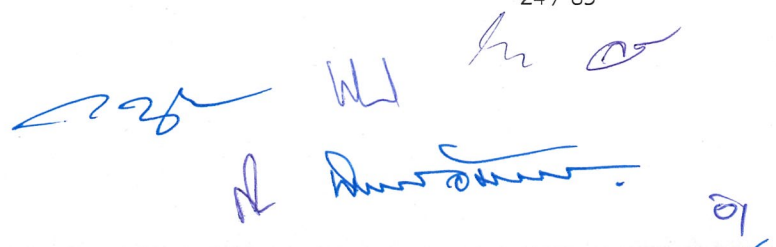
Frequency (Hz)	Acceleration Spectral Density (G^2/Hz)
20	0.0016
20-300	+4dB/oct
300-700	0.06
700-2000	-3dB/oct
2000	0.021
Overall	8.7 Grms

1.14 The equipment must have the Natural frequency detection at any position on equipment under test

1.15 The equipment must have control, protection and automatic cut off system in case of emergency or error and including force overload (Force limiting) and resonance with equipment under test (Notching) for protection damaging at vibration test itself, equipment under test and operator.

1.16 The equipment must be able to be installed in an area of 10 meters in length, 10 meters in width and 2.7 meters in depth with the floor load of 5,000 kg / sq. m. The working area shall be level with the adjacent surface according to Figure 1 and the depth shall be no more than 2.7 m. The installation of the vibration test equipment must be done to ensure there is no vibration to the building when the equipment is in use.

1.17 The electrical wiring and control cables must be routed to the control room or designated office for the vibration test simulation and the wiring must be routed neatly



and should not create an obstacle to the working of the equipment or the people in the AIT center.

- 1.18 There must be warning sticker or label or sign which are clearly visible all around the equipment to increase caution while near or operating the equipment.

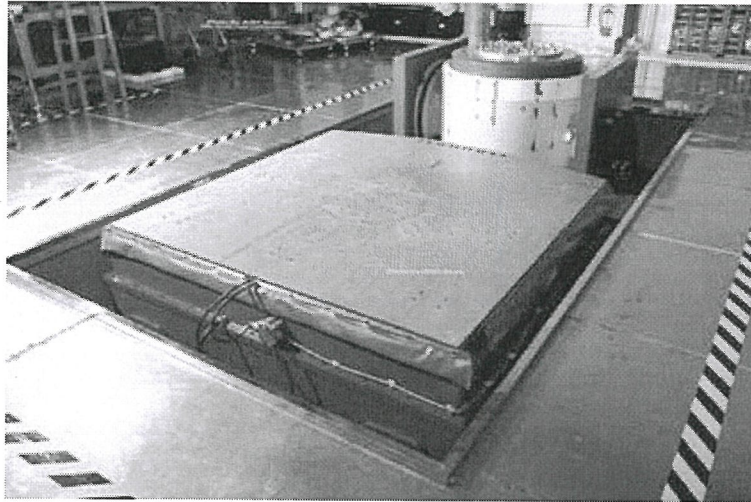


Figure 1: Example of Vibration Test equipment installation*

2. Thermal Vacuum Chamber (1 set)

- 2.1 The diameter of the internal space for testing must be more than or equal to 1.8 meters and the depth of the test area must be more than or equal to 1.5 meters. (Cylinder)
- 2.2 The lowest Test temperature must be lower or equal to -150 degrees Celsius
- 2.3 The highest test temperature must be higher than or equal to +150 degrees Celsius
- 2.4 The Temperature Ramping Rate must be greater than or equal to 2.0 °C / min.
- 2.5 The Cool Down Rate must be greater than or equal to 2.0 °C / min.
- 2.6 The Vacuum pressure must be less than or equal to 10^{-6} mbar
- 2.7 The Chiller system must be at least 25,000 kg
- 2.8 The equipment must have a Liquid Nitrogen System (LN2)
- 2.9 There is a glass for IR box to inspect the Equipment under Test while testing.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

[Handwritten signatures and initials in blue ink]

- 2.10 The delivery must include Installation of the computer and program for monitoring and control.
- 2.11 There must be more than 128 channels of data acquisition and display in real time with Thermocouple
- 2.12 The system must be able to support test profile.
- 2.13 The equipment must have an automatic cut off in case of emergency or error.
- 2.14 The equipment must be able to be installed in a room of 15 meters in width and 15 meters in length.
- 2.15 The installation shall be carried out in such a way that the door of the equipment which is the entry point of the test piece must be in the clean room area and the other part of the test equipment must be integrated into the wall of the room as shown in Figure 2.
- 2.16 The door or access to the Thermal Vacuum Chamber must have a system to help with opening and closing such as a wheel system or sliding rail system, etc.

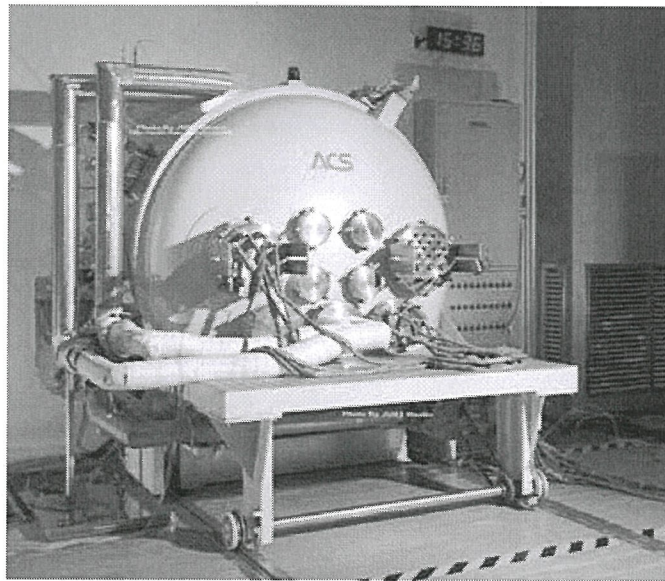


Figure 2: Example of Vacuum Test Chamber Installation*

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including a large signature on the left, a smaller one in the middle, and a signature on the right with the number '01' below it.

3. Thermal Cycling Chamber (1 set)

- 3.1 The test area must have the length be greater than or equal to 1.5 m, the width be more than or equal to 1.5 m and the depth be more than or equal to 1.5 m.
- 3.2 The Minimum test temperature must be less than or equal to -70 °C
- 3.3 The Maximum test temperature must be more than or equal to +150 °C
- 3.4 The humidity in the chamber must be in the range of 20 - 98% RH
- 3.5 The average of Heating up rate must be greater than or equal to 3 °C / min, as specified by IEC 60068-3-5.
- 3.6 The average of Cool down rate must be greater than or equal to 1.5 °C / min as specified by IEC 60068-3-5.

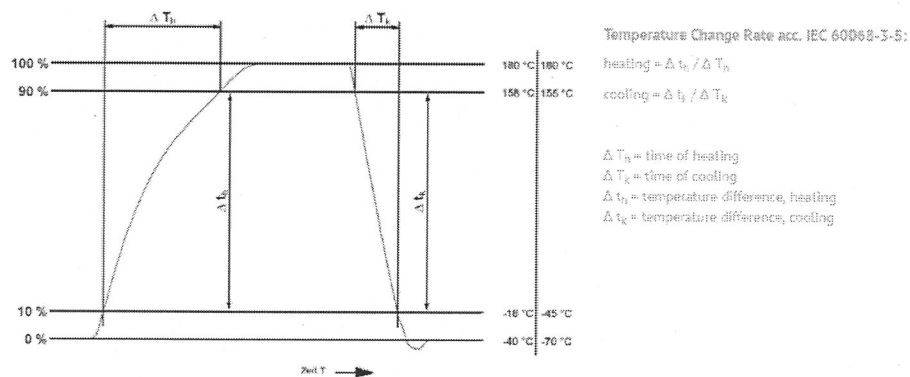


Figure 3 Test standard IEC 60068-3-5

- 3.7 The delivery must include Installation of the computer and program for monitoring and control.
- 3.8 There must be Sensor at least 128 channels to measure data or acquisition of data.
- 3.9 The system must be able to support test profile.
- 3.10 The equipment must have an automatic cut off in case of emergency or error.

4. Mass properties measurement equipment (1 set).

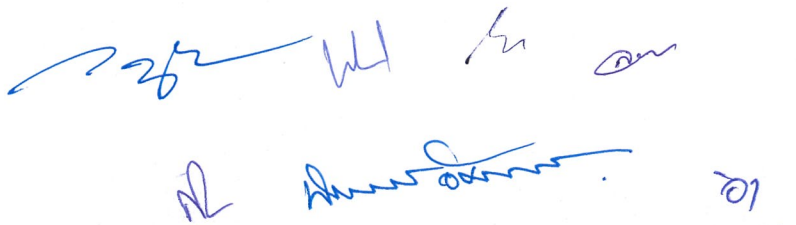
- 4.1 The equipment must be able to test the Equipment Under Test with the mass of no less than 500 kg in vertical measurement.

[Handwritten signatures and marks]

- 4.2 The equipment must be able to test the Equipment Under Test with the mass of no less than 500 kg in horizontal measurement (after excluding the weight of L shape steel frame)
- 4.3 The delivery must include a Horizontal L-shape adapter which the dimension is width must not be less than 900 mm, the maximum length must not be less than 4800 mm (be able to slide mounting base from the maximum length to the middle of L-shape by motor at least 1500mm.) and the height must not be less than 1500 mm. The base for installation of the work piece must have a diameter not less than 900 mm.
- 4.4 The Spin rate for testing the satellite must be less than or equal to 30rpm and it must be able to support spin rate up to at least 250 rpm.
- 4.5 The acceptable Total dynamic unbalance measurement error is in range of less than +5% and more than -5%, ($\pm 5\%$.)
- 4.6 The Static CG accuracy must be less than +0.1% of measured moment value
- 4.7 The Moment of Inertia accuracy must be less than +0.1% and more than -0.1%, ($\pm 0.1\%$) of the measured value.
- 4.8 The delivery must include Installation of the computer and program for monitoring and control.
- 4.9 The system must be able to support test profile.
- 4.10 The equipment must have an automatic cut off in case of emergency or error.
- 4.11 The equipment must be able to be installed and operate in a class 100000 clean room.
- 4.12 The equipment must be able to be installed in an area of 8 meters wide by 8 meters long and 1.5 meters deep with a load floor of 5,000 kg per square meter. The working area shall be level with the adjacent surfaces and adequate for operation with the L-shape adapter. (the depth shall be no more than 1.5 m.)
- 4.13 The electrical wiring and control cables must be routed neatly and should not create an obstacle to the working of the equipment or the people in the AIT center.

5. Theodolite (3 units)

- 5.1 Telescope System



- (1) Must have a magnification greater than or equal to 30 times
- (2) The width of the lens is must be greater than or equal to 45 mm
- (3) Vertical image at a distance of 1 km over or must be equal to 26 meters or 1 degree 20 arcminute
- (4) Must have a laser pointing system for easy aiming.
- (5) Must have a Laser Plummet which can adjust the focus of light or camera peg.
- (6) The Optical Plummet must have a magnification more than or equal to 3 times and can be focused

5.2 Distance Measurement

- (1) Must be able to measure distance without using a prism (reflectiveness) at a distance greater than or equal to 500 meters.
- (2) Must be able to measure distance up to 3,000 meters using a single prism.
- (3) The mean square error must be within $\pm 2\text{mm} + 2\text{ppm} \times D$

5.3 Angle Measurement

- (1) Must be able to read the horizontal and vertical angle up to 1 arc second/ 5 arc second.
- (2) The Standard deviation of horizontal and vertical angles must not exceed 5 arc second.
- (3) Must use an Absolute rotary encoder angle measurement system

5.4 Data logging and programming

- (1) Must be able to record the data inside the camera more than or equal to 2GB / 528MHZ.
- (2) Must be able to transfer data to computer using data cable, mini USB, Flash Drive, Bluetooth (class2)
- (3) Must be able to perform the following functions:
 - Set the azimuth and coordinate measurement to 3 axes.

- Must be able to perform remote elevation measurement
- Must be able to support Stake Out function
- Must be able to distance of an obstacle or remote distance Measurement
- Must be able to pinpoint the location of the camera (Free Station)
- Road Design Program

5.5 General

- (1) Must have Microsoft Window operating system
- (2) Must have a Touch Screen with which one can enter numbers and letters directly.
- (3) Must be resistant to environmental conditions and water resistant according to IP55 standard.
- (4) The spirit level at the base of the camera must have an accuracy 8 arcminute 2 millisecond or better.
- (5) The battery must work for at least 8 hours.

5.6 Accessories:

- (1) 1 set of prism with aluminum tripod
- (2) 1 set of prism with range pole of length of 2 meters
- (3) Aluminum tripod with height adjustment mechanism
- (4) Rechargeable battery.
- (5) Charger
- (6) Camera bag and correction set
- (7) Data cable
- (8) Instruction Manual
- (9) Software and programs

Handwritten signatures and initials in blue ink.

Appendix B.

Technical Specifications – Facility and laboratory tools.

Handwritten signatures and initials in blue ink, including "WJ", "L", "an", and a large signature.

Appendix B - Technical Specifications – Facility and laboratory tools.

1. Setup and installation of class 100000 cleanroom (3 rooms)

- 1.1 Setup and installation of three class 100000 cleanroom. The first clean room is 30 meters wide, 50 meters high, 12 meters high (AIT high bay) and the second and third clean room are 10 meters wide, 15 meters high, 12 meters (Storage room and Loading room). Room details as shown in picture 3.

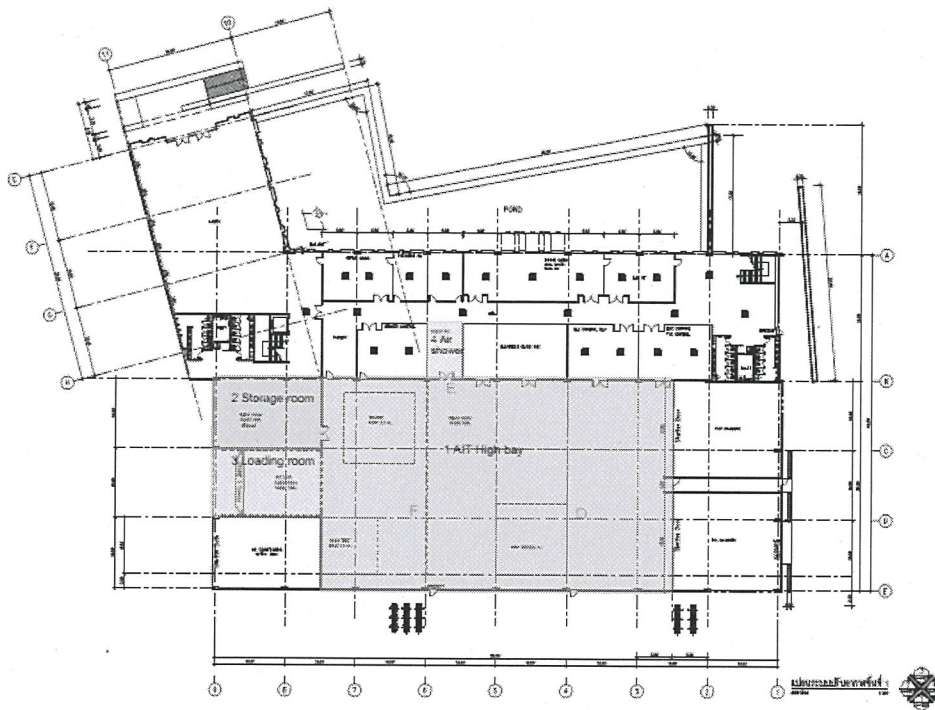


Figure 4: Layout of clean room and air shower

- 1.2 The Clean rooms must be temperature controlled within the range of $22^{\circ}\text{C} \pm 3^{\circ}\text{C}$
- 1.3 The Clean rooms must be humidity controlled within the range of $55\% \pm 10\% \text{ RH}$
- 1.4 The Clean rooms must have at least 3 mm thick Epoxy floor with grounding system installed.
- 1.5 The Clean rooms must be ISO 14644 standard or equivalent where class 100000 is equal to ISO 8, which allows 3,520,000 particles per cubic meter of 0.5-micron dust particles 29,300 particles per cubic meter of 5.0-micron dust particles.

Handwritten signatures and initials in blue ink, including 'K. H. H.' and '2010'.

- 1.6 The Clean rooms walls must have Isowall insulation with grooved joints or glass to prevent dust retention.
- 1.7 The Clean rooms must be Installed with electrical shutter door for the class 100000 clean room. This include installation for the room which are 8 meters wide and 6 meters high (2 rooms) and for the EMC room which 5 meters wide, 6 meters high. An example can be seen in Figure 4.



Figure 5: Example of shutter door*

- 1.8 There must be a pass box for loading in and out of the storage room which is a class 100000 clean room.
- 1.9 There must be an installation of an at least 1 set of air shower room or air shower equipment in area as depicted in figure 3. The area must be 5 meters in width and 8 meters in length and must include an area for locker, luggage storage facility and closet for grounding coat for prior to entering the clean room.
- 1.10 There must be lockers, luggage storage facility and closet for grounding coat before entering the clean room.
- 1.11 1There must be an installation of dust trap floor mat (clean room mat) before entering clean room.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including "WH", "L", "an", and a large signature.

- 1.12 Must deliver at least 500 sets of ground coats, clean room shoes, cleanroom gloves and hair caps.
- 1.13 Must deliver at least 50 sets of safety goggles and earplugs.
- 1.14 There must be a Fire alarm system for the Clean rooms with the following characteristics:
- (1) Photoelectric smoke detector or fire detection device at a height of 12 meters and must be able to work in a class 100000 clean room according to the standards of the Ministry of Industry or its equivalent.
 - (2) There must be installations of CO2 fire extinguisher or sprinkler or fire horse or handheld fire extinguisher according to the standards of the Ministry of Industry or its equivalent.
 - (3) There must be an audible alarm.
 - (4) There must be a control unit system for controlling all devices as shown in figure 5. The flow of the system is shown in the figure.

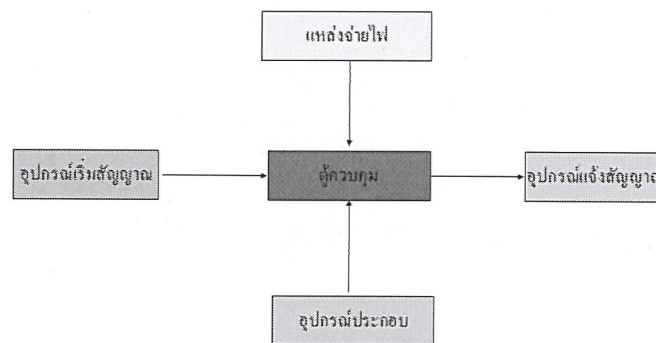


Figure 6: Diagram showing the control of Fire safety system

- 1.15 There must be an installation of Eyewashes and Showers

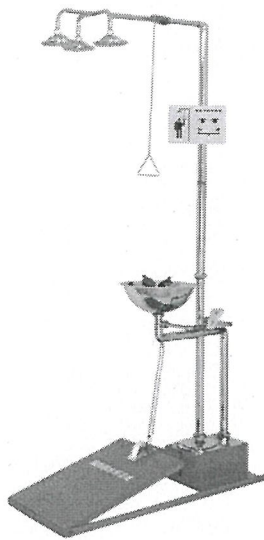


Figure 7: Example of Eyewashes and Showers*

- 1.16 The clean rooms must have lighting that have illuminance within 500-800 lux.
- 1.17 Upon completion of installation, the bidder must perform a certification of the clean room according to ISO 14644 (ISO 8) and a certificate of compliance must be provided the certifications must be done by a reliable institute.
2. **Class 100 Clean room tent (1 set)**
 - 2.1 There must be an installation of a tent with class 100 clean room system which is 10 meters wide, 20 meters long and a height of at least 6 meters.
 - 2.2 The clean room tent must be installed in the AIT high bay.
 - 2.3 The clean room tent must meet ISO 14644 standard or equivalent with class 100 equivalent to ISO 5 which allows no more than 4 particles per cubic meter of 0.5-micron dust particles.
 - 2.4 Upon completion of installation, the bidder must perform a certification of the clean room according to ISO 14644 (ISO 2) and a certificate of compliance must be provided the certifications must be done by a reliable institute.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

[Handwritten signatures and initials in blue ink]

3. Foundation Isolator (1 set)

- 3.1 Installation of a concrete block structure for a 10m wide, 10 m deep and 3 m deep hole.
- 3.2 There must be an installation of a concrete structure with an area no less than 64 sqm. with the thickness of 1 meter and it must be supported by vibration isolation equipment or materials such as pads (neoprene, fiberglass, felt, cork or other similar compressive material) or spring or air spring.
- 3.3 In case of installation which requires maintenance area (according to Figure 7), a removable walking platform must be installed when there is no need for access to maintenance area. However, such installation may be different to Figure 7 if it is more appropriate or effective.
- 3.4 After installing Seismic concrete, the top surface level shall be equal to the adjacent surface
- 3.5 The equipment or material supporting the seismic block must have a natural frequency not equal to disturbed frequency or ambient frequency which is from system of building.
- 3.6 The Foundation Isolator must have isolation efficiency no less than 90%.
- 3.7 The Foundation Isolator must be able to be installed in a class 100000 clean room.

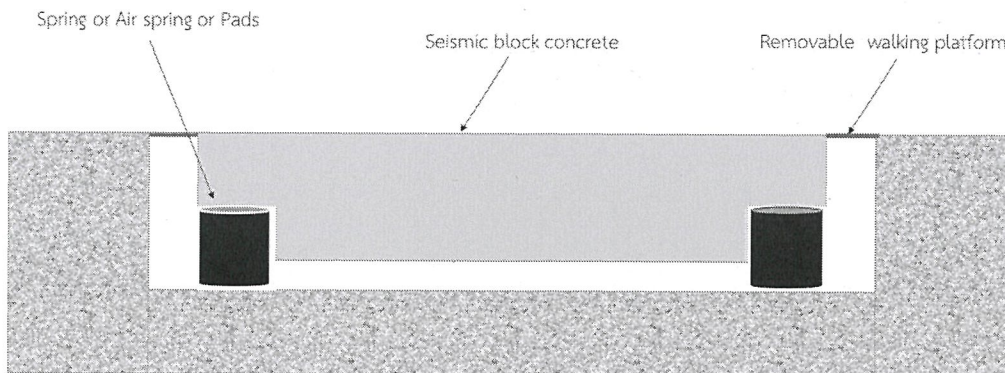


Figure 8: Example of an installation of Foundation Isolator

4. Furniture for the clean rooms.

The equipment to be used in the clean room must be in compliance with ISO Class 8 or FED-STD-209D (Federal Standard) class 100000 and ESD-Safe standard (Electro Static Discharged), that is it prevents electrostatic discharge which prevent rapid electrical discharge and affect electronic components.

4.1 Stainless steel working table for clean room with ESD-Safe standard with anti-static mats (10 sets).

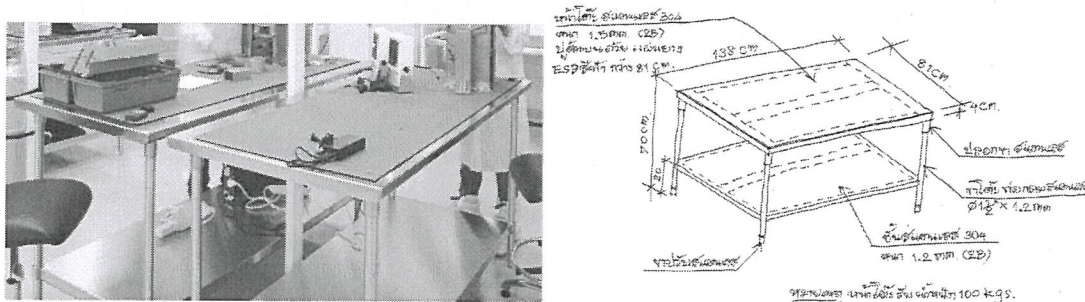


Figure 9: Example of stainless steel working table for clean room*

Unique features:

- (1) The table must have a dimension greater than or equal to 0.81 meters long x 1.38 meters wide x 0.7 meter high
- (2) The structure must be made from stainless steel. The surface of the table must be more than or equal to 4 mm thick. The top surface of the table must be covered with anti-static mats (ESD Table Mats) with a thickness of more than or equal to 1.5 mm.
- (3) There must be a second tier of stainless steel surface with the thickness of more than or equal to 1.2 millimeters which is 20 centimeters of higher from the floor.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink at the bottom right of the page.

- (4) The table legs must be made from stainless steel and the height of the table must be adjustable.
- (5) The structure of the table must be able to support more than or equal to 100 kg of load.
- (6) There must be a Ground Cord which is connected from the connective plate on the antistatic rubber sheet to the ground.

4.2 Table for holding satellite in class 100000 clean room class in accordance to ESD-Safe standard (Electro Static Discharged) with anti-static mats (2 sets)

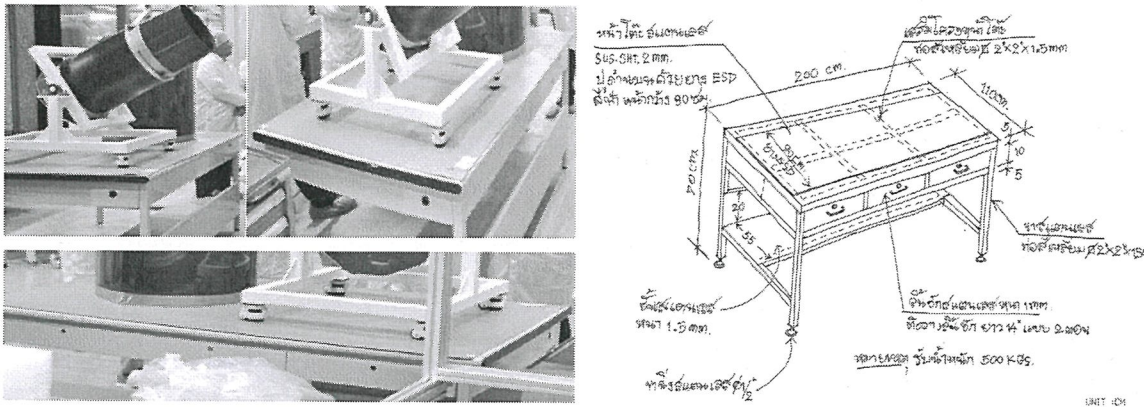


Figure 10: Example of table for holding satellite *

Unique features

- (1) The table must have the dimensions greater than or equal to 1.1 meters long x 2 meters wide x 0.7 meters high
- (2) The structure must be made from stainless steel. The top surface of the table must be covered with anti-static mats (ESD Table Mats).
- (3) The table must have 3 drawers for tool storage with lock and keys.
- (4) The structure of the table must be able to support more than or equal to 500 kg of load.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink at the bottom right of the page.

- (5) There must be a Ground Cord which is connected from the connective plate on the antistatic rubber sheet to the ground.

4.3 Chair with ESD-Safe standard (Electro Static Discharged) to be used in class 100000 clean rooms (20 sets).



Figure 11: Example of Chair with ESD safe standards*

Unique features

- (1) Soft surface with pneumatic height control.
- (2) Ergonomics Design
- (3) Static-safe model features dissipative Micron nylon
- (4) The structure and base of the chair must be made of polished aluminum.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including a large signature on the left and several smaller ones on the right.

4.4 ESD-Safe Parts Storage Cabinets with Drawers (6 sets - 3 large cabinets and 3 small cabinets)

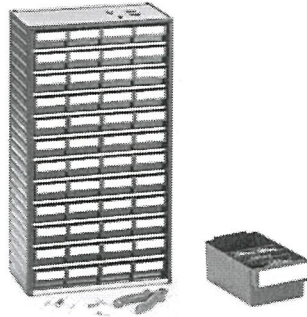


Figure 12: Example of Parts storage cabinets with drawers*

4.4.1 Large ESD-Safe Parts Cabinet (3 sets)

Unique features:

- (1) The number of drawers must be more than or equal to 16 drawers.
- (2) The dimensions of the drawers must be more than or equal to 15 inches long x 15 inches wide x 15 inches high
- (3) The structure must be made with antistatic plastic material.

4.4.2 Small ESD-Safe Small Parts Cabinet (3 sets)

Unique features:

- (1) The number of drawers must be more than or equal to 40 drawers.
- (2) The dimensions of the drawers must be more than or equal to 7 inches long x 12 inches wide x 21 inches high
- (3) The structure must be made with antistatic plastic material.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including "WJ", "to", "on", "R", "D", and "01/".

- 4.5 Size 48" Standard Tool Storage Cupboard with more than 170 Conductive Bins (4 sets)



Figure 13: Example of ESD-Safe standard tool storage cupboard*

Unique features

- (1) The dimensions must be more than or equal to 24 inches long x 48 inches wide x 78 inches high

- 4.6 Corrosive Safety Cabinet for clean room (1 set)

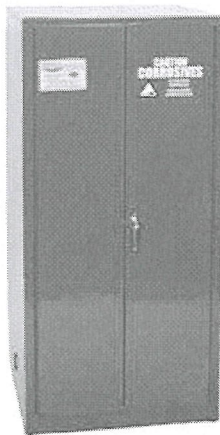


Figure 14: Example of Corrosive Safety cabinet*

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including "WJ", "H", "an", "AL", and "Shirley" followed by a date "10/1".

Unique features

- (1) The dimensions must be more than or equal to 18 inches long x 43 inches wide x 44 inches high

5. Materials Handling Equipment

- 5.1 ESD-Safe Stackable Super Tek-Trays with Foam made with High Impact Polypropylene having the dimensions 18 "x11-3/8" x1-3/4" (10 sets) and 22-3/4"x17-1/2" x2-1/2" (10 sets)

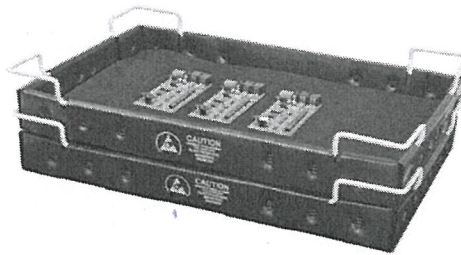


Figure 15: Example of ESD-Safe Trays*

- 5.2 ESD-Safe Steel mobile shelving system (5 tiers) with adjustable height with dimension more than or equal to 60 cm long x 150 cm wide x 170 cm high (4 sets)

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including "HJ", "L", "an", "Shur-Sant", and "01".

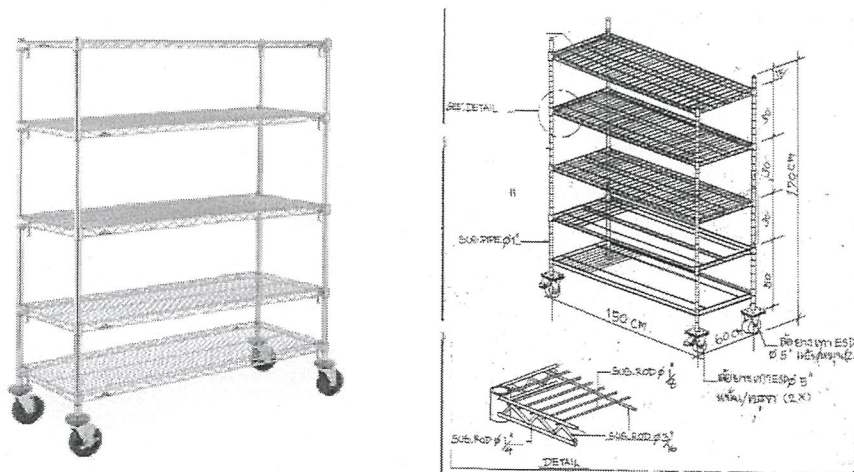


Figure 16: Example of Steel Mobile shelf*

- 5.3 Two-tier stainless-steel trolley with dimensions greater than or equal to 60 cm long x 90 cm wide X 90 cm high (3 sets)

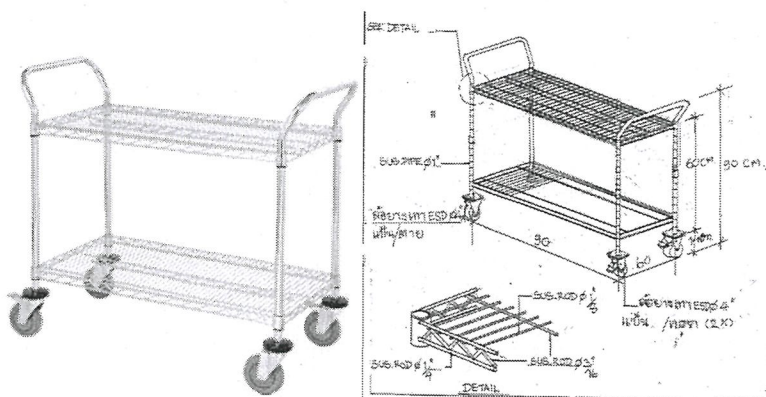


Figure 17: Example of Two-tier Stainless-Steel Trolley*

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink.

- 5.4 Mobile Instruments Carts with Steel Cabinet with dimensions greater than or equal to 18 "x 24" with 3 shelves (5 sets)



Figure 18: Example of mobile instruments cart*

- 5.5 Utility Carts with Pneumatic Wheels and can support load more than or equal to 225 kg and have the dimensions greater than or equal to 44 inches x 25 inches x 30 inches (3 sets)



Figure 19: Example of Utility Cart*

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

- 5.6 Single-tier Stainless steel cart with dimensions greater than or equal to 65 cm long x 50 cm wide x 90 cm height from floor to handle 90 cm with ESD-Safe grey rubber tires (2 sets)

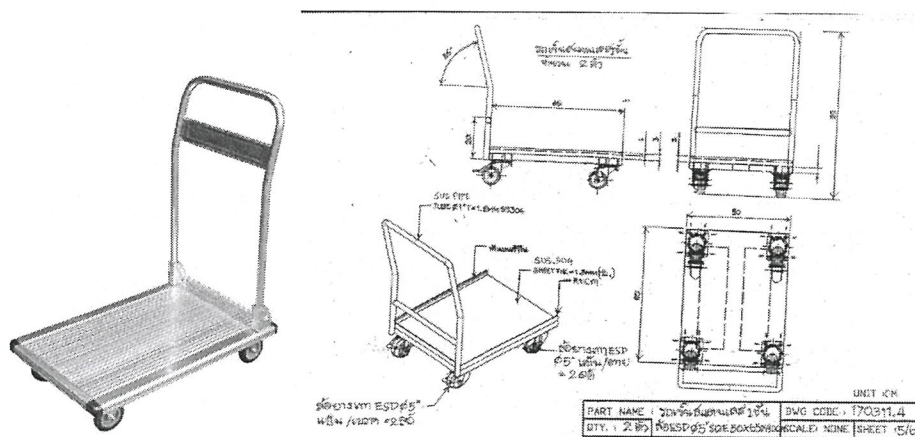


Figure 20: Example of single-tier stainless steel cart*

- 5.7 Plastic Pallet with all sides being similar and can be used on all sides. The width must be no less than 1 meter and must be able to support greater than or equal to 4500 kilograms with a carrying capacity greater than or equal to 1,500 kilograms while moving (5 sets)

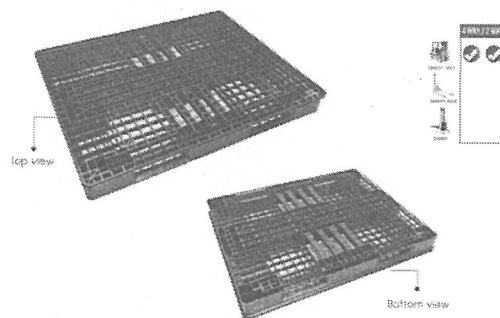


Figure 21: Example of Plastic Pallet that can be used on all four sides*

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

- 5.8 Five-liter stainless steel trash bin with foot pedal and top for closing (5 sets)

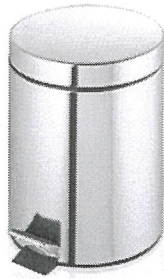


Figure 22: Example of bin with foot pedal*

- 5.9 A-shape Aluminum ladder with height more than or equal to 1100 mm, 4 steps and tool holder (1 set)



Figure 23: Example of A-shape Aluminum Ladder with 1100 mm height*

- 5.10 A-shape Aluminum ladder with height more than or equal to 2075 mm, 7 steps and tool holder (1 set)

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink.



Figure 24: Example of A-shape Aluminum Ladder with 2075 mm height*

5.11 Mobile Stainless-Steel ladder (1 set)

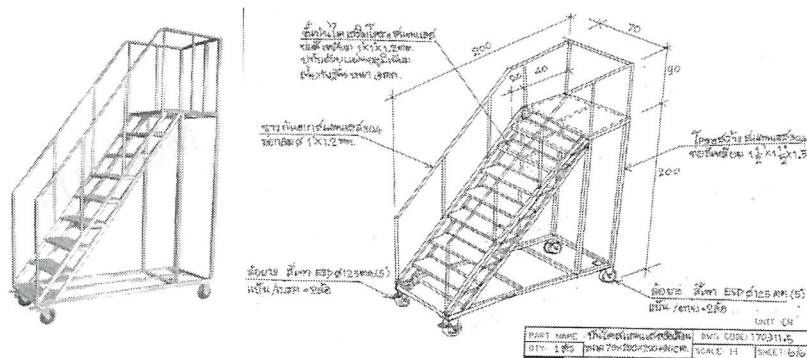


Figure 25: Example of Mobile Stainless-Steel ladder*

Unique features

- (1) The dimensions must be greater than or equal to 70 cm wide x 200 cm long x 200 cm high+ hand rail of 90 cm height
- (2) The structure must be made with stainless steel.
- (3) The step of the ladder floor must be made with anti-slip aluminum.
- (4) The tires must be grey high-quality ESD-Safe tires.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including 'W', 'L', 'an', 'R', and '01'.

5.12 Anti-electrostatic Adjustable Wrist Strap with 6ft. Coil Cord (20 sets)

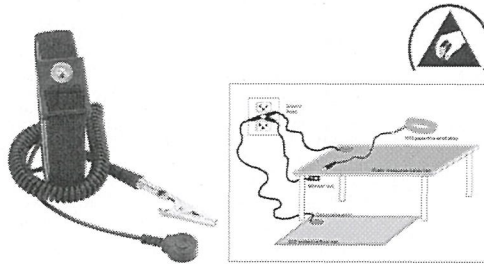


Figure 26: Example of Anti-static adjustable wrist strap

Unique features

- (1) Built-in $1M\Omega$ resistor for safety
- (2) Alligator clip included
- (3) Adjustable type wrist band

6. Forklift for Clean room (1 set)



Figure 27: Example of Forklift*

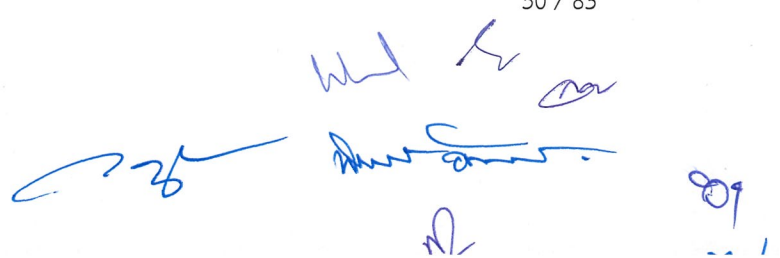
- 6.1 The forklift must be a rider forklift with battery powered, electric motor driven with 4-wheels.

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink, including "25", "H", "L", "M", and "b".

- 6.2 The height of the forklift from the floor to the roof (Overhead Guard Height) must be more than or equal to 2030 mm.
- 6.3 The length to Fork Face + Length of Fork Side must be more than or equal to 3,400 mm
- 6.4 The load Capacity must be more than or equal to 1,000 kg, Load center must be more than or equal to 500 mm, Maximum fork height must be more than or equal to 3,000 mm.
- 6.5 The Mast Lowered Height must be greater than or equal to 1,900 mm.
- 6.6 The Mast Extended with STD Backrest height must be greater than or equal to 4,000 mm.
- 6.7 The height at Free lift with STD Backrest (not lifting hydraulic cylinder) must be greater than or equal to 140 mm.
- 6.8 The Fork length must be greater than or equal to 1,000 mm.
- 6.9 The Turning Radius (Outside) must be greater than or equal to 1,700 millimeters.
- 6.10 The Tilt Range Forward and backward angle must be more than or equal to 7 degree and 11 degree respectively.
- 6.11 The forklift must be powered by an Electric Motors for driving with power output greater than or equal to 7 kW and an Electric Motors for Load Handling with power output greater than or equal to 9 kW.
- 6.12 The battery must have Voltage greater than or equal to 48 volts and Capacity greater than or equal to 330 Ampere-Hour.
- 6.13 The fork must be able to Side Shift (left and right).
- 6.14 There must be control levers for controlling inversion and up-down motion of the hydraulic cylinder.
- 6.15 The turning system must have hydraulic Power Steering.
- 6.16 The braking systems must be hydraulic or similar system which is more efficient and safer.

- 6.17 The front and back tires must be white toned tires with standard size as defined by equipment's manufacturer and will not cause smudges or leave mark on any type of floor.
- 6.18 The forklift must have front light, reverse light, turn signal and brake light with audible reverse alarm.
- 6.19 The seat must have a safety switch such that if it doesn't detect the presence of someone sitting in the seat, the hydraulic system will not work.
- 6.20 The Under-Clearance Steer Axle (No Load) must be greater than or equal to 110 mm
- 6.21 The forklift must have anti-rollback capability.
- 6.22 The forklift must be able to automatically right the fork back to 90 degrees.
- 6.23 The forklift must be able to automatically adjust the balance of the forklift body while turning to ensure safety.
- 6.24 The forklift must be able to automatically adjust (reduce) the speed of the fork before the fork touches the ground.
- 6.25 The forklift must have the capability to prevent itself from overturning on an inclined surface. If the accelerator and brake pedal is not pressed on a inclined surface, it must be able to slowly moves down the slope with brief pause.
- 6.26 The forklift must have the capability to measure the brake pedestal sinking and also control the release and hold of the brake during braking.
- 6.27 The forklift must be delivered with a Charger (1 set) which shall work with the electrical systems of the Satellite AIT facility.
- 6.28 The forklift must be delivered with a standard toolset for the forklift (1 set).

The bottom of the page contains several handwritten signatures and initials in blue ink. On the left, there is a long, sweeping signature. In the center, there are two distinct signatures, one above the other. To the right of these, there are some initials and a small mark that looks like a stylized 'M' or 'W'. On the far right, there is a small, handwritten number '09'.

Appendix C.

Technical Specifications – Hand tools.

Handwritten signatures and initials in blue ink, including a large signature on the left and several smaller initials and signatures on the right.

Appendix C - Technical Specifications – Hand tools.

1. Screwdrivers and wrenches set (3 sets), each set consists of the set of screwdrivers and wrenches, as follows:
 - 1.1 Hexagon screwdriver set (11 pieces) which includes assorted Hex Driver Blades with extension and Handle (11-Piece Regular End Inch Hex Driver Set) in the size range of 0.050 " - 3/16" inches
 - 1.2 Hexagon screwdriver with ballpoint head set (11 pieces) which includes assorted Hex Driver Blades with extension and Handle (11-Piece Ballpoint Inch Hex Driver Set) in the size range of 0.050 " - 3/16" inches
 - 1.3 Hexagon screwdriver set (9 pieces) which includes Hex Driver Blades with extension and Handle (9-Piece Metric Regular End Metric Hex Driver Set) in the size range of 1.27 - 5 millimeters.
 - 1.4 Hexagon screwdriver with ballpoint head set (9 pieces) which includes Hex Driver Blades with extension and Handle (9-Piece Metric Ballpoint End Metric Hex Driver Set) in the size range of 1.27 - 5 millimeters.
 - 1.5 Screwdriver and Nut Driver Set (13 pieces) including assorted Nut Driver Blades in the size range of 3/16 "-3/8" inches and assorted Screwdriver Blades with extension and handle.
 - 1.6 Hexagon wrench Set Ball-end (9 pieces) including assorted Balldriver Insert Bit Set in the size range of 2-12 millimeters.
 - 1.7 Hexagon Set Ball-end (12 pieces) including assorted Balldriver Insert Bit Set in the size range of 5/64" – 1/2" inches
 - 1.8 Assorted Long-arm L-shape Hexagon wrench set (13 pieces) in the size range of 0.050 "-3/8" inches
 - 1.9 Assorted Long-arm L-shape Hexagon wrench set (15 pieces) in the size range of 1.27-10 millimeters.
 - 1.10 Assorted Short-arm L-shape Hexagon wrench set (13 pieces) in the size range of 0.050 "-3/8" inches

- 1.11 Assorted Short-arm L-shape Hexagon wrench set (9 pieces) in the size range of 1.5-10 millimeters.
- 1.12 Assorted Balldriver L-shape Hexagon wrench set (13 pieces) in the size range of 0.050 "-3/8" inches
- 1.13 Assorted Balldriver L-shape Hexagon wrench set (15 pieces) in the size range of 1.27 – 10 millimeters
- 1.14 Assorted T-Handles Hexagon End wrench (10 pieces) in the size range of 3/32" -3/8 " inches
- 1.15 Assorted T-Handles Hexagon End wrench (8 pieces) in the size range of 2-10 millimeters
- 1.16 Assorted T-Handles Hexagon Ball End wrench (10 pieces) in the size range of 3/32" - 3/8 " inches
- 1.17 Assorted T-Handles Hexagon Ball End wrench (7 pieces) in the size range of 2-10 millimeters
- 1.18 Assorted Fold-Up Key Hexagon Wrench Set (9 pieces) in the size range of the 0.050 "- 1/4" inches
- 1.19 Assorted Fold-Up Key Hexagon Wrench Set (7 pieces) in the size range of the 1.5-8 millimeters
- 1.20 Assorted Pivot Head Hexagon wrench set (6 pieces) in the size range of the 3-10 millimeters
- 1.21 Assorted Pivot Head Hexagon wrench set (8 pieces) in the size range of the 1/8" – 3/8" inches

2. Torque wrenches and screwdrivers (3 sets), each set consists of the set of screwdrivers and wrenches, as follows:

- 2.1 Torque Screwdriver, size 1/4 " inches with Capacity 4-20 cNm
- 2.2 Torque Screwdriver, size 1/4 " inches with Capacity 15-75 cNm



- 2.3 Click Wrenches with removable ratchet, 9x12 End Fitting, size 1/4" inches Drive, Capacity 1-5 cNm
- 2.4 Click Wrenches with removable ratchet, 9x12 End Fitting, size 1/4" inches Drive, Capacity 5-25 cNm
- 2.5 Click Wrenches with removable ratchet, 9x12 End Fitting, size 3/8" inches Drive, Capacity 5-25 cNm
- 2.6 Click Wrenches with removable ratchet, 9x12 End Fitting, size 3/8" inches Drive, Capacity 10-50 cNm
- 2.7 Torque wrench accessory - Open End Bits, End Fitting 9x12, assorted size (13 pieces) in the size range of the 7-19 millimeters
- 2.8 Torque wrench accessory - Open End Bits, End Fitting 9x12, assorted size (8 pieces) in the size range of the 1/4" – 3/4" inches
- 2.9 Torque Wrench Head, Square Drive, End Fitting 9x12, size 3/8" inches
- 2.10 Crowfoot Square Set 3/8" Drive (8 pieces) assorted size in the range of 5/8" -1 1/16" inches

3. Screwdrivers set (3 sets) , each set consists of the set of screwdrivers, as follows:

- 3.1 Assorted Slotted Screwdrivers (13 pieces) with blade length in the region of 60 – 250 mm. with at least 2 pieces each having 3mm., 4mm., 5.5 mm and 6.5mm and at least 1 piece each having 2.5mm, 3.5mm, 8mm, 10mm and 12mm
- 3.2 Assorted Stubby Slotted Screwdrivers (3 pieces) with blade length of 4, 5.5 and 6.5 mm.
- 3.3 Assorted Phillips Screwdrivers set (10 pieces) Each size and length of blade is in the range of 60-250mm. with at least 2 pieces each of size PH0, PH1, PH2 and at least 2 piece each of size PH3 and PH4.
- 3.4 Stubby, short blade length Phillips screwdriver set (2 pieces) of size PH1 and PH2.
- 3.5 Pozidriv Screwdriver set (5 pieces) with blade length in the region of 60 – 250 mm. and size PZ0, PZ1, PZ2, PZ3, PZ4

- 3.6 Stubby Pozidriv Screwdriver set (2 pieces) with blade length in the region of 25 - 35 mm. and size PZ1, PZ2
- 3.7 Offset Slotted / Phillips Screwdrivers set (3 pieces) with offset slotted of size 4mm, 5mm, PH1xPH2
- 3.8 Jeweler's Screwdriver Set / Precision Screwdriver Set
- 3.9 Assorted Nut Drivers Screwdriver set (10 pieces) with size in the range of 4 - 13 mm.
- 3.10 Assorted Nut Drivers Screwdriver set (10 pieces) with size in the range of 3/16" - 9/16" inches.
- 3.11 Minimum 11 pieces of accessories including handle and blade of Slotted, PHILIPS, POZIDRIV, TORX, HEX type
- 4. Socket Sets of size 1/4" inches Drive (3 sets of each size range) with Socket sizes in the range of 4 - 13 mm. and 3/16" - 1/12" inches.
- 5. Wrench Set (3 sets), each set consists of the set of wrenches, as follows:
 - 5.1 Assorted Combination Wrench Set (17 pieces) in the size range of the 6-24 mm.
 - 5.2 Assorted Combination Wrench Set (17 pieces) in the size range of the 1/4" - 1 1/4" inches
 - 5.3 Ratchet combination wrenches (Straight) (18 pieces) in the size range of the 8-32 mm
 - 5.4 Hinged Joint combination wrenches (12 pieces) in the size range of the 8-19 mm
 - 5.5 Double Open-End Wrenches (24 pieces) in the size range of the 6x7 - 30x32 mm
 - 5.6 Double Open-End Wrenches (10 pieces) in the size range of the 1/4" x 5/16" - 1 1/8" x 1 1/4" inches
 - 5.7 Double Ring-End Wrenches (12 pieces) in the size range of the 6x7 - 30x32 mm
 - 5.8 Ratcheting Adjustable Wrenches (3 pieces) with the size of 6", 8", 10" inches
- 6. Tool cart with toolbox (1 set) which include 1 tool cart with the following tools in the cart:
 - 6.1 Tool cart with toolset (1 set) with at least 7 drawers with 1 toolbox which must have at least 4 drawers and more than 350 tools.



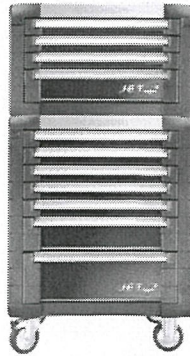


Figure 28: Tool cart with toolbox*

Unique features

- (1) must have locking mechanism
 - (2) must have a handle for easy transportation.
 - (3) must have soft bumper, to prevent jolt, on all four corners
 - (4) must have heavy duty wheels and provide high resistance to heavy loads with wheel locking mechanism
 - (5) The Work top of the cart must be able to support at least 900kg
 - (6) The drawer must be able to support total load no less than 150 kg.
 - (7) The drawer must be laid with foam that has been cut to fit precisely with the provided tools
- 6.2 Toolbox within the tool cart must have more than 350 tool pieces and must include the following tools:
- 6.2.1 Combination Wrenches
 - 6.2.2 Open-End Wrenches
 - 6.2.3 Flare-nut Wrenches
 - 6.2.4 Open-End Wrenches
 - 6.2.5 Adjustable Wrenches
 - 6.2.6 Pin Wrench

* (Figure is used for installation and physical characteristics reference only. There is no affiliation to the product.)

Handwritten signatures and initials in blue ink.

- 6.2.7 1/2" Socket Sets and accessories
- 6.2.8 1/2" Long Drive Hinged Handle
- 6.2.9 1/4" Sockets and accessories
- 6.2.10 3/4" Sockets and accessories
- 6.2.11 Torque Wrench
- 6.2.12 Screwdrivers for Slotted Heads, Philips, Pozidriv
- 6.2.13 Hexagonal Blade Screwdriver for Slotted, Phillips, Pozidriv
- 6.2.14 1,000 Volts Insulated Screwdrivers Slotted, Phillips
- 6.2.15 Multifunction Tester
- 6.2.16 Voltage Tester Screwdriver
- 6.2.17 Screw Starter for Slotted Heads
- 6.2.18 Sleeve set of hexagonal Keys, Spherical Head Hex Keys
- 6.2.19 Torx Keys
- 6.2.20 Case set of screwdrivers
- 6.2.21 Pliers
- 6.2.22 Nippers
- 6.2.23 Clamp
- 6.2.24 Circlip
- 6.2.25 Cutters
- 6.2.26 Locking Tape Measure
- 6.2.27 Scriber
- 6.2.28 Rule
- 6.2.29 Feeler Gauge 19 blades
- 6.2.30 Hacksaw Frame
- 6.2.31 Hacksaw Blades
- 6.2.32 Files
- 6.2.33 Square Punch
- 6.2.34 Right-cut scroll tool

Handwritten signatures and initials in blue ink.

- 6.2.35 Scraper
- 6.2.36 Box set of drill-bits
- 6.2.37 Tap and die set
- 6.2.38 Ratchet tool-holder
- 6.2.39 Riveting Hammers
- 6.2.40 Plastic-tip mallet
- 6.2.41 Dead-blow hammer
- 6.2.42 Chisel
- 6.2.43 Wire Stripper
- 6.2.44 Crimping pliers

7. Pliers and cutters set (3 sets) each consisting of the following types of pliers: (Note: Items 7.1-7.8 must meet the ESD-Safe standard, that is, it prevents electrostatic discharge which prevent rapid electrical discharge and affect electronic components).

- 7.1 Oval Head Cutters (1 piece)
- 7.2 Tapered Head Cutters (1 piece)
- 7.3 Relieved Head Cutters (1 piece)
- 7.4 Flush Cutting Edges (1 piece)
- 7.5 Round Nose Pliers (1 piece)
- 7.6 Short Nose Pliers (1 piece)
- 7.7 Long Nose Pliers (2 pieces), 1 piece each of Smooth Jaws and Serrated Jaws type
- 7.8 Tweezers (1 set), each with minimum of 5 pieces per set, such as the 2A, 3C, 5, 7, 00 set or AA, 00, 2A, 3C, 5, 7 set or 2A, 3, 00, 6, 7 set
- 7.9 Circlip Pliers Set (4 pieces) which includes the External Circlip Pliers (Straight-with Spring), External Circlip Pliers (Bent-with Spring), Internal Circlips Pliers (Straight-with Spring), Internal Circlips Pliers (Bent-without Spring)
- 7.10 Screw Removal Pliers (2 pieces), with each having different jaw
- 7.11 Locking Pliers, Mole Grip, Vice-Grip Pliers (2 pieces), with size 6LN and 10WR
- 7.12 Wire Twisting Pliers (1 piece)

Handwritten signatures and initials in blue ink at the bottom of the page, including a large signature on the left and several smaller initials and signatures on the right.

- 7.13 Stripper, Cutter and Crimper (Bolt Cutter) (2 piece each) with 1 type each with unit in millimeters and the other in inches

8. Inspection / Marking up tools (3 sets)

- 8.1 LED Magnifiers Lens (1 set)
- 8.2 Digital Microscope with Polarizer (1 set) with magnification more than or equal to 20x-220x, 1.3 M Pixels with the following accessories.
 - 8.2.1 Wi-Fi connectivity
 - 8.2.2 Backlight illuminator for both Brightfield and Darkfield illumination
 - 8.2.3 Stand and table top stand with quick-release
 - 8.2.4 X-Y sliding platform with 360-degree swivel base
 - 8.2.5 8Backlight Pad (Polarizer)
- 8.3 Circular Inspection Mirror (2 pieces), assorted small and large size
- 8.4 Rectangular Inspection Mirror (2 pieces), assorted small and large size
- 8.5 LED Pen Light Aluminum Tube
- 8.6 Stainless Steel Rule Rounded End, size 6" inches
- 8.7 Stainless Steel Rule Rounded End, size 12" inches
- 8.8 Powerlock Measuring Tape Rules, 5m long
- 8.9 Feeler gauge , 19 blades, 0.04-1 millimeter
- 8.10 Digital Micrometer Moore and Wright with measuring range of 0-25 millimeters
- 8.11 Digital/Electronic Caliper Stainless Steel frame with measuring range of 0-150 millimeters
- 8.12 Analog Vernier Calipers with measuring Needle and measuring range of 0-300 millimeters
- 8.13 Assorted Scribes (at least 4 pieces)
- 8.14 G-Clamp, size 100 millimeters
- 8.15 Dial Gauge, needle type, size 0-100 millimeters
- 8.16 Spirit Level, size more than 200 millimeters
- 8.17 Self-leveling Cross-Line Laser with Plumb Points

9. General tools (3 sets), with each set including the following tools or better:

9.1 Cordless Impact Hand-held drill - 12 V

9.1.1 The Torque must be greater than or equal to (hard / soft): 30/13

9.1.2 The Idle speed must be greater than or equal to (1st gear/2nd gear): 0-380/0-1300 rpm

9.1.3 The type of battery must be lithium-ion.

9.2 Heat Gun

9.2.1 The Power must be greater than or equal to 2000W

9.2.2 Adjustable levels with more than or equal to 3 levels.

9.2.3 Adjustable heating level in the range of 50-630°C.

9.2.4 Must produce air volume in the range of 120-550 liters/minute

9.2.5 Must have Electronic temperature control system with digital dial

9.3 Jigsaw

9.3.1 The Rated power input must be more than or equal to 710W

9.3.2 . The stroke range must be more than or equal to 500-3100 time/minute.

9.3.3 The Stroke range must be greater than or equal to 20mm

10. Hammers (3 sets) with each set including the following items or better:

10.1 Ball Pein Hammer with diameter of 1/2" inches

10.2 Ball Pein Hammer with diameter of 1 1/2" inches

10.3 Dead Blow Hammer Nylon Tip with diameter of 40 millimeters

10.4 Dead Blow Hammer with steel micro balls with diameter of 60 millimeters

11. Infrared Thermometer (1 set)

11.1 General Features

The Infrared Thermometer must be able to display the heat image and indicate the source of heat clearly as well as simultaneously capture an optical image with the thermal image as well as record audio and save onto memory card and can also produce report on the computer and mobile devices that support the application.

11.2 Technical Features including Imaging Performance:

- 11.2.1 The Field of View must be greater than or equal to 34 degree (Horizontal) x greater than or equal to 24 degree (Vertical).
- 11.2.2 The Minimum Focus Distance must be less than or equal to 15 centimeters
- 11.2.3 The IFOV with standard lens must be less than or equal to 0.93 mRad
- 11.2.4 The IFOV with 2x telephoto lens must be less than or equal to 0.46 mRad
- 11.2.5 Must have at least the following focus capability - Laser sharp Auto Focus, Multi Sharp Focus and Manual Focus
- 11.2.6 Must have Detector Type - Focal Plane Array (FPA) Uncooled, microbolometer, 640 x 480 pixels (1280 x 960 with Super Resolution)
- 11.2.7 Must have Visible Light Camera Built-in with resolution more than or equal to 5.0 megapixels
- 11.2.8 Must have at least the following On Camera Operating Modes - Full thermal, thermal-visual imager
- 11.2.9 The Measurement Temperature Range must be less than or equal to -20°C to greater than or equal to 800°C
- 11.2.10 The LCD Panel must be more than or equal to 3.5 "Color LCD (640 x 480) with Touch Screen capability
- 11.2.11 Must be able to support Laser distance meter and calculates distance
- 11.2.12 Must have the following Storage Medium capability - micro SD card, Flash memory, USB Flash with minimum support for size larger than or equal to 4GB
- 11.2.13 Must be able to streaming video via USB and HDMI
- 11.2.14 Must have Rechargeable Li-Ion battery system
- 11.2.15 Must have 2-bay intelligent charger powered via AC outlet for battery charging
- 11.2.16 The Operating temperature range must be less than or equal to -10°C to greater than or equal to 50°C
- 11.2.17 Must meet the Environmental Protection IP 54 standard
- 11.2.18 Must meet the Shock 25G standard IEC 68-2-29

11.2.19 Must meet the Drop2 meter standard with standard lens

11.2.20 Must meet the Safety Standards IEC 61010-1

11.2.21 The software must be able to manage and manipulate the Thermal Image data and the software must be able to be installed in unlimited number of computers.

11.3 Accessories:

11.3.1 Carrying case (soft and hard) (1 set)

11.3.2 Rechargeable battery packs with 2 LED indicated energy (2 sets)

11.3.3 Micro SD Card (1 set)

11.3.4 Infrared Telephoto (2X magnification) (1 set)

11.3.5 Infrared Wide-Angle Lens (1 set)

11.3.6 Tripod Mounting Accessory with Tripod (1 set)

Handwritten signatures and initials in blue ink at the bottom right of the page. There are several distinct marks, including what appears to be a signature on the left and some initials or smaller signatures on the right.

Appendix D.
Technical Specifications – Security and Electrical Systems

Handwritten signatures and initials in blue ink:
C. Z. [unclear] [unclear] [unclear] [unclear] [unclear]
[unclear] [unclear] 01

Appendix D.- Technical Specifications – Security and Electrical Systems.

1. Installation of CCTV system

- 1.1 Network type closed circuit camera with fixed view for indoor installation (at least 24 sets) with the following characteristics:
 - 1.1.1 The image resolution must not be less than 1,920x1,080 pixels or 2,073,600 pixels.
 - 1.1.2 The frame rate must not less than 50 frames per second at the image resolution of not less than 1,920 by 1,080 pixels or 2,073,600 pixels.
 - 1.1.3 Must have IR-Cut filter or Infrared Cut-off Removable (ICR) technology for day and night recording.
 - 1.1.4 Must have light sensitivity no greater-than 0.22 LUX for color and 0.04 LUX for black and white monitoring.
 - 1.1.5 The Image Sensor must not be smaller than 1/3 inch
 - 1.1.6 The focal length range must not less be than 4.5 millimeters
 - 1.1.7 Must have Motion Detection
 - 1.1.8 Must be able to display the details of the image with Wide Dynamic Range or Super Dynamic Range
 - 1.1.9 The video stream must be able to stream to at least two locations
 - 1.1.10 Must meet Onvif standard (Open Network Video Interface Forum)
 - 1.1.11 Must be able to support and transmit at least H.264 codec video or newer.
 - 1.1.12 Must be compatible with IPv4 and IPv6 network standards.
 - 1.1.13 Must have at least one 10/100 Base-T Network Interface or better and support POE (Power over Ethernet: IEEE 802.3af or IEEE 802.3at standard) over the same port.
 - 1.1.14 Must be compatible with HTTP, HTTPS, "NTP or SNTP", SNMP, RTSP protocols and IEEE802.1X standards.
 - 1.1.15 Must include a slot for recording data to SD Card or MicroSD Card or Mini SD Card.
 - 1.1.16 Must include a Software Development Kit (SDK) or Application Programming Interface (API) in the form of a properly licensed CD or DVD or downloadable file.
 - 1.1.17 Must have the appropriate security standards for end-users.

- 1.1.18 The manufacturer must be certified for environmental management systems.
- 1.1.19 The manufacturer must be certified for quality management or organization management standards.
- 1.2 Network Video Recorder which supports no less than 24 channels:
 - 1.2.1 Must be an equipment that has been designed to record from CCTV specifically.
 - 1.2.2 Must be able record and compress images in MPEG4 or H.264 format or better.
 - 1.2.3 Must meet Onvif standard (Open Network Video Interface Forum)
 - 1.2.4 Must have at least one 10/100/1000 Base-T Network Interface or better
 - 1.2.5 Must be able to record and send image resolution of no less than 1,920 x1,080 pixels or less than 2,073,600 pixels.
 - 1.2.6 Must be compatible with HTTP, SMTP, "NTP or SNTP", SNMP, RTSP protocols
 - 1.2.7 Must have a dedicated SATA Surveillance Hard Disk with total capacity of not less than 8TB for storing CCTV footage.
 - 1.2.8 Must have no less than 2 USB interfaces.
 - 1.2.9 Must be compatible with IPv4 and IPv6 standards.
 - 1.2.10 Must include a Software Development Kit (SDK) or Application Programming Interface (API) in the form of a properly licensed CD or DVD or downloadable file.
 - 1.2.11 Must be able to replay recorded footage via network.
 - 1.2.12 The manufacturer must be certified for quality management or organization management standards.

2. Uninterruptable Power Supply (UPS):

- 2.1 The Uninterruptable Power Supply shall support the following areas and equipment:
 - 2.1.1 Vibration test equipment
 - 2.1.2 Thermal Vacuum Chamber
 - 2.1.3 Satellite Testing and Development center
 - 2.1.4 Clean rooms
- 2.2 120 kVA Uninterruptable Power Supply (3-phase electrical system):
 - 2.2.1 Input Features

- (1) Input voltage: 380 to 415V, 3 Phases
- (2) Input frequency: 50 to 60 Hz (or better)
- (3) THDi (Total current harmonic distortion): less than 4.5% at full load or better
- (4) Input Power Factor: 0.99 or better

2.2.2 Output characteristics

- (1) Output voltage: 380/400/415V, 3 Phases
- (2) Output frequency: 50 Hz (or better)
- (3) Total voltage harmonic distortion (THDV): Less than 3% for non-linear load or better
- (4) Overload capacity: 10 minutes for 125% overload or better
- (5) Output Power Factor: 0.9 or better

2.2.3 Display Unit:

- (1) Must have a LCD Display for displaying the status and anomalous conditions of the UPS.
- (2) Must have a LCD displays for displaying information such as voltage, current, power, backup time, etc.
- (3) Must have a communication port (Potential-free contact) that supports connection to a computer.

2.2.4 Performance and Standards:

- (1) The overall efficiency must not be less than 92%
- (2) Must meet these following international standard:

EMC/EMI/RFI: : IEC 62040-2 or EN 62040-2

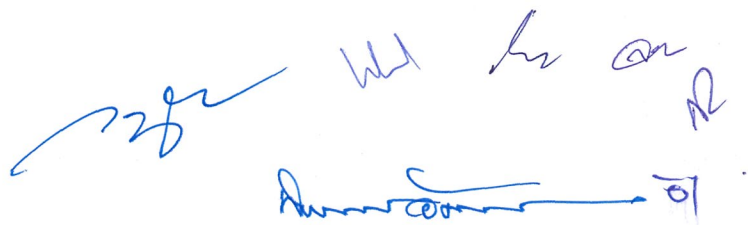
Safety: : IEC 62040-1 or EN 62040-1

Other (Option): : CE or TUV

2.2.5 Environmental conditions

- (1) Operating Temperature Range: 0 - 40 ° C (or better)
- (2) Relative humidity: less than 90 (non-condensing) (or better)

2.2.6 Battery



- (1) Must use a Maintenance Free such as Sealed Lead Acid or better battery
- (2) The battery must be flame resistant.
- (3) The battery must be able to provide backup for not less than 10 minutes while operating on full load throughout the lifetime of the battery.
- (4) The battery pack must be installed within a battery cabinet which must be strong, rust-free or installed as a built-in within the UPS
- (5) Must have battery protection system such as individually fused or Circuit Breaker or better.
- (6) Other accessories, such as terminals connections between rows and between layers of batteries.

2.3 1500 kVA Uninterruptable Power Supply (3 phase)

2.3.1 Input Features

- (1) Input voltage: 250 to 600, 3 Phases
- (2) Input frequency: 40 to 70 Hz (or better)
- (3) THDi (Total current harmonic distortion): less than 3% at full load or better
- (4) Input Power Factor: 0.98 or better

2.3.2 Output characteristics

- (1) Output voltage: 380/400/415V, 3 Phases
- (2) Output frequency: 50 Hz $\pm$ 0.1% (or better)
- (3) Total voltage harmonic distortion (THDV): Less than 3% for non-linear load or better
- (4) Overload capacity: 10 minutes for 125% overload or better
- (5) Output Power Factor: 0.9 or better

2.3.3 Display Unit: The proposed UPS system

- (1) Must have a LCD Display for displaying the status and anomalous conditions of the UPS.
- (2) Must have a LCD displays for displaying information such as voltage, current, power, backup time, etc.

- (3) Must have a communication port (Potential-free contact) that supports connection to a computer.

2.3.4 Performance and Standards:

- (1) Must meet these following international standard:

EMC/EMI/RFI: : IEC 62040-2 or EN 62040-2

Safety: : IEC 62040-1 or EN 62040-1

Other (Option): : CE or TUV

2.3.5 Environmental conditions

- (1) Operating Temperature Range: 0 - 40 ° C (or better)
- (2) Relative humidity: less than 90 (non-condensing) (or better)

2.3.6 Spare Power System (Battery)

- (1) Must use a Maintenance Free such as Sealed Lead Acid or better battery
- (2) The battery must be flame resistant.
- (3) The battery must be able to provide backup for not less than 10 minutes while operating on full load throughout the lifetime of the battery.
- (4) The battery pack must be installed within a battery cabinet which must be strong, rust-free or installed as a built-in within the UPS
- (5) Must have battery protection system such as individually fused or Circuit Breaker or better.
- (6) Other accessories, such as terminals connections between rows and between layers of batteries.



Appendix E.

Scoring Rubric for proposal consideration.

[Handwritten signatures and initials in blue ink]

Appendix E - Scoring Rubric for proposal consideration.

Table 2: Scoring Rubric for technical evaluation

Item no.	Details	Weight	Full Score	Received Score	Scoring Details	Note
1	Vibration Test		50			
	Sine $\geq 160\text{Kn}$		4		4 points $\geq 170\text{kn}$, 3 points $\geq 165\text{kn}$, 2 points $\geq 160\text{kn}$	
	Random $\geq 160\text{Kn}$		4		4 points $\geq 170\text{kn}$, 3 points $\geq 165\text{kn}$, 2 points $\geq 160\text{kn}$	
	Shock $\geq 300\text{Kn}$		4		4 points $\geq 500\text{kn}$, 3 points $\geq 400\text{kn}$, 2 points $\geq 300\text{kn}$	
	Maximum Displacement $\geq 30\text{ mm (P-p)}$		4		4 points $\geq 70\text{mm}$, 3 points $\geq 50\text{mm}$, 2 points $\geq 30\text{mm}$	
	Maximum load capacity $\geq 500\text{ kg}$		4		4 points $\geq 1500\text{kg}$, 3 points $\geq 1000\text{kg}$, 2 points $\geq 500\text{kg}$	
	Minimum frequency $\leq 5\text{ Hz}$		4		4 points $\leq 3\text{Hz}$, 3 points $\leq 4\text{Hz}$, 2 points $\leq 5\text{Hz}$	
	Acquisition data $\geq 64\text{ channel}$		4		4 points $\geq 100\text{Ch}$, 3 points $\geq 80\text{Ch}$, 2 points $\geq 64\text{Ch}$	
	sampling rate $\geq 51\text{kHz}$		4		4 points $\geq 100\text{kHz}$, 3 points $\geq 70\text{kHz}$, 2 points $\geq 51\text{kHz}$	
	The average weight of the 1-axis accelerometer		2		2 points $\leq 30\text{g}$, 1 points $\geq 30\text{g}$	
	The average weight of the 3-axis accelerometer		2		2 points $\leq 30\text{g}$, 1 points $\geq 30\text{g}$	
	Lowest ambient temperature of sensor		3		3 points $\leq -20\text{C}$, 2 points $\geq -20\text{C}$	
	Highest ambient temperature of sensor		3		3 points $\geq 150\text{C}$, 2 points $\leq 150\text{C}$	
	Amplitude sine error smaller than $\pm 10\%$		4		4 points $\leq 0\%$, 3 points $\leq \pm 2\%$, 2 points $\leq \pm 5\%$, else 1 points	
	Frequency sine error smaller than $\pm 2\%$		4		4 points $\leq 0\%$, 3 points $\leq \pm 1\%$, 2 points $\leq \pm 2\%$, else 1 points	
	Warranty		10			

[Handwritten signatures and initials]

Item no.	Details	Weight	Full Score	Received Score	Scoring Details	Note
	Warranty ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	After sales service		15			
	Maintenance services ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Calibration services ≥ 1 year		5		5 points ≥ 5 years, 4 points ≥ 3 years, 3 points ≥ 1 years	
	Experience		20			
	Installation Experience (years)		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Installation Experience (in Space sector)		5		5 points = Have relevant experience, 2.5 points = No relevant experience	
	Contract value (baht)		5		5 points ≥ 20 million baht, 4 points ≥ 15 million baht, 3 points ≥ 5 million baht	
	Distributor		5			
	Authorized distributor		5		5 points = possess authorized distributor letter, 2.5 points = does not possess authorized distributor letter	
	Total points (100)	20%	100	A1		
2	Thermal Vacuum Chamber		50			
	internal diameter ≥ 1.8 m		7		7 points ≥ 2m, 6 points ≥ 1.9mm, 5 points ≥ 1.8m	
	length ≥ 1.5 m		7		7 points ≥ 2m, 6 points ≥ 1.8mm, 5 points ≥ 1.5m	
	Minimum Temperature ≤ -150 C		6		6 points ≤ -170C, 5 points ≤ -160C, 4 points ≤ -150C	
	Maximum Temperature ≥ +150 C		6		6 points ≥ +170C, 5 points ≥ +160C, 4 points ≥ +150C	

[Handwritten signatures and initials]

Item no.	Details	Weight	Full Score	Received Score	Scoring Details	Note
	Heating rate ≥ 2.0 C/min		6		6 points ≥ 4.0 C/min, 5 points ≥ 3.0 C/min, 4 points ≥ 2.0 C/min	
	Cooling rate ≥ 2.0 C/min		6		6 points ≥ 4.0 C/min, 5 points ≥ 3.0 C/min, 4 points ≥ 2.0 C/min	
	(Vacuum pressure $\leq 10^{-6}$ mbar		6		6 points $\leq 10^{-8}$ mbar, 5 points $\leq 10^{-7}$ mbar, 4 points $\leq 10^{-6}$ mbar	
	Acquisition data ≥ 128 channels		6		6 points ≥ 200 Ch, 5 points ≥ 150 Ch, 4 points ≥ 128 Ch	
	Warranty		10			
	Warranty ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	After sales services		15			
	Maintenance services ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Calibration services ≥ 1 year		5		5 points ≥ 5 years, 4 points ≥ 3 years, 3 points ≥ 1 years	
	Experience		20			
	Installation Experience (years)		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Installation Experience (in Space sector)		5		5 points=Have relevant experience, 2.5 points=No relevant experience	
	Contract value (baht)		5		5 points ≥ 20 million baht, 4 points ≥ 15 million baht, 3 points ≥ 5 million baht	
	Distributor		5			
	Authorized distributor		5		5 points=possess authorized distributor letter, 2.5 points=does not possess authorized distributor letter	

Handwritten signature and notes in blue ink.

Item no.	Details	Weight	Full Score	Received Score	Scoring Details	Note
	Total points (100)	20%	100	A2		
3	Mass properties measurement		40			
	Highest spin rate		10		10 points $\geq$ 300 RPM, 9 points $\geq$ 270 RPM, 8 points $\geq$ 250 RPM	
	Total dynamic unbalance measuring error $\leq \pm 5\%$		10		10 points $\leq \pm 3\%$, 9 points $\leq \pm 4\%$, 8 points $\leq \pm 5\%$	
	CG accuracy $< +0.1\%$		10		10 points $\leq +0.01\%$, 9 points $\leq +0.05\%$, 8 points $\leq +0.1\%$	
	MOI accuracy $< \pm 0.1\%$		10		10 points $\leq \pm 0.01\%$, 9 points $\leq \pm 0.05\%$, 8 points $\leq \pm 0.1\%$	
	Warranty		10			
	Warranty ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	After sales services		15			
	Maintenance services ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Calibration services ≥ 1 year		5		5 points ≥ 5 years, 4 points ≥ 3 years, 3 points ≥ 1 years	
	ประสบการณ์		25			
	Installation Experience (years)		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Installation Experience (in Space sector)		10		5 points = Have relevant experience, 2.5 points = No relevant experience	
	Contract value (baht)		5		5 points ≥ 20 million baht, 4 points ≥ 15 million baht, 3 points ≥ 5 million baht	
	Distributor		10			
	Authorized Distributor		10		5 points = possess authorized distributor letter, 2.5 points = does not possess authorized distributor letter	

[Handwritten signatures and initials]

Item no.	Details	Weight	Full Score	Received Score	Scoring Details	Note
	Total points (100)	20%	100	A3		
4	Clean room					
	Warranty		20			
	Warranty ≥ 1 year		20		20 points ≥ 5 years, 18 points ≥ 3 years, 16 points ≥ 1 years	
	After sales services		20			
	Maintenance services ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Calibration services ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	
	Experience		60			
	Installation Experience (years)		20		20 points ≥ 5 years, 18 points ≥ 3 years, 16 points ≥ 1 years	
	Installation Experience (in Space sector)		10		10 points = Have relevant experience, 5 points = No relevant experience	
	Contract value (baht)		30		30 points ≥ 20 million baht, 20 points ≥ 15 million baht, 10 points ≥ 10 million baht, 5 points ≥ 5 million baht	
	Total points (100)	4%	100	A4		
5	UPS 1,500 KVA		40			
	Overload capacity		20		20 points ≥ 20 minutes, 18 points ≥ 15 minutes, 16 points ≥ 10 minutes	
	output power factor		20		20 points ≥ 1.0, 18 points ≥ 0.9, 16 points ≥ 0.8	
	Warranty		10			
	Warranty ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 years	

[Handwritten signatures and initials]

Item no.	Details	Weight	Full Score	Received Score	Scoring Details	Note
	After sales services		15			
	Maintenance services ≥ 1 year		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 year	
	Calibration services ≥ 1 year		5		5 points ≥ 5 years, 4 points ≥ 3 years, 3 points ≥ 1 year	
	ประสบการณ์		25			
	Installation Experience (years)		10		10 points ≥ 5 years, 9 points ≥ 3 years, 8 points ≥ 1 year	
	Installation Experience (in Space sector)		10		5 points = Have relevant experience, 2.5 points = No relevant experience	
	Contract value (baht)		5		5 points ≥ 20 million baht, 4 points ≥ 15 million baht, 3 points ≥ 5 million baht	
	Distributor		10			
	Authorized Distributor		10		5 points = possess authorized distributor letter, 2.5 points = does not possess authorized distributor letter	
	Total Points (100)	4%	100	A5		
6	Appendix C		100			
	List Items No.2		50		50 Points = Have, 25 Points = Do not have Certification from calibration center ISO17025	
	List item No.5		50		50 Points = Have, 25 Points = Do not have Standard DIN ISO or equivalent	
	Total Points (100)	2%	100	A6		

Technical Evaluation Scoring (70) = (0.2*A1) + (0.2*A2) + (0.2*A3) + (0.04*A4) + (0.04*A5) + (0.02*A6)

76 / 83

AR

[Signature]

[Signature]

or

Financial proposal score (30) is scored whereby the lowest bidder shall receive a full score and the score shall be adjusted accordingly based on the ratio of price differences according to the following formula:

Financial proposal score (30) = $30 \times (\text{price of the lowest proposal} / \text{price of the proposal under consideration})$

The overall score = Technical Evaluation Scoring + Financial proposal score

Therefore, the successful bidder shall be whom evaluated the highest overall score.

List of Deliverables

No.	Lists	Specifications	Amount	Unit	Milestone	Note
Appendix A. the characteristics of the equipment and measurement for satellite test and integration						
1.1	Vibration Test	≥ 160 KN	1	Set	5	
1.2	data acquisition	(64 CH) or more than				
2	Thermal Vacuum Chamber	-work space diameter ≥ 1.8 m and L ≥ 1.5 m temp ≤-150c to ≥150c	1	Set	7	
3	Thermal Cycling	-work space 1.5x1.5x1.5 m *-temp ≤-70c to ≥150c	1	set	3	
4	Mass Properties Measurement	-maximum load Equipment under test 500 kg (exclude L fixture)	1	set	6	
5	Theodolite	Total station	3	set	2	
Appendix B the characteristics of supporting equipment and facility						
1	Installation clean room Class 100k	30x50x12 m	1	room	8	
	Installation clean room Class 100k	10x15x12 m	2	room	8	
	Accessories					






No.	Lists	Specifications	Amount	Unit	Milestone	Note
	shutter door electrical type for loading room	- w 8 x h 6 m	2	set	8	
	shutter door electrical type for EMC room	- w 5 x h 6 m	1	set	8	
	Passed box		1	set	8	
	Air shower box		1	set	8	
	Locker for Ground coat		1	set	8	
	Ground coats, clean room shoes, cleanroom gloves and hair caps		500	set	8	
	Safety goggles and earplugs		50	set	8	
2	Installation - clean tent class 100	10 x 20 m	1	set	8	
3	Foundation Isolator		1	set	4	
4	Furniture					
	4.1 Stainless steel working table	≥ 0.81 x 1.5 x 0.7 m.	10	set	4	

Handwritten signatures and initials in blue ink, including a large signature on the right and smaller initials on the left.

No.	Lists	Specifications	Amount	Unit	Milestone	Note
	4.2 Table for holding satellite	≥ 1.2 x 2 x 0.7 m. (supports 500 kg)	2	set	4	
	4.3 Chair with ESD-Safe standard		20	set	4	
	4.4 ESD-Safe Parts Storage Cabinets with Drawers		2	set	4	
	4.5 Standard Tool Storage Cupboard		2	set	4	
	4.6 Corrosive Safety Cabinet		1	set	2	
	Materials Handling Equipment					
5	5.1 ESD-Safe Stackable Super Tek-Tray	size 18"x11-3/8"x1-3/4" – 10 sets and size 22-3/4"x17-1/2"x2-1/2" – 10 sets	20 (10/size)	set	4	

No.	Lists	Specifications	Amount	Unit	Milestone	Note
	5.2 ESD-Safe Steel mobile shelving system		4	set	4	
	5.3 Two-tier stainless-steel trolley	(Wire-Shelving System 2 levels)	3	set	4	
	5.4 Mobile Instruments Cart	(Mobile Instruments Carts Optional Steel Cabinet)	5	set	4	
	5.5 Utility Carts with Pneumatic Wheel	(Utility Carts) PNEUMATIC WHEELS	3	set	4	
	5.6 Single-tier Stainless steel cart		2	set	4	
	5.7 Plastic Pallet	Plastic Pallet	5	set	4	
	5.8 Stainless steel trash bin		5	set	4	
	5.9 A-shape Aluminum ladder	Height is not less than 1100 millimeter (Ladder aluminum type A ≥ 1100mm)	1	set	4	





No.	Lists	Specifications	Amount	Unit	Milestone	Note
	5.10 A-shape Aluminum ladder	Height is not less than 2075 millimeter (Ladder aluminum type A ≥ 2075mm)	1	set	4	
	5.11 Mobile Stainless-Steel ladder	(Ladder stainless with wheels)	1	set	4	
	5.12 Anti-electrostatic Adjustable Wrist Strap	(Adjustable Wrist Strap with 6ft. Coil Cord)	20	set	4	
6	Forklift for Clean room		1	set	4	
Appendix C Hand tools equipment						
1	Screwdriver / hex wrench	(Screwdriver / hex wrench)	3	set	2	
2	Torque Wrench / Screwdriver	(Torque Wrench)	3	set	2	
3	Screwdrivers / nuts / screws	(Screwdrivers / nuts / screws)	3	set	2	
4	Socket Sets	(Socket Sets)	3	set	2	






No.	Lists	Specifications	Amount	Unit	Milestone	Note
5	Spanner sets	(Spanner sets)	3	set	2	
6	Tool cart with toolbox		1	set	2	
7	Pliers and Cutters	(Pliers and Cutters)	3	set	2	
8	Inspection/Marking up	(Inspection/Marking up)	3	set	2	
9	General tools		3	set	2	
10	Hammers	(Hammers)	3	set	2	
11	IR Thermometers	(IR Thermometers)	1	set	2	
Appendix D Security System and Electrical Supply						
1	CCTV camera	≥ 24 CH	1	set	5	
2	UPS	(120Kva,1500Kva)	2	set	4	
3	Transformer	2000 KVA	1	set	3	

WJ for an
 22/8/2019
 12