

## REQUEST FOR EXPRESSION OF INTEREST FOR PROVISION OF LABORATORY TEST SERVICE

REFERENCE NO.: CPP-PROC-UG-055-1012-C2 (RE-ADVERTISE)-20240930

China Petroleum Pipeline Engineering Co., Ltd. (hereinafter abbreviated as CPP) as Pipeline, Feederline & Above Ground Installation Contractor for the East African Crude Oil Pipeline (EACOP) Project invites experienced and reputable Contractors to express their interest in providing **laboratory test service** to the EACOP Project.

**The previous EOI of No. CPP-PROC-UG-055-1012-C2 will be replaced by the new one No. CPP-PROC-UG-055-1012-C2 (RE-ADVERTISE)-20240926.**

The EACOP Project involves the construction and operation of an underground and cross-border pipeline to transport crude oil for export to international markets. The pipeline will run from Kabaale, Hoima District in Uganda to the Chongoleani peninsula near Tanga in Tanzania. The length of the pipeline is 1,443 km, of which 296 km will be in Uganda.

### BRIEF DESCRIPTION OF THE SCOPE OF THE SERVICES:

- ♦ Laboratory test service include civil material testing, coating sampling test, welding coupon mechanical test, instrument calibration, NDT equipment & instrument calibration etc. Please find attached (Appendix 4,5,6,7,8) for more details.

### MINIMUM REQUIREMENTS:

**Companies or organizations expressing their interest are invited to document their request with:**

- Proof of business registration and business license for Uganda.
- Proof of registration with the Uganda Tax Revenue Authority.
- Proof of registration with the National Supplier Database (NSD) for Uganda.
- Compliance with the Petroleum Midstream National Content Regulation # 34,2016 for Uganda.
- Fully filled Key personnel list with CV (Appendix 1) in requested format. (Blank is regarded as an unqualified item.)
- Proof of registration with the Engineers Registration Board (ERB).
- Similar supplying experience within the last three years (Appendix 2) in the requested format.
- Copy of certificates of ISO 9001, ISO 45001, ISO 14001, ISO 17025 accreditation (Mandatory) or equivalent of them.
- Deliver the services in 2 weeks after signing the contract.
- Tax Clearance Certificate for the latest year available.

This is a complicated EOI, the participator needs to submit the dossier and Appendix 3 according to which test service you are interested.

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Companies which have the ability, capacity, and resources to implement the activities listed above should express their interest by sending together with the documents stated in the above section through an email to **biddingbox@cpptz.com** (Max. Email Size: 20 MBs, all documents must be submitted in the English language) on or before **24:00 hours East African Time (EAT), on 30<sup>th</sup> October 2024. Subject of the email should be "EOI for CPP-PROC-UG-055-1012-C2 (RE-ADVERTISE)-20240930-COMPANY NAME". ME**". CPP reserves the right **not to consider companies that submit an incorrect email subject and the incorrect format of Appendix 1, 2, 3, 4, 5, 6, 7 and 8**

The **format** of the required documents and **relevant technical requirements** which are mentioned in Minimum Requirements should be **downloaded from EACOP's website**

( <https://eacop.com/opportunities-by-main-construction-contractors/china-petroleum-pipeline-engineering-co-ltd/>).

**Note:** CPP will review and assess the documents provided by companies that have expressed interest in accordance with this EOI and conduct evaluations based on internal criteria to determine which companies will be included in the list of pre-qualified companies. Only the pre-qualified companies will receive, by signing a Non-Disclosure Agreement (NDA), an invitation to bid as a continuation of the call for tender process. CPP reserves the right at its sole discretion to make the decision to select or reject a company and maintain its decision.

2. Companies who have submitted the EOI response to REQUEST FOR EXPRESSION OF INTEREST FOR PROVISION OF LABORATORY TEST SERVICE which REFERENCE NO.: CPP-PROC-UG-055-1012-C2, continue to be valid. EOI response could be submitted again if any renewed information added.





### APPENDIX 3 Lab Equipment & Instruments Register

| S/N | Description | Picture of Sample |
|-----|-------------|-------------------|
| 1   |             |                   |
| 2   |             |                   |
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**APPENDIX 4 Civil Material Test List**

| <b>A</b> | <b>FIELD TESTING AND VISIT CHARGES</b>   | <b>Standards Requirement</b>              | <b>whether or not equipped</b> |
|----------|--|---|--------------------------------|
| 1        | Sampling freshly mixed concrete  | ASTM C 172                                |                                |
| 2        | Temperature of freshly mixed concrete  | ASTM C 1064                               |                                |
| 3        | Slump test of freshly mixed concrete   | ASTM C 143                                |                                |
| 4        | Air content of fresh concrete  | ASTM C 231                                |                                |
| 5        | Unit weight of fresh concrete  | ASTM C 231                                |                                |
| 6        | Making concrete cylinders/motor/grout specimen(Max.1 hour for                    | ASTM C-31/109                             |                                |
| 7        | Sampling of aggregate/soil   | ASTM D 75                                 |                                |
| 8        | In-situ density test,(minimum 5 test shall be charged at each visit)             | ASTM D 6938                               |                                |
| 9        | Non-productive waiting time due to client related reason                         |   |                                |
| 10       | Mobilization and De-mobilization of crew for field testing and                   |   |                                |
|          |  |   |                                |
| <b>B</b> | <b>SOIL TESTING</b>  |   |                                |
| 1        | Grading/Sieve analysis   | BS 1377-2/BS EN ISO 14688-2               |                                |
| 2        | Classification of soil   | ASTM D 2487                               |                                |
| 3        | Classification of soil   | ASTM D 3282                               |                                |
| 4        | Specific gravity of soil   | ASTM D 854                                |                                |
| 5        | Atterberg Limits   | BS 1377-2                                 |                                |
| 6        | Compaction Test - BS Heavy-4.5kg rammer method.                                  | BS 1377:Part 4:1990                       |                                |
| 7        | Chloride Content   | BS EN 1744-1                              |                                |
| 8        | Water soluble sulphate content(mg/kg)  | BS 1377-3                                 |                                |
| 9        | Organic matter content, %  | BS 1377-1 & 3                             |                                |
| 10       | Relative density by vibratory table  | ASTM D 4253/4254                          |                                |
| 11       | Effective angle of internal friction $\phi'$ and Effective Cohesion              | BS 1377-7                                 |                                |
| 12       | Dynamic Cone Penetrometer Test (In-situ CBR%)                                    | BS 1377-9                                 |                                |
| 13       | California Bearing Ratio.3 points test (CBR)                                     | BS 1377-4                                 |                                |
| 14       | Undrained shear strength of remolded material, kPa ( Effective angle of internal | BS 1377-9 (field) /BS 1377-7 (laboratory) |                                |
| 15       | Field density test by Sand Replacement Method                                    | Adopted by 3rd Party Laboratory, Refer to |                                |
| 16       | Field density test by Sand Replacement by nuclear methods                        | Adopted by 3rd Party Laboratory, Refer to |                                |
|          |  |   |                                |
| <b>C</b> | <b>CONCRETE TESTING</b>  |   |                                |
| 1        | Sampling/Making Concrete cubes   | EN 12390-1 to 8.                          |                                |
| 2        | Slump Test for Workability   | ASTM C 617                                |                                |
| 3        | Provision of a temporary Curing Tank equiped with a temperature                  | Relevant Standard                         |                                |
| 4        | Compressive strength of concrete cubes   | EN 12390-1 to 8.                          |                                |
| 5        | Compressive strength of concrete blocks  | ASTM C 140                                |                                |
| 6        | Concrete Mix design Trials(Each Concrete Class)                                  | Standard method                           |                                |
| 7        | Bitumen coating test (DFT) on burried concrete                                   | ASTM D-1005/BS 8102                       |                                |
| 8        | Schmidt Rebound Hammer test (10 point each test)                                 | ASTM C 805                                |                                |
| 9        | Temperature of fresh concrete  | EN 206                                    |                                |
| 10       | Chloride content   | EN 480-10                                 |                                |
|          |  |   |                                |
| <b>D</b> | <b>AGGREGATE TESTING ( Fine and Coarse Aggregates as found</b>                   |   |                                |
| 1        | Magnesium Sulphate Soundness, % 5 cycles   | ASTM D5240                                |                                |
| 2        | Sieve analysis/Grading   | BS EN 12620+A1                            |                                |
| 3        | Petrographic Examination   | Absence of weakness or materials that     |                                |
| 4        | Specific gravity and absorption  | ASTM C 127/128 or BS EN 1097-6 as found   |                                |
| 5        | Soundness  | ASTM C 88                                 |                                |
| 6        | Degradation  | ASTM D3744                                |                                |
| 7        | Los Angeles Abrasion, %  | ASTM C535                                 |                                |
| 8        | Flakiness and Elongation   | BS 812                                    |                                |
| 9        | Nominal Size, D50 (visual inspection by a qualified engineering                  | -   |                                |
| 10       | Water absorption test  | BS EN 1097-6                              |                                |
| 11       | Ten percent fines value (TFV) test   | BS 812-111                                |                                |
| 12       | Chloride Content.  | Available relavant BS or ASTM             |                                |
| 13       | Sulphate (Sulfate) Content   | Available relavant BS or ASTM             |                                |
| 14       | Silt, Clay and Dust Content  | Available relavant BS or ASTM             |                                |
| 15       | Organic Impurities (Fine Aggregate Only).  | Available relavant BS or ASTM             |                                |

|          |   |                           |  |
|----------|---|---------------------------|--|
|          |   |                           |  |
| <b>E</b> | <b>WATER FOR CONSTRUCTION</b>                                   |                           |  |
| 1        | All Tests in accordance with methods/requirements in BS EN 1008 | BS EN 1008                |  |
|          |   |                           |  |
| <b>F</b> | <b>GEOTEXTILE TESTING</b>                                       |                           |  |
| 1        | Tensile Strength, kN/m (MD/CMD)                                 | EN ISO 10319              |  |
| 2        | Elongation at maximum load, % (MD/CMD)                          | EN ISO 10319              |  |
| 3        | Penetration resistance, N (Static Penetration Test)             | EN ISO 12236              |  |
| 4        | Fall cone test, mm  | EN ISO 13433              |  |
| 5        | Equivalent mesh size (O90), mm                                  | EN ISO 12956              |  |
| 6        | Permeability (H50), l/m2.s                                      | EN ISO 11058              |  |
|          |   |                           |  |
| <b>G</b> | <b>STEEL REINFORCEMENT</b>                                      |                           |  |
| 1        | Characteristic Yield Strength                                   | BS EN 10080 or BS 4449+A3 |  |
|          |   |                           |  |
| <b>H</b> | <b>CEMENTIOUS AND EPOXY GROUT</b>                               |                           |  |
| 1        | Cementious grout: Compressive Strength                          | ASTM C1107/C1107M         |  |
| 2        | Epoxy Grout Compressive strength                                | ASTM C579                 |  |
| 3        | Epoxy grout: Flexural strength                                  | ASTM C580                 |  |
| 4        | Epoxy grout: Tensile strength                                   | ASTM C307                 |  |
|          |   |                           |  |
| <b>F</b> | <b>PRELIMINARIES</b>  |                           |  |
| 1        | Provision of 3 Laboratory Engineers                             |                           |  |
| 2        | Provision of Laboratory Equipment                               |                           |  |

**APPENDIX 5 Coating Sampling Test List**

|          | <b>FIELD TESTING AND VISIT CHARGES</b>           | <b>Standards Requirement</b> | <b>Whether or not equipped</b> |
|----------|--|------------------------------|--------------------------------|
| <b>A</b> | <b>PPL-Felid joint Coating</b>                   |                              |                                |
| 1        | Impact Resistance                                | ISO 21809-3                  |                                |
| 2        | Cathodic Disbondment (48 hours)                  | ISO 21809-3                  |                                |
|          |  |                              |                                |
| <b>B</b> | <b>PPL-Field joint HDPE (PE100) outer casing</b> |                              |                                |
| 1        | Melt mass flow rate (MFR)                        | ISO 1133-1                   |                                |
| 2        | Density  | ISO 1183                     |                                |
| 3        | Carbon black content                             | ISO 6964                     |                                |
| 4        | Thermal Stability (OIT)                          | ISO 11357-6                  |                                |
| 5        | Hardness   | ISO 868                      |                                |
|          |  |                              |                                |
| <b>C</b> | <b>PPL-Field joint POLYURETHANE FOAM</b>         |                              |                                |
| 1        | Foam density                                     | ISO 845                      |                                |
| 2        | Voids and bubbles                                | EN 253:2019                  |                                |
| 3        | Closed cell content                              | ISO 4590                     |                                |
| 4        | Cell size  | EN 489:2009                  |                                |



## APPENDIX 6 Welding Coupon Sampling Test List

|   | <b>Welding Coupon Mechanical Test</b> | <b>Standards Requirement</b> | <b>Whether or not equipped</b> |
|---|---------------------------------------|------------------------------|--------------------------------|
| 1 | Tensile Strength                      | ISO 6892-1-2019              |                                |
| 2 | Bending Test                          | ISO 7438:2020                |                                |
| 3 | Charpy-V Notch Impact Test            | ISO 14556:2015               |                                |
| 4 | Hardness Test                         | ASTM E18-22                  |                                |
| 5 | Marco Test                            | ASME B31.4-8                 |                                |
| 6 | EDX & SEM                             | ASTM F1375-92                |                                |
| 7 | Welding Metal tensile                 | ISO 6892-1-2019              |                                |

**APPENDIX 7 Instrument Calibration List**

| <b>SN</b> | <b>Item Description</b>                                      | <b>Discipline</b>             | <b>Reference Calibration Method</b>         | <b>Whether or not equipped</b> |
|-----------|--|-------------------------------|---|--------------------------------|
| 1         | Multi meter  | Welding/Electrical/Instrument | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0 |                                |
| 2         | CO2 Gas Gauge  | Welding                       | DKD- R 6-1                                  |                                |
| 3         | Argon Gas Gauge  | Welding                       | DKD- R 6-1                                  |                                |
| 4         | Combination Gas Gauge  | Welding                       | DKD- R 6-1                                  |                                |
| 5         | Infrared Thermometer   | Welding                       | ASTM E2847                                  |                                |
| 6         | Ampere Meter-Electrode drying box                            | Welding                       | ISO1766:2016                                |                                |
| 7         | Volt Meter -Electrode drying box                             | Welding                       | ISO1766:2016                                |                                |
| 8         | Temperature Gauge (Electrode drying box)                     | Welding                       | EURAMET CALIBRATION GUIDE 11<br>VERSION 2.0 |                                |
| 9         | Infrared Thermometer   | Welding                       | ASTM E2847                                  |                                |
| 10        | Anemometer   | Welding                       | EURAMET CALIBRATION GUIDE 25<br>VERSION 1.0 |                                |
| 11        | Welding Inspection Ruler                                     | Welding                       | ISO1766:2016                                |                                |
| 12        | Vernier caliper  | Welding                       | ISO 6906                                    |                                |
| 13        | High-Low gauge   | Welding                       | ISO6906                                     |                                |
| 14        | Digital Thermo-Hygrometer                                    | Welding/Coating               | NIST S.O.P 49                               |                                |
| 15        | Quiver   | Welding                       | ISO1766:2016                                |                                |
| 16        | Oven   | Welding                       | EURAMET CALIBRATION GUIDE 20<br>VERSION 5.0 |                                |
| 17        | Welding Parameter Recorder (High Frequency<br>Sample Device) | Welding                       | ISO1766:2016                                |                                |
| 18        | Degauss Apparatus  | Welding                       | ISO1766:2016                                |                                |
| 19        | Earth Resistance Tester                                      | Welding                       | KET/TSP/GS/01, Based on ISO16664;2017       |                                |
| 20        | Portable Gas Detector  | Welding                       | KET/TSP/GS/01, Based on ISO16664;2018       |                                |
| 21        | Tensometer for weld stress crack resistance test<br>(Lab)    | Welding                       | ISO1766:2016                                |                                |
| 22        | Auto Level (level gauge)                                     | Survey                        | ISO17123:2012                               |                                |
| 23        | Theodolite   | Survey                        | ISO17123:2013                               |                                |
| 24        | GPS  | Survey                        | ISO17123:2014                               |                                |
| 25        | Total Station  | Survey                        | ISO17123:2015                               |                                |
| 26        | Dew Point Meter  | Coating/Hydro- test           | NIST S.O.P 49                               |                                |
| 27        | Profile Gauge  | Coating                       | ASTM D7091                                  |                                |
| 28        | Temperature & Humidity Meter                                 | Coating                       | NIST S.O.P 49                               |                                |
| 29        | Coating Thickness Gauge (DFT Gauge)                          | Coating                       | ASTM D7091                                  |                                |
| 30        | Pressure Gauge (Includes Pressure Gauge on<br>the Equipment) | Coating/Hydro- test           | DKD- R 6-1                                  |                                |
| 31        | Pressure Relief Valve  | Coating/Hydro- test           | DKD- R 6-1                                  |                                |

|    |  |               |   |  |
|----|--|---------------|---|--|
| 32 | Needle Pressure Gauge                            | Coating       | DKD- R 6-1  |  |
| 33 | Air Compressor                                   | Coating       | DKD- R 6-1  |  |
| 34 | Orifice Gauge                                    | Coating       | Manufacturer Instructions based on ISO4518 requirements |  |
| 35 | Breath Box                                       | Coating       | -   |  |
| 36 | Contact Pyrometer                                | Coating       | ASTME2847   |  |
| 37 | Holiday Detect Device                            | Coating       | ASTMG62-14  |  |
| 38 | Voltmeter for setting holiday voltage.           | Coating       | EURAMET CALIBRATION GUIDE 15 VERSION 3.0                |  |
| 39 | Salt Contaminant Measure Device                  | Coating       | ISO 8502-6/9  |  |
| 40 | Cross Cut Equipment                              | Coating       | ISO2409   |  |
| 41 | Hydraulic Adhesion Test Equipment                | Coating       | DKD- R 6-1  |  |
| 42 | Abrasive conductivity meter                      | Coating       | ASTM D4940-98   |  |
| 43 | Dial thickness gauge for testex                  | Coating       | ASTM D7091  |  |
| 44 | Durometer  | Coating       | ASTM D2240  |  |
| 45 | Balance for ratio check.                         | Coating       | EURAMET CALIBRATION GUIDE 18 V4.0                       |  |
| 46 | Weight for impact test                           | Coating       | OIML R111   |  |
| 47 | Cathodic Disbondment test equipment              | Coating (Lab) | Manufacturer Instructions based on ASTMA775             |  |
| 48 | DSC for glass transition and oxidation induction | Coating (Lab) | Manufacturer Instructions based on ISO11357:1999        |  |
| 49 | Temperature sensors for polyol and iso.          | Coating       | EURAMET CALIBRATION GUIDE 11 VERSION 2.0                |  |
| 50 | Balance for mix ratio.                           | Coating       | EURAMET CALIBRATION GUIDE 18 V4.0                       |  |
| 51 | PUF flow meter.                                  | Coating       | ISO 12242:2021  |  |
| 52 | Pycnometer for closed cell content.              | Coating (Lab) | Manufacturer Instructions based on ISO4518 requirements |  |
| 53 | Heat flow meter for thermal conductivity.        | Coating (Lab) | ISO 12242:2021  |  |
| 54 | Compressive strength load cell                   | Coating (Lab) | ASTM E4   |  |
| 55 | Torque wrench for HDPE welding bands.            | Coating       | EN ISO6789:2017   |  |
| 56 | Cell size measuring equipment                    | Coating       | Manufacturer Instructions based on ISO4518 requirements |  |
| 57 | Thermocouples used for FJ testing                | Coating       | EURAMET CALIBRATION GUIDE 8 V3.0                        |  |
| 58 | Dead Weight Tester                               | Hydro-test    | EURAMET CALIBRATION GUIDE 3                             |  |
| 59 | Pressure Chart Recorder                          | Hydro-test    | DKD- R 6-1  |  |
| 60 | Temperature Chart Recorder                       | Hydro-test    | EURAMET CALIBRATION GUIDE 11 VERSION 2.0                |  |
| 61 | Flow Meter                                       | Hydro-test    | ISO 12242:2021  |  |
| 62 | Displacement Meter                               | Hydro-test    | ASTM D4940-98   |  |
| 63 | Hydraulic Pump                                   | Hydro-test    | DKD- R 6-1  |  |
| 64 | Digital Insulation Tester                        | CP            | ASTM D2865-01   |  |

|    |  |                |  |  |
|----|--|----------------|--|--|
| 65 | Decade Resistance Box                        | CP             | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 66 | Cable Locator (RD)                           | CP             | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 67 | Digital Earth Tester                         | CP             | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 68 | Pipeline Current Mapper                      | CP             | Manufacturer instructions based on ASTM<br>standard            |  |
| 69 | Micrometer Caliper                           | Mechanical     | ISO6906  |  |
| 70 | Auto Angel Meter                             | Mechanical     | Manufacturer instructions based on ASTM<br>D5725-99            |  |
| 71 | Audi Gauge                                   | Mechanical     | Manufacturer instructions based on ASTM<br>standard            |  |
| 72 | Torque Wrench                                | Mechanical     | EN ISO6789:2017  |  |
| 73 | Hydraulic Torque Wrench                      | Mechanical     | EN ISO6789:2018  |  |
| 74 | Megohm meter                                 | Electrical     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 75 | GND- Resistance Tester                       | Electrical     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 76 | DC Leakage Tester                            | Electrical     | ASM-D257   |  |
| 77 | Transformer DC Resistance Tester             | Electrical     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 78 | AC Withstand Voltage Tester                  | Electrical     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 79 | Megger                                       | Instrument     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 80 | Earthing Megger                              | Instrument     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 81 | The fluke 744 Documenting Process Calibrator | Instrument     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.1                    |  |
| 82 | Digital Pressure Gauge                       | Instrument     | DKD- R 6-1   |  |
| 83 | Milliamp Process Clamp Meter                 | Instrument     | EURAMET CALIBRATION GUIDE 15<br>VERSION 3.0                    |  |
| 84 | Pressure Comparator                          | Instrument     | DKD- R 6-1   |  |
| 85 | Pressure Transmitter                         | Instrument     | DKD- R 6-1   |  |
| 86 | Temperature Gauge                            | Instrument     | EURAMET CALIBRATION GUIDE 11<br>VERSION 2.0                    |  |
| 87 | Temperature Transmitter                      | Instrument     | EURAMET CALIBRATION GUIDE 11<br>VERSION 2.0                    |  |
| 88 | LEL Gas Detector                             | Instrument     | KET/TSP/GS/01, Based on ISO16664;2017                          |  |
| 89 | Optical Time Domain Reflectometer (OTDR)     | Communication  | Manufacturer Instruction based on<br>ISO/IEC14763-3:2014 Part3 |  |
| 90 | FOC Fusion Splice Machine                    | Communication  | US6294760B1  |  |
| 91 | Optical Power Meter                          | Communication  | IEC61315   |  |
| 92 | O2 Gas Detector                              | Pre-Commission | KET/TSP/GS/01, Based on ISO16664;2017                          |  |
| 93 | Combustible Gas Detector                     | Pre-Commission | KET/TSP/GS/01, Based on ISO16664;2018                          |  |
| 94 | H2S Gas Detector                             | Pre-Commission | KET/TSP/GS/01, Based on ISO16664;2019                          |  |

**APPENDIX 8 NDT equipment & instrument calibration List**

|    | <b>NDT equipment &amp; instrument calibration List</b> | <b>Whether or not equipped</b> |
|----|--|--------------------------------|
| 1  | Ultrasonic Testing Instrument                          |                                |
| 2  | High-frequency Directional X-RAY Machine               |                                |
| 3  | Directional X-RAY Machine                              |                                |
| 4  | Circumferential X-RAY Machine                          |                                |
| 5  | X-RAY Crawler  |                                |
| 6  | X-RAY Crawler Head                                     |                                |
| 7  | Film Viewer  |                                |
| 8  | Density Meter  |                                |
| 9  | Magnetic Particle Testing Equipment                    |                                |
| 10 | Magnetometer   |                                |
| 11 | Magnetic Field Indicator                               |                                |
| 12 | Illuminance Meter                                      |                                |
| 13 | Film Scan  |                                |
| 14 | PAUT+TOFD Equipment                                    |                                |
| 15 | Film Developer   |                                |
| 16 | Basic Radiation Safety Instrument                      |                                |
| 17 | TOFD detector  |                                |