PETROBRAS	TECHNICAL SPECIFICATION	Nº: I-ET-3010.00-1200-970-P4X-003	
	CLIENT: SRGE	SHEET: 1 of 16	
	PROGRAM: ALL		
	AREA: ALL		
SRGE	TITLE: REQUIREMENTS FOR PERSONNEL QUALIFICATION AND CERTIFICATION	SRGE/ESUP/EICOM	
		INTERNAL	

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SUMMARY

1 SCOPE

This technical specification establishes required conditions for Personnel Qualification and Certification, as well as the requirements for Inspection Process Supervision.

The requirements herein listed are applicable to all levels of fabrication, construction and assembly of all equipment, piping, pipeline and structures within the contractual scope of work, including subcontractors and suppliers.

The requirements herein listed are applicable to all players performing such related activities within the scope of this Unit, including manufacturers, packagers, main contractor, subcontractors, suppliers, sub suppliers, integrators, constructors, and all technical personnel involved. Within the scope of this document, they are all referred to as being a SELLER.

NOTE: The qualification of procedures shall be in accordance with design code, applicable standards and technical specifications, such as:

- I-ET-3010.00-1200-970-P4X-004 REQUIREMENTS FOR NON-DESTRUCTIVE TESTING
- I-ET-3010.00-1200-955-P4X-001 WELDING
- I-ET-3010.00-1200-200-P4X-115 REQUIREMENTS FOR PIPING FABRICATION ASSEMBLY INSPECTION AND COMMISSIONING
- I-ET-3010.00-1200-956-P4X-002 PAINTING
- I-ET-3010.00-1200-200-P4X-003 DESIGN, CONSTRUCTION AND ASSEMBLY OF FRP PIPING.

2 NORMATIVE REFERENCES AND DESIGN SPECIFICATIONS

The latest editions of the following codes and standards shall be used as general rule.

- ABNT NBR 14842 Soldagem - Critérios para a Qualificação e Certificação de Inspetores para o setor de Petróleo e Gás, Petroquímico, Fertilizantes, Naval e Termogeração (exceto nuclear)
- ABNT NBR 15218 - Critérios para qualificação e certificação de inspetores de pintura industrial
- ABNT NBR 16278 - Inspeção de fabricação - Qualificação e Certificação de Pessoas para o setor de Petróleo e Gás
- ABNT NBR 16378 - Critérios para qualificação e certificação de pintores industriais, jatistas e hidrojatistas
- ANSI/ASNT CP-189 - Qualification and Certification of Nondestructive Testing Personnel
- ASME Boiler and Pressure Vessel Code
- ASME B31.3 – Process Piping
- ASNT SNT-TC-1A – Recommended Practice: Personnel Qualification and Certification in Nondestructive Testing

- ASTM D4228 - Standard Practice for Qualification of Coating Applicators for Application of Coatings to Steel Surfaces
- AWS B5.1 – Specification for the Qualification of Welding Inspectors
- AWS D1.1 – Structural Welding Code — Steel
- AWS QC1 – Specification for AWS Certification of Welding Inspectors
- CSA W178.2-01 – Certification of Welding Inspectors
- CSWIP WI-6-92 - Requirements for the Certification of Visual Welding Inspectors Welding Inspectors and Senior Welding Inspectors (fusion welding) in accordance with the requirements of BS EN ISO 17637:2016
- IECEx OD 504 - Scheme for Certification of Personnel Competence for Explosive Atmospheres – Specification for Units of Competence Assessment
- IRAM-IAS U500-169 - Inspector de Soldadura
- ISO 2178 - Non-Magnetic Coatings on Magnetic Substrates - Measurement of Coating Thickness - Magnetic Method
- ISO 9223 - Corrosion of metals and alloys – Corrosivity of atmospheres – Classification, determination and estimation
- ISO 9712 - Non-Destructive Testing - Qualification and Certification of NDT Personnel
- ISO 12690 - Metallic and other inorganic coatings - Thermal spray coordination - Tasks and responsibilities
- ISO 14918 - Thermal spraying - Qualification testing of thermal sprayers
- ISO 17020 - Conformity assessment - Requirements for the operation of various types of bodies performing inspection
- ISO 17024 - Conformity assessment - General requirements for bodies operating certification of persons
- I-ET-3010.00-1200-955-P4X-001 WELDING
- I-ET-3010.00-1200-956-P4X-002 PAINTING
- I-ET-3010.00-1200-200-P4X-003 DESIGN, CONSTRUCTION AND ASSEMBLY OF FRP PIPING
- I-ET-3010.00-1200-970-P4X-004 NON-DESTRUCTIVE TESTING REQUIREMENTS FOR METALLIC AND NON-METALLIC MATERIALS
- I-ET-3010.00-1200-972-P4X-006 REQUIREMENTS FOR MANUFACTURING SURVEY INSPECTION
- I-ET-3010.00-1200-200-P4X-115 REQUIREMENTS FOR PIPING FABRICATION ASSEMBLY INSPECTION AND COMMISSIONING

3 ABBREVIATIONS

ABNT	Associação Brasileira de Normas Técnicas
ASNT	American Society for Nondestructive Testing
ACCP	ASNT Central Certification Program
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
AWS	American Welding Society
BINDT	British Institute of Non-Destructive Testing
CSA	Canadian Standards Association
CSW	Canadian Welding Bureau
CSWIP	Certification Scheme for Weldment Inspection Personnel
EFNDT	European Federation for NDT
FIRJAN	Federação das Indústrias do Estado do Rio de Janeiro
FROSIO	Faglig Råd for Opplæring og Sertifisering av Inspektører innen Overflatebehandling
FRP	Fiber Reinforced Glass (or GRP)
GRP	Glass Reinforced Plastic
IAF	International Accreditation Forum
ICNDT	The International Committee for Non-Destructive Testing
ICORR	Institute of Corrosion
IRAM	Instituto Argentino de Normalización y Certificación
ISA	International Society of Automation
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
NCCER	National Center for Construction, Education and Research
NDT	Non Destructive Testing
PWHT	Post Weld Heat Treatment
RT	Radiographic Testing
SENAI	Serviço Nacional de Aprendizagem Industrial
SSPC	Society for Protective Coatings
TSA	Thermally Sprayed Aluminum

VT Visual Testing

4 GENERAL REQUIREMENTS

The following services require qualification and/or certification of personnel competencies:

a) Welding

b) Non-destructive Testing

c) Industrial Painting

d) Thermal Spray

e) Inspection of Instrumentation / Electrical and Automation Systems

f) Manufacturing Survey Inspection

g) Inspection of equipment, systems and installations in explosive atmospheres

h) Thermal Insulation

i) FRP

The qualification and certification details for each activity is detailed on the following sections.

5 WELDING

5.1 WELDERS

5.1.1 Qualification

Tack welders, welders and welding operators shall be qualified before the commencement of work. Their qualifications shall be based on the applicable qualification standard as per the design code used (for example ASME BPVC Section IX for welding pressure vessel designed as per ASME BPVC Section VIII, process piping designed as per ASME B31.3, AWS D1.1 for metallic structures and so on). Tack welders, welders and welding operators' qualification shall also attend the Classification Society (CS) rules.

Qualifications of tack welders, welders and welding operators on production welds is not acceptable.

Tack welders, welders and welding operators' qualification validity shall be according to the standard used for qualification.

Additionally, qualification of welders and welding operators for duplex and superduplex stainless steel shall comply with requirements described in table 1.

Table 1: Welders and welding operators tests for duplex and superduplex stainless steel.

Test	Extent	Acceptance Criteria
VT	100% of Welds	Qualification Standard
RT	100% of Butt Welds	Qualification Standard
Bend Testing	2 Face + 2 Root Bend or 4 Side Bends	Qualification Standard

5.1.2 Performance of Welder and Welding Operator

Welders and welding operators that are not in activity for a period longer than 90 days shall be considered disqualified. Welders and welding operator that have had none of its weld examined and approved by RT or UT within a 90 day period shall be considered as disqualified as well.

Welders and welding operators' performance shall be constantly monitored, and a Welder Performance Report shall be issued bi-weekly. The maximum repair rate shall be limited to 2.5%, measured in defective length **per total length inspected** within 15 consecutive days. Repair rates above the maximum permitted shall disqualify the welders.

Welders and welding operators that were disqualified shall be retrained and requalified before they can start production welding again.

5.2 WELDING INSPECTORS

Welding inspection shall always be performed by certified personnel.

For services rendered in Brazil, Welding Inspectors shall be certified according to standard ABNT NBR 14842, which is considered the reference system of Welding Inspector certification. The Welding Inspector IS-N2 shall be qualified in the main applicable standard.

For services rendered abroad, the certification of Welding Inspectors shall be issued by organizations that comply with the requirements of ISO 17024. Welding Engineers and Certified Welding Inspectors certified by recognized organizations may be accepted as a substitute for the certified personnel mentioned above only when approved by BUYER representative.

Table 2 presents the equivalence between Certification Systems of Welding Inspectors Level 1, Level 2 and Level 3, followed by main assignments.

Table 2: Equivalence between Welding Inspection Certification Systems.

Certification System	Standard	Reference Levels		
		Level 1	Level 2	Level 3
ABENDI	ISO 9712	Exame Visual - Solda EV-N2-S	-	-
FBTS	ABNT NBR 14842	Inspetor de Soldagem Nível 1 IS-N1	Inspetor de Soldagem Nível 1 IS-N1	Inspetor de Soldagem Nível 2 IS-N2
IRAM (IAS)	IRAM-IAS U500-169	See Note 1	Inspector de Soldadura Nivel II	Inspector de Soldadura Nivel III
CWB	CSA W178.2-01	WI-L1 Welding Inspector Level 1	WI-L2 Welding Inspector Level 2	WI-L3 Welding Inspector Level 3
CSWIP (TWI)	CSWIP -WI-6-92	Visual Welding Inspector (Level 1)	Welding Inspector (Level 2)	Senior Welding Inspector (Level 3)
AWS	AWS QC1 AWS B5.1	CAWI Certified Associate Welding Inspector	CWI Certified Welding Inspector	SCWI Senior Certified Welding Inspector
IIW/EWF	IAB-252r5-19/SV-01	International Welding Practitioner (IWP)	International Welding Specialist (IWS)	International Welding Technologist (IWT) or International Welding Engineer (IWE)
IIW/EWF	IAB-041r4-16	Basic (IWI B)	Basic (IWI B)	Standard (IWI S) or Comprehensive (IWI C)
PCN	PCN WI	Weld Inspector Level 1	Weld Inspector Level 2	Weld Inspector Level 3
Note 1: Welding Inspector Level I Certification is not accepted for visual inspection of welding purposes.				

5.3 ASSIGNMENTS AND COMPETENCES OF REFERENCE LEVELS

The main obligations for each reference level are listed as follows, but not limited to this list. Welding Inspector shall proceed according to assignments stated in the standard of his certification.

5.3.1 Reference Level 1

Execution of visual and dimensional inspection of joint preparation and finished welded joints with further evaluation of testing results according to the acceptance criteria.

Issue welding inspection reports.

5.3.2 Reference Level 2

Typically ground floor inspector, who shall take part in following activities:

- Qualification of welding procedures: witness execution of welding, checking test pieces, NDT extension and results, qualification of NDT procedure and inspectors.
- Qualification of welders and weld operators: check validity of qualification and suitability to the service.

- Base metals: check identification, traceability and compliance with design.
- Weld consumables: check identification, traceability, compliance with design, storage, handling, drying and maintenance after re-drying.
- Welding equipment: check safety, preservation and calibration.
- Prior welding: check availability of procedures and instructions to the welders/weld operator, adjustment, dimension, preparation and preheating of joints are in compliance with procedures, instruction and drawing.
- During welding: check the execution according to procedure and instruction, such as sequence of welding, cleaning, deformation control, interpass temperature and other welding parameters.
- After welding: check if post heating is required and in compliance with the welding procedures, perform visual examination and dimensional control.
- NDT: check approval of procedure, personnel qualification and monitor the results for improvement of welding process.
- Perform hardness measurement with portable instrument.
- PWHT: check NDT approval prior heat treatment, execution according to procedure and instructions, such as placement of thermocouple, position inside furnace or electrical resistances, calibration of instruments and NDT required after heat treatment.
- Weld repair: check marking of repair in accordance with results of inspection and method of execution is according to procedure and instruction.
- Follow preparation and execution of production tests.
- Issue welding inspection records, control performance of welder/weld operator and report non-conformities.

5.3.3 Reference Level 3

Typically, management of technical requirements, documentation, supervision and welding activities, who shall take part in following activities:

- Coordination of Welding Inspectors Reference Level 1 and Level 2.
- Interpretation and implementation of technical requirements.
- Qualification of welding procedures: follow execution of welding, check preparation of specimens, witness and assess required tests.
- Base Metal: check material certificate against technical specification.
- Welding Consumable: specify welding consumable according to project requirements and check material certificate against technical specification.

- Welding: check if welding instruction are in compliance with technical requirements, such as dimensions, adjustments, joint preparation, pre-heating, interpass temperature, post-heating, visual and dimensional of finished welds and assess production test results.
- NDT: check if it was performed by qualified personnel, according to approved procedure, in required extension and monitor the results for improvement of welding process.
- PWHT: check if it is according to technical requirements.
- Weld Repair: check compliance with technical requirements.
- Production Test: plan the execution, amount and stage of fabrication.
- Elaborate instructions for execution and inspection of welding and list of qualified welder/weld operator.

All welding documents shall be issued and signed by the Welding Inspector Level 3, including:

- Welders Qualification Certificates
- Welding Procedure Specifications (WPS)
- Procedure Qualification Records (PQR)
- Bi-weekly Welders Performance Reports
- Weld and Inspection Maps

Welding procedures shall be qualified by the Welding Inspector Level 3 before the beginning of activities.

5.4 SUPERVISION OF WELDING ACTIVITIES

SELLER shall perform regular supervision of all welding activities on all Construction, Assembly and Erection sites, typically shipyards.

These supervisions shall be performed and recorded by Welding Inspector Level 3.

Supervision activities shall be planned and included in the Quality Plan specific for the contract.

Welding Inspectors Level 3 may work in more than one job site under the scope of contract.

Welding Inspectors Level 1 and Level 2 shall be resident to each and every job site, where welding activities are performed under the scope of contract.

6 NON-DESTRUCTIVE TESTING

6.1 NDT INSPECTORS

The following NDT inspector certification systems are acceptable:

a) NDT inspectors certified by certification bodies that operate in accordance with ISO 9712 for applicable methods. Certification body shall be accredited according to ISO 17024.

b) NDT inspectors certified by certification bodies that operate in accordance with ISO 9712 for applicable methods. Certification bodies recognized by ICNDT or EFNDT MRA (Mutual Recognition Agreement).
NOTE 1: ICNDT website www.efndt.org/Members
NOTE 2: EFNDT website www.icndt.org.

c) NDT inspectors certified by ASNT ACCP program.

NOTE: Self-certification programs, such as ASNT SNT TC-1A or ANSI/ASNT CP-189, are not acceptable.

As a general rule, NDT inspectors shall be certified for the following methods:

- Visual Examination (VT)
- Liquid Penetrant (PT)
- Magnetic Particles (MT)
- Radiography (RT)
- Ultrasonic (UT)
- Eddy Current (ET)

6.2 SUPERVISION OF NDT ACTIVITIES

SELLER shall perform regular supervision of all NDT activities on all Construction, Assembly and Erection sites, typically shipyards.

These supervision activities shall be performed and recorded by Level 3 NDT Inspectors.

Supervision activities shall be planned and shall be included in the Quality Plan specific for the contract.

Level 3 NDT Inspector may work in more than one job site under the scope of contract.

6.3 OTHER NDT METHODS

The methods for which no system of certification is available, such as listed below, competence requirements are stated as follows:

- Hardness Testing (HT)
- Positive Material Identification (PMI)
- Ferrite Testing (FT)
- Dimensional Control (DC)
- Leak (Tightness) Testing (LT)

The inspectors that will perform these testing shall be qualified by the SELLER.

Inspectors who perform testing mentioned above must have knowledge about operation of the instruments and apparatus required, test method being applied and applicable procedures. The SELLER is responsible to assure that all inspectors performing these testing are trained and qualified in accordance with the applicable testing procedure.

Qualifications of the inspector who perform the testing, including training and experience, shall be documented and available for review by the BUYER representative.

The inspector's qualification is specific for a given test procedure and a given test apparatus. Inspector's requalification is required in case of any alteration in the test procedure or in the apparatus.

Inspector’s knowledge and competence shall be demonstrated to BUYER representative when requested, as follows: qualified inspector shall be capable of performing all the operations detailed in the procedure and further assessment of results successfully. The inspector must proceed 10 measurements or samples of materials, depending on the NDT method, chosen among those covered by testing procedure.

7 INDUSTRIAL PAINTING

The Painting Applicator Organization shall comply with requirements of SSPC QP 01 and SSPC QP 03, as applicable. The certification as per this standard is recommended.

7.1 PAINTERS, BLASTERS AND HYDROBLASTERS

Industrial painters, blasters and hydroblasters shall be trained and qualified before commencing of work under the supervision of a Certified Level 2 Painting Inspector. Training and qualifying methodology shall follow SSPC QP 01; SSPC QP 03 and ASTM D4228 requirements, as applicable.

- Blasters, Hydroblasters and Spray painters shall be qualified per the Contractor’s quality control Procedures using ASTM D4228 test panel.
- Power tooling surface preparators, Brush and Roller painters shall demonstrate proficiency and ability in executing their routine tasks (as surface preparation and paint application in touch-up and repair areas). A test panel shall be elaborated for personnel qualification simulating typical services (consider, at least, scallops and flat area spot repair).

For services rendered in Brazil painters, blasters and hydroblasters qualified and certified according to the criteria established in ABNT NBR 16378 are considered acceptable.

The SSPC and NACE certification programs are considered acceptable for industrial painters and blasters for services rendered in Brazil and abroad.

Others certification programs provided by independent entities shall be submitted to BUYER approval.

SELLER shall notify in advance the qualification testing schedule to allow BUYER to witness the testing.

Painters, blasters and hydroblasters that are not in activity for a period longer than 90 days shall be considered disqualified.

7.2 PAINTING INSPECTORS

For industrial painting inspection activities, the certification of personnel shall be in accordance with reference system ABNT NBR 15218, as reference system, or equivalent established in 7.3.

7.3 PAINTING INSPECTOR CERTIFICATION EQUIVALENCE

All situations listed in table 3 are considered as equivalent for industrial paint inspector's certification.

Table 3: Equivalence for Industrial Painting Inspector.

Reference	Equivalence Certification Levels					
ABNT NBR 15218	ABRACO	NACE	CSWIP – British Gas BGAS/ER1	SSPC	FROSIO	ICORR
Inspector Level 1	Inspector Level 1	NACE Certified Coating Inspector Level 2	Painting Inspector Grade 2	Protective Coating Inspector Level 2	Frosio Inspector Level 2	ICORR Level 2 Coating Inspector
Inspector Level 2	Inspector Level 2	NACE Certified Coating Inspector Level 3	Painting Inspector Grade 1	Protective Coating Inspector Level 3	Frosio Inspector Level 3	ICORR Level 3 Coating Inspector

7.4 SUPERVISION OF PAINTING ACTIVITIES

SELLER shall perform regular supervision of all painting activities on all sites.

These supervision activities shall be performed by ABNT NBR 15218 Painting Inspector Level 2.

Supervision activities shall be planned and shall be included in the Quality Plan specific for the contract.

Painting Inspector Level 2 may work in more than one job site under the scope of contract.

Painting Inspector Level 1 shall be resident to the specific job sites under the scope of contract.

8 THERMAL SPRAY ALLUMINUM COATING

The TSA Applicator shall comply with requirements of SSPC QP 06. The certification as per this standard is recommended.

The TSA Applicator shall be evaluated by SELLER, considering all technical requirements of the project, prior to the beginning of the job. The result of this evaluation, including all actions required to be implemented by the TSA Applicator shall be presented to BUYER.

8.1 INSPECTION AND SUPERVISION ACTIVITIES

A Painting Inspector Level 1, or equivalent, according to section 7, shall perform the quality control, supervision of coating activities, inspection and testing during application of TSA coating.

A Painting Inspector Level 2, or equivalent, according to section 7, shall issue the quality plan and perform preparation and qualification of procedure.

SSPC thermal spray inspector, denominated THERMAL INSP, is acceptable as inspector of TSA coating.

Qualification program provided by SENAI for thermal spray anti-corrosive coatings inspector (*Inspetor de Revestimento Anticorrosivo por Aspersão Térmica*) is also acceptable.

Tasks and responsibilities of supervising and coordinating thermal spraying activities shall follow the principles of ISO 12690.

8.2 THERMAL SPRAYER

The Thermal Sprayers shall be qualified according to ISO 14918. The qualification body required in ISO 14918 shall be an independent third-party organization.

9 INSTRUMENTATION, ELECTRICAL AND AUTOMATION SYSTEMS

To perform the inspection and testing during construction, assembly, pre-commissioning and commissioning of instruments, electrical and associated automation systems, professionals shall be certified by independent international entities that meet requirements of standard ISO 17024.

Although certifications issued by ISA and NCCER are not strictly in accordance with ISO 17024, its qualification is considered acceptable within their approximate correspondence. Table 4 present the equivalence between certification systems. The exact activities that each inspector may perform are only those detailed in their qualification standards.

Table 4: Equivalence Table for Process Automation Systems Inspector.

Activities	Certification entity		
	SISTEMA FIRJAN	ISA	NCCER
Construction & assembly	Inspetor de Armazenamento e Instalação de Processos	CCST Level I	Instrumentation Construction and Maintenance
Pre-commissioning and commissioning	Inspetor de Comissionamento	CCST Levels II and III, ISA CAP	Not applicable

10 MANUFACTURING SURVEY INSPECTION

Services rendered in Brazil, Manufacturing Survey Inspector shall be certified according to ABNT NBR 16278 in the modalities described therein, which is considered the reference system of Manufacturing Inspector certification.

The Manufacturing Inspector, or Survey Inspector, is responsible to assure the conformity of the equipment with technical contractual requirements at fabricator facilities and release it after successful inspection, in accordance with I-ET-3010.00-1200-972-P4X-006.

All and every equipment being acquired by the SELLER within the contracted scope of work must be released from its supplier only if dully inspected and approved by a certified Manufacturing Inspector.

10.1 CERTIFICATION EQUIVALENCE

API Source Inspector certification is considered equivalent to ABNT NBR 16278, with respect to responsibilities stated in respective certification program.

Other certifications of manufacturing inspector, since ruled by an independent body and examination of specific knowledge and experience are required, shall be subject to BUYER for approval.

10.2 MANUFACTURING INSPECTION ALTERNATIVES

As an option of personnel certification, SELLER may hire an INSPECTION BODY, which shall have its competence recognized through one of the options below:

a) Accreditation in **Manufacturing Inspection** activity in accordance with ISO/IEC 17020 Type A.

b) Member of International Association of Classification Societies (IACS).

Additionally, and regardless of inspection body competence above, evidence of experience and knowledge of Manufacturing Inspector are subjected to BUYER approval.

11 EQUIPMENT AND INSTALLATIONS IN EXPLOSIVE ATMOSPHERES

Professionals performing the visual, accurate or detailed inspection in explosive atmospheres shall be certified according to Personnel Competence Certification Units "Ex", based on IECEx Operational Document OD 504. The acceptable certified entities are presented at Table 5.

Table 5: Certified Competencies - Equivalence Table for explosive atmospheres.

Personal Competence Certification Systems in Explosive Atmospheres		
IECEx OD 504	FIRJAN/SENAI-RJ MC-0001	Abendi NA-017
UNIT Ex 007 - Performing visual and accurate inspections of equipment and installations in or associated with explosive atmospheres.	Unit Ex 007 - Performing visual and accurate inspections of equipment and installations in hazardous areas.	Unit Ex 007 - Performing visual and accurate inspections of equipment and installations in or associated with explosive atmospheres
UNIT Ex 008 - Performing detailed inspections of equipment and installations in or associated with explosive atmospheres.	Unit Ex 008 - Performing detailed inspections of equipment and installations in hazardous areas.	Unit Ex 008 - Performing detailed inspections of equipment and installations in or associated with explosive atmospheres

12 THERMAL INSULATION

SELLER shall qualify at the Job, before the beginning of activities, procedures for the application of thermal insulation systems.

All people performing and inspecting these activities shall be properly trained before commencing work. Training shall contemplate theoretical and practical activities. Proper training records shall be made available to BUYER representatives.

13 FIBER REINFORCED GLASS

SELLER shall qualify fitters/bonders, supervisors and inspectors according to I-ET-3010.00-1200-200-P4X-003.