



Badrakh Energy LLC
Zuuvch-Ovoo Uranium Project
H376521

Specification
Mechanical Engineering
Mechanical Specification for Insulation and Cladding

Mechanical Specification for Insulation and Cladding

H376521-8000-240-242-0003

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1. Introduction

1.1 Scope

- 1.1.1 This specification describes the design, material specification, and method of application requirements for thermal insulation, including both heat conservation and personnel protection, and Acoustic Control Insulation to be used on equipment for the Zuuvch-Ovoo Uranium Project.

1.2 Definitions

- 1.2.1 The following definitions are used in this document:

Table 1-1: List of Definitions

Term	Description
Client	Badrakh Energy LLC, its authorised representatives and respective affiliates
Client's Representative	Hatch
Vendor/Tenderer	Individual or company that submits a proposal or bid in response to an RFQ, aiming to supply goods or services to a client

2. Codes, Standards and Reference Documentation

2.1 International and National Codes and Standards

Insulation systems shall conform to the requirements of the Statutory Authorities and the relevant sections of the latest edition of the applicable Codes, Standards and Specifications including:

2.1.1 *EN Standards*

Table 2-1: Applicable EN Standards

Standard Number	Standard Title
EN 13472	Thermal insulating products for building equipment and industrial installations
EN 14303	Thermal insulation products for building equipment and industrial installations. Factory made mineral wool (MW) products
EN 13162	Thermal insulation products for buildings. Factory made mineral wool (MW) products
EN 12241	Thermal insulation for building equipment and industrial installations – Calculation rules

2.1.2 *ASTM Standards*

Table 2-2: Applicable ASTM Standards

Standard Number	Standard Title
ASTM A167	Standard specification for stainless steel and heat resisting chromium – Nickel steel plate, strip and sheet
ASTM A313	Standard specification for stainless steel spring wire

Standard Number	Standard Title
ASTM A480	Standard specification for general requirements for flat-rolled stainless and heat-resisting steel plate, sheet, and strip
ASTM A580	Standard specification for stainless steel wire
ASTM C390	Standard criteria for sampling and acceptance of preformed thermal insulation lots
ASTM C547	Standard specification for mineral fibre preformed pipe insulation
ASTM C552	Standard Specification for Cellular Glass Thermal Insulation
ASTM C553	Standard specification for mineral fibre blanket thermal insulation for commercial and industrial applications
ASTM C585	Standard practice for inner and outer diameters of thermal insulation for nominal sizes of pipe and tubing
ASTM C592	Standard specification for mineral fibre blanket insulation and blanket-type pipe insulation (Metal-mesh covered) (Industrial type)
ASTM C612	Standard specification for mineral fibre block and board thermal insulation
ASTM E84	Standard test method for surface burning characteristics of building materials
ASTM C795	Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
STP 880	Corrosion of Metals under Thermal Insulation
NACE RP0198	The control of Corrosion Under Thermal Insulation and Fireproofing Materials
NFPA 225	National Fire Protection Agency Model Manufactured Home Installation Standard

2.1.3 Chinese Standards

Equivalent Chinese standards may be offered and must be approved by the Client's Representative.

2.2 Units

SI units shall be used in all datasheets, drawings and other documentations.

2.3 Project Documentation

Table 2-3: Applicable Project Reference Documentation

Document Number	Description
H376512-8000-240-242-0002	Painting and Protective Coatings Specification
H376512-8000-240-242-0001	Standard Mechanical Specification for Packaged Equipment
H376512-8000-250-242-0002	Piping Insulation and Tracing Specification
H376512-8000-200-242-0001	Site Climatic Conditions

3. General Requirements

3.1.1 The insulation systems specified herein are designed for:

- Heat conservation (hot and cold) – To reduce heat gain or loss to the process and to maintain temperatures for efficient operation of the process
- Personnel Protection from hot surfaces – Insulation or guard mesh shall be provided if the normal operating temperature is above 65°C
- Minimising heat gain during fire conditions or fireproofing – Purpose is to reduce the heat input and secure the temperature on equipment below the critical temperature when exposed to a specific fire scenario for the actual area of installation as required to meet the Project Specification
- Acoustic or Soundproofing – Acoustic insulation is required to ensure the noise emission from equipment do not exceed the area noise requirements for the working environment for the Project.

3.2 Health and Safety Considerations

3.2.1 The consideration of personnel safety during construction, ongoing operation and maintenance, in the design, selection and installation of insulation is paramount.

3.2.2 Use of asbestos and asbestos based products is not allowed.

3.2.3 The use of fire-resistant materials is strictly required.

3.2.4 Contractor/Supplier shall take appropriate preventative measures and precautions to ensure that personnel exposure to hazardous dust and fibres is not compromised in any way during the construction and installation.

3.2.5 All such measures shall fully comply with the local, state and federal regulations regarding health and safety.

4. Insulation Requirements

4.1 General

4.1.1 Where there are specific cases which are not covered by this standard, the Contractor/Supplier shall submit any discrepancies to the Company for approval before carrying out the work.

4.1.2 Insulation shall be designed to achieve the most economic material thickness for process reasons and such that the surface temperature of cladding or guarding of the plant, equipment shall not exceed 65°C with the maximum contact surface temperature differing from the ambient temperature by not more than 25°C.

4.1.3 It is essential that if any insulating material becomes wet from any process fluid, washdown, spillage, overflow, salt laden precipitation, or from any other source, it must be demonstrated that it quickly dries out without any loss of mechanical strength or insulating properties and exhibit no tendency to disintegrate either when wet or when returned to the fully dry condition.

4.1.4 Any proposed alternative materials to those specified in this document must be demonstrated to be 100% fully sealed and tested, so that moisture from any source cannot enter the insulation from any inside or outside surface, top or bottom edge or any joint, seam or fastener.

4.1.5 Hazardous fluids shall have a non-absorbent type of insulation applied.

4.2 Temperature

4.2.1 The continuous normal operating fluid temperature shall be used to determine the need for insulation and insulation thickness during normal operating conditions. Where equipment has refractory lining or internal insulation, the metal or surface temperature shall be used if external insulation is specifically required.

4.2.2 For steam jacketed equipment, the jacket metal temperature shall be considered as the operating temperature.

4.2.3 Temperatures reached during upset conditions shall not be used as the operating temperature; insulation thickness shall be designed based on operating temperature.

4.2.4 The overall insulation shall withstand the maximum or minimum upset/emergency temperature.

4.2.5 For heat traced equipment, the operating temperature of heat tracer shall be used unless specified otherwise. It shall be insulated in the same manner for hot piping, and with a maximum thickness of 40 mm.

4.3 Description of Insulation Systems

Insulation shall be applied in one, two, or three layers depending upon:

- Equipment dimensions
- Operating environment
- Heat conservation requirements
- Surface temperature limits for personnel protection, except where an alternative guarding system is used for personal protection.

4.4 Insulation Required

The following shall be insulated:

- Equipment exposed to below freezing temperatures
- Equipment requiring heat conservation or personnel protection and noise control
- Equipment where the contained fluid becomes corrosive or produces corrosive condensate when cooled below normal operating temperatures
- Equipment with an operating temperature above 65°C that is accessible to operators and other personnel during normal performance of duties (for personnel protection)
- Nozzle of equipment shall be considered a part of the piping and shall have the same insulation requirements as the attached piping
- Valves and flanges requiring heat conservation for steam service or electrically traced

- Pumps and turbines operating above 120°C unless otherwise specified
- Equipment where specifically noted on the P&IDs and detailed drawing
- Equipment where the contained solution becomes supersaturated when cooled below normal operating temperatures which may lead to severe scaling
- Drain points shall be insulated and equipped with removable insulation boxes.

4.5 Insulation Not Required

The following items shall not be insulated unless specified otherwise on the drawings:

- Vessel skirts
- Saddle supports for horizontal vessels
- Manway covers and blind flanged nozzles. Guarding shall be used for personnel protection unless temperature limits dictate otherwise
- Equipment nozzles connected to uninsulated piping
- Water side of coolers
- Steam and condensate lines vented to atmosphere and drains
- All in-line fittings (strainers, bucket type steam traps, and thermostatic type steam traps)
- Equipment where surface operating temperature is below 65°C except where heat preservation is required due to ambient conditions
- Expansion joints and equipment name plates
- Instruments, orifice and spectacle flanges unless in molten services
- Surfaces where heat loss is beneficial, except where required for personnel protection
- All pressure/vacuum relief devices
- Rotating equipment (except boiler feed water pumps and steam turbines)
- Shell and tube heat exchanger nozzle neck flanges channel-end and shell cover flanges
- Drains, pressure tapping's, sample connections, thermowells, vents and weep holes
- HVAC systems (not considered under this Specification)
- Flanges in hydrogen or toxic service (such as hydrogen sulphide).

5. Materials

5.1 Insulation Materials

5.1.1 General

- 5.1.1.1 Unless otherwise specified, the thermal insulation materials in Table 5-1 shall be used where applicable:

Table 5-1: Insulation Material

Insulation Materials	ASTM	Type	Service Temperature Limits [°C]
Calcium Silicate	C533 Type I	Preformed Block, Shape	27 to 650
Cellular Glass	C552	Preformed Block, Shape and Sheet	-260 to 205
Elastomeric	C534	Type I (perform); Type II (sheet)	-183 to 176
Polyurethane (PUR)	C945	Spray-applied or pour in place Rigid	-30 to 107
Polyurethane Foam	C1029	Spray-applied	-30 to 107
Mineral Fibre (Rock Wool)	C547 Type II, III	Moulded Fibre Sections	-40 to 650
	C553 Type I	Blanket	-40 to 455
	C612 Type I	Board	-40 to 650

- 5.1.2 Insulation materials shall meet the fire hazard requirements of applicable building codes when tested in composite form in accordance with test methods in ASTM E84 and National Fire Protection Agency, NFPA 225.
- 5.1.3 Cellular glass insulation shall be performed or block insulation per ASTM C552.
- 5.1.4 Glass fibre insulation should not be used except for internal applications and approved by Client.
- 5.1.4.1 No substitution of material may be used without written consent from the Client's Representative. Only materials of a grade equivalent to the specified material shall be considered. The responsibility shall be on the Contractor to prove the suitability of proposed equivalent material.
- 5.1.4.2 Original Manufacturer datasheets for various insulating and cladding materials, together with samples shall be provided to the Client for approval prior to commencement of the work.
- 5.1.5 Insulation Forms**
- 5.1.5.1 Insulation material used to insulate equipment shall be of the following form for equipment and duct work:
- Resin bonded mineral/fibre blankets (mattress) stitched onto galvanised wire-mesh.
- 5.1.6 Technical Requirements**
- 5.1.6.1 Mineral wool/fibre blankets (mattress) shall meet the following requirements:
- Density shall be in the range of 80 kg/m³ to 160 kg/m³
 - The insulation shall be suitable for operating temperature up to 300°C.
- 5.1.6.2 Any proposed alternative materials must be demonstrated to be 100% fully sealed and tested, so that moisture from any source cannot enter into the insulation from any inside or outside surface, top or bottom edge or any joint, seam or fastener.

- 5.1.6.3 It is essential that if any insulating material can become wet from any process fluid, wash-down, spillage, overflow, salt laden precipitation, or from any other source, it must be demonstrated to quickly dry-out without any loss of mechanical strength or insulating properties and exhibit no tendency to disintegrate either when wet or when returned to the fully dry condition.
- 5.1.6.4 All other materials used such as tapes, adhesives, etc., shall be suitable for the operating temperature of the equipment.
- 5.1.6.5 Low chloride (less than 10 ppm) insulation material shall be used for insulating stainless steel equipment.

5.2 Cladding Materials

5.2.1 Mechanical Equipment

- 5.2.1.1 Insulation materials of lagged and cladded equipment shall be protected with flexible sheets of Grade 304 Stainless Steel in accordance with ASTM A167.
- 5.2.1.2 Air-gap insulated equipment shall be cladded with Glass Reinforced Plastic (GRP – Vinyl Ester Resin) sheets.
- 5.2.1.3 Cladding thicknesses shall be as per Table 5-2.

Table 5-2: Mechanical Equipment Insulating Cladding Thicknesses

Insulation Outside Diameter (mm)	Sheet Thickness	
	Aluminium	Stainless Steel
Up to 200	0.634 mm (22 ga.)	0.635 mm (24 ga.)
250 to 600	0.912 mm (19 ga.)	0.874 mm (21 ga.)
Over 600	1.024 mm (18 ga.)	0.874 mm (21 ga.)

- 5.2.1.4 The cladding of air-gap insulated tanks longitudinal joint shall be secured with stainless steel bands positioned at 500 mm centres.
- 5.2.1.5 The bands shall be made of stainless steel in accordance with ASTM A167 grade 304.
- 5.2.1.6 Bands shall be 0.5 mm thickness and to the following widths specified in Table 5-3.

Table 5-3: Mechanical Equipment Cladding Fastening Band Widths

Insulation Outside Diameter (mm)	Fastening Band Widths (mm)
Up to 1,800	15
1,800 to 3,000	20
Over 3,000	30

- 5.2.1.7 The cladding circumferential and longitudinal joint of lagged and cladded tanks shall be overlapped by not less than 40 mm and secured with stainless steel self-tapping screws or rivets installed at 150 mm centres. All overlapping joints shall be sealed. One circumferential joint shall be left free for expansion every 4,500 mm.

5.3 Cladding Sealant

All joints shall be weather sealed by applying an approved sealant underneath the lap. Cladding sealant shall be in the form of a bitumen paste or tape impregnated with petroleum jelly ensuring weatherproofing. A cladding sealant suitable for the application shall be proposed by the Contractor and subject to the approval from the Client before commencement of the work.

5.4 Coating under Insulation

5.4.1 Equipment shall be coated under insulation to the extent and with the materials set out in the Specification for Painting and Protective Coating Specification. Inorganic zinc silicate paints shall NOT be used as a primer under insulated surfaces where operating temperature of the fluid exceeds 400°C.

5.4.2 Protective coating for carbon and stainless steel to prevent corrosion under insulation shall be selected in conjunction with ASTM C795, STP 880 and NACE RP0198.

5.5 Insulation Support Rings Materials

Unless otherwise specified, insulation support shall be made of:

- Mild steel for carbon steel equipment (Mild steel insulation supports shall be painted in accordance with the project, Painting and Protective Coating Specification, H376512-8000-240-242-0002 or approved equivalent); or
- Grade 304L stainless steel for austenitic stainless steel and titanium equipment (Stainless steel insulation supports shall not be painted); or
- GRP or thermoplastic for GRP or thermoplastic equipment.

6. Thickness of Insulation

Insulation thickness shall be selected based on the insulation function, insulation material, maximum operating temperature.

6.1 Heat Conservation

6.1.1 When the primary object of insulation is to conserve heat or for personal protection, the insulation thickness for flat equipment surfaces, based on Cellular glass, Mineral Fibre and Calcium silicate shall be as listed in Table 6-1.

Table 6-1: Insulation Thickness (mm) for Heat Conservation

Description	Operating Temperature (°C)								
	60	90	120	150	180	210	240	270	300
Cellular glass	25	25	25	40	40	-	-	-	-
Mineral fibre	25	25	25	25	25	40	50	50	65
Calcium silicate	-	-	-	40	40	50	65	75	75

6.2 Personnel Protection

6.2.1 When the primary object of insulation is to for personal protection, the minimum insulation thickness for flat equipment surfaces, based on Cellular glass, Mineral Fibre and Calcium silicate shall be as listed in Table 6-1.

6.3 Cold Insulation with Cladding

When the primary object is cold insulation with Aluminium or stainless-steel cladding, the insulation thickness for flat equipment surfaces, based on cellular glass and polyurethane foam shall be as listed as in Table 6-2.

Table 6-2: Cold Insulation Thickness (mm) with Aluminum or Stainless Steel Cladding

Description	Ambient Operating Temperature (°C)				
	+1 to +10	0 to -10	-11 to -20	-21 to -30	-31 to -40
Cellular glass	75	100	125	165	190
Polyurethane Foam	50	50	70	90	110
Mineral Fibre (Rockwool)	60*	100*	120*	160*	180*

* The minimum cold insulation thickness for Mineral Fibre should be calculated based on the manufacturers guidelines.

7. Application of Insulation Materials

7.1 General Installation Requirements

7.1.1 It is essential that all insulation and cladding materials shall be protected from the weather both prior to and during application. Materials shall be stored in moisture-proof containers until required for use. The storage temperature shall be in accordance with the Manufacturer's recommended storage temperature. Insulation materials that become moist or damp to touch shall be discarded and will not be permitted to be applied. Drying of moist and damp insulation and its use thereafter is not permitted.

7.1.2 Prior to proceeding with the installation of the insulation materials, the Contractor shall make sure that:

- All equipment supports are installed
- All insulation supports are installed
- All surfaces to be insulated are clean and dry
- The paint film of the painted surfaces is completely dry
- The insulation material is clean, dry, and in good mechanical condition with all factory-applied vapour or weather barriers intact and undamaged
- Heat tracing, when required, is completed.

7.1.3 Hydrostatic tests shall be completed before insulation is installed. If insulation is applied before tests, welds, threads and bolted connections shall be left un-insulated and exposed until completion of tests. Exposed insulation shall be weatherproofed to prevent ingress of

moisture. Shop welds may be insulated if the item has been hydrostatically tested in the shop.

- 7.1.4 Flanged fittings, flanged valves, flanged pumps, flanged blinds and single flange pairs on equipment including manways and nozzles, if insulated, shall be insulated last, after the completion of all testing, and insulation of adjacent equipment surfaces.
- 7.1.5 Insulation materials and accessories shall be installed in accordance with Manufacturer's published instructions and recognised industry practices.
- 7.1.6 The insulation materials shall have smooth and even surfaces.
- 7.1.7 All insulation must be covered by cladding as soon as possible, and no later than 24 hours after installation of insulation.
- 7.1.8 Insulation surrounding code inspection plates and/or nameplates shall be bevelled away from the markings, so that plates are always visible.
- 7.1.9 Insulation shall be applied without gaps and voids. Should gaps or voids be present, these shall be filled with material similar to the adjacent insulation material.
- 7.1.10 Provision shall be made where necessary for thermal expansion.

7.2 Equipment Insulation

- 7.2.1.1 Vessels of diameter 600 mm or less shall be insulated in the same manner as a pipe see the project Piping Insulation and Tracing Specification, H376512-8000-250-242-0002 Appendix A, B and C.
- 7.2.1.2 Vessels of diameter larger than 600 mm shall be insulated using one of the following two techniques:
 - Air-gap insulation
 - Lagging and cladding.
- 7.2.1.3 The type of insulation system required for each vessel will be indicated on the project Mechanical Equipment List, H376512-8000-240-216-0001.

7.2.2 Air-gap Insulation

Tanks requiring air-gap insulation will not require insulation material.

7.2.3 Lagging and Cladding

- 7.2.3.1 Resin bonded mineral/fibre blankets (mattress) stitched onto galvanised wire-mesh and applied in maximum available sheet sizes commensurate with the vessel diameter shall be used.
- 7.2.3.2 Insulation shall be laid with staggered, closely butted joints; with cracks and voids packed out. In the case of double layer application, the longitudinal and circumferential joints in the outer layer of mineral fibre blankets shall be offset from those in the inner layer by half the blanket length and half the blanket width respectively.
- 7.2.3.3 The insulation shall be supported from insulation supports (pins or forked studs) welded to the vessel by the Contractor.

- 7.2.3.4 Spacing of the supports shall be designed to allow for the total weight of the insulation as well as for the thermal expansion/contraction of the equipment. Pitches separating supports shall be in accordance with insulation material manufacturer recommendations.
- 7.2.3.5 Pins and forked studs, when required, shall be made of the same material of construction as the vessel.
- 7.2.3.6 Forked studs shall be longer than the insulation thickness. Forked studs should be turned back and recessed into the insulation so it does not come into contact with the cladding.
- 7.2.3.7 Pickling and passivation of stainless-steel surfaces, and touch-up on carbon steel surfaces following support installation shall be performed by the Contractor in accordance with Painting and Protective Coating Specification.
- 7.2.3.8 Walls of insulated tanks shall have a 30 mm deep un-insulated band around the base, to prevent corrosion of the base of the wall by ground water.
- 7.2.3.9 Insulation shall be fitted as closely as possible around equipment nozzles; all gaps and crevices shall be effectively sealed.
- 7.2.3.10 At equipment flanges, the insulation shall be stopped short of the studs and nuts allowing sufficient distance to facilitate the withdrawal of studs without damaging adjacent insulation.
- 7.2.3.11 Thermowell bosses, pressure tappings, and nameplates shall not be insulated. The insulation and cladding around these points shall be cut back and effectively sealed.

7.3 Acoustic Insulation

- 7.3.1 Acoustic insulation is normally not required. The application of external acoustic insulation on piping and equipment subject to emission of noise levels exceeding the following:
 - An 8-hour equivalent continuous A-weighted sound pressure level, $L_{Aeq,8h}$, of 85 dB(A) at 1 metre away from the source
 - For peak noise a C-weighted peak sound pressure level, $L_{C,peak}$, of 140 dB(C) at the operator's ear.
- 7.3.2 Guidelines to noise control design shall be in accordance with ISO 15665 or CINI insulation manual.
- 7.3.3 Acceptable insulation material shall be:
 1. Mineral Fibre of moulded pipe sections in accordance with ASTM C547.
 2. Mineral Fibre in accordance with ASTM C612 Class 1.
 3. Cellular glass moulded pipe insulation in accordance with ASTM C552.
- 7.3.4 Acoustic insulation can be met by a combination of different insulation material and jacketing systems.
- 7.3.5 Where acoustic and thermal insulation systems are both required, the more stringent thickness shall be used.

- 7.3.6 For acoustic and cold insulation systems where both are required, the cold insulation shall be applied first followed by acoustic insulation.

8. Application of Insulation Cladding

8.1 General

- 8.1.1.1 Cladding shall be cut and fitted in such a way as to take into consideration all allowances for thermal expansion, whilst at the same time, excluding any potential water ingress at overlaps and terminals.
- 8.1.1.2 All cladding shall overlap to prevent ingress of water. The overlap shall be 40 mm minimum.
- 8.1.1.3 All overlaps in the cladding, and terminals between cladding and equipment surfaces shall be sealed with a suitable mastic sealant.
- 8.1.1.4 Overflow of sealant shall be removed in accordance with sealant manufacturer's recommendations.
- 8.1.1.5 All joints shall be straight and square to preserve a symmetrical appearance.
- 8.1.1.6 Drain points shall be performed at the lowest point of cladding in order to prevent fluid entrapment.
- 8.1.1.7 Equipment Cladding.
- 8.1.1.8 Air-gap Insulation.
- 8.1.1.9 Tanks requiring air-gap insulation will be supplied complete with standoffs.
- 8.1.1.10 Glass Reinforced Plastic (GRP) sheets shall be supported by the tank stand-offs and secured with stainless steel bands positioned at 500 mm centres.
- 8.1.1.11 GRP sheets shall be as large as practicable in order to reduce the number of joints.
- 8.1.2 Lagging and Cladding**
- 8.1.2.1 All circumferential joints must be overlapped in order to shed water and secured with self-tapping screws or rivets.
- 8.1.2.2 All insulated surfaces of equipment shall be cladded. Sheet metal on convex heads shall be fabricated from sector shaped sheets with flanged or standing joints.
- 8.1.2.3 All cut-outs in stainless steel cladding shall be weatherproofed by flashing with mastic or equivalent approved by the Client.
- 8.1.2.4 Stainless steel sheets shall be as large as practicable in order to reduce the number of joints.
- 8.1.2.5 The cladding system shall be constructed so that due allowance is provided for the expansion or contraction of the equipment.
- 8.1.2.6 At points where dissimilar metals may come in contact with one another, precautions must be taken to prevent galvanic action.

9. Marking

- 9.1 Marking or colour coding of the equipment shall not be required unless especially requested.

10. Inspection

- 10.1 Where ducting and equipment is to be insulated, the Contractor shall inspect the surface to be insulated to detect all visible defects such as gouges, cracks, sagging, gaps and/or blisters. Where defects are found the Contractor shall report all defects to the Client and shall not apply insulation until remedial work has been carried out.
- 10.2 All insulation work shall be visually inspected to verify that it has been correctly installed. Visual inspection will be carried out during insulation installation, by the project appointed quality controller, to ensure compliance with requirements herein to cover and protect insulation materials from indoor and outdoor environmental conditions during installation.
- 10.3 The Client shall have the right to call for site tests in respect of the thickness and density of the insulating material as well as material of construction of cladding. Other tests such as combustibility (UL214 CSIR Method), toxicity (NES713) and conductivity (ASTM C177) could be requested by the Client.
- 10.4 The Contractor shall provide certificates for the following materials:
- Mill certificates for stainless steel cladding
 - Manufacturer certificates for insulation material.