
OYSTER PROJECT

Key Specification for Pressure Vessels

Doc. No. : OYSTER-EM-GME-KS-A01

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Revision History

Document Title: Key Specification for Pressure Vessels


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Rev. No.	Date	Description of Revision (Including the chapters and provisions of the revision)	Prepared by	Approved by
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Notes

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ATTACHMENT

1. P & I Diagram
2. General Arrangement drawings
3. Data sheets
 - 3-1 Data Sheet for Tanks
 - 3-2 Data Sheet for Pressure Safety Valves
 - 3-3 Data Sheet for Manual Valves
 - 3-4 Data Sheet for Temperature Sensors
4. Piping Material Classification

1.0 GENERAL

- 1) Project Name : OYSTER
- 2) Client : RID (Reactor Institute Delft)
- 3) Plant Location : TUD (Delft University of Technology)
in Netherlands


- 4) Equipment Number and Name

<u>Equipment No.</u>	<u>Equipment Name</u>
HRS-TK01	Helium Buffer Tank
HRS-TK02	Helium Buffer Tank
HRS-TK03	Instrument Air Buffer Tank
HYD-TK01	Hydrogen Buffer Tank
VAS-TK05	Discharged Gas Collection Tank
GBS-TK01	Nitrogen Buffer Tank

- 5) Required Date of Quotation : [by HDEC]
- 6) Required Date of Delivery : [by HDEC]
- 7) Delivery Terms

The quotation price shall be quoted DDP, TUD site in Netherlands, Unloaded including the installation supervision and performance test [by HDEC].

- 8) Contact Point
 - Address : Hyundai Engineering & Construction Co., Ltd.
 - Attn. : [by HDEC]
 - Tel. : [by HDEC]
 - Fax. : [by HDEC]
 - E-mail : [by HDEC]

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2.0 SCOPE

2.1 General


- 1) This Specification covers the technical and associated requirements for design manufacturing and furnishing of Six (6) pressure vessels for use in the CNS facility in TU Delft, Netherlands.
- 2) It is not the Buyer's intent to specify all technical requirements or to set forth those requirements adequately covered by applicable codes and standards. The Supplier shall furnish high quality equipment and accessories meeting the requirements of this Specification and the industry standards.
- 3) All intrinsic equipment necessary for the proper and safe operation of the equipment and auxiliaries furnished under this Specification shall be provided by the Supplier.
- 4) The Supplier shall design, procure, manufacture, inspect, test and deliver completely assembled in accordance with this Specification. The equipment name and tag numbers of each component are designated in the attached P&IDs.

2.2 Work Included

- 1) In addition to the Supplier's scope of works specified in other section of this Specification, the Supplier shall furnish the equipment and services, including all necessary features, components, accessories and appurtenances for the safe, efficient and reliable erection, operation and maintenance whether mentioned in this Specification or not.
- 2) The scope of supply shall include, but not limited to, the followings;
 - A. One (1) helium buffer tank (for inside CNS utility building)
 - i. Four (4) ball valves (HRS-V301/V302/V303/V304)
 - ii. One (1) screwed cap for drain nozzle, One (1) connecter with blind cap for helium injection, and One (1) connector with blind cap for vacuum
 - iii. One (1) safety & relief valve (HRS-PSV002)
 - B. One (1) helium buffer tank (for inside reactorhall)

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- i. Four (4) ball valves (HRS-V305/V306/V307/V308)
 - ii. One (1) screwed cap for drain nozzle, One (1) connector with blind cap for helium injection and One (1) connector with blind cap for vacuum
 - iii. One (1) safety & relief valve (HRS-PSV003)
 - C. One (1) instrument air buffer tank (for inside isolation valve room)
 - iv. One (1) ball valves (HRS-V310)
 - v. One (1) screwed cap for drain nozzle
 - vi. One (1) safety & relief valve (HRS-PSV001)
 - D. One (1) hydrogen buffer tank
 - i. One (1) Temperature Element with Thermowell
 - E. One (1) discharged gas collection tank
 - i. Five (5) ball valves (VAS-V203/V204/V205/V206/V207)
 - ii. One (1) diaphragm valve (VAS-V302)
 - iii. One (1) safety & relief valve (VAS-PSV001)
 - iv. One (1) screwed cap for drain nozzle
 - F. One (1) nitrogen buffer tank
 - i. One (1) ball valve (GBS-V203)
 - ii. One (1) diaphragm valve (GBS-V302)
 - iii. One (1) safety & relief valve (GBS-PSV303)
 - iv. One (1) screwed cap for drain nozzle
- 3) Each tank shall be provided with all the accessories specified in this specification including but not limited to the following;


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- A. Nozzles, flanges, weld connections, supports, grounding pads, lifting lug, piping, valves
 - B. Sizing and arranging of nozzles and other connections to the Buyers system
 - C. Anchor bolts, bolts, nuts, gaskets, counter flanges for nozzle and appurtenance
 - D. Manhole and blind flanges for nozzle, ladders and platforms, if required.
 - E. Name plates
- 4) The supplier shall provide one (1) set of special tools with the list of deliverables that are necessary for installation, maintenance and dismantling of the equipment. All the tools shall be new and any secondhand good shall be rejected.
 - 5) The supplier shall provide one (1) set of spare parts for two (2) years of normal operation. The list for the spare parts and the cost of each item shall be provided. All the spare parts shall satisfy the same requirement for original parts as specified in this specification.
 - 6) Foundation design information including loading data and arrangement and assembly drawings
 - 7) Shop inspection and test
 - 8) Electro-polishing for hydrogen buffer tank interior surface of inner vessel
 - 9) Painting
 - 10) Shipping

2.3 Related Work Not Included

The following works and services shall be furnished by the Buyer;

- 1) Civil and foundation works
- 2) Installation works
- 3) All piping, valves, hangers, supports and fittings external to the Supplier's terminal

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point beyond the Supplier's scope of supply

- 4) External power and control cables to the Supplier's terminal point
- 5) Utility supply such as service water, compressed air to the Supplier's terminals

2.4 Terminal Points

- 1) Terminal points of interconnection piping between the Buyer's and the Supplier's equipment are shown in the attached P&IDs.
- 2) Terminal points of all drain and vent lines are up to the valves and screwed caps.
- 3) All interconnecting piping between the Supplier's equipment is the Supplier's scope, unless otherwise especially specified.
- 4) The counter flange, packing, bolts and nuts at terminal point shall be supplied by the Supplier.

3.0 QUALITY STANDARDS

3.1 General


The Supplier shall comply with the quality requirement of this Specification, applicable codes and standards.

The Supplier shall have a quality assurance program to verify that items and services, including sub-contracted items and services, complete with the Contract and this Specification.

All manufacturing, processing, testing, inspection and operations affecting the equipment or material may be subject to quality assurance surveillance by the Buyer, or his representative.

3.2 Codes and Standards

The codes and standards and regulations applicable as of the date of April 1, 2014 shall be applied. Equipment shall comply with all EU and Dutch laws and regulations. Nothing in this specification shall be permitted to relieve Supplier of this responsibility. Buyer and Supplier, each shall exercise due care to advise the other as their current knowledge pertaining to national and local laws and regulations. The applicable codes and standards are the following:

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- 1) Pressure Equipment Directive (PED)
 - DIRECTIVE 97/23/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 29 May 1997
on the approximation of the laws of the Member States concerning pressure equipment

- 2) American Society of Mechanical Engineer (ASME)
 - B & PV Sec. VIII, Div.1 Pressure Vessels
 - B & PV Sec. IX Welding and Brazing Qualifications
 - B16.5 Pipe Flanges and Flanged Fittings
 - B16.11 Forged Fittings, Socket Welding and Thread
 - B16.25 Butt Welding Ends
 - B31.1 Power Piping
 - B31.3 Process Piping


- 3) ATEX

ATEX 95

 - DIRECTIVE 94/9/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL
of 23 March 1994
on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres

ATEX 137

 - DIRECTIVE 1999/92/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL
of 16 December 1999
on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres (15th individual Directive

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within the meaning of Article 16(1) of Directive 89/131/EEC)

- 4) American Society for Testing and Materials (ASTM)
- 5) Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
 - SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions
 - SP-55 Quality Standard for Steel Castings for Valves, Flanges and Fitting and Other Piping Components - Visual Method of Evaluation of Surface Irregularities
 - SP-61 Pressure Testing of Steel Valves
- 6) European Standards (EN)

3.3 Quality Requirements

- 1) The Supplier shall control the quality of items and services to meet the requirements of this Specification, applicable codes and standards and other procurement documents.
- 2) The quality requirements shall satisfy the ASME NQA-1(partial) or ISO9001.
- 3) The hydrogen buffer tank and discharged gas collection tank shall satisfy the requirements specified in ATEX 95 and 137.
- 4) All the equipment subjected to EC directive provided by the Supplier shall meet the requirements of each EC directive and be affixed with CE certification or marking.


3.4 Conflict

Any conflict among codes, standards, this Specification and its references shall be notified to the Buyer for resolution prior to any further action by the Supplier.

The Supplier shall declare in written form any deviation from the requirement or discrepancy in this Specification he may find.

4.0 SUBMITTALS

4.1 Submittal Requirements


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- 1) All data, specification, drawings and documents shall be written in English. All units of measurements and dimension shall be in SI units (International System of Units), except those used internationally in the English measurement system such as pipe sizes.
- 2) The Supplier shall submit the drawings and data as required in this Specification to the Buyer for the purpose of review.
- 3) The Supplier shall provide a complete list of drawings and documents to be submitted.
- 4) The Supplier shall officially notify any changes or revisions to the Buyer for approval in advance of the fabrication.

4.2 Drawings and Data

- 1) The physical information such as weight, dimension and center of gravity shall be clearly defined. All the interface requirements with the Buyer's terminal points shall be clearly specified in the Supplier's drawings.
- 2) The following information shall be defined on the Supplier's drawings;
 - A. Outline dimensions of each component *¹
 - B. Mounting dimensions and information required for design of supports and foundations including any applicable serviceability *
 - C. Locations, details and sizes of each nozzle and connections *
 - D. Operating and shipping weight of the unit and its component *
 - E. Location and sizes of anchor bolts and bolt holes, bolt material and lubrication fittings *
 - F. Space required for removal of equipment components or sections *
- 3) The list of drawings and data provided by the Supplier shall include, but not limited to, the followings;

¹ "*" marked items shall be submitted with the proposal.

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- A. Engineering, fabrication and equipment delivery schedules
- B. Work progress reports, if required
- C. Test procedures and reports
- D. Shipping procedure
- E. Welding procedure specification (WPS), procedure qualification record (PQR), welding repair procedure in accordance with related codes and standards
- F. Repair procedure
- G. Equipment datasheets including the technical data
- H. Cleaning and protection procedure
- I. Surface preparation and coating procedure
- J. Quality Assurance Manual
- K. "AS-BUILT" drawings and documents

5.0 DESIGN REQUIREMENTS

5.1 General Requirements

- 1) All vessels shall have a design life of not less than 20 years at the specified conditions excluding consumable items such as packing, seals and gaskets.
- 2) All vessels shall be designed according to the design requirements stated in the attached data sheets and the appropriate codes and standards.
- 3) All vessels shall be evacuated by vacuum pumps prior to the initial filling. Therefore, all vessels shall be designed and fabricated to be suitable for the vacuum condition.
- 4) All vessels shall be designed taking into account the arrangement of the given area as shown in the attached General Arrangement drawings.
- 5) The total inventory of helium fluid and the design requirements of helium refrigerator system shall be considered to decide the exact capacity of helium buffer tanks. The

capacities specified in section 5.2.2 1) C. and 5.2.2 2) C. are not the settled value but the estimated value. RHDHV shall calculate and confirm the exact volume of helium buffer tanks to accept the result of detail design and equipment data.

5.2 Operating and Design Conditions

5.2.1 Environmental Conditions

Location	Temperature (°C)		Humidity (%RH)		Remark
	Max.	Min.	Max.	Min.	
Indoor	40	20	70	30	
Outdoor	40	-15	75	30	


5.2.2 Design Requirements

1) Helium Buffer Tank (HRS-TK01)

- A. Type : Horizontal
- B. Fluid : helium gas
- C. Capacity : 2.0 m³
- D. Design Pressure : 1x10⁻⁸ ~ 3,000 kPa(a)
- E. Design Temperature : 333 K
- F. Operating Pressure : 2,000 ~ 2,700 kPa(a)
- G. Operating Temperature : AMB
- H. Material : stainless steel
- I. Location : Roof of the CNS utility building (outdoor)
- J. Nozzles : See the attached data sheet

2) Helium Buffer Tank (HRS-TK02)

- A. Type : Vertical
- B. Fluid : helium gas

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- C. Capacity : 2.3 m³
- D. Design Pressure : 1x10⁻⁸ ~ 3,000 kPa(a)
- E. Design Temperature : 333 K
- F. Operating Pressure : 2,000 ~ 2,700 kPa(a)
- G. Operating Temperature : AMB
- H. Material : stainless steel
- I. Location : Reactor hall (indoor)
- J. Nozzles : See the attached datasheet

3) Instrument Air Buffer Tank (HRS-TK03)

- A. Type : Vertical
- B. Fluid : Instrument Air
- C. Capacity : 0.3 m³
- D. Design Pressure : 1,100 kPa(a)
- E. Design Temperature : 333 K
- F. Operating Pressure : 600 ~ 800 kPa(a)
- G. Operating Temperature : AMB
- H. Material : stainless steel
- I. Location : CNS utility building (indoor)
- J. Nozzles : See the attached datasheet

4) Hydrogen Buffer Tank (HYD-TK01)

- A. Type : Horizontal, double walled
- B. Fluid : hydrogen gas
- C. Capacity
 - Inner : 1.75 m³

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- Outer : < 2.0 m³ (shall be specified by the Supplier)

D. Design Pressure

- Inner : 1x10⁻⁸ ~ 600 kPa(a)

- Outer : 1x10⁻⁸ ~ 3,000 kPa(a)

E. Design Temperature

- Inner : 353 K

- Outer : 353 K

F. Operating Pressure

- Inner : 200 ~ 400 kPa(a)

- Outer : 120 kPa(a)

G. Operating Temperature : AMB

H. Material : stainless steel

I. Location : Reactor hall (indoor)

J. Remarks : ATEX codes shall be applied

K. Nozzles : See the attached data sheet

5) Discharged Gas Collection Tank (VAS-TK05)

A. Type : Vertical

B. Fluid : helium / nitrogen / hydrogen gas

C. Capacity : 2.0 m³


D. Design Pressure : 1x10⁻⁸ ~ 600 kPa(a)

E. Design Temperature : 353 K

F. Operating Pressure : 110 ~ 400 kPa(a)

G. Operating Temperature : AMB

H. Material : stainless steel

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- I. Location : CNS utility building (indoor)
- J. Remarks : ATEX codes shall be applied
- K. Nozzles : See the attached data sheet

6) Nitrogen Buffer Tank (GBS-TK01)

- A. Type : Vertical
- B. Fluid : nitrogen gas
- C. Capacity : 1.0 m³
- D. Design Pressure : 1x10⁻⁸ ~ 1,100 kPa(a)
- E. Design Temperature : 353 K
- F. Operating Pressure : 800 ~ 900 kPa(a)
- G. Operating Temperature : AMB
- H. Material : stainless steel
- I. Location : CNS utility building (indoor)
- J. Nozzles : See the attached data sheet

5.3 Expected Nozzle Loads

Allowable forces and moments at the equipment nozzles shall be submitted for the buyer's approval. All nozzles shall be reinforced by pad, unless otherwise specified.

- 1) Maximum Allowable Nozzle Forces F_R (kgf)

PIPE SIZE (DN)	NOMINAL WALL THICKNESS				
	SCH 10 & 10S	STD & SCH 40S	SCH 40	X.STG & SCH 80S	SCH 80
15	110	150	150	200	200
20	130	180	180	240	240
25	190	240	240	320	320
40	240	320	320	440	440

PIPE SIZE (DN)	NOMINAL WALL THICKNESS				
	SCH 10 & 10S	STD & SCH 40S	SCH 40	X.STG & SCH 80S	SCH 80
50	290	410	410	570	570
65	370	620	620	840	840
80	420	760	760	1050	1050
100	530	1030	1030	1470	1470
150	800	1550	1550	2200	2200
200	1060	2050	2050	2950	2950

2) Maximum Allowable Nozzle Moments M_R (kgf-m)

PIPE SIZE (DN)	NOMINAL WALL THICKNESS				
	SCH 10 & 10S	STD & SCH 40S	SCH 40	X.STG & SCH 80S	SCH 80
15	20	30	30	30	30
20	30	40	40	50	50
25	40	50	50	70	70
40	60	80	80	110	110
50	90	130	130	180	180
65	130	220	220	290	290
80	170	280	280	430	430
100	270	530	530	750	750
150	400	790	790	1120	1120
200	540	1060	1060	1500	1500


3) $F_R^2 = F_X^2 + F_Y^2 + F_Z^2$, $M_R^2 = M_X^2 + M_Y^2 + M_Z^2$

F_R and M_R shall be assumed to act in the direction that yields the highest.

(Equivalent stainless steel schedules 10S, 40S, and 80S)

6.0 MATERIALS AND FABRICATION

6.1 General

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- 1) Materials and fabrication shall satisfy the design and operating conditions and the requirements of applicable code and standards specified in this specification.
- 2) The requirements of materials and fabrication that are not specified in this Specification shall follow the manufacturer's standard.
- 3) For the base material of the pressure vessels, the Supplier shall submit the Material Manufacturer's Certificate of Compliance.
- 4) The Supplier may offer alternative materials that proved to have superior or equal properties. The alternative materials shall be reviewed and approved by the Buyer.

6.2 Design and Construction

- 1) The vessels shall be of welded construction, of the size and arrangement and with connections and appurtenances shown on the data sheets.
- 2) The vessels shall be provided with at least two lifting lugs. Equipment supports shall be designed in accordance with requirements of the applicable codes for the loads encountered during operation.
- 3) Manholes or hand-holes shall include gaskets and fasteners. The covers shall be provided with lifting lugs handles or hinges as appropriate for the size and weight of the cover.
- 4) Carbon steel supports (where required) shall be provided with a stainless steel pad of adequate thickness between the dissimilar materials.
- 5) The vessels shall have grounding provisions at two diametrically opposite points. The grounding pad or channel shall be welded to the vessel before any coating is applied.

6.3 Fabrication

- 1) Welding
 - A. The welding process permitted shall be in accordance with this Specification and all applicable codes and standards
 - B. Welders shall be qualified and the written welding procedure shall be submitted.

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- C. Surface defects shall be eliminated as required by the applicable code.
- D. Repair of defects requiring welding shall be made only after the repair procedure has been approved by the Buyer and reports of the major weld repair shall be submitted to the Buyer.
- E. All repairs of material defects shall be done at the Supplier's expense.

2) Connections

- A. The number, sizes and arrangement of all connections shall be subject to the acceptance of the Buyer after award of the order. The relocation of connections prior to final acceptance of drawings shall not result in a change in the quoted price.
- B. Weld end preparations that interface with Buyer's piping shall conform to "Butt welding Ends ASME B16.25" or "Socket welding Ends (including fitting) ASME B16.11".
- C. Pipe flanges and flanged fittings shall comply with ASME B16.5 or equivalent codes. Flanges shall be raised face to suit the service.
- D. Forged fittings, socket-welding and threaded shall comply with ANSI B16.11 or equivalent codes.
- E. The connections nozzles for instrumentation shall be provided by the Supplier.

3) Finish


- A. Sharp welds and sharp corners shall be ground smooth and blended into the base material.
- B. For all tanks covered by this specification, the interior surfaces of shell and nozzle shall be cleaned all mill scale, grease, oil dirt, cuttings, weld spatter and other foreigners as well as cleaned in accordance with ASTM A 380 or equivalent codes.
- C. For the hydrogen buffer tank, the interior surface of inner vessel shall be performed electro-polishing.

- D. The Supplier shall submit the cleaning procedure before fabrication for the Buyer's review and approval.
- E. Contamination should be removed by immersing, spraying or swabbing the component with acetone and isopropyl alcohol. Items being cleaned should be slightly above room temperature. Ultrasonic cleaning and passivation are also acceptable cleaning methods.
- F. Drying ensures the moisture and dew point levels of each tank are reduced as much as possible. System components should not be subjected to cleaning and drying, which could potentially degrade or damage themselves. The proposed alternate drying process for them which could be damaged by this drying process should be submitted on a standard deviation request for Buyer's approval.
- G. The system pipe and system components shall be purged with nitrogen heated to at least 135 °C for a minimum of 30 minutes.
- H. Effluents from components which have been cleaned with alcohol or other hydrocarbons shall be monitored for hydrocarbons. Any measurable concentration above ambient in the drying gas shall necessitate additional drying.
- I. The cleanliness class for each vessel shall be specified as follows:

Item	Cleanness Class	Flushing Criteria
Hydrogen buffer tank	Class B	No residues, no particle larger than 0.1 mm
Discharged gas collection tank	Class B	No residues, no particle larger than 0.1 mm
Nitrogen buffer tank	Class B	No residues, no particle larger than 0.1 mm
Helium buffer tanks	Class B	No residues, no particle larger than 0.1 mm Less than - 40 °C of the dew point

4) Surface preparation and painting

- A. Before shipment, all parts of the equipment shall be thoroughly cleaned of all

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mill scale, rust, grease and other foreign matter, and all external unmachined ferrous metal surfaces shall be given a shop coat of paint. Paint shall be suitable for the service and acceptable to the Buyer.

- B. All exposed machined ferrous metal surface shall be coated with a suitable antirust compound before shipment.
- C. Unless otherwise specified by the Buyer, the following surfaces of the equipment shall not be painted
 - i. Stainless Steel
 - ii. Galvanized Steel
 - iii. Polished or machined surfaces
- D. The Supplier shall submit its standard surface preparation and painting procedure for the approval of the Buyer.

7.0 INSPECTION AND TESTING

7.1 General

- 1) The Supplier shall prepare and submit to the Buyer the test and inspection procedures and plan for approval.
- 2) Requisite factory tests shall be given to each component as necessary to determine that works and materials are free defects and to establish that the design and construction meet the requirements of this Specification.
- 3) All castings and forgings shall be subjected by the Supplier to chemical analysis, material tests and inspections in accordance with related standards except where otherwise agreed by the Buyer. Inspection should be scheduled in order to detect as early as possible, to avoid unnecessary delay in manufacture and delivery of the equipment. In case of a rejection influencing the delivery time, written and certificated notice must be given in due time to the Buyer.
- 4) The Buyer reserves the right to examine and witness acceptance tests, prior to and following weld repairs and subsequent post weld heat treatment, mechanical test,

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etc., at the material suppliers works.

- 5) The test for pipe and valves shall be performed in accordance with the PED or ASME B31.1.
- 6) The requirements of NDE and pneumatic pressure test shall be performed in accordance with the PED or ASME Sec. VIII.

7.2 Inspection and Test

- 1) If the shop tests indicate that the equipment fail to comply with the performance guarantees, the Supplier shall immediately proceed with developing proposed equipment modifications to obtain the guaranteed performance. Proposed modifications shall be subject to the Buyer's review and acceptance prior to implementation. Modifications which do not comply with this Specification, or in the opinion of the Buyer could result in a decrease in reliability, will not be acceptable.
- 2) If the Supplier's proposed modifications are acceptable, the Supplier shall immediately proceed with such modifications and retesting. Acceptance does not relieve the Supplier of the responsibility for meeting guarantees.
- 3) When witness testing is required, the test required shall be witnessed by the Buyer or its authorized representative unless waived in writing, and the equipment shall not be shipped until it has been approved for shipment by the Buyer.
- 4) Certified test reports shall be prepared and submitted to the Buyer. The report shall include test arrangement, instrumentation and calibration data, test procedure, test data, and test results.
- 5) **Cleanness Inspection**

For the hydrogen, vacuum, and helium refrigeration system, the surface of components should be rubbed with a clean, lint-free, white cotton cloth, commercial paper product, or filter paper moistened (but not saturated) with high-purity isopropyl alcohol. The flushing test can be used in lieu of the wipe test if the wipe test is impossible to be performed due to the pipe or component's configuration. To evaluate the cleanness of internal surfaces, a 20-mesh (850µm) or fine filter (or equivalent) shall be installed and the item flushed at the design velocity with a 99.9% dry nitrogen gas with no particle.

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- E. Under the white bright light (more than 1076 lx), no residue (moisture, cleaning agents, residues from welding, foreign materials like scale, oil, grease, etc) should be present on this cloth or paper after the completion of the wipe test.
- F. Under the white bright light (more than 1076 lx), no particle larger than 0.1 mm and other residues should be present on a 20-mesh or equivalent.

6) Pneumatic Tests

The vessel shall be pneumatically tested by the Supplier. A pneumatic test pressure shall be done according to the proper codes and standards such as ASME Sec. VIII, PED and etc. Pneumatic test pressure shall be maintained for at least 30 minutes.

7) Nondestructive Tests

All welding points shall be inspected through visual inspection and radiographic tests by the Supplier at shop according to the applicable codes and standards. If the radiographic test cannot be performed in certain welding points, the liquid penetration test may be applied to inspect welding points under the Buyer's approval.

8) Helium Leak Tests

For the hydrogen buffer tank and Helium buffer tank the helium leak test shall be performed (Leak tightness $< 1 \times 10^{-10}$ kPa-ℓ/sec, individually), and for other vessels the allowable leak rate shall be as follows;

$< 1 \times 10^{-6}$ mbar-ℓ/sec (single leak)

$< 1 \times 10^{-4}$ mbar-ℓ/sec (global)

7.3 Witness and Hold Points


The witness and hold point list shall be provided by the Supplier for the Buy's approval.

The detail witness and hold points will be decided after the Buyer's review of the Supplier's quality plan.

8.0 SHIPPING REQUIREMENTS

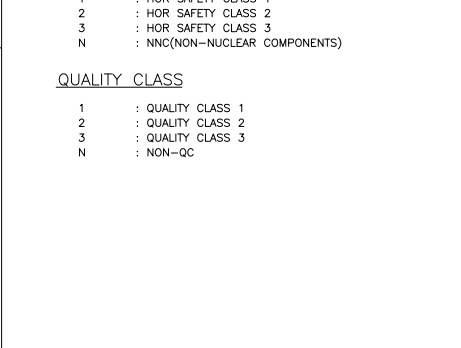
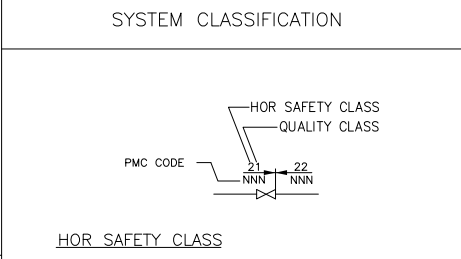
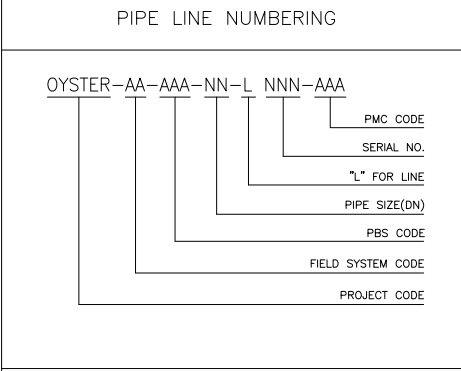
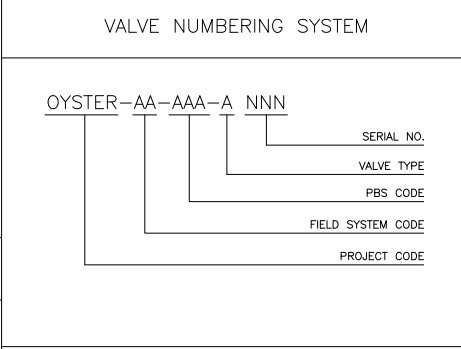
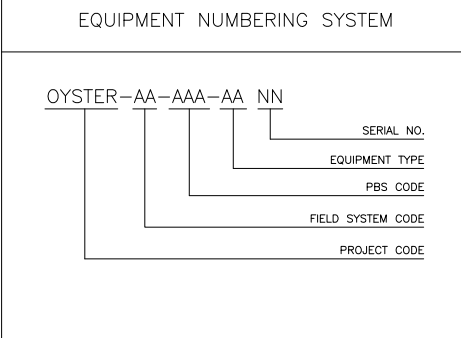
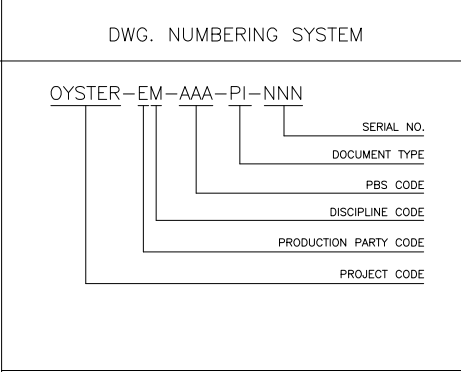
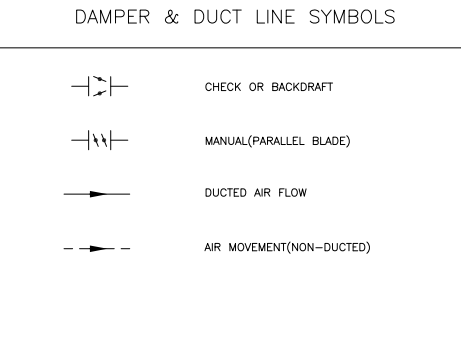
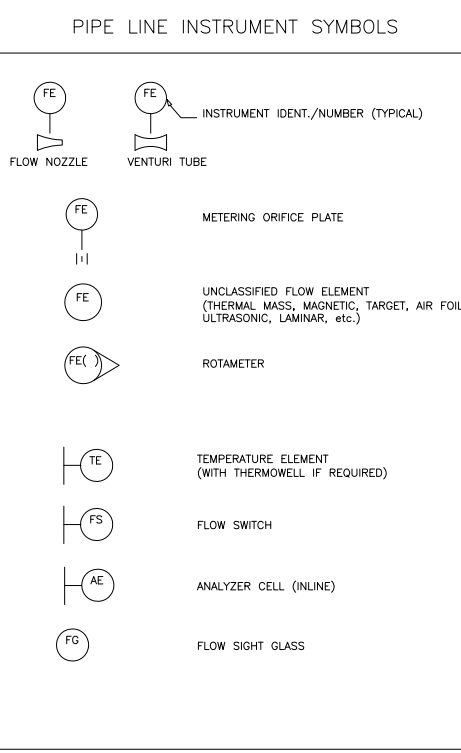
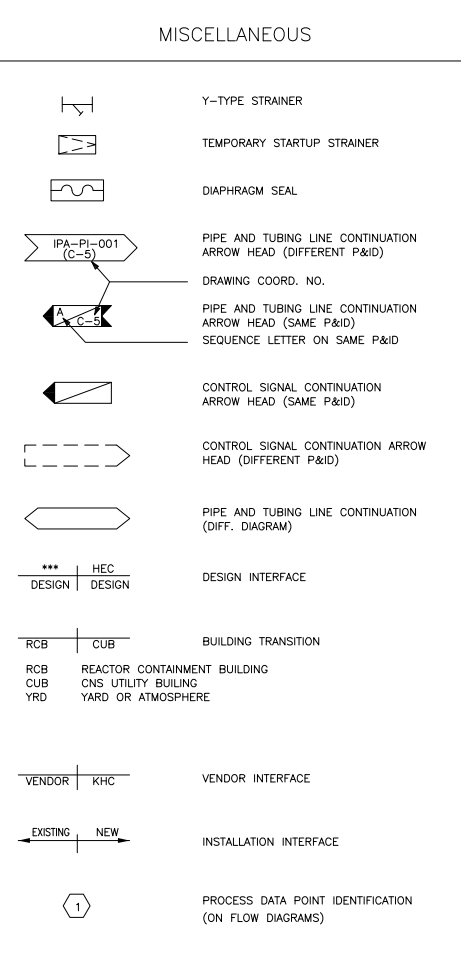
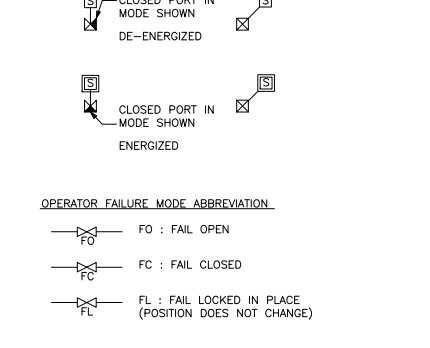
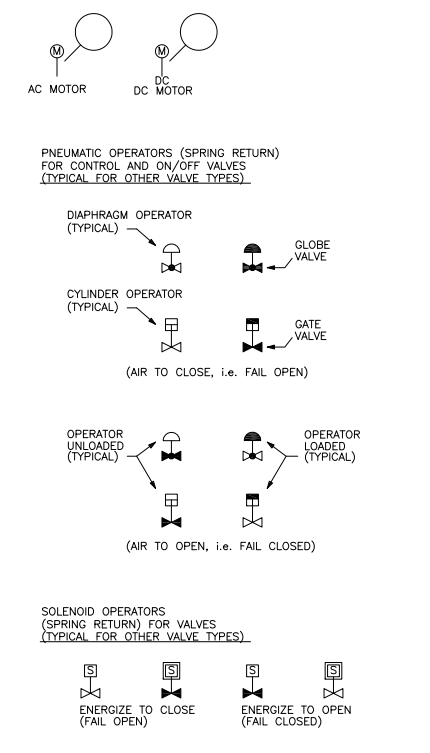
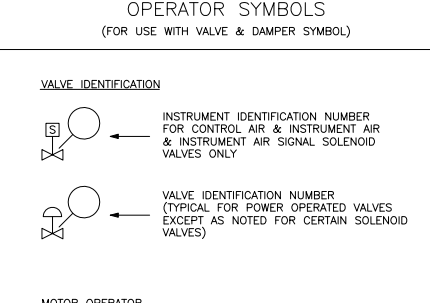
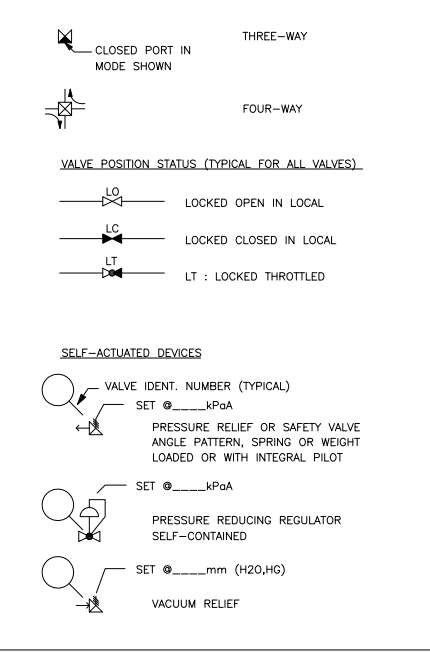
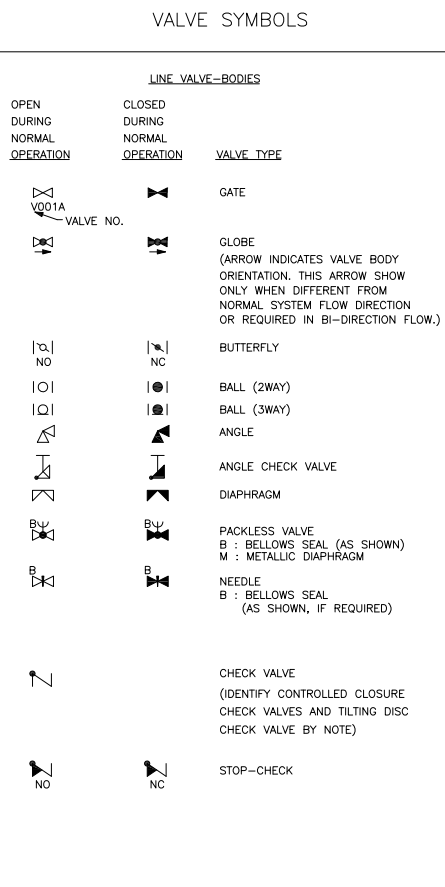
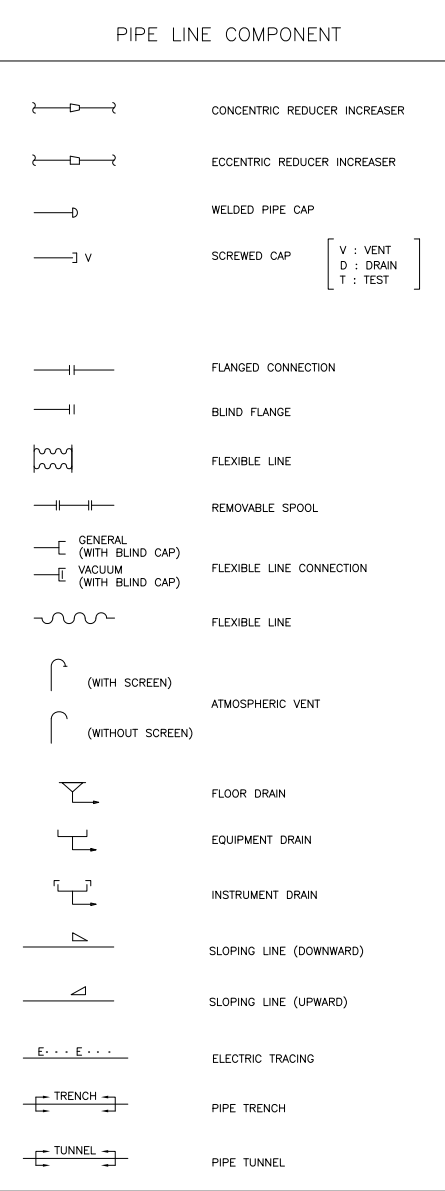
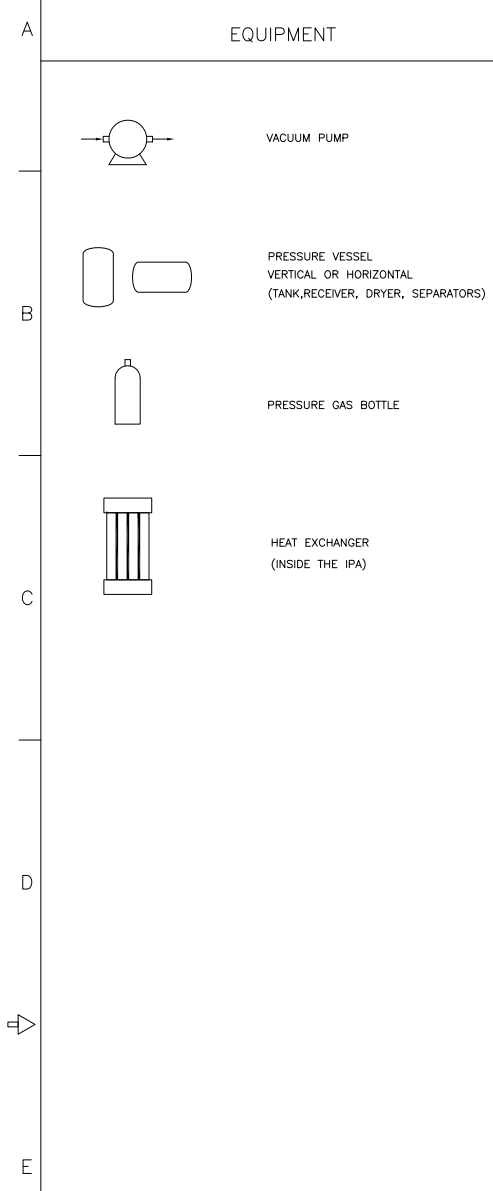
8.1 General

- 1) All the items provided by the Supplier shall meet the requirement of subpart 2.2 of

	OYSTER PROJECT	Rev. P0
	Key Specification for Pressure Vessels	Page 25 of 25

ASME NQA-1 Part II or equivalent codes. Instructions covering receiving, storage, handling, installation and maintenance at the site shall be submitted by the Supplier.

- 2) The Supplier shall clean all components and preserve and protect them on the basis that equipment and all accessories will be stored unprotected in the field for a minimum period of six (6) months.
- 3) Prior to shipment, the equipment shall be completely drained and thoroughly dry. When such draining requires removal of plugs, drain valves, etc., the Supplier shall make sure that these parts are reinserted or reassembled prior to shipment.
- 4) All openings, nozzles, flanged, threaded and weld-end connections shall be provided with protection to prevent damage, corrosion and entrance of foreign matter during shipment and storage.



PRODUCTION PARTY CODE

- KHC KAERI-HYUNDAI CONSORTIUM
- K KAERI
- C HDEC
- E HEC
- V VENDORS

DISCIPLINE CODE

- G GENERAL
- A ARCHITECTURAL
- E ELECTRICAL
- J I&C
- M MECHANICAL
- N NUCLEAR
- P PIPING

PBS CODE

- GME MECHANICAL-GENERAL
- IPA IN-POOL ASSEMBLY
- HRS HELIUM REFRIGERATION SYSTEM
- HVD HYDROGEN SYSTEM
- VAS VACUUM SYSTEM
- GBS GAS BLANKET SYSTEM
- CCS CNS CONTROL SYSTEM

DOCUMENT TYPE

SEE THE PROJECT EXECUTION PLAN (OYSTER-KHC-GPJ-PL-001)

FIELD SYSTEM CODE

- CO COMMON SYSTEM
- RM REACTOR MODIFICATION
- CU CNS UTILITIES

EQUIPMENT TYPE CODE

- RF REFRIGERATOR
- FN FAN
- IP IN-POOL ASSEMBLY
- PP PUMP
- TK TANK & PRESSURE VESSEL
- HE HEAT EXCHANGER
- ZZ MISCELLANEOUS

VALVE TYPE CODE

- V MANUAL VALVE
- AV AUTOMATIC VALVE
- SOV SOLENOID VALVE
- PCV PRESSURE CONTROL VALVE
- PRV PRESSURE REGULATING VALVE
- PSV PRESSURE SAFETY VALVE

PMC CODE

SEE THE PIPE MATERIAL CLASS (OYSTER-EP-GPI-DR-001)

GENERAL NOTES

- VALVE SIZE AND MATERIAL ARE IDENTIFIED WITH THE PIPING.
- THE VARIOUS CODES AND THE COMPLETE NUMBERING SYSTEM FOR OYSTER PROJECT ARE DESCRIBED IN THE PROJECT EXECUTION PLAN (OYSTER-KHC-GPJ-PL-001).

FOR INFORMATION

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By

OYSTER PROJECT

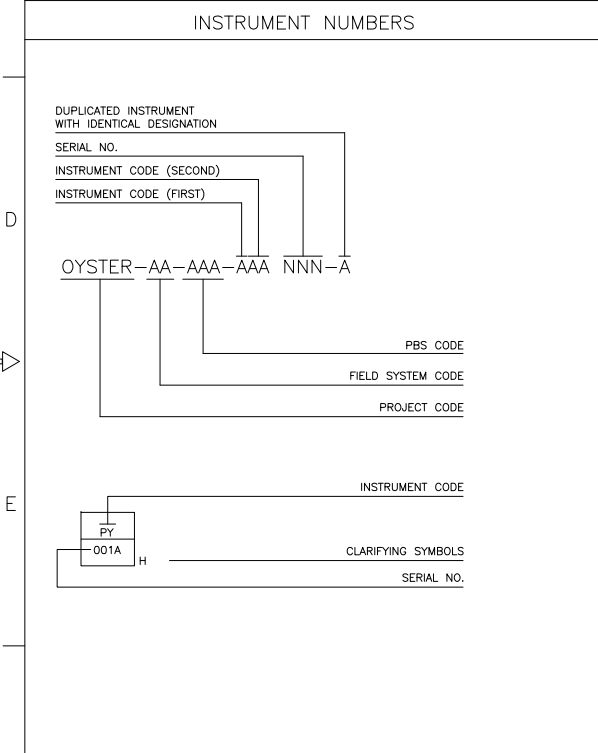
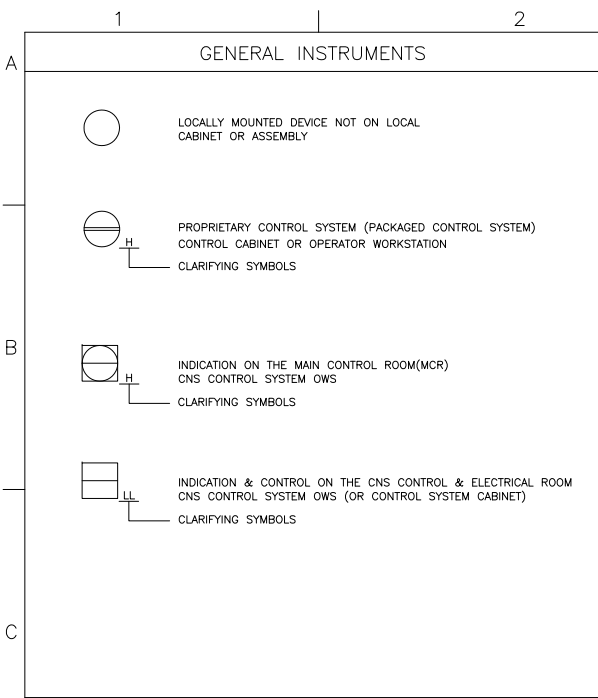
EMPLOYER: KAERI, REACTOR INSTITUTE, TU Delft

CONTRACTOR: KAERI, Korea Atomic Energy Research Institute, HYUNDAI ENGINEERING & CONSTRUCTION, HYUNDAI ENGINEERING CO., LTD.

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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.	TITLE
N/A	N/A		P & I Diagram for Symbol & Legend

PROJECTION	DRAWING NO.	REV.	SIZE	SHEET	SCALE
	OYSTER-EM-GME-PI-001	-	A1	1/2	None



INSTRUMENT CODES

FIRST LETTER VARIABLE
(MEASURED OR INITIATING)

A	ANALYSIS
B	BURNER
C	CONDUCTIVITY
D	DENSITY
E	VOLTAGE
F	FLOW
H	HAND (MANUAL)
I	CURRENT (ELEC.)
J	POWER (ELEC.)
K	TIME
L	LEVEL(LIQUID OR SOLID)
M	MOISTURE (HUMIDITY)
N	NEUTRON FLUX
P	PRESSURE OR VACUUM
PD	DIFFERENTIAL PRESSURE
R	RADIOACTIVITY
S	SPEED OR FREQUENCY
T	TEMPERATURE
U	MULTIVARIABLE
V	VIBRATION
W	WEIGHT OR FORCE
X	SPECIAL (REFER TO CLARIFYING SYMBOL LIST)
Y	STRAIN
Z	POSITION

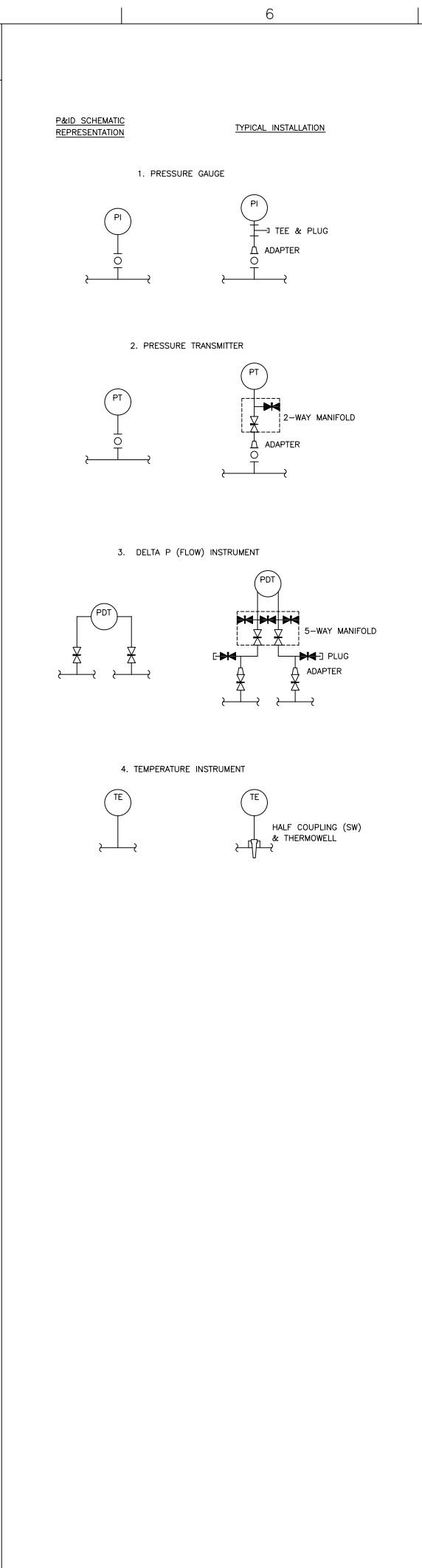
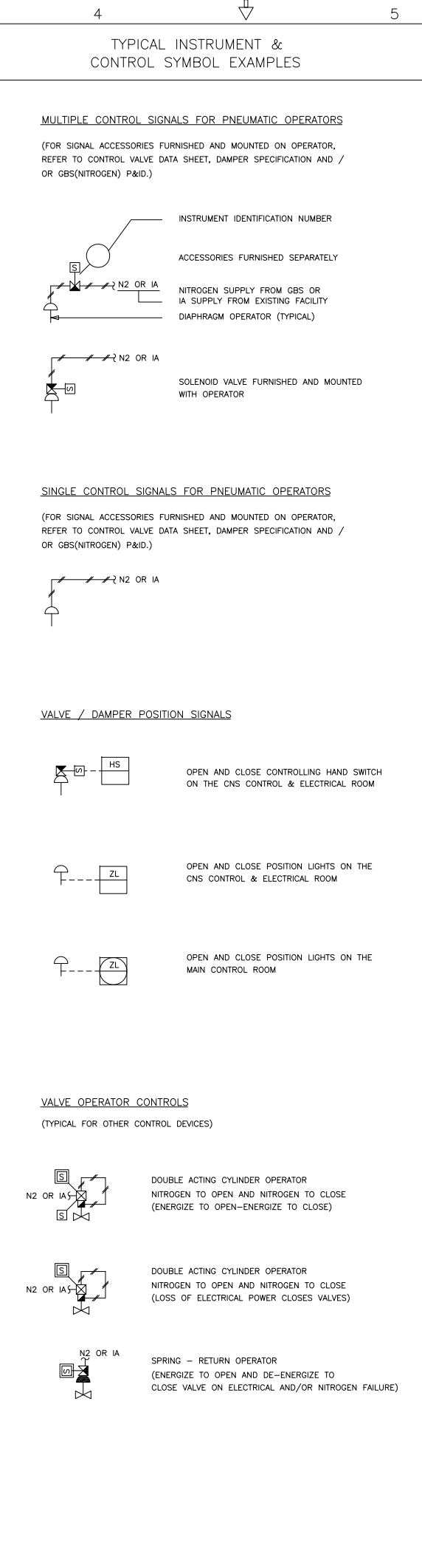
SECOND OR SUCCEEDING LETTERS

(INSTRUMENT FUNCTION)

A	ALARM
AC	ALARM CLOSED
AH	ALARM HIGH
AHH	ALARM HIGH HIGH
AHL	ALARM HIGH OR LOW
AL	ALARM LOW
ALL	ALARM LOW LOW
AO	ALARM OPEN
C	CONTROLLER (BLIND)
D	DIFFERENTIAL
E	PRIMARY ELEMENT
EW	PRIMARY ELEMENT WELL
G	GLASS
I	INDICATOR
IC	INDICATING CONTROLLER
IK	INDICATING CONTROL STATION (MANUAL/AUTO)
IR	INDICATING RECORDER
IS	INDICATING SWITCH
IT	INDICATING TRANSMITTER
IY	INDICATING RELAY
JR	MULTIPOINT RECORDER (MORE THAN 3 PENS)
K	CONTROL STATION-VARIABLE TYPE (MANUAL/AUTO) WITHOUT CONTROLLER
L	LIGHT (PILOT)
Q	INTEGRATOR
R	RECORDER
RC	RECORDER CONTROLLER
S	SWITCH
T	TRANSMITTER
U	MULTIFUNCTION
W	WELL
X	UNCLASSIFIED
Y	RELAY, SIGNAL CONVERTER, COMPUTING
Z	POSITIONER / CONTROL DRIVE (EXCEPT VALVE MOUNTED)

CLARIFYING SYMBOL LIST

A	ANALOG SIGNAL
AVG	AVERAGE
BI	BIAS
C	CONDUCTIVITY
CO2	CARBON DIOXIDE
D	DIGITAL
DIR	DIRECT ACTING
E/I	CONVERTER (VOLTAGE TO CURRENT)
FC	FAIL CLOSED
F/H	FOLLOW / HOLD
FI	FAIL INTERMEDIATE
FL	FAIL LOCK
FO	FAIL OPEN
H2	HYDROGEN
HE	HELIUM
H	HIGH LIMIT
HH	HIGH HIGH LIMIT
HHH	HIGH HIGH HIGH LIMIT
HP	HIGH PASS
I/E	CONVERTER (CURRENT TO VOLTAGE)
INT	INTEGRATOR
I/P	CONVERTER (ELECTRIC CURRENT TO PNEUMATIC)
ISO	ISOLATOR
L	LOW LIMIT
LL	LOW LOW LIMIT
LLL	LOW LOW LOW LIMIT
LP	LOW PASS
M	MANUAL
MAX	MAXIMUM
M/A	MANUAL / AUTOMATIC
MIN	MINIMUM
N2	NITROGEN
O2	OXYGEN
pH	pH ANALYSIS
RES	RESET
REV	REVERSE ACTING
SC	SPECIFIC CONDUCTIVITY
SM	SMOKE OR IONIZATION
SQRT	SQUARE ROOT
TURB	TURBIDITY
VOL	VOLUME
X	MULTIPLE
REF	REFRIGERANT
DC	DEDICATED CONTROL
IPS	INFORMATION PROCESSING SYSTEM
LDP	LARGE DISPLAY PANEL



INSTRUMENT & CONTROL SIGNAL SYMBOLS

	PNEUMATIC SIGNAL
	ELECTRIC SIGNAL (HARDWIRED CABLE)
	CAPILLARY TUBE (FILLED SYSTEM)
	HYDRAULIC SIGNAL
	ELECTROMAGNETIC OR SONIC SIGNAL
	DATA LINK SIGNAL (COMMUNICATION CABLE)
	UNDEFINED SIGNAL

FOR INFORMATION

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By

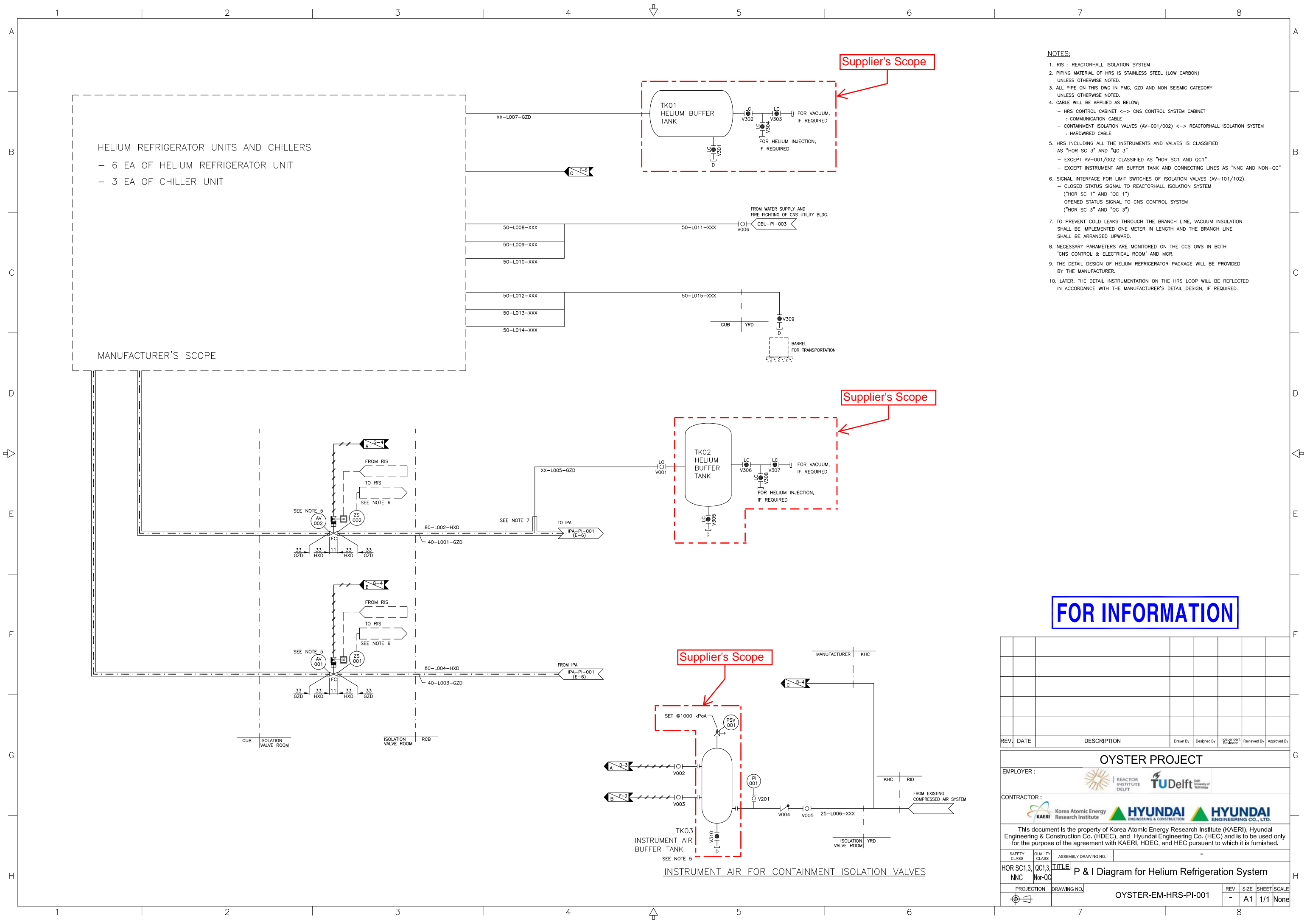
OYSTER PROJECT

EMPLOYER:

CONTRACTOR:






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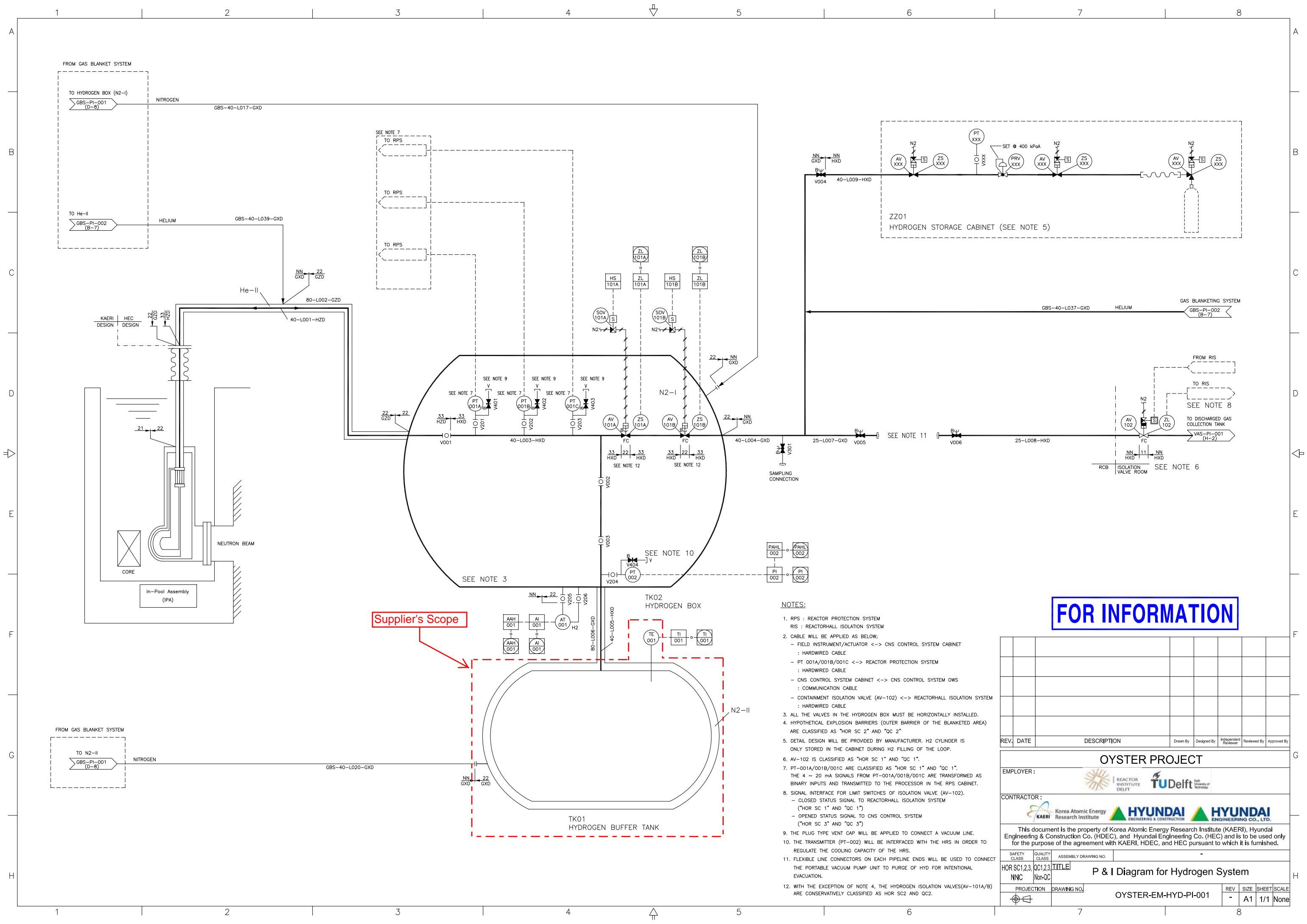
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N/A	N/A		P & I Diagram for Symbol & Legend				
PROJECTION	DRAWING NO.	OYSTER-EM-GME-PI-002		REV	SIZE	SHEET	SCALE
				-	A1	2/2	None



- NOTES:**
- RIS : REACTORHALL ISOLATION SYSTEM
 - PIPING MATERIAL OF HRS IS STAINLESS STEEL (LOW CARBON) UNLESS OTHERWISE NOTED.
 - ALL PIPE ON THIS DWG IN PMC, GZD AND NON SEISMIC CATEGORY UNLESS OTHERWISE NOTED.
 - CABLE WILL BE APPLIED AS BELOW:
 - HRS CONTROL CABINET <-> CNS CONTROL SYSTEM CABINET : COMMUNICATION CABLE
 - CONTAINMENT ISOLATION VALVES (AV-001/002) <-> REACTORHALL ISOLATION SYSTEM : HARDWIRED CABLE
 - HRS INCLUDING ALL THE INSTRUMENTS AND VALVES IS CLASSIFIED AS "HOR SC 3" AND "QC 3"
 - EXCEPT AV-001/002 CLASSIFIED AS "HOR SC1 AND QC1"
 - EXCEPT INSTRUMENT AIR BUFFER TANK AND CONNECTING LINES AS "NNC AND NON-QC"
 - SIGNAL INTERFACE FOR LIMIT SWITCHES OF ISOLATION VALVES (AV-101/102).
 - CLOSED STATUS SIGNAL TO REACTORHALL ISOLATION SYSTEM ("HOR SC 1" AND "QC 1")
 - OPENED STATUS SIGNAL TO CNS CONTROL SYSTEM ("HOR SC 3" AND "QC 3")
 - TO PREVENT COLD LEAKS THROUGH THE BRANCH LINE, VACUUM INSULATION SHALL BE IMPLEMENTED ONE METER IN LENGTH AND THE BRANCH LINE SHALL BE ARRANGED UPWARD.
 - NECESSARY PARAMETERS ARE MONITORED ON THE CCS OWS IN BOTH "CNS CONTROL & ELECTRICAL ROOM" AND MCR.
 - THE DETAIL DESIGN OF HELIUM REFRIGERATOR PACKAGE WILL BE PROVIDED BY THE MANUFACTURER.
 - LATER, THE DETAIL INSTRUMENTATION ON THE HRS LOOP WILL BE REFLECTED IN ACCORDANCE WITH THE MANUFACTURER'S DETAIL DESIGN, IF REQUIRED.

FOR INFORMATION

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By
OYSTER PROJECT							
EMPLOYER :  							
CONTRACTOR :   							
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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.					
HOR SC1,3, NNC	QC1,3, Non-QC	TITLE	P & I Diagram for Helium Refrigeration System				
PROJECTION	DRAWING NO.	OYSTER-EM-HRS-PI-001	REV	SIZE	SHEET	SCALE	
			-	A1	1/1	None	



Supplier's Scope

- NOTES:**
- RPS : REACTOR PROTECTION SYSTEM
RIS : REACTORHALL ISOLATION SYSTEM
 - CABLE WILL BE APPLIED AS BELOW:
 - FIELD INSTRUMENT/ACTUATOR <-> CNS CONTROL SYSTEM CABINET : HARDWIRED CABLE
 - PT 001A/001B/001C <-> REACTOR PROTECTION SYSTEM : HARDWIRED CABLE
 - CNS CONTROL SYSTEM CABINET <-> CNS CONTROL SYSTEM OWS : COMMUNICATION CABLE
 - CONTAINMENT ISOLATION VALVE (AV-102) <-> REACTORHALL ISOLATION SYSTEM : HARDWIRED CABLE
 - ALL THE VALVES IN THE HYDROGEN BOX MUST BE HORIZONTALLY INSTALLED.
 - HYPOTHETICAL EXPLOSION BARRIERS (OUTER BARRIER OF THE BLANKETED AREA) ARE CLASSIFIED AS "HOR SC 2" AND "QC 2"
 - DETAIL DESIGN WILL BE PROVIDED BY MANUFACTURER. H2 CYLINDER IS ONLY STORED IN THE CABINET DURING H2 FILLING OF THE LOOP.
 - AV-102 IS CLASSIFIED AS "HOR SC 1" AND "QC 1".
 - PT-001A/001B/001C ARE CLASSIFIED AS "HOR SC 1" AND "QC 1". THE 4 ~ 20 mA SIGNALS FROM PT-001A/001B/001C ARE TRANSFORMED AS BINARY INPUTS AND TRANSMITTED TO THE PROCESSOR IN THE RPS CABINET.
 - SIGNAL INTERFACE FOR LIMIT SWITCHES OF ISOLATION VALVE (AV-102).
 - CLOSED STATUS SIGNAL TO REACTORHALL ISOLATION SYSTEM ("HOR SC 1" AND "QC 1")
 - OPENED STATUS SIGNAL TO CNS CONTROL SYSTEM ("HOR SC 3" AND "QC 3")
 - THE PLUG TYPE VENT CAP WILL BE APPLIED TO CONNECT A VACUUM LINE.
 - THE TRANSMITTER (PT-002) WILL BE INTERFACED WITH THE HRS IN ORDER TO REGULATE THE COOLING CAPACITY OF THE HRS.
 - FLEXIBLE LINE CONNECTORS ON EACH PIPELINE ENDS WILL BE USED TO CONNECT THE PORTABLE VACUUM PUMP UNIT TO PURGE OF HYD FOR INTENTIONAL EVACUATION.
 - WITH THE EXCEPTION OF NOTE 4, THE HYDROGEN ISOLATION VALVES(AV-101A/B) ARE CONSERVATIVELY CLASSIFIED AS HOR SC2 AND QC2.

FOR INFORMATION

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By

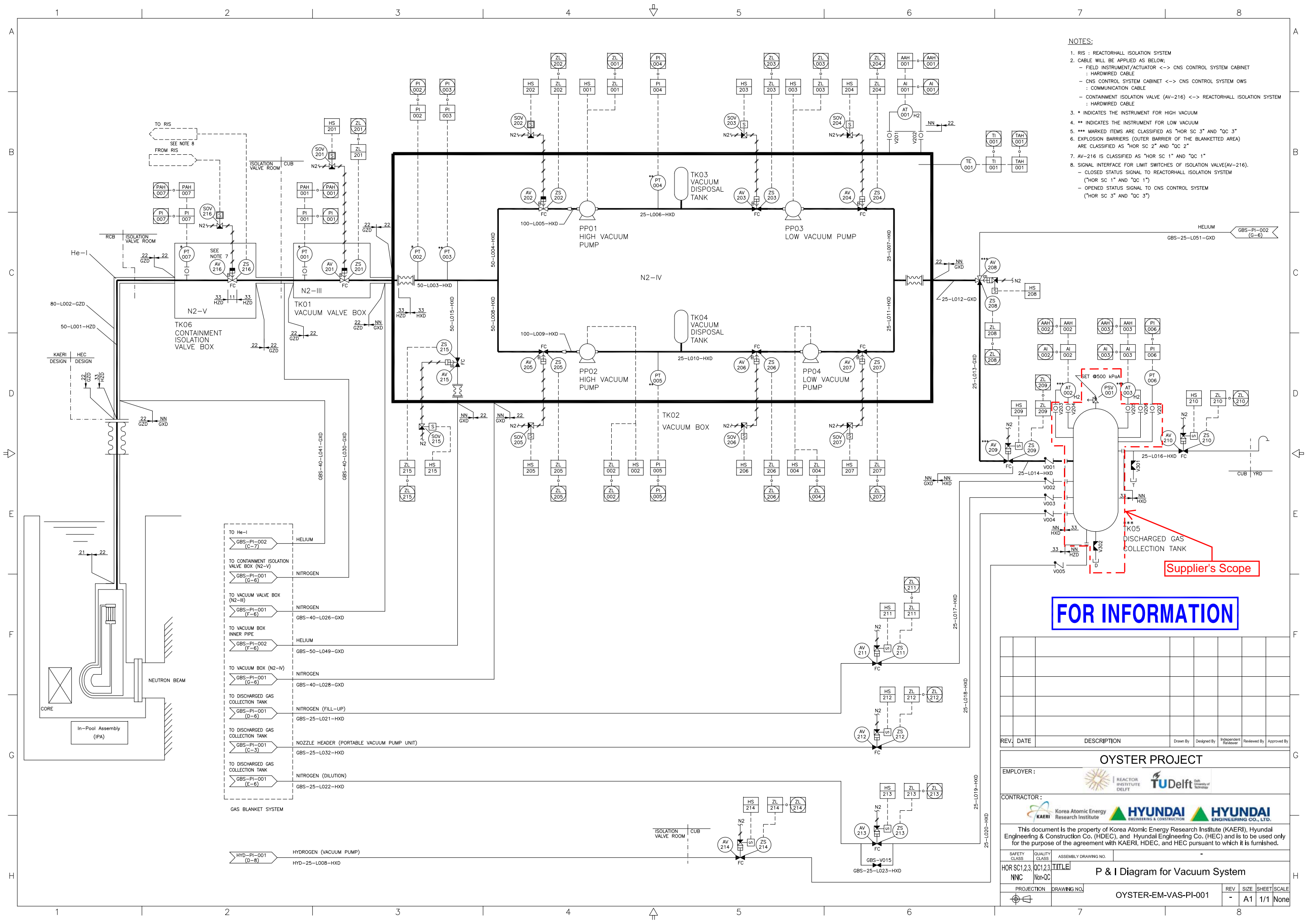
OYSTER PROJECT

EMPLOYER: KAERI, TU Delft

CONTRACTOR: KAERI, HYUNDAI ENGINEERING & CONSTRUCTION, HYUNDAI ENGINEERING CO., LTD.

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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.	TITLE
HOR SC1,2,3	QC1,2,3		P & I Diagram for Hydrogen System
PROJECTION	DRAWING NO.	OYSTER-EM-HYD-PI-001	REV. SIZE SHEET SCALE
			- A1 1/1 None



- NOTES:**
- RIS : REACTORHALL ISOLATION SYSTEM
 - CABLE WILL BE APPLIED AS BELOW:
 - FIELD INSTRUMENT/ACTUATOR <-> CNS CONTROL SYSTEM CABINET : HARDWIRED CABLE
 - CNS CONTROL SYSTEM CABINET <-> CNS CONTROL SYSTEM OWS : COMMUNICATION CABLE
 - CONTAINMENT ISOLATION VALVE (AV-216) <-> REACTORHALL ISOLATION SYSTEM : HARDWIRED CABLE
 - * INDICATES THE INSTRUMENT FOR HIGH VACUUM
 - ** INDICATES THE INSTRUMENT FOR LOW VACUUM
 - *** MARKED ITEMS ARE CLASSIFIED AS "HOR SC 3" AND "QC 3"
 - EXPLOSION BARRIERS (OUTER BARRIER OF THE BLANKETTED AREA) ARE CLASSIFIED AS "HOR SC 2" AND "QC 2"
 - AV-216 IS CLASSIFIED AS "HOR SC 1" AND "QC 1"
 - SIGNAL INTERFACE FOR LIMIT SWITCHES OF ISOLATION VALVE(AV-216).
 - CLOSED STATUS SIGNAL TO REACTORHALL ISOLATION SYSTEM ("HOR SC 1" AND "QC 1")
 - OPENED STATUS SIGNAL TO CNS CONTROL SYSTEM ("HOR SC 3" AND "QC 3")

- TO He-I
- GBS-PI-002 (C-7) HELIUM
 - TO CONTAINMENT ISOLATION VALVE BOX (N2-V)
 - GBS-PI-001 (G-6) NITROGEN
 - TO VACUUM VALVE BOX (N2-III)
 - GBS-PI-001 (F-6) NITROGEN
 - GBS-40-L026-GXD
 - TO VACUUM BOX INNER PIPE
 - GBS-PI-002 (F-6) HELIUM
 - GBS-50-L049-GXD
 - TO VACUUM BOX (N2-IV)
 - GBS-PI-001 (G-6) NITROGEN
 - GBS-40-L028-GXD
 - TO DISCHARGED GAS COLLECTION TANK
 - GBS-PI-001 (D-6) NITROGEN (FILL-UP)
 - GBS-25-L021-HXD
 - TO DISCHARGED GAS COLLECTION TANK
 - GBS-PI-001 (C-3) NOZZLE HEADER (PORTABLE VACUUM PUMP UNIT)
 - GBS-25-L032-HXD
 - TO DISCHARGED GAS COLLECTION TANK
 - GBS-PI-001 (E-6) NITROGEN (DILUTION)
 - GBS-25-L022-HXD
- GAS BLANKET SYSTEM
- HYD-PI-001 (D-8) HYDROGEN (VACUUM PUMP)
 - HYD-25-L008-HXD

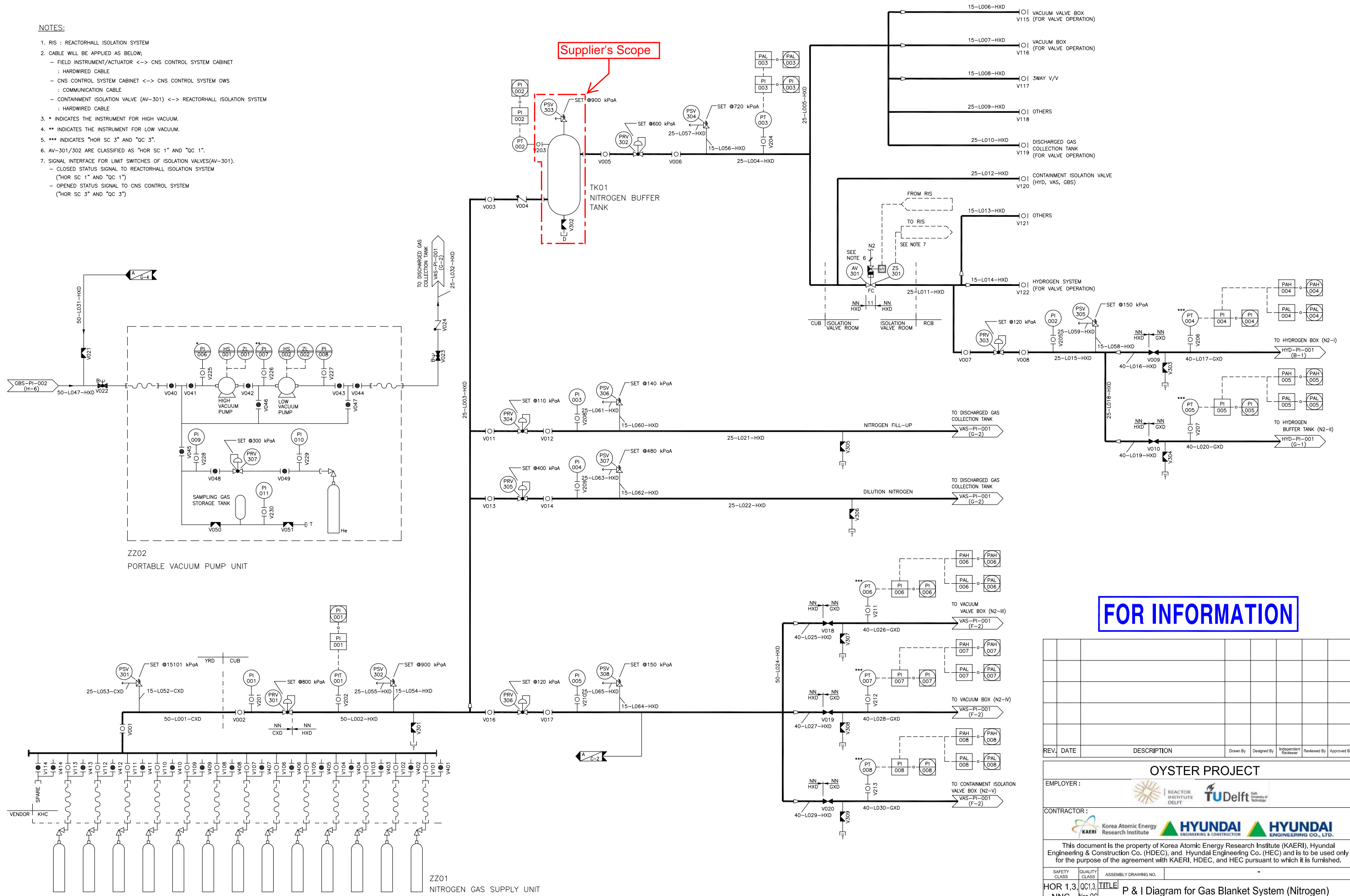
FOR INFORMATION

Supplier's Scope

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By
OYSTER PROJECT							
EMPLOYER:							
CONTRACTOR:							
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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.					
HOR SC1,2,3	QC1,2,3	TITLE	P & I Diagram for Vacuum System				
Non-OC	Non-OC	PROJECTION	DRAWING NO.	REV	SIZE	SHEET	SCALE
			OYSTER-EM-VAS-PI-001	-	A1	1/1	None

NOTES:

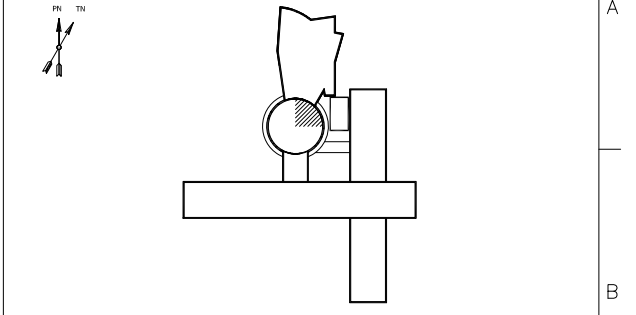
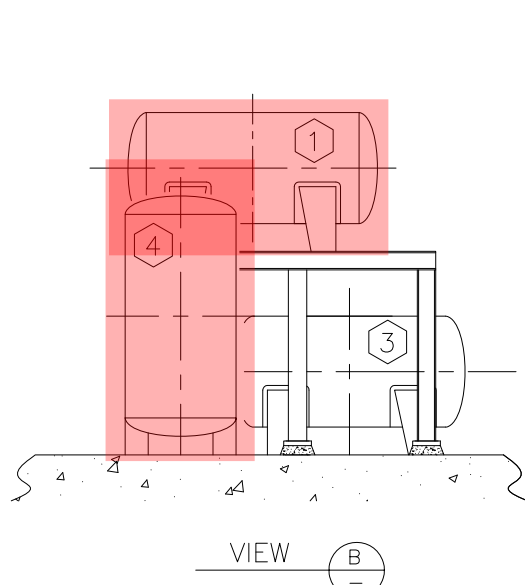
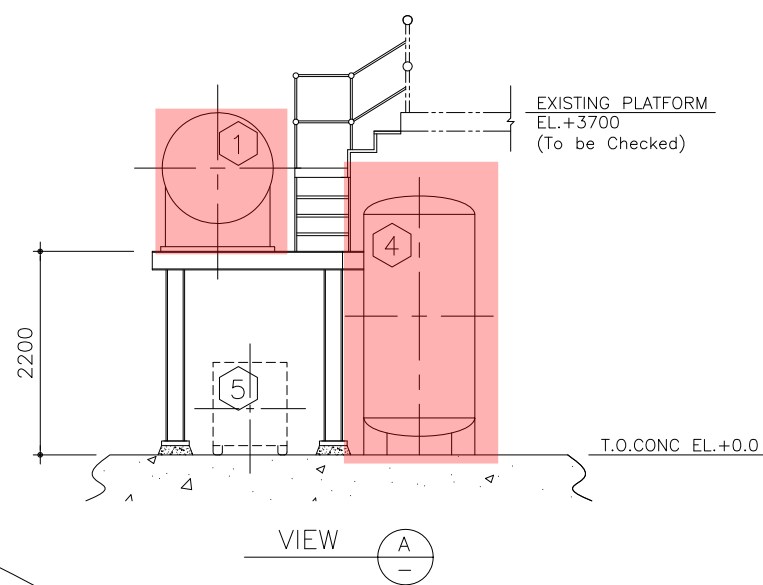
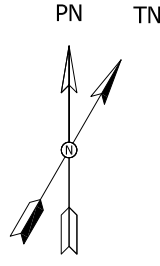
1. RIS : REACTORHALL ISOLATION SYSTEM
2. CABLE WILL BE APPLIED AS BELOW;
 - FIELD INSTRUMENT/ACTUATOR <-> CNS CONTROL SYSTEM CABINET : HARDWIRED CABLE
 - CNS CONTROL SYSTEM CABINET <-> CNS CONTROL SYSTEM OWS : COMMUNICATION CABLE
 - CONTAINMENT ISOLATION VALVE (AV-301) <-> REACTORHALL ISOLATION SYSTEM : HARDWIRED CABLE
3. * INDICATES THE INSTRUMENT FOR HIGH VACUUM.
4. ** INDICATES THE INSTRUMENT FOR LOW VACUUM.
5. *** INDICATES "HOR SC 3" AND "QC 3".
6. AV-301/302 ARE CLASSIFIED AS "HOR SC 1" AND "QC 1".
7. SIGNAL INTERFACE FOR LIMIT SWITCHES OF ISOLATION VALVES(AV-301).
 - CLOSED STATUS SIGNAL TO REACTORHALL ISOLATION SYSTEM ("HOR SC 1" AND "QC 1")
 - OPENED STATUS SIGNAL TO CNS CONTROL SYSTEM ("HOR SC 3" AND "QC 3")



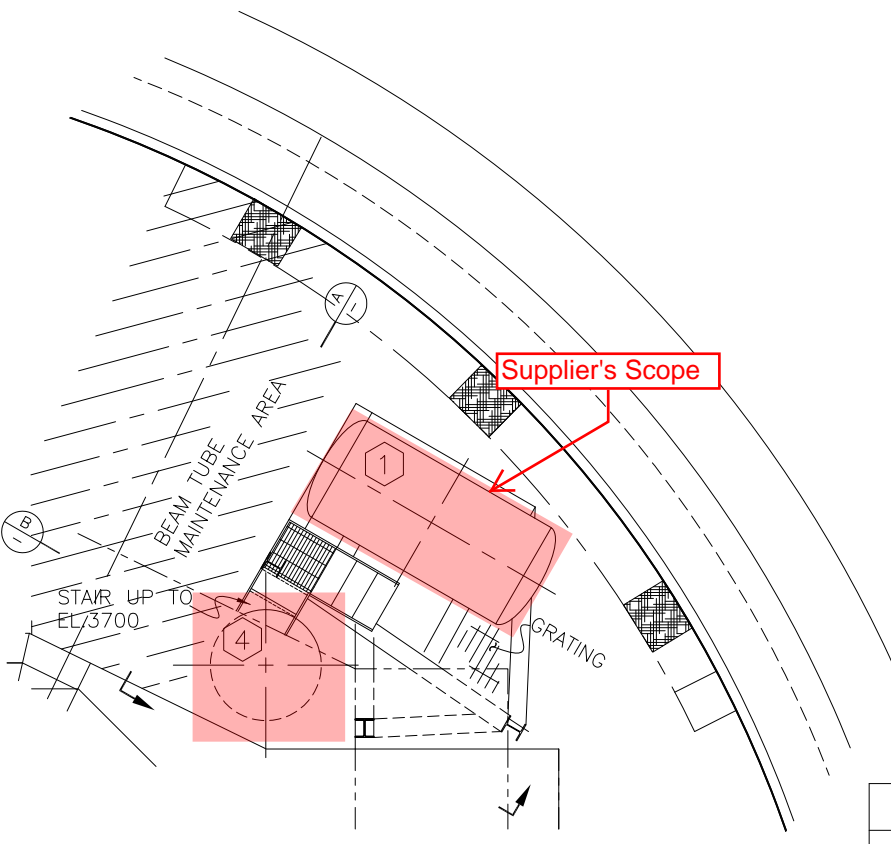
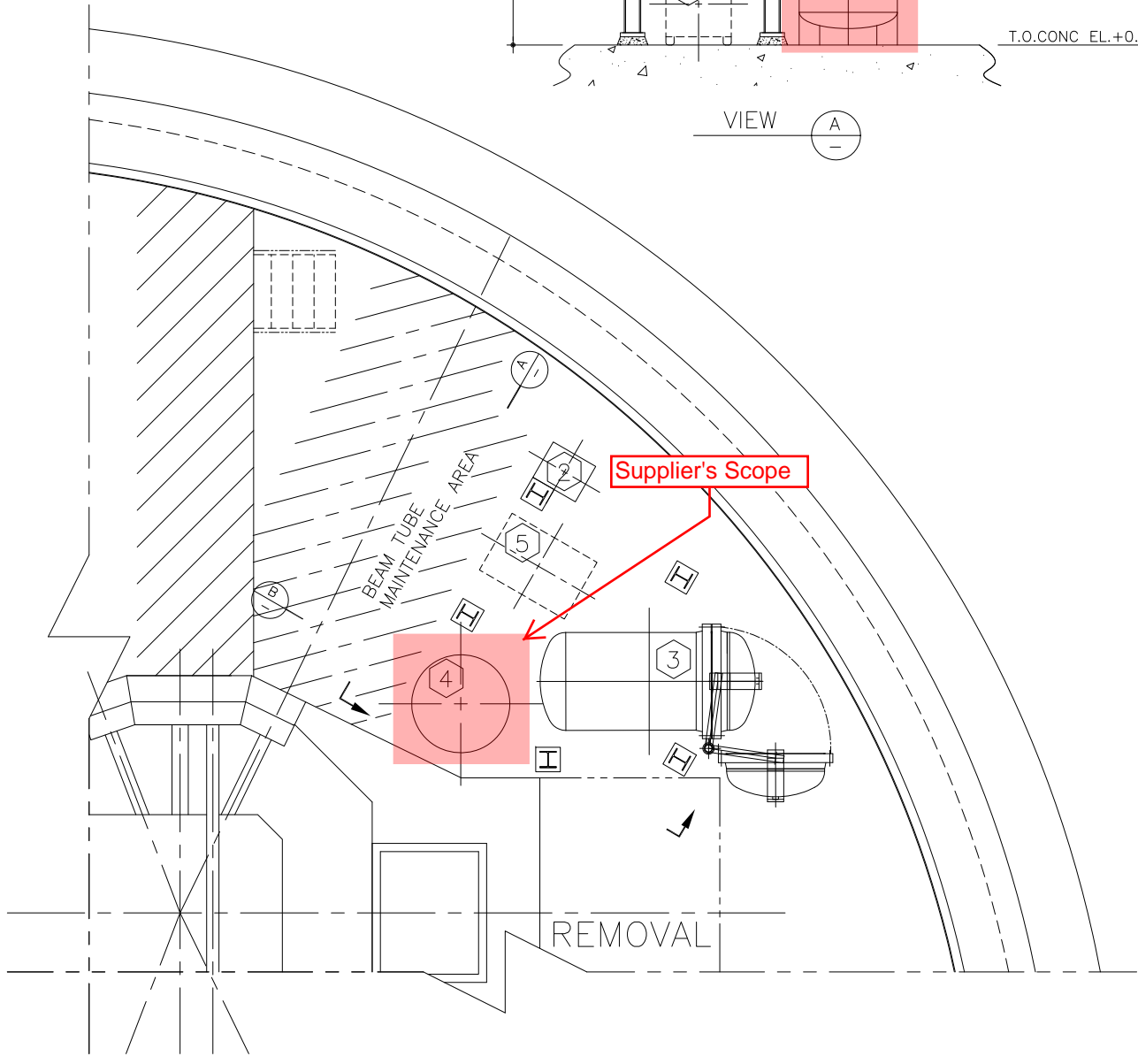
FOR INFORMATION

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By
OYSTER PROJECT							
EMPLOYER:							
CONTRACTOR:							
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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.					
HOR 1,3,OC1,3, NNC	Non-QC	TITLE	P & I Diagram for Gas Blanket System (Nitrogen)				
PROJECTION	DRAWING NO.	OYSTER-EM-GBS-PI-001	REV	SIZE	SHEET	SCALE	
			-	A1	1/2	None	

Att 2. General Arrangement drawings

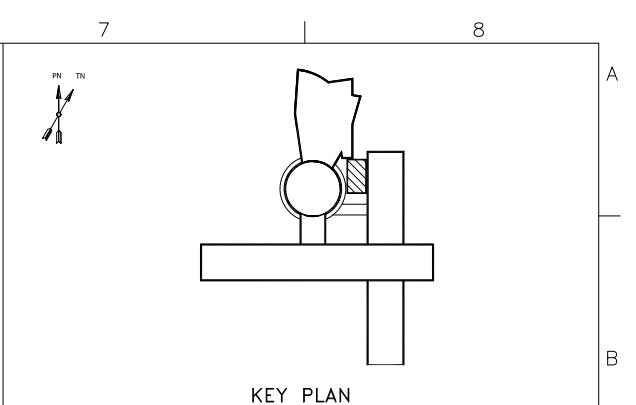
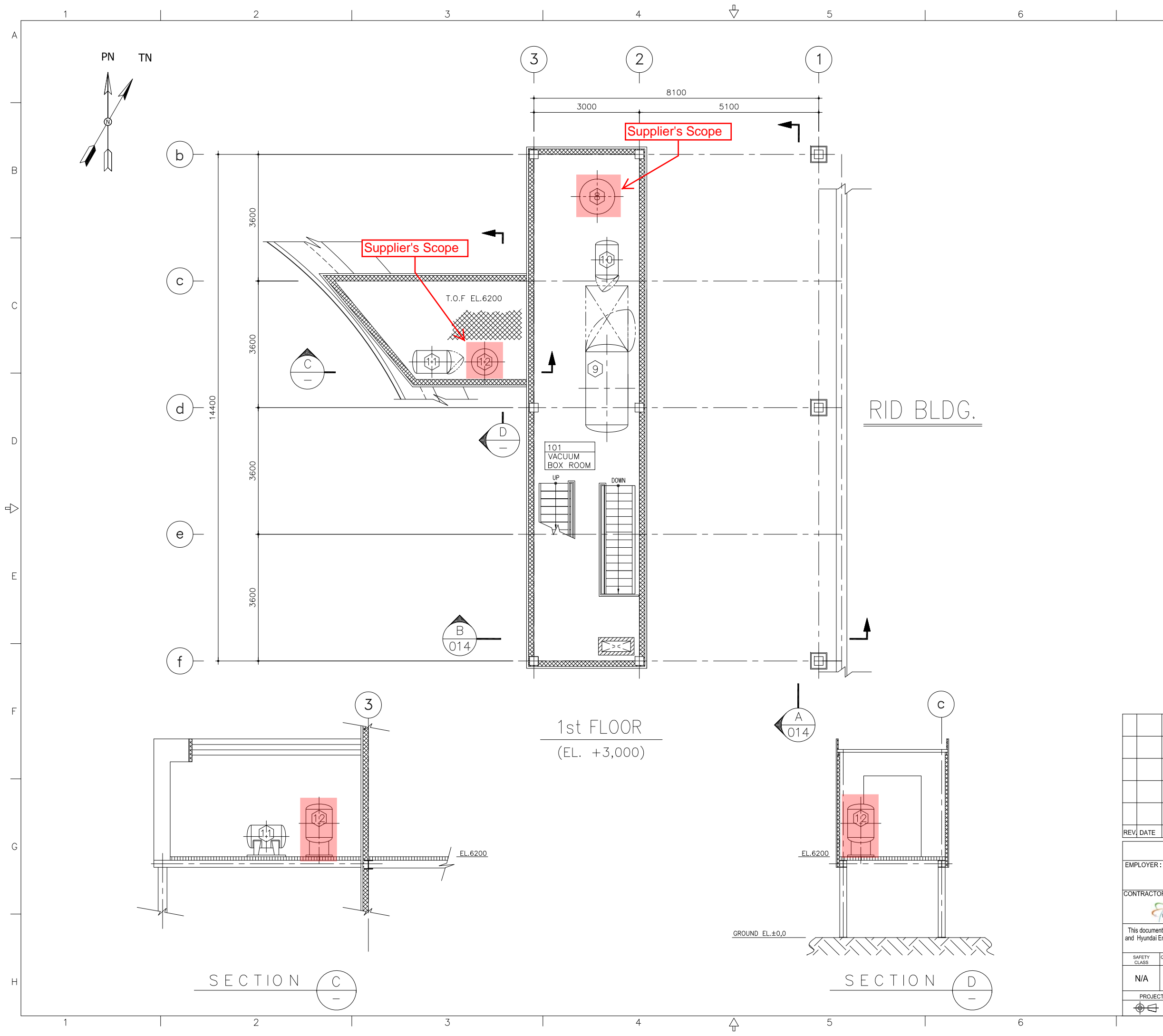


NO.	EQUIPMENT TITLE	Q'TY	REMARK
①	HYDROGEN BUFFER TANK	1	HYD-TK01
②	HYDROGEN STORAGE CABINET	1	HYD-ZZ01
③	HYDROGEN BOX	1	HYD-TK02
④	HELIUM BUFFER TANK	1	HRS-TK02
⑤	PORTABLE VACUUM PUMP UNIT AREA	TBD	GBS-ZZ02



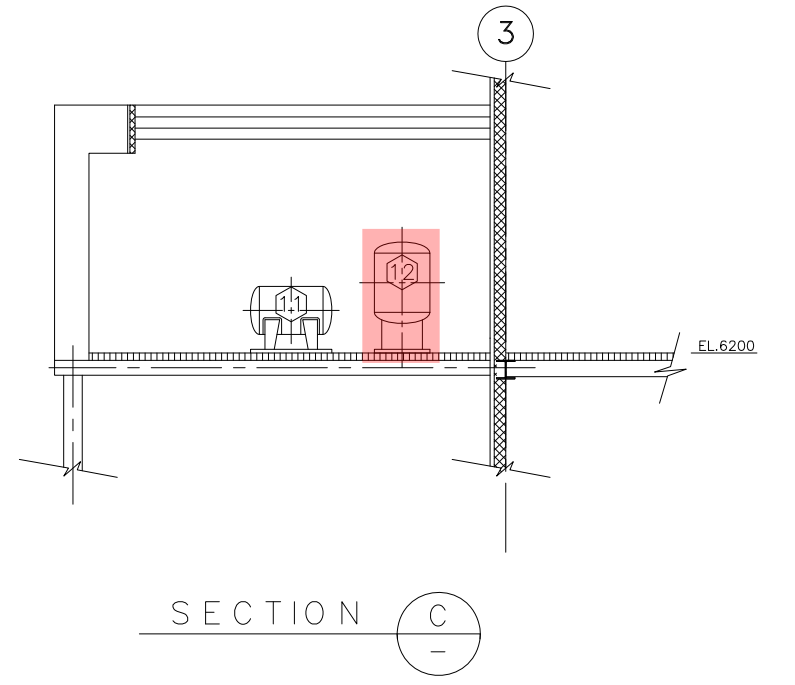
FOR INFORMATION

REV	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By
OYSTER PROJECT							
EMPLOYER :							
CONTRACTOR :							
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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.	OYSTER - EP- GPI - AR - 001				
N/A	-	TITLE	GENERAL ARRANGEMENT - GROUND FLOOR (RCB)				
PROJECTION	DRAWING NO.	OYSTER - EP- GPI - AR - 001	REV	REV	SHEET	SCALE	
			-	A1	1/1	1/40	

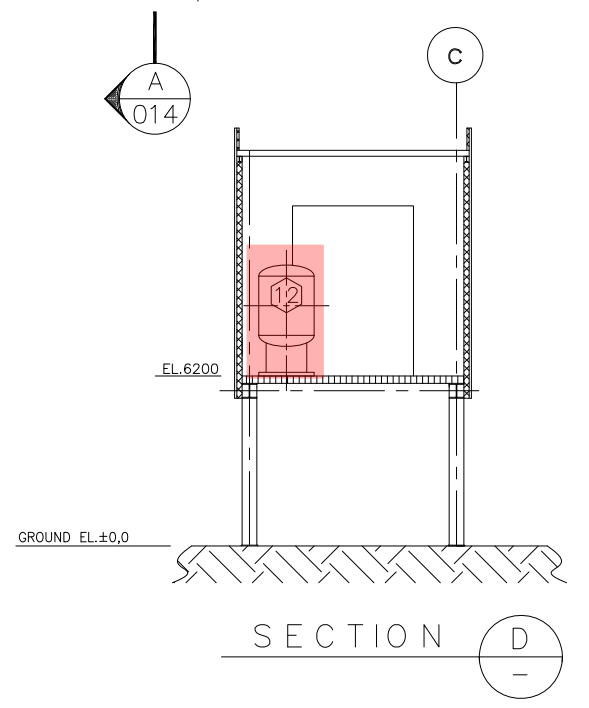


NO.	EQUIPMENT TITLE	Q'TY	REMARK
8	N2 BUFFER TANK	1	GBS-TK01
9	VACUUM BOX	1	VAS-TK02
10	VACUUM VALVE BOX	1	VAS-TK01
11	CONTAINMENT ISOLATION VALVE BOX	1	VAS-TK06
12	INSTRUMENT AIR BUFFER TANK	TBD	HRS-TK03

FOR INFORMATION

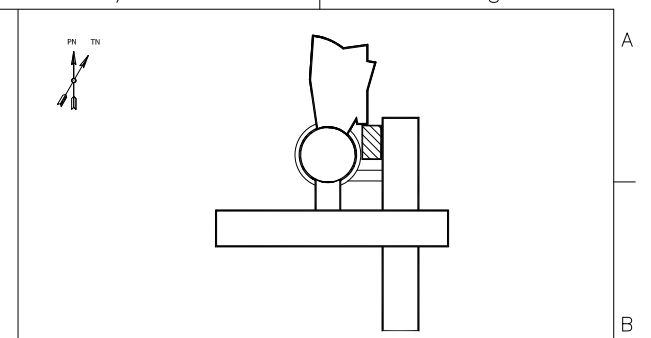
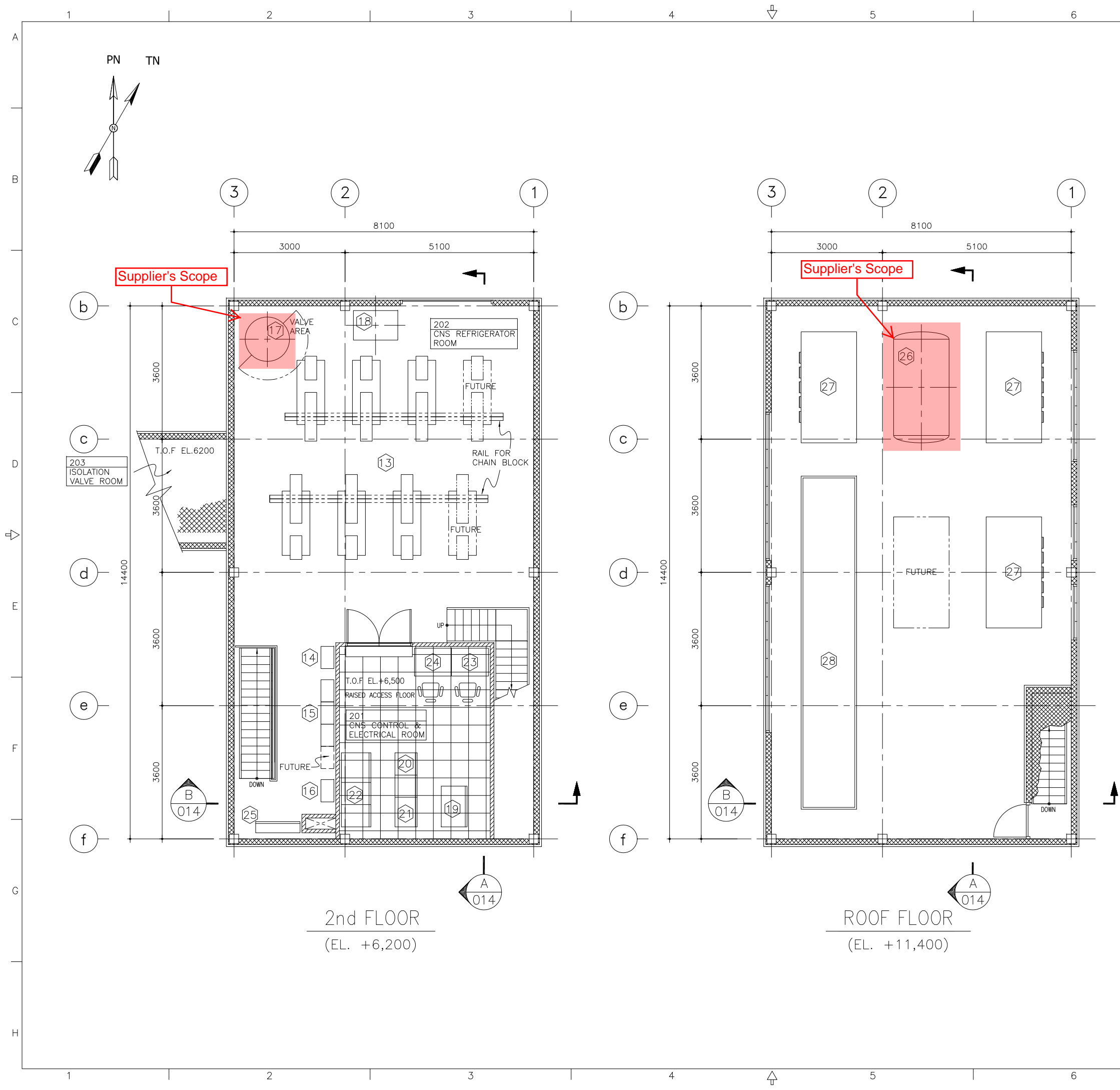


1st FLOOR
(EL. +3,000)



SECTION D

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By
OYSTER PROJECT							
EMPLOYER :							
CONTRACTOR :							
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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.		OYSTER - EP- GPI - AR - 012			
N/A	-	TITLE		GENERAL ARRANGEMENT - 1st FLOOR (CUB)			
PROJECTION	DRAWING NO.	OYSTER - EP- GPI - AR - 012		REV.	BYE	SHEET	SCALE
First Angle				-	A1	1/1	1/50

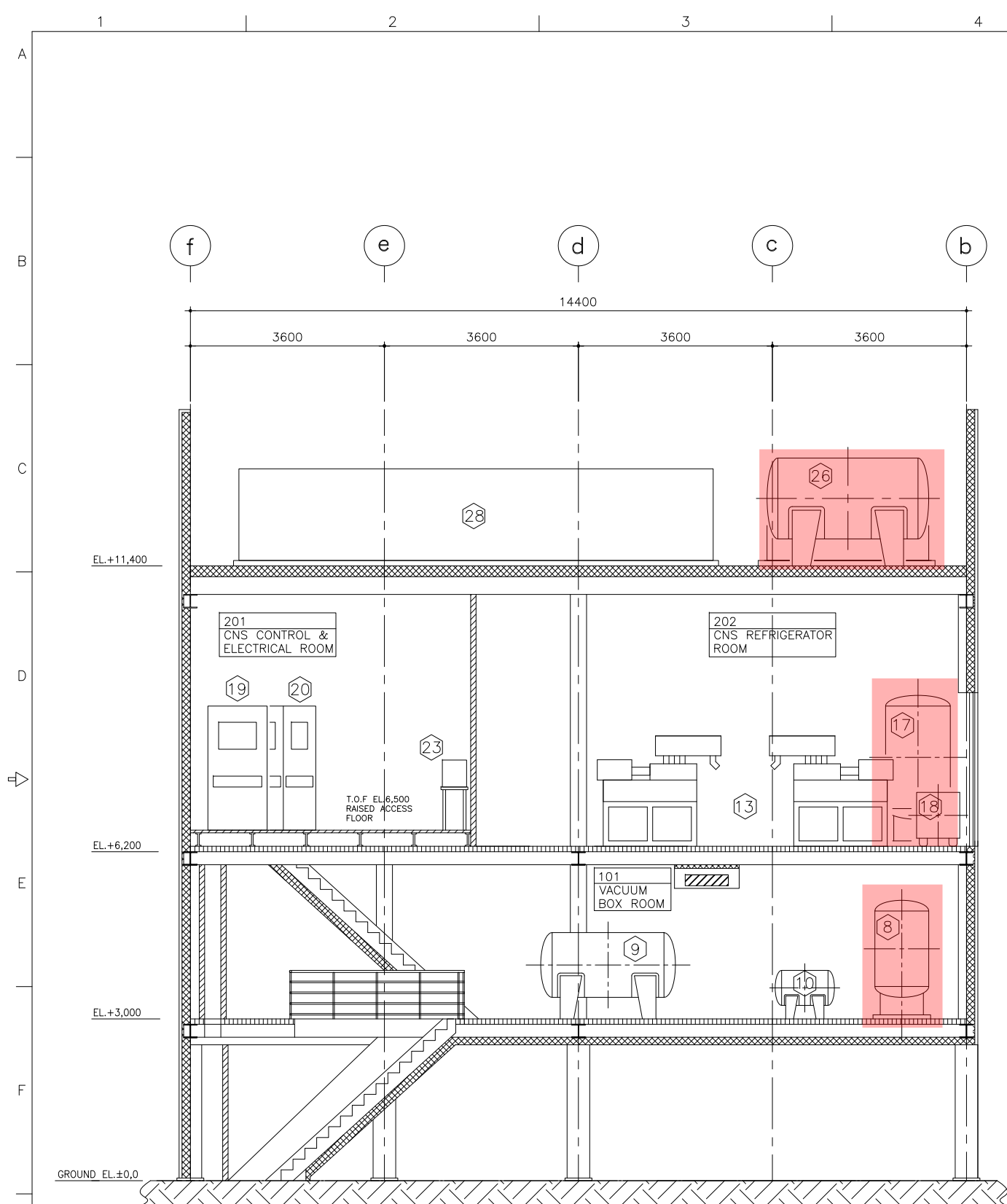


KEY PLAN

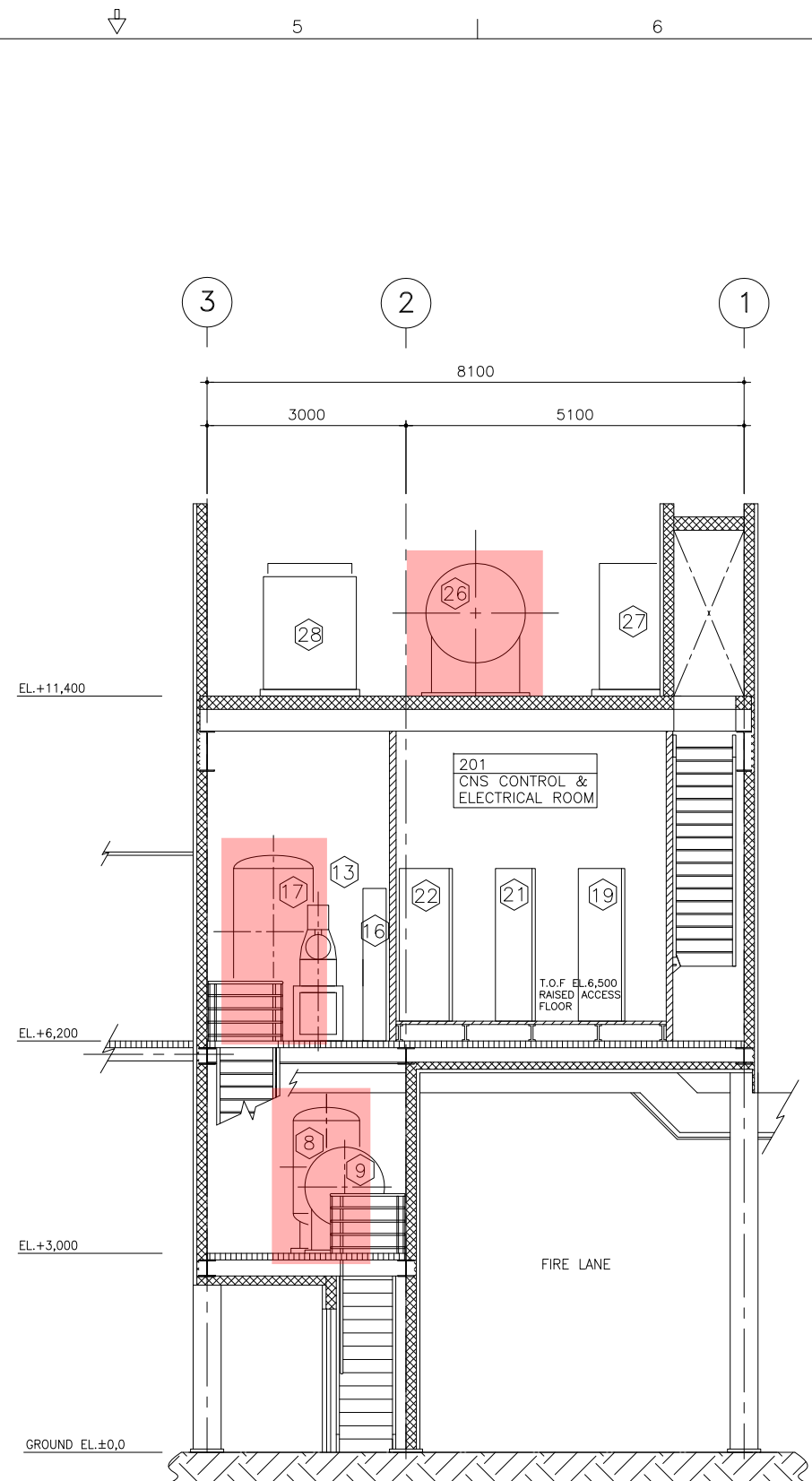
NO.	EQUIPMENT TITLE	Q'TY	REMARK
13	REFRIGERATION UNIT	6	HRS-RF01 ~ RF06
14	HRS MAIN CONTROL CABINET	TBD	HRS-CS01
15	CRYOGENERATOR CONTROL CABINETS	TBD	HRS-LP01 ~ LP06
16	HRS ELECTRICAL DISTRIBUTION PANEL	2	HRS-DP01
17	DISCHARGED GAS COLLECTION TANK	1	VAS-TK05
18	PORTABLE VACUUM PUMP UNIT	1	GBS-ZZ02
19	CNS CONTROL SYSTEM CABINET	1	CCS-CS01
20	400V DISTRIBUTION PANEL	1	ELE-DP01
21	MOTOR CONTROL CENTER	2	ELE-DP02
22	UPS PANEL	3	ELE-DP03
23	LINE PRINTER	1	CCS-PR01
24	CNS CONTROL SYSTEM OPERATOR WORKSTATION	1	CCS-OW01
25	HVAC CONTROL PANEL	1	HOLD
26	HELIUM BUFFER TANK	1	HRS-TK01
27	CHILLER UNIT	3	HRS-ZZ01 ~ ZZ03
28	AIR HANDLING UNIT	1	HOLD

FOR INFORMATION

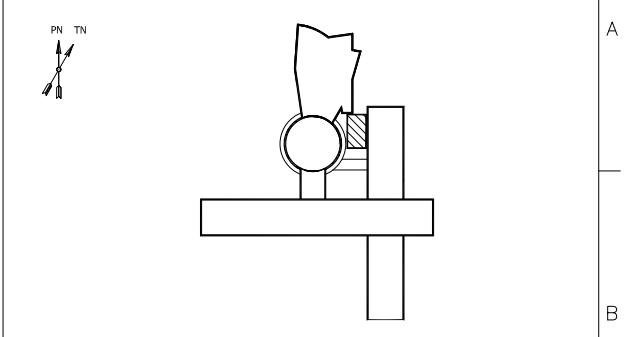
REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By
OYSTER PROJECT							
EMPLOYER:							
CONTRACTOR:							
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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.	OYSTER - EP- GPI - AR - 013				
N/A	-	TITLE	GENERAL ARRANGEMENT - 2nd & ROOF FLOOR (CUB)				
PROJECTION	DRAWING NO.	OYSTER - EP- GPI - AR - 013		REV.	BYE	SHEET	SCALE
				-	A1	1/1	1/50



SECTION A
011~013



SECTION B
011~013



KEY PLAN

NO.	EQUIPMENT TITLE	Q'TY	REMARK
8	N2 BUFFER TANK	1	GBS-TK01
9	VACUUM BOX	1	VAS-TK02
10	VACUUM VALVE BOX	1	VAS-TK01
13	REFRIGERATION UNIT	6	HRS-RF01 ~ RF06
16	HRS ELECTRICAL DISTRIBUTION PANEL	2	HRS-DP01
17	DISCHARGED GAS COLLECTION TANK	1	VAS-TK05
18	PORTABLE VACUUM PUMP UNIT	1	GBS-ZZ02
19	CNS CONTROL SYSTEM CABINET	1	CCS-CS01
20	400V DISTRIBUTION PANEL	1	ELE-DP01
21	MOTOR CONTROL CENTER	2	ELE-DP02
22	UPS PANEL	3	ELE-DP03
23	LINE PRINTER	1	CCS-PR01
24	CNS CONTROL SYSTEM OPERATOR WORKSTATION	1	CCS-OW01
25	HVAC CONTROL PANEL	1	HOLD
26	HELIUM BUFFER TANK	1	HRS-TK01
27	CHILLER UNIT	3	HRS-ZZ01 ~ ZZ03
28	AIR HANDLING UNIT	1	HOLD

FOR INFORMATION

REV.	DATE	DESCRIPTION	Drawn By	Designed By	Independent Reviewer	Reviewed By	Approved By

OYSTER PROJECT

EMPLOYER:

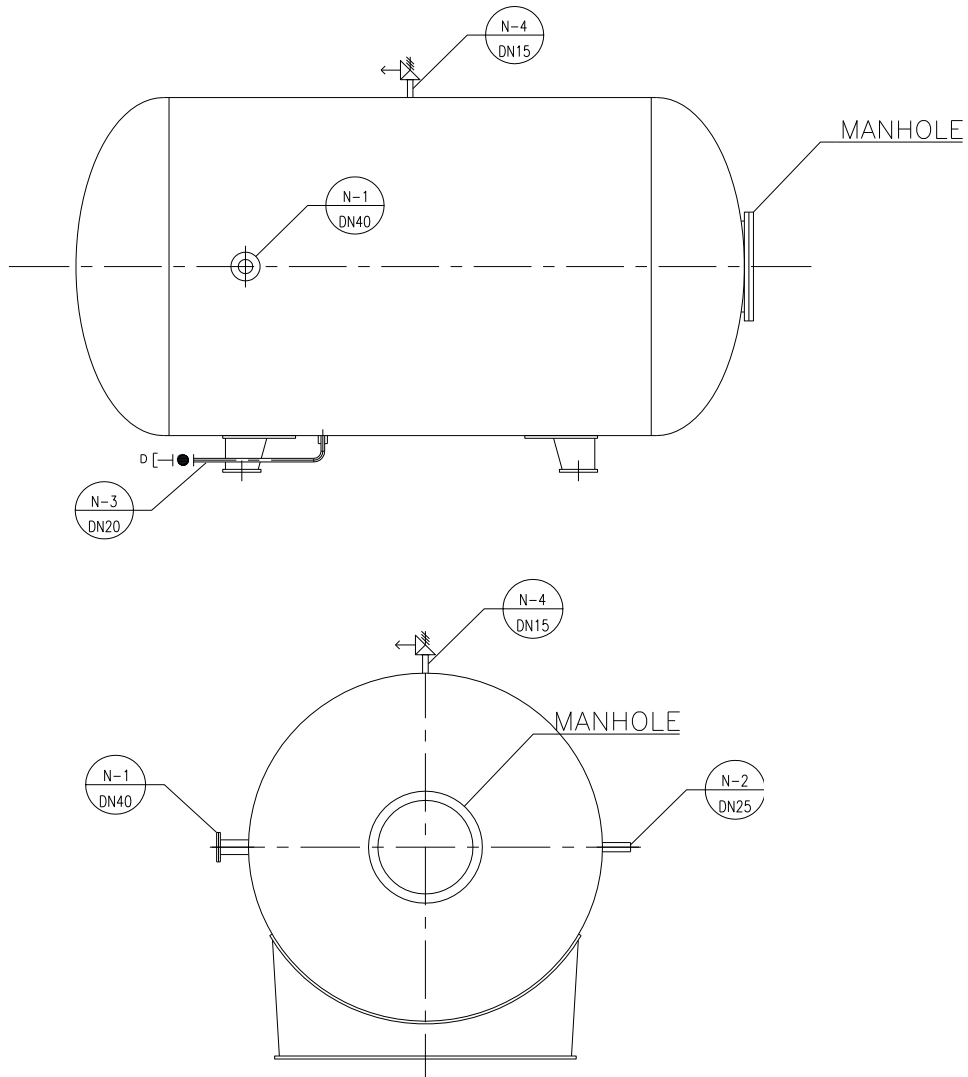
CONTRACTOR:

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SAFETY CLASS	QUALITY CLASS	ASSEMBLY DRAWING NO.	OYSTER - EP- GPI - AR - 014
N/A	-	TITLE	GENERAL ARRANGEMENT - SECTIONS (CUB)
PROJECTION	DRAWING NO.	OYSTER - EP- GPI - AR - 014	REV. SHEET SCALE
			- A1 1/1 1/50




TECHNICAL DATA SHEET FOR TANK			
PROJECT	OYSTER		EQUIPMENT NO.
CLIENT	RID (Reactor Institute Delft)		HRS-TK01
MANUFACTURER			TOTAL NO. REQ'D 1
			LOCATION Roof of the CNS utility building (outdoor)
DESIGN CONDITION	1	Type	Horizontal, Cylindrical
	2	Service Fluid	Helium Gas
	3	Capacity	2.0 m ³
	4	Design Pressure (Min/Max)	1x10 ⁻⁸ / 3000 kPa(a)
	5	Design Temperature	60 °C
	6	Operating Pressure	2000 ~ 2700 kPa(a)
	7	Operating Temperature	AMB °C
	8	Test Pressure	kPa(a)
	9	Code and Standards	ASME VIII, Div.1
	10		
SIZE OF VESSEL	11		
	12	Outside Diameter	mm
	13	Height	mm
	14	Shell Thickness	mm
	15	Head Type / Thickness	mm
	16	Insulation Thickness	N/A mm
	17	Manhole Required	mm
	18		
MATERIAL SPECIFICATIONS	19		
	20	Type	
	21	Shell	Stainless Steel
	22	Internals	Stainless Steel
	23	Support	Stainless Steel
	24	Corrosion Allowance	
	25	Radiography	
	26	Type of Inside Protective Coating	
27	Type of Outside Protective Coating		
28			
NOZZLE DATA	29	N-1 Helium Gas Inlet/Outlet	DN40(1 1/2") ASME Flange 300# RF
	30	N-2 Connection for portable vacuum pump unit	ASME B31.1 DN25(1") Pipe Sch.40S
	31	N-3 Drain Line with Valve	ASME B31.1 DN20(3/4") Pipe Sch.40S
	32	N-4 Safety Valve and Connection	DN15(1/2") ASME Flange 300# RF
	33		
	34		
	35		
	36		
CONSTRUCTON INFORMATIONS	37	WEIGHT	
	38	- Net Weight(Vessel Only)	
	39	- Flooded	
	40		
	41		
ACCESSORIES & SPECIAL REQ'D	42	Tank Ground Pad	YES
	43	Drain Valve	YES
	44	Hand / Man Hole	YES
	45	Safety Valve	YES
	46		
NOTES : 1. The Seller shall fill in all blanks above, if not applicable "N/A"			
PROJECT	OYSTER		SPEC. NO.
EQUIPMENT	HELIUM BUFFER TANK		OYSTER-EM-GME-KS-A01
			JOB. NO.
			SHEET NO.
			1 OF 2
			REV.P0

TECHNICAL DATA SHEET FOR TANK			
PROJECT	OYSTER	EQUIPMENT NO.	HRS-TK01
CLIENT	<u>RID (Reactor Institute Delft)</u>	TOTAL NO. REQ'D	<u>1</u>
MANUFACTURER	_____	LOCATION	<u>Roof of the CNS utility building (outdoor)</u>



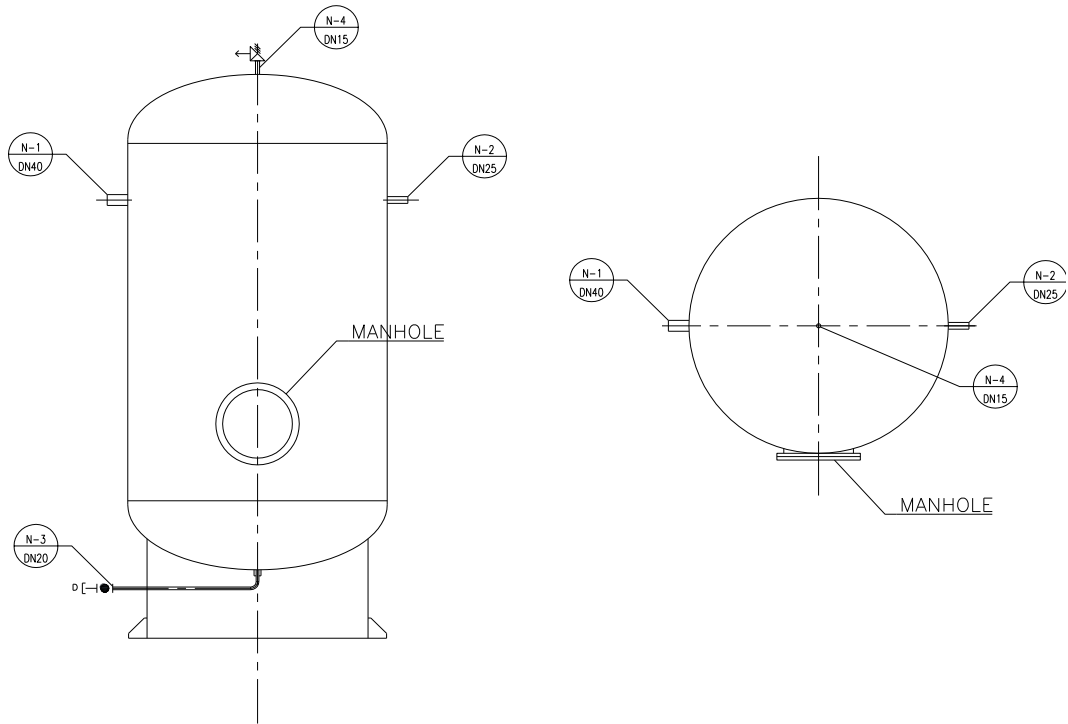
Nozzel locations are schematic only. Final arrangement shall be marked on vendor's drawings.

PROJECT	OYSTER	SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	HELIUM BUFFER TANK	JOB. NO.	
Korea Atomic Energy Research Institute HYUNDAI ENGINEERING & CONSTRUCTION HYUNDAI ENGINEERING CO., LTD.		SHEET NO.	2 OF 2
			REV.P0

TECHNICAL DATA SHEET FOR TANK			
PROJECT	OYSTER		EQUIPMENT NO.
CLIENT	RID (Reactor Institute Delft)		TOTAL NO. REQ'D
MANUFACTURER			LOCATION
			HRS-TK02
			1
			Reactor hall (indoor)
DESIGN CONDITION	1	Type	Vertical, Cylindrical
	2	Service Fluid	Helium Gas
	3	Capacity	2.3 m ³
	4	Design Pressure (Min/Max)	1x10 ⁻⁸ / 3000 kPa(a)
	5	Design Temperature	60 °C
	6	Operating Pressure	2000 ~ 2700 kPa(a)
	7	Operating Temperature	AMB °C
	8	Test Pressure	kPa(a)
	9	Code and Standards	ASME VIII, Div.1
	10		
SIZE OF VESSEL	11		
	12	Outside Diameter	mm
	13	Height	mm
	14	Shell Thickness	mm
	15	Head Type / Thickness	mm
	16	Insulation Thickness	N/A mm
	17	Manhole Required	mm
	18		
MATERIAL SPECIFICATIONS	19		
	20	Type	
	21	Shell	Stainless Steel
	22	Internals	Stainless Steel
	23	Support	Stainless Steel
	24	Corrosion Allowance	
	25	Radiography	
	26	Type of Inside Protective Coating	
	27	Type of Outside Protective Coating	
	28		
NOZZLE DATA	29	N-1 Helium Gas Inlet/Outlet	ASME B31.1 DN40(1 1/2") Pipe Sch.40S
	30	N-2 Connection for portable vacuum pump unit	ASME B31.1 DN25(1") Pipe Sch.40S
	31	N-3 Drain Line with Valve	ASME B31.1 DN20(3/4") Pipe Sch.40S
	32	N-4 Safety Valve and Connection	DN15(1/2") ASME Flange 300# RF
	33		
	34		
	35		
	36		
CONSTRUCTON INFORMATIONS	37	WEIGHT	
	38	- Net Weight(Vessel Only)	
	39	- Flooded	
	40		
	41		
ACCESSORIES & SPECIAL REQ'D	42	Tank Ground Pad	YES
	43	Drain Valve	YES
	44	Hand / Man Hole	YES
	45	Safety Valve	YES
	46		
NOTES : 1. The Seller shall fill in all blanks above, if not applicable "N/A"			
PROJECT	OYSTER		SPEC. NO.
EQUIPMENT	HELIUM BUFFER TANK		JOB. NO.
  		SHEET NO.	1 OF 2
			REV.P0




TECHNICAL DATA SHEET FOR TANK

PROJECT	OYSTER	EQUIPMENT NO.	HRS-TK02
CLIENT	RID (Reactor Institute Delft)	TOTAL NO. REQ'D	1
MANUFACTURER		LOCATION	Reactor hall (indoor)



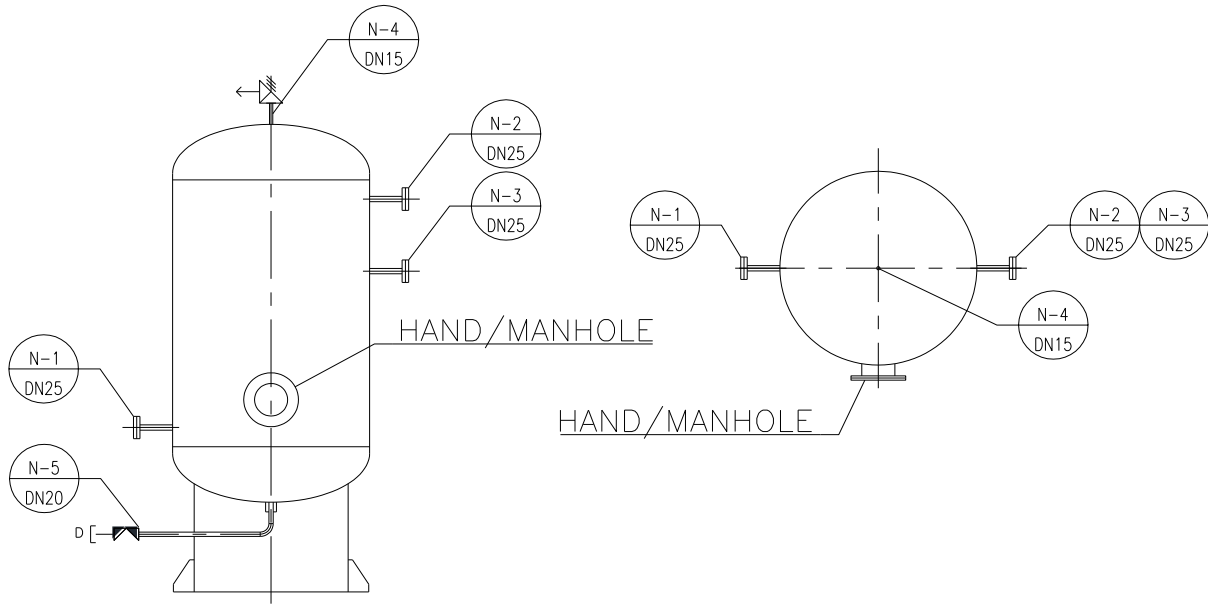
Nozzel locations are schematic only. Final arrangement shall be marked on vendor's drawings.

PROJECT	OYSTER	SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	HELIUM BUFFER TANK	JOB. NO.	
		SHEET NO.	2 OF 2
			REV.P0

TECHNICAL DATA SHEET FOR TANK			
PROJECT	OYSTER		EQUIPMENT NO.
CLIENT	RID (Reactor Institute Delft)		TOTAL NO. REQ'D
MANUFACTURER			LOCATION
			HRS-TK03
			1
			CNS utility building (indoor)
DESIGN CONDITION	1	Type	Vertical, Cylindrical
	2	Service Fluid	Instrument Air
	3	Capacity	0.3 m ³
	4	Design Pressure(Min/Max)	1100 kPa(a)
	5	Design Temperature	80 °C
	6	Operating Pressure	600 ~ 800 kPa(a)
	7	Operating Temperature	AMB °C
	8	Test Pressure	By Codes & Standard kPa(a)
	9	Code and Standards	PED or ASME VIII, Div.1
SIZE OF VESSEL	10		
	11	Outside Diameter	mm
	12	Height	mm
	13	Shell Thickness	mm
	14	Head Type / Thickness	mm
	15	Insulation Thickness	mm
	16	Manhole Required	mm
MATERIAL SPECIFICATIONS	18	Type	
	19	Shell	Stainless Steel
	20	Internals	Stainless Steel
	21	Support	Stainless Steel
	22	Corrosion Allowance	
	23	Radiography	
	24	Type of Inside Protective Coating	
	25	Type of Outside Protective Coating	
NOZZLE DATA	27	N-1 Instrument air Inlet	DN25(1") ASME Flange 150# RF
	28	N-2 Instrument air Outlet	DN25(1") ASME Flange 150# RF
	29	N-3 Instrument air Outlet	DN25(1") ASME Flange 150# RF
	30	N-4 Safety Valve and Connection	DN15(1/2") ASME Flange 150# RF
	31	N-5 Drain Line with Valve	DN20(3/4") Pipe Sch. 40S SW
	32		
	33		
	34		
	35		
	36		
CONSTRUCTON INFORMATIONS	38	WEIGHT	
	39	- Net Weight(Vessel Only)	
	40	- Flooded	
	41		
	42		
ACCESSORIES & SPECIAL REQ'D	43	Tank Ground Pad	YES
	44	Drain Valve	YES
	45	Hand / Man Hole,	If required
	46	Safety Valve	YES
	47	Instrument Isolation Valve	NO
NOTES : 1. The Seller shall fill in all blanks above, if not applicable "N/A"			
PROJECT	OYSTER		SPEC. NO.
EQUIPMENT	INSTRUMENT AIR BUFFER TANK		JOB. NO.
  		SHEET NO.	1 OF 2
			REV.P0




TECHNICAL DATA SHEET FOR TANK

PROJECT	OYSTER	EQUIPMENT NO.	HRS-TK03
CLIENT	RID (Reactor Institute Delft)	TOTAL NO. REQ'D	1
MANUFACTURER		LOCATION	CNS utility building (indoor)



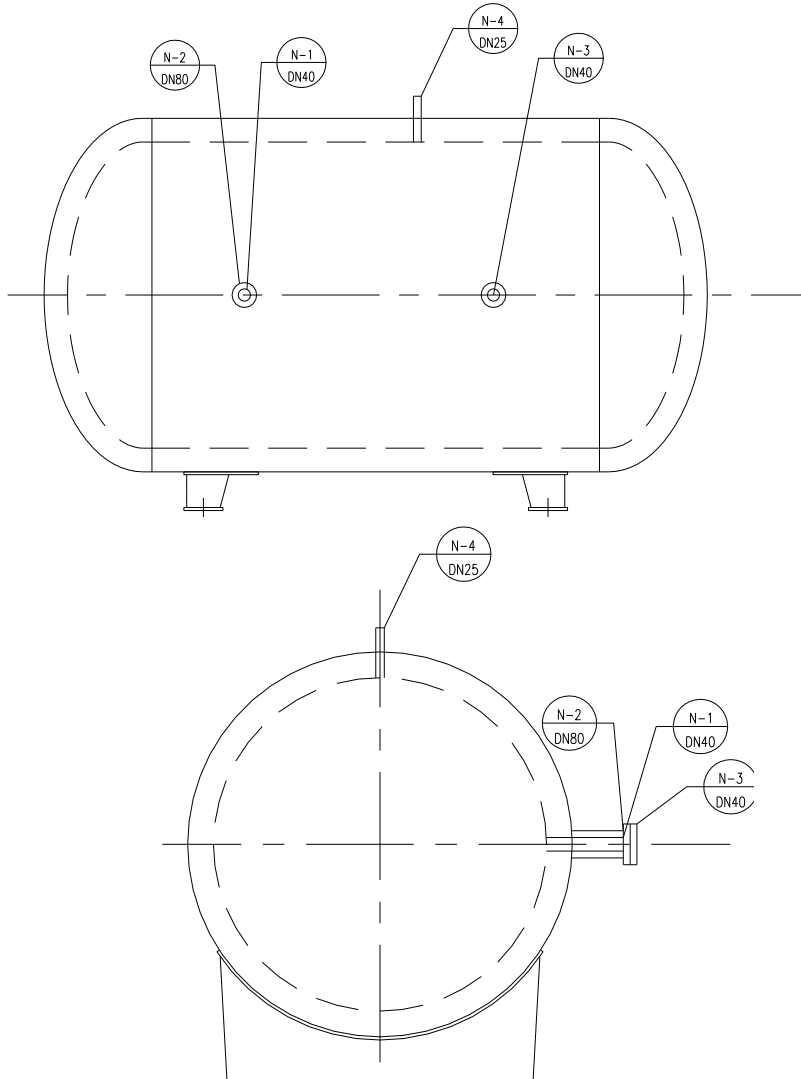
Nozzel locations are schematic only. Final arrangement shall be marked on vendor's drawings.

PROJECT	OYSTER	SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	INSTRUMENT AIR BUFFER TANK	JOB. NO.	
		SHEET NO.	2 OF 2
			REV.P0

TECHNICAL DATA SHEET FOR TANK				
PROJECT CLIENT MANUFACTURER	OYSTER		EQUIPMENT NO. TOTAL NO. REQ'D LOCATION	HYD-TK01
	RID (Reactor Institute Delft)			1
				Reactor Hall (indoor)
DESIGN CONDITION	1	Type		Horizontal, Cylindrical, Double walled
	2	Service Fluid Inner Vessel		Hydrogen Gas
	3	Outer Vessel		Nitrogen Gas
	4	Capacity Inner Vessel (actual volume)	Exactly	1.75 m ³
	5	Outer Vessel		m ³ (< 2.0)
	6	Design Pressure Inner Vessel(Min/Max)	1x10 ⁻⁸ /	600 kPa(a)
	7	Outer Vessel(Min/Max)		1x10 ⁻⁸ / 3000 kPa(a)
	8	Design Temperature		80 °C
	9	Operating Pressure Inner Vessel	200 ~ 400 kPa(a)	
	10	Outer Vessel		120 kPa(a)
	11	Operating Temperature		AMB °C
	12	Test Pressure		kPa(a)
	13	Code and Standards		ASME VIII, Div.1
	SIZE OF VESSEL	15		
16		Outside Diameter(Inner/Outer)		/ mm
17		Height(Inner/Outer)		/ mm
18		Shell Thickness (Inner/Outer)		/ mm
19		Head Type-Thickness(Inner/Outer)		/ mm
20		Insulation Thickness		N/A mm
21		Manhole Required		N/A mm
MATERIAL SPECIFICATIONS	22			
	23	Type		
	24	Shell (Inner/outer)		Stainless Steel / Stainless Steel
	25	Internals		Stainless Steel
	26	Support		Stainless Steel
	27	Corrosion Allowance		
	28	Radiography		
	29	Type of Inside Protective Coating		Electro-polishing (Inner Vessel)
	30	Type of Outside Protective Coating		
	31			
NOZZLE DATA	32			
	33	N-1	Hydrogen Line(Inner Pipe)	ASME B31.1 DN40(1 1/2") Pipe Sch.40S
	34	N-2	Hydrogen Line(Outer Pipe)	ASME B31.1 DN80(3") Pipe Sch. 10S
	35	N-3	Blanketing Gas Inlet	DN40(1 1/2") ASME Flange 300# RF
	36	N-4	Temperature Instrument Connection	DN25(1") HALF COUPLING SW 3000#
	37		Drain	N/A
	38			
	39			
	40			
	41			
CONSTRUCTON INFORMATIONS	42			
	43			
	44	WEIGHT (Inner/Outer)		
	45	- Net Weight(Vessel Only)		
	46	- Flooded		
47	WEIGHT (Total)			
48				
49				
ACCESSORIES & SPECIAL REQ'D	50	Tank Ground Pad		YES
	51	Drain Valve		N/A
	52	Hand / Man Hole,		N/A
	53			
	54			
NOTES : 1. The Seller shall fill in all blanks above, if not applicable "N/A"				
PROJECT	OYSTER		SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	HYDROGEN BUFFER TANK		JOB. NO.	
 Korea Atomic Energy Research Institute  HYUNDAI ENGINEERING & CONSTRUCTION  HYUNDAI ENGINEERING CO., LTD.			SHEET NO.	1 OF 2
				REV.P0




TECHNICAL DATA SHEET FOR TANK

PROJECT	OYSTER	EQUIPMENT NO.	HYD-TK01
CLIENT	RID (Reactor Institute Delft)	TOTAL NO. REQ'D	1
MANUFACTURER		LOCATION	Reactor Hall (indoor)

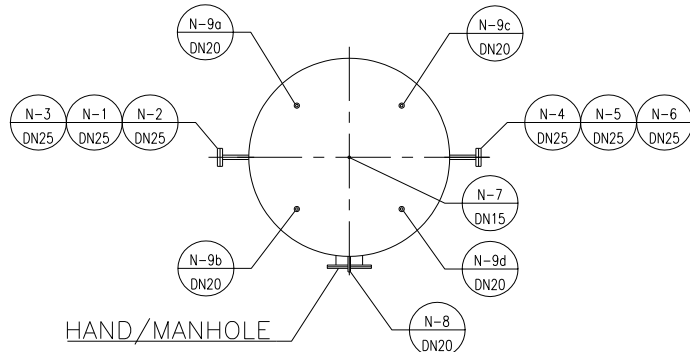
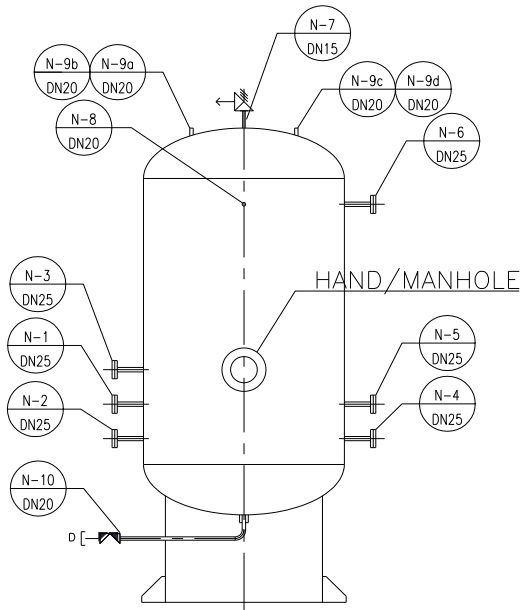


Nozzel locations are schematic only. Final arrangement shall be marked on vendor's drawings.

PROJECT	OYSTER	SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	HYDROGEN BUFFER TANK	JOB. NO.	
		SHEET NO.	2 OF 2
			REV.P0




TECHNICAL DATA SHEET FOR TANK				
PROJECT		OYSTER		EQUIPMENT NO.
CLIENT		RID (Reactor Institute Delft)		TOTAL NO. REQ'D
MANUFACTURER				LOCATION
				1
				CNS utility building (indoor)
DESIGN CONDITION	1	Type		Vertical, Cylindrical
	2	Service Fluid		Nitrogen / Hydrogen / Helium Gas
	3	Capacity		2 m ³
	4	Design Pressure (Min/Max)		1x10 ⁻⁸ / 600 kPa(a)
	5	Design Temperature		80 °C
	6	Operating Pressure		110 ~ 400 kPa(a)
	7	Operating Temperature		AMB °C
	8	Test Pressure		kPa(a)
	9	Code and Standards		ASME VIII, Div.1
SIZE OF VESSEL	10			
	11	Outside Diameter		mm
	12	Height		mm
	13	Shell Thickness		mm
	14	Head Type / Thickness		mm
	15	Insulation Thickness		N/A mm
	16	Manhole Required		mm
MATERIAL SPECIFICATIONS	18	Type		
	19	Shell		Stainless Steel
	20	Internals		Stainless Steel
	21	Support		Stainless Steel
	22	Corrosion Allowance		
	23	Radiography		
	24	Type of Inside Protective Coating		
	25	Type of Outside Protective Coating		
NOZZLE DATA	27	N-1	Inlet - Vacuum System	DN25(1") ASME Flange 150# RF
	28	N-2	Inlet - Gas Blanketing System (fill-up)	DN25(1") ASME Flange 150# RF
	29	N-3	Inlet - Gas Blanketing System (dilution)	DN25(1") ASME Flange 150# RF
	30	N-4	Inlet - Portable Vacuum Pump Unit	DN25(1") ASME Flange 150# RF
	31	N-5	Inlet - Hydrogen System (vacuum pump)	DN25(1") ASME Flange 150# RF
	32	N-6	Oulet	DN25(1") ASME Flange 150# RF
	33	N-7	Safety Valve and Connection	DN15(1/2") ASME Flange 300# RF
	34	N-8	Pressure Instrument Connection with Valve	DN20(3/4") Pipe Sch. 40S SW
	35	N-9	Hydrogen Detector Connection with Valve	DN20(3/4") Pipe Sch. 40S SW
	36	N-10	Drain Line with Valve	DN20(3/4") Pipe Sch. 40S SW
CONSTRUCTON INFORMATIONS	37	WEIGHT		
	38	- Net Weight(Vessel Only)		
	39	- Flooded		
	40			
	41			
ACCESSORIES & SPECIAL REQ'D	42	Tank Ground Pad		YES
	43	Drain Valve		YES
	44	Hand / Man Hole		YES
	45	Safety Valve		YES
	46	Instrument Isolation Valve		YES
NOTES : 1. The Seller shall fill in all blanks above, if not applicable "N/A"				
PROJECT	OYSTER			SPEC. NO.
EQUIPMENT	DISCHARGED GAS COLLECTION TANK			JOB. NO.
  		SHEET NO.	1 OF 2	REV.P0

TECHNICAL DATA SHEET FOR TANK			
PROJECT	OYSTER	EQUIPMENT NO.	VAS-TK05
CLIENT	<u>RID (Reactor Institute Delft)</u>	TOTAL NO. REQ'D	<u>1</u>
MANUFACTURER	_____	LOCATION	<u>CNS utility building (indoor)</u>



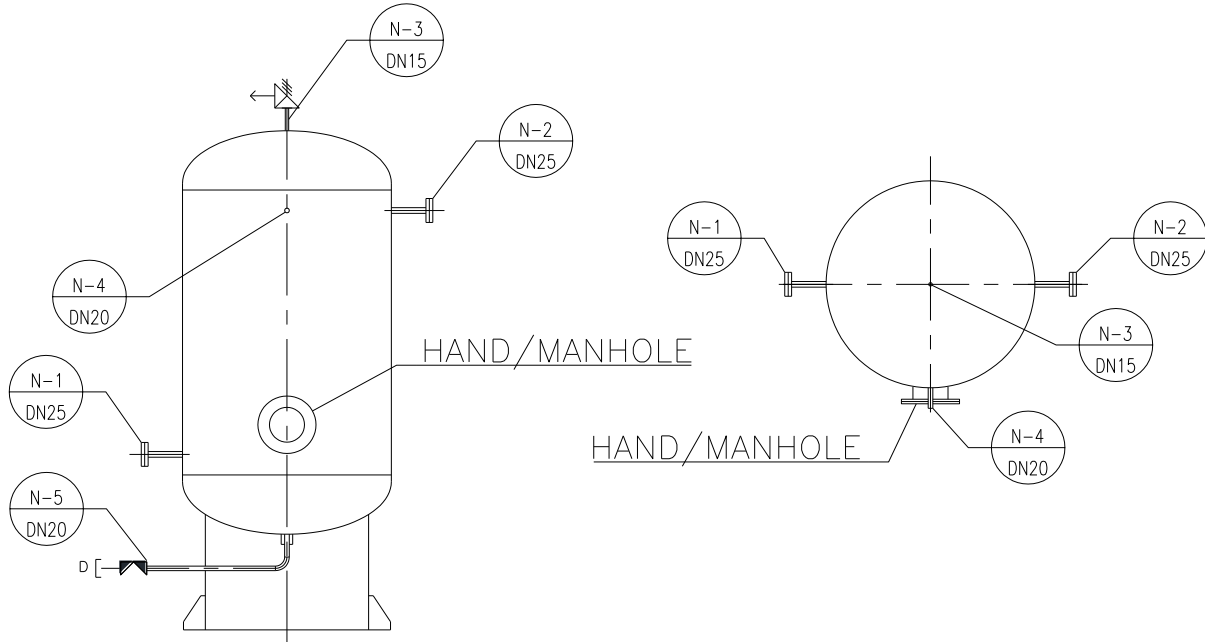
Nozzel locations are schematic only. Final arrangement shall be marked on vendor's drawings.

PROJECT	OYSTER	SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	DISCHARGED GAS COLLECTION TANK	JOB. NO.	
Korea Atomic Energy Research Institute HYUNDAI ENGINEERING & CONSTRUCTION HYUNDAI ENGINEERING CO., LTD.		SHEET NO.	2 OF 2
			REV.P0

TECHNICAL DATA SHEET FOR TANK				
PROJECT	OYSTER		EQUIPMENT NO.	GBS-TK01
CLIENT	RID (Reactor Institute Delft)		TOTAL NO. REQ'D	1
MANUFACTURER			LOCATION	CNS utility building (indoor)
DESIGN CONDITION	1	Type		Vertical, Cylindrical
	2	Service Fluid		Nitrogen Gas
	3	Capacity		1 m ³
	4	Design Pressure(Min/Max)		1x10 ⁻⁸ / 1100 kPa(a)
	5	Design Temperature		80 °C
	6	Operating Pressure		800 ~ 900 kPa(a)
	7	Operating Temperature		AMB °C
	8	Test Pressure		kPa(a)
	9	Code and Standards		ASME VIII, Div.1
SIZE OF VESSEL	10			
	11	Outside Diameter		mm
	12	Height		mm
	13	Shell Thickness		mm
	14	Head Type / Thickness		mm
	15	Insulation Thickness		mm
	16	Manhole Required		mm
	17			
MATERIAL SPECIFICATIONS	18	Type		
	19	Shell		Stainless Steel
	20	Internals		Stainless Steel
	21	Support		Stainless Steel
	22	Corrosion Allowance		
	23	Radiography		
	24	Type of Inside Protective Coating		
	25	Type of Outside Protective Coating		
	26			
NOZZLE DATA	27	N-1	Nitrogen Gas inlet	DN25(1") ASME Flange 150# RF
	28	N-2	Nitrogen Gas Outlet	DN25(1") ASME Flange 150# RF
	29	N-3	Safety Valve and Connection	DN15(1/2") ASME Flange 150# RF
	30	N-4	Pressure Instrument Connection with Valve	DN20(3/4") Pipe Sch. 40S SW
	31	N-5	Drain Line with Valve	DN20(3/4") Pipe Sch. 40S SW
	32			
	33			
	34			
	35			
	36			
CONSTRUCTON INFORMATIONS	37	WEIGHT		
	38	- Net Weight(Vessel Only)		
	39	- Flooded		
	40			
	41			
ACCESSORIES & SPECIAL REQ'D	42	Tank Ground Pad		YES
	43	Drain Valve		YES
	44	Hand / Man Hole,		If required
	45	Safety Valve		YES
	46	Instrument Isolation Valve		YES
	NOTES : 1. The Seller shall fill in all blanks above, if not applicable "N/A"			
PROJECT	OYSTER		SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	NITROGEN BUFFER TANK		JOB. NO.	
 Korea Atomic Energy Research Institute  HYUNDAI ENGINEERING & CONSTRUCTION  HYUNDAI ENGINEERING CO., LTD.			SHEET NO.	1 OF 2
				REV.P0

TECHNICAL DATA SHEET FOR TANK

PROJECT	OYSTER	EQUIPMENT NO.	GBS-TK01
CLIENT	<u>RID (Reactor Institute Delft)</u>	TOTAL NO. REQ'D	<u>1</u>
MANUFACTURER	_____	LOCATION	<u>CNS utility building (indoor)</u>



Nozzel locations are schematic only. Final arrangement shall be marked on vendor's drawings.

PROJECT	OYSTER	SPEC. NO.	OYSTER-EM-GME-KS-A01
EQUIPMENT	NITROGEN BUFFER TANK	JOB. NO.	
		SHEET NO.	2 OF 2
			REV.P0

PRESSURE SAFETY & RELIEF VALVE DATA SHEET						SPEC. NO. OYSTER-EM-GME-KS-A01		REV. P0	
PRE'D :		CHK'D :		APP'D :		DATE :		Sheet 1 of 1	
PROJECT : OYSTER						PROJECT NO. : BQNL1401			
GENERAL	1 Tag No.		OYSTER-CU-HRS-PSV001						
	2 Quantity (set)		1						
	3 Line No.		-						
	4 Equipment Name or No.		OYSTER-CU-HRS-TK03						
	5 System		HELIUM REFRIGERATION SYSTEM						
	6 Location		Isolation Valve Room (indoor)						
	7 Code & Standard		ASME B31.1						
	8 Seismic Category		None						
	9 Quality Requirements		ISO 9001						
	10								
	11 Nozzle Type : Full / Semi		Full						
	12 Function		Safety or Relief						
	13 Type : Conventional / Bellows / Pilot		Conventional						
	14 Bonnet Type		Close						
	15 Weight [kg]		*						
	16 Helium Leak Test		Yes						
CONNECTION	17 Size		Inlet	Outlet	DN 15		DN 25		
	18 End Type		Inlet	Outlet	RF - Flanged		RF - Flanged		
	19 Rating or Thickness		Inlet	Outlet	ASME 150#		ASME 150#		
	20								
MATERIAL	21 Body		Bonnet		A182 F316		A351 CF8M		
	22 Disc		TP 316 (Stainless Steel)						
	23 Nozzle		TP 316 (Stainless Steel)						
	24 Trim		TP 316 (Stainless Steel)						
	25 Guide and Rings		TP 316 (Stainless Steel)						
	26 Spring		* (Corrosion resistant)						
	27 Bellows		*						
	28 Seal		*						
	29 Resilient Seat		No						
OPTION	30 Cap : Threaded / Bolted / Welded		Threaded						
	31 Lever : Plain or Packed		Packed						
	32 Test Gag		Yes						
	33								
FLUID DATA	34 Fluid and State		Compressed Air						
	35 Required Capacity (kg/s)								
	36 Actual Capacity (kg/s)		*						
	37 Mol. Wt. [g/mol]		Oper. Specific Gr.						
	38 Pressure [MPa(a)]		Dgn.	Oper.	Setting	1.1	0.6~0.8		1.0
	39 Temperature [°C]		Dgn.	Oper.	Relieving	60	ABM		
	40 Back Pressure [MPa]		Constant		ATM.				
	41		Variable		≡ 0				
	42		Total		ATM.				
	43 Set Pressure Tolerance		± 3 % of the Set Pressure						
	44 Blowdown Limitation		10 % of the Set Pressure						
	45 Accumulation		10 % of the Set Pressure						
	46 Ratio of Specific Heats		*						
	47 Operation Viscosity [cP]								
	48								
49									
OTHERS	50 Calculated Area [mm ²]		*						
	51 Selected Area [m ²]		*						
	52 Orifice Designation		*						
	53 Noize Level [dB]		*						
	54 Manufacturer		*						
	55 Model Number		*						
56 Reaction Force [kN]		*							
Notes : 1. Mark (*) : To be filled by the Seller.									




PRESSURE SAFETY & RELIEF VALVE DATA SHEET						SPEC. NO. OYSTER-EM-GME-KS-A01		REV. P0	
PRE'D :		CHK'D :		APP'D :		DATE :		Sheet 1 of 1	
PROJECT : OYSTER						PROJECT NO. : BQNL1401			
GENERAL	1 Tag No.		OYSTER-CU-HRS-PSV002						
	2 Quantity (set)		1						
	3 Line No.		-						
	4 Equipment Name or No.		OYSTER-CU-HRS-TK01						
	5 System		HELIUM REFRIGERATION SYSTEM						
	6 Location		CNS utility building (outdoor)						
	7 Code & Standard		ASME B31.1						
	8 Seismic Category		None						
	9 Quality Requirements		ISO 9001						
	10								
	11 Nozzle Type : Full / Semi		Full						
	12 Function		Safety or Relief						
	13 Type : Conventional / Bellows / Pilot		Conventional						
	14 Bonnet Type		Close						
	15 Weight [kg]		*						
	16 Helium Leak Test		Yes						
CONNECTION	17 Size		Inlet	Outlet	DN 15		DN 25		
	18 End Type		Inlet	Outlet	RF - Flanged		RF - Flanged		
	19 Rating or Thickness		Inlet	Outlet	ASME 150#		ASME 150#		
	20								
MATERIAL	21 Body		Bonnet		A182 F316		A351 CF8M		
	22 Disc		TP 316 (Stainless Steel)						
	23 Nozzle		TP 316 (Stainless Steel)						
	24 Trim		TP 316 (Stainless Steel)						
	25 Guide and Rings		TP 316 (Stainless Steel)						
	26 Spring		* (Corrosion resistant)						
	27 Bellows		*						
	28 Seal		*						
	29 Resilient Seat		No						
OPTION	30 Cap : Threaded / Bolted / Welded		Threaded						
	31 Lever : Plain or Packed		Packed						
	32 Test Gag		Yes						
	33								
FLUID DATA	34 Fluid and State		Helium Gas						
	35 Required Capacity (kg/s)								
	36 Actual Capacity (kg/s)		*						
	37 Mol. Wt. [g/mol]		Oper. Specific Gr.						
	38 Pressure [MPa(a)]		Dgn.	Oper.	Setting	30	20~27	[by RH]	
	39 Temperature [°C]		Dgn.	Oper.	Relieving	60	ABM		
	40 Back Pressure [MPa]		Constant		ATM.				
	41		Variable		≡ 0				
	42		Total		ATM.				
	43 Set Pressure Tolerance		± 3 % of the Set Pressure						
	44 Blowdown Limitation		10 % of the Set Pressure						
	45 Accumulation		10 % of the Set Pressure						
	46 Ratio of Specific Heats		*						
	47 Operation Viscosity [cP]								
	48								
49									
OTHERS	50 Calculated Area [mm ²]		*						
	51 Selected Area [m ²]		*						
	52 Orifice Designation		*						
	53 Noize Level [dB]		*						
	54 Manufacturer		*						
	55 Model Number		*						
56 Reaction Force [kN]		*							
Notes : 1. Mark (*) : To be filled by the Seller.									

PRESSURE SAFETY & RELIEF VALVE DATA SHEET					SPEC. NO. OYSTER-EM-GME-KS-A01		REV. P0							
PRE'D :		CHK'D :		APP'D :		DATE :		Sheet 1 of 1						
PROJECT : OYSTER					PROJECT NO. : BQNL1401									
GENERAL	1 Tag No.		OYSTER-CU-HRS-PSV003											
	2 Quantity (set)		1											
	3 Line No.		-											
	4 Equipment Name or No.		OYSTER-CU-HRS-TK02											
	5 System		HELIUM REFRIGERATION SYSTEM											
	6 Location		Reactor Hall (indoor)											
	7 Code & Standard		ASME B31.1											
	8 Seismic Category		None											
	9 Quality Requirements		ISO 9001											
	10													
	11 Nozzle Type : Full / Semi		Full											
	12 Function		Safety or Relief											
	13 Type : Conventional / Bellows / Pilot		Conventional											
	14 Bonnet Type		Close											
	15 Weight [kg]		*											
	16 Helium Leak Test		Yes											
CONNECTION	17 Size		Inlet		Outlet		DN 15		DN 25					
	18 End Type		Inlet		Outlet		RF - Flanged		RF - Flanged					
	19 Rating or Thickness		Inlet		Outlet		ASME 150#		ASME 150#					
	20													
MATERIAL	21 Body		Bonnet		A182 F316		A351 CF8M							
	22 Disc		TP 316 (Stainless Steel)											
	23 Nozzle		TP 316 (Stainless Steel)											
	24 Trim		TP 316 (Stainless Steel)											
	25 Guide and Rings		TP 316 (Stainless Steel)											
	26 Spring		* (Corrosion resistant)											
	27 Bellows		*											
	28 Seal		*											
	29 Resilient Seat		No											
OPTION	30 Cap : Threaded / Bolted / Welded		Threaded											
	31 Lever : Plain or Packed		Packed											
	32 Test Gag		Yes											
	33													
FLUID DATA	34 Fluid and State		Helium Gas											
	35 Required Capacity (kg/s)													
	36 Actual Capacity (kg/s)		*											
	37 Mol. Wt. [g/mol]		Oper. Specific Gr.											
	38 Pressure [MPa(a)]		Dgn.		Oper.		Setting		30		20~27		[by RH]	
	39 Temperature [°C]		Dgn.		Oper.		Relieving		60		ABM			
	40 Back Pressure [MPa]		Constant		ATM.									
	41		Variable		≡ 0									
	42		Total		ATM.									
	43 Set Pressure Tolerance		± 3 % of the Set Pressure											
	44 Blowdown Limitation		10 % of the Set Pressure											
	45 Accumulation		10 % of the Set Pressure											
	46 Ratio of Specific Heats		*											
	47 Operation Viscosity [cP]													
	48													
49														
OTHERS	50 Calculated Area [mm ²]		*											
	51 Selected Area [m ²]		*											
	52 Orifice Designation		*											
	53 Noize Level [dB]		*											
	54 Manufacturer		*											
	55 Model Number		*											
56 Reaction Force [kN]		*												
Notes : 1. Mark (*) : To be filled by the Seller.														




PRESSURE SAFETY & RELIEF VALVE DATA SHEET						SPEC. NO. OYSTER-EM-GME-KS-A01		REV. P0		
PRE'D :		CHK'D :		APP'D :		DATE :		Sheet 1 of 1		
PROJECT : OYSTER						PROJECT NO. : BQNL1401				
GENERAL	1 Tag No.		OYSTER-CU-VAS-PSV001							
	2 Quantity (set)		1							
	3 Line No.		-							
	4 Equipment Name or No.		OYSTER-CU-VAS-TK05							
	5 System		VACUUM SYSTEM							
	6 Location		CNS utility building (indoor)							
	7 Code & Standard		ASME B31.1							
	8 Seismic Category		None							
	9 Quality Requirements		ISO 9001							
	10									
	11 Nozzle Type : Full / Semi		Full							
	12 Function		Safety or Relief							
	13 Type : Conventional / Bellows / Pilot		Conventional							
	14 Bonnet Type		Close							
	15 Weight [kg]		*							
	16 Helium Leak Test		Yes							
CONNECTION	17 Size		Inlet	Outlet		DN 15		DN 25		
	18 End Type		Inlet	Outlet		RF - Flanged		RF - Flanged		
	19 Rating or Thickness		Inlet	Outlet		ASME 150#		ASME 150#		
	20									
MATERIAL	21 Body		Bonnet		A182 F316		A351 CF8M			
	22 Disc		TP 316 (Stainless Steel)							
	23 Nozzle		TP 316 (Stainless Steel)							
	24 Trim		TP 316 (Stainless Steel)							
	25 Guide and Rings		TP 316 (Stainless Steel)							
	26 Spring		* (Corrosion resistant)							
	27 Bellows		*							
	28 Seal		*							
	29 Resilient Seat		No							
OPTION	30 Cap : Threaded / Bolted / Welded		Threaded							
	31 Lever : Plain or Packed		Packed							
	32 Test Gag		Yes							
	33									
FLUID DATA	34 Fluid and State		Nitrogen / Hydrogen / Helium Gas							
	35 Required Capacity (kg/s)									
	36 Actual Capacity (kg/s)		*							
	37 Mol. Wt. [g/mol]		Oper. Specific Gr.							
	38 Pressure [MPa(a)]		Dgn.	Oper.	Setting	0.6	0.11~0.40	0.5		
	39 Temperature [°C]		Dgn.	Oper.	Relieving	80	ABM			
	40 Back Pressure [MPa]		Constant		ATM.					
	41		Variable		≅ 0					
	42		Total		ATM.					
	43 Set Pressure Tolerance		± 3 % of the Set Pressure							
	44 Blowdown Limitation		10 % of the Set Pressure							
	45 Accumulation		10 % of the Set Pressure							
	46 Ratio of Specific Heats		*							
	47 Operation Viscosity [cP]									
	48									
49										
OTHERS	50 Calculated Area [mm ²]		*							
	51 Selected Area [m ²]		*							
	52 Orifice Designation		*							
	53 Noize Level [dB]		*							
	54 Manufacturer		*							
	55 Model Number		*							
56 Reaction Force [kN]		*								
Notes : 1. Mark (*) : To be filled by the Seller.										

PRESSURE SAFETY & RELIEF VALVE DATA SHEET						SPEC. NO. OYSTER-EM-GME-KS-A01		REV. P0		
PRE'D :		CHK'D :		APP'D :		DATE :		Sheet 1 of 1		
PROJECT : OYSTER						PROJECT NO. : BQNL1401				
GENERAL	1 Tag No.		OYSTER-CU-GBS-PSV303							
	2 Quantity (set)		1							
	3 Line No.		-							
	4 Equipment Name or No.		OYSTER-CU-GBS-TK01							
	5 System		GAS BLANKET SYSTEM							
	6 Location		CNS utility building (indoor)							
	7 Code & Standard		ASME B31.1							
	8 Seismic Category		None							
	9 Quality Requirements		ISO 9001							
	10									
	11 Nozzle Type : Full / Semi		Full							
	12 Function		Safety or Relief							
	13 Type : Conventional / Bellows / Pilot		Conventional							
	14 Bonnet Type		Close							
	15 Weight [kg]		*							
	16 Helium Leak Test		Yes							
CONNECTION	17 Size		Inlet	Outlet	DN 15		DN 25			
	18 End Type		Inlet	Outlet	RF - Flanged		RF - Flanged			
	19 Rating or Thickness		Inlet	Outlet	ASME 150#		ASME 150#			
	20									
MATERIAL	21 Body		Bonnet		A182 F316		A351 CF8M			
	22 Disc		TP 316 (Stainless Steel)							
	23 Nozzle		TP 316 (Stainless Steel)							
	24 Trim		TP 316 (Stainless Steel)							
	25 Guide and Rings		TP 316 (Stainless Steel)							
	26 Spring		* (Corrosion resistant)							
	27 Bellows		*							
	28 Seal		*							
	29 Resilient Seat		No							
OPTION	30 Cap : Threaded / Bolted / Welded		Threaded							
	31 Lever : Plain or Packed		Packed							
	32 Test Gag		Yes							
	33									
FLUID DATA	34 Fluid and State		Nitrogen Gas							
	35 Required Capacity (kg/s)									
	36 Actual Capacity (kg/s)		*							
	37 Mol. Wt. [g/mol]		Oper. Specific Gr.							
	38 Pressure [MPa(a)]		Dgn.	Oper.	Setting	<u>1.1</u>	<u>0.8~0.9</u>	<u>0.9</u>		
	39 Temperature [°C]		Dgn.	Oper.	Relieving	80	ABM			
	40 Back Pressure [MPa]		Constant			ATM.				
	41		Variable			≒ 0				
	42		Total			ATM.				
	43 Set Pressure Tolerance		± 3 % of the Set Pressure							
	44 Blowdown Limitation		10 % of the Set Pressure							
	45 Accumulation		10 % of the Set Pressure							
	46 Ratio of Specific Heats		*							
	47 Operation Viscosity [cP]									
	48									
49										
OTHERS	50 Calculated Area [mm ²]		*							
	51 Selected Area [m ²]		*							
	52 Orifice Designation		*							
	53 Noize Level [dB]		*							
	54 Manufacturer		*							
	55 Model Number		*							
56 Reaction Force [kN]		*								
Notes : 1. Mark (*) : To be filled by the Seller.										




MANUAL VALVE DATA SHEETS

I D E N T	TAG NO.		OYSTER-CU-HRS-V301, OYSTER-CU-HRS-V304		OYSTER-CU-HRS-V302, OYSTER-CU-HRS-V303			
	DESCRIPTION		DRAIN, VENT		CONNECTION FOR PORTABLE VACUUM PUMP			
	P&ID		OYSTER-EM-HRS-PI-001		OYSTER-EM-HRS-PI-001			
	MANUFACTURER *							
	MODEL NO. *							
	QUALITY REQUIREMENTS		ISO9001		ISO9001			
	PIPING MATERIAL CLASSIFICATION		GZD**		GZD**			
	CLEANNESS CLASS		B		B			
	APPLICABLE CODE		ASME B31.1		ASME B31.1			
ACTIVE / PASSIVE		PASSIVE		PASSIVE				
S E R V I C E C O N D	FLUID		Helium		Helium			
	DESIGN PRESS.(kPaA)	DESIGN TEMP.(°C)	3000	60	3000	60		
	OPER. PRESS.(kPaA)	OPER. TEMP.(°C)	2000~2700	AMB	2000~2700	AMB		
B O D Y	SIZE(DN)	TYPE	DN20	BALL	DN25	BALL		
	PRESS.RATING	CONNECTIONS	600#	SW	600#	SW		
	MATERIAL		A182 F316L		A182 F316L			
	BONNET TYPE	BOLTS *						
	WEDGE	SEAT						
	PIPE SIZE(DN)	SCHEDULE	DN20	40S	DN25	40S		
APPLICABLE SPEC NO.								
REMARK 1. * : BY SUPPLIER 2. ** : SEE THE ATTACHED PIPING MATERIAL CLASSIFICATION								
								




MANUAL VALVE DATA SHEETS

I D E N T	TAG NO.		OYSTER-CU-HRS-V305, OYSTER-CU-HRS-V308		OYSTER-CU-HRS-V306, OYSTER-CU-HRS-V307			
	DESCRIPTION		DRAIN, VENT		CONNECTION FOR PORTABLE VACUUM PUMP			
	P&ID		OYSTER-EM-HRS-PI-001		OYSTER-EM-HRS-PI-001			
	MANUFACTURER *							
	MODEL NO. *							
	QUALITY REQUIREMENTS		ISO9001		ISO9001			
	PIPING MATERIAL CLASSIFICATION		GZD**		GZD**			
	CLEANNESS CLASS		B		B			
	APPLICABLE CODE		ASME B31.1		ASME B31.1			
ACTIVE / PASSIVE		PASSIVE		PASSIVE				
S E R V I C E C O N D	FLUID		Helium		Helium			
	DESIGN PRESS.(kPaA)	DESIGN TEMP.(°C)	3000	60	3000	60		
	OPER. PRESS.(kPaA)	OPER. TEMP.(°C)	2000~2700	AMB	2000~2700	AMB		
B O D Y	SIZE(DN)	TYPE	DN20	BALL	DN25	BALL		
	PRESS.RATING	CONNECTIONS	600#	SW	600#	SW		
	MATERIAL		A182 F316L		A182 F316L			
	BONNET TYPE	BOLTS *						
	WEDGE	SEAT						
	PIPE SIZE(DN)	SCHEDULE	DN20	40S	DN25	40S		
APPLICABLE SPEC NO.								
REMARK 1. * : BY SUPPLIER 2. ** : SEE THE ATTACHED PIPING MATERIAL CLASSIFICATION								
 Korea Atomic Energy Research Institute  HYUNDAI ENGINEERING & CONSTRUCTION  HYUNDAI ENGINEERING CO., LTD.								





MANUAL VALVE DATA SHEETS

I D E N T	TAG NO.		OYSTER-CU-HRS-V310			
	DESCRIPTION		DRAIN			
	P&ID		OYSTER-EM-HRS-PI-001			
	MANUFACTURER *					
	MODEL NO. *					
	QUALITY REQUIREMENTS		ISO9001			
	PIPING MATERIAL CLASSIFICATION		HXD**			
	CLEANNESS CLASS		B			
	APPLICABLE CODE		ASME B31.1			
ACTIVE / PASSIVE		PASSIVE				
S E R V I C E C O N D	FLUID		Compressed Air			
	DESIGN PRESS.(kPaA)	DESIGN TEMP.(°C)	1100	60		
	OPER. PRESS.(kPaA)	OPER. TEMP.(°C)	600~800	AMB		
B O D Y	SIZE(DN)	TYPE	DN20	BALL		
	PRESS.RATING	CONNECTIONS	600#	SW		
	MATERIAL		A182 F316			
	BONNET TYPE	BOLTS *				
	WEDGE	SEAT				
	PIPE SIZE(DN)	SCHEDULE	DN20	40S		
APPLICABLE SPEC NO.						
REMARK 1. * : BY SUPPLIER 2. ** : SEE THE ATTACHED PIPING MATERIAL CLASSIFICATION						
 Korea Atomic Energy Research Institute  						

MANUAL VALVE DATA SHEETS

I D E N T	TAG NO.		OYSTER-CU-VAS-V203, OYSTER-CU-VAS-V204, OYSTER-CU-VAS-V205, OYSTER-CU-VAS-V206, OYSTER-CU-VAS-V207		OYSTER-CU-VAS-V302		
	DESCRIPTION		Instrument Connection		DRAIN		
	P&ID		OYSTER-EM-VAS-PI-001		OYSTER-EM-VAS-PI-001		
	MANUFACTURER *						
	MODEL NO. *						
	QUALITY REQUIREMENTS		ISO9001		ISO9001		
	PIPING MATERIAL CLASSIFICATION		HXD**		HXD**		
	CLEANNESS CLASS		B		B		
	APPLICABLE CODE		ASME B31.1		ASME B31.1		
ACTIVE / PASSIVE		PASSIVE		PASSIVE			
S E R V I C E C O N D	FLUID		Nitrogen / Hydrogen / Helium Gas		Nitrogen / Hydrogen / Helium Gas		
	DESIGN PRESS.(kPaA)	DESIGN TEMP.(°C)	600	80	600	80	
	OPER. PRESS.(kPaA)	OPER. TEMP.(°C)	110~400	AMB	110~400	AMB	
B O D Y	SIZE(DN)	TYPE	DN20	BALL	DN20	DIAPHRAGM	
	PRESS.RATING	CONNECTIONS	600#	SW	150#	SW	
	MATERIAL		A182 F316		A182 F316		
	BONNET TYPE	BOLTS *					
	WEDGE	SEAT					
	PIPE SIZE(DN)	SCHEDULE	DN20	40S	DN20	40S	
APPLICABLE SPEC NO.							
REMARK 1. * : BY SUPPLIER 2. ** : SEE THE ATTACHED PIPING MATERIAL CLASSIFICATION							
 Korea Atomic Energy Research Institute  HYUNDAI ENGINEERING & CONSTRUCTION  HYUNDAI ENGINEERING CO., LTD.							

MANUAL VALVE DATA SHEETS

I D E N T	TAG NO.		OYSTER-CU-GBS-V203		OYSTER-CU-GBS-V302			
	DESCRIPTION		Instrument Connection		DRAIN			
	P&ID		OYSTER-EM-GBS-PI-001		OYSTER-EM-GBS-PI-001			
	MANUFACTURER *							
	MODEL NO. *							
	QUALITY REQUIREMENTS		ISO9001		ISO9001			
	PIPING MATERIAL CLASSIFICATION		HXD**		HXD**			
	CLEANNESS CLASS		B		B			
	APPLICABLE CODE		ASME B31.1		ASME B31.1			
ACTIVE / PASSIVE		PASSIVE		PASSIVE				
S E R V I C E C O N D	FLUID		Nitrogen Gas		Nitrogen Gas			
	DESIGN PRESS.(kPaA)	DESIGN TEMP.(°C)	1100	80	1100	80		
	OPER. PRESS.(kPaA)	OPER. TEMP.(°C)	900	AMB	900	AMB		
B O D Y	SIZE(DN)	TYPE	DN20	BALL	DN20	DIAPHRAGM		
	PRESS.RATING	CONNECTIONS	600#	SW	150#	SW		
	MATERIAL		A182 F316		A182 F316			
	BONNET TYPE	BOLTS *						
	WEDGE	SEAT						
	PIPE SIZE(DN)	SCHEDULE	DN20	40S	DN20	40S		
APPLICABLE SPEC NO.								
REMARK 1. * : BY SUPPLIER 2. ** : SEE THE ATTACHED PIPING MATERIAL CLASSIFICATION								
   								



HYUNDAI ENGINEERING CO., LTD.

RESISTANCE TEMPERATURE SENSORS

REV.	DATE	BY	CHK'D	APP'D
P0	15.02.16	H.S.SIM	S.J.KOH	H.S.CHANG

PROJECT OYSTER PROJECT NO. BQNL1401 SHEET 1 OF 1
 CLIENT Reactor Institute Delft UNIT SPEC. NO.

1 Complete Assembly Other
 MFR & Model No.

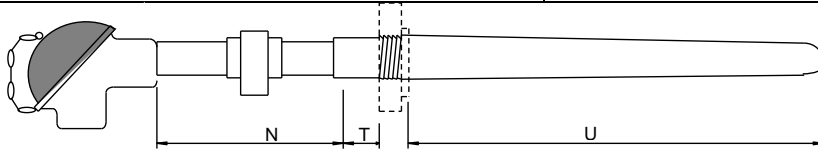
ELEMENT

2 Platinum Nickel Other
 3 Ice Point Resistance Pt 100 Ω at 0°C
 4 Temperature Range 0 ~ 100°C
 5 Leads : STD Potted Herm. Sealed
 6 Sheath Material 316SS O.D.
 7 Connection : 2-wire 3-wire 4-wire
 Lead Wires Receptacle Bayonet Lock
 Others

HEAD

8 Screwed Cover Other
 9 Explosion Proof Class IP54
 10 Material Cond. Conn. 3/4" NPT(F)
 11 Nipple Size Dim. "N" Union
WELL or TUBE

9 Material STAINLESS STEEL
 10 Construction : Tapered Straight
 Drilled Built-Up Closed End Tube
 11 Dimensions : MFR STD O.D. I.D.
 12 Connections : Process DN25 SW Internal. 1/2" NPT
 13 Safety Class: Nuclear Safety Related Non Nuclear Safety Related
 14 Quality Class: ASME NQA-1 Non-QC



*** CONNECTION TYPE**
 - SW : SOCKET WELD TYPE
 - DW : DIRECT WELD TYPE
 - RF : RASD FACE FLANGE TYPE


Rev.	Tag No. (OYSTER- CU-)	Process Conn.	Line Size (INCH)	Well Dim. (mm)		Single/ Duplex	Type	Fluid	SERVICE	P&ID No. (OYSTER- EM-)
				U	T					
P0	HYD-TW/TE-001	DN25 SW	None	TBD	TBD	Duplex		N2	HYDROGEN BUFFER TANK H ₂ TEMPERATURE	HYD-PI-001

NOTE : 1. All the equipment shall meet the requirements of each EC directive and be affixed with CE certification or marking

DESIGN CONDITION	SYSTEM				MATERIAL CLASS	GZD		
60 °C, 3 Mpa (a)	- Helium Transfer pipe(Inner & Outer)[TBD] - Hydrogen Jacket(Inner) Pipe - Hydrogen Pipe From Hydrogen Box To First Isolation Valve				SERVICE RATING	ASME CL.300#		
CORROSION ALLOWANCE					APPLICATION CODE	ASME B31.1		
0.3 mm					MATERIAL	STAINLESS STEEL		
PIPE AND FITTING					VALVE			
ITEM	SIZE (DN)	WALL THK. or RATING	MATERIAL	DESCRIPTION	SIZE (DN)	DESCRIPTION	VALVE CODE	
PIPE	15A~50A	SCH.40S	A 312 TP316L	SMLS, BE	GATE			
	65A~200A	SCH.10S	A 312 TP316L	SMLS, BE	15A ~ 50A	A 182 F316L, 600#, SW	GZD-GTA	
					65A ~ 200A	A 351 CF8M, 300#, BW	GZD-GTB	
FITTING	15A ~ 50A	SCH.40S	A403 WP316L	SMLS, BW	GLOBE			
	65A ~ 200A	SCH.10S	A403 WP316L	SMLS, BW	15A ~ 50A	A 182 F316L, 600#, SW	GZD-GBA	
					65A ~ 200A	A 351 CF8M, 300#, BW	GZD-GBB	
FLANGE	15A ~ 50A	300# / SCH.40S	A 182 F316L	SW, RF	CHECK			
	65A ~ 200A	300# / SCH.10S	A 182 F316L	SO, RF	15A ~ 50A	A 182 F316L, 600#, SW, Y-LIFT	GZD-CKA	
					65A ~ 200A	A 351 CF8M, 300#, BW, SWING	GZD-CKB	
GASKET	ALL	300#	4.5mm THK. SPIRAL WOUND 316SS, WITH GRAPHITE FILLER, INNER RING & CENTERING RING WITH 316SS PER ASME B16.20	BALL				
				15A ~ 50A	A 182 F316L, 600#, SW		GZD-BLA	
				65A ~ 200A	A 351 CF8M, 300#, BW		GZD-BLB	
BOLT / NUT	ALL	- STUD BOLTS : A 193 Gr.B8M CL.2 - HEAVY HEX NUTS : A 194 Gr.8M						
PLATE		A 240 Gr. 316L			PRESSURE-TEMPERATURE RATING ASME B16.34(GROUP 2.3) STANDARD CLASS			
NOTE :					TEMP. (°C)	PRESSURE [Mpa (g)]	TEMP. [°F]	PRESSURE [psi (g)]
1. Electro Polishing is required in the inside of the pipe and inside & outside of Jacket inner pipe. - Max Surface roughness $\leq 0.9 \mu m$ - Average Surface roughness $\leq 0.5 \mu m$ 2. Wall thickness of pipe after bending must meet applicable Code requirement for specific system design condition ; heavier wall pipe may be used for bends, if required. 3. Fitting joining pipe of different schedule should conform to the higher schedule. 4. For Cryogenic Jacket pipe, maker standard flange type(NW,CF) should be used.					38	4.14	100	600
					60	3.90	140	565
					80	3.69	176	535
					100	3.48	212	505

DESIGN CONDITION		SYSTEM			MATERIAL CLASS		HXD	
100 °C 1 Mpa (a)		- Other Gas Blanket Pipe - Vacuum Pipe in Vacuum Box			SERVICE RATING		ASME CL. 150#	
CORROSION ALLOWANCE					APPLICATION CODE		ASME B31.1	
0.3 mm					MATERIAL		STAINLESS STEEL	
PIPE AND FITTING					VALVE			
ITEM	SIZE (DN)	WALL THK. or RATING	MATERIAL	DESCRIPTION	SIZE (DN)	DESCRIPTION	VALVE CODE	
PIPE	15A~50A	SCH.40S	A312 TP316	SMLS, PE	GATE			
	65A~200A	SCH.10S	A312 TP316	SMLS, BE	15A~50A 65A ~ 200A	A182 F316, 600#, SW A 351 CF8M, 150#, BW	HXD-GTA HXD-GTB	
TUBE	15A O.D & smaller	0.065"	A213 TP316	SMLS. Tube				
FITTING	15A ~ 50A	SCH.40S / 3000#	A 182 F316	SMLS, SW	GLOBE			
	65A ~ 200A	SCH.10S /150#	A 403 WP316	SMLS, BW	15A~50A 65A ~ 200A	A182 F316, 600#, SW A 351 CF8M, 150#, BW	HXD-GBA HXD-GBB	
TUBE FITTING	15A O.D & smaller	Comp.	A182 F316		CHECK			
					15A~50A 65A ~ 200A	A182 F316, 600#, SW, Y-LIFT A 351 CF8M, 150#, BW, SWING	HXD-CKA HXD-CKB	
FLANGE	15A ~ 50A	150# / SCH.40S	A 182 F316	SW, RF	BALL			
					15A~50A 65A ~ 200A	A182 F316, 600#, SW A 351 CF8M, 150#, BW	HXD-BLA HXD-BLB	
	65A ~ 200A	150# / SCH.10S	A 182 F316	SO, RF	DIAPHRAGM			
					15A~50A	A 182 F316, 150#, SW	HXD-DPA	
GASKET	ALL	150#	4.5mm THK. SPIRAL WOUND 316SS, WITH GRAPHITE FILLER, INNER RING & CENTERING RING WITH 316SS PER ASME B16.20		Packless, Bellows Sealed Valve			
					15A ~ 50A	A 182 F316, 600#, SW	HXD-PBA	
					Three Way			
15A ~ 50A	A 182 F316, 600#, SW	HXD-TWA						
BOLT / NUT	ALL	- STUD BOLTS : A 193 Gr.B8M CL.2 - HEAVY HEX NUTS : A 194 Gr.8M			PRESSURE-TEMPERATURE RATING ASME B16.34(GROUP 2.2) STANDARD CLASS			
PLATE		A 240 Gr.316			TEMP. (°C)	PRESSURE [Mpa (g)]	TEMP. [°F]	PRESSURE [psi (g)]
NOTE : 1. Wall thickness of pipe after bending must meet applicable Code requirement for specific system design condition ; heavier wall pipe may be used for bends, if required. 2. Fitting joining pipe of different schedule should conform to the higher schedule. 3. Electro Polishing is required in the inside of the pipe and inside & outside of Jacket inner pipe.[TBD] - Max Surface roughness ≤ 0.9 μm - Average Surface roughness ≤ 0.5 μm 4. For Vacuum Sys, maker standard flange type(NW,CF) should be used.					38	1.90	100	275
					60	1.80	140	260
					80	1.71	176	250
					100	1.62	212	235

DESIGN CONDITION		SYSTEM			MATERIAL CLASS		HZD	
100 °C 1 Mpa (a)		- Hydrogen Pipe in Hydrogen Box - Hydrogen Pipe From First Isolation Valve To Discharged Gas Collection Tank - Hydrogen Pipe from Hydrogen Box to Hydrogen Buffer Tank			SERVICE RATING		ASME CL. 150#	
CORROSION ALLOWANCE					APPLICATION CODE		ASME B31.1, B31.12	
0.3 mm					MATERIAL		STAINLESS STEEL	
PIPE AND FITTING					VALVE			
ITEM	SIZE (DN)	WALL THK. or RATING	MATERIAL	DESCRIPTION	SIZE (DN)	DESCRIPTION	VALVE CODE	
PIPE	15A~50A	SCH.40S	A312 TP316L	SMLS, PE	GATE			
	65A~200A	SCH.10S	A312 TP316L	SMLS, BE	15A~50A	A182 F316L, 600#, SW A 351 CF8M, 150#, BW	HZD-GTA	
TUBE	15A O.D & smaller	0.065"	A213 TP316L	SMLS. Tube	65A ~ 200A			HZD-GTB
FITTING	15A ~ 50A	SCH.40S / 3000#	A 182 F316L	SMLS, SW	GLOBE			
	65A ~ 200A	SCH.10S /150#	A 403 WP316L	SMLS, BW	15A~50A	A182 F316L, 600#, SW A 351 CF8M, 150#, BW	HZD-GBA	
TUBE FITTING	15A O.D & smaller	Comp.	A182 F316L		CHECK			
					15A~50A	A182 F316L, 600#, SW, Y-LIFT A 351 CF8M, 150#, BW, SWING	HZD-CKA	
FLANGE	15A ~ 50A	150# / SCH.40S	A 182 F316L	SW, RF	BALL			
					65A ~ 200A	A182 F316L, 600#, SW A 351 CF8M, 150#, BW	HZD-BLA	
	65A ~ 200A	150# / SCH.10S	A 182 F316L	SO, RF	DIAPHRAGM			
					15A~50A	A 182 F316L, 150#, SW	HZD-DPA	
GASKET	ALL	150#	4.5mm THK. SPIRAL WOUND 316SS, WITH GRAPHITE FILLER, INNER RING & CENTERING RING WITH 316SS PER ASME B16.20	Packless, Bellows Sealed Valve				
				15A ~ 50A	A 182 F316L, 600#, SW	HZD-PBA		
				Three Way				
BOLT / NUT	ALL	- STUD BOLTS : A 193 Gr.B8M CL.2 - HEAVY HEX NUTS : A 194 Gr.8M			PRESSURE-TEMPERATURE RATING			
					ASME B16.34(GROUP 2.3) STANDARD CLASS			
PLATE		A 240 Gr.316L			TEMP. (°C)	PRESSURE [Mpa (g)]	TEMP. [°F]	PRESSURE [psi (g)]
NOTE : 1. Wall thickness of pipe after bending must meet applicable Code requirement for specific system design condition ; heavier wall pipe may be used for bends, if required. 2. Fitting joining pipe of different schedule should conform to the higher schedule. 3. Electro Polishing is required in the inside of the pipe and inside & outside of Jacket inner pipe. - Max Surface roughness ≤ 0.9 μm - Average Surface roughness ≤ 0.5 μm 4. For Vacuum Sys, maker standard flange type(NW,CF) should be used.					38	1.59	100	231
					60	1.49	140	216
					80	1.41	176	205
					100	1.33	212	193

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	<i>Piping Material Classification</i>	<i>Page 4 of 5</i>

1.0 Valve Code & Identification

(1) - (2)

(1) Piping Material Classification

Refer to Clause 6. Piping Material Classification.

(2) Type of Valve

GT : Gate GB : Globe

CK : Check BL : Ball

DP : Diaphragm PB : Packless, Bellows Sealed

TW : Three Way

1) Gate Valves


- GTA: socket weld ends, bolted bonnet, OS&Y, solid wedge, hardfaced seats and wedge
- GTB: buttweld ends, bolted bonnet, OS&Y, flexible wedge, hardfaced seats and wedge

2) Globe Valves

- GBA: socket weld ends, bolted bonnet, OS&Y, solid wedge, hardfaced seats and wedge
- GBB: buttweld ends, bolted bonnet, OS&Y, flexible wedge, hardfaced seats and wedge

3) Check Valves

- CKA: socket weld ends, bolted cap, spring loaded piston type disc(y-lift), hardfaced seat and disc
- CKB: buttweld ends, bolted cap, swing type disc, hardfaced seats and disc

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	<i>Piping Material Classification</i>	<i>Page 5 of 5</i>

4) Ball Valves

- BLA: socket weld ends, full bore 900 turn, SS TP316/316L ball, teflon seat
- BLB: butt weld ends, full bore 900 turn, SS TP316/316L ball, teflon seat

5) Diaphragm Valve

- DPA: socket weld ends, high pressure type, Ni-Co Alloy Diaphragm, RPTFE seat

6) Packless, Bellows Sealed

- PBA: socket weld ends, seal welded bonnet, zero emission

7) Three Way Valve

- TWA: socket weld ends, bolted bonnet, hardfaced seat and disc