

**ARA**



## PURCHASE SPECIFICATION

Title : TILTING DISC CHECK VALVES

Spec. No. : F-145-UP206D

ARA

## SPECIFICATION ISSUE SUMMARY

Title : TILTING DISC CHECK VALVES

Spec. No. : F-145-UP206D

- Safety Category : Safety & Non-Safety -Related
- Safety Class : 3 & NNS
- Quality Class : Q & A

KEPCO E&C JOB No. : 1229L



### ISSUE STATUS

0	06/08/23	INVITATION TO TENDER ISSUE
ISSUE NO.	DATE	DESCRIPTION

Preparer : 박나희, Tel : 054-421-4542

## SPECIFICATION ISSUE SUMMARY

DESCRIPTION		REVISION
This specification for furnishing TILTING DISC CHECK VALVES consists of:		
Section 1	General Conditions	-
Section 2	Special Conditions	-
Section 3	Material Description and Pricing Data	0
	Certification of Specification	0
Section 4	Technical Specification	0
<b><u>ATTACHMENTS</u></b>		
4-1	Witness Points	0
4-2	Hold Points	0
4-3	Valve Descriptions	0
4-4	Valve Data Sheets	0
4-5	Cross Reference Table Between KEPIC and Referenced Codes & Standards	0
4-6	Exception List for KEPIC	0
4-7	Material Verification Report (Form)	0
4-8	Weld Map (Form)	0
4-9	Code & Standard Compliance Report (Form)	0
4-10	Parent Component Safety Functions and Classification Evaluation sheet (form)	0
4-11	Parent Component Design Functions and Classification Evaluation sheet (form)	0
<b><u>APPENDICES</u></b>		
4A1	Quality Assurance Program Requirements	0
4A2	Quality Verification Requirements of CFSI	0
4B	Quality Surveillance Requirements	0
4C	General Requirements for Submittal of Documents	0
4D	Drawing and Document Submittal Requirements	0
4E	Quality Verification Documentation List	0
4G2	Requirements for Coating Service Level II Equipment and Components	0
4H	Documentation Requirements of Supplier Deviations and Non-Conformances	0
4H1	Reporting Requirements for Defects and Noncompliance	0
4I	Dynamic Qualification Requirements for Seismic Category I Equipment	0
4J	Examination and Testing of ASME Section III Piping, Fittings and Valves	0
4K1	Welding Requirements for ASME Section III Items	0
4K4	Welding Requirements for ASME B31.1 Power Piping	0
4R	Chemical Requirements for Materials Used in Contact with Austenitic Stainless Steel or Nickel Base Alloys	0
4W	Weld End Details	0
4X	Requirement for Part Classification	0

## **SECTION 1 – GENERAL CONDITIONS**

The General Conditions of this purchase specification will be prepared and added by Buyer.

## **SECTION 2 – SPECIAL CONDITIONS**

The Special Conditions of this purchase specification will be prepared and added by Buyer.

ARA

## SECTION 3 MATERIAL DESCRIPTION AND PRICING DATA

Title : TILTING DISC CHECK VALVES

Spec. No. : F-145-UP206D

- Safety Category : Safety & Non-Safety -Related
- Quality Class : Q & A
- Safety Class : 3 & NNS

KEPCO E&C JOB No. : 1229L



### ISSUE STATUS

0	06/08/23	INVITATION TO TENDER ISSUE	박나희	김만로	이성하 박수원	김종강
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED

Preparer : 박나희, Tel : 054-421-4542

**FORM OF PROPOSAL**

SECTION 3, MATERIAL DESCRIPTION AND PRICING DATA

FOR

TILTING DISC CHECK VALVES

SPECIFICATION NUMBER: F-145-UP206D

SAFETY CATEGORY : Safety-Related  
& Non-Safety-Related

QUALITY CLASS : Q & A

SAFETY CLASS : 3 & NNS

FOR

KOREA ENGINEERING & CONSTRUCTION COMPANY, INC.  
ADVANCED REACTOR FOR MULTIPURPOSE APPLICATION

PROPOSAL No. :

TENDERER'S NAME :

BUSINESS ADDRESS :

TEL No. :

FAX No. :

E-MAIL ADDRESS :

## **SECTION 3 – MATERIAL DESCRIPTION AND PRICING DATA**

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**SECTION 3 – MATERIAL DESCRIPTION AND PRICING DATA**

Name of Tenderer : \_\_\_\_\_

**3A.1.0 GENERAL TECHNICAL DATA**

**3A.1.1 NET WEIGHTS (not shipping weight) (kg/lb), as follows:**

Unit complete ..... \_\_\_\_\_

Heaviest piece handled during erection ..... \_\_\_\_\_

Heaviest piece handled after erection ..... \_\_\_\_\_

**3A.1.2 OVERALL DIMENSIONS**

Length (mm/in) ..... \_\_\_\_\_

Width (mm/in) ..... \_\_\_\_\_

Height (mm/in) ..... \_\_\_\_\_

**3A.1.3 SHIPPING WEIGHT & VOLUME**

	<u>Shipping Weight</u>	<u>Shipping Volume</u>
Total .....	_____ (kg/lb)	_____ (m <sup>3</sup> /ft <sup>3</sup> )

**3A.1.4 DRAWING AND DATA SUBMITTAL**

The drawing and data submittals required by the Specification are summarized in Appendices 4D and 4E. Electronic media submittals for drawings and documents are required by Appendices 4C and 4D after purchase contract.

### **SECTION 3 – MATERIAL DESCRIPTION AND PRICING DATA**

Name of Tenderer : \_\_\_\_\_

#### **3A.2.0 EVALUATION DATA REQUIRED**

##### **3A.2.1 SPECIAL TOOL LIST AND THEIR DATA**

In addition to the list submitted as per para. 2.0 of Attachment 3-1, the Tenderer shall submit the following technical information in its proposal for each item of the above special tool list.

- Item description/name
- Rating, Grade or Type
- Usage

##### **3A.2.2 SPARE PART LIST AND THEIR DATA**

In addition to the list submitted as per para. 3.0 of Attachment 3-1, the Tenderer shall submit the following technical information in its proposal for each item in spare part list proposed by Tenderer.

- Item description/name
- Material Specification (Material, Size, Rating, Grade or Type, etc.)
- Drawing Item Number
- Part Number
- Original Manufacturer's Part Number
- Manufacturer's Name
- Period of Replacement
- Recommended Quantity
- For resilient materials, year of manufacture and the recommended shelf life
- Parent Item Stock Code Number
- One or more of the following code(s) shall be indicated in the remarks column.

### **SECTION 3 – MATERIAL DESCRIPTION AND PRICING DATA**

Name of Tenderer : \_\_\_\_\_

#### **3A.2.0 EVALUATION DATA REQUIRED (CONT.)**

Codes	Description
A	Non-standard Items (Code 'A' is assigned to those parts whose failures will cause a malfunction of adjacent components/equipment and itself, and cause significant affects to the related components/equipment.)
B	Standard Items (Code 'B' is assigned to off-the-shelf items, other than the non-standard items above, which are available for general industry application from manufacturers, or suppliers based solely on the manufacturer's catalog description and data. When failures occur in these components/equipment, they should be replaced with new off-the-shelf items purchased.)
C	Environmental Qualification required
D	UL Listed Item

#### **3A.2.3 TECHNICAL DATA**

The Tenderer shall include, in its proposal, sufficient data, drawings, and descriptions to describe completely the valves both qualitatively and quantitatively to facilitate a thorough evaluation of its proposal. This proposal information shall include, but not be limited to, the following:

Is this data included ?  
Yes/No

- A. Valve Assembly Drawings for each P.O. item with detailed specifications covering construction and materials used in the valves including detailed description of trim materials ..... \_\_\_\_\_
- B. Completed Valve Data Sheets (Attachment 4-4)..... \_\_\_\_\_
- C. Curves and Technical Data for the following :
  - Flow coefficient (Cv) vs. valve opening area curves  
for Tilting Disc Check Valves ..... \_\_\_\_\_
  - Minimum flow velocity for full disc lift and quick  
closing/opening time for all Tilting Disc Check Valves. .... \_\_\_\_\_

### **SECTION 3 – MATERIAL DESCRIPTION AND PRICING DATA**

Name of Tenderer : \_\_\_\_\_

#### **3A.2.0 EVALUATION DATA REQUIRED (CONT.)**

Is this data included ?  
Yes/No

- D. Summary of Functional Qualification Test Plan or Program including test method, facility/equipment list, sample procedure, etc., in accordance with Paragraph 4.05.A.9 of Section 4 ..... \_\_\_\_\_
- E. Hardsurfacing Material List and Data, such as the AWS Classifications, Hardsurfacing Material Description, and Manufacturer's Name, Brand Name or Trade Name, etc., as applicable ..... \_\_\_\_\_
- F. Summary of Tenderer's proposed Dynamic Qualification Program in accordance with Paragraph 3.1 of Appendix 4I ..... \_\_\_\_\_
- G. Work Schedule including Engineering, Procurement, Fabrication and Delivery ..... \_\_\_\_\_
- H. Countermeasures against following Information Notices from USNRC. Regarding the Information Notices of USNRC listed below, Tenderer shall submit the complete descriptions of countermeasures to solve or to avoid the problems discussed in USNRC Information Notices. If any Information Notice is not applicable to Tenderer's valve design/manufacturing, specify reason clearly..... \_\_\_\_\_

USNRC DOC. NO.	ISSUE DATE	SUBJECT
IN 91-09	02/05/92	Counterfeiting of Crane Valves
IN 92-56	08/06/92	Counterfeit Valves in the Commercial Grade Supply System
IN 92-22	03/24/92	Criminal Prosecution and Conviction of Wrongdoing Committed by a Commercial Grade Valve Supplier

### **SECTION 3 – MATERIAL DESCRIPTION AND PRICING DATA**

Name of Tenderer : \_\_\_\_\_

#### **3A.2.0 EVALUATION DATA REQUIRED (CONT.)**

##### **3A.2.4 Additional Proposal Data**

Tenderer shall submit the following data  
with each copy of his proposal.

Is this data included ?  
Yes/No

- A. Description of any variance between  
this specification and any code requirements..... \_\_\_\_\_
- B. Separate listing of all organic material used in the construction  
of the valve assembly..... \_\_\_\_\_
- C. List of the Certificate and copy of each Certificate according to  
applicable Codes & Standards  
(KEPIC/ASME/ISO, etc.)..... \_\_\_\_\_
- D. Quality Assurance Program / Manual in accordance with  
Paragraph 4.0 of Appendix 4A1 ..... \_\_\_\_\_

##### **3A.2.5 APPLICATION OF KOREA ELECTRIC POWER INDUSTRY CODE (KEPIC)**

Local Tenderer of ROK (Republic of Korea) shall apply the edition/addenda of KEPIC on the cross-reference table in the attachment 4-5 for the supply of Goods and Services specified in this specification.

##### **3A.2.6 LISTS OF SUPPLIED ITEMS**

Tenderer shall provide a list of the items supplied to customers during past  
ten(10) years as follows.

No.	Items Description	Supplied Date	Customer	Technical Specification	Project Name	* Note 1	Remarks

\* Note 1: Indicate whether or not a Certificate of Actual Supply was issued by customer  
by the marking (Yes or No).

**SECTION 3 – MATERIAL DESCRIPTION AND PRICING DATA**

Name of Tenderer : \_\_\_\_\_

3A.2.7 ADDENDA

Tenderer represents that this proposal includes provisions for the following Addenda.

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Authorized Signature

or Seal : \_\_\_\_\_

Print Name : \_\_\_\_\_

Print Title : \_\_\_\_\_

Date of Submission : \_\_\_\_\_

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART B- COMMERCIAL INFORMATION**

Name of Tenderer : \_\_\_\_\_

**3B.1.0    TENDER PRICE**

3B.1.1    The tender price is specified in Attachment 3-1, Pricing and Schedule Data.

3B.1.2    The tender price is for all the Goods and Services which shall be supplied under the Contract.

3B.1.3    The tender price shall be fixed and firm, not subject to price adjustment for the entire duration of contract. However, it is understood that the rates and expense for technical supervisory services as quoted shall also be firm, and total price therefore will be fixed on the basis of man-days actually performed until the expiration of the duration of contract.

**3B.2.0    DELIVERY SCHEDULE**

Delivery schedule is specified in Attachment 3-1, Pricing and Schedule Data.

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART B- COMMERCIAL INFORMATION**

Name of Tenderer : \_\_\_\_\_

**3B.3.0      PAYMENT METHOD**

3B.3.1      Payment for on-shore portion shall be made through the remittance to the Supplier's bank account (Bank account No. shall be presented to Buyer at the time of the demand for payment).

Payment for foreign tenderer's on-shore portion shall be made directly to the Subsupplier upon Supplier's request for payment. If applicable, Tenderer shall state the Subsupplier's name and address with the relevant items below (Bank account No. shall be presented to Buyer at the time of the demand for payment).

Items

Company Name and Address

\_\_\_\_\_  
\_\_\_\_\_

3B.3.2      Payment for off-shore portion shall be made through the medium of an unconfirmed irrevocable letter of credit or by telegraphic transfer (T/T) to the Supplier's bank.

The tenderer shall state his preference (L/C or T/T). \_\_\_\_\_

If the answer is "L/C", the Tenderer shall state the beneficiary's name and address on L/C below.

\_\_\_\_\_  
\_\_\_\_\_

If the answer is "T/T", the Tenderer shall state the Supplier's bank account below.

\_\_\_\_\_  
\_\_\_\_\_

Payment in U.S. dollars for domestic tenderer's off-shore portion shall be made through the transfer to the Supplier's Resident's Account opened with a foreign exchange bank (Resident's Account No. shall be presented to Buyer at the time of the demand for payment).



**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART B- COMMERCIAL INFORMATION**

Name of Tenderer : \_\_\_\_\_

**3B.4.0 POINT(S) OF ORIGIN**

The Point(s) of Origin and the manufacturer(s) for the Goods are indicated below with the applicable items.

Item	Point of Origin (City/State/Country)	Manufacturer
(Major Items & No.)		

**3B.5.0 PORT OF EXPORT**

For off-shore portion, the Tenderer shall indicate Port of Export where the Goods are shipped with the applicable items.

Item	Port of Export (City/State/Country)

**3B.6.0 PROPOSAL VALIDITY**

The Tenderer hereby agrees that this tender is firm for acceptance without any condition within eight (8) months from the stated tender due date.

(Yes / No) \_\_\_\_\_

**3B.7.0 AUTHORIZED REPRESENTATIVE**

The Tenderer shall designate below a representative who is authorized to make binding and enforceable decisions and assume financial responsibility on behalf of the Tenderer in all matters relating to clarification of the tender and the administration and performance of the resultant Contract.

Title : \_\_\_\_\_

Name : \_\_\_\_\_

Tel No. : \_\_\_\_\_

Fax No. : \_\_\_\_\_

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART B- COMMERCIAL INFORMATION**

Name of Tenderer : \_\_\_\_\_

**3B.8.0      SEAL TO BE USED (For domestic Tenderer only)**

The Tenderer shall mark the seal to be used in this tendering and for the execution of the Contract and all legal actions relating to the performance of the Contract.

Registered Seal

Seal to be used

**3B.9.0      TENDERER'S DEFINITE STATEMENT**

The undersigned hereby declares, as Tenderer, that the only persons or parties interested in this Tender as principals are those named herein, that this is made without connection to any other person or party for the same purpose, that this is in all respects fair and without collusion or fraud, and that the Tenderer agrees that as submitted based on the requirements, if it will be accepted, the Tenderer shall promptly execute and return to Buyer the acceptance copy of the Contract issued by Buyer in accordance with the tender, the contractual terms and conditions in ITT, and other documents agreed to between Buyer and Tenderer, that the Tenderer will perform and complete the Work within the time limit specified therein, and that Tenderer will accept in full payment therefor, the prices quoted above.

Authorized Signature      : \_\_\_\_\_  
(or Seal)

Print Name                      : \_\_\_\_\_

Print Title                      : \_\_\_\_\_

Tenderer                        : \_\_\_\_\_

Date of Submission          : \_\_\_\_\_

Note: The Tenderer shall attach the Certificate of Seal Impression for the Registered Seal or the notarized Power(s) of Attorney for the signer. In case of a partnership or joint venture, full names of partners or joint venturers shall be given herein.

<b>PRICE TENDER</b>		
ITT No.		
Tendering Date		
Goods		
Tender Price (DDP/ ARA, Loaded)	On-shore Portion	Say Won <span style="float: right;">only</span> (₩ <span style="float: right;">)</span> ※ Including V.A.T.
	Off-shore Portion	Say U.S. dollars <span style="float: right;">only</span> (US\$ <span style="float: right;">)</span> ※ Including V.A.T.
<p>We submit this tender in strict compliance with the provisions in Buyer's Invitation to Tender (ITT), and hereby promise definitely that if this tender is accepted by Buyer, we will supply the Goods and/or Services at the above Tender Price within the time limit therefor in accordance with the terms and conditions in the resultant Contract.</p> <p style="margin-top: 20px;">Date : _____</p> <p style="margin-top: 10px;">Authorized Signature : _____</p> <p style="margin-top: 10px;">or Seal</p> <p style="margin-top: 10px;">Print Name : _____</p> <p style="margin-top: 10px;">Print Title : _____</p> <p style="margin-top: 10px;">Tenderer : _____</p> <p style="margin-top: 10px;">Address : _____</p> <p style="margin-top: 20px;">Note: If the affixed signature or seal is not identical to the presented, the tender will become nullified.</p> <p style="text-align: center; margin-top: 20px;"><b>KEPCO ENGINEERING &amp; CONSTRUCTION COMPANY, INC.</b></p>		

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

**PRICING DATA SUMMARY**

No.	Description	On-shore(₩)	Off-shore(US\$)
1	Equipment & Material	_____	_____
2	Special Tools	_____	_____
3	Spare Parts	_____	_____
4	Sub-Total (Sum of Items 1 through 3)	_____	_____
		(Jobsite Loaded Price)	(FOB Price)
5	All Charges for Off-shore Portion;		
	- Overseas and inland freight, insurance premium, customs duties and other charges from FOB to Jobsite Loaded	N/A	_____
6	Total (Sum of Items 4 and 5)	_____	_____
		(Jobsite Loaded Price)	(Jobsite Loaded Price)
7	Technical Supervisory Service (if required)	_____	_____
		[By Domestic (sub)Supplier]	[By Foreign (sub)Supplier]
8	Total (Sum of Items 6 and 7)	_____	_____
9	Value-Added Tax	_____	_____

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

**PRICING DATA SUMMARY (CONT.)**

No.	Description	On-shore(₩)	Off-shore(US\$)
-----	-------------	-------------	-----------------

- 10    Grand Total  
       (Sum of Items 8 and 9)                      ₩ \_\_\_\_\_    US\$ \_\_\_\_\_
- On-shore : Say Korea Won only
- Off -shore : Say U.S. Dollars only

Authorized Signature or  
 Seal : \_\_\_\_\_

Print Name : \_\_\_\_\_

Print Title : \_\_\_\_\_

Tenderer : \_\_\_\_\_

Date of Submission : \_\_\_\_\_

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

**1.0 EQUIPMENT & MATERIALS**

**Confirmation of quantity**

Quantities specified in this Pricing and Schedule Data are estimated ones that are shown to indicate the probable scope of supply under the Contract. Therefore, actual quantities of individual items may be subject to an increase and/or decrease from those shown herein, according to the project requirements. The actual quantities to be supplied will be fixed by the Buyer's Release to Manufacture as stated below.

In the event of an increase and/or decrease in the quantities by Buyer's requirements, despite Article 2.13.1 of Section 2, the unit price shall be adjusted as stated below.

1. In the event of the same specification items, the unit price shall be applied Attachment 3-1 Pricing and Schedule Data.
2. In the event of new specification items not provided in Section 3, the unit price shall be decided within the range of price not exceeding the price for the next larger size of a similar item in this contract. If not a similar item in this contract, the price shall be discussed separately.

In the event that no more goods are required according to the completion of Buyer's detailed architect engineering, the accumulated price of the final "Release to Manufacture" shall be considered the final fixed contract price without any contract revision.

Supplier shall adjust the amounts of Security Deposit for Performance(including Security Deposit for Repair of Defects) according to the final contract price.

**Release to Manufacture**

Buyer will issue a "Release to Manufacture" in a prescribed form according to project requirements. The release may be initially ordered by fax and later confirmed by the Release to Manufacture form. Shipments made without the Buyer's Release to Manufacture may not be accepted and paid for. Any work performed prior to receipt of such release shall be totally at the Supplier's risk.

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

**1.0 EQUIPMENT & MATERIALS**

Item No.	Mark No. (ERP Material No.)	Size (DN)	Weld End Schedule	Q'ty	Unit Price (₩/ US\$)	Extension (₩/ US\$)
1.01	097-C-CKF					
1.01.A	F-462-V-1001 (ARA-P206D-1.01.A	300	Flanged End	1	[ ]	[ ]
1.01.B	F-462-V-1002 (ARA-P206D-1.01.B	300	Flanged End	1	[ ]	[ ]
1.01.C	F-462-V-1003 (ARA-P206D-1.01.C	300	Flanged End	1	[ ]	[ ]
1.01.D	F-462-V-1004 (ARA-P206D-1.01.D	300	Flanged End	1	[ ]	[ ]
1.02	105-C-CKF					
1.02.A	F-461-V-1001 (ARA-P206D-1.02.A	300	Std. Wt	1	[ ]	[ ]
1.02.B	F-461-V-1002 (ARA-P206D-1.02.B	300	Std. Wt	1	[ ]	[ ]
1.02.C	F-461-V-1003 (ARA-P206D-1.02.C	300	Std. Wt	1	[ ]	[ ]
1.02.D	F-461-V-1004 (ARA-P206D-1.02.D	300	Std. Wt	1	[ ]	[ ]
1.03	097-D-CKF					
1.03.A	F-553-V-1102 (ARA-P206D-1.03.A	80	Flanged End	1	[ ]	[ ]
1.03.B	F-553-V-1202 (ARA-P206D-1.03.B	80	Flanged End	1	[ ]	[ ]
1.04	105-D-CKF					
1.04.A	F-562-V-1003 (ARA-P206D-1.04.A	100	40	1	[ ]	[ ]
1.04.B	F-562-V-1007 (ARA-P206D-1.04.B	100	40	1	[ ]	[ ]
1.05	105-D-CKF					
1.05.A	F-562-V-1004 (ARA-P206D-1.05.A	200	40	1	[ ]	[ ]
1.05.B	F-562-V-1008 (ARA-P206D-1.05.B	200	40	1	[ ]	[ ]
1.06	330-D-CKF					
1.06.A	F-531-V-1047 (ARA-P206D-1.06.A	80	80	1	[ ]	[ ]
1.06.B	F-531-V-1048 (ARA-P206D-1.06.B	80	80	1	[ ]	[ ]
1.06.C	F-531-V-1049 (ARA-P206D-1.06.C	80	80	1	[ ]	[ ]
1.06.D	F-531-V-1050 (ARA-P206D-1.06.D	80	80	1	[ ]	[ ]
1.07	630-D-CKF					
1.07.A	F-541-V-1012 (ARA-P206D-1.07.A	40	80	1	[ ]	[ ]
1.07.B	F-541-V-1010 (ARA-P206D-1.07.B	40	80	1	[ ]	[ ]

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

**1.0 EQUIPMENT & MATERIALS**

Item No.	Mark No. (ERP Material No.)	Size (DN)	Weld End Schedule	Q'ty	Unit Price (₩/ US\$)	Extension (₩/ US\$)
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1.08 630-D-CKF

1.08.A	F-541-V-1002 (ARA-P206D-1.08.A	80	80	1	[	]	[	]
1.08.B	F-541-V-1004 (ARA-P206D-1.08.B	80	80	1	[	]	[	]
1.08.C	F-541-V-1006 (ARA-P206D-1.08.C	80	80	1	[	]	[	]
1.08.D	F-541-V-1008 (ARA-P206D-1.08.D	80	80	1	[	]	[	]

1.09 Sub-Total of Equipment & Materials,  
Excluding V.A.T. (Sum of Items 1.01 through 1.08)

- On-shore, Jobsite Loaded	N/A	N/A	₩	_____
- Off-shore, FOB	N/A	N/A	US\$	_____

1.10 All charges for Off-shore portion

- Overseas and inland freight, insurance premium, Customs duties duties and other charges from FOB to Jobsite Loaded	N/A	N/A	US\$	_____
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1.12 Total of Equipment & Materials, Excluding V.A.T.  
(Sum of Items 1.09 and 1.10)

- On-shore, Jobsite Loaded	N/A	N/A	₩	_____
- Off-shore, Jobsite Loaded	N/A	N/A	US\$	_____



**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

**2.0 SPECIAL TOOLS**

Below is a list of special tools being supplied which are required for installation (mark \*), adjustment, calibration, maintenance and dismantling of the equipment. The items which are specified in Section 4, Technical Specifications, if any, shall be included in the list. If no items are required, "N/A" shall be indicated below.

No.	Item	Recom. Q'ty	Unit Price (₩/US\$)	Extension (₩/US\$)	Site Delivery Date
	<ul style="list-style-type: none"> <li>· Description</li> <li>· Material Specification (Rating, Grade, Type, etc.)</li> <li>· Part No./Orig. Mfr's Part No.</li> <li>· Mfr's Name</li> </ul>				2025.10.31

A. Sub-Total of Special Tools

- On-shore, Jobsite Loaded
- Off-shore, FOB

₩ \_\_\_\_\_  
 US\$ \_\_\_\_\_

B. All charges for Off-shore portion:

- Overseas and inland freight, insurance premium,  
customs duties and other charges from FOB to  
Jobsite Loaded

US\$ \_\_\_\_\_

C. Total of Special Tools (Sum of Items A and B),  
Excluding V.A.T.

- On-shore, Jobsite Loaded
- Off-shore, Jobsite Loaded

₩ \_\_\_\_\_  
 US\$ \_\_\_\_\_

**ATTACHMENT 3-1**

Name of Tenderer : \_\_\_\_\_

### 3.0 SPARE PARTS

Below is a list of spare parts including consumable parts being supplied which are required for installation (mark \*), start-up (mark \*\*) and two (2) years operation (mark \*\*\*). The items which are specified in Section 4, Technical Specifications, if any, shall be included in the list. If no items are required, "N/A" shall be indicated below.

No.	Item	Recom. Q'ty	Unit Price (¥/US\$)	Extension (¥/US\$)	Site Delivery Date
	· Description · Material Specification (Material, Size, Rating, Grade or Type, etc.) · Part No./Orig. Mfr's Part No. · Mfr's Name · Period of Replacement				2025.10.31

### A. Sub-Total of Spare Parts

- On-shore, Jobsite Loaded
- Off-shore, FOB

W

US\$

B. All charges for Off-shore portion:

- Overseas and inland freight, insurance premium, customs duties and other charges from FOB to Jobsite Loaded

US\$

C. Total of Spare Parts (Sum of Items A and B),  
Excluding V.A.T.

- On-shore, Jobsite Loaded
- Off-shore, Jobsite Loaded

W

US\$

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

#### **4.0 DELIVERY**

##### **4.1 Delivery Required**

In case of delivery to FOB port of export, schedule date is two (2) months before site delivery date.

##### **A. Tenderer's Promised Delivery**

Actual delivery date to be specified on each "Release to Manufacture" shall be decided considering the Lead Time in weeks after Supplier's receipt of "Release to Manufacture" as follows:

<u>Item No.</u>	<u>Lead Time in Weeks</u>
-----------------	---------------------------

ALL

B. The maximum permissible leadtime for all items supplied under this purchase contract is "LATER" weeks after receipt of "Release to Manufacture".

C. The following is the preliminary required schedule for delivery. Actual delivery requirements will be fixed by the Buyer's "Release to Manufacture" as stated in Item 1.0, Equipment & Materials. The "Release to Manufacture" will list specific quantities, type of valves, and include complete technical information to ensure Supplier to proceed with the design/fabrication of valve assembly.

Percentage of piping spool required

Materials	Percentage of Goods	Site Delivery Date
1	20%	2025.10.31
2	20%	2026.02.28
3	20%	2026.06.30
4	20%	2026.10.31
5	20%	2027.02.28
Special Tools		2025.10.31
Spare Parts		2025.10.31

D. Shipping shall not be made more than one (1) month prior to the delivery date specified on each "Release to Manufacture". However, early delivery may be acceptable upon the written approval of the Buyer.

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

**4.0 DELIVERY (CONT.)**

**4.2 Document Submittal Schedule**

- A. Can the Tenderer meet the document submittal schedule given in Appendix 4D? (Yes or No)  
(If the answer to this question is “No”, Tenderer shall list the earliest possible submittal dates in the appropriate column in Appendix 4D.) ..... \_\_\_\_\_
- B. Will the document submittal schedule in Appendix 4D and the review period specified in Appendix 4C permit the Tenderer to commence fabrication in sufficient time to meet the delivery date(s) given in Items? (Yes or No)  
(If the answer to this question is “No”, Tenderer shall list the required submittal dates in Appendix 4D and/or indicate which documents will require expedited review.) ..... \_\_\_\_\_

Authorized Signature  
or Seal : \_\_\_\_\_

Print Name : \_\_\_\_\_

Print Title : \_\_\_\_\_

Tenderer : \_\_\_\_\_

Date of Submission : \_\_\_\_\_

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

**5.0 TECHNICAL SUPERVISORY SERVICES**

The Tenderer shall furnish the following information related to the technical supervisory services which are required for the Equipments at the Site per Section 2, Special Conditions, and Section 4, Technical Specifications.

**5.1 Number of working days and Supervisory/Technicians**

**A. Total**

- Supervisory : [     ] persons X [     ] days = [     ] man-days  
 - Technician : [     ] persons X [     ] days = [     ] man-days

Note : 1. The above working days shall be expected requirements based upon Tenderer's experience.  
 2. The actual working days shall be determined when the Buyer requests such services.

**5.2 Rate and Expense (for a person)**

	<u>Supervisory</u>	<u>Technician</u>
A. Basic rate per day for a normal	W/US\$ _____	W/US\$ _____
B. Hourly rate for overtime (including Sunday and Holidays)	W/US\$ _____	W/US\$ _____
C. Sojourn rate per day, excluding lodging and local transportation	W/US\$ _____	W/US\$ _____
D. Travel expense of round trip		
- Domestic person : 2days / trip	W/US\$ _____	W/US\$ _____
- Foreign person : 4days / trip	W/US\$ _____	W/US\$ _____
E. Economy round trip air fare	W/US\$ _____	W/US\$ _____

Note : The ceiling of the air fare unit price shall be presented here.

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

**5.0 TECHNICAL SUPERVISORY SERVICES(CONT.)**

5.3 Estimated Amount of Technical Supervisory Services

A. Total, Excluding V.A.T.

- Portion by Supervisor

W\_\_\_\_\_

US\$\_\_\_\_\_

- Portion by Technician

W\_\_\_\_\_

US\$\_\_\_\_\_

Note : A detailed calculation sheet shall be attached hereto.

Authorized Signature or Seal : \_\_\_\_\_

Date of Submission : \_\_\_\_\_

**ATTACHMENT 3-1**  
**PRICING AND SCHEDULE DATA**

Name of Tenderer : \_\_\_\_\_

**5.0 TECHNICAL SUPERVISORY SERVICES (CONT.)**

5.4 Detailed Calculation Sheet

Grade		Supervisor	Technician	Total
Man-Days				
Services Fee	Rate (₩/US\$)			
	Extension (₩/US\$)			
Sojourn Allowance	Rate (₩/US\$)			
	Extension (₩/US\$)			
Travel Expenses of Round Trip (₩/US\$)				
Air Fares of Round Trip (₩/US\$)				
Total (₩/US\$)				

**ATTACHMENT 3-2**  
**EXCEPTIONS**

Name of Tenderer : \_\_\_\_\_

1.0 The Tenderer hereby certifies that it agrees to all provisions of the Contractual terms and conditions and the Specifications Documents unless exceptions are specifically and clearly listed hereafter.

A. Tenderer's printed terms and conditions are not considered specific exceptions to Terms and Conditions of the ITT. Exceptions to Tendering Instructions and Terms and Conditions of the ITT will not be accepted, in principle.

B. If no exceptions are taken by Tenderer, "No Exceptions" shall be indicated below.

Authorized Signature : \_\_\_\_\_  
or Seal

Print Name : \_\_\_\_\_

Print Title : \_\_\_\_\_

Date of Submission : \_\_\_\_\_



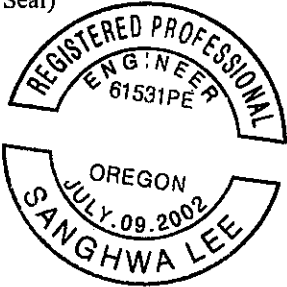
**ARA**

**CERTIFICATION OF SPECIFICATION**

Title : TILTING DISC CHECK VALVES

Spec. No.: F-145-UP206D

Pursuant to the provision of ASME Boiler and Pressure Vessel Code, Section III, Article NCA-3110, I certify that to the best of my knowledge, this specification is in compliance with the requirements of Article NCA-3250, and is correct and complete.

(RPE Seal) 	(RPE Seal)	(RPE Seal)
(RPE Seal)	(RPE Seal)	(RPE Seal)

Revision : 0 Certified by : Lee. S. H Date : 2023-6-8

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Notes : This certificate form shall be utilized for ASME, Section III, Division 1&2.


**ARA**

**CERTIFICATION OF SPECIFICATION**

Title : TILTING DISC CHECK VALVES

Spec. No.: F-145-UP206D

Pursuant to the provision of KEPIC MNA-3110, I certify that to the best of my knowledge, this specification is in compliance with the requirements of MNA-3240, 6110, and is correct and complete.

(RPE Seal) 	(RPE Seal)	(RPE Seal)
(RPE Seal)	(RPE Seal)	(RPE Seal)

Revision : 0 Certified by : 전진한 Date : 2023-6-8

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Notes : This certificate form shall be utilized for only local and international procurement specification applied to KEPIC MN.

## ASME/KEPIC Design Specification Requirements Locator

(ASME Section III, Div.1/KEPIC MN)

<u>Items</u>	<u>Specification Paragraphs or Reference Documents</u>
1. Functions and boundaries of the components .....	4.05.A.1 and 4.05.A.4
2. Design requirements, including all required overpressure protection requirements .....	4.05
3. Environmental conditions, including radiation.....	4.05.D
4. Code classification of the components .....	4.05.A.2
5. Material requirements, including impact test requirements when applicable .....	4.06.A and 4.06.B
6. Operability requirements.....	4.05.A and 4.05.B
7. Effective Code Edition, Addenda and Code Cases to be used for construction .....	4.03.B and 4.03.F

ARA

## SECTION 4 TECHNICAL SPECIFICATION

Title : TILTING DISC CHECK VALVES

Spec. No. : F-145-UP206D

- Safety Category : Safety & Non-Safety  
-Related
- Quality Class : Q & A
- Safety Class : 3 & NNS

KEPCO E&C JOB No. : 1229L



### ISSUE STATUS

0	06/08/23	INVITATION TO TENDER ISSUE	박나희	정만로	이상하 박수원	김정강
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED

Preparer : 박나희, Tel : 054-421-4542

## **SECTION 4 - TECHNICAL SPECIFICATION**

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## **SECTION 4 - TECHNICAL SPECIFICATION**

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## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.01 SCOPE**

#### **A. WORK INCLUDED**

1. The Supplier shall design, furnish materials, fabricate, examine, test, package and deliver in accordance with this specification the following:
  - a. This specification defines the technical requirements for tilting disc check valves for nuclear power plant services in accordance with 2007 Edition through 2008 Addenda of ASME Section III Code for safety related items, and 2016 Edition of ASME B31.1 Code for non-safety related items respectively, hereinafter referred to as the "Code".
  - b. The Supplier shall furnish materials, tools and equipment and perform all operations necessary to design, fabricate, examine, test, qualify, clean, certify, stamp, package and deliver tilting disc check valves with all appurtenances in accordance with this specification.
  - c. For the components and equipment that require ultrasonic test for ISI, UT requirements of ASME Section XI, in addition to the volumetric tests as required by manufacturing codes and standards, shall be applied during fabrication at the shop to prepare for the preservice inspection.
2. The Supplier shall supply all necessary drawings, reports and certified documents required by the applicable codes and this specification.
3. The Supplier shall furnish one (1) lot of all special tools required for adjustment, maintenance and dismantling of the equipment. Tools shall be new and of first class quality. Tools shall be shipped in a separate suitable container clearly marked with the name of the equipment. Tool container shall be marked for delivery in accordance with the requirements in Section 2.
4. When requested by the Buyer, the Supplier shall furnish the services of competent technical advisor(s) who shall provide technical advice, guidance and assistance in the erection and testing of the equipment furnished under this Specification, as required for the placement of the equipment in successful operation by the Buyer's personnel.
5. The Supplier shall furnish one (1) lot of Spare Parts required during installation, start-up, and two (2) years of normal operation. All requirements that apply to the original parts of the specified valve shall apply equally to the spare parts of the specified valve. All documentation for spare parts shall be submitted in the same manner as for original parts.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.01 SCOPE (CONT.)**

#### **B. RELATED WORK NOT INCLUDED**

The following work will be by others:

1. All external wiring not forming an integral part of Supplier's equipment
2. Foundations, supporting steel and anchor bolts
3. Connections to Buyer's interface
4. Installation

### **4.02 ABBREVIATIONS AND DEFINITIONS**

In addition to definitions included in the General Conditions and Special Conditions, the following shall apply:

1. Buyer will review drawings and data submitted by the Supplier, therefore, reference to the terms "approve", "approved", "approval", etc., shall be construed to mean "review" or "reviewed".
2. Wherever the terms "or equal" or "as agreed upon" are used in this Specification, they shall mean "as agreed upon" by "Buyer" unless otherwise specifically stated.
3. Wherever the word "harsh environment" appears in the Specification it shall mean an environment which experiences a significant increase in pressure, temperature, relative humidity, or chemical environment as a result of a design basis event or is predicted to experience Total Integrated Dose (TID) greater than  $10^2$  Gy (greater than 10 Gy for electronic components such as semiconductors or electronic components containing organic material).
4. Existing Qualification Report:  
Report prepared by the Supplier at the date of the purchase contract award.
5. KEPIC: Korea Electric Power Industry Code
6. ASME Section III valve: Valves designed and manufactured in accordance with the ASME Section III Code.
7. ASME B31.1 valve: Valves designed and manufactured in accordance with the ASME B31.1 Code.



## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.03 QUALITY STANDARDS**

#### **A. GENERAL**

Supplier shall control the quality of Goods and Services to meet the requirements of this specification, applicable codes and standards.

#### **B. CODES AND STANDARDS**

1. For ASME Boiler and Pressure Vessel Code Section III and Section XI, the 2007 Edition through 2008 Addenda shall apply (except that NB-3683.4(c)(1), Footnote 11 to Figure NC/ND-3673.2(b)-1 in the 1989 Edition shall be used). For all other Section of ASME Boiler and Pressure Vessel Code, 2007 Edition through 2008 Addenda shall apply. For ASME B31.1, the 2016 Edition shall apply. For the other Codes and Standards listed on the cross-reference table in Attachment 4-5, the applicable edition/addenda shall be as specified on the cross-reference table.

For the other Codes and Standards not listed on cross-reference table, the latest edition/addenda in effect as of June 30, 2019 shall apply, unless indicated otherwise

2. For the Codes and Standards listed on the Cross-Reference Table in Attachment 4-5, the applicable edition/addenda shall be as specified on the Cross-Reference Table. For Local Supplier, the applicable edition/addenda of KEPIC shall be as specified on the Cross-Reference Table in Attachment 4-5.  
For the Codes and Standards not listed on the Cross-Reference Table, the latest edition/addenda in effect as of June 30, 2019 shall apply, unless indicated otherwise.
3. Should conflict exist between KEPIC and the referenced codes and standards, the referenced codes and standards take precedence over KEPIC except KEPIC QAI, QAR, MNA, SNA and STB for Local Supplier.
4. Codes and standards mentioned in this specification including Attachments and Appendices shall be read to mean the equivalent Article or Subarticle of KEPIC code for Local Supplier.
5. Authorized inspection requirements specified in KEPIC MG are not applied for Local Supplier.

## **SECTION 4 – TECHNICAL SPECIFICATION**

### **4.03 QUALITY STANDARDS (CONT.)**

6. The Supplier shall comply with all the requirements set forth in this specification and its referenced documents. Approval of drawings, specifications, procedures or tests by the Purchaser shall in no way relieve the Supplier from these responsibilities. There shall be no deviations from this Specification or its referenced applicable Codes and Standards without prior written approval from the Buyer.
7. The WORK performed shall comply with the applicable codes, standards and regulations, and in particular the following:

<b><u>SPONSOR</u></b>	<b><u>NUMBER</u></b>	<b><u>SUBJECT</u></b>
ASME	B1.20.1 ['13 Ed./ R '18]	Pipe Threads, General Purpose
ASME	B16.5 ['17 Ed.]	Pipe Flanges and Flanged Fittings, NPS 1/2 Though NPS 24
ASME	B16.10 ['17 Ed.]	Face-to-Face and End-to-End Dimensions of Valves
ASME	B16.25 ['17 Ed.]	Buttwelding Ends
ASME [KEPIC]	B16.34 ['17 Ed.] [MGG]	Valves-Flanged, Threaded, and Welding End
ASME [KEPIC]	B31.1 ['16 Ed.] [MGE]	Power Piping
ASME [KEPIC]	QME-1 ['07Ed.] [MF]	Qualification of Active Mechanical Equipment Used in Nuclear Power Plant
ASME [KEPIC]	NQA-1 ['94Ed. & '95Add.] [QAP]	Quality Assurance Requirements for Nuclear Facility Applications
ASME [KEPIC]	Sec. II ['07 Ed. ~ '08 Add.] [MD]	Materials
ASME [KEPIC]	Sec. III ['07 Ed. ~ '08 Add.] [MN]	Rules for Construction of Nuclear Power Plant Components
ASME [KEPIC]	Sec. V ['07 Ed. ~ '08 Add.] [MEN]	Nondestructive Examination

## **SECTION 4 – TECHNICAL SPECIFICATION**

### **4.03 QUALITY STANDARDS (CONT.)**

<b><u>SPONSOR</u></b>	<b><u>NUMBER</u></b>	<b><u>SUBJECT</u></b>
ASME [KEPIC]	Sec. IX ['07 Ed. ~'08 Add.] [MQW]	Qualifications Standard for Welding and Brazing Procedures, Welders, Brazers and Welding and Brazing Operators
ASME [KEPIC]	Sec. XI ['07 Ed. ~'08 Add.] [MI]	Rules for Inservice Inspection of Nuclear Power Plants Components
ASME Code Case	N-855	SB-148 C95800 Valves for ASME Sec. III Division 1, Class 3 Construction
MSS	SP-55 ['11 Ed.]	Quality Standard for Steel Castings for Valves, Flanges and Fittings and other Piping Components -Visual Method for Evaluation of Surface Irregularities
MSS	SP-61 ['13 Ed.]	Pressure Testing of Steel Valves
IEEE [KEPIC]	323 ['03 Ed./R'08]) [END 1100]	Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations
IEEE [KEPIC]	344 ['04 Ed.] [END 2000]	Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations
SSPC	Various	The Society for Protective Coatings
SSPC/ NACE	SP-10/ No.2 ['07 Ed.]	Near-White Metal Blast Cleaning
USNRC	10 CFR 50 Appendix B	Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
AWS	Various	Weld Filler Metal Specification
USNRC	RG 1.28 (Rev. 5)	Quality Assurance Program Requirements (Design and construction)
USNRC	RG 1.44 (Rev. 1)	Control of the Processing and Use of Stainless Steel

## **SECTION 4 – TECHNICAL SPECIFICATION**

### **4.03 QUALITY STANDARDS (CONT.)**

#### **C. QUALITY REQUIREMENTS**

1. This specification covers Goods and Services that have a safety related and non-safety related function in a nuclear power plant. The Supplier shall meet the specific requirements of App. 4A1, 4B, 4H, and 4H1, as applicable. Appendix 4H1 is only applicable to Quality Class "Q" items.
2. A distinct quality class is assigned to all work within this specification. Unless specifically noted otherwise in this specification, the following Quality Classes shall be applied to the specified work.

<u>Quality Class</u>	<u>Items</u>
Q	ASME Section III valves
A	All ASME B31.1 valves

#### **D. CONFLICT**

Should conflict exist among codes, standards and the technical specification including Attachments and Appendices, the Supplier shall notify the Buyer of clarification prior to proceeding the work. Any deficiency resulting from a failure to follow this process shall be corrected at the Supplier's expense.

#### **E. SUBSUPPLIERS**

A Subsupplier, i.e., a foundry, forging shop, or independent testing agency, may perform operations, tests or examinations that require procedure submittals and documentation of results. The organization which proposes to perform or performs the activity shall prepare the procedure and documentation covering that activity.

However, the Supplier is solely responsible for the acquisition of procedures and certified documents, for their submittal to Buyer, and shall assure that the Subsuppliers are properly qualified in accordance with Appendix 4A1 and 4B.

#### **F. CODE CASES**

Applicable code case rulings as listed in USNRC Regulatory Guide 1.84 may be invoked in the construction of valves in accordance with this Specification upon Buyer's approval. Adoption of any subsequent code case rulings shall also be subject to Buyer's approval prior to implementation.

## **SECTION 4 – TECHNICAL SPECIFICATION**

### **4.03 QUALITY STANDARDS (CONT.)**

#### **G. REQUIREMENT FOR QUALIFICATION OF MANUFACTURING, AUTHORIZED INSPECTION AND STAMPING**

1. The Local Supplier shall comply with the requirements for qualification of manufacturing, authorized inspection and stamping in accordance with the KEPIC MNA
2. The Local Supplier shall have a current KEPIC MN Certificate of Authorization for use of pertinent KEPIC Symbol in accordance with KEPIC MNA-8000. The Local Supplier shall furnish to the Buyer, prior to any material procurement or fabrication, documentation that he is authorized to use pertinent KEPIC Stamping.
3. The Foreign Supplier shall comply with the requirements for qualification of manufacturing, authorized inspection and stamping in accordance with the ASME NCA.
4. The Foreign Supplier shall have a current ASME N Certificate of Authorization for use of pertinent Code Symbol Stamp in accordance with ASME NCA-8000. The Foreign Supplier shall furnish to the Buyer, prior to any material procurement or fabrication, documentation that he is authorized to use pertinent Code Symbol Stamp.
5. The Supplier must have its own Certificate that the Supplier is qualified to manufacture and supply the equipment. If the Supplier is processing a sub-part/component from a Sub-supplier, the Sub-supplier's own Certificate for that component is acceptable provided that the Sub-supplier must be registered on the Supplier's approved vendor list in accordance with the Supplier's quality assurance program.

## **SECTION 4 – TECHNICAL SPECIFICATION**

### **4.04 SUBMITTALS**

#### **A. SUBMITTAL REQUIREMENTS**

1. Drawings and data shall be submitted in accordance with Appendices 4A2 and 4C. Drawings and data requirements and quality verification document requirements are summarized in Appendices 4D and 4E, and are augmented by detailed requirements in this Specification (Appendix 4C). The Supplier shall provide a list of drawings and documents to be submitted in accordance with Appendix 4C. The list of drawings and documents shall be cross referenced with those drawings and documents itemized in Appendix 4D.
2. The Supplier shall notify the revised parts in the drawing and document to A/E by "Supplier's Drawing/Document Change Notice" attached to Supplier's Transmittal in accordance with Appendix 4C.
3. After incorporating the A/E's comments and after completion of fabrication, the Supplier shall submit the "AS-BUILT" drawings and documents in accordance with the submittal requirements of Appendix 4D and the AS-Built guideline to be provided by the Buyer after Award.

#### **B. DRAWINGS AND DOCUMENTS**

1. The Supplier shall submit, after award of Purchase Contract/Order, certified drawings of the design of valves to be furnished. The following information shall be included on or submitted with the drawings:
  - a. Two views of the valve assembly
  - b. Bill of materials with parts referenced the KEPIC/ASME/ASTM specifications as appropriate for all valves purchased under this specification. The bill of materials shall indicate which component parts could compromise the safety-related function of the valve, upon failure of that component. All recommended spare parts for valves shall be identified by part number.
  - c. Requirements for nondestructive examinations, calculations (seismic, design reports, etc.), and tests. All interface requirements, if any, such as end force and moment allowable shall be specified on the valve assembly drawing.
  - d. Hydrostatic test pressures for body and seat leakage tests
  - e. Weight and center of gravity of valve assembly. The center of gravity of valve assembly shall be shown on each of the two views so that its location is defined in all three global directions.

**SECTION 4 - TECHNICAL SPECIFICATION**

**4.04 SUBMITTALS (CONT.)**

- f. Butt weld end detail and schedule, or flanged end detail
  - g. Dimensions, such as end-to-end, maintenance space required, height, width, minimum allowable wall thickness, and other pertinent dimensions
  - h. Cv values (flow coefficients) at full open and minimum flow positions and curve of Cv values vs. valve disc position from full open to full close
  - i. Valve minimum flow passage diameter and flow direction
  - j. Purchase Contract/Order number, item number, mark number and/or tag number, pressure class
  - k. For all welding performed on a valve pressure retaining item, including hardsurfacing and overlay welding, the valve drawing shall indicate the welding procedure or procedures proposed to be used.
  - l. Applicable Code and ASME Section III Code Class.
  - m. Flow directions, if any, upstream or downstream of valve
  - n. Position of disc during welding of valve into the line shall be identified
  - o. The minimum flow velocity (and/or pressure drop) required to lift the disc to the full open
  - p. Detailed description of trim materials.
  - q. The torque required for all pressure containment bolting, i.e., torque required to provide specified gasket loading
  - r. Lubricant required for valve top works and lifting lugs, where applicable
  - s. Any installation limitation for tilting disc check valves
- 2. The Supplier shall submit, in accordance with Appendix 4A1 controlled copies of the Quality Assurance Manual that will be applicable to all quality assurance activities related to the scope of the procurement documents.
  - 3. The Supplier shall submit for acceptance, after award of Purchase Contract, a package of sample forms of verification documents listed in Appendix 4E for transmittal to Buyer showing format and typical content, in accordance with Appendix 4C.

#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.04 SUBMITTALS (CONT.)**

4. The Supplier shall submit design reports for ASME Section III valves for acceptance in accordance with the Code and this specification.
5. The Supplier shall submit functional qualification plan, functional qualification reports, and application reports for all Active valves for acceptance in accordance with ASME QME-1 and Paragraph 4.05.A.9 of this specification.
6. The Supplier shall submit for acceptance, prior to the beginning of manufacturing and fabrication, (post weld) heat treatment procedures in accordance with the Code and Appendices 4K1 and 4K4. Where applicable, Supplier should submit the list for simulated post weld heat treatment(S-PWHT) specified in 4.06.A.11.c of this Specification.
7. The Supplier shall submit dynamic qualification program (procedure or plan), and complete documentation of dynamic qualification in accordance with Appendix 4I of this specification.
8. The Supplier shall submit for acceptance, prior to the beginning of manufacturing and fabrication, written welding procedure specification (WPS) including procedure qualification records (PQR) and weld repair procedures in accordance with the Code and Appendices 4K1 and 4K4.
9. The Supplier shall submit cleaning procedures for acceptance, prior to the beginning of manufacturing and fabrication, in accordance with Paragraph 4.06.D.5 of this specification.
10. The Supplier shall submit for acceptance, prior to the beginning of manufacturing and fabrication, surface preparation and coating procedures in accordance with Paragraph 4.07 of this specification.
11. The Supplier shall submit for information, prior to packaging and shipping, the procedures for packaging, shipping, receiving, storage and handling in accordance with Paragraph 4.09 of this specification.
12. The Supplier shall submit for acceptance, prior to the beginning of test and examination, all applicable nondestructive examination procedures prepared in accordance with the requirements of the Code and Paragraph 4.08.B.1 of this specification.
13. The Supplier shall submit for acceptance, prior to the beginning of test and examination, the procedures for hydrostatic testing and seat leakage testing in accordance with Paragraph 4.08.B.3 of this specification.
14. The Supplier shall submit for acceptance, prior to the beginning of test and examination, the procedures for wall thickness measurements in accordance with Paragraph 4.08.B.2. of this specification.



#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.04 SUBMITTALS (CONT.)**

15. The Supplier shall submit the work schedule including engineering, procurement, fabrication, testing, delivery and work progress report for Buyer's information through on-line management system.
16. The Supplier shall submit the list of loose parts (parts or accessories not attached to valves).
17. The Supplier shall furnish the instruction manuals for all valve assemblies furnished by Supplier in accordance with Paragraph 4.10 of this specification.
18. After award, the Supplier shall submit spare parts and/or special tools data information in accordance with data formats provided by the buyer.
19. To support building "Equipment master database", the supplier shall submit the electronic files for the followings in accordance with the guideline to be provided by Buyer.
  - a. Design data shown on Supplier's finalized data sheet and other required data in instruction manual for valves.
20. The Supplier shall furnish the material verification report (Attachment 4-7) which demonstrates that pressure retaining material and support material of KEPIC MN (ASME Section III) equipment conforms to the requirements of KEPIC MND-2120 (ASME Section ND-2120) in accordance with Paragraph 4.06.C.9 of this specification. The report attest the conformance of requirements for the materials listed in drawings, design reports and CMTRs (Certified Material Test Report), as applicable.  
The Supplier also shall provide the reason with MVR for not selecting material for KEPIC MN (ASME Section III) in the other parts.
21. The Supplier shall furnish the codes & standards compliance report (Attachment 4-9) for information which demonstrates that assembly/part (pressure retaining material of KEPIC MN/ASME Section III is assigned to Part) of all tag equipment (subject to Q-class or seismic category I or environmental qualification) confirms to the requirements of code & standards in accordance with Paragraph 4.03 of this specification.
22. The Supplier shall submit the Part List(s) in accordance with Appendix 4X for Information.
23. Supplier shall submit for review, after award of Purchase Contract/Order, completed valve data sheets.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.04 SUBMITTALS (CONT.)**

#### **C. QUALITY VERIFICATION DOCUMENTS**

1. All quality verification documentation shall be furnished with shipment of the valve assemblies in accordance with the instructions in Appendix 4E and shall be specifically identified with the valve(s) to which it applies.
2. The Supplier shall submit material and weld repair verification reports in accordance with Appendix 4E and this specification.
3. Records of heat treatment either as heat treatment charts or a summary description of heat treatment with time and temperature data certified by the Supplier shall be submitted in accordance with Appendix 4E. The chart or record shall record the temperature of each thermocouple or other temperature sensor during the entire period of heat treatment when the temperature being recorded is above 315.6°C (600 °F). The record shall show valve identification number, date, and time.
4. Certified Material Test Reports and/or Material Organization's Certificates of Compliance shall be prepared and submitted for pressure retaining part in accordance with Appendix 4B and applicable Code, and shall include results of chemical and physical property tests required by the Code and material specifications. The reports for supplementary tests required shall also be included. Instead of CMTR, Material Test Report may substitute for Non-safety-related items such as Quality Class "A"
5. A Certificate of Conformance shall be submitted by the Supplier certifying conformance to all the requirements of the appropriate Sections of the Code and this specification.
6. Radiographic (including film), ultrasonic, liquid penetrant, and magnetic particle examination records shall show the valve mark number and tag number, examination procedure, acceptance standards, and other pertinent information. The records shall also show the acceptance of examination results by the Supplier's examiner.
7. Hydrostatic shell test and seat leakage test results, including reference to the test procedure used, in accordance with the requirements in Paragraph 4.08.B.3 shall be submitted.
8. For the ASME Section III valves, Ferrite data per Paragraph 4.06.B.1 shall be transmitted with shipment. Impact test results shall be shown in the Certified Material Test Report.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.04 SUBMITTALS (CONT.)**

9. For ASME Section III valves, Wall thickness verification reports shall be submitted in accordance with the requirements of Paragraph 4.08.B.2 of this specification.
10. Code Data Reports for ASME Section III valves prepared in accordance with the ASME Section III Code shall be submitted.
11. The Supplier deviations and non-conformances from this specification must be documented on a Supplier Deviation Disposition Request (SDDR) as described in Appendix 4H.
12. The Supplier shall submit quality verification documentations of coating work in accordance with Appendices 4G2, and this specification.

### **4.05 DESIGN CONDITIONS**

#### **A. GENERAL**

1. The basic design function of the tilting disc check valve is to prevent the backflow into the upstream lines, and promote the reduction in the slamming effect of the disc upon flow reversal and tendency to prevent water hammer because of the quick-closing stroke due to the short length of travel.

Code Case N-855 shall be applied for the construction of ASME SB-148 C95800 valves.

2. Valves furnished under this specification will be operated in a Nuclear Pressurized Water Reactor Power Plant, and shall be designed to meet the requirements of the Code and this specification including the supplemental information in Attachments and Appendices, as applicable. Valves covered under this specification are rated as ASME Section III Class 3 or ASME B31.1 and shall be designed and constructed in accordance with the rules of the respective ASME Section III Class 3 or ASME B31.1 Code, respectively.
3. Valves and accessories shall be designed and constructed to withstand the environmental conditions of temperature, humidity, radiation, chemical spray and seismic loading as specified in Paragraphs 4.05.C and 4.05.D.
4. The Code Class jurisdictional boundary of valves, relative to the connecting piping, shall be taken as the weld-end, flange face or any piping connection to the pressure boundary.

#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.05 DESIGN CONDITIONS (CONT.)**

5. Valves shall have a minimum design life of 30 years at the specified environmental and service conditions with normal maintenance, accounting for corrosion and material life.
6. ASME Section III valves shall be designed with due consideration of the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Rules for In-service Inspection of Nuclear Power Plant Components.
7. Disc shall be designed and manufactured to remain stable during minimum flow conditions.
8. All valves shall prevent from becoming potential missiles. The supplier shall prove by test or analysis that the pressurized parts of valve (such as bonnet, cover plate which is maintained by bolts, etc.) will not become a missile and damage surrounding safety-related systems, equipments, and structures. Compliance with this requirement shall be submitted by test result or documented in the valve design report.
9. ASME Section III valves designated as "Active" on Valve Data Sheets shall remain intact and be capable of both opening and closing to perform their safety related function during and after Design Basis Accidents. Functional qualification shall be demonstrated by tests per requirements provided in QME-1. This qualification shall include all necessary calculations, test results, and justifications used to demonstrate functional capability during and after Design Basis Accidents. The following information, as a minimum, shall be provided by Supplier;
  - a. Valve sealing capability
  - b. Operability under maximum pipe-reaction end loading
  - c. Operability during and after loading representative of the maximum seismic and/or vibratory incident
  - d. Flow interruption and functional capability
  - e. Adequacy of the materials of construction to survive environmental and aging effect
  - f. Valve closing time and stroke verification
  - g. Maximum stresses in valve parts, disc parts and/or hinges

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.05 DESIGN CONDITIONS (CONT.)**

- h. Maximum impact loads on valve seat and/or limitations in valve orientation and/or configuration
  - i. Any specific installation requirements and/or limitations in valve orientation and/or configuration
10. The Safety functions and Design Functions of Tilting Disc Check Valves are shown in Attachment 4-10 and Attachment 4-11.

#### **B. OPERATING AND DESIGN CONDITIONS**

- 1. Valve shall be designed and manufactured to meet the requirements of the Code and this specification including the supplemental information in Attachments and Appendices.
- 2. Pressure-temperature ratings of the valves shall be in accordance with ASME B16.34
- 3. Design/operating pressures and temperatures for all service conditions shall be in accordance with Attachment 4-4, Valve Data Sheets.
- 4. Valves including accessories shall be designed and constructed to withstand the environmental conditions of temperature, humidity, radiation, chemical spray, and seismic loading as specified in this specification.
- 5. Valves shall have a minimum design life of 30 years at the specified conditions with normal conditions, accounting for corrosion and material life. The minimum corrosion allowance for the pressure retaining components of carbon steel castings and forgings shall be 2.032 mm (0.08 inch). The minimum corrosion allowance for the 400 series stainless steel valve trim shall be 0.051 mm (0.002 inch).
- 6. The valves provided shall be capable of providing their intended function of opening and closing for normal and accident conditions. The valves must operate within the time specified on the Valve Data Sheets where required.

#### **C. DYNAMIC DESIGN REQUIREMENTS**

- 1. Valves shall retain their pressure integrity during and after the seismic events specified herein.
- 2. ASME Section III valves shall remain functional and maintain structural integrity during and after the Design Basis Events specified herein.

**SECTION 4 - TECHNICAL SPECIFICATION**

**4.05 DESIGN CONDITIONS (CONT.)**

3. The Supplier shall submit qualification documents to demonstrate the capability of the valve to sustain the forces resulting from the specified Design Basis Events by qualifying the Seismic Category I valve in accordance with the requirements of Appendix 4I. The qualification report shall include seismic qualification supplier's checklist in accordance with the requirement in Appendix 4I.
4. An existing dynamic qualification report that was prepared before the award of this purchase contract may be acceptable if properly documented, and if it meets all the requirements of this specification. The acceptability of an existing report will be determined solely by Buyer.
5. For Active Valves, Supplier shall prove by test and/or analysis the operability of the valves before, during, and after design basis accidents and provide the test or analysis report as a part of the dynamic qualification report in accordance with the requirements of Appendix 4I.
6. Following seismic coefficients in g's shall be used for seismic qualification purposes:

Design Basis Event					
Operating Basis Earthquake			Safe Shutdown Earthquake		
H1	H2	V	H1	H2	V
4.0	4.0	4.0	5.0	5.0	5.0

- a. "H1" shall act along the axis of the worst possible position of the equipment.
  - b. "H2" and "V" will be mutually perpendicular and perpendicular to "H1".
  - c. "H1", "H2" and "V" shall be applied simultaneously.
  - d. The valves shall be designed to accept the resultant seismic forces.
  - e. The above seismic coefficients for a few certain valves may change as design progresses.
7. The valves including accessories, shall withstand seismic forces assuming that the valve is installed in any position. The seismic stresses in the valve components due to the seismic loads stated in Paragraph 4.05.C.6 shall be combined with stresses due to live and dead loads and operating loads.

## SECTION 4 - TECHNICAL SPECIFICATION

### **4.05 DESIGN CONDITIONS (CONT.)**

8. The resultant stresses, due to the combined loads, shall be computed at all critical sections. The stress limits in all those sections shall conform with the stress limits specified in Paragraph 4.05.E.1.
9. The lowest natural frequency of vibration of each equipment assembly shall be greater than 33 Hz.

#### **D. ENVIRONMENTAL DESIGN REQUIREMENTS**

1. Safety-related active mechanical equipment located in mild environment shall address or consider equipment aging (i.e. radiation, thermal, and cyclic) in their qualification program. The method used by the supplier to satisfy aging shall be consistent with methodologies acceptable to industry code & standard. The Supplier shall submit a justification document for aging condition in accordance with IEEE 323.

##### **a. Outside Containment - Harsh Environment ("D")**

<u>Condition</u>	<u>Normal</u>	<u>Accident*</u>
Duration	30 years	1 year
Pressure, kPa (psig)	101.3 (0)	222.6 (121.3)
Temperature, °C (°F)	10 to 40 (50 to 104)	Max. 300 (572)
Relative Humidity, %	7 to 90	Max. 100
Radiation TID**, Gy	7x10 <sup>3</sup>	9x10 <sup>3</sup>

##### **b. Outside Containment - Mild Environment ("O")**

<u>Condition</u>	<u>Normal</u>	<u>Accident*</u>
Duration	30 years	1 year
Pressure, kPa (psig)	101.3 (0)	101.3 (0)
Temperature, °C (°F)	10 to 50 (50 to 122)	10 to 50 (50 to 122)
Relative Humidity, %	7 to 90	7 to 90
Radiation TID**, Gy	1x10 <sup>2</sup>	1x10 <sup>2</sup>

\* For ASME Section III valves only.

\*\* Total Integrated Dose (TID) for normal conditions is 30 years normal operation dose. TID for accident condition is 30 years normal TID plus the design basis accident dose for a maximum of one year.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.05 DESIGN CONDITIONS (CONT.)**

#### **E. EXPECTED NOZZLE LOAD**

1. All valves shall be designed to be stronger than the connecting pipe. That is, the valves shall be designed to withstand moments applied at each valve end, and aligned about the axis most detrimental to the valve that would cause stress levels in the attached piping to be at the Code allowable maximum.
2. The valve body is considered adequate to withstand piping end loads provided the following criteria are met:
  - a. The section modulus and metal area of a plane normal to the flow passage through the region at the valve body crotch shall be not less than 110% of the section modulus and metal area of the piping connected to the valve body inlet and outlet nozzle.
  - b. The allowable stress for valve body is equal to or greater than the allowable stress of the connected piping material. If the valve body material allowable stress is less than that of the connecting piping material, the valve section modulus and metal area shall be not less than 110% of the section modulus and metal area of the connected piping multiplied by the ratio  $S_{\text{pipe}}/S_{\text{valve}}$ .

#### **F. DESIGN LIMITS AND LOADING COMBINATIONS**

1. Service loading combinations and stress limits shall be in accordance with Table I of Appendix 4I and Table ND-3521.1 of the ASME Section III Code for ASME Section III valves and Chapter II of ASME B31.1 Code for ASME B31.1 valves.
2. Valves shall be subject to Design and Normal conditions and shall conform to the requirements of Paragraph ND-3500 of the ASME Section III Code and Chapter II of ASME B31.1 Code, as applicable.

### **4.06 MATERIALS AND FABRICATION**

#### **A. GENERAL**

1. Material and fabrication shall be suitable for the design and service conditions specified, and shall be in accordance with the applicable requirements of the Code and this specification.
2. Materials and fabrication not specifically covered by this specification shall be covered by manufacturer's standard, suitable for the application.



#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.05 DESIGN CONDITIONS (CONT.)**

3. Pressure retaining items shall be of materials in accordance with the Code. Selection of materials not specified herein shall be subject to acceptance by Buyer. Request to use alternative material shall include basis for selection. Stainless steel bolting shall be provided on the stainless steel valves.
4. Pressure-retaining items are defined as bodies or discs, and the bolting required for joints between pressure-retaining items, and shall be identified on the assembly drawings.
5. Nitriding treatment or chrome plating on any surface exposed to the working fluid is prohibited. Care must be taken to avoid use of any welding flux, gaskets, anti-rust compound or other chemical employed in the fabrication or production that contain chlorides or other constituents capable of inducing stress corrosion in stainless steel or copper alloys.
6. All stainless steel components shall be handled using slings, ropes, or other media free from ferrous contamination. All grinding performed on stainless steel components shall be accomplished using iron free compounds, files or burring tools which have not been used previously on iron or carbon steel.
7. Valve trim materials shall be selected by the Supplier to ensure maximum protection against the effects of corrosion, erosion, wear, and galling for the particular service conditions shown on the Valve Data Sheets.
8. Cobalt material shall be utilized for seat area only, if necessary.
9. The use of asbestos in the manufacture of any component purchased under this specification is prohibited.
10. The PBC (Polybutylcuprasil) lubricant shall not be used for bolts/nuts lubrication to avoid the stress corrosion cracking or similar problems discussed in the document O&MR 397 (Stress Corrosion Cracking in Valve assembly Bolts, Oct. 06, 1992).
11. Heat treatment for Simulated Post Weld Heat Treatment (S-PWHT)

Ferritic steel material means carbon and low-alloy steels, higher alloy steels including all stainless alloys of the 4xx series, maraging and precipitation hardening steels with a predominantly body-centered cubic crystal structure in accordance with 10 CFR 50 Appendix G and ASME Section III, ND-2200.

- a. Where ferritic steel material is subjected to heat treatment during fabrication or installation of a component, the material used for tensile and impact tests shall be heat treated in accordance with ASME Section III, ND-2200.

#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.06 MATERIALS AND FABRICATION (CONT.)**

- b. Post weld heat treatment, which will be performed during field installation, shall be performed in accordance with ASME Section III, ND-4620. Holding temperatures duration and heating/cooling rates will be based on material (P number and nominal material thickness at the welded joint.)
  - c. The total time of Simulated Post Weld Heat Treatment (S-PWHT) for the tensile and impact test of specimen shall include the actual PWHT duration for fabrication plus Five (5) hours for installation and repair welds using for over the 30 years expected life time of the component/piping welds. The total time, temperature profile and results of tensile and impact test for S-PWHT specimen shall be incorporated in CMTR.
  - d. When materials of two different P-Number groups are joined by welding, the applicable post weld heat treatment for the material requiring the higher temperature range shall be applied on the test specimen.
  - e. When hard surfacing or buttering is made, the applicable post weld heat treatment shall be applied on the test specimen.
  - f. When buttering is made, the applicable post weld heat treatment for the material requiring the higher temperature range shall be applied on the welding material used for buttering.
  - g. The Supplier shall provide S-PWHT related information in the Material Verification Report (Attachment 4-7).
12. The Supplier shall not proceed with fabrication of any supplier scope of supply without the Buyer's explicit written approval of equipment qualification reports described in D.10 of Appendix 4D.
13. The pressure retaining material of KEPIC MN (ASME Section III) equipment shall conform to the requirements of one of the specifications for materials given in Tables 1A, 1B and 3 of ASME Section II, Part D, Subpart 1, including all applicable notes in the tables in accordance with KEPIC MND-2120 (ASME Section III ND-2120).
14. The Supplier shall submit Weld Map for all weld parts of KEPIC MN (ASME Section III) Equipment pressure retaining parts in accordance with the form of Attachment 4-8 for information and provide related information in Quality Plan.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.06 MATERIALS AND FABRICATION (CONT.)**

#### **B. MATERIALS**

##### **1. Austenitic stainless steel**

- a. All austenitic stainless steel ferrite control shall be in accordance with Paragraph 4.0 of Appendix 4K1. All pressure retaining austenitic stainless steel castings shall contain a ferrite content between 8 % and 30 % volume fraction determined by ASTM A 800 except 8 % to 20 % for normal operating temperature above 260°C (500°F). The results of the ferrite determination for both castings and filler metal shall be included in the Certified Material Test Report (CMTR), or in the delta ferrite determination report when CMTR is not submitted.

- b. Safety Related Items

Austenitic stainless steels shall be in a solution annealed condition, which shall consist of heating to 1038°C~1121°C (1900°F~2050°F) and holding for appropriate time based on maximum thickness. Austenitic stainless steel shall then be cooled rapidly from the annealing temperature to below 371°C (700°F) and, if any, the quenching temperature specified in the applicable material specification, so as to prevent carbide precipitation in the grain boundaries.

Non-sensitization of austenitic stainless steels of pressure retaining parts shall be verified using ASTM A262-02a, Practices A or E. Results of these tests shall be documented in Certified Material Test Report. Test specimens shall be selected from material subjected to each different heat treatment practice and from each heat.

Test specimens of low carbon grades marked with the suffix “L” in (Certified) Material Test Report shall be tested in the sensitized condition in accordance with ASTM A262-02a.

If it is necessary to use cold worked austenitic stainless steel of pressure retaining parts, cold work of austenitic stainless steel shall be controlled not to exceed 0.2% offset yield strength of 620 MPa (90,000 psi).

- c. Non-Safety Related Items

Austenitic stainless steels shall be in a solution annealed condition, which shall consist of heating to 1038°C~1121°C (1900°F~2050°F) and holding for an appropriate time based on maximum thickness. Austenitic stainless steel shall then be cooled rapidly from the annealing temperature to below 371°C (700°F), so as to prevent carbide precipitation in the grain boundaries.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.06 MATERIALS AND FABRICATION (CONT.)**

#### **2. Precipitation hardened stainless steel**

ASME SA 564 Type 630 (17-4PH Type) for ASME Section III valves and ASTM A 564 Type 630 (17-4PH Type) for ASME B31.1 valves material shall be solution heat treated at  $1038 \pm 25^{\circ}\text{C}$  ( $1900 \pm 25^{\circ}\text{F}$ ) for one (1) hour minimum, followed by air cooling. Age hardening shall be done at  $593 \pm 15^{\circ}\text{C}$  ( $1100 \pm 15^{\circ}\text{F}$ ) for four (4) hours minimum, followed by air cooling.

#### **3. Galling prevention**

Surfaces in moving contact, including seats, shall have a suitable differential hardness or other provisions to prevent galling. In case of differential hardness between main seating surfaces, the body seat shall have the higher relative hardness.

#### **4. Hardsurfacing material**

Hardsurfacing materials shall be in accordance with ASME SFA5.13 Classifications E CoCr/E NiCr or SFA5.21 ER CoCr/ER NiCr for ASME Section III valves and AWS A5.13 Classifications E CoCr/E NiCr or A5.21 ER CoCr/ER NiCr for ASME B31.1 valves. Other materials may be used subject to prior acceptance by Buyer.

#### **5. Overlay materials**

Overlay materials shall be in accordance with ASME SFA-5.4 E309 or E410 or ASME SFA-5.9 ER309 or ER410 for ASME Section III valves and AWS A-5.4 E309 or E410 or AWS A-5.9 ER309 or ER410 for ASME B31.1 valves. The final machined overlay shall be at least 3/16" thickness. Other materials may be used subject to prior Buyer's acceptance.

#### **6. Gasket material**

Gasket shall be asbestos free material to manufacturer's standard type. Gasket filler material shall contain a maximum 200 ppm leachable chlorides.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.06 MATERIALS AND FABRICATION (CONT.)**

#### **7. Non-pressure retaining parts**

- a. For all valves furnished under this specification the Supplier shall identify in the bill of materials those parts of the valve assembly, including top works, which are beyond the scope of the applicable Code, the failure of which could compromise the safety-related functions of the valve and shall further identify the materials to be used in the aforementioned parts. The Supplier's quality assurance program shall include material control for these selected parts to ensure that only the identified materials are used.
- b. The Supplier shall certify that all the parts identified in Paragraph 4.06.B.7.a have been procured, received, processed and installed as identified.

#### **8. Nickel-Aluminum-Bronze Valves**

Nickel-Aluminum-Bronze valves shall be provided with renewable seat. Seat ring shall be Monel, threaded and screwed or may be welded into the body. Disc shall have Monel seating surface or integral type of corrosion resistant material for sea water service with prior approval by the Buyer.

9. KEPIC material with the same designation number as ASME Section II material can be used instead of the ASME Section II material.

### **C. CONSTRUCTION**

1. Valve end-to-end or face-to-face dimensions shall be in accordance with ASME B16.10 or shall be subject to Buyer's prior acceptance, and valve end type shall be as indicated in Attachment 4-3 and valve data sheets.
2. Valves of Class 600 or higher shall be breech lock or pressure seal bonnet type. For lower pressure ratings, the Supplier may supply bolted bonnet construction. Bolted designs at higher pressure ratings shall be subject to prior Buyer's acceptance.
3. Valves other than Nickel-Aluminum-Bronze valves shall be provided with either integral or renewable seats. Renewable seats may be threaded, rolled, expanded, or pressed into the seat ring cavity, and shall be seal welded. Main seats and discs shall be Manufacturer's Standard, but hardsurfaced with materials in accordance with Paragraph 4.06.B.4. All austenitic stainless steel valves with integral seats shall have the integral seat hardsurfaced using only the gas tungsten-arc, plasma-arc, or manual shielded metal-arc processes. Nickel-Aluminum-Bronze valves shall be constructed in accordance with Paragraph 4.06.B.8.

#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.06 MATERIALS AND FABRICATION (CONT.)**

4. Bolts and nuts shall be of materials most suitable for the specified service condition. Stainless steel bolting shall be provided on stainless steel valves.
5. The nameplate shall be permanently attached to the valve by tack welding or by corrosion resistant drivescrews tapped into a non-pressure retaining part or by method that will not affect the structural integrity of the valve.

##### **D. FABRICATION**

1. All welding including overlay and hardsurfacing shall be performed in accordance with the Code and Appendices 4K1 and 4K4.
2. The Supplier is permitted to use electrodes of 6.4 mm (1/4 inch) maximum diameter to weld repair austenitic stainless steel casting provided the entire casting shall receive a solution heat treatment in accordance with Paragraph 4.06.B.1.b after weld repair.
3. Surface defects shall be repaired in accordance with the Code.
4. Defects that require welding repair shall be repaired in accordance with the Code. A detailed written report of these repairs shall be made by the Supplier and copies shall be furnished to Buyer. The report shall state the nature and location of the defect, repair details, and subsequent heat treatment, and shall include copies of all examination records.
5. Cleaning
  - a. The Supplier shall submit, for Buyer's acceptance, the cleaning procedures to be used, prior to proceeding with the work. The procedure shall state clearly the final cleanliness acceptance criteria to be used.
  - b. All valve parts shall be thoroughly cleaned of oil, grease, scale, rust, chips, organic matter, loose particles, and all potentially harmful foreign matter.
  - c. Preliminary cleaning of stainless steel parts shall be done only with stainless steel wire brushes, which have not been used on other types of materials. Cleaning agents in contact with austenitic stainless steel shall meet the requirements of Appendix 4R.

#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.06 MATERIALS AND FABRICATION (CONT.)**

- d. Cleaning processes shall be controlled to ensure effective cleaning without injuring the surface finishes, material properties, or metallurgical structure of the materials. Final rinsing of austenitic stainless steel shall be done with high quality water acceptable by ASME NQA-1, Part II Subpart 2.1. The valves shall be dried with oil free air or nitrogen or other methods acceptable by ASME NQA-1, Part II Subpart 2.1.

##### **4.07 SURFACE PREPARATION AND COATING**

###### **A. GENERAL**

1. All exterior ferrous metal surfaces shall be coated except:
  - a. Stainless steel surfaces.
  - b. Galvanized Steel surfaces.
  - c. Aluminum bronze surfaces.
  - d. Machined or wearing surfaces. (a suitable shipping and storage preservative is required)
  - e. Edges within 50.8 mm (2 inch) of field welds.
2. The exterior ferrous metal surfaces of valves shall be prepared and coated in accordance with the requirements of Appendix 4G2.
3. The coating materials for the valve shall be inorganic zinc primer as specified in Paragraph 5.1.c of Appendix 4G2.
4. The finish color of inorganic zinc primer shall be grey without the designation of Munsell No.

**SECTION 4 - TECHNICAL SPECIFICATION**

**4.08 INSPECTION AND TESTING (CONT.)**

**A. GENERAL**

1. The Supplier shall conduct and be responsible for the shop examinations, inspections and tests called for in the specification as well as the applicable codes and standards, and shall furnish all facilities necessary for the performance of such tests.
2. Buyer has the right to inspect and witness Supplier's manufacturing and testing operations for the valves purchased in accordance with Section 2 and Appendix 4B of this specification. Buyer shall be given the opportunity to witness the final inspection of all valves prior to shipment.
3. The Supplier shall submit records and reports for tests and inspections required by this specification. These records and reports shall be prepared promptly after each test or inspection and shall be transmitted to Buyer prior to shipment of the valve to the project site.
4. Examination and testing shall be in accordance with the applicable code and applicable requirements Appendix 4J.
5. The testing clamp ring on butt-weld end valves shall be placed a sufficient distance from the weld end bevel so as not to interfere with proper welding. Fillets and outside edges of clamp rings shall be rounded.
6. The equipment/materials which have been subject to destructive design test(s) such as seismic qualification test, fire retardant test, etc., shall not be delivered unless it can be demonstrated by analysis, or other means acceptable to Buyer, that the accumulated stress cycles already experienced by the tested equipment will not degrade, in any way, its ability to perform its function.



## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.08 INSPECTION AND TESTING (CONT.)**

#### **B. INSPECTION AND TESTS**

##### **1. Nondestructive Examination**

- a. All nondestructive examination procedures to be used, by the material supplier as well as the Supplier shall be submitted for Buyer's acceptance prior to their implementation. Examinations shall be performed by personnel qualified in accordance with the Code. Buyer or Buyer's representative will review personnel qualification test records.
- b. When liquid penetrant and magnetic particle examinations are required, the examinations shall be performed after machining
- c. Quality verification documentation shall be submitted for the results of the required examinations. The verifying document shall include the identification of the examination procedure used. Radiographic film shall be submitted as part of the quality verification documentation.
- d. Volumetric examination of cast products by the ultrasonic technique is not required.
- e. The pressure retaining parts and welds of all valves shall be nondestructively examined in accordance with the applicable codes/standards, and the additional requirements specified in this specification.
- f. Cast ASME Section III Class 3 pressure retaining items of all valve sizes shall be examined by the magnetic particle or liquid penetrant method using the procedures and acceptance standards for the particular product from under the ASME Section III Code rules for Class 1 valves and Paragraphs 4.08.B.1.1 and 4.08.B.1.m.
- g. Butt weld end preparations for Class 400 or higher cast ASME Section III Class 3 valves shall be radiographically examined in accordance with procedures stated in Paragraph 4.08.B.1.k. Acceptance standards for these areas shall be to severity level 2 for Category A, B, and C indications. Category D, E, F, and G indications are unacceptable. Areas to be inspected shall be from the end of the valve in a finished condition, for a distance along the run of 38.1 mm (1-1/2 inch) from the end for valves DN 65 (NPS 2-1/2) through DN 200 (NPS 8). For valves DN 250 (NPS 10) and larger, the area to be inspected shall be 76.2 mm (3 inch) from the end.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.08 INSPECTION AND TESTING (CONT.)**

#### **h. Additional Requirements for ASME B31.1 High Pressure Valves**

All ASME B31.1 valves of ANSI pressure rating of Class 900 and higher shall meet the following additional requirements in addition to those required by the codes and the ASTM material specifications.

- h1. Cast pressure retaining items, in all valve sizes, shall be 100 percent radiographically examined in accordance with the procedures and acceptance standards in Paragraph 4.08.B.1.k.
- h2. Wrought pressure retaining items shall be examined on all accessible surfaces by the magnetic-particle or liquid-penetrant method in accordance with the procedure and acceptance standards in Paragraphs 4.08.B.1.l and 4.08.B.1.m.
- h3. Buttweld end preparations of cast valves shall be radiographically examined in accordance with the procedures and acceptance standards in Paragraph 4.08.B.1.k. Areas to be inspected shall be from the end of the valve finished dimension for a distance along the run as follows:
  - h3.1 Valves DN 65 (NPS 2-1/2) through DN 200 (NPS 8):  
3.81 cm(1-1/2 inch) from the end
  - h3.2 Valves DN 250 (NPS 10) and larger: 7.62 cm (3 inch) from the end
- h4. The buttweld end preparations shall be examined in the finished condition by the magnetic-particle or liquid-penetrant method in accordance with the procedures and acceptance standards in Paragraphs 4.08.B.1.l and 4.08.B.1.m.
- i. All hardsurfacing, overlay, and the adjacent base metal shall be liquid penetrant examined in accordance with the procedure and acceptance standards in Paragraph 4.08.B.1.m.
- j. Weld repair on cast or wrought pressure retaining parts shall be radiographically examined in accordance with the procedures and acceptance standards in Paragraph 4.08.B.1.k.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.08 INSPECTION AND TESTING (CONT.)**

#### **k. Radiographic Testing**

Radiographic testing (RT) procedures and acceptance standards shall be in accordance with the applicable codes, Appendix 4J and the following additional requirements:

- k1. All radiographic testing (RT) shall be performed with lead intensifying screens, or with lead film filters, both front and back, to reduce scatter.
- k2. Composite viewing of double film exposure is not acceptable for welds. Composite viewing of double film exposure is acceptable for castings and castings repair welds, where section thickness is non-uniform on castings.
- k3. Buyer reserves the right to interpret the radiographic film and accept or reject the quality of film and weld.
- k4. Rejection by Authorized Inspector shall override acceptance by Buyer's representative.

#### **l. Magnetic Particle Testing**

Magnetic particle testing (MT) procedures and acceptance standards shall be in accordance with the Code plus the following additional requirements:

- l1. Except as permitted by Paragraph 4.08.B.1.1.12, magnetic particle testing (MT) shall be by the prod, coil and direct contact method using DC or rectified AC.
- l2. The yoke method may be used only for supplementary surface examinations such as examination of arc strikes and machined surfaces.
- l3. As-cast surfaces shall be examined by the wet or dry particle methods.

#### **m. Liquid Penetrant Testing**

Liquid penetrant testing (PT) procedures and acceptance standards shall be in accordance with the applicable codes. Penetrant testing materials used for examination of austenitic stainless steel shall meet the requirements of Appendix 4R.

Penetration times should be a minimum of 10 minutes, unless it can be demonstrated that equivalent detection sensitivity can be achieved using a lesser time.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.08 INSPECTION AND TESTING (CONT.)**

#### **n. Ultrasonic Testing**

Ultrasonic testing (UT) procedures and acceptance standards shall be in conformance with the applicable codes, however calibration holes shall not be drilled in the test article.

#### **2. Wall Thickness Measurements**

The body wall and neck thickness of all valves shall be measured and verified to be in accordance with the Code. The valve bonnet and flanges shall be measured as specified herein.

The Supplier shall submit his procedure for thickness measurements for review and acceptance prior to fabrication, and only the accepted procedure shall be used for performing measurements. The Supplier shall include in his procedure a sketch or diagram showing the dimensions to be measured. As a minimum, the procedure for measurement shall include the requirements of the following subparagraphs.

- a. The wall thickness shall be measured and recorded at 4 points, 90° apart on each nozzle in planes near the neck and in a plane near the weld end, as defined by the Code, and on the neck of the valve. The valve body shall be measured at two points approximately 90° apart in a plane through its thinnest cross section. Additionally the bonnet of the valve shall be measured at its thinnest cross section at four points 90° apart, and the valve body flanges (if applicable) shall be measured at four points 90° apart. The base point of each of these planes of measurement shall be the thinnest point, and its location and the measurements taken shall be recorded.
- b. The entire valve shall be visually examined. Suspect locations, such as indentations in the surface contour, shall be measured and recorded.
- c. The valve bonnet and flanges, if any, shall be measured as noted in Paragraph 4.08.B.2 for record purpose only.
- d. The Supplier shall indicate on his drawings, or relate thereto the actual dimensions measured, the procedure used, and the valve identification number.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.08 INSPECTION AND TESTING (CONT.)**

#### **3. Hydrostatic Tests**

- a. Procedure for hydrostatic shell testing and seat leakage testing shall be submitted to Buyer for acceptance prior to implementation. Prior to hydrostatic test, valves shall be cleaned in accordance with the provisions of Paragraph 4.06.D.5 of this specification.
- b. All valves supplied under this specification shall be hydrostatically tested in accordance with the requirements of the Code. The valve seat leak test shall be in accordance with MSS-SP-61, except seat leakage shall not exceed 2 cc per hour per inch of nominal valve size, and duration of test shall be at least 4 minutes. The hydrostatic shell and seat leak test pressure of valves subject to ASME Sec. III Code Case N-855 shall be maintained for at least 10 minutes.
- c. Water quality requirements for hydrostatic tests of austenitic stainless steel or nickel base alloy valves shall be in accordance with Appendix 4R.

#### **4. Impact Testing**

- a. Pressure retaining material shall be impact tested in accordance with the requirements of ASME Section III, ND-2300.
- b. Impact test results shall meet acceptance standards applicable to the specified test methods of SA-370 and/or ASTM E208 in accordance with ASME Section III, ND-2300.
- c. The lowest service temperature for the component and component support is 1.7°C (35°F).
- d. Number of impact tests for forgings larger than 4,540kg (10,000lb) shall meet the requirements of ASME Section III, ND-2300.

#### **5. Final Cleaning**

- a. After completion of shop tests, the surfaces of valves shall be cleaned and visually examined to ensure meeting the cleanliness levels of Class C for internal surface and Class D for external surface in accordance with KEPIC QAP-2, II.1. After cleaning, the valves shall be protected from contamination until preservation or packaging is complete.
- b. Cleaning procedure in accordance with ASME NQA-1, Part II, Subpart 2.1 and 2.2 shall be submitted for the Buyer's review.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.08 INSPECTION AND TESTING (CONT.)**

#### **C. WITNESS AND HOLD POINTS**

1. The items covered by this specification shall be subject to at least the minimum level of Quality Surveillance actions as indicated in the witness and hold point lists attached to this specification.
2. However, the actual and detailed witness and hold points will be decided when Buyer reviews and confirms the Supplier's quality plan specified in Appendix 4B of this specification.

### **4.09 SHIPPING REQUIREMENTS**

#### **A. GENERAL**

1. The items procured by this specification are to be shipped, handled, stored, packaged and marked in accordance with ASME NQA-1, Part II, Subpart 2.2 and Section 2 of this specification. The ASME NQA-1, Part II, Subpart 2.2 classification of each item is designated below.

<u>Item</u>	<u>Cleanliness Class</u>
ALL	C

2. Instruction covering handling, storage, installation and maintenance at construction site shall be prepared and submitted by the Supplier.
3. Special tools, if applicable, shall be shipped in suitable, separate container, clearly marked with the name of the equipment for which the tools are intended.

#### **B. SPECIFIC REQUIREMENTS**

1. Supplier shall submit, for Buyer's acceptance, the packaging procedures to be used prior to proceeding with the work.
2. Valve ends shall be sealed with suitable nonmetallic covers or plugs and pressure sensitive tape. Pressure sensitive tapes for use on austenitic stainless steel shall meet the requirements of Appendix 4R. Provisions shall be implemented as necessary to protect weld end preparations from damage during shipment, storage and handling. For carbon steel valves, silica gel desiccant shall be firmly attached to the inside of the end protector caps. The number and size of bags used shall be marked on the outside of the end protector caps and shall be in accordance with the manufacturer's recommendation for the enclosed volume.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.09 SHIPPING REQUIREMENTS (CONT.)**

3. Valves shall be marked in accordance with the Code, ASME B16.34 and/or MSS SP-25.
4. Each valve shall be provided with impressed, stamped, or etched stainless steel tags. The tags shall be secured to the valve by corrosion resistant screws tapped into a non-pressure retaining part of the valve or by method that will not affect the structural integrity or functional capability of the valve. The following information shall be shown on each tag.
  - a. Purchase Contract number and P.O. item number
  - b. Valve mark number and tag numbers as indicated in the "Release to Manufacture" and the same number shall appear on any loose or accessory package shipped with the valve. Mark number shall be followed with a dash (-) and Attachment code/codes as indicated in the "Release to Manufacture".
  - c. Size
  - d. Flow direction arrow unless it is cast in or stamped into valve body
  - e. Environmental code (capital letters I, D or O as applicable)
  - f. Weight

### **4.10 INSTRUCTION MANUALS**

#### **A. GENERAL**

1. Supplier shall furnish twenty (20) bound sets to KAERI site and six (6) bound sets to the A/E of the instruction manual for all valves furnished by supplier. Such instructions shall incorporate operational adjustments, maintenance, receipt, storage, installing, setup, torque limit, periodic maintenance & replacement requirements, instructions for disassembly and assembly, and complete material/parts listing showing shelf life, replacement schedule and part number and part material. Site storage instructions shall include requirements for handling.

For a standard production valve, the standard operating and maintenance manual will suffice. For valves that have special features, a special manual covering those features shall be provided. In either case, the manual shall include lubrication material, packing, assembly, disassembly, and special tooling information for valves, Warranted Performance Data, Valve Assembly Drawings and Complete Start-up, Operation, Troubleshooting and Maintenance Instruction.

#### **SECTION 4 - TECHNICAL SPECIFICATION**

##### **4.10 INSTRUCTION MANUALS (CONT.)**

Instruction books shall include, but not be limited to the following:

- a. Pickup points for handling during installation shall be identified.
  - b. Position of compressor/diaphragm during welding of valve into the line shall be identified.
  - c. Special instructions to be followed, or precautions to be observed, during welding of the valve into the line shall be listed to provide maximum assurance that the valve performance is not compromised.
  - d. Installation instruction and the shelf life of O-rings shall be listed.
  - e. Instruction books shall be thoroughly edited before submittal to exclude and/or to cross out text, data, illustrations, etc., that do not apply to the specific valves purchased under this specification.
2. Parts List: The instruction manual shall include a complete parts listing for the valve assemblies. This parts list, using Microsoft Excel only, shall be inclusive for and applicable to all equipment, components, auxiliaries, accessories, and materials being furnished under the contract. Each part shall be completely identified by part number, part description and part classification and drawing reference in accordance with Appendix 4X.
  3. The installation instructions, disassembly and assembly procedure(s), assembly drawing(s), erection drawing(s), and material/parts list(s) shall be completely and consistently cross-referenced by drawing number, part number, piece mark number, etc.
  4. Each instruction book shall have an index listing of all leaflets, etc., in the same order as they appear in the book. Individual submittal of various manufacturers' instruction books, etc., will not be acceptable. The index listing shall also identify the specific equipment, including all furnished options and accessories that the instruction literature is to cover.



**SECTION 4 - TECHNICAL SPECIFICATION**

**4.10 INSTRUCTION MANUALS (CONT.)**

B. Erection Information

1. Supplier shall furnish to Buyer for the erection of the equipment, a detailed scope of the work involved in the complete erection of this equipment, including all accessories and appurtenances furnished therewith.
2. This information shall include all necessary drawings and a comprehensive outline as to the extent of field fabrication required; and as to all temporary falsework, scaffolding, blocking, shoring, heating, disassembling, reassembling, welding, bolting, cleaning, checking, inspection, painting, testing, etc., required to be done by the Construction Contractor.

**ATTACHMENT 4-1**

Spec.: F-145-UP206D  
Rev. 0

**WITNESS POINTS**

The following tests/operations are to be witnessed by Buyer's representative a first operation basis. Witnessing of these activities after acceptable first operation will be on a representative sample basis unless otherwise directed below.

Witness Point(s)	Sample Size Alternative
<ol style="list-style-type: none"><li>1. Material verification prior to use</li><li>2. Fit-up and welding inspection</li><li>3. Heat-treatment</li><li>4. Weld repair</li><li>5. Non-destructive examination</li><li>6. Wall thickness measurement for ASME Section III valves</li><li>7. Assembly of components</li><li>8. Surface preparation and application of coating</li><li>9. Cleaning inspection</li></ol>	

**HOLD POINTS**

The following tests/operations are to be witnessed by Buyer's representative on a 100% basis unless otherwise directed below. Waiver of Hold Point(s) must be given by Buyer.

Hold Point(s)	Sample Size Alternative
<ol style="list-style-type: none"><li>1. Hydrostatic and seat leakage test</li><li>2. Review radiographic film</li><li>3. Final inspection</li><li>4. Review and sign-off quality verification documents</li><li>5. Packing inspection</li><li>6. Release for shipment</li><li>7. Functional Qualification Test for Active Valve</li><li>8. Inspections and tests of equipment qualification</li></ol>	

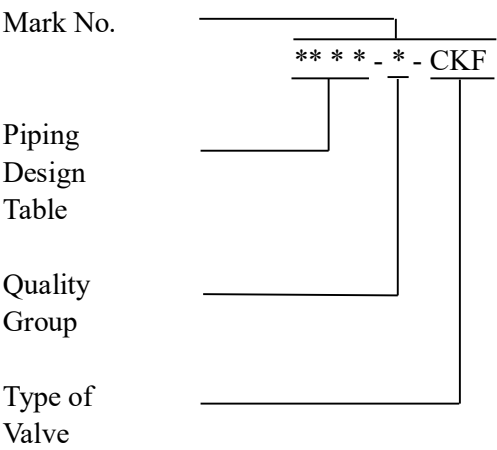
**VALVE DESCRIPTIONS**

**1.0 PURPOSE**

This Valve Description specifies the valve by mark number and attachment code letter, where applicable. It also provides the general description of valve and its attachments. Special features for valves shall be indicated by a suffix letter or group of letters added to the valve mark number in alpha order and identified on the valve, as illustrated below.

**2.0 EXAMPLE**

**VALVE MARK NUMBER**



The asterisks in the Mark Nos. represent the following:

- \*\*\*\_\* or \*\*\*\_\*\_\* Represents the pressure rating of the valve.
- \*\*\_\*\_\* Represents the material of the valve .
- \*\*\*\_\*\_\* Represents variation designation.
- \*\*\*\_\*\_\* Represents the applicable Quality Group

**VALVE DESCRIPTIONS****3.0 VALVE DESCRIPTION****A. ASME Section III valves (See Note 1)**


<u>Mark No.</u>	<u>Description</u>
097-C-CKF	Class 150 Tilting Disc Check, nickel aluminum bronze body (ASME SB-148 Copper Alloy UNS No. C95800), nickel aluminum bronze disc (ASME SB-148, UNS No. C95800 or Buyer approved corrosion resistant material for sea water service), flat face flanged ends per AWWA C207 Steel-hub Class E, integral body end type, tilting type disc, Code Class 3. (See Paragraph 4.06.B.8 also)
105-C-CKF	Class 150 Tilting Disc Check, carbon steel, cast ASME SA-216 Gr. WCB or forged ASME SA-105, butt weld ends, tilting type disc, Code Class 3.

**B. ASME B31.1 valves (See Note 1)**


<u>Mark No.</u>	<u>Description</u>
097-D-CKF	Class 150 Tilting Disc Check, nickel aluminum bronze body (ASTM B148 Copper Alloy UNS No. C95800), nickel aluminum bronze disc (ASTM B148 UNS No. C95800 or Buyer approved corrosion resistant material for sea water service), flat face flanged ends per ASME B16.5, integral body end type, tilting type disc. (See Paragraph 4.06.B.8 also)
105-D-CKF	Class 150 Tilting Disc Check, carbon steel ASTM A105 or A216 Gr. WCB, butt weld ends, alloy steel trim.
330-D-CKF	Class 300 Tilting Disc Check, alloy steel ASTM A182 Gr. F91 or A217 Gr. C12A, butt weld ends, alloy steel trim.
630-D-CKF	Class 600 Tilting Disc Check, alloy steel ASTM A182 Gr. F91 or A217 Gr. C12A, butt weld ends, alloy steel trim.

Note 1. Tilting disc check valve with counter weight at the outside of valve body is not acceptable.


**ATTACHMENT 4-4**  
**VALVE DATA SHEET**

VALVE TAG NUMBER		F-462-V-1001/1002/ 1003/1004 <sup>1)</sup>	F-461-V-1001/1002/ 1003/1004	F-553-V-1102/1202	
Input	GENERAL	P&ID Number	F-462-UN105-001	F-461-UN105-001	F-553-UM105-001
		Safety Class/Seismic Category	3/I	3/I	ASME B31.1/III
		Quality Class/Safety Related	Q/Yes	Q/Yes	A/No
		Active or Passive	Active	Active	-
		Valve Mark Number	097-C-CKF	105-C-CKF	097-D-CKF
		P.O Item Number	1.01	1.02	1.03
		Environmental Code	"O" (Outside CTMT)	"O" (Outside CTMT)	"O" (Outside CTMT)
		Indoor or Outdoor Use	Indoor	Indoor	Indoor
		Function	Pump Discharge	Pump Discharge	Pump Discharge
		Connecting Piping Material	<sup>2)</sup>	ASME SA106 Gr.B	<sup>6)</sup>
	SERVICE CONDITION	Service Fluid	Sea Water	Demineralized Water	Sea Water
		Pressure MPa(psig): Design/Operating	0.76/0.50(110/72)	1.38/1.28(200/185)	1.2/0.72(175/105)
		Temperature °C(°F): Design/Operating	43.33/32.3(110/90)	93.33/65.56(200/150)	32/35(89.6/95)
		Maximum Flow Rate M <sup>3</sup> /hr(gpm)	820.80(3,614.4) <sup>3)</sup>	1071.36(4,717) <sup>5)</sup>	60(264.18) <sup>7)</sup>
		ΔP Max.( MPa/psi): Close	0.76/110	1.38/200	1.2/175
VALVE DATA	Valve Type	Check	Check	Check	
	Nominal Size (DN/NPS)/Press. Rating	(300/12)/150#	(300/12)/150#	(80/3)/150#	
	End Type/Schedule	FL/Std.[9.53mm(3/8")] <sup>4)</sup>	B.W/Std.[9.53mm(3/8")]	Flat Face Flange/40	
Input by Supplier	Valve Material Spec. No.	SB-148 C95800	SA-216 WCB	B-148 C95800	
	Manufacturer				
	Valve Assembly Drawing No. *				
	Approx. Weight Kg(Kg/Lbs) *				
	Flow Coefficient, Cv *				
	Min. Flow Velocity M/Sec(Ft/Sec) *,**				
	Close Time (Sec) *				
<b>REMARKS</b> (Vendor to complete this valve data sheet and return to the A/E with valve assembly drawing.) * - For reference only. Changes to these data by the Supplier do not require a SDDR. ** - Minimum flow velocity required to lift the disc to full open. 1) ASME BPVC Section III, Code Case N-855 shall be applied. 2) Glass flake reinforced polyester/vinylester Lined C.S. or Ceramic Composite Lining (ASME SA105 Flange) 3) Valve disc shall be stable and unfluttery at normal flow rate 684.08 M <sup>3</sup> /hr (3,012 gpm). 4) Flange shall be steel hub slip-on types per AWWA C207 Class E, Flat Faced. 5) Valve disc shall be stable and unfluttery at normal flow rate 892.80 M <sup>3</sup> /hr (3,931 gpm). 6) Ceramic Composite Lining (ASTM A105 Flange) 7) Valve disc shall be stable and unfluttery at normal flow rate 23 M <sup>3</sup> /hr (101.27 gpm).					
 <b>KEPCO ENGINEERING &amp; CONSTRUCTION COMPANY, INC.</b>		JOB No.	Sheet No.		
		1229L	TDCV-1		

**ATTACHMENT 4-4**  
**VALVE DATA SHEET**

VALVE TAG NUMBER		F-562-V-1003/1007	F-562-V-1004/1008	F-531-V-1047/1048/ 1049/1050	
Input	GENERAL	P&ID Number	F-562-UM105-001	F-562-UM105-001	F-531-UM105-001/002
		Code Class/Seismic Category	ASME B31.1/III	ASME B31.1/III	ASME B31.1/III
		Quality Class/Safety Related	A/No	A/No	A/No
		Active or Passive	-	-	-
		Valve Mark Number	105-D-CKF	105-D-CKF	330-D-CKF
		P.O Item Number	1.04	1.05	1.06
		Environmental Code	"D" (Outside CTMT)	"D" (Outside CTMT)	"D" (Outside CTMT)
		Indoor or Outdoor Use	Indoor	Indoor	Indoor
		Function	Pump Mini Flow	Pump Discharge	Pump Discharge
		Connecting Piping Material	ASTM A106 Gr.B	ASTM A106 Gr.B	ASTM A335 Gr. P91
	SERVICE CONDITION	Service Fluid	Demineralized Water	Demineralized Water	Condensate
		Pressure MPa(psig): Design/Operating	1.04/0.60 (150/87)	1.04/0.60 (150/87)	1.5/1.1(218/160)
		Temperature °C(°F): Design/Operating	50/45(122/113)	50/45(122/113)	100/60(212/140)
		Maximum Flow Rate M <sup>3</sup> /hr(gpm)	22(96.87)	216(951.05)	45/198 <sup>1)</sup>
		ΔP Max.( MPa/psi): Close	1.04/150	1.04/150	1.5/218
	VALVE DATA	Valve Type	Check	Check	Check
		Nominal Size (DN/NPS)/Press. Rating	(100/4)/150#	(200/8)/150#	(80/3)/300#
End Type/Schedule		B.W./40	B.W./40	B.W./80	
Input by Supplier	Valve Material Spec. No.	A-216 WCB	A-216 WCB	A-216 WCB	
	Manufacturer				
	Valve Assembly Drawing No. *				
	Approx. Weight Kg(Kg/Lbs) *				
	Flow Coefficient, Cv *				
	Min. Flow Velocity M/Sec(Ft/Sec) *,**				
	Close Time (Sec) *				
<p>REMARKS (<i>Vendor to complete this valve data sheet and return to the A/E with valve assembly drawing.</i>)</p> <p>* - For reference only. Changes to these data by the Supplier do not require a SDDR.</p> <p>** - Minimum flow velocity required to lift the disc to full open.</p> <p>1) Valves for Dynamometer. To be determined later.</p>					
 <b>KEPCO ENGINEERING &amp; CONSTRUCTION COMPANY, INC.</b>		JOB No.	Sheet No.		
		1229L	TDCV-2		

**ATTACHMENT 4-4**  
**VALVE DATA SHEET**

VALVE TAG NUMBER		F-541-V-1012/1010	F-541-V-1002/1004/ 1006/1008	Intentionally Blanked
Input	GENERAL	P&ID Number	F-541-UM105-001	F-541-UM105-001
		Code Class/Seismic Category	ASME B31.1/III	ASME B31.1/III
		Quality Class/Safety Related	A/No	A/No
		Active or Passive	-	-
		Valve Mark Number	630-D-CKF	630-D-CKF
		P.O Item Number	1.07	1.08
		Environmental Code	"D" (Outside CTMT)	"D" (Outside CTMT)
		Indoor or Outdoor Use	Indoor	Indoor
		Function	-	Startup FWP Discharge
		Connecting Piping Material	ASTM A335 Gr. P91	ASTM A335 Gr. P91
Input	SERVICE CONDITION	Service Fluid	Feedwater	Feedwater
		Pressure MPa(psig): Design/Operating	9/7.5(1,306/1,088)	9/7.5(1,306/1,088)
		Temperature °C(°F): Design/Operating	100/60(212/140)	100/60(212/140)
		Maximum Flow Rate M <sup>3</sup> /hr(gpm)	LATER	LATER
		ΔP Max.( MPa/psi): Close	9/1,306	9/1,306
Input by Supplier	VALVE DATA	Valve Type	Check	Check
		Nominal Size (DN/NPS)/Press. Rating	(40/1-1/2)/600#	(80/3)/600#
		End Type/Schedule	B.W./80	B.W./80
		Valve Material Spec. No.	A-217 C12A	A-217 C12A
		Manufacturer		
		Valve Assembly Drawing No. *		
		Approx. Weight Kg(Kg/Lbs) *		
		Flow Coefficient, Cv *		
Min. Flow Velocity M/Sec(Ft/Sec) *,**				
Close Time (Sec) *				
REMARKS (Vendor to complete this valve data sheet and return to the A/E with valve assembly drawing.) <p>* - For reference only. Changes to these data by the Supplier do not require a SDDR.</p> <p>** - Minimum flow velocity required to lift the disc to full open.</p> <p>1) Valve disc shall be stable and unfluttery at normal flow rate 53 M<sup>3</sup>/hr (233.36 gpm).</p> <p>2) Valves for Dynamometer. To be determined later.</p>				
 <b>KEPCO ENGINEERING &amp; CONSTRUCTION COMPANY, INC.</b>			JOB No.	Sheet No.
			1229L	TDCV-3



<p style="text-align: center;"><b>CROSS-REFERENCE TABLE</b> <b>Between KEPIC and Referenced Codes &amp; Standards</b></p>
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**ATTACHMENT 4-5****1. Quality Assurance (QA)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
QAP (2005 Ed.)	Nuclear Quality Assurance	ASME NQA-1 (94 Ed. ~ 95 add.)
QAI (2017 add.)	Authorized Inspection	ASME QAI-1 (01 Ed. ~ 03 add.)
QAR (2015 Ed.)	Registered Professional Engineers	ASME III Appendix XXIII (01 Ed. ~ 03 add.)

**2. Nuclear Mechanical Components (MN)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MNA (2009 add.)	General Requirements	ASME Sec.III NCA (07 Ed. ~ 08 add.)
MNB (2009 add.)	Class 1 Components	ASME Sec.III Div.1 NB (07 Ed. ~ 08 add.)
MNC (2009 add.)	Class 2 Components	ASME Sec.III Div.1 NC (07 Ed. ~ 08 add.)
MND (2009 add.)	Class 3 Components	ASME Sec.III Div.1 ND (07 Ed. ~ 08 add.)
MNE (2009 add.)	Class MC Components	ASME Sec.III Div.1 NE (07 Ed. ~ 08 add.)
MNF (2009 add.)	Supports	ASME Sec.III Div.1 NF (07 Ed. ~ 08 add.)
MNG (2009 add.)	Core Support Structures	ASME Sec.III Div.1 NG (07 Ed. ~ 08 add.)
MNZ (2009 add.)	Appendices	ASME Sec.III Div.1 Appendix (07 Ed. ~ 08 add.)

**3. Inservice Inspection of Nuclear Power Plant Components (MI)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MIA (2009 add.)	General Requirements	ASME Sec.XI Div. 1 IWA (07 Ed. ~ 08 add.)
MIB (2009 add.)	Class 1 Components	ASME Sec.XI Div. 1 IWB (07 Ed. ~ 08 add.)
MIC (2009 add.)	Class 2 Components	ASME Sec.XI Div. 1 IWC (07 Ed. ~ 08 add.)

**3. Inservice Inspection of Nuclear Power Plant Components (MI) - (Continued)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MID (2009 add.)	Class 3 Components	ASME Sec.XI Div. 1 IWD (07 Ed. ~ 08 add.)
MIE (2009 add.)	Class MC and Metallic Liners Components	ASME Sec.XI Div. 1 IWE (07 Ed. ~ 08 add.)
MIF (2009 add.)	Supports	ASME Sec.XI Div. 1 IWF (07 Ed. ~ 08 add.)
MIL (2009 add.)	Concrete Components	ASME Sec.XI Div. 1 IWL (07 Ed. ~ 08 add.)
MIZ (2009 add.)	Appendices	ASME Sec.XI Div. 1 App. (07 Ed. ~ 08 add.)

**4. Inservice Testing of Nuclear Power Plant Components (MO)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MOA (2005 Ed.)	General Requirements	ASME OM Subsec. ISTA (01 Ed. ~ 02 add.)
MOB (2005 Ed.)	Inservice Test of Pumps	ASME OM Subsec. ISTB (01 Ed. ~ 02 add.)
MOC (2005 Ed.)	Inservice Test of Valves	ASME OM Subsec. ISTC (01 Ed. ~ 02 add.)
MOD (2005 Ed.)	Inservice Test of Pressure Relief Devices	ASME OM Mandatory App. 1 (01 Ed. ~ 02 add.)
MOE (2018 add.)	Inservice Test of Dynamic Restraints	ASME OM Subsec. ISTD (17 Ed.)
MOF (2018 add.)	Performance Test of Cooling Water Systems	ASME OM S/G Part 2 (17 Ed.)
MOG (2018 add.)	Vibration Test of Piping Systems	ASME OM S/G Part 3(17 Ed.)
MOH (2015 Ed.)	Performance Test of Power Operated Relief Valve Assemblies	ASME OM S/G Part 13 (00 Ed. ~ 02 add.)
MOI (2016 add.)	Performance Test of Diesel Drive Assemblies	ASME OM S/G Part 16 (15 Ed.)

**5. Qualification of Mechanical Equipment (MF)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MFA (2010 Ed.)	General Requirements	ASME QME-1 Sec. QR (07 Ed.)
MFB (2010 Ed.)	Qualification of Active Pump Assemblies	ASME QME-1 Sec. QP (07 Ed.)
MFC (2010 Ed.)	Qualification of Active Valve Assemblies	ASME QME-1 Sec. QV (07 Ed.)
MFD (2010 Ed.)	Qualification of Dynamic Restraints	ASME QME-1 Sec. QDR (07 Ed.)

**6. Heating, Ventilation, and Air Conditioning (MH)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MHN (2015 Ed.)	In-Service Testing of Nuclear Air Treatment, Heating, Ventilation, and Air-Conditioning Systems	ASME N511 (07 Ed.)

**7. General Mechanical Components (MG)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MGA (2015 Ed.)	General Requirements	-
MGB (2009 add.)	Pressure Vessels	ASME Sec.VIII Div.1 (07 Ed. ~ 08 add.)
MGC (2015 Ed.)	Heat Exchangers	TEMA (07 Ed.)
MGD (2016 add.)	Storage Tanks	API 650 (13 Ed. ~ 16 add.)
MGE (2017 add.)	Piping	ASME B31.1 (16 Ed.)
MGF (2017 add.)	Pumps	HI 1.1-1.2( ' 14 Ed), 1.3( ' 13 Ed), 1.4( ' 14 Ed), 9.1-9.5( ' 15 Ed), 14.6( ' 16 Ed)
MGG (2018 add.)	Valves	ASME B16.34 (17 Ed.)
MGH (2016 add.)	Condensers	HEI 2629 (14 Ed.)

**8. Boilers (MB)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MBB (2009 add.)	Boilers	ASME Sec. I (07 Ed. ~ 08 add.)

**9. Crane (MC)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MCN (2006 add.)	Nuclear Power Plant Cranes	ASME NOG-1 (04 Ed.)
MCF (2015 Ed.)	Fossil Power Plant Cranes	CMAA 70 (00 Ed) ASME B30.2 (98 Ed)

**10. Materials (MD)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MDF (2009 add.)	Ferrous Materials	ASME Sec. II Part A (07 Ed. ~ 08 add.)
MDN (2009 add.)	Nonferrous Materials	ASME Sec. II Part B (07 Ed. ~ 08 add.)
MDW (2009 add.)	Welding Materials	ASME Sec. II Part C (07 Ed. ~ 08 add.)
MDP (2009 add.)	Material Properties	ASME Sec. II Part D (07 Ed. ~ 08 add.)

**11. Nondestructive Examination (ME)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MEN (2009 add.)	Nondestructive Examination	ASME Sec. V (07 Ed. ~ 08 add.)

**12. Performance Test (MP)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MPT 19.2 (2015 Ed.)	Pressure Measurement	ASME PTC 19.2 (10 Ed.)
MPT 19.3 (2015 Ed.)	Temperature Measurement	ASME PTC 19.3 (74 Ed., Reaff. 98)
MPT 19.5 (2015 Ed.)	Flow Measurement	ASME PTC 19.5 (04 Ed.)

**13. Welding and Brazing Qualifications (MQ)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
MQW (2009 add.)	Welding Qualification	ASME Sec.IX Part QW (07 Ed. ~ 08 add.)
MQB (2008 add.)	Brazing Qualification	ASME Sec.IX Part QB (04 Ed. ~ 06 add.)

**14. Nuclear Electric (EN)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
ENA (2008 add.)	-	General Requirements -
ENB Design	1100 (05 Ed.)	Criteria for Safety Systems for Nuclear Power Generating Stations IEEE 603 (98 Ed.)
	1200 (15 Ed.)	Method for Identification of Documents Related to Class 1E Equipment and Systems for Nuclear Power Generating Stations IEEE 494 (74 Ed., Reaff. 90)
	2000 (15 Ed.)	Independence of Class 1E Equipment and Circuits IEEE 384 (08 Ed.)
	3000 (15 Ed.)	Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems IEEE 379 (00 Ed. Reaff. 08)
	4100 (15 Ed.)	Guide for General Principles of Reliability Analysis of Nuclear Power Generating Station Safety Systems IEEE 352 (87 Ed., Reaff. 99)
	4200 (15 Ed.)	Requirements for Reliability Analysis in the Design and Operation of Safety Systems for Nuclear Facilities IEEE 577 (12 Ed.)
	5000 (05 Ed.)	Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations IEEE 741 (97 Ed., Reaff. 02)
	6210 (05 Ed.)	Criteria for Class 1E Power Systems for Nuclear Power Generating Stations IEEE 308 (01 Ed.)
	6220 (10 Ed.)	Preferred Power Supply (PPS) for Nuclear Power Generating Station (NPGS) IEEE 765 (06 Ed.)

**14. Nuclear Electric (EN) -(Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
ENB Design	6230 (15 Ed.)	Recommended Practice for the Design of DC Auxiliary Power Systems for Generating Stations	IEEE 946 (04 Ed.)
	6240 (15 Ed.)	Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations	IEEE 387 (95 Ed., Reaff. 07)
	6330 (18 add.)	Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations	IEEE 497 (16 Ed.)
	6340 (15Ed., Reaff. 17)	Design and Qualification of Class 1E Control Boards, Panels, and Rack Used in Nuclear Power Generating Stations	IEEE 420 (13 Ed.)
	6350 (15 Ed.)	Setpoints for Nuclear Safety-Related Instrumentation	ISA S67.04.01 (06 Ed.)
	6370 (2010 Ed.)	Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations	IEEE 7-4.3.2 (03 Ed.)
	6380 (15 Ed.)	Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents	IEEE N42.18 (04 Ed.)
	6410 (05 Ed.)	The Design and Installation of Cable System for Class 1E Circuits in Nuclear Power Generating Stations	IEEE 690(84 Ed., Reaff. 02)
	6420 (15 Ed.)	Criteria for the Design, Installation, and Qualification of Raceway Systems for Class 1E Circuits for Nuclear Power Generating Stations	IEEE 628 (11 Ed.)
	6430 (05 Ed.)	Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations	IEEE 317 (83 Ed., Reaff. 96)
	6500 (15 Ed.)	Recommended Practice for the Design and Installation of Electric Heat Tracing Systems for Nuclear Power Generating Stations	IEEE 622 (87 Ed., Reaff. 94)



**14. Nuclear Electric (EN) -(Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
END Equipment Qualification	1100 (15 Ed.)	Qualifying Class 1E Equipment for Nuclear Power Generating Stations	IEEE 323 (03 Ed., Reaff. 08)
	2000 (10 Ed.)	Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations	IEEE 344 (04 Ed.)
	3100 (15 Ed.)	Qualification of Equipment Used in Nuclear Facilities	IEEE 627 (10 Ed.)
	3150 (15 Ed.)	Qualification of Class 1E Transformers for Nuclear Power Generating Stations	IEEE 638 (92 Ed., Reaff. 06)
	3211 (15 Ed.)	The Qualification of Switchgear Assemblies for Class 1E Applications in Nuclear Power Generating Stations	IEEE C37.82 (87 Ed., Reaff. 04)
	3220 (15 Ed.)	Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations	IEEE 649 (06 Ed.)
	3300 (15 Ed.)	Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations	IEEE 334 (06 Ed.)
	3400 (00 Ed.)	Qualifying Class 1E Protective Relays and Auxiliaries for Nuclear Power Generating Stations	IEEE C37.105 (87 Ed.)
	3500 (05 Ed.)	Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations	IEEE 535 (86 Ed., Reaff. 94)
	3600 (15 Ed.)	Qualification of Class 1E Static Battery Chargers and Inverters for Nuclear Power Generating Stations	IEEE 650 (06 Ed.)

**14. Nuclear Electric (EN) -(Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
END Equipment Qualification	3700 (15 Ed.)	Qualification of Safety-Related Actuators for Nuclear Power Generating Stations	IEEE 382 (06 Ed.)
	3810 (15 Ed.)	Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations	IEEE 383 (03 Ed.)
	3830 (15 Ed.)	Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations	IEEE 572 (06 Ed., Reaff. 11)
ENE Installation	1100 (05 Ed.)	Guide for Installation, Inspection, and Testing for Class 1E Power, Instrumentation, and Control Equipment at Nuclear Facilities	IEEE 336 (85 Ed.,Reaff. 91)
	2300 (05 Ed.)	Transducer and Transmitter Installation for Nuclear Safety Applications	ISA 67.01 (94 Ed.)
	2410 (10 Ed.)	Nuclear Safety-Related Instrument-Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants	ISA 67.02.01 (99 Ed.)
	2430 (15 Ed.)	High Voltage Connectors for Nuclear Instruments	IEEE N42.4 (71 Ed., Reaff. 91)
ENF Test & Inspection	3100 (05 Ed.)	Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems	IEEE 338(87 Ed.,Reaff. 00)
	3400 (05 Ed.)	Recommended Practice for Maintenance, Testing and Replacement of Vented Lead-Acid Batteries for Stationary Applications	IEEE 450 (02 Ed.)
	3620 (15 Ed.)	Radiation Protection Instrumentation Test and Calibration	IEEE N323 (78 Ed., Reaff. 93)
	3700 (18 add.)	Earthquake instrumentation Criteria for Nuclear Power Plants	ANSI/ANS 2.2(16 Ed.)

**ATTACHMENT 4-5****15. Measuring & Control Equipment (EM)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EMA (2015 Ed.)	-	General Requirements	-
EMB Measuring Equipment	2100 (15 Ed.)	Pressure Gauges and Gauge Attachment	ASME B40.100 (13 Ed.)
	3100 (15 Ed.)	Area Flowmeter	ISA RP 16.1.2.3 (61 Ed.)
	4100 (18 add.)	Machinery Protection Systems	API 670 (14 Ed.)
	4200 (15 Ed.)	Accelerometer-Based Vibration Monitoring System	API 678 (81 Ed.)
	5100 (15 Ed.)	Requirements for Instrument Transformers	IEEE C57.13(08 Ed.)
EMC Transduce and Control Equipment	1100 (15 Ed.)	Industrial Control and Systems General Requirements	NEMA ICS 1(00 Ed., Reaff. 08)
	2100 (05 Ed.)	Manual & Magnetic Controllers Rated Not More Than 2000 V AC or 750 V DC	NEMA ICS 2-Part-1, 3, 5, 6, Annex(A) (00 Ed., Reaff. 05) NEMA ICS 2-Part-2 (08 Ed.) ICS 2-324 & 325 (88 Ed.)
	2200 (05 Ed.)	Magnetic Lighting Contactor Rated Not More Than 2000 V AC or 750 V DC	NEMA ICS 2-Part 7 (00 Ed., Reaff. 05)
	2300 (05 Ed.)	Industrial Control Devices- Connectors, Contact and Semiconductor Switching Element	NEMA ICS 2-221 (88 Ed.)
	2400 (05 Ed.)	Control Relays Rated Not More Than 2000 V AC or 750 V DC	NEMA ICS 2-Part 4 (00 Ed. Reaff. 05),
	2500 (05 Ed.)	Industrial Control Devices- Resistors, Auto-Transformer and Rheostats	NEMA ICS 2-213, 214 (88 Ed.)
	2600 (05 Ed.)	Industrial Control Devices- Control Switches, Indicating Lights	NEMA ICS 2-447 (88 Ed.)
	3000 (18 Ed.)	Industrial Control and Systems Enclosures	NEMA ICS 6 (93 Ed., Reaff. 16)

**ATTACHMENT 4-5****15. Measuring & Control Equipment (EM) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EMC Transduce and Control Equipment	3100 (17 add.)	Enclosures for Electrical Equipment(1000 Volts Maximum)	NEMA 250 (14 Ed.)
	4000 (15 Ed.)	Industrial Control and Systems Control-Circuit and Polot Devices	NEMA ICS 5 (08 Ed., Reaff.10)
	5000 (15 Ed.)	Guide for Instrumentation and Control Equipment Grounding in Generating Station	IEEE 1050 (04 Ed.)
EMD Indication &Recording Equipment	1100 (15 Ed.)	Requirements for Electrical Analog Indicating Instrument	ANSI C39.1 (81 Ed., Reaff. 92)
	2100 (15 Ed.)	Annunciator Sequences and Specifications	ISA 18.1 (79 Ed, Reaff. 04)
EME Process Control and Computer System for Monitoring	3100 (06 Ed.)	System, Software and Hardwares Verification and Validation	IEEE 1012 (04 Ed.)
	3200 (15 Ed.)	Recommended Practice for Software Requirements Specifications	IEEE 830 (98 Ed.)
	3210 (10 Ed.)	Information Technology - System Design - Software Design Descriptions	IEEE 1016 (09 Ed.)
	3300 (10 Ed.)	Software Configuration Management Plans	IEEE 828 (05 Ed.)
	3400 (15 Ed.)	Developing a Software Project Life Cycle Process	IEEE 1074 (06 Ed.)
	3500 (05 Ed.)	Software Unit Testing	IEEE 1008 (87 Ed. Reaff. 02)
	3600 (09 Ed.)	Standard for Software and System Test Documentation	IEEE 829 (08 Ed.)
	3700 (10 Ed.)	Software Reviews and Audits	IEEE 1028 (08 Ed.)
	3800 (10 Ed.)	Standard for Software Safety Plan	IEEE 1228 (94 Ed., Reaff. 10)
	3900 (15 Ed.)	Standard Quality Assurance Processes	IEEE 730 (14 Ed.)

**ATTACHMENT 4-5****15. Measuring & Control Equipment (EM) -(Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EMF Measurement Method of Process Variable & Process Control- General	2100 (18 add.)	Compatibility of Analog Signals for Electronic Industrial Process Instruments	ISA 50.00.01 (75 Ed., Reaff. 12)
EMG Smart Grid Power System and Control	1200 (15 Ed.)	Electrical Power System Device Function Numbers, Acronyms, and Contact Designations	IEEE C37.2 (08 Ed.)
	2500 (15 Ed.)	Electric Meters Code for Electricity Metering	ANSI C12.1 (08 Ed.)
EMS Measuring & Control Equipment Security	1000 (15 Ed.)	Protection of Wire-Line Communication Facilities Serving Electric Supply Locations	IEEE 487 (07 Ed.)
	1300 (15 Ed.)	Standard Criteria for Security Systems for Nuclear Power Generating Stations	IEEE 692 (13 Ed.)

**16. Electric Equipment (EE)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EEA (2015 Ed.)	-	General Requirements	-
EEB Rotating Equipment	1000 (18 add.)	Rotating Equipment General Requirement	NEMA MG 1 Section I Part 1 (16 Ed.)
	1100 (17 add.)	Safety Standard and Guide for Selection, Installation, and Use of Electrical Motors and Generators	NEMA MG 2 (14 Ed.)
	1200 (15 Ed.)	Recommended Practice for Insulation Testing of Large AC Rotating Machinery with High Voltages at Very Low Frequency	IEEE 433 (09 Ed.)
	1300 (17 add.)	Recommended Practice for Testing Insulation Resistance of Rotating Machinery	IEEE 43 (13 Ed.)

**ATTACHMENT 4-5****16. Electric Equipment (EE) -(Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EEB Rotating Equipment	2110 (17 add.)	Small and Medium Induction Motor	NEMA MG 1 Section II (16 Ed.)
	2120 (18 add.)	Large Induced Motor	NEMA MG 1 Section II Part 20 (16 Ed.)
	2200 (15 Ed.)	Test Procedure for Polyphase Induction Motors and Generators	IEEE 112 (04 Ed.)
	2210 (15 Ed.)	Guide for AC Motor Protection	IEEE C37.96 (12 Ed.)
	2300 (15 Ed.)	Guide for Testing Turn Insulation on Form-Wound Stator Coils for Alternating-Current Electric Machines	IEEE 522 (04 Ed. Reaff 09 Ed.)
	2400 (15 Ed.)	Polyphase Induction Motors for Power Generating Stations	NEMA C50.41 (12 Ed.)
	2500 (15 Ed.)	Guide for the Presentation of Thermal Limit Curves for Squirrel Cage Induction Machines	IEEE 620 (96 Ed. Reaff 08 Ed.)
	3000 (15 Ed.)	Cylindrical-Rotor 50 Hz and 60 Hz Synchronous Generators Rated 10 MVA and Above	IEEE C50.13 (14 Ed.)
	4000 (15 Ed.)	Guide for Generator Ground Protection	IEEE C37.101 (06 Ed.)
	4100 (18 add.)	Guide for AC Generator Protection	IEEE C37.102 (06 Ed. Reaff 12 Ed.)
	4200 (18 Ed.)	Control Switchboards	IEEE C37.21 (17 Ed.)
	5000 (15 Ed.)	Standard Definitions for Excitation Systems for Synchronous Machines	IEEE 421.1 (07 Ed.)
	5100 (18 add.)	Guide for Identification, Testing and Evaluation of the Dynamic performance of Excitation Control Systems	IEEE 421.2 (14 Ed.)
	5200 (18 add.)	Recommended Practice for Excitation System Models	IEEE 421.5 (16 Ed.)

**ATTACHMENT 4-5****16. Electric Equipment (EE) -(Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EEC Transformer	1000 (15 Ed.)	Terminal Markings and Connections for Distribution and Power Transformers	IEEE C57.12.70 (11 Ed.)
	2100 (18 add.)	General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers	IEEE C57.12.00 (15 Ed.)
	2110 (17 add.)	Requirements for Liquid-Immersed Power Transformers	IEEE C57.12.10 (10 Ed.)
	2200 (15 Ed.)	Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers	IEEE C57.12.90 (10 Ed.)
	3100 (17 add.)	General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid-Cast and/or Resin-Encapsulated Windings	IEEE C57.12.01 (15 Ed.)
	3200 (15 Ed.)	Test Code for Dry-Type Distribution and Power Transformers	IEEE C57.12.91 (11 Ed.)
	4100 (15 Ed.)	Performance Characteristics and Dimensions for Power Transformer and Reactor Bushings	IEEE C57.19.01 (05 Ed.)
	5000 (15 Ed.)	Protecting Power Transformers	IEEE C37.91 (08 Ed.)
	5200 (15 Ed.)	Terminology for Power and Distribution Transformers	IEEE C57.12.80 (10 Ed.)
	5300 (15 Ed.)	Guide for Installation and Maintenance of Liquid-Immersed Power Transformers	IEEE C57.93 (07 Ed.)
EED Protection Equipment	1100 (15 Ed.)	Rating Structure for AC High- Voltage Circuit Breakers Rated on a Symmetrical Current Basis	IEEE C37.04b (08 Ed.)
	1110 (05 Ed.)	Test Procedure for AC High- Voltage Circuit Breakers Rated on a Symmetrical Current Basis	IEEE C37.09b (99 Ed.)

**ATTACHMENT 4-5****16. Electric Equipment (EE) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EED Protection Equipment	1120 (15 Ed.)	AC High- Voltage Circuit Breakers Rated on a Symmetrical Current Basis-Preferred Ratings and Related Capabilities for Voltages Above 1000V	IEEE C37.06 (09 Ed.)
	1130 (16 add.)	Standard Requirements for Electrical Control for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis	IEEE C37.11 (14 Ed.)
	1140 (15 Ed.)	Application guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis	IEEE C37.010 (99 Ed.)
	1150 (15 Ed.)	Standard for AC High-Voltage Generator Circuit Breakers Rated on a Symmetrical Current Basis	IEEE C37.013 (97 Ed.)
	1160 (15 Ed.)	Guide for Specifications of High-Voltage Circuit Breakers (over 1000 Volts)	IEEE C37.12 (08 Ed.)
	1170 (17 add.)	Alternating-Current High-Voltage Circuit Breakers	NEMA SG 4 (09 Ed. Reaff 13 Ed.)
	1200 (17 add.)	Low-Voltage AC Power Circuit Breakers Used in Enclosures	IEEE C37.13 (15 Ed.)
	1210 (15 Ed.)	Preferred Ratings, Related Requirements, and Application Recommendations for Low-Voltage AC(635 V and below) and DC(3200 V and below) Power Circuit Breakers	IEEE C37.16 (09 Ed.)
	1220 (15 Ed.)	Switchgear - Low Voltage AC Power Circuit Breakers Used in Enclosures - Test Procedures	IEEE C37.50 (12 Ed.)
	1300 (16 add.)	Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures	UL 489 (16 Ed.)



**ATTACHMENT 4-5****16. Electric Equipment (EE) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EED Protection Equipment	1400 (18 add.)	Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers used in commercial and Industrial Applications	NEMA AB 4 (17 Ed.)
	1500 (17 add.)	DC(3200 V and below) Power Circuit Breakers Used in Enclosures	IEEE C37.14 (15 Ed.)
	2000 (15 Ed.)	Requirements, Terminology, and Test Procedure for Neutral Grounding Devices	IEEE 32 (72 Ed., Reaff 97 Ed.)
	2100 (17 add.)	Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System	IEEE 81 (12 Ed.)
	3000 (15 Ed.)	Application Guide for Surge Protection of Electric Generating Plants	IEEE C62.23 (95 Ed.)
	3100 (15 Ed.)	Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits	IEEE C62.45 (02 Ed., Reaff 08 Ed.)
	3200 (15 Ed.)	Standard Test Methods for Surge Protectors and Protective Circuits Used in Information and Communications Technology(ICT) Circuits, and Smart Grid Data Circuits	IEEE C62.36 (00 Ed., Reaff 06 Ed.)
	4100 (15 Ed.)	Standard Requirements for High-Voltage Switches	IEEE C37.30 (97 Ed.)
	4200 (15 Ed.)	Standard Test Code for High-Voltage Air Switches	IEEE C37.34 (94 Ed.)
	4300 (15 Ed.)	Guide for the Application, Installation, Operation, and Maintenance of High-Voltage Air Disconnecting and Load Interrupter Switches	IEEE C37.35 (95 Ed.)

**ATTACHMENT 4-5****16. Electric Equipment (EE) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EED Protection Equipment	4310 (17 add.)	Specifications for High-Voltage (>1000 V) Expulsion and Current-Limiting Power Class Fuses and Fuse Disconnecting Switches	IEEE C37.46 (10 Ed.)
	4400 (17 add.)	Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum)	NEMA KS 1 (13 Ed.)
	5000 (15 Ed.)	Guide for Generation Station Grounding	IEEE 665 (95 Ed. Reaff 01 Ed.)
	6000 (15 Ed.)	Metal-Oxide Surge Arresters for AC Power Circuits(>1KV)	IEEE C62.11 (12 Ed.)
	6100 (15 Ed.)	Guide for the Application of Metal-Oxide Surge Arresters for Alternating -Current System	IEEE C62.22 (09 Ed.)
	6500 (17 add.)	General Requirements and Test Procedures for outdoor Apparatus Bushings	IEEE C57.19.00 (04 Ed.)
EEE Switchgear & Distribution Panel	1000 (15 Ed.)	Standard for Safety Motor Control Centers	UL 845 (11 Ed.)
	2000 (17 add.)	Metal-Enclosed Low-Voltage(1000 Vac and below, 3200 Vdc and below) Power Circuit Breaker Switchgear	IEEE C37.20.1 (15 Ed.)
	3000 (17 add.)	Metal-Clad Switchgear	IEEE C37.20.2 (15 Ed.)
	3100 (15 Ed.)	Deadfront Distribution Switchboards	NEMA PB 2 (11 Ed.)
	3200 (15 Ed.)	Metal-Enclosed Interrupter Switchgear (1 kV-38 kV)	IEEE C37.20.3 (13 Ed.)
	4000 (15 Ed.)	Panelboards	NEMA PB 1 (11 Ed.)
	4100 (16 add.)	General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less	NEMA PB 1.1 (13 Ed.)
	4200 (15 Ed.)	Control Switchboards	IEEE C37.21 (17 Ed.)
	5000 (17 add.)	Metal-Enclosed Bus	IEEE C37.23 (15 Ed.)
	5100 (16 add.)	Application Guide for Ground Fault Protective Devices for Equipment	NEMA PB 2.2 (14 Ed.)

**ATTACHMENT 4-5****16. Electric Equipment (EE) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
EEF Relay	1000 (15 Ed.)	Relays and Relay Systems Associated with Electric Power Apparatus	IEEE C37.90 (05 Ed., Reaff. 11)
	2000 (10 Ed.)	Surge Withstand Capability(SWC) Tests for Relays and Relay System Associated with Electric Power Apparatus	IEEE C37.90.1 (02 Ed.)
	4000 (18 add.)	Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	IEEE C37.90.2 (04 Ed., Reaff. 10)
EEG Station Battery	1100 (15 Ed.)	Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications	IEEE 484 (02 Ed., Reaff. 08)
	1200 (10 Ed.)	Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications	IEEE 485 (97 Ed., Reaff. 03)
	1450 (18 add.)	Standard for Safety Lithium Batteries	UL 1642 (15 Ed.)
EEH Battery Charger	1000 (15 Ed.)	Utility Type Battery Charger	NEMA PE-5 (97 Ed., Reaff 03)
EEl High Voltage Equipment	3000 (17 add.)	High-Voltage Testing Techniques	IEEE 4 13 (13 Ed.)
EEK Cathodic Protection Facilities	1000 (16 add.)	Control of External Corrosion on Underground or Submerged Metallic Piping Systems	NACE SP 0169 (13 Ed.)
	1100 (15 Ed.)	Design, Installation, Operation and Maintenance of Impressed Current Deep Anode Beds	NACE SP 0572 (07 Ed.)
EEL Uninterruptible Power Supplies	1000 (15 Ed.)	Application and Testing of Uninterruptible Power Supplies for Power Generating Stations	IEEE 944 (86 Ed., Reaff. 96)
	1100 (18 add.)	Uninterruptible Power Systems ( UPS) Specification and Performance Verification	NEMA PE 1 (12 Ed., Reaff. 17)

**ATTACHMENT 4-5****17. Cable & Raceways (EC)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
ECA (2015 Ed.)	-	General Requirements	-
ECB Electric Wire & Cable	1100 (16 add.)	Soft or Annealed Copper Wire	ASTM B 3 (13 Ed.)
	1200 (15 Ed.)	Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes	ASTM B 33 (10 Ed.)
	1300 (15 Ed.)	Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes	ASTM B 189 (05 Ed., Reaff. 10)
	1400 (18 add.)	Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft	ASTM B 8 (17 Ed.)
	4000 (16 add)	Control, Thermocouple Extension, and Instrumentation Cables	NEMA WC 57 (14 Ed.)
	5100 (15 Ed.)	Test Procedures for Impulse Voltage Tests on Insulated Conductors	IEEE 82 (02 Ed., Reaff. 09)
	5300 (15 Ed.)	Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems	IEEE 400 (12 Ed.)
	5400 (15 Ed.)	Guide for the Design and Installation of Cable Systems in Substations	IEEE 525 (07 Ed.)
	5500 (15 Ed.)	Guide for Selecting and Testing jackets for Power, Instrumentation, and Control Cables	IEEE 532 (07 Ed.)
	5600 (15 Ed.)	Standard Cable-Penetration fire Stop Qualification Test	IEEE 634 (04 Ed., Reaff. 10)
	5700 (15 Ed.)	Standard for Flame-Propagation Testing of Wire and Cable	IEEE 1202 (06 Ed., Reaff. 12)
	5800 (18 add.)	Standard Test method for Extruded Dielectric Power, Control, Instrumentation Portable Cables for Test	NEMA WC 53 (16 Ed.)
	6000 (15 Ed.)	Binational Wire and Cable Packaging Standard	NEMA WC 26 (08 Ed.)
	6100 (15 Ed.)	Standard for Safety Armored Cable	UL 4 (04 Ed.)
	7100 (15 Ed.)	Nonshielded Power Cables Rated 2000 Volts or Less for The Distribution of Electrical Energy	NEMA WC 70 (09 Ed.)

**ATTACHMENT 4-5****17. Cable & Raceways (EC) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
ECB Electric Wire & Cable	7200 (15 Ed.)	5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy	NEMA WC 74 (12 Ed.)
	7300 (16 add.)	Nonshielded Cables Rated 2001-5000 Volts for Use in The Distribution of Electric Energy	NEMA WC 71 (14 Ed.)
	7400 (18 add)	Ampacities of Cable Installed in Cable Trays	NEMA WC 51 (09 Ed., Reaff. 14)
	8000 (15 Ed.)	Recommended Practice for Field Testing Electric Submersible Pump Cable	IEEE 1017 (13 Ed.)
	8100 (15 Ed.)	Recommended Practice for Specifying Electric	IEEE 1018 (13 Ed.)
	8200 (15 Ed.)	Recommended Practice for Specifying Electric	IEEE 1019 (13 Ed.)
ECC Electric Wire Accessories	1100 (15 Ed.)	Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV through 765kV or Extruded Insulation Rated 2.5 kV through 500 kV	IEEE 48 (09 Ed.)
	1200 (15 Ed.)	Extruded and Laminated Dielectric Shielded Cable Joints Rated 2,500 V to 500,000 V	IEEE 404 (12 Ed.)
	1300 (15 Ed.)	Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5kV through 35kV	IEEE 386 (06 Ed.)
	3000 (16 add.)	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable	NEMA FB 1 (14 Ed.)
	3100 (15 Ed.)	Standard for Safety Conduit, Tubing, and Cable Fittings	UL 514B (12 Ed.)
ECD Raceway Supplies	1100 (18 add.)	Electric Rigid Steel Conduit (ERSC)	ANSI C80.1 (15 Ed.)
	2100 (15 Ed.)	Electrical Polyvinyl Chloride (PVC) Tubing and Conduit	NEMA TC 2 (13 Ed.)
	2200 (17 add.)	Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing	NEMA TC 3 (16 Ed.)

**ATTACHMENT 4-5****17. Cable & Raceways (EC) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
ECD Raceway Supplies	2300 (17 add.)	Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations	NEMA TC 6&8 (13 Ed.)
	3100 (18 add.)	Metal Cable Tray Systems	NEMA VE 1 (17 Ed.)
	4100 (15 Ed.)	General Instructions for Handling, Installation, Operation and Maintenance of Busway Rated 600 Volts or Less	NEMA BU 1.1 (10 Ed.)
	5000 (15 Ed.)	Guide for Design and Installation of Cable Systems in Power Generating Stations	IEEE 422(15 Ed.)
	6000 (16 add.)	Guideline for Terminal Blocks	NEMA ICS 4 (15 Ed.)

**18. Transmission, Transformation & Distribution (ET)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
ETA (2015 Ed.)	-	General Requirements	-
ETB Overheadline Raceway	2210 (15 Ed.)	Construction of Composite Fiber Optic Ground Wire (OPGW) for Use on Electric Utility Power Lines	IEEE 1138 (09 Ed.)
ETD Mechanical Apparatus	3430 (15 Ed.)	High-Voltage(>1,000 V) Expulsion Type Distribution Class Fuses, Fuse and Disconnecting Cutouts, Fuse Disconnecting Switches, and Fuse Links, and Accessories Used with These Devices	IEEE C37.42 (09 Ed.)
ETE System Protection Apparatus & Measuring Equipment	2200 (15 Ed.)	SCADA and Automation Systems	IEEE C37.1 (07 Ed.)
	2700 (17 add.)	Recommended Practice for Determining the Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault	IEEE 367 (07 Ed.)
	3100 (18 add.)	Guide for the Application of Neutral Grounding in Electrical Utility Systems - Part I: Introduction	IEEE C62.92.1 (00 Ed.)
	3200 (18 add.)	Guide for the Application of Neutral Grounding in Electrical Utility Systems Part II: Synchronous Generator Systems	IEEE C62.92.2 (89 Ed.)

**ATTACHMENT 4-5****19. Nuclear Structures (SN)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
SNA (2009 add.)	General Requirements	ASME Sec. III NCA (07 Ed. ~ 08 add.)
SNB (2009 add.)	Concrete Containment	ASME Sec. III Div.2 (07 Ed. ~ 08 add.)
SNC (2005 Ed.)	Nuclear Safety-Related Concrete Structures	ACI 349 (97 Ed., 01 Ed.) (97 Ed. Composite Structures only.)
SND (2005 Ed.)	Safety-Related Steel Structures for Nuclear Facilities	AISC-N690 (94 Ed ~ 02 Supp.1)

**20. General Structures (SG)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
SGA (2015 Ed.)	General Requirements	-
SGB (2016 add.)	Building Code Requirements for Structural Concrete	ACI 318M (14 Ed.)
SGD (2005 Ed.)	Steel Structure - LRFD	AISC LRFD (99 Ed.)
SGE (2015 Ed.)	Code for Structural Steel Buildings	AISC 360 (10 Ed.)

**21. Extra Provisions for Structures (ST)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
STA (2009 add.)	Minimum Design Loads	ASCE 7 (05 Ed., 10 Ed.) (05 Ed. Wind and Tornado Load only.)
STB (2016 add.)	Seismic Analysis and Seismic Capacity Evaluation for Nuclear Facilities	ASCE 4 (98 Ed., Reaff 16)

**ATTACHMENT 4-5****22. Structural Welding (SW)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
SWS (2016 add.)	Structural Welding - Steel	AWS D1.1/D1.1M (15 Ed.)
SWT (2018 add.)	Structural Welding - Sheet Steel	AWS D1.3/D1.3M (18 Ed.)
SWL (2018 add.)	Structural Welding □ Stainless Steel	AWS D1.6/D1.6M (17 Ed.)

**23. Fire Protection (FP)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
FPC 72 (2015 Ed.)	Fire Alarm Code	NFPA 72 (07 Ed.)
FPC 75 (2015 Ed.)	Standard for the Protection of Information Technology Equipment	NFPA 75 (13 Ed.)
FPC 780 (2016 add.)	Standard for the Installation of Lightning Protection Systems	NFPA 780 (08 Ed.)
FPN 803 (2015 Ed.)	Standard for Fire Protection for Light Water Nuclear Power Plants	NFPA 803 (98 Ed.)
FPN 804 (2015 Ed.)	Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants	NFPA 804 (10 Ed.)



**ATTACHMENT 4-6**

**Exception List for KEPIC**

Specification Number: F-145-UP206D	Title: Tilting Disc Check Valves							
Supplier:	Certificates Status:							
KEPIC Application: <input type="checkbox"/> All KEPIC, <input type="checkbox"/> Partial, <input type="checkbox"/> All Ref. Codes & Standards								
<p>Applicable Referenced Codes &amp; Standards instead of KEPIC</p> <table border="1"> <thead> <tr> <th>Item or Codes &amp; Standards</th> <th>Reason for Application</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			Item or Codes & Standards	Reason for Application	Remarks			
Item or Codes & Standards	Reason for Application	Remarks						
Authorized Inspection Agency for KEPIC MN:								
Others:								

\* Note : Exception list for KEPIC Code is considered Technical Specification requirements. Changes to these data by the Supplier shall require a SDDR in accordance with the Appendix 4H.

## **Material Verification Report (Form)**

**Material Verification Report for Pressure Retaining Part (Spec. : F-145-UP206D).**

Applicable Code : KEPIC MN/MDP (Reference Code : ASME Sec. III / Sec. II Part D) \_\_\_\_\_ Edition

(Supplier's Symbol & Logo, etc)

Project Name :  
Spec. No. :  
Supplier's Doc. No. :  
Revision No. :  
Sheet :  
Issued Date (DD/MM/YY) :

Prepared by : \_\_\_\_\_  
( Name / Signature )

Reviewed by : \_\_\_\_\_  
( Name / Signature )

Approved by : \_\_\_\_\_  
( Name / Signature )

Notes : 1. This report is to confirm the use of the ASME code materials per NX-2000 (Part B), and check for requirements for exempting mandatory PWHT (Part B), S-PWHT (Part III) and Impact Test (Part IV).

2. Per 1315141 MVR Issue (A3 Size) - When material selection is made of design report is prepared for A/E's approval per App. 4D, and

3. Per 1212141 MVR Issue (A3 Size) - When item is delivered with QVO Documents per App. 4E,

4. Per 2KPC Material MNX-46221 (ASME Sec. II, Table NX-4622-7B) (1)

5. PWHT may be exempted if the material satisfies all of the requirements in (1), (2), (3) and (4).

6. S-PWHT may be exempted, if PWHT is exempted per Note 4) above, or material is P-No.1, Group No.1 or 2 with nominal thickness of 2 inch and less.

7. Supplier shall verify and fill out the information based on certified documents.

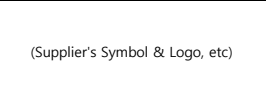
8. Per 2KPC Material MNX-231 (ASME Sec. II, NX-231)

9. Per 2KPC Material MNX-2570 (ASME Sec. II, NX-2570)

10. Any revised part (column) shall be cloud marked, whenever this report is revised.

[illegible]

(        ) **Issued Material Verification Report for not selecting KEPIC MN (ASME Sec. III) Material**



Project Name :  
Spec. No. :  
Supplier's Doc. No. :  
Revision No. :  
Sheet : /  
Issued Date (DD/MM/YY) :

Prepared by : \_\_\_\_\_  
( Name / Signature )  
  
Reviewed by : \_\_\_\_\_  
( Name / Signature )  
  
Approved by : \_\_\_\_\_  
( Name / Signature )

Notes : 1st (Initial) MVR Issue (A3 Size) : When Material Selection & Design Report Submittal Week.  
2nd (Final) MVR Issue (A3 Size) : When After Manufacturing and Fabrication, QVD Submittal Week.

No.	Item No.	Mark No. (Material No.)	Part Name, if applicable	Part Classification	Reason for not selecting KEPIC MN (ASME Sec. III) Material	Remarks

## **Weld Map (Form)**

**ATTACHMENT 4-8**

Spec : F-145-UP206D  
Rev. 0

**Weld Map (P.O. Spec. No.: F-145-UP206D)**

Applicable Codes & Standards : KEPIC MNX / MDX (2009 Add.) [Referenced Codes & Standards : ASME Sec. III MX / Sec. II Part A, B, C, D (2007 Ed.~2008 Add.)]

- ☐ 1st Issue (PI) : Before Manufacturing and Fabrication Submittal Week
- ☐ 2nd Issue(FI) : After Manufacturing and Fabrication, QVD Submittal Week

Notes: 1) Confirm whether or not PWHT and Impact Test are contained in welding procedure specification when weld joints require PWHT and Impact Test are referring to Weld Map.

2) The Supplier's Weld Map(Form) shall include minimum design thickness check on the clad thickness measurement system after clad welding.

[illegible]

# **Codes & Standards Compliance Report (Form)**

## Codes & Standards Compliance Report

Rev. 0

[illegible]



**Parent Component Safety Functions and Classification Evaluation Sheet Form**

<b>1. Evaluation Sheet No.</b>	F-145-UP206D-ES-001	<b>2. Station/Unit(s)</b>	ARA
<b>3. System/Component Identification</b>			
System	Component Cooling Water System(461), Essential Service Water System(462)		
Component	Tilting Disc Check Valves	Component Item No.	Refer to Para 6. References
Specification No.	F-145-UP206D	Supplier/Manufacturer	
<b>4. Component Safety Functions Evaluation</b>			
Safety Function Code No. (CSF)	Safety Function Description		
CSF01	Maintain Pressure Integrity		
	Required to prevent the escape or entry of an excessive quantity of fluid between the working pressure boundary and the atmosphere. Applies to both active and passive equipment, inclusive of items containing fluid or gas.		
CSF04	To Close, Isolate		
	Active components normally open and required to perform a mechanical movement to achieve and maintain a closed position, thereby stopping process flow.		
<b>5. Component Classification</b>			
Safety Class(SC)	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> NNS	Quality Class	<input checked="" type="checkbox"/> Q <input type="checkbox"/> A <input type="checkbox"/> S
Electrical Class	<input type="checkbox"/> 1E <input type="checkbox"/> Non-1E <input checked="" type="checkbox"/> N/A	Seismic Category	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III
Quality Group	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> N/A		
Safety Classification	<input checked="" type="checkbox"/> SR <input type="checkbox"/> AQ <input type="checkbox"/> NSR		
Environment Qualification	<input checked="" type="checkbox"/> EQ <input type="checkbox"/> N/A	Operational Mode	<input checked="" type="checkbox"/> Active <input type="checkbox"/> Passive <input type="checkbox"/> N/A
<b>6. References</b>	Component Item No. 1.01.A, 1.01.B, 1.01.C, 1.01.D, 1.02.A, 1.02.B, 1.02.C, 1.02.D		

**Parent Component Design Functions and Classification Evaluation Sheet Form**

<b>1. Evaluation Sheet No.</b>	F-146-UP206D-ES-002	<b>2. Station/Unit(s)</b>	ARA
<b>3. System/Component Identification</b>			
System	Condensate System(531), Feedwater System(541), Advanced Reactor For Multipurpose Application(553) Turbine Generator Area Closed Cooling Water System(562)		
Component	Tilting Disc Check Valves	Component Item No.	Refer to Para 6. References
Specification No.	F-145-UP206D	Supplier/Manufacturer	
<b>4. Component Design Functions Evaluation</b>			
Design Function	Design Function Description		
Maintain Pressure Integrity	Required to prevent the escape or entry of an excessive quantity of fluid between the working pressure boundary and the atmosphere. Applies to both active and passive equipment, inclusive of items containing fluid or gas.		
To Close, Isolate	Active components normally open and required to perform a mechanical movement to achieve and maintain a closed position, thereby stopping process flow.		
<b>5. Component Classification</b>			
Safety Class(SC)	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> NNS	Quality Class	<input type="checkbox"/> Q <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> S
Electrical Class	<input type="checkbox"/> 1E <input type="checkbox"/> Non-1E <input checked="" type="checkbox"/> N/A	Seismic Category	<input type="checkbox"/> I <input type="checkbox"/> II <input checked="" type="checkbox"/> III
Quality Group	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input checked="" type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> N/A		
Safety Classification	<input type="checkbox"/> SR <input checked="" type="checkbox"/> AQ <input checked="" type="checkbox"/> NSR		
Environment Qualification	<input type="checkbox"/> EQ <input checked="" type="checkbox"/> N/A	Operational Mode	<input type="checkbox"/> Active <input type="checkbox"/> Passive <input checked="" type="checkbox"/> N/A
<b>6. References</b>	Component Item No. 1.03.A, 1.03.B, 1.04.A, 1.04.B, 1.05.A, 1.05.B, 1.06.A, 1.06.B, 1.06.C, 1.06.D, 1.07.A, 1.07.B, 1.08.A, 1.08.B, 1.08.C, 1.08.D		

ARA

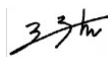
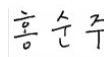
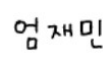
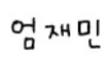
## APPENDIX 4A1

### Quality Assurance Program Requirements

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

0	03/24/23	Issue for Use				
REV. NO	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED

Preparer : 조무현, Tel : 054-421-7803

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## 1.0 SCOPE \*

- 1.1 This appendix applies to the suppliers of items and services and the construction contractors (hereinafter called as supplier) as specified in the contract.
- 1.2 The supplier shall establish and implement a quality assurance program which wholly or selectively complies with the “Quality Assurance Program Criteria in Sec. 3.0” depending upon the work scope of the contract and the quality level of material, equipment and services supplied. Specially, a comparative matrix table which shows conformance to the applied quality assurance program requirements and justification for the selective application shall be included in the quality assurance program.
- 1.3 The quality system, policy, organization, responsibility, and other requirements (and including a list of procedures as necessary) necessary for control and assurance of quality throughout all phases of the contract shall be documented and implemented.
- 1.4 The requirements specified in the contract (general conditions, special conditions, and technical specification) have priority over the requirements of this appendix.
- 1.5 If the supplier believes that an inconsistency and an ambiguity exists between this appendix and the contract, the supplier shall immediately notify the Buyer, and shall proceed with relevant activities only after obtaining the Buyer's acceptance.
- 1.6 The supplier may delegate any or all activities to the sub-supplier. The supplier shall assure that the sub-supplier is subjected to the same applicable quality assurance requirements of this appendix.
- 1.7 The Supplier shall establish and implement an acceptable CFSIs(Counterfeit, Fraudulent, Suspected Items) control Program. If needed, Completeness of Goods shall be confirmed through sample test, etc.
- 1.8 In case the supplier is not capable of conducting the tests and inspections using its own equipment, the originals of CGID(Commercial Grade Item Dedication) Documents, QVDs(Quality Verification Documents), and EQ(Equipment Qualification) Documents shall be submitted directly to the buyer through mail, e-mail, fax, etc. The supplier shall comply with QVD requirements of CFSI in Appendix 4A2 to prevent forgery verification of quality-related documents(EQ/CGID/QVD) submitted to the Buyer. Otherwise, the Buyer may extend the duration of the inspection for the contract or stop the inspection. All documents(CGID Documents, QVDs and EQ Documents) submitted to the buyer Owner should be self-checking for the truth.

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\* Note : This appendix may be changed by the Quality Policy and QA Program of KAERI.

- 1.9 The supplier shall not submit forged·falsified or any other wrongful CGID(Commercial Grade Item Dedication) Documents, QVDs(Quality Verification Documents) and EQ(Equipment Qualification) Documents to the buyer in relation to the contract fulfillment of this tender. If the supplier fails to do so, he or she shall be subject to criminal penalties, constraint to participation in tenders as an unjust supplier, cancellation of registration onto and prohibition on reentrance into Buyer's qualified suppliers' list of quality-related equipment and materials(for a certain period of time), claims for damages, and so on.

## **2.0 TERMINOLOGY**

- 2.1 Buyer : The Buyer is defined as the Owner of ARA or his/her representative and as the orderer in case of project contract.
- 2.2 Supplier : Any individual or organization who furnishes items or services in accordance with a procurement document. An all-inclusive term used in place of any of the following: seller, contractor, subcontractor, fabricator, consultant, and their subtier levels.
- 2.3 Controlled Copy : A copy of the supplier's documents which is marked with a controlled copy number through which the current status shall be maintained by transmittals of revisions, additions, and deletions.
- 2.4 Procedure : Written requirements which specify operational steps, how an activity is to be performed, and which assigns responsibilities for reaching objectives.
- 2.5 Quality Assurance Manual(QA Manual) : A written document which prescribes quality assurance program requirements so that all quality related activities are systematically performed and controlled in accordance with regulatory requirements, contract requirements, codes and standards.
- 2.6 Nuclear Safety Act and Decrees : The Korea Nuclear Safety Act, the Presidential Decree of the Nuclear Safety Act, the Ordinance of the Nuclear Safety Act, the NSSC(Nuclear Safety and Security Commission) Notices and Regulations.
- 2.7 Regulatory Institute : The NSSC(Nuclear Safety and Security Commission) or its agent, the Korea Institute of Nuclear Safety (KINS)
- 2.8 Q-class Items : Items or related services which perform safety related functions in the normal operation and safe shutdown of power plants, and whose failure could impact the environment (e.g., radiation damage) and public safety.
- 2.9 A-class Items : The following items or services which are not safety-related structure, system and components, however, shall be classified as Augmented requirements item "A" class and appropriate QA requirements designated shall be applied for the design, procurement,

construction and operation.

A. The items which QA activities are required in the regulatory requirements.

B. The Structure, system and component classified as seismic category II.

- 2.10 S-class Items : Industrial standard items or services that are not quality class Q or A.
- 2.11 CFSIs (Counterfeit, Fraudulent, Suspect Items) : The all items are not authentic.
- 2.12 Goods : Goods means any and all machinery, materials, components, parts, tools, goods and/or related services of any kind to be supplied by the Supplier under the Contract.
- 2.13 Commercial Grade Item – an item satisfying A, B, and C below
- A. Not subject to design or specification requirements that are unique to nuclear facilities ;
  - B. Used in applications other than nuclear facilities ;
  - C. Is to be ordered from the manufacturer/supplier on the basis of specifications set forth in the manufacturer's published product description (for example, catalog)
- 2.14 Commercial Grade Item Dedication : A process (as per ASME NQA-1) to assure that a commercial grade item, manufactured not in accordance with Clauses 68 to 85, Regulations on Technical Standards for Nuclear Reactor Facilities (or U.S. 10 CFR 50 App. B), could satisfy its intended safety function by one.
- 2.15 Significant condition adverse to quality : A significant condition adverse to quality is one that, if uncorrected, could have a serious effect on safety or operability.
- 2.15 Quality Verification Documentation (QVD) : A documentation summarizing all documents and drawings related to tests and inspections in the quality assurance activities of manufacturing this document shall be submitted to the Buyer in accordance with the contract requirements.

### **3.0 REQUIREMENTS**

#### **3.1 General**

- 3.1.1 The Regulatory requirements and applicable codes and standards effective as of June 30, 2019 shall be used except as described otherwise herein.
- 3.1.2 The supplier shall identify a management position that retains overall authority and responsibility for the Quality Assurance Program (normally, this position is the QA Manager). This position is at the same or higher organization level as the highest line manager directly responsible for performing activities affecting quality (such as engineering, procurement, production, and construction) and has no other duties or responsibilities unrelated to QA that would prevent his full attention to QA matters.

- 3.1.3 In case QA Records are controlled as electronic media, the control measures, including requirements for retrieval of stored information and duration life of media, shall be established and implemented.

### **3.2 Q-class Quality Assurance Program Criteria**

- 3.2.1 The supplier who performs safety-related work (relevant to Q-class) shall establish a QA program to meet the criteria of the Korea Nuclear Safety Act and Decrees, U.S. 10 CFR 50 App. B and the following criteria, KEPIC QAP (Korea Electric Power Industry Code-Nuclear QA) (2005 edition)/ASME NQA-1 (1994 edition and 1995 addenda), and U.S.NRC Regulatory Guide 1.28.

#### **3.2.1.1 Domestic supplier**

- A. NSSC Regulation : Regulations on Technical Standards for Nuclear Reactor Facilities, Etc.
- B. NSSC Notice : Detailed Requirements for Quality Assurance of Nuclear Reactor Facilities
- C. KEPIC MN/SN/EN Items
  - a. Component/part : KEPIC MNA/SNA/ENA 4200 and KEPIC QAP
  - b. Material : KEPIC MNA/SNA 4300
- D. Items except KEPIC MN/SN/EN : KEPIC QAP

#### **3.2.1.2 Foreign supplier**

- A. U.S. 10 CFR 50 App. B
- B. ASME B&PV Code Sec. III Items
  - a. Component : ASME B&PV Code Sec. III, NCA 4000 and ASME NQA-1
  - b. Material : ASME B&PV Code Sec. III, NCA 3800
- C. Items except ASME B&PV Code Sec. III : ASME NQA-1

- 3.2.2 In case of the ISO 9001 or other internationally accepted nuclear quality assurance standards based quality assurance program, a comparative matrix table which shows conformance to the applied quality assurance program requirements (KEPIC QAP/ASME NQA-1) shall be included in the quality assurance program.

### **3.3 A-class Quality Assurance Program Criteria**

The suppliers of A-class items shall establish and implement a QA Manual, and this QA Manual shall contain the requirements described in section 5.0(5.1~5.18) of this appendix depending on applicable contract requirements. In case of the ISO 9001 based quality assurance program, a comparative matrix table which shows conformance to the applied quality assurance program requirements and the justification for the selective application to Section 5.0 shall be included in the quality assurance program.

### **3.4 S-class Quality Assurance Program Criteria**



For S-class items, it is not required to establish a specific QA Manual, but it is required to perform quality activities in accordance with the item's characteristics and the contract requirements. In case Quality Assurance Program is specifically required by the applicable regulatory requirements, code and standards in the contracts, the supplier shall establish and implement the quality controls to meet those quality requirements. For General Items(GENE), does not require quality verification documents in principle.

#### **4.0 QUALITY ASSURANCE MANUAL SUBMITTAL REQUIREMENTS(Q, A-class)**

- 4.1 Tenderers shall submit a QA Manual with Tender. The Tenderer who holds any certificates according to applicable codes and standards, such as, KEPIC / ASME Certificate of Authorization, ISO Certificates and other accredited authorization, shall submit a copy of his current certificates.
- 4.2 Supplier shall submit a Controlled Copy of QA Manual within two(2) weeks from the Award date in accordance with this appendix. The Supplier, who has QA Manual accepted by the Buyer for the same quality class previously in this project, might only provide commitment that the controlled copy QA Manual is applicable to the scope of the work.

#### **5.0 QUALITY ASSURANCE PROGRAM REQUIREMENTS(A-class)**

The Supplier shall establish and maintain a quality assurance program in compliance with KEPIC-QAP, ASME NQA-1 or following requirements. The QA Manual shall meet these criteria, as a minimum. In case justification for selective application of quality assurance requirement is clearly identified, the following quality assurance program requirements may be tailored in accordance with the item's characteristics.

##### **5.1 Organization**

- 5.1.1 The supplier shall organize and operate the quality-related project organizations consisted of functional groups that perform designing, purchasing, fabricating, and Quality Assurance, etc.
- 5.1.2 The QA organization performing QA function shall operate QA offices considering the location and effectiveness of work performance. Each QA office shall maintain mutual cooperation for the efficiency of quality assurance-related activities under the supervision of the Quality Assurance Manager.

##### **5.2 Quality Assurance Program**

- 5.2.1 This QA Manual or its revision is effective only after an approval by the authorized personnel.

- 5.2.2 Preparation, review, approval, revision, issuance, distribution and control of this QA Manual shall be processed in accordance with the separate procedure.

### **5.3 Design Control**

- 5.3.1 Design input such as design basis, design function, performance requirements, regulatory requirements, contract requirements and quality requirements of the design items, shall be identified, reviewed, and approved by the responsible design organization.
- 5.3.2 The design input shall be specified in detail and accurately enough to provide a consistent basis for making a design decision, accomplishing design verification, and evaluation of design changes
- 5.3.3 Changes from approved design input, as well as the reason for the changes, shall be reviewed and approved.
- 5.3.4 All design changes including field design changes shall be controlled with the identical level of the original design, and shall be correctly reflected into as-built drawings and technical specifications.
- 5.3.5 Changes shall apply design criteria equal to the initial design or design criteria, and shall be reviewed and approved by the same organizations which performed the original design. However, other qualified personnel or organizations are designated, changes may be verified by them.
- 5.3.6 When design changes are made, a consideration on the effect for the total design aspects and the adequacy of design analysis shall be evaluated. Such changes shall be notified to organizations affected by design changes.

### **5.4 Procurement Document Control**

- 5.4.1 The procurement documents for items, services, and facility modifications shall be prepared based on related regulatory requirements, contract documents, applicable codes & standards.
- 5.4.2 The procurement document shall include the followings:
- A. Scope of work and delivery schedule
  - B. Regulatory requirements, applicable codes & standards, QA requirements
  - C. Technical requirements for drawings, technical specifications and equipment design data
  - D. Document submittal requirements
  - E. Inspection, test, and acceptance criteria
  - F. Purchaser's right to access at the supplier's plant facilities and to read the quality related documents for inspection, audit, surveillance purpose after contract termination
  - G. Purchaser's right to access at the supplier's plant facilities and to read the quality related documents for inspection, audit, surveillance purpose after contract termination
  - H. Purchaser's right to request work stop to the supplier

- I. Provision for reporting of nonconformance and Purchaser's review of its disposition
- J. Requirements for spare and replacement parts
- K. QA records to be submitted prior to use or installation.

- 5.4.3 Procurement requesting organization shall review the procurement documents to verify that the documents include applicable requirements for assuring that the items and services being purchased meet the specified requirements.
- 5.4.4 Procurement document review shall be completed prior to contract award, and documentation of the results shall be prepared and maintained.
- 5.4.5 Changes made as a result of the bid evaluation or contract negotiations shall be incorporated into the procurement documents. The review of such changes and their effects shall be completed prior to contract award.
- 5.4.6 Procurement document review shall be performed by personnel who have knowledge about purchased items and services and have an adequate understanding of the requirements and the intent of the procurement documents. QA requirements shall be reviewed by QA personnel.
- 5.4.7 Procurement document changes shall be subject to the same degree of control as applied in the preparation of the original documents. However, in case that it is difficult to control the changed document for some reasons such as termination or release of contract, and/or change of organization, it may be controlled with a practice directed by Supplier.

## **5.5 Instructions, Procedures, and Drawings**

- 5.5.1 Activities affecting quality shall be performed in accordance with documented instructions, procedures or drawings.
- 5.5.2 Each responsible quality organization shall prepare instructions, procedures, and drawings to implement activities affecting quality, and approve them prior to commencement of the work.
- 5.5.3 Instructions, procedures, and drawings shall include at least the following :
  - A. The sequence and methods for the activities being performed.
  - B. Responsibility of organizations and personnel performing the concerned activities.
  - C. Quantitative or qualitative acceptance criteria for determining that activities affecting quality are accomplished in accordance with the instructions, procedures, and drawings.
- 5.5.4 Each QA organization is responsible for reviewing and verifying that activities affecting quality are performed in accordance with the instructions, procedures, or drawings.

## **5.6 Document Control**

- 5.6.1 Each responsible quality organization shall establish and implement procedures to prepare, review, approve, issue, distribute, and control quality-related documents and their changes.

## **5.7 Control of Purchased Items and Services**

- 5.7.1 The procurement requesting department shall establish systematic procurement planning to assure that equipment and services can be procured in accordance with a procurement schedule. Procurement planning shall be accomplished as early as practicable, and no later than at the start of those procurement activities, and this planning shall be documented.
- 5.7.2 Procurement planning shall specify the following :
- A. Preparation, review, and control of procurement documents
  - B. Evaluation and selection of procurement sources
  - C. Bid evaluation and contract award
  - D. Control of supplier performance
  - E. Verification activities(surveillance, inspection and audit) by purchaser including inspection point(Witness/Hold points)
  - F. Control methods of supplier nonconformance
  - G. Corrective action
  - H. Acceptance method of purchased items and services
  - I. QA records
- 5.7.3 Quality related items and services shall be procured from the verified suppliers who have been recognized to be capable of providing items and services in accordance with the procurement document requirements.
- 5.7.4 The evaluation and selection of supplier shall be performed based on the supplier's evaluations for contract observance capability, technical and quality assurance capability.
- 5.7.5 Supplier selection shall be performed using more than one of the following methods.
- A. Evaluation of the supplier's experiences of providing identical or similar items or services
  - B. Objective evaluation of supplier's quality assurance records
  - C. Direct evaluation through supplier verification survey
- 5.7.6 The results of evaluation and selection of supplier shall be documented. The department responsible for supplier evaluation shall prepare an approved supplier list and distribute it to the applicable departments for their use.
- 5.7.7 Acceptance of items and services related to purchased items  
Acceptance of items shall be determined the conformance to procurement requirements by reviewing the certificate of conformance, source verification, receiving inspection or post-installation test, of a combination of thereof.
- 5.7.7.1 Review of certificate of conformance(C of C)

The responsible department shall establish and implement a measure to review and control the supplier's certificate of conformance and verify the effectiveness and adequacy of the supplier's certification system. The certificate of conformance shall include the following as a minimum.

- A. Identification of the purchase items, such as purchase order number
- B. Applied procurement requirements
- C. Identify nonconformities, if any and their resolution plan
- D. Signature of responsible QA personnel

5.7.7.2 Source verification

- A. Source verification shall be performed for the scope properly defined in accordance with the importance, complexity and procurement requirements of procured items.
- B. Source verification records to be submitted to the plant sites shall be specified procurement documents.

5.7.7.3 Receiving inspection

- A. The receiving inspection shall be performed in accordance with the established procedures or instructions to verify the following items.
  - (1) Identification status of items, and consistency between the procurement documents and the received documents
  - (2) Physical and other characteristics
  - (3) Freedom from shipping damages and cleanliness
  - (4) Completeness of QA records
- B. The inspection status of the items transported in storage area or released for subsequent work shall be identified prior to release to work.

5.7.7.4 Post-installation testing

When a post-installation test method is used, the test requirements and acceptance criteria shall be specified in the procurement document.

5.7.8 In case of simply purchasing services, such as third party inspection, engineering and consulting services, installation, repair, maintenance, etc., acceptance shall be determined by one of the following methods or a combination thereof.

- A. Technical verification for production data
- B. Quality surveillance and QA audits
- C. Review of objective evidence for conformance to the procurement document requirements, such as certifications, stress reports, etc.

**5.8 Identification and Control of Items**

5.8.1 Items having a limited operating life or cycles shall be identified and controlled to preclude use of items whose shelf life or operating life has expired.

5.8.2 Identification status shall be verified and documented prior to release for manufacturing, fabrication, assembling, shipping, or installation of material, parts, and components.

- 5.8.3 The items in storage shall be identified and controlled in accordance with the duration and conditions of storage in consideration of the following.
- A. Provisions for maintenance or replacement of identification markings due to damage during handling or aging
  - B. Protection of identification on items subject to deterioration due to excessive environmental exposure
  - C. Provisions for updating associated records

## **5.9 Control of Process**

- 5.9.1 Special process is a work in which product quality is highly dependent on the control of the process or the skill of the operators, and quality cannot be readily verified by inspection or test of the product. Special processes are welding, heat treating, NDE, protective coating, and flushing, etc.
- 5.9.2 A special process shall be accomplished by qualified personnel using qualified procedures and equipment in accordance with the applicable codes and standards specified in pertinent design and procurement documents, technical specifications, and other special requirements.
- 5.9.3 A special process shall be controlled by instructions, procedures, drawings, checklists, travelers, or other appropriate means. The organization performing the special process shall establish and implement the procedure for controlling the special process.

## **5.10 Inspection**

- 5.10.1 Inspection shall be performed by a qualified personnel of the responsible quality inspection organization not having direct relation to, and organizationally independent from the activities being inspected. Inspection results shall be reported to the responsible quality inspection manager in accordance with the applicable procedures.
- 5.10.2 Inspection activities shall be accomplished in accordance with the approved procedures, instructions, or checklists.
- 5.10.3 When performing a sampling inspection out of a large number of items using a statistical analysis techniques method, a recognized sampling procedure shall be used.
- 5.10.4 The responsible quality inspection organization shall establish and document an inspection plan by using checklists, procedures, process tables, procurement documents, or supplier's procedures prior to performing inspection.
- 5.10.5 The Inspection plan shall specify the followings :
- A. Characteristics and functions of items to be inspected
  - B. Inspection methods
  - C. Acceptance criteria

D. Documentation requirements for inspection results

- 5.10.6 Inspection plan shall be prepared in sequence according to the work process.
- 5.10.7 Where a sampling method is required to verify acceptability of a group of items, a sampling procedure based on recognized standard practices shall be established.

**5.11 Test Control**

- 5.11.1 Test plans shall be prepared to assure that plant structures, systems and components operate satisfactorily.
- 5.11.2 Unless otherwise organization designated, test requirements and acceptance criteria shall be provided by the organization responsible for the design of items to be tested and shall be specified in test procedures, specifications, drawings, test instructions, and other relevant documents.
- 5.11.3 Each responsible organization shall establish and implement test procedures for performance and control of test.
- 5.11.4 Individuals performing testing shall be trained and qualified in accordance with related procedures.
- 5.11.5 Test procedures or instructions shall specify the followings.
  - A. Requirements specified in pertinent design and procurement documents
  - B. Pre-requisites for tests, such as calibrated instrumentation, appropriate equipment, trained personnel, conditions of test equipment and the item to be tested, and suitable environmental conditions
  - C. Acceptance criteria
  - D. Documentation requirements of test results
  - E. Measures to verify that pre-requisites for the given test have been met

**5.12 Control of Measuring and Test Equipment**

- 5.12.1 Measuring and test equipment having proper type, range, accuracy, and tolerance to meet the requirements specified in the test procedures, instructions, or procurement documents shall be selected. Only calibrated and verified measuring and test equipment shall be used for quality related activities.
- 5.12.2 Measuring and test equipment to maintain the required accuracy shall be calibrated. The status of equipment calibration shall be identified, handled, controlled and stored.

**5.13 Handling, Storage, and Shipping**

- 5.13.1 Handling, storage, packaging, shipping, cleaning, and preservation of material and equipment

shall be controlled in accordance with related instructions or procedures.

#### **5.14 Inspection, Test, and Operating Status**

- 5.14.1 Only inspected and tested items shall be used and installed, and the status of inspection and test shall be identified on the items by stamps, tags, labels, shop travelers or other suitable means to prevent the missing of necessary inspection or test arising from carelessness.
- 5.14.2 When it is impractical to indicate directly the inspection and test status on the items, the status of items shall be described in documents traceable to permit verification of the status.
- 5.14.3 The indicator for the inspection and test status shall not be removed without acceptance from the person or the organization responsible for the indicator.
- 5.14.4 The status of items which have passed necessary inspections and tests shall be identified to prevent missing of inspections or tests due to carelessness. Also, the items which have not passed the required inspections and tests shall be identified not to miss the required inspections and tests.

#### **5.15 Control of Nonconforming Items**

- 5.15.1 Controls shall provide for identification, documentation, segregation, and the disposition of nonconforming items, and for notification to affected organizations to prevent their inadvertent use.
- 5.15.2 Identification of nonconforming items shall be made by marking, tagging, or other methods which shall not adversely affect the end use of the items. If identification of each nonconforming item is not practical, other methods such as the container, package, traceable documents, or segregated storage areas, as appropriate, shall be identified.
- 5.15.3 The identification shall not adversely affect the end use of the items, and shall be legible and easily recognizable.

#### **5.16 Corrective Action**

- 5.16.1 CAR, NCR, Work Order, inspection and test reports, etc., shall be used for documentation methods of handling conditions adverse to quality.
- 5.16.2 Each responsible organization shall establish and implement a procedure for conducting appropriate corrective action for conditions adverse to quality. The procedure shall specify requirements for identification, documentation, classification, cause analysis, and implementation and traceability of corrective actions.



- 5.16.1 Conditions adverse to quality shall be identified promptly and corrected as soon as practical.
- 5.16.2 Detailed contents and causes, taken actions for the significant conditions adverse to quality shall be documented and reported to appropriate levels of management.
- 5.16.3 Conditions adverse to quality shall be documented and identified, and shall be taken corrective action in accordance with the associated procedures.

#### **5.17 Quality Assurance Records**

- 5.17.1 Management system of the record that assures the quality of affairs or equipment affecting to the quality, shall be established and implemented as a procedure. The Procedure shall specify the scope collection, index, identification, classification, retrieval, storage, preservation, change method of the QA records and the responsibility of related organizations.
- 5.17.2 Each responsible organization shall designate an organization responsible for the overall receipt and overall control of QA records.
- 5.17.3 Documents shall be valid as QA records only if they are stamped or signed by authorized personnel or certified by electronic record certification. These records may be originals or reproduced copies.
- 5.17.4 QA records shall not be destroyed or lost during production, storage and preservation, and when destroyed or lost, an restoration and alternative measure to replace QA records shall be established.
- 5.17.5 The scope of documents to be maintained as QA records shall be described specifically in design documents, procurement documents, or test procedures, etc.

#### **5.18 QA Audit**

- 5.18.1 The QA organization shall perform QA audits periodically for external or internal organizations, to verify that all quality related activities are performed in accordance with QA requirements, and to evaluate the effectiveness of the QA program in all areas where the requirements are applicable.
- 5.18.2 The QA audit shall be performed by qualified personnel not having direct responsibility in the area being audited.
- 5.18.3 The audit team leader shall prepare an audit report, and distribute it to the relevant management.
- 5.18.4 The audit team leader shall approve and issue a CAR(Corrective Action Request) for conditions adverse to quality identified throughout the QA audit. Audit results shall be

documented by auditing personnel and shall be reviewed by management having responsibility for the area audited.

- 5.18.5 The management of the audited organization shall take appropriate corrective actions for audit findings, and respond the corrective action results to the responsible QA organization within the requested due date.
- 5.18.6 The audit team leader shall verify the implementation of corrective action, and shall review and approve the adequacy of corrective action results. The responsible QA Manager shall notify the audited organization of the review results of the corrective action.

ARA

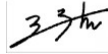
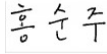
## APPENDIX 4A2

### Quality Verification Requirements of CFSI

KEPCO E&C JOB No. : 1229L



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## **ATTACHMENT**

A.1	CFSI VERIFICATION SHEET
A.2	GUIDELINE FOR PREPARATION
A.3	VERIFIED QVD LIST FOR CFSI

## **1.0 SCOPE AND APPLICABILITY\***

- 1.1 This appendix specifies detailed requirements that suppliers shall prevent CFSI and falsified QVD during design, procurement, manufacture, inspection, testing and shipping, which are to be submitted by the Supplier as per item purchase contract(or construction, or service contract) for operation and construction of the Advanced Reactor for multipurpose Application.

## **2.0 DEFINITIONS AND ABBREVIATIONS AND ACRONYMS**

### **2.1 Definitions**

#### **2.1.1 Counterfeit Item**

Counterfeit items, which are intentionally manufactured or altered to imitate a legitimate product without the legal right to do so. Examples of a counterfeit item include one that has been fabricated in imitation of something else with purpose to defraud by passing the false copy for genuine or original or an item copied without the legal right or authority to do so.

#### **2.1.2 Fraudulent Item**

Fraudulent items, which are intentionally misrepresented with intent to deceive. Fraudulent items include items provided with incorrect identification or falsified or inaccurate certification. Fraudulent items also include used items sold as new as well as manufacturing overages sold by entities that have acquired the legal right to manufacture a specified quantity of an item (such as an integrated circuit) but produce a larger quantity than authorized and sell the overage as legitimate inventory.

#### **2.1.3 Suspect Item**

Suspect Items, which are suspected of being counterfeit or fraudulent.

#### **2.1.4 Substandard Item**

Substandard Items do not meet the intended product specification. It is possible for legitimate suppliers to unknowingly provide substandard items that were manufactured using raw materials or part-level items that were acquired from sub-tier suppliers and that, for some reason, did not meet the applicable specifications.

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\* Note : This appendix may be changed by the Quality Policy and QA Program of KAERI.

#### 2.1.5 Quality Verification Document

Quality verification documents comprise material test reports, heat treatment charts, welding records, NDE results, performance test reports and similar document(s), which demonstrate or certify conformance to the technical or inspection requirements of the procurement documents. This Quality Verification Document includes CGI dedication report and equipment qualification report including raw data in this Appendix.(See Attachment A.3 Document Type)

#### 2.1.6 Equipment Qualification

The generation and maintenance of evidence to ensure that equipment will operate on demand to meet system performance requirements during normal and abnormal service conditions and postulated design basis events.

NOTE (Equipment qualification includes environmental and seismic qualification)

#### 2.1.7 Raw Data

Initial data generated through type tests or analysis verification during equipment qualification (environmental qualification and seismic qualification). Refers to raw data, or testing results with no amendment or processing: performance test data of equipment produced at each phase of environmental qualification's type test, or output of seismic qualification's interpretation program created from seismic qualification analysis test.

#### 2.1.8 Commercial Grade Item Dedication

Dedication is an acceptance process undertaken to provide reasonable assurance that a commercial grade item to be used as a basic component will perform its intended safety function and, in this respect, is deemed equivalent to an item designed and manufactured in accordance with nuclear safety class, and applicable codes and standards under a Nuclear Quality Assurance program complying with regulation requirements

#### 2.1.9 Unqualified Source Material

Source material not produced by a Certificate Holder, Material Organization in accordance with the requirements of KEPIC MNA 3500/4300 and SNA 3600/4300, or ASME BPVC Section III, NCA 3800, or approved supplier that has been evaluated and approved by a Material Organization or Certificate Holder in accordance with the requirements of KEPIC MNA/SNA or ASME BPVC Section III, NCA-3800.

#### 2.1.10 Supply Chain Management

A system management concept designed to optimize material costs, quality, and service. This is accomplished by consolidating the following operating activities: purchasing, transportation, warehousing and quality assurance for incoming materials inventory management and their internal distribution. These activities normally are combined in a single department, similar to the arrangement under a materials management organization.

#### 2.1.11 Supplier

Any individual or organization who furnishes items or services in accordance with a procurement document. An all-inclusive term used in place of any of the vendor, seller, contractor, subcontractor, fabricator, consultant, and their subtier levels.

## 2.2 Acronyms

CFSI	Counterfeit, fraudulent and suspect item
CRM	Certified Reference Material
PMI	Positive Material Identification
NDE	Non-destructive Examination
QVD	Quality Verification Document
USM	Unqualified Source Material

## 3.0 CFSI SELF-VERIFICATION REQUIREMENTS

### 3.1 Design and Procurement Phase

3.1.1 The Supplier shall identify and pass on to the subtier suppliers Owner's QVD documentation requirements for CFSI verification as the following QVD:

- A. QVD for procured items(Raw Material, Parts, etc.)
- B. EQ(including raw data & Mock-up), CGID Report
- C. QVD for unqualified source material (including inspection and test report for use)

3.1.2 The Supplier shall provide the subtier supplier with the additional requirements, except the requirement of this appendix, para. 3.1.1, for CFSI verification, if necessary.

### 3.2 Manufacturing Phase

- 3.2.1 The Supplier shall complete the verification for CFSI and falsified documents before using or receiving inspection of furnished items and accompanying documents.
- 3.2.2 The Suppliers shall perform the verification for CFSI in parallel the inspection and test of Quality Plan. If required, additional inspection/test (using PMI and/or NDE) should be conducted.
- 3.2.3 In case of CGID, EQ and using USM, the verification of CFSI shall be completed same as para. 3.2.1, except that the CMTR has been prepared for USM by fully retesting with test specimen.

### **3.3 Shipping Phase**

- 3.3.1 The Supplier shall verify that the final verification for CFSI and falsified documents have been completed for shipping items and accompanying documents.
- 3.3.2 The Supplier shall verify that corrective actions (including conditional release) for CFSI and falsified document have been completed and closed.
- 3.3.3 The Shipping items shall be met the requirements of this appendix, such as Certificate of Conformance, the verified QVD and list for CFSI and documented evidence etc.

## **4.0 SUBMITTAL REQUIREMENTS OF CFSI VERIFICATION DOCUMENT**

### **4.1 General**

The Supplier shall perform the verification of CFSI and falsified documents as the following methods for the QVDs that the Supplier has not been directly issued.

- 4.1.1 Safety-Related(“Q” Class) and Augmented Quality(“A” Class) Items
  - A. The Supplier shall submit the documented evidence in accordance with the requirement of this Appendix, para. 4.2
  - B. The Supplier shall submit the CFSI verification list in accordance with the requirement



of this Appendix, para. 4.3

- C. The Supplier shall submit the Certificate of Conformance in accordance with the requirement of this Appendix, para. 5.1

The CFSI verification is not required for QVD that Owner's witness inspector has been inspected and signed, but it shall be included in the QVD list and submitted.

#### 4.1.2 Industrial Standard ("S"Class) Items

In case of industrial standard ("S" class) structures, systems, components and parts, the CFSI verification shall be performed the followings:

- A. The Supplier shall verify the CFSI and falsified documentation in accordance with the Supplier's CFSI program/procedure, and the verified records shall be maintained, controlled in accordance with the Supplier's quality assurance program
- B. The Supplier shall submit the CFSI certificate of Conformance in accordance with the requirement of this Appendix, para. 5.1
- C. The Supplier shall be available for the control of Suppliers CFSI verification system to Owner audit, or survey and evaluation for requalification due to expiration of Certificate of Registration.

#### 4.2 CFSI Verification of Safety-Related("Q" Class) and Augmented Quality("A" Class) Items

##### 4.2.1 Self-verification through QVD issuer

The Supplier shall performed CFSI verification for issuer' QVD, and submit the documented evidence of the following:

- A. In case QVD is received directly from or requested through letter, e-mail, fax, etc to the issuer.

The Supplier shall submit the Issuer' QVD and documented evidence such as confirmed documents(letter, e-mail, fax etc.) from issuer. The documented evidence shall include the QVD identification number, confirmation, verifier, contact point and etc.

- B. In case QVD is confirmed through the issuer computerizing system or directly a visit.

The Supplier shall submit the issuer' QVD and CFSI Verification Sheet, FORM 1(see Attachment 1).

##### 4.2.2 Self-verification through inspection and test

In case confirmation is not available to QVD issuer and the Supplier shall directly perform CFSI verification such as inspection, test and etc., the Supplier shall submit the documented

evidence of the following:

A. Self-verification through the PMI equipment

A1. Issuer' QVD and Material Verification Test Report(Results of PMI TEST)

A2. Material Verification Test Report shall identify the following:

A2.1 Issuer document number, Certified Reference Material(CRM) number, material specification, tested date(by PMI)

A2.2 PMI Facilities shall be analyzed the minimum element such as C, P, S, Si, Mn and shall include measurement data is required by material specification and CRM element values.

A2.3. Material Verification Test Report shall be signed by a person who is responsible for this quality assurance function when the report shall be met the designated material specification and no CFSI evidence of issuer' QVD.

B. Self-verification through NDE

The Supplier shall submit the Issuer' QVD, NDE Report. NDE shall be performed under identical criteria and accepted, maintained the results, and the NDE Report shall be identified the Issuer' QVD number.

C. Self-verification through the performance test and inspection

The Supplier shall submit the Issuer' QVD and performance test and/or inspection Report. The Report shall be identified the Issuer' QVD number, the results of inspection and test, shall be performed under identical criteria, and shall be accepted, and maintained.

4.2.3 CFSI verification through a third party

In case confirmation is not available to QVD issuer and the Supplier will perform CFSI verification by a third party, the Supplier shall submit the documented evidence of the following:

a. Material verification with chemical Analysis

The Supplier shall submit the issuer' QVD and third parties' Chemical Analysis Report, and chemical analysis shall be performed per heat number(minimum). Third parties' Report shall be submitted along with documented evidence in accordance with para. 4.2.1.A

b. Performance test and Inspection

The Supplier shall submit the issuer' QVD and third parties' inspection and test Report. Third parties' Report shall be submitted along with documented evidence in accordance with para. 4.2.1.A

4.3 The Verified QVD List for CFSI

The Supplier shall be responsible for providing the verified QVD list for CFSI and submit the controlled copies.

4.4 Alternatives Verification

The Supplier, if determined that a portion of QVDs cannot meet the requirements of this appendix, para. 4.1 and 4.2, shall propose appropriate alternatives and perform the CFSI verification with the alternative that is mutually agreed to.

**5.0 SUBMITTAL REQUIREMENTS OF CERTIFICATE FOR CFSI VERIFICATION**

5.1 The Certificate of Conformance shall be furnished with shipment of item in accordance with the technical specification.

5.2 The Certificate of Conformances shall contain the following statements to assure that the result of CFSI verification was performed in accordance with the requirements of this appendix section 4.0.

**Statement Requirements of Certificate**

All items and QVDs have been duly inspected for use and procurement of counterfeit, fraudulent and suspect items, and falsified documents according to the requirements of CFSI verification, and we hereby attest there to be no evidence of CFSI.

**6.0 PREVENTION REQUIREMENTS OF CFSI**

6.1 The supplier shall perform the CFSI prevention activities for the subtier Supplier by considering the characteristics of the purchased items as the following methods;

- A. Quality assurance audit
- B. Quality surveillance, Monitoring or spot check
- C. CFSI-preventive education etc.

6.2 The supplier shall allow that the Owner or its designated representative and/or other parties authorized by the Owner shall be available for the Supplier's/its subtier Supplier's prevention activities of CFSI such as Quality Assurance audit, Quality surveillance,

Monitoring or spot check etc.

## **7.0 IDENTIFICATION AND REPORTING REQUIREMENTS OF CFSI**

### **7.1 Identification of CFSI**

The Supplier shall identify and dispose the CFSI, and the dispositioned records shall be maintained and controlled in accordance with the Supplier's quality assurance program and CFSI program.

### **7.2 Notification of CFSI Incident**

Upon recognizing the CFSI on supplied items to Owner, the Supplier shall notify the related information of CFSI and falsified document to the Owner, including the following information.

- A. Supply chain from a raw material manufacturer to a final supplier
- B. Root Cause Analysis and Corrective Action Plan

### **7.3 Reporting of Noncompliance**

If CFSI on supplied items to Owner are furnished and identified as noncompliance, the Supplier shall comply with the following regulations:

#### **7.3.1 Domestic Supplier**

The Supplier shall comply with the article 15-3(Reporting of Nonconformance) of Nuclear Safety Act and NSSC Notice(Regulation on Reporting of Nonconformance). Should the Supplier notify the NSSC concerning defects or nonconformance covered by the NSSC Notice which are related to items or services covered by purchase Order, concurrent notification shall be made to the Owner.

#### **7.3.2 Foreign Supplier**

The Supplier shall comply with the provisions of 10 CFR Part 21 "Reporting of Defects and Nonconformance". Should the Supplier notify the NRC concerning defects or nonconformance covered by 10 CFR Part 21 which are related to items or services covered by purchase Order, concurrent notification shall be made to the Owner.

**Attachment 1**

## CFSI VERIFICATION SHEET

1. Company(Doc. issuer) :

2. Contract No. :

3. Item :

4. Documents Verification List

No	① Documents No	② Documents Type	③ Method	④ Result	Remark
1					
2					
3					
4					
5					
6					

※ if necessary, use extension sheet.

5. Confirmer

Classification	Doc. Issuer	Supplier	Owner or his designee
Department			
Position			
Name	(Signed)	(Signed)	(Signed)
Date			
Tel./Mobile			

① Documents unique Number

② Type : C of C, Test Report, CMTR/MTR, NDE, Heat treatment, CGID, EQ, etc(Paint, ...)

③ Method : Internet(homepage or website), Company visit

④ Result : Accepted, Rejected

## Attachment 2 GUIDELINE FOR PREPARATION

No	Classification	Detailed Contents
④	Quality Class	Safety Related "Q", Augmented-Q "A", Industrial Standard "S"
⑥	Issuer Location	Domestic "DO", Overseas "FO"
⑦	Document Type	Write the unique No. as below 100 (Certificate of Conformance) 200 (Test Report, Performance Test, Functional Test) 300 (CMTR or MTR) 400 (NDE Report) 500 (Heat Treatment Record) 600 (CGID Report) 700 (EQ Report) 800 (Paint, Welding, WPS, PQR, etc.)
⑨	Issue Date	YYYY-MM-DD (Ex. 2019-01-01)
⑩	QVD Vol.	QVD Volume(Package) Number
⑪	QVD Page	QVD Page Number
⑫	CFSI Method by supplier	1 : Company Website 2 : E-mail/Fax/Letter 3 : Company visit 4 : etc.(PMI, NDE, etc) 5 : Owner witness
⑬	CFSI Date by supplier	YYYY-MM-DD (Ex. 2017-01-03)
⑮	CFSI Result by supplier	Accepted "ACP" Rejected "RJT"
⑯	CFSI Date by Owner	YYYY-MM-DD (Ex. 2019-01-01)
⑰	CFSI Result by Owner	Accepted "ACP" Rejected "RJT" Unconfirmed"UNC"
⑲	Remark	if necessary, write other details(NCR, DDN, SDDR, etc.)

Attachment 3

**Verified QVD List for CFSI**

No	Contract or P/O No ①	Supplier ②	Item ③	Quality Class ④	Document Issuer ⑤	Issuer Location ⑥	Document Type ⑦	Document No ⑧	Issue Date ⑨	QVD Vol. ⑩	QVD Page ⑪	CFSI Method by supplier ⑫	CFSI Date by supplier ⑬	CFSI Confirmer by supplier ⑭	CFSI Result by supplier ⑮	CFSI Date by OWNER ⑯	CFSI Confirmer by OWNER ⑰	CFSI Result by OWNER ⑱	Remark ⑲
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## APPENDIX 4B

### Quality Surveillance Requirements

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

0	03/24/23	Issue for Use	윤재성	김종강	김종강	김종강
REV. NO	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED

Preparer : 윤재성, Tel : 054-421-3516



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### **Attachment**

1. Recommended Form of Supplier Quality Plan

## **1.0 SCOPE**

- 1.1 This Appendix describes the Buyer's quality surveillance authority, quality surveillance method and the Contractor's quality control responsibility, etc. for the work process of material or equipment manufacturing, repair or installation as specified in Technical Specification.

## **2.0 TERMINOLOGY**

- 2.1 Buyer : The Buyer is defined as the Owner of ARA and its representative
- 2.2 Contractor : An entity who provides equipment, fabrication, construction, components and services to the Buyer. As all-inclusive term used in place of any of the following : vendor, seller, contractor, supplier, fabricator and their subtier levels
- 2.3 Quality Plan (or Inspection & Test Plan) : A formal document which describes the inspection and tests including supplied items, work process, applied documents and the witness and hold points, etc. Quality Plan shall be prepared by the Contractor and reviewed by the Buyer in advance of the work start.
- 2.4 Witness Point : An important step in manufacturing and testing whereby the Contractor shall advise the Buyer by letter in advance of the operation. The Contractor may proceed with the work past the witness point only if the Buyer has accepted the inspection results by signature or advised the Contractor that the Buyer cannot attend.
- 2.5 Hold Point : A critical step in manufacturing and testing whereby the Contractor shall not proceed with the work past the hold point without the presence of the Buyer, unless there is a prior written agreement with the Buyer.
- 2.6 Release for Shipment : A written document, signed by the Buyer, permitting that the shipment of materials and/or equipment are available after the completion of quality surveillance. The Release for Shipment shall be submitted to the Buyer with Quality Verification Documents on delivery of materials and/or equipment. The delivery of materials and/or equipment without the Release for Shipment may be refused by the Buyer but the shipping inspection may be omitted according to circumstances.

- 2.7 Quality Surveillance : The selective review, observation, and monitoring of processes, procurements, manufacturing operations, quality control systems, and programs to determine supplier compliance with contractual quality requirements.
- 2.8 Inspection : An action that performs examination, investigation or measurement, etc to verify the compliance with the specified requirements for items or services and is described as quality surveillance, witness inspection or inspection, etc. in this Appendix.

### **3.0 CONTRACTOR'S QUALITY INSPECTION REQUIREMENTS**

- 3.1 The Contractor's Quality Inspection Organization shall prepare the related instructions and procedures, etc. to control the quality inspection in accordance with the requirements of the contract, the related codes and standards, the design documents reviewed by the Buyer and Quality Assurance Manual, etc.
- 3.2 Quality Surveillance includes quality assurance, design, procurement, welding, heat treatment, nondestructive examination, pressure (hydraulic, pneumatic, vacuum) test, performance test, coating, packaging, handling, shipping and transportation, etc.
- 3.3 The Contractor's Quality Inspection shall be completed in advance of the Buyer's Surveillance Inspection or Authorized Inspection and if not, the Buyer may refuse to proceed with his surveillance inspection. But the Buyer's and the Contractor's inspections may be simultaneously performed under impractical situations such as pressure tests.
- 3.4 The Contractor shall cooperate with the Buyer for the access to shop and data of the Contractor and using inspection tools, etc. without charge to the Buyer.

### **4.0 QUALITY PLAN SUBMITTAL REQUIREMENTS**

- 4.1 (Submittal and Review) The Contractor shall prepare and submit Quality Plan, describing in detail the inspections and tests during manufacturing, repair and installation, to the Buyer. The Quality Plan shall be reviewed by the Buyer in advance of the work start and the Buyer designates witness and hold points in the Quality Plan.

- 4.2 (Observance of Codes and Standards) Quality Plan shall be prepared to observe applicable codes and standards specified in the contract.
- 4.3 (Preparing Method) Quality Plan shall include at least the followings and the typical example is showed in Attachment 1.
- 1) Contract No. and name
  - 2) Component name, component No.
  - 3) Quality Plan No. and revision No.
  - 4) Operation, test and examination process
  - 5) Applied documents (procedure, drawing etc.) for each process and revision No.
  - 6) Blank for designating the Contractor's inspection points
  - 7) Blank for designating the Buyer's surveillance inspection points
  - 8) Blank for signature verifying inspection result
  - 9) Identification of Quality Verification Documents, etc.
- 4.4 The Contractor shall not proceed with fabrication without the Buyer's approval of Quality Plan.

## **5.0 BUYER'S QUALITY SURVEILLANCE REQUIREMENTS**

### **5.1 General**

- 5.1.1 The Buyer appoints a responsible Quality Surveillance Representative (QS Rep.) who may perform Initial Visit to the Contractor's shop prior to the start of manufacturing to consult with necessary matters.
- 5.1.2 Prior to the start of manufacturing, the Buyer will conduct an initial visit with the Contractor's appropriate representative, the quality requirements of the purchase contract/order and specification, etc. Production shall not start until this meeting is held or unless Buyer has given a prior approval.
- 5.1.3 During the initial visit, the Contractor shall furnish the names and addresses of material subcontractors, significant components and/or services, such as NDE, performance testing, etc.
- 5.1.4 During the initial visit, the Buyer will confirm scope of application and hold/witness points of the quality plan with the Contractor.

### **5.2 Manufacturing Inspection**

- 5.2.1 The Contractor shall advise the Buyer's QS Rep. by letter seven(7) working days in advance of the operation and confirm two(2) working days in advance of the operation.
  - 5.2.2 Inspection Request Form includes contract No., contract name, inspection item, inspection process, item No., inspection date, inspection place, the Contractor' person in charge and his telephone No., etc.
  - 5.2.3 The procedures and drawings applied to manufacturing, test and examination, etc. shall be reviewed and approved by Buyer according to the contract requirements prior to the operation.
  - 5.2.4 If any nonconformance is found in inspection, the applicable operation shall be held at the point and reinspected after the required corrective action is completed.
  - 5.2.5 If the Buyer finds any Contractor's nonconformance, the deficiencies shall be documented using the Quality Surveillance Deficiency Report (QSDR) which identifies the procedural requirement found deficient, the type and nature of the deficiency, and the documentation and/or hardware involved. A copy of this form shall be given to the Contractor for corrective action.
  - 5.2.6 If the inspection result is satisfactory, the Buyer signs on Quality Plan (a traveler as necessary) and if not, the Buyer can request the Contractor for corrective action by Nonconformance Report (NCR) or Corrective Action Request (CAR).
- 5.3 Shipping Inspection
- 5.3.1 The items shall be inspected by the Buyer for shipment in the Contractor's shop after the followings are completed.
    - 1) Completing the submittal of design and quality documents in accordance with Appendix 4D and the approval by the Buyer
    - 2) Close-out of the disposition or corrective action (NCR, CAR, SDDR, etc.) related to manufacturing, test, examination and audit
    - 3) Preparation of Quality Verification Documents (CMTR, C of C, Inspection Report and Record, etc.)
    - 4) Issuing the Contractor's Certificate of Conformance (For materials, CMTR or Certificate of Compliance shall be provided according to the applicable codes and standards)

5.3.2 After completing para.5.3.1, the Contractor shall request the Buyer for shipping inspection. If the shipping inspection result is satisfactory, the Buyer's QS Rep. issues Release for Shipment and if not, the Buyer can hold the shipping.

5.3.3 The issue of Release for Shipment does not mean the direction for shipment. The Contractor shall ship the items according to delivery schedule specified in the contract or the Buyer's direction.

5.3.4 The Buyer's Release for Shipment does not mean the quality assurance of the items. The Contractor is responsible for any quality problems in manufacturing found after Release for Shipment.

5.3.5 The detailed requirements for submittal of Quality Verification Documents are in accordance with Appendix 4E.

#### 5.4 Packaging, Handling, Shipping and Transportation Control

5.4.1 The packaging and shipping processes included in Quality Plan shall be witnessed by the Buyer.

5.4.2 The Contractor shall take necessary measures for the safe delivery of the item during packaging, handling, shipping and transportation after Release for Shipment.

5.4.3 The Contractor shall take special measures as necessary for heavy products and items with potential damage during transportation.

### 6.0 **NONCONFORMANCE CONTROL**

6.1 Upon finding any nonconformance during manufacturing, test and examination, the Contractor shall hold the applicable operation and dispose the nonconformance according to quality assurance requirements.

6.2 When multi-operation process, test and examination are required to dispose the nonconformance, a separate Quality Plan shall be prepared for the Buyer's review.

6.3 The disposition such as use-as-is or repair shall be approved by the Buyer.

- 6.4 The Contractor shall complete the nonconformance according to the necessary measures approved by the Buyer and closing NCR shall be verified by the responsible QS Rep.'s signature.
- 6.5 The closed NCR of the Contractor shall be included in Quality Verification Documents.

## **7.0 SUPPLIER DEVIATION CONTROL**

- 7.1 When the deviations from Purchase Specification requirements occur during performing the contract, the Contractor shall issue Supplier Deviation Disposition Request(SDDR) in accordance with Appendix 4H.
- 7.2 The Contractor shall not ship the material, equipment or service without the close-out of SDDR.
- 7.3 SDDR may be issued to dispose NCR and not to substitute for NCR.
- 7.4 The closed SDDR shall be included in Quality Verification Documents.

## **8.0 QUALITY PROGRAM VERIFICATION (QPV)**

- 8.1 QPV is a modified version of Contractor's quality program audit. It is performed by the Buyer to verify on a continuing and progressive basis, the implementation of the selected quality program elements for safety related items, in producing desired results in accordance with the contract.

Attachment 1

Recommended Form of Supplier Quality Plan

Page 1 of 3

Supplier:			Supplier Quality Plan		
Client:	Project No.:	PNS No.:	QP. No. / Rev.		
Purchase Spec. No./Description					Rev.
<p>Quality plan for _____</p>					
Rev.	Date	Revision Description	Prepared by (Supplier)	Reviewed by (Supplier)	Approved by (Supplier)



Quality Plan Summary	QP No.	Rev.
<p><u>Item Description :</u></p> <p>1. Quality Plan List</p> <p>2. Sequence of Fabrication</p>		

Quality Plan Detail				QP No.		Rev.			
Seq. No.	Description of Operation	Reference Document		Supplier Inspection Point		Buyer Inspection Point		Quality Verification Document	Remarks
		No.	Rev.	Point	Verify	Point	Verify		

Inspection Point
WP: Witness Point
; HP: Hold Point
R: Document Review

Quality Verification Document
W: With QVD

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## APPENDIX 4C

### General Requirements for Submittal of Document

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

0	03/24/23	Issue for Use	윤재성	김종강	김종강	김종강
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Preparer : 윤재성, Tel : 054-421-3516

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## **ATTACHMENT**

1. SUPPLIER'S TRANSMITTAL
2. DRAWING AND DOCUMENT SUBMITTAL SCHEDULE LIST
3. PLAN VIEW ASSIGNMENT METHOD
4. INSTRUMENT LOCATION GRID ASSIGNMENT METHOD
5. INTERNAL WIRING DIAGRAM - CONTROL BOARD
6. INTERNAL WIRING DIAGRAM - RELAY CABINET
7. INTERNAL - EXTERNAL WIRING DIAGRAM - TERMINAL BLOCKS
8. INTERNAL - EXTERNAL WIRING DIAGRAM - LOCAL CONTROL CABINET
9. INSPECTION REPORT FOR COMPACT DISC
10. STANDARD FORMAT FOR ELECTRICAL LOAD LIST
11. STANDARD FORMAT FOR EXTERNAL WIRING DIAGRAM

## **1.0 GENERAL**

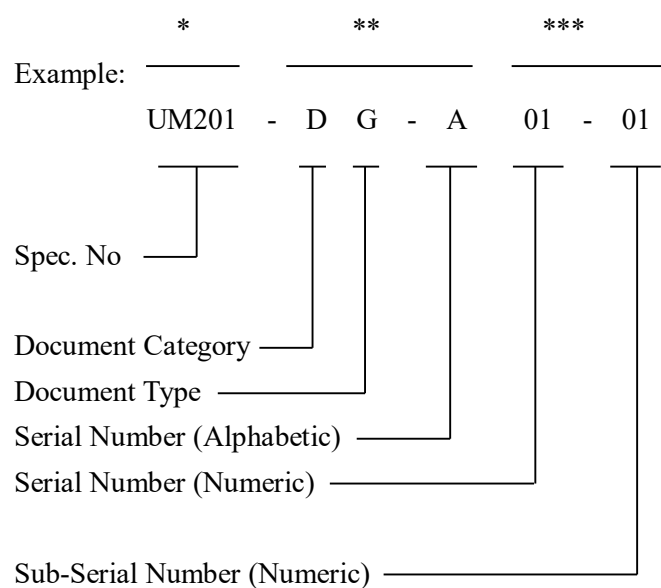
- 1.1 This appendix provides the requirements for the Suppliers on the content, submittal, and quality of their drawings and documents (hereinafter called documents) submitted to the Buyer. The scope includes documents submitted with proposals and after award and all types of engineering documents such as, but not limited to, design drawings, design reports, instruction manuals, quality verification documents, samples, manufacturer's data, engineering data, cuts and diagrams for plumbing fixtures, hardware schedules, information concerning materials and articles required, etc.
- 1.2 Definitions
  - 1.2.1 Where the term "design drawings" is used herein, it shall mean "the Buyer's Design Drawings" unless otherwise indicated.
  - 1.2.2 Where the term "shop drawings" is used herein, it shall mean "Supplier's shop drawings," consisting of erection drawings and shop detail drawings, unless otherwise indicated.
  - 1.2.3 Where the term "equipment outline drawings" is used herein, it shall mean Supplier's drawings that show the general arrangement and overall dimensions of Supplier's equipment (such as valves, pumps, heat exchangers, etc.) including, but not limited to, other major dimensions such as nozzle orientations/locations and sizes, anchoring details, etc.
  - 1.2.4 "Reproduction" - Image files covered from native file or scanned from hardcopies.
  - 1.2.5 "Native file" - Electronic file (2D CAD, 3D CAD, MS-word, Excel, etc.) which was developed by original software. The original software can read and write this kind of data file.
  - 1.2.6 "As-Built Drawing" - Finalized drawing after the completion of plant construction, showing all aspects of the as-built status.
- 1.3 The Buyer's Project Numbering System (PNS)
  - 1.3.1 In addition to the Supplier's own document number, the Supplier shall assign, for each document to be submitted to the Buyer in accordance with Appendix 4D, an identification number based upon the Buyer's Project Numbering System (PNS) as set forth in Section 1.3.3 of this Appendix.

- 1.3.2 The identification number in accordance with the PNS shall be indicated by the Supplier in document at the upper margin adjacent to the title block of the document as shown in the following example:

PNS : UM201-DG-A01-01

- 1.3.3 The numbering per the PNS shall be done as follows;

- a. PNS numbering method:



\* Specification Number

\*\* Provided by the A/E in Appendix 4D of this Specification  
(See Appendix 4D, Column 3)

\*\*\* To be assigned by suppliers

b. Document Category and Type Reference

Document Category		Document Type	
Symbol	Description	Symbol	Description
-	Submittal with Proposal	C	Calculation
C	Schedule and Progress	D	System Drawings such as P&ID, Heat Balance, etc.
D	Design & Engineering	E	Electrical Drawing
E	Equipment Qualification	G	Physical Drawings such as GA, Layout, Outline, Foundation Drawing etc.
I	Site Instruction & Guidelines	I	Instrumentation & Control Drawing
M	Manufacturing and Fabrication	L	List, Table and Data Sheet
P	Procurement	M	Manual, Instruction, Guide
Q	Quality Assurance/Quality Surveillance	P	Procedure
S	Packing and Shipping	R	Report
T	Test and Examination	S	Specification
V	Quality Verification Document	T	Performance or Characteristic Curve
		Z	Others (Including 3D CAD file)

## **2.0 SUBMITTAL OF DRAWING AND DOCUMENT**

### **2.1 General**

2.1.1 Drawings, data, or samples required by Appendix 4D or by other specific reference in this Specification, shall be submitted by and at the expense of the Tenderer/Supplier.

2.1.2 Documents submitted to the Buyer shall be one of the following acceptable sizes:

Korean Size Code	US Size Code	Document Size (mm)	Document Size (in)
A0	J	1189 x 841	36 x 48
A1	D	841 x 594	24 x 36 22 x 34
A2	C	594 x 420	17 x 22 18 x 24
A3	B	420 x 297	11 x 17 12 x 18
A4	A	297 x 210	8 1/2 x 11 9 x 12

2.1.3 Design information shall be included in the Drawings. The fact that such design information may later be included in the instruction and/or operating manuals does not relieve the Supplier from complying with these requirements.

2.1.4 For local items, Tenderers/Suppliers may submit Korean version for the following documents:

- a. Quality Assurance Program Manual
- b. Instruction Manual/Operating and Maintenance Manual
- c. Procedures and Reports

### **2.2 Submittal with Proposal**

2.2.1 Each copy of Tenderer's proposal shall include the drawings and data required in Section 3 and 4 of the Specification.

#### **2.2.2 Proposal Drawings and Data**

Drawings and data included as part of the proposal shall show equipment as required by the Specification.

### **2.3 Submittals after Award**

2.3.1 After award of contract, Supplier's drawings and documents shall be submitted to the Buyer in accordance with Appendix 4D.



### 2.3.2 Detail Drawing and Document Submittal Schedule List

Upon contract award, the Supplier shall prepare and submit for the Buyer's review, within 4 (four) weeks after award, a detail list of drawings and documents to be submitted by the Supplier specified in Appendix 4D. The list shall be prepared using Attachment 2 and shall include, for each drawing and document, the following information: document number base upon the PNS and the Supplier's own identification number, the title to be used by the Supplier, the submittal purpose ("R" for Review & "I" for Information), the number of submittal weeks required by Appendix 4D and the scheduled submittal date.

When there are changes on the list, the Supplier shall promptly submit the revised list for the Buyer's review. All the changes will be identified by revision bars in the right-hand margin adjacent to the revision items.

- 2.3.3 The Supplier's Transmittal shown in Attachment 1 shall accompany drawings, documents, etc. All submittals received without transmittal form will be returned to the Supplier. The Supplier is responsible for reproducing Attachment 1 in sufficient quantity for his submittals.
- 2.3.4 All submittals shall be transmitted to the Buyer by first class mail, express mail, hand carried, etc. Regarding submittals transmitted from foreign countries, the Supplier should use registered air mail or overnight express mail such as Federal Express, DHL, etc. The Supplier shall not send any invoices with the shipment. It is recommended that the Supplier declare the shipment simply, as "Printed Materials - No Commercial Value."
- 2.3.5 All U.S. size "B" and Korean size "A3" and smaller documents shall be mailed flat (unfolded) with chip board protectors on top and bottom of the transmittal. All other documents shall be rolled (unfolded) inside regular mailing tubes. The inside diameter of the rolled documents shall be no less than 3.8 cm (1-1/2 inches).

## 3.0 **PERMISSION TO PROCEED**

- 3.1 No design drawings, data, etc. will be considered for review which are not complete in all respects and which have not been thoroughly checked by the Supplier. No design drawings, data, etc. will be considered for review which cover features that are contingent upon review of other features for which the Supplier has not submitted drawings, etc. for review.
- 3.2 For shop drawings, one paper print of each submitted shop drawing will be returned to the Supplier marked with the Buyer's stamped review status, comments, and corrections or changes. Upon receipt of the returned print, the Supplier shall promptly incorporate these comments, corrections, or changes on that drawing and resubmit it for review as many times as required until the returned print is stamped with Status 1, and with no corrections or changes. Such procedure shall not be considered a cause for delay.

- 3.3 Proper erection drawings shall be submitted with each set of shop detail drawings to indicate correct location of all members submitted for review. Shop detail drawings submitted without erection drawings will be returned to the Supplier without review. Erection drawings showing members for which no shop details have been provided must be resubmitted when these shop details are submitted for review.
- 3.4 The Buyer will review the drawings, data, etc. for compliance with the Specifications and will mark and stamp to them indicate whether changes or corrections are required. If changes or corrections are necessary, drawings, data, etc. with such changes or corrections noted will be returned to the Supplier. The Supplier shall resubmit the corrected or changed drawings, data, etc. All changes, corrections, etc. shall be clearly indicated.
- 3.5 Drawing and document submitted by the Supplier will be processed by the Buyer within fifty (50) calendar days after receipt. Documents classified as status 4 or 5 will not be returned to Supplier. Their status will be indicated on the transmittal only. Documents classified as status 1, 2, 3, 6, or U will be returned with status stamp and/or marked comments. The definitions of the status are:

Status 1: No exception taken. Supplier may proceed with fabrication or construction in accordance with the Specification.

Note: Requests for additional information or documents shall be made in the remarks section of the Supplier Transmittal (Return Copy).

Status 2: Supplier may proceed in accordance with the Specification based on making revisions as noted and resubmit.

Status 3: Revise as noted and resubmit. Hold-related work.

Status 4: The document is to be distributed for the Buyer and A/E information according to project distribution requirements. However, the document may be used for construction, operation and permanent records.

Status 5: The document is to be used for A/E information only.

Status 6: Void or superseded. This document is not applicable.

Note: The proper box shall be marked to indicate the reason for processing the document.

- "Void" shall be marked when there is no other document replacing the voided document.
- "Superseded" shall be marked when other documents are being issued replacing the superseded document.

Status U: This status, which is to be determined and stamped by DDCC only, means that

the document is unacceptable for reproduction and should be resubmitted.

The "Status U" stamp shall be applied at the receiving phase.

- 3.6 Any action shown in Article 3.5 above is subject to the terms of the contract and does not relieve the Supplier from his obligations under the contract, including design and detailing. The Buyer's review of shop drawings shall not be interpreted as constituting approval of the adequacy of the shop drawings for their use. Permission to proceed does not constitute acceptance or approval of design details, calculations, analysis, test methods, or materials developed or selected by the Supplier and does not relieve the Supplier from full compliance with contractual obligations. Fabrication prior to the Buyer's permission to proceed shall be at the Supplier's risk.
- 3.7 The Supplier shall incorporate changes as required by comments on the drawing(s) or document(s) and resubmit revised drawing(s) or document(s) within 30 calendar days. Drawing(s) or document(s) having received previous authorization to proceed shall not be changed without prior notification to the Buyer. Changes to such drawing(s) or document(s) shall require resubmittal for the Buyer's permission to proceed.
- 3.8 The Supplier shall receive "Status 1" for the documents required the Buyer's review before shipment to the jobsite.

#### **4.0 DRAWING AND DOCUMENT CONTENTS**

- 4.1 All drawings that are drawn to scale shall have a graphic scale so that any proportional blowback from the Buyer's reproduction can be scaled.
- 4.2 All drawings, documents, or other data submitted by the Supplier shall include, as a minimum, the following information:
- a. Project Name: ARA or Advanced Reactor for Multipurpose Application
  - b. The Buyer's Name: KAERI / KEPCO E&C
  - c. Supplier's Name
  - d. Project Numbering System (PNS No.)
  - e. Drawing or Document Title and Number and Revision Designation
  - f. Specification Number & Description
  - g. Manufacturer's Name (if different from Supplier)
  - h. Model Number (if applicable)
  - i. Drawing Size (Drawing only)
  - j. The Buyer's Equipment Title and Tag Number and Equipment Location (Building Name and Elevation) where applicable
  - k. Quality Class (Q, A, S) and Seismic Category (I, II, or III) where applicable
  - l. Supplier's Certification where applicable
  - m. North Direction (In the case the Buyer provides the requirements for north direction to supplier or requests indication of north direction during the Buyer's review process, supplier shall indicate the north direction in the supplier's physical drawings.)

- 4.3 Drawings containing nuclear safety-related items shall be marked "NUCLEAR SAFETY RELATED" in large block letters.
- 4.4 Each issue of a drawing/document shall include the date of issue and a description of revision, if any. Each revised portion of the drawing/document shall be identified by encircling or revision bar with an appropriate revision letter or number.
- 4.5 A 7.62 cm x 15.24 cm (3"x6") space shall be provided in the lower right hand corner for the Buyer's status stamp. Drawings too small or crowded to provide this space shall be printed on a larger size of paper to provide a 7.62 cm (3") wide blank strip on the right border of the drawing.

4.6 Equipment Outline Drawings

All "Equipment Outline Drawings" shall be identified with the following pertinent information:

4.6.1 Location of Support and Equipment Mounting Details

To establish the embedment requirements when the component is mounted directly to the building structure, Equipment Support Details shall show the following information:

- a. Base plate size and thickness, bolt pattern, bolt size, and bolt material including each shear and tension load acting on each bolt for bolted mounting type according to each plant operating condition, or
- b. Welding plan, size, start and end point for welded mounting type according to each plant operating condition

The Supplier shall use ASTM A36, or ASTM A193 Grade B7 for concrete pad and ASTM A307, or ASTM A325 for steel pad as mounting bolt material unless otherwise noted.

4.6.2 Weights and Center of Gravity of Equipment

The weight and the center of gravity of equipment shall be defined for maximum normal operating, flooded, and dry conditions. The weight and the center of gravity of any major identifiable sub-assembly or component shall be identified.

4.6.3 Location of Nozzle Connection (if provided with piping connection)

All nozzles shall be dimensioned from the equipment base reference or centerline to provide orientation data.

4.6.4 Allowable Forces and Moments (if provided with piping connection)

The equipment supplier shall provide a tabulation of allowable forces and moments at each nozzle/piping interface oriented to the major axis of the components. If the maximum forces and moments are related by an equation allowing a variation in the ratio of forces and moments, this shall also be shown (as applicable).

- 4.6.5 The weight of complete motor, rotating assembly, rotor part only and shaft only shall be included in the motor outline drawing.
- 4.6.6 Equipment or anchor bolt installation tolerance shall be included in the drawing when required.
- 4.6.7 3D Surface Models of Equipment and Valve
- The 3D Surface Models of Equipment and Valve shall contain accurate external shape dimensions of geometry of equipment outline drawings so that verification of physical interference against adjacent structures and components can be made.
  - The electronic file of 3D Solid Model, which is a DB file or a macro file using in AVEVA E3D program, shall be submitted to Buyer whenever the equipment outline drawing is submitted. The 3D Solid Model shall be a simplified model including major accessories and shall be suitable for clash check and configuration management.
  - The Equipment and Valve 3D Solid Model shall be made with SI unit.
  - The Equipment data in excel format shall include the attributes of the equipment such as equipment tag number, equipment description, nozzle number, nozzle size, PNS number of Supplier's drawing, P.O. NO. and P.O. ITEM NO..
  - The Valve data in excel format shall include the attributes of the valve such as tag number, valve description, PNS number of Supplier's drawing, P.O. NO. and P.O. ITEM NO..
  - 3D CAD File List in excel format such as following sample shall be submitted.

3D CAD File List

Spec. No. : F-132-UN202

Project Document No. (문서번호)	공급사 3D CAD File 이름	Equipment Tag No.	Equipment Title	Remark
UN202-DZ-A01-01		F-463-M-PP01A	Spent Fuel Pool Cooling Pump 1A	
UN202-DZ-A01-02		F-463-M-PP01B	Spent Fuel Pool Cooling Pump 1B	

#### 4.7 Erection Drawings

- 4.7.1 Erection drawings shall be updated by the Supplier to reflect the latest revisions of the Design Drawings, at each submittal to the Buyer. Issuance of erection drawings shall also include references to the Buyer's Design Drawings, as well as issue dates of these Design Drawings.

- 4.7.2 Each erection drawing shall be identified with "ERECTION DRAWING" in 1.27 cm (1/2 inch) high bold lettering just above the title block.
- 4.8 Shop (Detail) Drawings
- 4.8.1 Shop (detail) drawings shall indicate in detail for the followings, when required:
- a. All materials to be fabricated for the work,
  - b. Electrical equipment provided by the supplier (outline drawings and wiring diagrams required),
  - c. Methods of anchoring,
  - d. Operating devices,
  - e. Construction joints, etc.
- 4.8.2 All shop (detail) drawings shall be clearly referenced to related erection drawings and other shop (detail) drawings.
- 4.8.3 Each shop (detail) drawing shall include the building name and location for which the materials are being furnished.
- 4.8.4 All shop (detail) drawings to be submitted to the Buyer shall be separated into unique unit, if requested.

## **5.0 QUALITY REQUIREMENTS**

- 5.1 All submitted drawings or data shall be of sufficiently high-quality drafting to permit reproduction by the Buyer. It is preferable that originals be submitted when possible. If reproductions of the originals are submitted, they shall be full size and direct-reading. The reproduction shall be of original quality having sharp, clean, well-defined lines, with a line density equal to or better than the original.

The lettering shall be large and of an open style permitting reductions down to 30X and blowback up to 14.5X and remain open with no plugging or loss of legibility. The reproduction shall maintain an evenly high contrast between image and background over the surface of the wing. Reproductions with low contrast or heavy background density with thin, weak lines and lettering are not acceptable.

- 5.2 Documents submitted to the Buyer that do not conform to the requirements of this Specification, shall be subject to reject by the Buyer, and upon request, the Supplier shall resubmit conforming documents. If conforming submittals cannot be obtained from the source documents, such source documents shall be retraced, redrawn, or photographically restored as may be necessary to meet such requirements. Supplier's (or his sub-supplier's) failure to initially satisfy the legibility quality requirements herein set forth, shall not relieve the Supplier (or his sub-suppliers) from meeting the required schedule for submittal of documents.

## **6.0 SAMPLES**

- 6.1 Where samples are required, they shall be submitted by and at the expense of the Supplier. Such submittals shall be made at least thirty (30) calendar days prior to the time that the materials represented by such samples need to be purchased for the work. Samples shall be subject to acceptance, and material represented by such samples shall not be manufactured, delivered, or incorporated into any work without such acceptance.
- 6.2 Each sample shall bear a label showing: Supplier's name, project name, name of the item, manufacturer's name, brand name, model number, as applicable; the appropriate drawing number; and the applicable section and paragraph number(s) of specification.

## **7.0 QUALITY VERIFICATION DOCUMENTATION**

- 7.1 The Supplier shall provide quality verification documents such as mill test reports, hydrostatic test reports, certificates of compliance, etc. as defined throughout the specification and in applicable codes, standards, etc. and as summarized on the Quality Verification Documentation List, Appendix 4E.

### **7.1.1 Certificate of Conformance**

A document signed or otherwise authenticated by an authorized individual certifying the degree to which items or services meet specified requirements.

- a. The certificate should identify the purchased material or equipment.
- b. The certificate should identify the specific procurement requirements such as codes, standards, and other specifications.
- c. The certificate should identify any procurement requirement that have not been met.
- d. The certificate should be attested to by a person who is responsible for this quality assurance function.

### **7.1.2 Certified Material Test Report / Material Test Report**

A document attesting that the material is in accordance with specified requirements, including the actual results of all required chemical analysis, tests, and examinations.

### **7.1.3 Certificate of Compliance**

A written statement attesting that the materials are in accordance with specified requirements.

- 7.2 Quality verification documents shall clearly identify the material being certified and shall include, but not limited to, providing the following information: Supplier's name,

specification number, project name, name of the item and reference to the appropriate drawing.

- 7.3 For the purpose of material verification, the Supplier shall provide the Buyer with a detailed list under the "Material Test Property" category to be included in the "QVDL and its Sample Forms Listed in Appendix 4E." This detailed list shall consist but not limited to: equipment, components, parts, module, assembly, material, etc., and the associated document required such as (certified) material test report, certificate of compliance or "not applicable" shall be indicated for each item.
- 7.4 Throughout the work process, the Supplier shall identify individual documents on the QVDL by serial number and/or attachment number, and shall certify their applicability to the item, verified by signature and date in the appropriate columns. Following such certification, the individual documents shall be reviewed by the Buyer/Buyer's Representative, who will indicate compliance to the requirement by sign-off on the Appendix 4E form.
- 7.5 Following completion of fabrication and final inspection, the responsible Buyer/Buyer's Representative will verify that all required quality verification documents have been reviewed and signed off and that copies are available for shipment with material, if required. The Buyer/Buyer's Representative will certify the completion of this requirement by providing the "acceptance signature" for the specified material or equipment, along with the necessary quality verification documents. Appendix 4E will serve as the transmittal form for the quality verification documents that accompany the shipment to the jobsite.
- 7.6 Additional Information
- In addition to the requirements of Appendix 4E and the technical specification, the following general rules shall apply, as applicable, to determine the quality verification documents to be prepared by the Supplier.
- 7.6.1 The finally assembled equipment will require the following QVDs:
- a. Certificate of conformance
  - b. Test reports or test certificates of the design tests specified in the specification
  - c. Final signed-off quality plan
  - d. Test reports of the production tests specified in the specification
  - e. Final close-out corrective action request
- 7.6.2 Quality Class Q or Class 1E components, module, subassembly, etc. which are parts of the finally assembled equipment shall require the Certificate of Conformance.



## **8.0 AS-BUILT DRAWINGS AND DOCUMENTS**

- 8.1 All as-built drawings and documents in an electronic file format or equivalent shall be the property of the Buyer. They shall be turned over to the Buyer, if the Buyer so requests, after of the Work and after completion incorporation field changes.
- 8.2 Prior to Supplier's application for payment, and as a condition for an approval of the payment by the Buyer, the Supplier shall transfer the as-built drawings and documents to the Buyer, if the Buyer so requests. The Supplier shall deliver the drawings and documents in appropriate containers, indexed and marked for each part of the Work.
- 8.3 In the event that the Buyer has not requested delivery of as-built drawings and documents and it is the intent of the Supplier to destroy these drawings and documents, a written approval shall be obtained from the Buyer prior to destroying them.
- 8.4 For nuclear safety related work, the transfer of the as-built to the Buyer shall not relieve the Supplier from his/her responsibility for collection, storage, and maintenance of quality assurance records as specified in this specification.

## **9.0 REQUIREMENTS FOR ELECTRONIC MEDIA**

### **9.1 General**

This section describes requirements for high density electronic storage media such as CD ROMs submitted by the Supplier to the Buyer. This section specifies requirements for media recording, submission, and acceptance inspection.

### **9.2 Definition of Terminology**

- 9.2.1 "Information Media" (hereinafter referred to as Media) means CD-ROMs. It contains the native files and image files which may be utilized by computer systems for archiving, retrieval, display and printing. Media other than industry standard CD-ROMs may be utilized only with prior approval of the Buyer.
- 9.2.2 "Drawing and Document file number" means the control number of drawing and document which is recorded on electronic media. The same number shall be assigned to each media or format (such as native document file, CAD-image file, and CAD vector file), if multiple formats are submitted.

### **9.3 Media Submission and Inspection**

#### **9.3.1 Submittal item and quantity**

- Compact Disc for Drawing and Document: Quantity to be adjusted as needed
- Data index (sorted by PNS No. and Rev. No.): One (1) set, the format of MS-Excel
- Inspection report: One (1) set

### 9.3.2 Submittal and Inspection

- a. Supplier shall submit the items listed in Section 9.3.1 to the Buyer in accordance with Appendix 4D.
- b. The Buyer shall confirm that Supplier's submittal is acceptable by signing the inspection report. The Supplier shall guarantee that the submitted item and its quantity are satisfactory and in accordance with the specification.
- c. If the quality and quantity do not meet the minimum requirements, the Buyer will request resubmittal.

### 9.4 Format of Index Data

The basic input elements for Index Data shall be as follows:

No.	Index Item	Width	Attribute	Remark
1	D/N (Disc-No: CD-ROM No.)	3	AN/F	01A, 01B, 02A,...
2	DRAWING / DOCUMENT FILE NO.	30	AN/V	
3	TITLE	80	AN/V	
4	SZ (Size)	2	AN/F	AL, A0, A1, A2,...
5	SUPPLIER NAME	30	AN/V	
6	REV. (Revision)	3	AN/V	F : As-built 001 : First Rev.
7	DATE(Issue Date, Approval Date)	6	N/F	101701 (MMDDYY)

\* N: Numeric, AN: Alpha Numeric, V: Variable, F: Fixed

#### 9.4.1 Index fields shall comply with the following requirements:

- a. D/N(Disc-No.), "Drawing File No." and/or "Document File No." shall be assigned in accordance with instructions provided by the Buyer.
- b. Drawing size shall be indicated by using two characters such as "A0", "A1", etc.. If the drawing size exceeds "A0" in size, "AL" should be used.
- c. "Title" column should be filled-in using alphabetical characters and numerics.
- d. Supplier name shall not be abbreviated.

### 9.5 Criteria for Production Compact Disc

#### 9.5.1 The file number shall match the PNS number and Revision number.

#### 9.5.2 Specification for CD-ROMs

CD record format must be compatible with the MS-Windows 10 or later version and should be in accordance with ISO 9660 standard. The Multi-session methodology is not acceptable.

#### 9.5.3 CAD file format

CAD file format shall be in DGN of MicroStation XM version.

#### 9.5.4 Document file format (Native File)

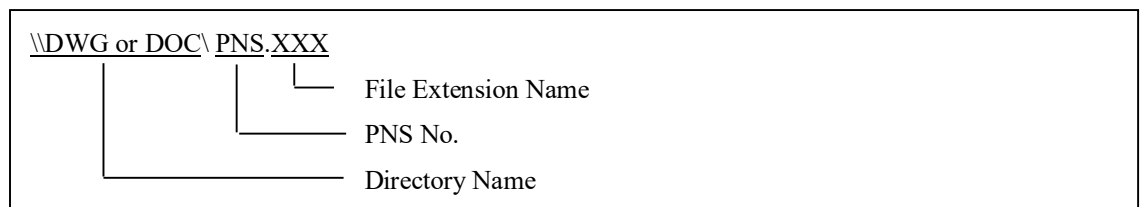
File format may be either the MS word file or HWP file.

#### 9.5.5 Image file format and standards for scanning

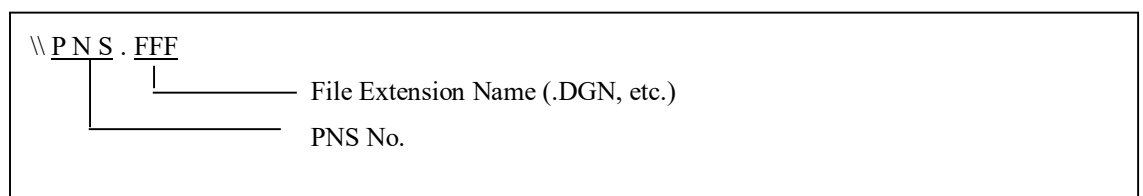
- a. Image file shall be in Text Searchable PDF (Portable Document Format).
- b. 200 DPI (dots per inch) or greater is required as a scanning resolution.
- c. 1 to 1 is required as a scanning reduction ratio.

#### 9.5.6 Arrangement and configuration of directory and guidelines for the file name assignment.

- a. Directory structure shall be as follows:



- b. An example of the file name structure is as follows:



#### 9.5.7 File Storage Structure and Label Attachment

- a. Files (Native, Image) shall be inputted in the appropriate sub-directory location.
- b. A Label shall be attached to the Compact Disc which contains the drawing files or document files.

The following Label must be attached to Compact Disc Cover.

<u>Project Name</u> / <u>DISC No.</u> / <u>PNS No.</u>
--

- c. The following Label must be attached to the CD box.

<u>DISC No.</u> / <u>PNS No.</u>
----------------------------------

- d. The following label must be attached to the front side of CD box.

TITLE			
Buyer		Responsible Person (Tel.)	
Supplier		Responsible Person (Tel.)	
Dwg. Quantity		Disc No.	
File No.		Completion Day of Inspection	
Submittal Date		Inspection Confirmation	
Remark			

## 9.6 Inspection and Acceptance Criteria

### 9.6.1 Procedure for Acceptance Inspection

- The Supplier shall submit an inspection report per Attachment 9 after an inspection.
- When a non-conformity is discovered, Supplier shall correct the non-conformity.

### 9.6.2 Inspection and Criteria for Suitability

- The Compact Disc inspection shall verify quantity, quality of the material, appearance and retrieval linkage.
- Acceptance criteria
  - Quantity of Material  
The quantity submitted by the Supplier shall match the as-supplied quantity checked by the Buyer.
  - Quality of Material  
Check points for image cutting, secession, damage, omission, overlapping triangular position, reversed image, readability, and recoverability shall meet the

requirements.

- Appearance

If there are any deficiencies or non-conformities such as label errors or disc damage, the submittal is not acceptable.

- Retrieval Linkage

Retrieved data through indexing tools shall match exactly with the image in the electronic media. Ten (10) image readings per disc shall be performed, as a minimum, to check the retrieval linkage capability.

## **10.0 STORAGE AND INSPECTION REQUIREMENTS FOR ELECTRONIC MEDIA**

10.1 The documents to be stored in the form of electronic media shall be the documents that have been authenticated by the supplier who prepared, reviewed, and approved them. The identification of directories shall be easily understandable and consistent with a written procedure.

10.2 Tests and inspection of magnetic media shall meet the following requirements:

10.2.1 Inspect magnetic media every 6 months for potential damages.

10.2.2 Test oxidized steel and chromic steel tapes at least every 3 years.

10.2.3 Replace tapes and cartridges with 10 defects and more (saves the data).

Conducts sampling tests on the same lot where the defected tapes or cartridges came from.

10.2.4 For reel tapes that are used for data storage,

- a. Skip error is allowed at less than 5 times, and error during the initial 30.48 cm (100 ft) distance and permanent error shall not be allowed.
- b. A scratched or restored tape shall not be used.
- c. A preliminary test of reel tapes for preservation shall be conducted at least 4 times over the entire process.
- d. For tape of records reservation, path test on the length of one rpm and high-speed rewinding shall not be permitted.
- e. A preliminary test of reel tapes for recording 4 to 10 times shall be conducted before use, and any error is not allowed in temporary writing.

10.3 The following storage conditions shall be met for storage facilities, and magnetic media, optical media and compact disk of electronic records:

10.3.1 Storage conditions for facility

- a. In storage facility any electronic device or non-magnetic device shall not be installed facility.
- b. All media and containers shall be inspected for their access to the facility.
- c. The electronic recording media should be protected from electronic signals.
- d. The temperature of 4.4 ~ 26.7°C (40 ~ 80 °F) and relative humidity of 30 ~ 50% shall be kept.
- e. No smoking and no food are allowed inside.

10.3.2 Storage conditions for magnetic media

- a. Be stored in a vertical rack according to a supplier's recommendations.
- b. The electronic media that are stored for a permanent or long period should be tested less than every 6 months before writing.
- c. Magnetic reel tapes shall be readable based on a statistical sampling method.
- d. 16.7 ~ 20°C (62 ~ 68 °F) and 35 ~ 45% humidity, etc.

10.3.3 Storage conditions for optical media

The optical media that have been stored for a permanent or long-term storage shall be replicated before their storage life are expired according to supplier's recommendations.

10.3.4 Storage conditions for CD-ROM

- a. 10 ~ 25°C (50 ~ 77°F) and 20 ~ 50% humidity
- b. The storage life span of CD-ROMs that are stored for a long term shall be specified.

10.4 The quality assurance records management system of electronic media should comply with following requirements:

- a. Regulatory Issue Summary 00-018 "Guidance on managing quality assurance records in electronic media"
- b. GL 88-18, "Plant record storage on optical disks"
- c. NIRMA, Technical Guide (TG) 11-1998, "Authentication of records and media"

- d. NIRMA, Technical Guide (TG) 15-1998, "Management of electronic records"
- e. NIRMA, Technical Guide (TG) 16-1998, "Software configuration management and quality assurance"
- f. NIRMA, Technical Guide (TG) 21-1998, "Electronic records protection and restoration"

## **11.0 ELECTRICAL DRAWING REQUIREMENTS**

### **11.1 General**

- 11.1.1 The Supplier shall furnish prints for all necessary data required for an adequate review of the schematic and wiring diagrams. This information typically consists of:
  - a. Complete drawings and development for all control and instrument switches, timers, motor operated valves, etc., when information is already shown on drawings supplied.
  - b. Individual internal connection diagrams for all instruments, recorders, relays, annunciators, power supplies, programmable controllers, etc.
- 11.1.2 Each device shall have the same identification wherever it is used on any other drawing.
- 11.1.3 All drawings shall be completely labeled to identify the drawing type and the project by customer and unit.
- 11.1.4 Electrical Load List shall be submitted in accordance with Attachment 10.
- 11.1.5 External Wiring Diagrams shall be submitted in accordance with Attachment 11.

### **11.2 Schematic Diagrams**

- 11.2.1 Schematic diagrams furnished by the Supplier shall be detailed so that the operation of the equipment is very evident and a person with an average understanding of schematics can become aware of the sequence of operations under normal conditions, while at the same time be able to determine corrective measures in the case of faulty or improper operation of the equipment. Circuit flow and component arrangement shall be from left to right or top to bottom.
- 11.2.2 Schematics shall show all electrical components. Components shall be identified with device numbers in accordance with applicable Industry Standards.
- 11.2.3 All devices shall have their terminal numbers shown. Any device with contacts shall have all of the contacts shown along side its operating coil. All such contacts shall be identified as to where they are used in other parts of the circuitry.

- 11.2.4 Schematics shall not be drawn where any part is crowded or illegible to the extent that its content is unclear.
- 11.2.5 Schematics shall show a relay development on the same drawing or page where it is used in the circuit. This development for each relay used shall show all terminal numbers and all normally open and/or normally closed contacts as furnished. On this development, each contact used shall have a reference to its use or position in the circuit and shall cross-reference all contacts between drawings using the drawing numbers assigned by the Buyer if the contacts are used on another drawing. When relay contacts are used on a drawing other than where the coil is shown, the Buyer's reference drawing number should be shown just above or below the relay contact device number. Black box devices shown on schematic diagrams shall reference the manufacturers' drawings or bulletins. These drawings or bulletins shall be part of the document submittal.
- 11.2.6 Schematics that do not meet all of the preceding requirements will not be accepted.
- 11.3 Wiring Diagrams
  - 11.3.1 The Supplier shall prepare detailed diagrams indicating all panel wire terminations in a manner that physically and visually identifies each wire connection. The diagram shall show a combination of wiring that connects to the internal components and to terminal blocks used for the field connections to the equipment.
  - 11.3.2 Each diagram shall show the devices in their physical positions relative to each other. The Supplier shall assign and affix an instrument location grid code to each device, physically and on the diagram.
  - 11.3.3 The Supplier shall indicate the location of any shipping-split and show the wiring of shipping-split terminal blocks if any are furnished. (A note should indicate the removable end of the shipping-split jumper wires.)
  - 11.3.4 Each device shall be shown as viewed from the wiring side of the device. Terminal position and terminal numbering shall be shown identical to the device. If none exist, the Supplier shall assign terminal numbers to be shown on all diagrams for the device.
  - 11.3.5 Plug and/or receptacle units for each instrument or annunciator shall be shown at their relative position with the type and style number as furnished. Wiring of these terminals shall be shown in sequential table form.
  - 11.3.6 Each device shall have its instrument number and other information shown adjacent to it. Black boxes shown on wiring diagram shall reference the manufacturer's drawings or bulletin. These drawings or bulletins shall be part of the document submittal.
  - 11.3.7 Each electrical connection (other than a jumper on the same device) shall be shown with its wire code and destination. The reference drawing number shall also be shown if the other end of the wire is shown terminated on another drawing. This facilitates the identification and tracing of the circuit throughout the diagrams.



- 11.3.8 Detailed wiring drawings of the panel connection side of all terminal blocks shall be furnished. A minimum of 10.16 cm (4 in) of space shall be furnished on the terminal block drawings for each row of terminals on the drawings (20.32 cm (8 in)) between each row of terminal blocks) to permit the addition of the field connections. (See Attachment 7.)
- 11.3.9 If wiring is color-coded, the coding shall be shown on the diagrams.
- 11.3.10 If wiring is numbered with bands or sleeves, these numbers shall appear on the diagrams.

Wiring and contacts on the diagrams shall be cross-referenced as specified under "Schematic Diagrams" in Subsection 10.2.5.

Attachments 3 through 8 indicate representative methods of assigning instrument location codes and preparing point-to-point wiring diagrams.

#### 11.4 Assignment of Instrument Location Grid Codes

- 11.4.1 Attachment 4 indicates the method to be used in the layout of the instrument locations for a typical panel. A left-to-right numbering sequence (when facing the wiring side of the respective panel) and a top-to-bottom lettering sequence are recommended. Note that "F" and "R" identify front and rear panels. (Eliminate use of "R" if no rear panel is furnished.)
- 11.4.2 Refer to the front panel elevations and internal views, if any, and assign a vertical row number to all devices including those mounted on the rear of the overhead, vertical, benchboard, and apron areas. The row numbers should be consecutive with respect to a position as viewed from the rear, and should include the maximum number of devices possible for the front panel.
- 11.4.3 Repeat the procedure for the top-to-bottom row letters ending with the lowest device on the apron.
- 11.4.4 The same procedure sequence should be followed before starting the wiring diagrams for the rear panels for a duplex control board.
- 11.4.5 With all possible locations identified, each wiring diagram can then be designed and numbered in an orderly fashion.

ATTACHMENT 1  
SUPPLIER'S TRANSMITTAL

ARA

Page \_\_\_\_\_ of \_\_\_\_\_

<div>From :</div> <div>Supplier</div> <div>Transmittal No. _____</div> <div>Date _____</div>	<div>To : <u>A/E DDCC</u></div> <div>ZIP CODE 39660</div> <div>269 HYEOKSIN-RO,</div> <div>GIMCHEON-SI,</div> <div>GYEONSANGBUK-DO,</div> <div>REPUBLIC OF KOREA</div>	<div>CC :</div>
--	--	-----------------

\* Sh : If Sheet No. Is Applicable

\*\* Submitted for : R – Review, I – Information

\*\*\* Review Status for A/E Use Only

Spec. No. :

Spec. Title :

DOCUMENT NUMBER		REV.	QTY & TYPE	DOCUMENT TITLE	**FOR		*** RS
Project Doc. No. (PNS)	Page				R	I	
Supplier's Doc. No.							
Remarks :				Supplier			
				_____ Name / Signature			
				Date : _____			



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REPUBLIC OF KOREA

Supplier

Transmittal No. \_\_\_\_\_

## A/E Transmittal

No. \_\_\_\_\_

Date \_\_\_\_\_

Date\_\_\_\_\_

Spec. No. :

Spec. Title :

\* Sh : If Sheet No. Is Applicable

\*\* Submitted for : R – Review, I – Information

\*\*\* Review Status for A/E Use Only

DOCUMENT NUMBER			REV.	QT'Y & TYPE	DOCUMENT TITLE	**FOR		*** RS
Project Doc. No. (PNS)		Page				R	I	
Supplier's Doc. No.	Sh.*							

Remarks :

A/E

/

Name / Signature

Date :

## SUPPLIER'S TRANSMITTAL

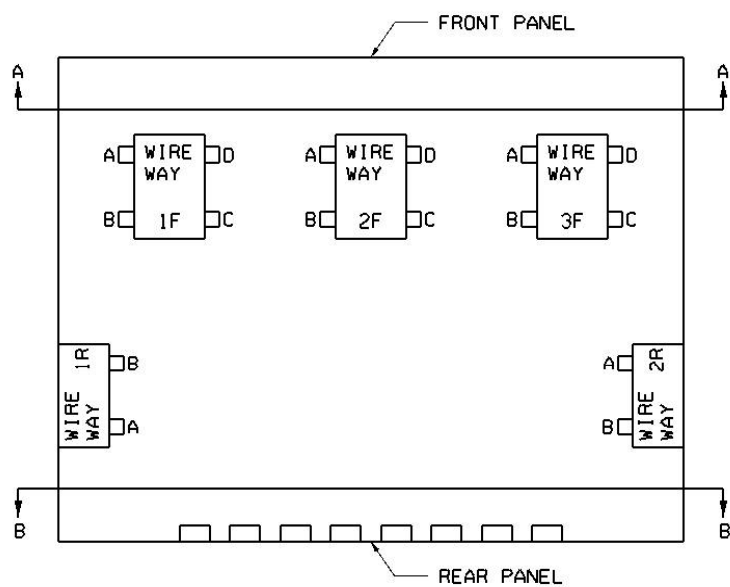
(RETURN COPY)

SUPPLIER DOCUMENT LIST (CONTINUED)

Page        of       [illegible]

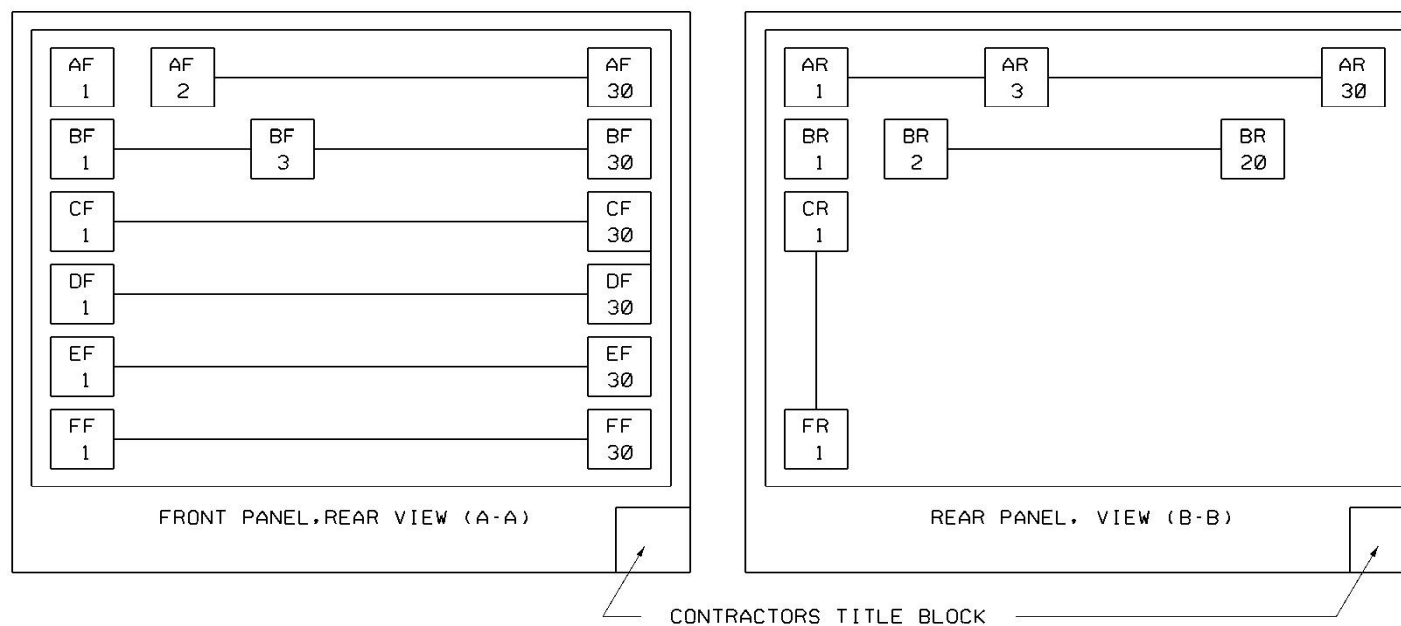


ATTACHMENT 3  
PLAN VIEW ASSIGNMENT METHOD



NOTE : SEE ATTACHMENT 4 FOR INSTRUMENT LOCATION GRIDS  
(A-A AND B-B) : TYPICAL WIRING OF TERMINAL BLOCKS  
IS SHOWN ON ATTACHMENT 7

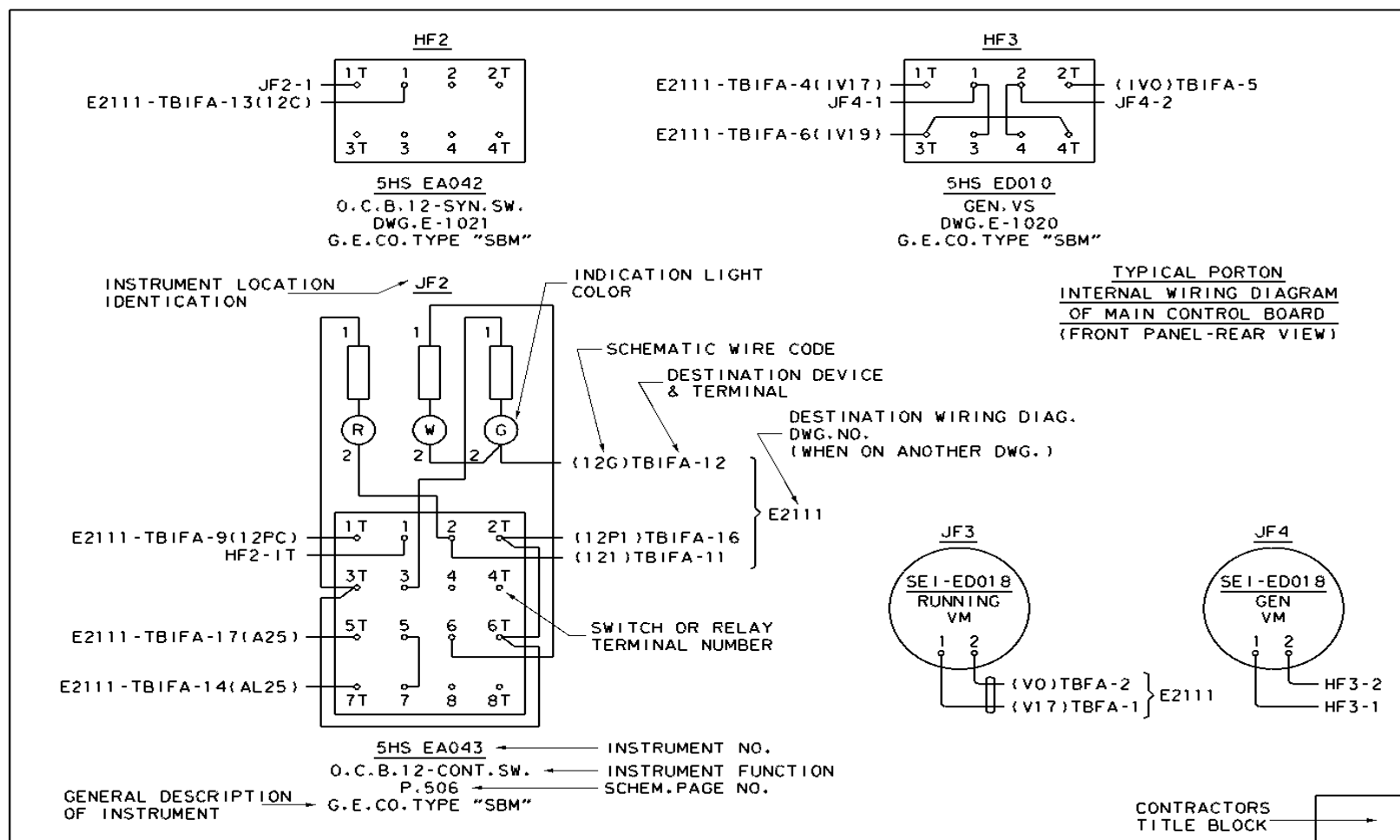
ATTACHMENT 4  
INSTRUMENT LOCATION GRID ASSIGNMENT METHOD



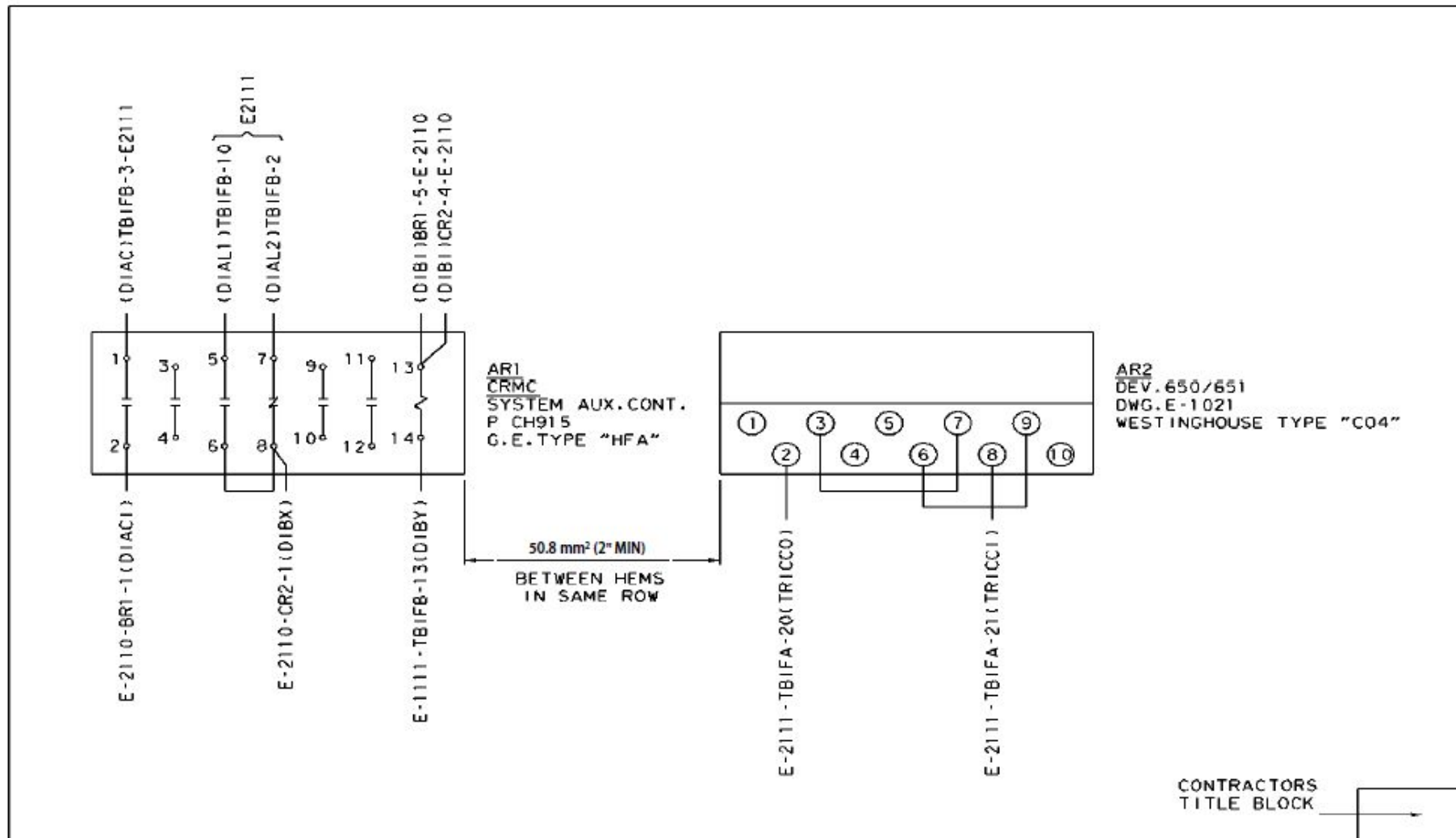
NOTE : 1. NO.30 IS THE MAXIMUM NUMBER OF ITEMS POSSIBLE  
(HORIZONTALLY) ON THIS PANEL EXAMPLE.  
2. SEE ATTACHMENT 5 AND 6 FOR TYPICAL WIRING



ATTACHMENT 5  
INTERNAL WIRING DIAGRAM - CONTROL BOARD

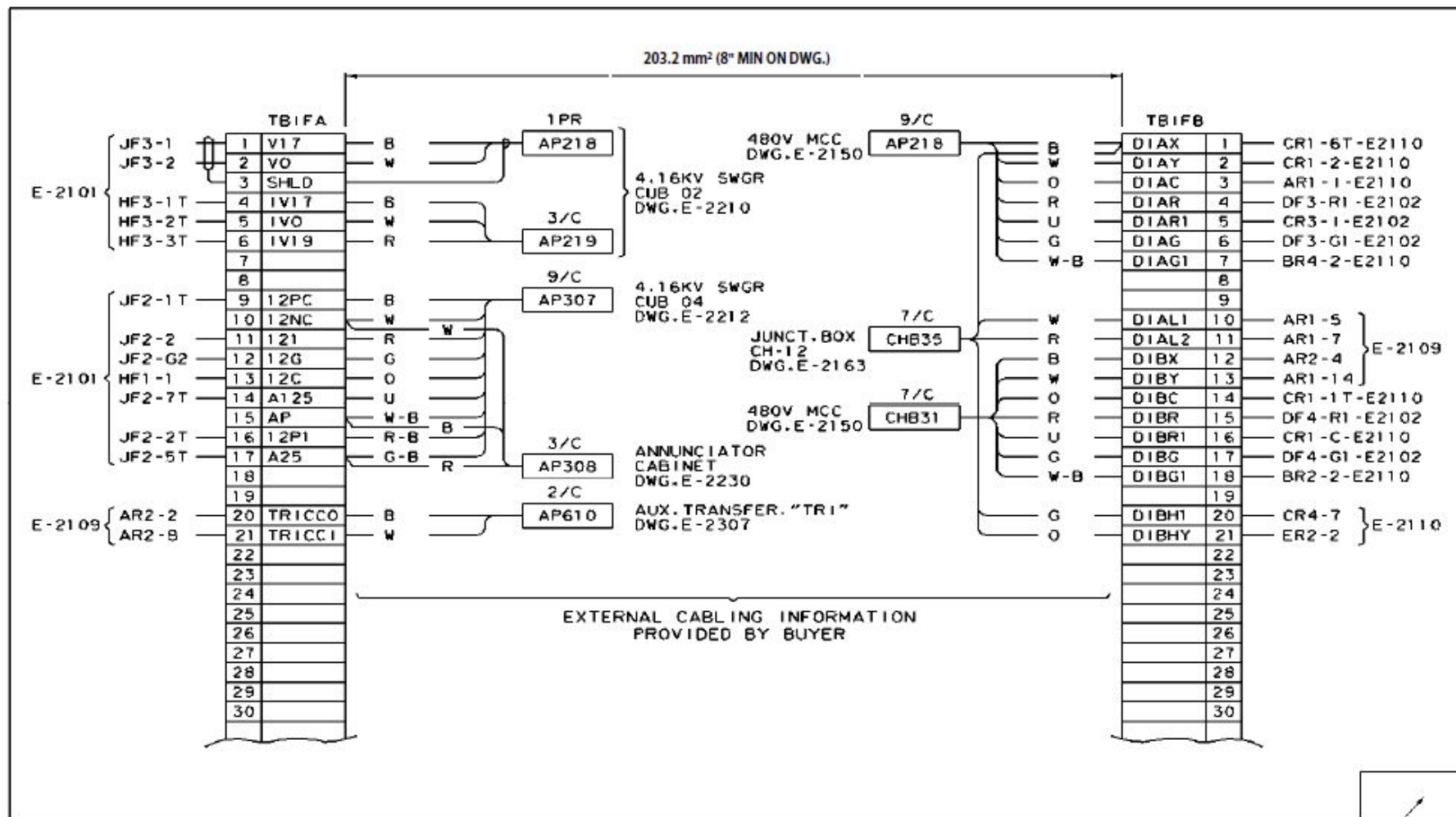


ATTACHMENT 6  
INTERNAL WIRING DIAGRAM – RELAY CABINET



# ATTACHMENT 7

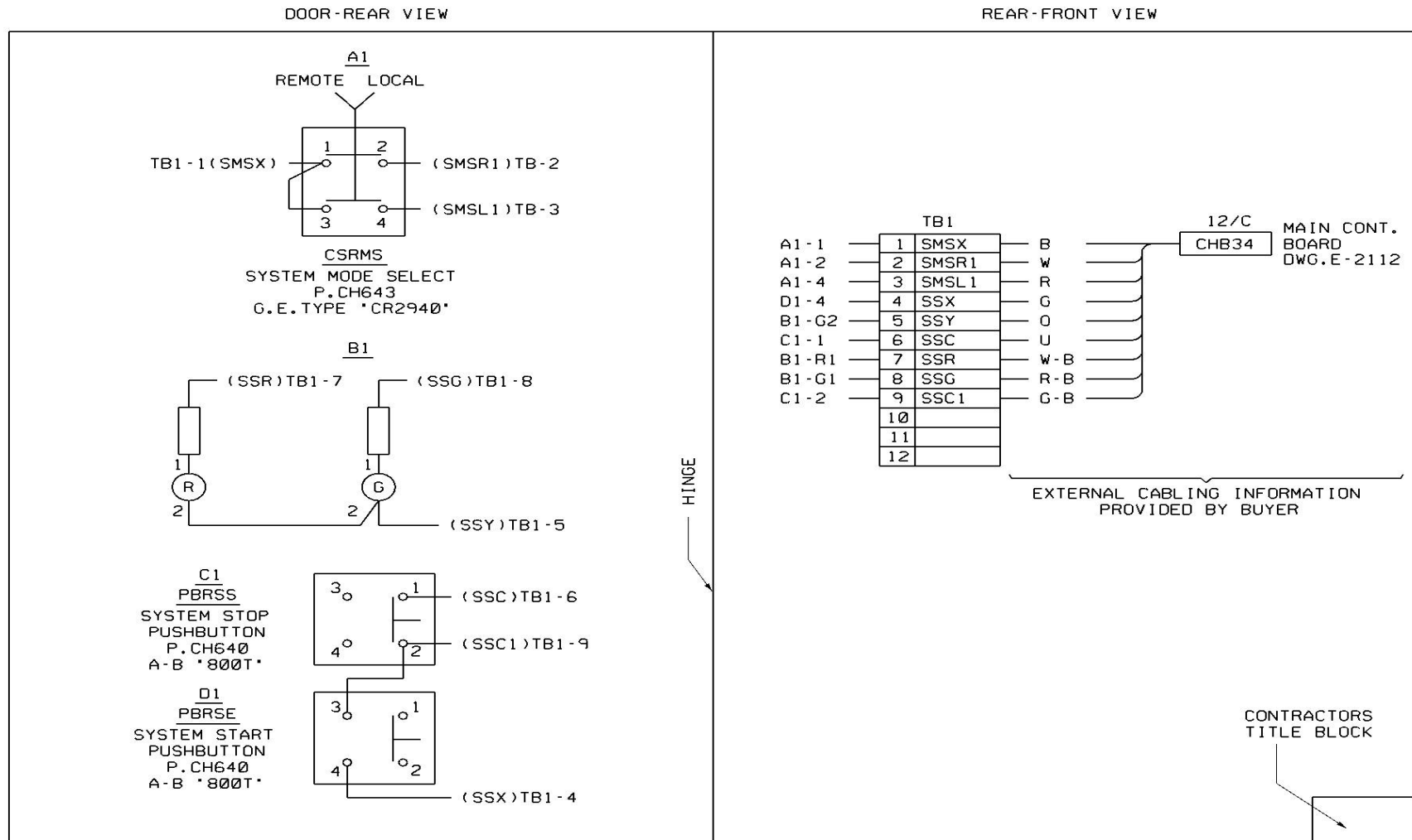
## INTERNAL – EXTERNAL WIRING DIAGRAM – TERMINAL BLOCKS



CONTRACTORS  
TITLE BLOCK

# ATTACHMENT 8

## INTERNAL – EXTERNAL WIRING DIAGRAM – LOCAL CONTROL CABINET



**ATTACHMENT 9**  
**Inspection Report for Compact Disc**

**Disc No :** \_\_\_\_\_

Item				
Buyer	Division	Dept.	Responsible person	[Tel :                      ]
Supplier	Division	Dept.	Responsible person	[Tel :                      ]

Classification	Statement of Compact disc submission and undertaking			
Supplier	(Signature)                      [Tel :                      ]			
Submitted Item and Quantity	(1) Compact Disc : Q'ty                      [                      ] (2) Processed Index List (sorted by PNS No.)			
Pertinent File No.				
Acceptor	(Signature)                      [Tel :                      ]			
Result for Inspection	Quantity inspection		Comprehensive decision	
	Image quality inspection			
	Appearance inspection			
	Retrieval linkage inspection			
Inspection Term				
Inspection Confirmed by Supplier		Inspector		Inspector
		[Tel :                      ]		[Tel :                      ]

This report guarantees that inspection was performed by the pertinent person according to the rules and procedures.

\_\_\_\_\_  
Certified by Buyer

**Attachment 10**  
**Standard Format for Electrical Load List**

**1. AC Load List** (except 120 VAC UPS load)

Load Tag No.	Load Description	Safety (Y/N)	Voltage (V) (Note 1)	Name Plate Rating	Unit (kW( HP), kVA)	Rated BHP (Note 2) (kW)	Max. BHP (Note 2) (kW)	Eff. (%)	PF (%)	FLC (A)	LRC (%)	Speed (rpm)	Remark
<b>Examples</b>													
F-606-M-HC01A	Complex Bldg. Controlled Area 1 ACU AU01A Elect. Heating Coil	Y	480	105	kW	N/A	N/A	100	100	126	N/A	N/A	AU01A-HC
F-691-J-LP01 (Note 3)	Motor Driven Fire Pump Controller	N	460	225	kW		N/A	94	90	250	600	1800	
F-746-J-LX01	Loop Controller Cabinet	N	120	0.28	kVA	N/A	N/A	-	95	2.3	15	N/A	

Note

1) The voltage, phase for motor and heater shall be as follows;

Rating	Voltage/Phase
Motor: under 0.37 kW (1/2 hp)	115/1
Heater: 2 kW and below	120/1
Motor: 1/2 hp to 225 hp	460/3
Heater: above 2 kW to 400 kW	480/3

- 2) Applicable to only motor load. (Max. BHP generally means the run-out Brake Horse Power)
- 3) The tag number indicates the equipment which the customer power cable is connected to. Electric power for the fire pump motor is fed through the controller. Therefore, the controller's tag number shall also be used for the purpose of identification.

**Attachment 10**  
**Standard Format for Electrical Load List**

**2. 120 VAC UPS Load List**

Load No.	Load Description	Safety (Y/N)	Voltage (V)	Rating (VA)	Static Current (A)	Inrush Current (A)	Inrush Current Time (ms)	PF (%)	Load Protection Device (Breaker /Fuse)	Load Protection Device Rating(A)	Remark
<b>Examples</b>											
F-745-J-LX01A	Loop Controller Cabinet	Y	120	1320	11	120	80	0.9	Fuse	16	
F-596-J-LP01	Air Compressor LCP	N	120	630	5.3	6.4	0.5	0.8	Breaker	20	

**3. 125/250 VDC Load List**

Load No.	Load Description	Safety (Y/N)	Voltage (V)	Rating (W)	Static Current (A)	Inrush Current (A)	Eff. (%)	Load Protection Device (Breaker /Fuse)	Load Protection Device Rating(A)	Remark
<b>Examples</b>										
F-601-J-LP01	Control Room HVAC Local Control Panel	Y	125	3,100	12.7	38	100	Breaker	15	
F-614-J-LP01	HVAC Local Control Panel	N	125	1,120	12.7	38	100	Breaker	15	1.5 hp

**Attachment 11**  
**Standard Format for External Wiring Diagram**

----- CABLE SUPPLIED BY SUPPLIER & INSTALLED BY BUYER  
..... CABLE SUPPLIED AND INSTALLED BY BUYER

From Equipment Reference Drawing	From Equipment Description	From Equipment No.		From Terminal Block No.	From Terminal No.	From Insulation Color or No.	Cable Description	To Insulation Color or No.	To Terminal No.	To Terminal Block No.	To Equipment No.	To Equipment Description	To Equipment Reference Drawing	Signal		
By Buyer	Buyer 480V AC 3φ	By Buyer		By Buyer	R(Phase A)		Power Cable		1	TB1	F-491-J-LP01		Normal Primary Sample LCP	Schematic J204-DE-A01-01, Sheet 1	Buyer 480V AC, 3φ, 60 Hz	
					S(Phase B)				2							
					T(Phase C)				3							
By Buyer	Buyer 125V DC 1φ	By Buyer		By Buyer	P(+)		Power Cable		4	TB1	F-491-J-LP01		Normal Primary Sample LCP	Schematic J204-DE-A01-01, Sheet 2	Buyer 125V DC, 1φ	
					N(-)				5							
By Buyer	Buyer 120V AC 1φ UPS, Ungrounded	By Buyer		By Buyer	H		Power Cable		1	TB1	F-491-J-LP0-B2		Normal Primary Sample Sink Handy Box	Schematic J204-DE-C01-02, Sheet 1	Buyer 120V AC, 1φ, 60 Hz	
					N				2							
By Buyer	Buyer 120V AC 1φ Grounded	By Buyer		By Buyer	H		Power Cable		1	TB2	F-491-J-LP0-B2		Normal Primary Sample Sink Handy Box	Schematic J204-DE-C01-02, Sheet 1	Buyer 120V AC, 1φ, 60 Hz	
					N				2							
By Buyer	Field Devices By Buyer	F-491-J-SV-024		By Buyer	H		Control Cable 7C * 14 AWG or 16 AWG		1	TB2	F-491-J-LP07		Normal Primary Sample LCP	Schematic J204-DE-A01-01, Sheet 2	On-off Signal	
					N				2							
		F-491-J-ZS-0101(LS-0)		By Buyer	C				3							
					NO				4							
		F-491-J-ZS-0101(LS-0)		By Buyer	C				5							
					NO				6							
Schematic Diagram J204-DE-A01-01, Sheets 3 & 4	Normal Primary Sample LCP	F-491-J-LP01		TB3	F		Control Cable 7C * 14 AWG or 16 AWG		1	TB1	F-491-J-LP07		SV-3205 ZS-3205 (LS-O) ZS-3205 (LS-C)	Post Accident Sample Control Panel	Schematic J204-DE-A01-07, Sheet 1	On-off Signal
								2								
								3								
								4								
								5								
								6								
Schematic Diagram J204-DE-A01-01, Sheet 4	Condenser Hotwell Sample Sink & Rack	F-791-J-LP02	Cation Cond CE/CIT-3081 (SW2A)  Sodium(Na) AE/AIT-3087 (SW2A)  Cation Cond CE/CIT-3082 (SW2B)	TB1			Instrumentation Cable 1C * 16 AWG/Shield		1	TB1	F-791-J-LP01	CJR-3081 CH1  AJR-3087 CH1  CJR-3081 CH2	Secondary Sample Control Panel	Schematic J204-DE-A01-01, Sheet 4	Analog 4~20mA	
								2								
								3								
							Instrumentation Cable 2C * 16 AWG/Shield		4							
								5								
								6								
							Instrumentation Cable 2C * 16 AWG/Shield		7							
								8								
								9								
Schematic Diagram N202-DE-B04-01, Sheet 4	Control Cabinet	F-472-J-LP01	RW71-CB01	Modular Jack Connector (RJ-45)			UTP Cable (8C * 24 AWG)			Modular Jack Connector (RJ-45)	F-472-E-RW72-CA01	Operator Station for LRS	Schematic N202-DE-B04-01, sheet4	Ethernet Signal		



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SUBMIT FOR		PNS GUIDE (1)	DOCUMENT DESCRIPTION	SPEC. PARA. NO.	REQUIREMENTS		REMARKS (4)
R E V W	I N F O				Q'TITY & TYPE (2)	SUBMITTAL WEEKS (3)	
			<b><u>D0. Submittal with Proposal</u></b>  - Valve Assembly Drawings - Completed Valve Data Sheets - Curves and Comparison Table of Tilting Disc Check Valves - Summary of Functional Qualification Plan/Program - Hardsurfacing Material List and Data - Summary of Dynamic Qualification Program - Work Schedule - Counter Measures to USNRC Information Notice - Special Tools List - Spare Parts List - Description of any Variance between this Specification and any Code Requirements - Separate Listing of all Organic Material - KEPIC/ASME / ISO Certificate, etc - Quality Assurance Manual - Manufacturing Lead Time - User's Certificate of Actual Supply	3A.2.3.A  3A.2.3.B  3A.2.3.C  3A.2.3.D  3A.2.3.E  3A.2.3.F App.4I, 3.1  3A.2.3.G  3A.2.3.H  3A.2.1  3A.2.2  3A.2.4.A  3A.2.4.B  3A.2.4.C  3A.2.4.D  Att.3-1, 4.1.A  3A.2.6,3A.2.7	*	PR	* One Copy Per Each Proposal
(1) Refer to Appendix 4C, Paragraph 1.3 for detail explanations. (2) Quantity: In numeral, Type: P=Paper Printing/Photocopy, E= Electronic Files (N:NATIVE, P: Searchable PDF, X:EXCEL) (3) Submittal due time in calendar weeks prior to (-) or after (+) the event indicated. PR = With Proposal, AW = Award, FB = Fabrication, SH = Shipping, * = Other Event/Activity defined in remarks column (4) Tenderer to indicate his schedule in remarks column if different from (3).							

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SUBMIT FOR		PNS GUIDE (1)	DOCUMENT DESCRIPTION	SPEC. PARA. NO.	REQUIREMENTS		REMARKS
R E V W	I N F O				Q'TITY & TYPE (2)	SUBMITTAL WEEKS (3)	
			<b><u>D1. Quality Assurance / Quality Surveillance</u></b>				
X		QM-A	- Quality Assurance Manual	4.04.B.2	3P+1ENα 1EP	AW+2	
X		QL-A	- Supplier's Quality Plan including (if any) Weld Map information	App.4B, 4.1 4.06.A.14	3P+1ENα 1EP	AW+4	Directly to Inspection Contractor
			<b><u>D2. Schedule &amp; Progress</u></b>				
X		CL-A	- Drawing and Data Submittal Schedule	App.4C, 2.32	3P+1EX	AW+4	
	X	CL-B	- Work Schedule (submit through on-line management system, no hard copy)	4.04.B.15		AW+8	To KEPCO E&C (Procurement)
	X	CR-A	- Work Progress Report including Status of CGID/EQ Performance (submit through on-line management system, no hard copy)	4.04.B.15		AW+8 & *	* Monthly to KEPCO E&C (Procurement)
			<b><u>D3. Design &amp; Engineering</u></b>				
X		DG-A	- Certified Valve Assembly Drawings	4.04.B.1	3P+1ENα 1EP	AW+8	
X		DR-A	- ASME III Code Design reports	4.04.B.4	3P+1ENα 1EP	AW+8	
X		DR-B	- Functional Qualification and Application Report	4.04.B.5	3P+1ENα 1EP	*1+4	*1 Relevant Test and/or Analysis
X		DL-A	- Completed Valves Data Sheets	4.04.B.23	3P+1ENα 1EP	AW+8	
X		DL-B	- Spare Parts and/or Special Tools Data	4.04.B.18	3P+1ENα 1EP	AW+8	
X		DR-C	- Material Verification Report	4.04.B.20	3P+1ENα 1EP	AW+8	
	X	DR-D	- Code & Standards Compliance Report	4.04.B.21	1P+1X	FB-4	
<p>(1) Refer to Appendix 4C, Paragraph 1.3 for detail explanations.</p> <p>(2) Quantity: In numeral, Type: P=Paper Printing/Photocopy, E= Electronic Files (N:NATIVE, P:Searchable PDF, X:EXCEL)</p> <p>(3) Submittal due time in calendar weeks prior to (-) or after (+) the event indicated. PR = With Proposal, AW = Award, FB = Fabrication, SH = Shipping, * = Other Event/Activity defined in remarks column</p> <p>(4) Tenderer to indicate his schedule in remarks column if different from (3).</p>							

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SUBMIT FOR		PNS GUIDE (1)	DOCUMENT DESCRIPTION	SPEC. PARA. NO.	REQUIREMENTS		REMARKS
REVIEW	INFO				Q'TITY & TYPE (2)	SUBMITTAL WEEKS (3)	
	X	SP-A	<b><u>D7. Packing and Shipping</u></b> - Packaging, Shipping, Handling and Storage Procedure	4.04.B.11	3P+1EN or 1EP	SH-20	
	X	SL-A	- List of Loose Parts (Part or accessories not attached to the valves delivered at site)	4.04.B.16	*3P+1EN or 1EP	SH	*2 Copies with shipment to site & 1 Copy to the A/E Including CD ROM
	X	IM-A	<b><u>D8. Site Instruction and Guideline</u></b> - Instruction Manual shall Include the Following Information : · Handling and Site Storage Instruction · Installation Instruction Including Assembly and Disassembly	4.10.A.1 4.04.B.17	**26P+1EP	SH	**20 Copies with shipment to site & 6 copies to the A/E including CD ROM
	X	IM-B	- Part List(s)	4.10.A.2 App 4X, 35	1P+1EX	FB-4	
X		VL-A	<b><u>D9. Quality Verification Document</u></b> - QVDL and It's Sample Forms of listed in Appendix 4E	4.04.B.3 App. 4C, 73	3P+1EN or 1EP	AW+4	Directly to Inspection Contractor
	X	VR-A	- Quality Verification Documents	4.04.C.1 App. 4C, 70	***3P+1EP	SH for 3P SH+4 for 1EP	***2 Copies with shipment to site & 1 copy to the A/E

(1) Refer to Appendix 4C, Paragraph 1.3 for detail explanations.

(2) Quantity: In numeral, Type: P=Paper Printing/Photocopy,  
E= Electronic Files (N:NATIVE, P: Searchable PDF, X:EXCEL)

(3) Submittal due time in calendar weeks prior to (-) or after (+) the event indicated.

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(4) Tenderer to indicate his schedule in remarks column if different from (3).

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SUBMIT FOR		PNS GUIDE (1)	DOCUMENT DESCRIPTION	SPEC. PARA. NO.	REQUIREMENTS		REMARKS
R E V W	I N F O				Q'TITY & TYPE (2)	SUBMITTAL WEEKS (3)	
X		EP-A	<b><u>D10. Equipment Qualification</u></b> - Dynamic Qualification Plan	4.04.B.7 App.4I, 3.3	3P+1EN or 1EP	AW+8 *8	*8 Qual. Test
X		ER-A	- Dynamic Qualification Report including Raw Test Data	4.04.B.7 App.4I, 14.0	3P+1EN or 1EP	FB-16	In case Raw Test Data 1P+1EN or 1EP
X		ER-C	- Justification Document for Aging Condition including Raw Test Data (Mild Environment)	4.05.D.1	3P+1EN or 1EP	FB-16	In case Raw Test Data 1P+1EN or 1EP
			<b><u>D11. 3D CAD Electronic File</u></b>				
		-	- Native 3D CAD File Format	App.4C, 4.6.7	1EN+1EP	AW+16	
		-	- Index of Equipment Part List	App.4C, 4.6.7	1EN	AW+16	
			<b><u>D12. AS-Built Drawing &amp; Document</u></b>				
		-	- As-Built Drawings	App.4C, 8.0	1P+1EN & 1EP	*	* After Installation
		-	- As-Built Documents	App.4C, 8.0	1P+1EN & 1EP	*	
			<b><u>D13. Electronic File for Equipment Master Database</u></b>				
			- Design Data for Valves	4.04.B.19	As per Guideline	**	** With Finalized Supplier's Technical Data
			<b><u>D14. Original Document</u></b>				
			- Equipment Qualification(EQ) Document (if any)	App.4A1, 1.8 App.4A2, 3.0	-	As required	To KAERI
			- Quality Verification Documents(QVDs)	App.4A1, 1.8 App.4A2, 3.0	-	As required	To KAERI

(1) Refer to Appendix 4C, Paragraph 1.3 for detail explanations.

(2) Quantity: In numeral, Type: P=Paper Printing/Photocopy,

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QUALITY VERIFICATION DOCUMENTATION LIST

Spec. Title : Tilting Disc Check Valves

Supplier \_\_\_\_\_ Spec.No F-145-UP206D Spec. Rev. No. 0 Packing List No. \_\_\_\_\_

Page 1 of 3

IDENTIFICATION AND DESCRIPTION OF EQUIPMENT		QUALITY PROGRAM DOCUMENT					CERTIFIED BY	THE BUYER'S
PROJECT IDENTIFICATION		EQUIPMENT DESCRIPTION	DESCRIPTION OF REQUIRED DOCUMENTS	PARA. NO.	SERIAL NO. *	PROVIDED BY ATTACH. NO.*	SUPPLIER	REPRESENTATIVE
ITEMNO.	EQUIP.NO/TAG NO.						SIGNATURE / DATE	SIGNATURE / DATE
			<b>E1. <u>CERTIFICATE OF CONFORMANCE</u></b>	4.04.C.5				
			<b>E2. <u>CODE DATA REPORT</u></b> (For ASME III Valves only)	4.04.C.10				
			<b>E3. <u>MATERIAL TEST PROPERTIES</u></b>  • (Certified) Material Test Report (CMTR) including Record S-PWHT data, if applicable / Material Manufacturer's Certificate of Compliance  • Ferrite Data / Ferrite Content Test Report	4.04.C.4        4.04.C.8				
			* SUPPLIER to show identification of individual documents					
<div>SUPPLIER CERTIFICATION</div> <div>We certify that listed documentation meets the requirements of the Purchase Contract and applicable Specifications.</div> <div>Supplier _____</div> <div>Title : _____ Date : _____</div>				<div>THE BUYER'S REPRESENTATIVE ACCEPTANCE</div> <div>The Buyer's Representative shall indicate acceptance. When inspection is not required at the shop, the Buyer's review will be made at the job site after material or equipment has been shipped.</div> <div>Accepted by : _____</div> <div>The Buyer's REP. &amp; Title _____ Date _____</div>				

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QUALITY VERIFICATION DOCUMENTATION LIST

Spec. Title : Tilting Disc Check Valves

Supplier \_\_\_\_\_ Spec.No F-145-UP206D Spec. Rev. No. 0 Packing List No. \_\_\_\_\_

Page 2 of 3

IDENTIFICATION AND DESCRIPTION OF EQUIPMENT			QUALITY PROGRAM DOCUMENT				CERTIFIED BY	THE BUYER'S
PROJECT IDENTIFICATION		EQUIPMENT DESCRIPTION	DESCRIPTION OF REQUIRED DOCUMENTS	PARA. NO.	SERIAL NO. *	PROVIDED BY ATTACH. NO.*	SUPPLIER	REPRESENTATIVE
ITEM NO.	EQUIP. NO./TAG NO.						SIGNATURE / DATE	SIGNATURE / DATE
			<div>E4. <u>INSPECTION &amp; TEST REPORTS</u></div> <div><div>• Nondestructive Examination Reports with RT Films, if applicable</div><div>• Heat Treatment Reports including Heat Treatment Charts</div><div>• Wall Thickness Verification Reports for ASME III Valves</div><div>• Hydrostatic Shell Test and Seat Leakage Test Reports</div><div>• Major Repair Verification Reports</div><div>• Welding Verification Documents</div><div>• Quality Verification Documentation for Coating Work</div></div>	<div>4.04.C.6</div> <div>4.04.C.3</div> <div>4.04.C.9</div> <div>4.04.C.7</div> <div>4.04.C.2</div> <div>App. 4K1</div> <div>App.4G2, Para. 4.3</div>				
			* SUPPLIER to show identification of individual documents					
<div>SUPPLIER CERTIFICATION</div> <div>We certify that listed documentation meets the requirements of the Purchase Contract and applicable Specifications.</div> <div>Supplier _____</div> <div>Title : _____ Date : _____</div>				<div>THE BUYER'S REPRESENTATIVE ACCEPTANCE</div> <div>The Buyer's Representative shall indicate acceptance. When inspection is not required at the shop, the Buyer's review will be made at the job site after material or equipment has been shipped.</div> <div>Accepted by : _____</div> <div>The Buyer's REP. &amp; Title _____ Date _____</div>				

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QUALITY VERIFICATION DOCUMENTATION LIST

Supplier \_\_\_\_\_ Spec.No \_\_\_\_\_ Spec. Title : Tilting Disc Check Valves Page 3 of 3  
F-145-UP206D Spec. Rev. No. 0 Packing List No. \_\_\_\_\_

IDENTIFICATION AND DESCRIPTION OF EQUIPMENT			QUALITY PROGRAM DOCUMENT				CERTIFIED BY SUPPLIER	THE BUYER'S REPRESENTATIVE
PROJECT IDENTIFICATION		EQUIPMENT DESCRIPTION	DESCRIPTION OF REQUIRED DOCUMENTS	PARA. NO.	SERIAL NO. *	PROVIDED BY ATTACH. NO.*	SIGNATURE / DATE	SIGNATURE / DATE
ITEMNO.	EQUIP.NO./TAG.NO.							
			<b>E5. <u>FINAL SIGNED-OFF QUALITY PLAN</u></b>  <b>E6. <u>SDDR/NCR/CAR(closed-out), if any</u></b>  <b>E7. <u>Others</u></b>  Other Inspection and Test Reports Required by Section 4 or Quality Plan	App.4C, 7.6.1  App.4H/ App.4B/ App.4C, 7.6.1				
* SUPPLIER to show identification of individual documents								
<b>SUPPLIER CERTIFICATION</b> We certify that listed documentation meets the requirements of the Purchase Contract and applicable Specifications.  Supplier _____  Title : _____ Date : _____				<b>THE BUYER'S REPRESENTATIVE ACCEPTANCE</b> The Buyer's Representative shall indicate acceptance. When inspection is not required at the shop, the Buyer's review will be made at the job site after material or equipment has been shipped.  Accepted by : _____ The Buyer's REP. & Title _____ Date _____				



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## APPENDIX 4G2

### Requirements for Coating Service Level II Equipment and Components

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

0	03/29/23	ISSUE FOR USE	김영우	김응두	이원준 원지영	김종강
REV. NO	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED

Preparer : 김영우, Tel : 054-421-6364

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## **ATTACHMENT**

1. COATING DOCUMENTATION FORMS

## **1.0 SCOPE**

- 1.1 The coating requirements specified herein are applicable for the exposed ferrous metal surfaces of equipment, components and miscellaneous steel surfaces. Coating steel surfaces in contact with concrete is not required.
- 1.2 The following surfaces shall not be coated unless otherwise indicated:
- a. Stainless steel
  - b. Galvanized steel
  - c. Machined or wearing surfaces (suitable shipping and storage preservative is required.)

## **2.0 DEFINITIONS**

- 2.1 The term "Coating Service Level II," as defined in RG 1.54, shall apply to all coatings used on equipment, systems or materials outside the confines of the Reactor Containment Building, but subject to radiation and decontamination. At least Service Level II coating systems shall be used in harsh areas which are predicted to experience a total integrated dose (TID) of greater than 100 Gy. This coating work is not required to withstand the Loss of Coolant Accident (LOCA) and Main Steam Line Break (MSLB) combined environment.
- 2.2 Coating Work - an all inclusive term to define all operations required to accomplish a complete coating job; the term shall be construed to include materials, equipment, labor, preparation of surfaces, control of ambient conditions, application of coating system inspection, etc.

## **3.0 REFERENCES**

- 3.1 The Supplier shall conform to the applicable requirements of the following references, which are in effect as of Jun. 30, 2019, unless otherwise indicated:

ASME NQA-1	Quality Assurance Requirements for Nuclear Facility Applications
ASTM D714	Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D3843	Standard Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities
ASTM D3912	Standard Test Method for Chemical Resistance of Coatings and Linings for Use in Nuclear Power Plants
ASTM D4060	Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser

ASTM D4082	Standard Test Method for Effects of Gamma Radiation on Coatings for Use in Nuclear Power Plants
ASTM D4214	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4228	Standard Practice for Qualification of Coating Applicators for Application of Coatings to Steel Surfaces
ASTM D4541 (2009 <sup>e1</sup> ed.)	Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers
ASTM D5144	Standard Guide for Use of Protective Coating Standard in Nuclear Power Plants
ASTM D7091	Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
SSPC-SP1	Solvent Cleaning
SSPC-SP2	Hand Tool Cleaning
SSPC-SP3	Power Tool Cleaning
SSPC-SP10 /NACE No.2	Near-White Metal Blast Cleaning
SSPC-SP11	Power-Tool Cleaning to Bare Metal
SSPC-PA2	Procedure for Determining Conformance to Dry Coating Thickness Requirements
SSPC-VIS1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
NRC Regulatory Guide 1.54	Service Level I, II, III, and In-Scope License Renewal Protective Coatings Applied to Nuclear Power Plants

#### **4.0 SUBMITTALS**

- 4.1 If the Supplier does not use the qualified coating system in Article 5.0 of this specification, the Supplier shall submit the following to evaluate the coating system to be proposed for the acceptability of the project requirements with the bid proposal.

- a. The name of coating manufacturer and coating systems that the supplier proposes to use.
  - b. Certified copies of the authorized laboratory's test reports performed in compliance with the requirements of Article 6.0 of this Appendix. (DBA tests will not be required)
- 4.2 The Supplier shall furnish procedures for storage, handling, surface preparation, application and inspection for specified coating system(s).
- 4.3 The Supplier shall submit the following documentation forms shown on Attachment 1 of this Appendix for quality verification as a minimum:
- a. A coating manufacturer's product identity certification record for each batch of coating material
  - b. A record of inspection and test as referred in Article 10.0 of this Appendix

## **5.0 MATERIALS**

- 5.1 The prime and finish coating system(s) shall be as follows:
- a. Exposed ferrous metal surfaces of structural steel and miscellaneous steel
    - a1. One coat of inorganic zinc primer and one coat of epoxy finish.
    - a2. Coating system thickness (DFT):
      - a2.1 Primer: As shown on paragraph 5.1.a. a3
      - a2.2 Finish: As shown on paragraph 5.1.a. a3
    - a3. Qualified coating materials as a complete system shall be one of the following for the entire carbon steel surfaces:

“LATER”

- b. Exposed ferrous metal surfaces of all other equipment and components having surface temperature of less than 93.3 °C (200°F).
  - b1. One coat of epoxy primer and one coat of epoxy finish.
  - b2. Coating system thickness (DFT):
    - b2.1 Primer: As shown on paragraph 5.1.b. b3
    - b2.2 Finish: As shown on paragraph 5.1.b. b3
  - b3. Qualified coating materials as a complete system shall be one of the following for the entire carbon steel surfaces:

“LATER”

- c. Exposed ferrous metal surfaces of equipment and components having surface temperature of 93.3 °C (200°F) to 398.9 °C (750°F).

“LATER”

- 5.2 Solvents, thinners, and cleaners shall be the product of the coating manufacturer. Products from different manufacturers or different type coating systems shall not be intermixed.
- 5.3 Abrasives used for blast cleaning shall be capable of producing the specified surface profile height.

## **6.0 COATING QUALIFICATION AND ACCEPTANCE TEST REQUIREMENTS**

The coating systems shall be satisfied with the quality tests for which the procedures and acceptance criteria are stated below:

### **6.1 Physical Properties Tests**

- a. Adhesion test
  - a1. Procedure : ASTM D4541
  - a2. The test method for steel substrate shall be a fixed-alignment adhesion tester Type II in ASTM D4541.
  - a3. Acceptance criteria : A minimum of five panels shall be tested for each coating system. At least three replications shall be required on each panel. The minimum adhesion shall be 200 psi for 4 of the 5 panels.
- b. Abrasion resistance test
  - b1. Procedure : ASTM D4060
  - b2. Acceptance criteria : Weight loss shall not exceed 175 mg/1,000 cycles when a CS-17 wheel is used with a 1,000-gram load.

### **6.2 Radiation Tolerance Test**

- a. Procedure: ASTM D 4082
  - a1. Irradiation dose rate (Gamma field) - Greater than  $1 \times 10^4$  Gy/hr
  - a2. The total integrated dose (TID) for satisfying the test requirements is  $1.0 \times 10^6$  Gy.
  - a3. Test environment - Air
- b. Acceptance Criteria : Checking, cracking, flaking, delamination, peeling, and blistering are not permitted.

### 6.3 Chemical Resistance Test

- a. Procedure: ASTM D3912
  - a1. Short Term Test
  - a2. Chemical solutions shall be in accordance with Fig.1 of ASTM D3912 (1995 ed.)
- b. Acceptance Criteria:
  - b1. Checking, cracking, flaking, delamination and peeling shall not be permitted.
  - b2. Blistering (ASTM D714) shall be limited to size 4, 6, or 8 intact blisters, not exceeding a "frequency of a few."
  - b3. Discoloration and softening will be permitted

### 6.4 Fire Evaluation Test

- a. Procedure : ASTM E84
  - a1. Flame - Spread tests
- b. Acceptance Criteria:
  - b1. Flame - Spread rating shall not exceed 50 as measured on the noncombustible substrate.

## 7.0 **MATERIAL HANDLING AND STORAGE**

7.1 Coating materials shall be delivered in the manufacturer's original sealed containers bearing legible labels.

7.2 The sides of each container shall have the following information listed:

- a. Manufacturer's name
- a. Product name and number
- c. Product color designation
- d. Product batch number and manufacturing date
- e. Product shelf life expiration date
- f. Service Area : Coating Service Level II Area



- 7.3 Materials from damaged containers shall not be used in the work. The containers of coatings or thinners shall not be opened unless ready for immediate use.
- 7.4 Coated steel or components shall be rested on wooden supports during shop storage or shipment. If it is necessary to stack members, wooden separators shall be used. Coated steel or components shall at no time be placed directly on other steel or directly on the ground.
- 7.5 Coating material shall be stored in designated areas according to the manufacturer's instructions and ASME NQA-1 Subpart 2.2 Level B. The storage temperature shall be between 4.4 °C (40°F) to 32.2 °C (90°F).

## **8.0 SURFACE PREPARATION**

- 8.1 Surface preparation by pickling or chemical treatment shall not be permitted.
- 8.2 Surfaces shall be blasted in accordance with SSPC-SP10/NACE No.2, unless noted otherwise (higher grade only), using dry blasting abrasive only. The height of the profile of the anchor pattern shall be as recommended by the manufacturer of the coating system, and as measured with a Keane-Tator profile comparator or Elcometer roughness gauge adjusted to profile height, or equivalent.
- 8.3 Steel and fabrication defects such as weld spatter, sharp edges of welds, delaminations, scabs and slivers visible before or revealed by blast cleaning shall be repaired prior to coating.
- 8.4 Surface preparation operations shall be performed under the following conditions:
  - a. Relative humidity shall not exceed 80 percent.
  - b. There shall be no moisture on the steel. The surface temperature of the steel shall be at least 3 °C (5°F) above the dew point.
  - c. Abrasive shall be dry and oil-free. Oil and water separators shall be used in compressed air lines to remove oil and moisture from the air before it is used. Separators shall be placed as close as possible to the blast equipment.
  - d. Blasting shall not be performed in the same area where coating or curing of coated surfaces is in progress.
  - e. Blasting equipment shall be in good operating condition.
- 8.5 The total elapsed time from blast cleaning to the application of the coating shall not exceed 4 hours, but in any event before visible rusting occurs.
- 8.6 After blasting and immediately prior to coating, the blasting dust shall be removed by using a high pressure air blow off and followed by vacuum cleaning.

## **9.0     APPLICATION OF COATING**

- 9.1     Mixing and application of coating material shall be in accordance with the coating manufacturer's published instructions.
- 9.2     Steel to be field welded shall be masked one inch from the edge prior to coating.
- 9.3     Application shall be performed under the following conditions:
- a.     Relative humidity shall not exceed 80 percent.
  - b.     Surface temperature of steel shall be between 10°C (50°F) and 38°C (100°F).
  - c.     There shall be no moisture on the steel surface.
  - d.     Metal temperature shall be at least 3°C (5°F) above dew point.
  - e.     Steel surfaces shall be clean and free from contamination.
  - f.     Lighting shall be adequate for proper application of coating material.
  - g.     Spray equipment shall be in good operating condition.
  - h.     Traps shall be used in air supply lines to remove moisture and oil.
- 9.4     Runs, sags, drips or overspray which cause failures by loss of adhesion, blistering, peeling, mudcracking or rusting of substrate shall not be permitted. Defective areas shall be reblasted and recoated.
- 9.5     Erection marks as shown on approved shop drawings shall be placed on each member after application of the coating with approved erection marking material.

## **10.0    INSPECTION AND TESTING**

- 10.1    The Supplier shall maintain necessary instruments to test and inspect surface preparation, coating application and fully cured coating at the place of work for the Supplier's quality control and shall be made available for the Buyer's use. These instruments shall include:
- a.     Thermometer
  - b.     Hygrometer
  - c.     A thickness gauge such as Mikrotest or Elcometer with range between zero and 1,016 $\mu$ m (40mils)

- d. A surface profile gauge such as Elcometer Roughness Gauge or a Keane-Tator Profile Comparator (ASTM D4417)
- e. 5X (or higher) magnifier
- f. Flashlight
- g. Wet film thickness gauge (ASTM D4414)
- h. Calibrated shims

10.2 The Supplier shall perform the following inspection and testing:

- a. Surface preparation:
  - a1. Verify compliance with the requirements of the coating manufacturer's specification.
  - a2. Confirm the blast quality by comparing the blasted surface with SSPC-VIS 1 and the surface profile by the approved steel sample with an adjusted Elcometer Roughness Gauge or a Keane-Tator Profile Comparator, or equivalent.
  - a3. Conduct an air blast test at the beginning of each shift of blasting. The air blast (free of sand) shall be directed towards a clean white absorbent paper or cloth for 2 minutes to detect any oil or moisture in the air supply. Blasting shall proceed only when oil or moisture is not detectable.
  - a4. Check the abrasive daily for grease and oil contamination. Place the abrasive into a glass of water to check for visual indications of grease or oil. If grease and oil are present the abrasive shall not be used.
  - a5. Inspect blasted surfaces immediately before application of the coating. Coating application shall proceed only when results of the inspection are acceptable to the Supplier's inspector.
- b. Handling and application of coating:
  - b1. Check each coating material shipment for acceptable condition of the containers and packages.
  - b2. Check spray equipment twice daily for correct air pressure, cleanliness of agitators, hoses and pots, and correct size of tips and caps.
  - b3. Mixed material that exceeds pot life shall be rejected.
  - b4. Check the dry film thickness of coating using SSPC-PA2(Coating thickness restriction level 3) and ASTM D7091.

- b5. Check continuously for the following coating defects and take immediate corrective action:
- Loss of adhesion
  - Blistering
  - Peeling
  - Mudcracking
  - Rusting of substrate
  - Dry overspray
  - Runs and sags
  - Embedded particles
  - Other imperfections and blemishes
- b6. Check the relative humidity and temperature to allow specified curing period.

## **11.0 MATERIAL FOR TOUCH-UP**

- 11.1 The Supplier shall provide to the Buyer, with the shipment of the equipment, components, or materials to the project site, one-gallon container(s) minimum of each coating material to be used for touch-up work unless described otherwise in applicable purchase spec., including required solvents, label each container with the color name, batch number, and attach the coating manufacturer's product identity certification record and application instruction.

**ATTACHMENT 1 OF APPENDIX 4G2**

**COATING DOCUMENTATION FORMS**

(These are suggested sample forms which comprise the documentation required for quality verification. Alternative forms may be used if they provide at least the same degree of documentation)

Form 1.

COATING MATERIALS – MANUFACTURER’S PRODUCT IDENTITY CERTIFICATION RECORD  
FOR COATING SERVICE LEVEL II

GENERAL DATA

(To Be Filled By Coating Manufacturer)

PROJECT DESIGNATION _____	DATE _____
PROJECT LOCATION _____	REPORT NO. _____
OWNER _____	PURCHASE ORDER NO. _____
BUILDING, UNIT, OR EQUIPMENT	CONTRACT NO. _____
DESIGNATION _____	SHOP WORK _____
_____	FIELD WORK _____

TECHNICAL DATA

(Submit At the Time of Shipment)

DATE \_\_\_\_\_

COATING MANUFACTURER \_\_\_\_\_

PRODUCT NAME & NUMBER \_\_\_\_\_ GENERIC TYPE \_\_\_\_\_

BATCH NO. \_\_\_\_\_ DATE OF MANUFACTURER \_\_\_\_\_ SHELF LIFE \_\_\_\_\_

NET WEIGHT, LBS. PER GALLON - - (BY ☐ Fed. Test Method Std. No. 141,  
Method 4184  $\pm$  or By ☐ ASTM D1475)

VISCOSITY RANGE \_\_\_\_\_ TEMPERATURE \_\_\_\_\_°F METHOD \_\_\_\_\_

SOLIDS VOLUME %  $\pm$  \_\_\_\_\_

DRY TIME: \_\_\_\_\_ HOURS @ \_\_\_\_\_°C (°F) \_\_\_\_\_ % R.H.

TACK FREE TIME \_\_\_\_\_ HOURS @ \_\_\_\_\_°C (°F) \_\_\_\_\_ % R.H.

RECOAT TIME RANGE \_\_\_\_\_ @ \_\_\_\_\_°C (°F) \_\_\_\_\_ % R.H.

MINIMUM DRY FILM THICKNESS PER COAT: \_\_\_\_\_  $\mu\text{m}$ (mils)

COLOR, VISUAL \_\_\_\_\_

MIXING RATIO _____	PARTS _____	COMPONENT
BY WT. _____	PARTS _____	COMPONENT
BY VOL. _____	PARTS _____	COMPONENT

INDUCTION PERIOD \_\_\_\_\_ HOURS @ \_\_\_\_\_°C (°F)

POT LIFE \_\_\_\_\_ HOURS @ \_\_\_\_\_°C (°F)

SPECIFIED THINNER \_\_\_\_\_

FLASH POINT TAG OPEN CUP \_\_\_\_\_°C (°F) (ASTM D-92)

SIGNATURE \_\_\_\_\_

TITLE \_\_\_\_\_

Form 2.

Appendix 4G2  
Rev. 0

DAILY COATING WORK INSPECTION RECORD  
FOR COATING SERVICE LEVEL II

PROJECT : \_\_\_\_\_ LOCATION : \_\_\_\_\_ DATE : \_\_\_\_\_ REPORT NO. : \_\_\_\_\_  
OWNER : \_\_\_\_\_ COATING APPLICATOR : \_\_\_\_\_ SHIFT : \_\_\_\_\_ SHIFT FOREMAN : \_\_\_\_\_  
TO : \_\_\_\_\_ COATING INSPECTOR : \_\_\_\_\_ MAP ATTACHED(With Batch Nos.) \_\_\_\_\_ SHIFT \_\_\_\_ OF \_\_\_\_

TIME	LOCATION	DRY BULB	WET BULB	REL. HUM.	DEW PT.	SURFACE TEMP.	SKY	WIND	PRECIP.	OPERATION PERMITTED

NO.	ITEM	LOCATION	OPERATION	SURFACE PREPARATION				COATING MATERIAL		COATING THICKNESS(DFT)				
				SPEC.	ACTUAL	PROFILE	METHOD*	SPEC.	APPLIED	SPEC.	MIN.	MAX.	AVG.	METHOD

COMMENTS : (Include Extent of Surface Preparation, Gallons Used, Any Defective Work, etc.)

A Key is Recommended, e.g., M=Mikrotest  
E=Elcometer

\*Method used to measure profile.

Distribution :

SIGNATURE \_\_\_\_\_  
TITLE \_\_\_\_\_

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## APPENDIX 4H

### Documentation Requirements of Supplier Deviations and Non-Conformances

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

0	03/24/23	Issue for Use	윤재성	김종강	김종강	김종강
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Preparer : 윤재성, Tel : 054-421-3516



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## **ATTACHMENT**

1. SDDR (SUPPLIER DEVIATION DISPOSITION REQUEST)

## **1.0 SCOPE**

- 1.1 This Appendix delineates requirements for notification to the Buyer of Supplier requested deviations and nonconformances to the technical specification requirements in the contract.

## **2.0 DEFINITION**

### **2.1 Modify Specification**

In general, modification of Specification is applicable to "proposed deviation" except "nonconformance." In case the proposed deviation is acceptable, A/E will issue addendum of technical specification to the Buyer for contract change.

### **2.2 Repair**

The process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though the item still may not conform to the original requirements. Repair includes alterations to the properties of the material through heat treating, welding, metal deposition, chemical processing, etc.

### **2.3 SDDR (Supplier Deviation Disposition Request)**

SDDR is a form that shall be prepared by a supplier to request the Buyer's acceptance of a proposed deviation from the technical specification requirements, having a proposed disposition of "modify specification," or to get the Buyer's decision of the supplier-detected nonconformances to the technical specification requirements and/or the requirements on drawings, procedures, or other documents, having a proposed disposition of "repair" or "use-as-is."

### **2.4 Supplier**

An entity who provides services, equipment, components, fabrication, assembly of components for a nuclear power plant. An all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, consultant, and their subtier levels.

### **2.5 Surveillance**

Surveillance, as used herein, may include inspection, survey, and/or audit requested by the Buyer.

## 2.6 Use-As-Is

A disposition which may be imposed for a nonconformance when it can be established that the discrepancy will result in no adverse conditions and that the item under consideration will continue to meet all engineering functional requirements including performance, maintainability, fitness and safety.

## 3.0 **REQUIREMENTS FOR SUPPLIER DEVIATION DISPOSITION REQUEST**

3.1 Supplier Deviation Disposition Request (SDDR) - A form that shall be prepared by all suppliers:

- to request the Buyer's acceptance of a proposed deviation that departs from the Technical Specification (Section 4) requirements prior to implementation of work associated with a deviation, having a proposed disposition of "Modify Specification," or
- to notify the Buyer of the Supplier-detected nonconformances to the Technical Specification requirements and/or the requirements on drawings, procedures, or other documents previously reviewed by the A/E, having a proposed disposition of "Repair" or "Use-As-Is"

3.2 The A/E shall be promptly (within five working days) advised of the above said nonconformances by means of SDDR. A copy of SDDR notifying the nonconformances to the Buyer shall be furnished to the Buyer's Quality Surveillance Representative.

3.3 The Buyer's acceptance of the SDDR shall be obtained prior to implementation of work associated with a deviation or implementation of a proposed disposition to the above said nonconformances.

3.4 The SDDR form shall not be used for cases where the Buyer has previously provided permission to proceed using an accepted repair procedure covering a specific type of repair, however, records shall be maintained for each specific repair.

3.5 The Supplier shall describe the recommended disposition based on appropriated analysis and provide technical justification to be firm basis for the proposed deviation. Submittal of requests for deviations to the A/E from lower-tier suppliers shall be through the prime supplier.

3.6 SDDRs shall be used for all applicable specifications, regardless of quality class. The form to be employed is attached to this Appendix as Attachment 1.

- 3.7 In case where the supplier proposed disposition (based on the deviation) involves cost impact, the detailed cost amount shall be addressed by the Supplier in a separate sheet as an attachment to the SDDR. A/E acceptance of the SDDR does not imply that the cost amount suggested by the supplier is accepted. The cost amount will be separately adjusted by the Buyer after issuing addendum of the Specification.
- 3.8 After Quality Surveillance Representative verifies and signs that the accepted disposition was correctly implemented and accomplished, one(1) copy of the final SDDR shall be submitted by the Supplier with a letter of transmittal to A/E DDCC.
- 3.9 A copy of all completed SDDRs shall be included in the Quality Verification Documentation Package.

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# ATTACHMENT 1

## SDDR (Supplier Deviation Disposition Request)

NOTE :

1. Complete instruction on back this sheet
2. Items 1-17 below to be completed by supplier
3. \*Items, Architect/Engineer entries only
4. Attach additional information whenever necessary

5. A copy of the completed SDDR form shall be included by the supplier in the quality verification documentation for each item to which this SDDR applies

FOR SUPPLIER USE		* FOR A/E USE	
Supplier SDDR No.	Date Submitted	A/E SDDR No.	Date Received
1. Supplier Name _____ Tel. No. / Fax. No./E-mail _____			
2. Supplier's Order No.	3. Supplier's Part No.	4. Supplier's Part Name	5. NCR Reference No.
6. Spec. & Rev. No.	7. A/E Part No.	8. A/E Part Name	9. Q. S. Rep. Notified Date _____ Method _____
10. A/E Engineer Notified Date _____ Method _____			
11. Deviation Description(attach extra sheets, sketches, photographs, etc., as necessary and identify quantity and serial numbers as applicable)			
12. Supplier's Proposed Disposition <input type="checkbox"/> Use-as-is <input type="checkbox"/> Repair <input type="checkbox"/> Modify Specification			
13. Cost Impact : <input type="checkbox"/> Yes <input type="checkbox"/> No		14. Schedule Impact : <input type="checkbox"/> Yes <input type="checkbox"/> No	
15. Proposed Disposition and Technical (plus cost/schedule if applicable) Justification (attach extra sheets, sketches, etc., as necessary)			
16. Associated Supplier Document Change (PNS No., Supplier Document No. and Title)			
17. Supplier's Authorized Representative Name _____ Title _____ Signature _____ Date _____			
*18. A/E Engineering Action <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected		Engineering Followup <input type="checkbox"/> Drawing change ( <input type="checkbox"/> A/E <input type="checkbox"/> Supplier) <input type="checkbox"/> Licensing document change <input type="checkbox"/> Spec. / req. change ( <input type="checkbox"/> A/E <input type="checkbox"/> Supplier) <input type="checkbox"/> Price adjustment <input type="checkbox"/> Other suppliers affected _____ <input type="checkbox"/> Other _____	
*19. A/E Disposition Statement Including Justification (attach extra sheets, sketches, etc., as necessary)			
*20. Signature/Date RE _____ / _____ EGS _____ / _____ APM _____ / _____		Construction action required <input type="checkbox"/> Yes <input type="checkbox"/> No 21. Supplier _____ *22. Quality Surveillance Representative _____	
		Date _____	

## Instruction for Completing SDDR

This form is to be used by a supplier to:

- a) Notify A/E when manufactured product or service does not meet established contract requirements and to document the supplier's proposed disposition with their technical (and where appropriate cost/schedule) justification.
- b) Notify A/E when the supplier wants to propose changes to the technical specification unanticipated at time of award.
- c) Record A/E's disposition of the SDDR.

A deviation is any departure from the requirements of the technical specification, which the supplier has incorporated or proposes to incorporate in the completed item or service provided. SDDR disposition can be classified as Use-As-Is, Repair, or Modify Specification.

Repair is defined as the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still may not conform to the original requirement. Repair includes alterations to the properties of the material through heat-treating, welding, metal deposition, chemical processing etc. The SDDR form is not to be used for cases where the A/E has previously provided authorization to proceed using as accepted repair procedure covering a specific type of repair, however, records must be maintained for each specific repair.

A/E's engineering action and disposition statement does not relieve the supplier from responsibility for the accuracy, adequacy, or suitability of the item or service being provided as defined in the technical specification, nor does it constitute waiver of the right to renegotiate the terms of the technical specification.

### Block No.

### Entry Information

1. Supplier's company name, telephone number, facsimile number, and e-mail address.
2. Supplier's order number if one has been assigned.
3. Supplier's Part No (s). as applicable from the drawing, catalog, internal specification, etc.
4. Supplier's Part Name
5. Supplier's NCR No.
6. Specification Number and Revision Number
7. A/E Part No.
8. A/E Part name, if one has been assigned.
9. Date and method (Fax, E-mail, Letter, etc.) used to notify the Buyer's Quality Surveillance Representative (QSR) whenever quality surveillance is applicable.
10. Date and method (Fax, E-mail, Letter, etc.) used to notify A/E Engineering
11. Describe the deviating characteristics and define the extent of the out-of-specification for each identified piece affected. Include quantities and serial, lot, batch, heat, or other numbers as appropriate. Identify the location of the deviating characteristic by print coordinates or specific location, as applicable. Attach reproducible-quality extra sheets, sketches, etc., as necessary. When proposing a change in either supplier or A/E documents : describe the change : identify the documents completely including title or subject, date, and revision : and where appropriate, attach a copy of areas in question.
12. State proposed disposition.
13. Check cost impact that would result from proposed changes. If cost impact is marked "yes," the detailed cost amount shall be addressed on a separate sheet as an attachment to this SDDR.
14. Enter delivery schedule impact that would result from proposed changes.
15. Describe the proposed disposition and provide technical (and where appropriate, cost/schedule) justification for A/E evaluation. Attach reproducible quality copies whenever required. If the deviation is correctable by repair, submit a detail repair procedure or reference procedure previously submitted. Provide the Buyer PNS number, supplier number, and procedure title. For documents, provide suggested corrective wording, procedures, documents, etc. Provide a copy of each SDDR attachment to the Buyer QSR at the supplier's location.
16. Identify the nature changes that may be needed on associated supplier documents (drawings, specifications, procedures, manual, etc.)
17. Enter the name (typed or printed) and title of the supplier representative authorizing the disposition request and appropriate signature and date signed.
- \*18 Check all applicable boxes to define the action required by the A/E engineering.
- \*19 Provide appropriate justification for the A/E actions indicated in Block 18. When changes to drawings, specification, or other A/E documents are involved, each document should be identified and the associated change briefly described. If other suppliers are affected, indicate who they are and the document that initiated resolution of that involvement. Other followup action (e.g. the need for additional A/E calculations, additional drawings or sketches, inspection by a KAERI QSR, etc.) should also be identified here. If construction action is required, so indicate.
- \*20 RE - Signature of the responsible engineer accepting the engineering action and the date signed.  
EGS - Signature of the Engineering Group Supervisor who reviewed and concurred with the disposition and date signed.  
APM - Signature of the APM (or designee) and the date signed.
21. Signature of the supplier's inspector or other representative authorized to verify that the accepted disposition was correctly accomplished and the date signed.
- \*22 Signature of the Buyer's QSR (when a QSR is assigned to the order) or designee and the date signed.  
This signature indicated that the accepted disposition was correctly implemented and verified (on a random sample basis if the SDDR applies to several parts)

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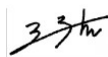
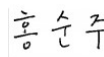
## APPENDIX 4H1

### Reporting Requirements for Defects and Noncompliance

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

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## **1.0**     **SCOPE**

- 1.1     This appendix specifies requirements necessary for implementing reporting of “Defects” and “Noncompliance” (Failure to comply) in accordance with regulations and notice below.
- (1) Foreign Supplier - When a defect or failure to comply under regulation of 10 CFR part 21 and 50.55(e) is discovered, it should be notified to the U.S.NRC/Buyer.
  - (2) Domestic Supplier - When a noncompliance to comply under NSSC(Nuclear Safety and Security Commission) Notice (Regulation on Reporting of Noncompliance) is discovered, it should be notified to NSSC.

## **2.0**     **TERMINOLOGY**

- 2.1     The terms used in 10 CFR part 21 and 50.55(e) of NRC Regulations are defined as follows:
- 2.1.1     10 CFR part 21(Reporting of Defects and Noncompliance)
- It requires that any individual director or responsible officer of a firm constructing, owning, operating or supplying the components of any facility or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended, or the Energy Reorganization Act of 1974, obtains information reasonably indicating :
- (1) that the facility, activity, or basic component supplied to such facility or activity fails to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, or license of the Commission relating to substantial safety hazards, or
  - (2) that the facility, activity, or basic component supplied to such facility or activity contains defects, which could create a substantial safety hazard, to immediately notify the Commission of such failure to comply or such defect.
- 2.1.2     10 CFR 50.55(e) (Condition of Construction Permits, Early Site Permits, Combined Licenses, and Manufacturing Licenses)
- It requires holders of construction permits for nuclear power facilities to report to the NRC those deviations, that on the basis of an evaluation, are determined to constitute a substantial safety hazard (defect); failures to comply that are associated with a substantial safety hazard; and significant programmatic breakdowns in the 10 CFR 50 Appendix B quality assurance program that could have led to the production of a defect.
- 2.1.3     Basic Component
- Nuclear power reactor plant structure, system, component or part thereof necessary to assure

- (1) The integrity of the reactor coolant pressure boundary,
- (2) The capability to shut down the reactor and maintain it in a safe shutdown condition, or
- (3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 50.34(a)(1), 50.67(b)(2), or 100.11, as applicable.

In all cases basic component includes safety-related design, analysis, inspection, testing, fabrication, replacement of parts, or consulting services that are associated with the component hardware, design certification, design approval, or information in support of an early site permit application under part 52, whether these services are performed by the component supplier or others.

2.1.4 Buyer

Purchaser, the organization responsible for issuance and administration of a contract, subcontract, or purchase order.

2.1.5 Constructing or Construction

The analysis, design, manufacture, fabrication, placement, erection, installation, modification, inspection, or testing of a facility or activity which is subject to the regulations in this part and consulting services related to the facility or activity that are safety-related.

2.1.6 Defect

- (1) A deviation in a basic component delivered to a Buyer for use in a facility, or an activity subject to the regulations in this part if, on the basis of an evaluation, the deviation could create a substantial safety hazard;
- (2) The installation, use, or operation of a basic component containing a defect as defined in (1);
- (3) A deviation in a portion of a facility subject to the early site permit, standard design certification, standard design approval, construction permit, combined license or manufacturing licensing requirements of part 50 or part 52, provided the deviation could, on the basis of an evaluation, create a substantial safety hazard and the portion of the facility containing the deviation has been offered to the Buyer for acceptance;
- (4) A condition or circumstance involving a basic component that could contribute to the exceeding of a safety limit, as defined in the technical specifications of a license for operation issued under part 50 or 52; or (5) An error, omission or other circumstance in a design certification, or standard design approval that, on the basis of an evaluation, could create a substantial safety hazard.

2.1.7 Deviation

A departure from the technical requirements included in a procurement document, or specified in early site permit information, a standard design certification or standard design approval.

2.1.8 Evaluation

The process of determining whether a particular deviation could create a substantial hazard

or determining whether a failure to comply is associated with substantial safety hazard.

**2.1.9 Substantial Safety Hazard**

A loss of safety function to the extent that there is a major reduction in the degree of protection provided to public health and safety for any facility or activity licensed, or otherwise approved or regulated by NRC, other than for export, under parts 30, 40, 50, 52, 60, 61, 70 or 71.

**2.1.10 U.S.NRC (United States Nuclear Regulatory Commission)**

Designated nuclear regulatory authority in U.S.

**2.2 The terms used in Notice of NSSS (Regulation on Reporting of Noncompliance) are defined as follows:**

**2.2.1 Nonconformance**

The condition of safety-related items which is deviated from or incompliant with requirements described in design or procurement documents.

**2.2.2 Noncompliance**

It is one of the below conditions of safety-related items

- (1) If not appropriate for technical standards on structure, items and performance as per “Regulations on Technical Standards for Nuclear Facilities, etc.” (including test, maintenance and repair related to structure, items and performance which is not properly conducted in accordance with technical standards);
- (2) If judged potential to violate licensing or permit criteria specified Article 11 and Article 21 of Nuclear Safety Act based on results of assessment of nonconformance detected by the operator under Article 6. However, when the operator is supplier or performance qualification institution, it applies only if its safety-related items are normally delivered to the Buyer.

**2.2.3 NSSC (Nuclear Safety and Security Commission) - Designated nuclear regulatory authority in Korea.**

**3.0 REQUIREMENTS**

**3.1 10 CFR part 21 (Reporting of Defects and Noncompliance)**

**3.1.1 The guidelines for reporting of defects and failure to comply under this regulation are as follows.**

- (1) Does the defect exist in a basic component?
- (2) Based on an evaluation is it determined that defect could create a substantial safety hazard?
- (3) Has the component been delivered or offered for acceptance?

3.1.2 It is the responsibility of the supplier to implement the provision of 10 CFR part 21 insofar as they are applicable to the supplier's work under this appendix.

3.1.3 The supplier should also require their sub-suppliers to implement the regulation of 10 CFR part 21.

**3.2 10 CFR 50.55(e) (Condition of Construction Permits, Early Site Permits, Combined Licenses, and Manufacturing Licenses)**

3.2.1 The guidelines for reporting of defects and failure to comply under this regulation are as follows.

- (1) Fail to comply with the Atomic Energy Act, as amended, or any applicable regulation, order, or license of the Commission, relating to a substantial hazard;
- (2) Contains a defect; or
- (3) Undergoes any significant breakdown in any portion of the quality assurance program conducted under the requirements of appendix B to 10 CFR part 50 which could have produced a defect in a basic component, These breakdowns in the quality assurance program are reportable whether or not the breakdown actually resulted in a defect in a design approved and released for construction, installation, or manufacture.

**3.3 NSSC Notice (Regulation on Reporting of Noncompliance)**

3.3.1 The guidelines for reporting of noncompliance under this regulation are as follows.

- (1) Does the safety-related items comply with technical standards for structure, items and performance related to NSSC Regulation (Regulations on Technical Standards for Nuclear Reactor Facilities. etc.) (including service that are testing and maintenance for structure, items and performance do not comply with technical standards)?
- (2) Does the nonconformance detected by suppliers have potential deviations to Article 11 and 21 of the Korea Nuclear Safety Act 15.3(Reporting on Nonconformities)?

**4.0 REPORTING**

4.1 The foreign supplier shall notify the U.S. NRC/Buyer of any defects and failure to comply which, based on evaluation, could create a substantial safety hazard which would normally be reportable under the requirements of 10 CFR part 21 and 50.55(e).

4.2 The domestic supplier shall evaluate if any nonconformance for safety-related items are subject to noncompliance. When the decision of noncompliance to comply under NSSC Notice (Regulation on Reporting of Noncompliance) is made, it should be notified to NSSS.

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## APPENDIX 4I

### Dynamic Qualification Requirements For Seismic Category I Equipment

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

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## **1.0 GENERAL**

- 1.1 The Scope of this Appendix is to establish the dynamic qualification requirements for Seismic Category I equipment. These requirements indicate the responsibility of the Supplier and provide the dynamic qualification requirements and typical procedures to qualify equipment.
- 1.2 Attachment 1 is a form to be used by the Supplier to summarize the Building Structure Loads at the equipment's foundation.
- 1.3 Attachment 2 is a form to be used by the Supplier at submittal of Dynamic Qualification Report.
- 1.4 Attachment 3 is a checklist to be used by the Supplier for the qualification test.
- 1.5 Attachment 4 is a form to be used by the Tenderer as a part of the proposal to evaluate the Supplier's qualification program.
- 1.6 When a Purchase Specification requires the Supplier to design welds, bolts, or anchor bolts used to mount equipment to the building structure, Section 10 of this Appendix provides design requirements.

## **2.0 DEFINITIONS**

- 2.1 Safe Shutdown Earthquake (SSE): The earthquake that produces the maximum vibratory ground motion for which all Safety-Related (S/R) structures, systems and components are designed to perform their safety (or intended) function. This earthquake is expected to be the largest earthquake that could occur at the site during the life of the plant and in some cases is called the Design Basis Earthquake (DBE).
- 2.2 Operating Basis Earthquake (OBE): The earthquake that produces a vibratory motion for which those structures, systems and components of a nuclear power plant which are necessary for continued operation are designed to perform their safety (or intended) functions without undue risk to the health and safety of the public. The 1/2 of SSE value is to be used for the OBE when OBE value is not provided by the Purchase Specification.
- 2.3 Seismic Category I Equipment
  - 2.3.1 Safety Related Equipment categorized as Seismic Category I shall necessarily ensure:
    - a. The integrity of the reactor coolant pressure boundary,
    - b. The capability to shut down the reactor and maintain it in a safe shutdown condition, or
    - c. The capability to prevent or mitigate the consequences of accidents that could result in

potential off-site exposures in excess of the limits stated in 10 CFR 100.11.

The Seismic Category I equipment associated with systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling and containment reactor heat removal; equipment essential to preventing significant release of radioactive material to the environment; and instrumentation needed to assess plant and environs conditions during and after an accident as described in NRC RG 1.97.

The function of this equipment may include:

- a. Equipment that performs the above functions automatically
- b. Equipment that operators use to perform the above functions manually
- c. Equipment for which failure can prevent satisfactory accomplishment of one or more of the above safety functions

#### 2.3.2 Non-Safety-Related Equipment Categorized as Seismic Category I

System designer may define non-safety-related equipment as Seismic Category I to ensure its intended function and structural integrity.

#### 2.3.3 All Safety-Related (S/R) included in Seismic Category I equipment shall be either active or passive.

#### 2.3.4 Active Equipment: Equipment containing moving parts, which in order to accomplish its function, must undergo mechanical movement of those parts, or must prevent a movement of those parts to ensure that the equipment will remain in its last position. The non-safety-related equipment that is categorized as Seismic Category I, and which can be classified with the same definition of active equipment above is also classified as 'active equipment' within this Appendix. This is because the same qualification approach for these equipment shall be applied wherever it is safety-related or not.

#### 2.3.5 Passive Equipment: Equipment that must maintain its pressure boundary and/or structural integrity (but not necessarily perform mechanical motion or have certain deflection limits) during the course of accomplishing a system safety function.

#### 2.3.6 Any equipment that is not designated as a Seismic Category I but could degrade the integrity of a Seismic Category I component shall be designed so that SSE would not cause structural failure.

#### 2.4 Floor Acceleration: The maximum acceleration of a particular building floor (or equipment mounting) resulting from a given dynamic excitation applied to the building. The maximum floor acceleration can be obtained from the floor response spectrum as the acceleration at high frequencies (the flat portion of the response spectrum curve) and sometimes referred to as the Zero Period Acceleration (ZPA).

#### 2.5 Response Spectrum: A plot of maximum responses of a family of idealized single-degree of freedom linear elastic oscillators subjected to transient vibratory base input motion. Each



damping value produces a different response spectrum.

- 2.5.1 Floor Response Spectrum: The response spectrum when the transient base excitation is the floor motion rather than the ground motion. The response spectra at the elevations where the equipment will be located are included with the Purchase Specification and are called Floor Response Spectrum (FRS).
- 2.5.2 The required response spectrum (RRS) constitutes a requirement to be met, which can be defined from FRS attached in the Purchase Specification, and includes the test margin required by IEEE-323.
- 2.5.3 Test Response Spectrum: The response spectrum resulting from the actual motion of the shake table for specified damping values. They may be derived by analytical techniques or by using spectrum analysis equipment, i.e., real time analyzer.
- 2.6 Dynamic Characteristics: The characteristics that are needed to determine the dynamic behavior of the equipment due to any forcing function. These characteristics are:
  - 2.6.1 Natural Frequencies: Free vibration frequencies of the system or a body depending only on its own physical characteristics (mass and stiffness), restraints and supports.
  - 2.6.2 Mode Shapes: The vibrational shape of the system when vibrating at one of its natural frequencies. Each natural frequency has a different mode shape.
  - 2.6.3 Damping: An energy dissipation mechanism that reduces the amplification and broadens the vibratory response in the region of resonance. Damping is usually expressed as a percentage of critical damping. Critical damping is defined as the least amount of viscous damping that causes a single-degree-of-freedom system to return to its original position without oscillation after initial disturbance.
- 2.7 Resonance: The condition that exists when the equipment has the same predominant period as does the applied forcing function.
- 2.8 Mathematical Model: The idealization of a component/structure/equipment as an assemblage of linear systems suitable for detailed dynamic analyses.
- 2.9 Dynamic Analysis: An analysis procedure for multi-degree of freedom systems where the responses are obtained for each normal mode and then combined to predict the true response and the associated stress and deflection due to any forcing function.
- 2.10 Static (coefficient) Analysis: An analysis that evaluates the stresses and deflections due to equivalent steady state forces acting through the center of gravity of the equipment. These forces shall be chosen conservatively such that it results in stresses and deflections higher than those predicted by dynamic analyses.
- 2.11 Supporting Tests: Tests that are conducted to determine the properties and characteristics of

the equipment and to provide data needed for the analysis or qualification tests.

- 2.12 Qualification Tests: Tests that are conducted to prove that the equipment shall perform its safety (or intended) function and maintain structural integrity when subjected to the loading combinations associated with different postulated plant conditions.
- 2.13 Device: An item of electric equipment that is used in connection with, or as an auxiliary to, other pieces of equipment.
- 2.14 Assembly: Two or more devices (or elements) sharing a common mounting or supporting structure.
- 2.15 Failure: The condition when an equipment can no longer perform its intended safety function.
- 2.16 Malfunction: Improper performance of mechanical or electrical equipment.

### **3.0 TENDER REQUIREMENTS AND SUPPLIER'S RESPONSIBILITIES**

- 3.1 The Tenderer shall submit a summary of dynamic qualification program (refer to Attachment 4), as a part of the proposal.
- 3.2 The Tenderer shall be responsible for resolving with the Buyer any uncertainties regarding the specifications and requirements of dynamic qualification, prior to award of contract.
- 3.3 The dynamic qualification of the equipment shall be achieved by testing, analysis or a combination of testing and analysis. When testing is employed, the Supplier shall submit to the Buyer a detailed test plan that satisfies the requirements of codes and Purchase Specification for review at the time that shall be strictly followed and specified in Appendix 4D of this specification. When analysis is employed, the Supplier shall submit to the Buyer a detailed analysis procedure showing the methodology, approval, and description of the computer program used. The qualification plan shall provide assurance that the equipment will perform its intended or safety function during and after Design Basis Earthquake. If the Buyer is not satisfied, the test plan or analysis procedure shall be modified accordingly.
- 3.4 The choice between testing and analysis may be made by the Supplier. However, the selected qualification program shall satisfy the requirements of this Appendix.
- 3.5 The Supplier shall describe in the qualification plan in detail how to fulfill the Code requirement and specification requirement set forth in this appendix and dynamic qualification requirement in Section 4 of technical specification. Detail qualification program such as qualification method, applicable Code & Standard and acceptance criteria shall also be described in the qualification plan.
- 3.6 After the Supplier submits the equipment drawings for final review, the Supplier is required to submit the dynamic qualification report for the test results and/or dynamic calculations.

The drawings, test results and analytical calculations will be reviewed for acceptability by the Buyer. The equipment drawing shall represent the dynamically qualified equipment to be finally supplied.

- 3.7 The Supplier shall answer all appropriate questions the Buyer may submit after reviewing the dynamic qualification report. If the answers given are not acceptable to the Buyer, the Supplier shall modify the method of qualification i.e., dynamic testing and/or the analysis procedure to satisfy the requirements of this Appendix and the dynamic requirements stipulated in the section 4 of the Purchase Specification.
- 3.8 In cases where the equipment fails to withstand the loads associated with the postulated plant condition under the dynamic qualification program, the Supplier shall be responsible for making all necessary changes to his equipment, at his own expense, so that the dynamic test results and/or the analytical calculations meet the dynamic qualification criteria requirements.
- 3.9 The Supplier shall assume that the supporting structure such as any in-place steel provided by the Buyer will behave as a rigid structural support (e.g. natural frequency greater than cutoff frequency). In cases where the supporting structure is not considered to be a rigid structure, the information to be utilized in the dynamic qualification will be provided by the Buyer.

#### **4.0 QUALIFICATION REQUIREMENTS**

- 4.1 The dynamic qualification of Seismic Category I equipment is achieved by assuring its structural integrity and verifying operability when subjected to equivalent conditions which would be seen during the postulated plant conditions. The Supplier may select one of the following qualification programs:
  - 4.1.1 Qualification by tests only.
  - 4.1.2 Qualification by analytical methods only.
  - 4.1.3 Qualification by the use of experience data.
  - 4.1.4 Qualification by combination of qualification tests, analytical method and experience.
- 4.2 Regardless of the equipment qualification programs chosen, the conditions and requirements for those portions of the program are stated in the following sections and shall be met.

#### **5.0 QUALIFICATION PROGRAMS**

- 5.1 Many factors control the design of a qualification program. If qualification is to be achieved by analysis only, all assumptions used in the analysis shall be given and justified. If testing alone is used for qualification, all applicable loads shall be simulated during the test unless it can be shown that the simultaneous application of certain loads is not necessary for assuring

the equipment's safety (or intended) function.

- 5.2 If the actual equipment and the qualification item (i.e. test specimen and/or static/dynamic analysis model) is not identical, it shall be verified through similarity analysis that the qualification item is the representative of the actual equipment.
- 5.3 When the equipment of the same type is installed in various locations, the seismic excitations specified in the Purchase Specification shall be applied in the most conservative way to envelop all seismic excitations at the installation locations over the entire frequency range.
- 5.4 Any external connection to the Buyer such as electric, mechanical, and any other interfaces shall be identified by the Supplier and qualification (by test and/or analysis) shall be performed by considering the effect of the external connection.
- 5.5 If the equipment is designed to be installed in-line and also supported on the primary structure, the dynamic qualification shall consider the effect of load transfer to the equipment.
- 5.6 For ARA project, Supplier shall satisfy the following Code & Standards conforming to type of equipment in accordance with US NRC Reg. Guide 1.100 Rev.3.

Type of Equipment	Applicable Code & Standards for Dynamic Qualification
Active Mechanical Equipment designed by KEPIC MN(ASME Section III)	ASME QME-1 QR-A-2007 <sup>1)</sup>
Air and Gas Treatment equipment designed by KEPIC MH (ASME AG-1)	KEPIC MH (ASME AG-1) IEEE 344-2004
Other Mechanical Equipment	IEEE 344-2004
Electrical Equipment	IEEE 344-2004

Note:

- 1) For any active mechanical equipment composed of electrical components such as motors, electric valve actuators, solenoid valves, and instrumentation and controls, the qualification result of the components shall meet the requirements of IEEE 344 and/or IEEE 382.
- 5.7 Qualification by Testing Only: Qualification by testing only is recommended when the following conditions are fulfilled:
- 5.7.1 The test machine is capable of producing the required motion in accordance with the conditions stated in Section 6 of this Appendix.
- 5.7.2 The applicable loads are of a simple nature or it is possible to simulate them.
- 5.7.3 The test table allows the simulation of actual mounting.
- 5.7.4 It is possible to monitor the functional capability of active equipment\* and electrical

equipment during the test.

\* This condition is also applicable to the non-safety-related equipment categorized as Seismic Category I where the definition of the active equipment in Section 2.3.4 is applicable.

- 5.7.5 The structural configuration of the equipment is extremely complex and beyond the capability of mathematical modeling techniques.
- 5.7.6 The response of the equipment is expected to be extremely nonlinear.
- 5.8 Qualification by Analytical Methods Only: Analytical calculations only may be used as a qualification method in the following cases:
  - 5.8.1 When maintaining the structural integrity is an assurance for the safety (or intended) function. In the case of equipment and devices that perform the function with electrical power or signals, the qualification only by analysis is not permitted.
  - 5.8.2 When the equipment is structurally simple.
  - 5.8.3 When the response of the equipment is linear or is a simple nonlinear behavior.
  - 5.8.4 When the effect of attached components and the superposition of load conditions are too complex for testing.
- 5.9 Qualification by the use of experience data: Experience Data may be used for a qualification of the equipment as follows:
  - 5.9.1 When qualifying equipment that are similar in function and physical characteristics to equipment that have been previously qualified by testing, analysis or a combination of testing and analysis.
  - 5.9.2 When the equipment type is similar to the equipment that has been in-service for various periods of time and has been exposed to in-plant vibration and natural seismic disturbances.
- 5.10 Qualification by Combination Tests and Analytical method:
  - 5.10.1 This approach may be used for qualification of complex and large assemblies such as control boards, switchgear assemblies, vertical pumps and motors, etc. An analysis approach may be used to determine the overall equipment integrity and response at the subassembly or component locations and the subassemblies may be tested to the response levels that are predicted analytically.
  - 5.10.2 After collecting the required information from test result (e.g. deflection, dynamic parameter, damping value, assumption of analysis), analytical techniques may be used to show that the structural integrity and/or operability of equipment is maintained. It must be noted that without performing some tests, analytical calculations alone is weak evidence for assuring operability. Each method shall satisfy relevant section of code and standard.

- 5.10.3 Based on analysis result (e.g. dynamic parameter), the most conservative test inputs that represent the dynamic characteristics of the equipment supplied can be determined or the representativeness of test specimen can be verified.
- 5.10.4 The response level derived by analysis shall be smoothed with each peak broadened to account for uncertainties in equipment natural frequency. The amount of broadening shall be justified by reference document.

## **6.0 QUALIFICATION TESTS**

- 6.1 Test method shall satisfy the requirements of IEEE Std. 344, ASME QME-1 QR-A and US NRC Regulatory Guide 1.100. Equivalent operating loads shall be simulated to act on equipment, but the equipment itself need not be under an operating condition. The following requirements are conditions for a properly conducted qualification test and shall be fulfilled:
- 6.2 Dynamic Input: The input for dynamic testing shall be determined from the floor motion or line-mounted equipment motion and shall be conservatively modified, as necessary, by the qualification procedure, setup and installed location. The input for dynamic testing shall include non-seismic vibratory loads (e.g. hydrodynamic loads, line break loads, and etc.) as well as seismic loads specified in the purchase specification. Appropriate margin shall be considered in required seismic input in accordance with IEEE 323. The horizontal dynamic loads shall be applied to envelop two horizontal direction loads simultaneously along with vertical dynamic loads.
- 6.3 Mounting: The equipment shall be mounted to simulate the actually installed service mounting. If this cannot be done, the effect of the actual supporting structure shall be considered in determining the input motion and a justification ensuring that the mounting condition of the equipment being qualified is conservative than the actual mounting condition shall be provided by the Supplier.
- 6.4 Nozzle Loads: The Purchase Specification states the expected (or calculated) piping reaction loads on the equipment that shall be used in the qualification.
- 6.5 Other Loads: Any other loads that may act on the equipment (Mechanical, electrical or instrument) during the postulated dynamic event shall be simulated during the test, unless the supporting tests (or calculations) show that they are insignificant.
- 6.6 Damping: The selection of damping values to be used with the response spectrum curves in determining the acceleration is a significant factor. If damping value of purchase specification is not used, justified value can be used according to code and standard. Appropriate value of damping may be obtained from test or other justifiable source (for example the US NRC Regulatory Guide 1.61).
- 6.7 In case that the FRS is provided for the seismic input in Purchase Specification, Random Multi-

Frequency Test shall be performed in accordance with IEEE 344. For the random multi-frequency test, the duration of the strong motion of each test should at least be equal to the strong motion portion of the original time history used to obtain the RRS, with a minimum of 15 s. Also, in case that Seismic Coefficient, which is the seismic acceleration value of in-line system, is required in Section 4 of Purchase Specification, Single-Frequency test shall be performed in accordance with the requirement of IEEE-382. In case of sine beat test, a test consists of a series of several sine beats at any frequency and each beat has peak acceleration. The peak acceleration of all beats shall satisfy the requirement of the Purchase Specification.

- 6.8 Basis of Acceptability: Inspection shall be made by the test conductor to assure that no structural damage has occurred. For equipment whose operability shall be verified, sufficient monitoring devices shall be used to evaluate the performance of the tested equipment during the test. The equipment shall demonstrate its ability to perform its safety (intended) function when subjected to all applicable loads. A test report, which includes all test data, results and conclusions, shall be submitted to the Buyer for review. A suggested format for the test report is presented in Section 12. The Supplier shall follow the outline of Section 11 for documenting the dynamic testing. This will facilitate the review of the material in the report and ensure its completeness.
- 6.9 The Supplier shall attend Equipment Qualification test if it is a part of the qualification plan. Test agency and the Supplier (or the equipment manufacturer) shall have a general review meeting prior to the test and after the test. The Equipment Qualification test checklist in Attachment 3 of this appendix shall be confirmed and signed by both a test agency and a supplier. The checklist shall be appended in the qualification report.

## **7.0 ANALYTICAL QUALIFICATION**

- 7.1 The methods to be used for qualification, by analysis only or by analysis based on test results, are stated in this section. Analytical methods will depend on the type of equipment and supporting structure.
- 7.2 The selection of damping values to be used with the response spectrum curves in determining the acceleration is a significant factor. If damping value of purchase specification is not used, justified value can be used according to code and standard. Appropriate value of damping may be obtained from test and other justifiable source (for example the US NRC Regulatory Guide 1.61)
- 7.3 Equipment Supplied with Attached Piping:
- a. For equipment supplied with attached piping, due to construction requirements, the Supplier shall perform an analysis for the attached piping as well as the equipment.
  - b. The analysis shall satisfy the piping design criteria specified in the Purchase Specification.

- c. The procedure for analysis shall be determined according to the situation. If the equipment is attached to the floor, then the equipment shall be analyzed first to determine the input to the piping. However, if the equipment is attached to the piping only, (pipe-mounted) the analysis of the piping shall yield the loads to be used in the analysis of the equipment.

7.4 Equipment Supported by Different Buildings or Different Elevations within the Same Building:

- a. This is usually the case for piping, HVAC ducts and cable trays.
- b. Stresses resulting from relative displacements at various support locations for systems identified above shall be superimposed to the stresses produced in the system due to inertia effects.
- c. Additional restraints, supports or other means shall be employed to limit or reduce the high response loads.

7.5 Plant Conditions/Service Levels/Loading Combinations:

The loading combinations are defined in accordance with different real and postulated plant conditions and equipment service levels for pressure retaining components. These plant conditions/equipment service levels shall be classified as stated in the Pressure Vessel Code & Standards (e.g. ASME Boiler and Pressure Vessel Code, Section III). The same concept of plant condition/equipment service levels shall be applied on all mechanical and electrical equipment, as well as control and instrumentation. However, if the stresses and deflections of the more severe loading condition/service level meets the design limits of the less severe loading condition/service level, it may not be required to check the additional loading conditions/service levels. The loading combinations for the same plant condition/service level shall depend on whether the equipment is a pressure retaining (fluid system component) or a non-pressure retaining (non-fluid system component). In addition, the design stress limits shall depend on whether the equipment is classified as active or passive.

7.6 Service/Design Limits: Unless otherwise stated in the Purchase Specification, there shall be no deflection limits required for passive equipment. However, for active equipment the deflection limits shall be those maximum deflections that would not impair the operability of the equipment. The stress limits for Pressure Vessel Code & Standards (ASME Section III) and Non-Pressure Vessel Equipment and Supports are summarized in Table I.

7.7 Dynamic Loads: The dynamic loads shall be obtained, in the horizontal and vertical directions, from the corresponding response spectra provided by the Buyer for the two postulated accidents, upset and emergency conditions. Dynamic loads are specified in the purchase specification by designer, and dynamic loads include seismic load, hydrodynamic loads, line break loads and etc. Supplier shall perform seismic qualification by combining loads according to method specified in the purchase specification. The horizontal dynamic loads shall be applied to envelop two horizontal direction loads simultaneously along with the vertical dynamic loads. For the analysis of the tank containing liquid inside, the sloshing effect should be considered. The seismic input with 0.5% damping value shall be applied when the sloshing effect should be



considered. If the corresponding response spectrum is not available from the specification, the Supplier should request the information to Buyer for the qualification.

- 7.8 Nozzle Loads: The Purchase Specification will specify the nozzle loads that shall be used in the qualification.
- 7.9 Operating Loads: All loads resulting from the operation of the equipment such as torque due to rotating parts, vibratory loads due to eccentricities, etc. Operating loads shall be combined with specified dynamic load for seismic qualification.
- 7.10 Methods of analysis: Acceptable analytical procedures, for the various conditions, are described in the following sections:
  - 7.10.1 Static (coefficient) Analysis: If it can be shown that the equipment and its support are rigid, a static analysis may be performed to determine the stresses and deflections due to dynamic loads. In this case, the dynamic forces shall be determined by multiplying the mass of the subassembly or parts of the equipment times ZPA (zero period acceleration from the response spectra). If the fundamental natural frequency is not known, a static analysis using 1.5 times the maximum peak of the applicable floor response spectra, is acceptable. If the fundamental natural frequency is known, a Simplified Dynamic analysis using 1.5 times the highest g value of the applicable floor response spectra from the fundamental frequency to the cutoff frequency, is acceptable. These forces shall be applied through the center of gravity of the subassembly or the part of the equipment. The stresses resulting from each force (in each of the three directions) shall be combined by taking the square root of the sum of the squares (SRSS) to yield the dynamic stresses. The dynamic deflections (deflections due to dynamic loads) shall be calculated in the same manner. These dynamic stresses and deflections shall be added to all stresses and deflections resulting from all applicable loads, to obtain the final resultant stresses and deflections, which shall be compared with the design limits stated in Section 7.6. Furthermore, deflections are verified by the assuring operability. For ARA project, 50 Hz of cutoff frequency shall be applied.
  - 7.10.2 Dynamic Analysis: When acceptable justification for static (coefficient) analysis cannot be provided, a dynamic analysis shall be required, and unless a conservative factor is used to account for the participation of higher modes, a detailed dynamic analysis shall be performed. A mathematical model may be constructed to represent the dynamic behavior of the equipment. The model can be analyzed using the response spectrum modal analysis or time-history (modal or step-by-step) analysis. The maximum inertia forces, at each mass point, from each mode, shall be applied at that point, to calculate the modal stresses and modal deflections. The various modal contributions shall be combined by taking the square root of the sum of the squares of the individual modal stresses or deflections. Closely spaced modes shall be combined by using an approach from US NRC Regulatory Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis". The stresses and deflections resulting from each of the three directions shall be combined by taking the square root of the sum of the squares, to obtain the dynamic stresses and deflections. These dynamic stresses and deflections shall be added to all stresses and deflections resulting from all applicable loads and then compared with the design limits stated in Section 7.6.

- 7.11 Basis of Acceptability: The resultant stresses and deflections, due to all loads included in the loading combinations stated in the Purchase Specification, shall be within the design limits stated also in the Purchase Specification. Any deviation from these criteria shall be justified and the calculations shall show that the structural integrity of all Seismic Category I equipment, as well as the operability of active equipment and non-safety related equipment whose operability should be demonstrated is maintained when subjected to the specified loading combinations. The Supplier shall submit to the Buyer a report, which includes the data, calculations, results and conclusions of the analysis. A suggested form for the report is presented in Section 12.

## **8.0 EXPERIENCE DATA**

- 8.1 The method to be used for qualification, by the use of experience data, is stated in this section. This method may be accomplished by justifying similarity with the previously qualified equipment or earthquake experience data. Experience data may be derived from the following source.
- 8.1.1 Previous Qualification Item
- a. Pre-qualified item shall meet the codes and specification requirements.
  - b. Supplier shall document in detail whether the capacity of pre-qualified item satisfy the responses at the installed location within all frequency range meeting the Codes and Specification requirement.
- 8.1.2 Earthquakes experience data
- a. Earthquake experience data may be obtained from equipment in facilities that have experienced natural earthquakes.
  - b. The use of earthquake experience data for the seismic qualification requires an approval of regulatory commission in accordance with US NRC Reg. Guide 1.100 Rev.3.
- 8.2 Similarity: Qualification by the use of experience data shall be based on the concept of dynamic similarity for excitation, physical system, dynamic response and operability as follows.
- 8.2.1 Similarity of excitation such as spectral characteristics, duration, directions of excitation axes, and location of measurement, for the motions relative to the equipment mounting.
- 8.2.2 Similarity of the equipment configuration (e.g. dimension, weight, material property, etc.) shall be established.
- 8.2.3 A physical system dynamic response can be described through the same quantities as those applied to excitation or through a physical system description (e.g. natural frequency, damping, etc.).
- 8.2.4 The experience data shall provide documented evidence to support the demonstration of proper operability.

## **9.0 OPERABILITY OF SEISMIC CATEGORY I EQUIPMENT**

The Supplier shall prove by test and/or analysis the operability of all active equipment before, during, and after (if required) Design Basis Earthquake. If the Supplier verify the operability of equipment by analysis, safety (or intended) function shall be clearly identified and quantified in terms of stress, deformation and displacement limits in any critical part of the equipment. Otherwise, operability shall be demonstrated by testing. Also the supplier provides the test or analysis report as a part of the dynamic qualification report.

### **9.1 Electrical and Instrumentation**

The Supplier shall use the qualification test methods described in Section 6.0 of this Appendix to prove the operability of active electrical and instrumentation equipment.

### **9.2 Mechanical Equipment**

For mechanical equipment, the Supplier should prove the operability by analysis and/or tests as follows:

#### **9.2.1 Pumps**

A static deflection analysis and/or test for the shaft and rotor (if applicable) should be performed under design base loading, including the maximum allowable nozzle loads specified in the Purchase Specification. The deflection shall be less than the allowable/recommended deflection by the Supplier.

#### **9.2.2 Valves**

The operability requirements shall be followed by the Supplier and are considered part of this Appendix.

##### **9.2.2.1 Acceptable Methods to Prove Valve Operability**

The following are the acceptable methods that can be applied by the Supplier to demonstrate valve operability:

##### **9.2.2.1.1 Manual Valves**

Active manual valves are those that should be opened, or closed, after Design Basis Earthquake. In this case, Supplier shall prove by analysis and/or test that the valve moving parts (stem, disc, etc.) are not permanently damaged due to Design Basis Earthquake along with the maximum operating and nozzle loads.

##### **9.2.2.1.2 Check Valves**

Supplier shall prove by test and/or analysis the integrity of the valve and its critical parts.

The valve's operability verification document should address by test and/or analysis all possible worst loading conditions on the valve during and after seismic events including any applicable impact loading.

##### **9.2.2.1.3 Other Active Valves**

All other active valves (except manual, and check valves) should be subjected to the following tests and/or analyses to demonstrate operability:

- a. Test and/or analysis should be performed for static equivalent seismic loads applied at the center of gravity (CG) of valve's extended structure.

9.2.3 Mechanical Drive Turbines

The operability of the mechanical drive turbine should focus primarily on the operability of auxiliary active components (valves, pumps, instruments) associated with or mounted on the turbine. The operability should be performed by analysis and/or test.

9.2.4 Fans

The Supplier shall demonstrate the operability of fans by performing an analysis and/or test to determine the shaft and bearing deflections when the fan is subjected to the external design base loads. The resulting clearance between the shaft and bearing as a result of these loads shall be smaller than the recommended clearance by the manufacturer.

9.2.5 Diesel Engine

For the operability of the diesel engine and its auxiliary active components (valves, pumps, instruments), the Supplier shall follow the methods described in IEEE 387 and US NRC Reg. Guide 1.9.

## **10.0 BUILDING STRUCTURE LOADS**

- 10.1 Regardless of the qualification method(s) used, the Supplier shall be required to provide the Buyer with all the loads transmitted to the building structure. The following loads shall be included in the calculations and the results for each shall be given separately:

10.1.1 Dead load

10.1.2 Operating loads

10.1.3 Nozzle Loads (if applicable)

10.1.4 Pressure and thermal loads (if applicable)

10.1.5 Additional loads due to dynamic excitations (if applicable)

10.1.6 Any other loads which may be transmitted to the foundation during the dynamic event.

- 10.2 The Supplier shall fill the Building Structure Load Summary Form (Attachment 1) for each equipment. And, detailed load and stress calculation of mounting connection shall be included in Building Structure Load Summary.

- 10.3 When the purchase specification requires the Supplier to design the mounting connection to the building structure, calculations may be included in the Building Structure Load Summary. If these calculations are provided as a separate document, they shall be referenced in the Building Structure Load Summary. Table II and Table III indicate load combinations and

stress limits and strength limits for design of bolted and anchor bolted connections to the building structure.

## **11.0 DOCUMENTATION**

Prior to start any qualification program, the supplier shall submit to the buyer for approval the selected qualification method and the related proper justification. If the qualification is based on analysis, the Supplier shall submit to the Buyer for approval, prior to start any calculation, the selected method of analysis with Codes and Standards to be applied for the qualification by analysis. If qualification is based on testing, the supplier shall submit to the Buyer approval, prior to start any qualification program, the test method and procedure.

The dynamic qualification report shall include all the information stated in Section 12 and shall be submitted to the Buyer for review and approve. The Seismic Qualification Supplier Checklist (Attachment 2) shall be included in the dynamic qualification report.

## **12.0 FORMAT OF THE DYNAMIC QUALIFICATION REPORTS**

The qualification reports shall include both information suggested below and documentation requirement of Sec.11.3 of IEEE 344, and shall present a clear, logical explanation of how the data has been used to achieve qualification.

### **Title Page**

The following information should be shown on the Title Page:

- A. Buyer
- B. Supplier and Equipment Name
- C. Specification Number
- D. Revision Number
- E. Date
- F. Equipment Tag Number
- G. Quality class and Seismic Category

### **I - General**

This section shall include the seismic qualification supplier checklist (Attachment 2) and a description of the equipment, its safety (or intended) function(s) and the qualification program used to verify the safety (or intended) function(s). In addition, the following information shall be provided:

- A. The Seismic Qualification Supplier Checklist (Attachment 2)
- B. Project and the Buyer Names
- C. Specification and Purchase Order Numbers
- D. Equipment Name and Number

- E. Organization(s) performing qualification program
- F. Similarity analysis showing the similarity between the equipment being qualified and the equipment purchased from Supplier.
- G. Location (Building, Elevation)
- H. For qualification agencies located in Korea, the Supplier shall submit the qualification certificate issued by Korea Foundation of Nuclear Safety (KoFONS) in seismic qualification report. The only exception to this requirement is for pre-qualified reports issued before 2016 January 1st.
- I. Acceptance Criteria

## II - Data and Assumptions

### A. Testing Section

The following data shall be included:

- 1) Type of testing machine
- 2) Loads considered and attempts made to idealize them during the test
- 3) Methods used to simulate the supporting structure
- 4) Position and orientation of setting equipment
- 5) Steps taken to monitor the function of equipment during the test and tentative accelerometer locations (photographs are recommended)
- 6) Means of generating test response spectra (if applicable)
- 7) Calibration dates and results for all instruments used in the dynamic test
- 8) Approved test plan
- 9) Anomaly with justification and refurbishment during seismic testing (if any)
- 10) All document used in generating seismic qualification report shall be identified and referenced.
- 11) Data for independent input motion (if any)

### B. Analytical Section

The following data shall be presented:

- 1) Loads considered
- 2) Damping values used in the analysis
- 3) Codes and Standards used as bases for the analysis
- 4) Assumptions made for idealizing boundary conditions, converting the load criteria to actual loads used for calculations and converting the design criteria to actual stress, deformation and stability limits.
- 5) A list of the computer programs used in the analysis and the documentation, which establish the validity of any computer program used, if not included in the public domain.
- 6) Input and output data of the computer program to verify the loading criteria and analysis result.
- 7) The failure modes used to determine functional adequacy shall be clearly identified and computed margins to failure presented for active mechanical equipment and the

equipment defined Section 2.3.4 of this Appendix.

### III - Qualification Procedure

- A. Testing Section: State type of test, wave form, frequency range, acceleration levels, axes of excitation, phase between inputs, equipment mounting details during testing, and any other data to completely describe the input motion and show how it is applied.
- B. Analytical Section: State the method used in the analysis, analytical equations and their derivation from basic principles. The calculations should be mentioned, if any.

### IV - Results

- A. Testing Section: This section shall include the measurements obtained from the test and their interpretations. Findings and observations from monitoring the function of the equipment and/or inspection shall be presented. The generated test response spectra curves superimposed on the required response spectra curve shall be shown in this section, when applicable. All results should be presented in either numerical or graphical form. A detailed summary of the test and result such as time history, TRS, coherence, natural frequency, correlation data and monitoring data shall be presented. Also if anomaly or exception is experienced during testing, it shall be justified and documented in the qualification report.
- B. Analytical Section: Show actual design calculations and sketches for the mathematical models, including numbering used for the node points and numbers. If possible, show loads, resultant forces, moments, stresses and deformation on the mathematical model of the equipment. A detailed summary of the analysis and result such as stress, mass, natural frequency and participant factor shall be presented. If some contents in other reports (e.g. design report) are referenced for the purpose of the dynamic qualification, the dynamic qualification report shall include the result that the stresses and natural frequencies satisfy the qualification requirements.
- C. For Active equipment: Demonstrate the method used and results of equipment operability during and/or after design basis events, as required in Purchase Specification.

### V - Conclusions

Give a brief summary of the results obtained from the qualification program. A concise statement of the conclusion reached, which should satisfy the qualification requirements, shall be stated in this section.

### VI - Drawings

Submit approved design drawings of the equipment and its supports. All necessary dimensions shall be shown on these drawings.

## **13.0    REFERENCES**

- 13.1    US NRC Reg. Guide 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants"
- 13.2    US NRC Reg. Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis."
- 13.3    NUREG-0800 (SRP 3.7, 3.9 and 3.10), "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. "
- 13.4    IEEE Std 323, " Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations."
- 13.5    IEEE Std 344, "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."
- 13.6    IEEE Std. 382, "Standard for Qualification of Safety-Related Actuator for Nuclear Power Generating Stations."
- 13.7    ASME QME-1, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants "
- 13.8    US NRC Generic letter No. 89-10, "Safety-Related MOV testing and Surveillance."
- 13.9    IEEE Std. 387, "Standard Criteria for Diesel-Generator Units Applied as Standby Power Suppliers for Nuclear Power Generating Stations."
- 13.10    US NRC Reg. Guide 1.9 "Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants."
- 13.11    ACI 349, "Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-01) and Commentary."
- 13.12    ANSI/AISC N690 - including Supplement 1, "Specification for Safety-Related Steel Structures for Nuclear Facilities."
- 13.13    US NRC Reg. Guide 1.73, "Qualification tests of electric valve operators installed inside the containment of nuclear power plants."
- 13.14    US NRC Reg. Guide 1.199, "Anchoring Components and Structural Supports in Concrete."
- 13.15    US NRC Reg. Guide 1.29, "Seismic Design Classification."



- 13.16 US NRC Reg. Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants."
- 13.17 US NRC Reg. Guide 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants."

**TABLE I – STRESS LIMITS FOR EQUIPMENT & SUPPORTS**  
(EXCLUDING ITEMS ASSOCIATED WITH BUILDING STRUCTURE – REFER TO SKETCH1 (a))

Plant Operating Condition	Loading Combination	**Stress Limits for KEPIC MN (ASME Section III) Equipment and Supports (use Appropriate class and subsections)		**Stress Limits for Non-KEPIC MN (Non – ASME Section III) Equipment and Supports <sup>1)</sup>
		Active Equip.	Passive Equip.	
Normal	Dead Loads + Pressure Loads + Thermal Expansion Loads <sup>4)</sup> + Equip. Operation Loads <sup>5)</sup> + Nozzle Loads	Service Limit A	Service Limit A	KEPIC SND 3000 (AISC N690-94 including Supplement 1, section Q1.5)
Upset	Dead Loads + Pressure Loads + Thermal Expansion Loads <sup>4)</sup> + Equip. Operation Loads <sup>5)</sup> + Nozzle Loads + Upset Condition Dynamic Loads <sup>6)</sup>	* Service Limit B	Service Limit B	* KEPIC SND 3000 (AISC N690-94 including Supplement 1, section Q1.5)
Emergency And Faulted	Dead Loads + Pressure Loads + Thermal Expansion Loads <sup>4)</sup> + Equip. Operation Loads <sup>5)</sup> + Nozzle Loads + Emergency / Faulted Condition Dynamic Loads <sup>7)</sup>	* Service Limit B	Service Limit C and D respectively	* KEPIC SND 3000 (AISC N690-94 including Supplement 1, section Q1.5) multiplied by 1.6 but not to exceed 0.95 F <sub>y</sub> for tension; and multiplied by 1.4 but not to exceed 0.95 F <sub>y</sub> /√3 for shear

\* For active components, shaft (rotor) deflection analysis shall be performed for verifying operability.

\*\* The allowable limits for Seismic Category I equipment shall be applied to evaluate the structural integrity in accordance with the Codes and Standards applied for the equipment design. If not, the recommended allowable limits(above table) can be used.

\*\*\*The Loading Combination is an example. Detailed loading combination method shall be confirmed to system designer and/or comply with the Purchase Specification.

**TABLE II – STRENGTH LIMITS FOR BOLTING TO STEEL BUILDING STRUCTURE \***  
(INDEPENDENT OF EQUIPMENT CLASSIFICATION – REFER TO SKETCH 1 (b))

Plant Operating Condition	Loading Combination	Strength Limits
Normal	Dead Loads + Pressure Loads + Thermal Expansion Loads <sup>4)</sup> + Equip. Operation Loads <sup>5)</sup> + Nozzle Loads	KEPIC SND 3000/ 5000/8000 (AISC N690-94 including Supplement 1, section Q1.5/Q1.6/ Q1.16/Q1.23)
Upset	Dead Loads + Pressure Loads + Thermal Expansion Loads <sup>4)</sup> + Equip. Operation Loads <sup>5)</sup> + Nozzle Loads + Upset Condition Dynamic Loads <sup>6)</sup>	KEPIC SND 3000/ 5000/8000 (AISC N690-94 including Supplement 1, section Q1.5/Q1.6/ Q1.16/Q1.23)
Emergency And Faulted	Dead Loads + Pressure Loads + Thermal Expansion Loads <sup>4)</sup> + Equip. Operation Loads <sup>5)</sup> + Nozzle Loads + Emergency / Faulted Condition Dynamic Loads <sup>7)</sup>	KEPIC SND 3000/ 5000/8000 (AISC N690-94 including Supplement 1, section Q1.5/Q1.6/ Q1.16/Q1.23) multiplied by 1.6 and 1.4 for tension and shear stress limits respectively

\* BUILDING STRUCTURE REFERS TO A/E DESIGNED COMPONENT (REFER TO SKETCH 1(b))

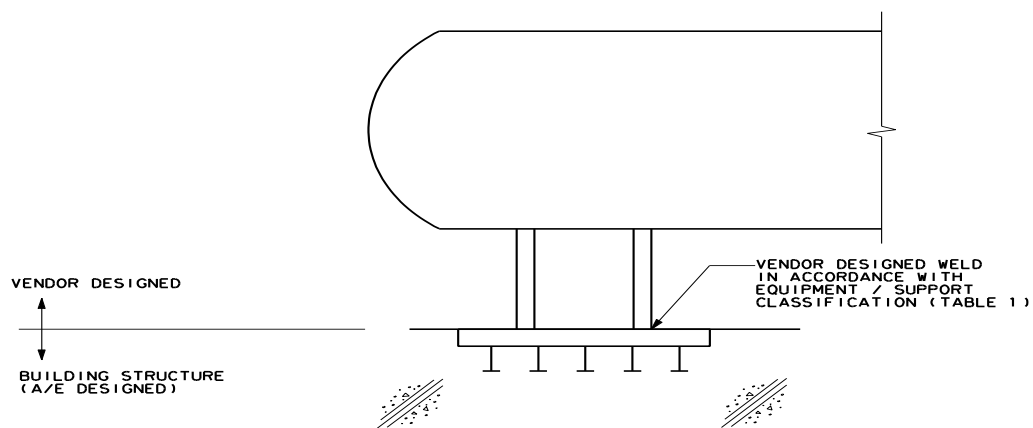
**TABLE III – STRENGTH LIMITS FOR ANCHOR BOLTS IN BUILDING STRUCTURE \***  
(INDEPENDENT OF EQUIPMENT CLASSIFICATION – REFER TO SKETCH 1 (c))

Plant Operating Condition	Loading Combination	Strength Limits for cast-in anchor per KEPIC SNC 2005(ACI 349-01) Appendix B <sup>2)</sup>
Normal	(1.4 <sup>3)</sup> ) Dead Loads + (1.7) Pressure Loads + (1.3) Thermal Expansion Loads <sup>4)</sup> + (1.7) Equip. Operation Loads <sup>5)</sup> + (1.4) Nozzle Loads	Tensile Strength $\phi_n N_s = \phi_n A_{se} f_{ut} \geq N_u$ where, $f_{ut}$ shall not be taken greater than $1.9f_y$ or 125,000 psi.
Upset	(1.4 <sup>3)</sup> ) Dead Loads + (1.7) Pressure Loads + (1.3) Thermal Expansion Loads <sup>4)</sup> + (1.7) Equip. Operation Loads <sup>5)</sup> + (1.4) Nozzle Loads + (1.7) Upset Condition Dynamic Loads <sup>6)</sup>	Shear Strength $\phi_s V_s = \phi_s (0.8)^{8)} (0.6) A_{se} f_{ut} \geq V_u$ where, $f_{ut}$ shall not be taken greater than $1.9f_y$ or 125,000 psi.  Tension / Shear Interaction $\frac{N_u}{\phi_n \cdot N_s} + \frac{V_u}{\phi_s \cdot V_s} \leq 1.2$ where, $\phi_n = 0.80, \phi_s = 0.75$
Faulted	(1.0 <sup>3)</sup> ) Dead Loads + (1.0) Pressure Loads + (1.0) Thermal Expansion Loads <sup>4)</sup> + (1.0) Equip. Operation Loads <sup>5)</sup> + (1.0) Nozzle Loads + (1.0) Emergency / Faulted Condition Dynamic Loads <sup>7)</sup>	Note) <ul style="list-style-type: none"> <li>■ The tensile &amp; shear stress area for anchor shall be taken as  <math display="block">A_{se} = 0.7854 \left[ D - \frac{0.9743}{n} \right]^2</math> where,  D : Major thread diameter  n : Number of threads per inch</li> <li>■ Minimum center-to-center spacing  For untorqued anchors : <math>4d_o</math>  For torqued anchors : <math>6d_o</math>  Maximum anchor diameter(<math>d_o</math>) <math>\leq 2</math> in  where,  <math>d_o</math> : Outside diameter of anchor</li> <li>■ If required, Vendor shall modify anchor bolt details including bolt diameter, number of bolt, bolt material and bolt arrangement as recommended by A/E</li> <li>■ If the concrete expansion anchor (post installed anchor) is used, the bolt adequacy check shall be done based on the KEPIC SNC 2005(ACI 349-01) Appendix B.</li> <li>■ See KEPIC SNC 2005(ACI 349-01) Appendix B for nomenclatures shown on this table.</li> </ul>

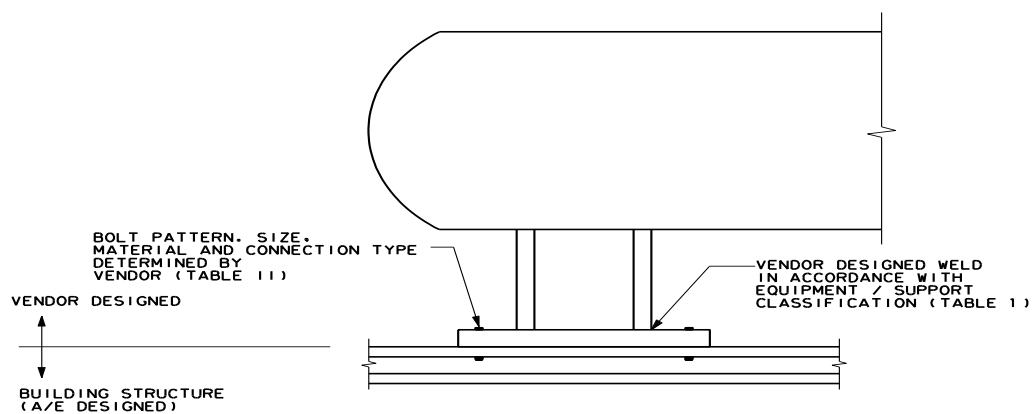
\* BUILDING STRUCTURE REFER TO A/E DESIGNED COMPONENT (REFER TO SKETCH 1(c))

Note:

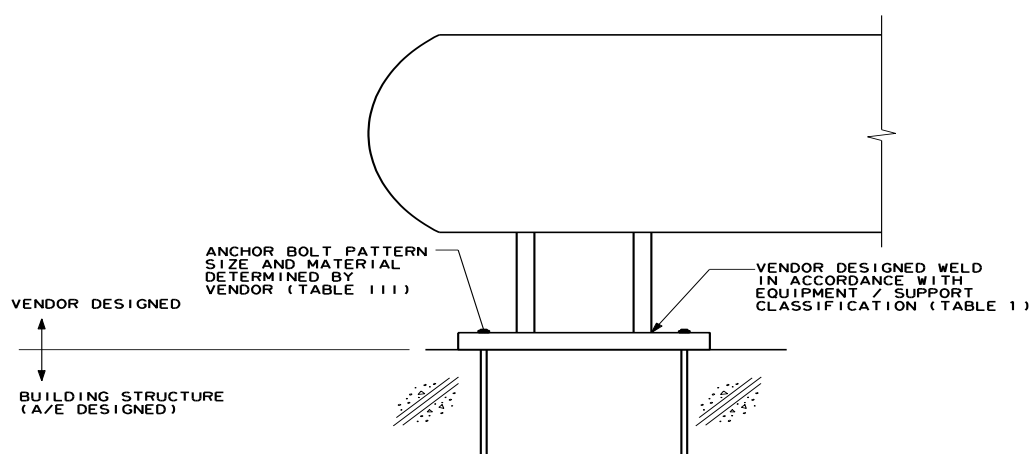
- 1) Weld allowable stresses shall be per KEPIC SND 3000 (AISC N690-94 including Supplement 1, Q1.5.3) for Normal & Upset Load Cases.  
For Emergency and Faulted Load Cases, the allowable stresses per KEPIC SND 3000 (AISC N690-94 including Supplement 1, Table Q1.5.3) may be increased by 1.6 but shall not exceed  $0.95 F_y$  for tension and by 1.4 but shall not exceed  $0.95 F_y / \sqrt{3}$  for shear.
- 2) Strength limits follow the conditions set forth in Regulatory Guide 1.199.
- 3) When calculating the vertical forces induced from the gravity of the floor-mounted equipment, the load factor of the dead load shall be (-)0.9 instead of (+)1.4 or (+)1.0.
- 4) Thermal expansion load shall be considered only if the thermal expansion of equipment affects the supporting system.
- 5) Equipment operating loads are those loads associated with the operation of the equipment being qualified. Equipment operating loads include but are not limited to :
  - a) Motor start-up and running torque
  - b) Valve seating torque and/or thrust
  - c) Thrust load on fans and pumps
- 6) Upset condition dynamic loads include operating basis earthquake plus other postulated dynamic loads as identified in the Purchase specification.  
When design of connections (weld, bolt or anchor bolt) to A/E designed building structures, operating basis earthquake is not considered in upset condition dynamic loads.
- 7) Faulted condition dynamic loads include the safe shutdown earthquake plus other postulated dynamic loads as identified in the Purchase Specification.
- 8) The factor shall be used only where anchor is used with built-up grout pad.



(a) EQUIPMENT SUPPORT DIRECTLY WELDED TO BUILDING STRUCTURE



(b) EQUIPMENT SUPPORT BOLTED TO STEEL BUILDING STRUCTURE



(c) EQUIPMENT SUPPORT ANCHOR BOLTED TO CONCRETE BUILDING STRUCTURE

## SKETCH 1 - TYPICAL EXAMPLES OF EQUIPMENT ATTACHMENTS TO BUILDING STRUCTURE

**ATTACHMENT 1**

**BUILDING STRUCTURE LOAD SUMMARY FORM**

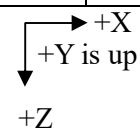
**BUILDING STRUCTURE LOAD SUMMARY FORM**  
(Seismic Category I Equipment Foundation)

Client:		Prepared by :	Date :
Project :	Project No. :	Reviewed by :	Date :
Equip. Name :		Approved by :	Date :
Equip. No. :		Drawing No. :	
Building Location :		<input type="checkbox"/> Safety Related Equipment	
Building Elevation :		<input type="checkbox"/> Non-Safety Related Equipment	

Building Structure Loads		Forces (kips)			Moments (ft-kips)		
		F <sub>X</sub>	F <sub>Y</sub>	F <sub>Z</sub>	M <sub>X</sub>	M <sub>Y</sub>	M <sub>Z</sub>
Dead Loads							
Operating Loads							
Pressure Loads							
Nozzle Loads	Service Level A&B (Normal & Upset)						
	Service Level D (Faulted)						
Dynamic Loads	Service Level B (Upset)						
	Service Level D (Faulted)						
Thermal Expansion Load	Service Level A (Normal)						
	Service Level B (Upset)						
	Service Level D (Faulted)						

Foundation Plan Sketch<sup>1), 2)</sup>

(If necessary, use separate page.)



- Note 1) The above building structure loads are the resultant directional forces and moments at the geometric center of the foundation bolt group or weld group and unfactored loads. Indicate the geometric center of the foundation bolt group or weld group on the foundation plan sketch.
- 2) Global axes X, Y & Z are mutually perpendicular at the equipment base/foundation, where axis Y coincides with the vertical direction
- 3) The resultant directional moments at the foundation are a summation of applicable local moments and transferred local force contributions.



**ATTACHMENT 2**

**SEISMIC QUALIFICATION SUPPLIER CHECKLIST**

## INSTRUCTIONS

In the space provided for comments after each question, the supplier shall

- a. indicate the applicable sections of the dynamic qualification report (where such information can be found) in “comments” column if answer to the question is "YES."
- b. indicate if the exclusion of information is acceptable or unacceptable and provide justification, if answer to the question is "NO."

### Seismic Qualification Supplier Checklist

PNS No. : \_\_\_\_\_  
Supplier Doc. No. : \_\_\_\_\_

Date : \_\_\_\_\_  
Page : \_\_\_\_ of \_\_\_\_

Item No.	Description	Yes	No	N/A	Comments (Related pages)
1	Did you adequately describe the qualified equipment (Manufacturer, Model number, Equipment ID, etc.) and the physical description, including dimensions, weight, and field mounting condition, and identification of whether the equipment is pipe-, floor-, or wall-supported?				
2	Did you identify the equipment mounting location (Building, Elevation)?				
3	Did you adequately describe all safety components installed in the qualified equipment and the indication of whether the equipment has met the qualification requirements?				
4	Did you describe equipment's safety function or intended function?				
5	Did you compile RRS and corresponding damping values, or Seismic Coefficients (Required Acceleration)?				
6	Did you adequately describe the description of the required loads and their intensities for which the equipment must be qualified?				
7	Did you consider other non-seismic loads specified for the equipment and describe the dynamic load specified for the equipment together with all other loads considered in the qualification and the method of combining all loads?				
8	Did you contain finalized outline drawing including dimension and foundation that is approved?				
9	If qualification by an experience-based approach, did you adequately describe identification of the type of experience and the source of experience database?				
10	If the qualification is performed by a test, did you identify the following?				
	a – Applicable codes and standards				
	b – Test input with margins including the mounting condition				
	c – Component list (Q or 1E, Non-Q or Non-1E, CGI, *PQI, etc.)				
	d – All safety components installed in the equipment				
	e – In case of electrical equipment, conformity of the requirement in accordance with the Daughter standard specified in the technical specification				
	f – If applicable, required aging prior to seismic testing				

### Seismic Qualification Supplier Checklist

PNS No. : \_\_\_\_\_  
Supplier Doc. No. : \_\_\_\_\_

Date : \_\_\_\_\_  
Page : \_\_\_\_ of \_\_\_\_

Item No.	Description	Yes	No	N/A	Comments (Related pages)
	g – If any, similarity between tested and installed equipment				
	h – Acceptance criteria				
	i – Mounting condition conforming to the actual equipment (Mounting method, material, size, torque, welding size etc.)				
	j – Operability requirements and test results				
	k – Test methods and procedures, important test parameters				
	l – Equipment performance before/during/after test				
	m – Monitoring of the equipment to evaluate its performance				
	n – Natural frequencies				
	o – Test results for 5 OBE and 1SSE tests including duration of excitation				
	p – TRS enveloping RRS				
	q – Anomalies and its dispositions				
	r – Test equipment, its accuracy and date of calibration				
	s – Coherence value or correlation coefficient				
	t – A compilation of the required response spectra and time history				
	u – Identification of whether the equipment may be affected by vibration fatigue cycle effects and a description of the methods and criteria used to qualify the equipment for such loading conditions.				
	v – Submittal of raw test data				

\*PQI : 1. Pre-qualified item are that meet the codes and specification requirements.

2. As a minimum, the acceleration level of pre-qualified item shall exceed the responses at the installed location within all frequency range.

### Seismic Qualification Supplier Checklist

PNS No. : \_\_\_\_\_  
Supplier Doc. No. : \_\_\_\_\_

Date : \_\_\_\_\_  
Page : \_\_\_\_ of \_\_\_\_

Item No.	Description	Yes	No	N/A	Comments (Related pages)
11	If the qualification is performed by an analysis, did you identify the following?				
	a – Analysis methods and assumptions				
	b – Applicable codes and standards				
	c – If Computer-Aided Calculation, programs used with validation information				
	d– Postulated Static Loads to be considered (weight, pressure, thermal loads, startup torque for rotating equipment etc.)				
	e – Natural frequencies				
	f – Adequacy of the analysis method				
	g– Materials and mechanical properties for each members, and their basis				
	h– Comparisons between the calculated and allowable stresses				
	i – Deflections for critical elements				
	j – Demonstration for operability of active equipment				
	k – Model adequacy (Weight comparison, Boundary Condition, Effective mass, Material property)				
	l – Check the input loads (Pressure, Nozzle loads, Torque, Thrust, Seismic load, Non-seismic loads if applicable)				
	m – Check whether the output stress values in the report is equal to the values of being described in the body of the report. Are the output stress results attached adequately?				
	n – Weight participation factor, if any				
	o – Adequacy of allowable stresses				
	p – Identification of whether the equipment is low cycle fatigue sensitive equipment or not				

**ATTACHMENT 3**

**EQUIPMENT QUALIFICATION TEST CHECKLIST**

### Equipment Qualification Test Checklist

<b>I. General</b>			
Project / Spec. No.			
Equipment Tag No.			
Quality Class / Seismic Category	/	Test Sample Model No.	
Equipment Installation Building / Elevation		Installation Zone (for Env. Qual. Test)	
Test Plan (EQP) No.		Test Plan (EQP) Approval Date	
Test Agency		Supplier (or Manufacturer)	
<b>II. Checklist Prior to Test</b>			
No.	Item		Check Result [Y / N / NA]
1	Does the qualification plan include code requirement and specification requirement related to relevant test such as test method, acceptance criteria, etc.?		
2	Are all A/E's comments to the previous qualification plan incorporated?		
3	Is the qualification plan approved as "Review Status 1" by A/E?		
4	Is test setup prepared in accordance with the latest approved qualification plan?		
Check Date			Check Venue
Checker (Test Agency)		(Sign)	Checker (Supplier or Manufacturer) (Sign)
<b>III. Checklist After Test</b>			
No.	Item		Check Result [Y / N / NA]
1	Is test performed in accordance with the procedures set forth in the approved qualification plan?		
2	Is any anomaly and justification, if any, treated properly?		
3	Are test raw data (operability checklist, TRS plots for OBE and SSE, coherence or correlation factor and Time histories for OBE and SSE) attached?		
Check Date			Check Venue
Checker (Test Agency)		(Sign)	Checker (Supplier or Manufacturer) (Sign)

**ATTACHMENT 4**

**SUMMARY FORM FOR PROPOSAL EVALUATION**



### Summary Form for Proposal Evaluation

Project Name : \_\_\_\_\_  
Tender Name : \_\_\_\_\_  
Spec. No. : \_\_\_\_\_

Page : \_\_\_\_ of \_\_\_\_

Item No.	Description	Tender Response	Remarks
1	Tender shall confirm the equipment to be qualified (i.e. seismic category I equipment) suggested in the specification.	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	
2	Which method will be used for seismic qualification(e.g. Testing, Analytical Method, Combination of Testing and Analytical Method, The use of Pre-Qualified Item)?		
3	If the seismic qualification is conducted by new testing or new analysis other than using of pre-qualified item, please response below details.		
	a – Which code and standard will be applied for seismic qualification?		
	b – Procedure and details of the seismic qualification shall satisfy the requirements of Codes and Purchase Specification.	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	
4	If the seismic qualification is conducted by using of PQI (pre-qualified item), please response below details.		
	a – It shall be confirmed that the test result of the PQI envelops dynamic requirements of Purchase Specification (i.e. floor response spectra or in-line seismic coefficient) including 10% margin.	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	
	b – Specify Codes and Standards applied for previous seismic qualification program.		
	c – Procedure and details in the previous seismic qualification program shall satisfy the requirements of Codes and Purchase Specification.	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	
	d – Confirm that a new qualification will be performed if the previous seismic qualification program is determined to be unacceptable in terms of the requirements of Codes and Purchase Specification.	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	
	e – Analysis or test data shall be attached in seismic qualification report. If it is not possible to attach it, details below shall be assured. 1. Possession of all analysis or test data. 2. If there is no data relevant to the qualification test or analysis, the qualification is regarded as unacceptable and the new re-qualification shall be assured.(See Section 12 of this Appendix for the list of data.)	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	
5	After award of contract, dynamic qualification plan shall be submitted for review at the time specified in the Appendix 4D of Purchase Specification.	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	

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## APPENDIX 4J

### Examination and Testing of ASME III Piping, Fitting, and Valves

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

0	03/21/23	Issue for Use	박병률	이준우	탁성현	김정강
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Preparer : 박병률, Tel : 054-421-4684

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5.0	EXAMINATION OF PLATE PIPE	4J-2
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## **1.0     SCOPE**

- 1.1     This Appendix delineates the additional requirements for examination and testing of ASME Section III piping, fittings, and valves. This Appendix does not relieve the Supplier from compliance with the requirements of all applicable codes, design drawings, Technical Specification or other contract documents.

## **2.0     TERMINOLOGY**

- 2.1     Repairs  
The process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though the item still may not conform to the original requirements. Repair includes alterations to the properties of the material through heat treating, welding, deposition, chemical processing, etc.

## **3.0     GENERAL**

- 3.1     Conformance  
The examination and testing of ASME Section III piping, fittings and valves shall conform to the requirements of this Appendix and shall satisfy all conditions and requirements set forth in the Technical Specification. This Appendix establishes the examination and testing requirements in addition to the requirements of ASME Section III and XI; This includes examination and testing procedures and acceptance standards, submittals of documentation, as well as examination and test reports.
- 3.2     Code  
Inspection and testing of materials shall be performed in accordance with the requirements of Section III and XI, as applicable, of the ASME Boiler and Pressure Vessel Code.

## **4.0     EXAMINATION AND REPAIR OF SEAMLESS AND WELDED (WITHOUT FILLER METAL) PIPE AND FITTINGS**

- 4.1     Class 1 Pipe and fittings - Repair of injurious defects shall be permitted only upon approval of Buyer.
- 4.2     Class 1, 2, and 3 pipe and fittings - For seamless and welded (without filler metal) pipe, tubing and fittings, the examination of ASME Section III, NX-2550 shall be required.
- 4.3     Examination of Plate - Ultrasonic examination shall be performed after forming into a fitting.

## **5.0 EXAMINATION OF PLATE PIPE**

- 5.1 ASME Section III, Class 1, 2, and 3 plate pipe - For plate pipe welded with filler metal, the examination shall be performed in accordance with ASME Section III, NX-2560.
- 5.2 ASME Section III, Class 3 plate pipe shall meet a weld joint efficiency factor based upon ASME Section III, Table ND-3613.4-1. The longitudinal joint efficiency factor for pressure design based upon Table ND-3613.4-1 shall be applied to the allowable stress value given in ASME Section II, Part D. Subpart 1. Table 1A, 1B, and 3.
- 5.3 Ultrasonic Examination (when required by ASME Section III)  
Time of Examination: Ultrasonic examination shall be performed after rolling to pipe size, welding, and heat treatment other than post weld heat treatment.

## **6.0 RADIOGRAPHIC EXAMINATION OF PIPE AND FITTING WELDS**

- 6.1 The radiographic coverage shall provide 100 percent volumetric examination in accordance with ASME Section III.
- 6.2 Radiography shall be in accordance with the requirements of ASTM E-94, E-142, and ASME Section III.

## **7.0 RADIOGRAPHIC EXAMINATION OF CAST FITTINGS AND VALVE COMPONENTS**

- 7.1 Time and extent of examination:
- A. The radiographic coverage shall be in accordance with NX-2575 of ASME Section III.
  - B. All castings shall be radiographed after a heat treatment, and not prior to PWHT if required.
- 7.2 Radiography shall be in accordance with the requirements of ASME Section III and the followings:
- A. The double/multiple film technique shall be used to obtain a minimum of two films for each radiograph location.
  - B. Only Type 1 or 2 film shall be used.
  - C. Penetrators shall be fabricated from materials that are radiographically similar to the materials being radiographed.
  - D. The transmitted film density through the radiographic image of the body of the

appropriate penetrometer and the area of interest shall meet the requirements of ASME Section III.

**8.0 SUPPLEMENTAL RADIOGRAPHY REQUIREMENTS FOR PIPING, FITTINGS AND VALVES**

- 8.1 Permanent identification shall be evident on each film. This shall include date, specification, component, heat number and manufacturer's identification, as appropriate. The letter "R" shall be used to designate a reshoot of a repair.
- 8.2 The Buyer's Representative shall be provided with the following for review:
- A. The negative film of each radiograph location, including those of repaired areas made before and after the repairs.
  - B. Supplier's radiograph inspection report covering his interpretation for each film (Reader Sheet).
  - C. Supplier's radiographic technique report covering essential variables.
  - D. Supplier's shooting sketch showing identification and location of film and placement of radioactive source.
- 8.3 All films shall be transmitted to the responsible organization for storage in accordance with the Code and Technical Specification requirements.
- A. Supplier's radiographic technique report covering essential variables.
  - B. Supplier's shooting sketch showing identification and location of film and placement of radioactive source.

**9.0 EXAMINATION OF VALVE COMPONENTS**

- 9.1 Visual Inspection:
- A. The Supplier shall perform a visual inspection of all castings.
  - B. The visual inspection shall be performed in accordance with the Code and industrial standards.
  - C. Class 1, 2, and 3 castings: Acceptable surface irregularities are those as indicated by the Code and industrial standards. No indication of hot tears, cracks or chaplets shall be permitted.

9.2 Examination of bolts, studs and nuts

- A. Class 1, 2, and 3 bolts, studs and nuts shall be examined in accordance with ASME Section III, NX-2580.
- B. Visual, magnetic particle and liquid penetrant examination and acceptance standards for Class 2 bolting shall be the same as required in ASME Section III for Class 1 bolting.

9.3 Examination of hardsurfacing welds

- A. The Supplier shall perform liquid penetrant examination for machined surfaces of hardfaced (Stellite or equivalent) seats, (includes backseats) discs and pressure seal areas of valve bodies.
- B. Class 1, 2, and 3 acceptance standards of liquid penetrant examination shall be in accordance with ASME Section III, NX-5273.

9.4 Minimum wall thickness

- A. The Supplier shall measure the wall thickness of all pressure retaining parts of finished Class 1, Class 2, and Class 3 valves.
- B. The report of wall thickness measurements shall include the actual numerical values of each dimensional measurement made and cover all pressure retaining parts of finished ASME Section III, Class 1, 2, and 3 valves. The required minimum wall thickness shall be listed for each measured location. The measurements and their location shall be documented in sufficient detail to permit subsequent verification of each individual measurement.

**10.0 HYDROSTATIC TESTING FOR PIPING**

- 10.1 The Supplier shall hydrostatically test all fabricated piping subassemblies (shop fabricated piping spool) in the supplier's shop per ASME Section III. However, the technical specification may require field hydrostatic testing in lieu of shop testing.
- 10.2 Tubular products and fittings for shop and field fabricated piping should be hydrostatically tested per the applicable material specifications (e.g., ASTM, ASME Section II).

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## APPENDIX 4K1

### Welding Requirements for ASME Section III Items

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

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Preparer : 강민구, Tel : 054-421-7871



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## **1.0 SCOPE**

- 1.1 This Appendix describes welding requirements for ASME Section III items.

## **2.0 CODES & STANDARDS**

- 2.1 Welding Procedure Specifications (WPS) and the qualification of welding procedures, welders, and welding operators shall be in accordance with the rules of ASME B&PV Code, Section III and IX.

## **3.0 GENERAL**

- 3.1 All welding shall conform to the requirements of this Appendix, the Technical Specification and the design drawings.
- 3.2 All welding procedures shall be approved by the Buyer prior to the commencement of any welding activities.
- 3.3 The Supplier shall be responsible for the welding performed by his organization. Qualification of welding procedures, welders, and welding operators by other organizations shall not be permitted.
- 3.4 All welding and repair shall comply with the fabrication requirements specified in ASME Section III and Section IX supplemented by the following: When physical conditions restrict the welder's access to a production weld to less than 300 mm (12 inches) in any direction from the joint and Which would affect electrode manipulation, or bead progression, or require an indirect means of weld pool observation (such as a mirror), mock-up test for welder or welding operator qualification under simulated conditions shall be performed.
- 3.5 The completed WPS shall describe all the essential, nonessential, and, when required, supplementary essential variables for each welding process used in the WPS. Ranges of these variables shall be correctly addressed.
- 3.6 The Supplier shall maintain a record of the results obtained in the WPS, Procedure Qualification Record (PQR), and Welder and Welding Operator Performance Qualification (WPQ).
- 3.7 Records of WPS, PQR, and WPQ shall be in reproducible form, as appropriate.
- 3.8 The WPS, PQR, and WPQ shall be certified by the Supplier.
- 3.9 The welder and welding operator shall be tested under the full supervision and control of the Supplier.

- 3.10 The Buyer or Buyer's Representative shall have the right of free access to the Supplier's facilities and equipment for the purpose of monitoring and witnessing welding activities performed by the Supplier.

#### **4.0 SUBMITTAL AND APPROVAL**

- 4.1 In case of specific applications deviated from this Appendix, the Supplier shall submit complete details of the applications to be used for the Buyer's review and approval. Specific applications shall not be permitted without written acceptance from the Buyer.
- 4.2 The Supplier shall demonstrate his capability to use specific application beyond this Appendix, if required. The Buyer shall be notified of the demonstration in advance for witnessing purposes. Test specimens, such as procedure qualification test specimen used for specific application, should be maintained and accessible to the Buyer for review.
- 4.3 The Supplier's submittals for the Buyer's review and approval are listed below as applicable:
- o Welding Procedure Specification (WPS)
  - o Procedure Qualification Record (PQR)
  - o Heat Treatment Procedure
  - o Details of Specific Applications
  - o Others, if requested by the Buyer

#### **5.0 LIMITATIONS**

- 5.1 Gas Tungsten Arc Welding (GTAW) shall be used for:
- A. The root pass of all single welded circumferential butt joints in ASME Section III piping;
  - B. The root pass for items other than piping where access is from one side only and radiographic examination is required.
- 5.2 Backing gas is required for all materials using consumable inserts, or in open-root joints, using the GTAW or GMAW process, on nickel-alloys, stainless steels, and low-alloy steels containing more than 2.25% Cr and for repairs to materials when remaining material is less than 5 mm (3/16 inch) thick. For austenitic stainless steel, nitrogen backing gas may be used, as applicable.
- 5.3 Consumable inserts are optional. However, if used, they shall exhibit the same nominal chemical composition and mechanical properties of the filler metal.
- 5.4 Gas Metal Arc Welding (GMAW) in the short circuiting transfer mode is permitted for:

- A. All ferrite materials with nominal thickness not greater than 6 mm (1/4 inch);
  - B. All austenitic stainless steel and nickel base alloys with nominal thickness not greater than 5 mm (3/16 inch);
  - C. The root pass for single welded butt joints in the flat and rotated (1GR) position;
  - D. Tack welds and other application with subsequent removal of weld metal deposited by GMAW short circuiting transfer mode.
- 5.5 Flux Cored Arc Welding (FCAW) shall be used under the following restrictions:
- A. For pressure retaining materials, a shielding gas shall be used except that corrosion resistant weld metal overlays may be deposited without shielding gas in the flat position;
  - B. For structure and storage tanks, the use of shielding gas shall be optional.
- 5.6 Submerged Arc Welding (SAW) shall be used under the following restrictions:
- A. The maximum individual layer thickness shall be 13 mm (1/2 inch) for materials with thickness not less than 32 mm (1-1/4 inch), and 10 mm (3/8 inch) for materials with thickness less than 32 mm (1-1/4 inch);
  - B. 2.25Cr-1Mo and higher alloys shall be welded with alloy wire and neutral flux.
- 5.7 Except for SAW, a minimum of two weld layers shall be required on groove weld for thickness up to 6 mm (1/4 inch), two or three weld layers for thickness between 6 mm (1/4 inch) and 9 mm (11/32 inch), and at least three weld layers for thickness over 9 mm (11/32 inch).
- 5.8 Each weld layer shall be completed before subsequent layer is deposited, unless otherwise approved for special application.
- 5.9 Peening shall not be permitted without the prior written acceptance by the Buyer. Peening shall not be used on the initial layer nor on the final layer. The use of pneumatic tools for slag removal is not considered peening and is acceptable.
- 5.10 Alloy steel with nominal 2.25% Cr content or higher shall have the finished weld bevel surfaces machined or ground. If flame or arc cutting is used, sufficient metal of the cut surfaces shall be removed by machining or grinding to bright metal to ensure complete removal of surface contamination. Flame cutting on austenitic stainless steels shall not be permitted.
- 5.11 Run-off weld tabs, when used in production welding of longitudinal welds, shall be removed after weld completion.

- 5.12 For SAW process, the flux and wire combination specified on the WPS shall be the same type qualified on the PQR. The flux manufacturer's trade name and wire trade name shall also be specified.
- 5.13 This Paragraph describes the requirements for austenitic stainless steel:
- A. Test piece welded from each austenitic stainless steel welding procedure (other than those for materials restricted specifically to the low-carbon grades, i.e., 0.03% carbon maximum, the stabilized grades, or where post-weld heat treatment is solution annealed) shall be subjected to the ASTM A 262 intergranular corrosion test of Practice "A" or "E". When welding a material of product form other than castings, it is prohibited to use castings with duplex structures (CF8, CF8M etc.) as procedure qualification test specimens. The welding procedure shall be acceptable for use if the sample passes this test; or, if the sample fails this test, the welding procedure shall be acceptable if the sample then passes the test of practice "E." Documentation of these test results shall be submitted with each Procedure Qualification Record;
  - B. Material of product form with simple shapes not subject to distortion during heat treatment such as plates, sheets, bars, pipes and tubes need not be tested for intergranular stress corrosion provided the solution heat treatment is followed by water quenching in accordance with Reg. Guide 1.44;
  - C. The application of heat to correct weld distortion and dimensional deviations shall not be permitted unless followed by full solution annealing;
  - D. All slag shall be carefully and thoroughly removed from the surface including the backside of the weld;
  - E. Only stainless steel brushes and aluminum oxide grinding wheels shall be used. Tools previously used on ferritic materials shall not be used;
  - F. For weld repairs of austenitic stainless steel castings, the filler metal used shall be appropriate welding material, and its average ferrite content of the filler metal shall be in the range of 5FN to 15FN (Ferrite Number);
  - G. Maximum heat input shall be 23.6 kJ/cm (60 kJ/in).

## **6.0 WELDING MATERIAL**

- 6.1 Welding materials shall be selected such that:
- A. The strength of weld metal shall be at least equal to the specified minimum tensile strength of the material being welded;
  - B. When joining similar materials, the chemical composition of the deposited weld

metal shall match that of the base material as closely as possible.

- 6.2 Suitable storage and handling of electrodes, flux and other welding materials shall be maintained. Precaution shall be taken to minimize absorption of moisture by fluxes and cored, fabricated, and coated electrodes.
- 6.3 A written procedure shall be established to describe the method used to control the receipt, storage, baking, drying, and disbursal of all welding materials.
- 6.4 For austenitic stainless steel welding, the maximum electrode diameter for SMAW shall be 4.0 mm (5/32 inch).
- 6.5 Filler metal shall meet the requirements of the applicable Fabrication Code in conjunction with ASME Code, Section II, Part C. For filler metal not specified in engineering specifications, the requirements of NX-2400 of ASME Section III shall be observed.
- 6.6 Welding materials of type 309 or 309L shall be used for the first layer welding carbon or low alloy steel to austenitic stainless steel, including the first layer of corrosion-resistant weld metal overlays.
  - 6.6.1 When PWHT of a dissimilar joint is required, the carbon or low alloy steel member shall be "buttered" with type 309 or 309L, and heat treated prior to welding to the austenitic stainless steel member.
  - 6.6.2 For corrosion-resistant overlay welding, the first weld layer shall be welded with Type 309L and all subsequent layers welded with Type 308L.
- 6.7 Welding materials of the joining of austenitic stainless steel shall have a chemical composition similar to the base material, except that the composition should be modified as required to assure a Ferrite Number of 5 to 15 in the deposited weld metal. This is not required of filler metal classifications 16-8-2. The results of the ferrite determination shall be included in the Certified Material Test Report (CMTR).
- 6.8 Unless specifically approved in writing by the Buyer, nonremovable backing rings or strips shall not be used for groove welds.

## **7.0 HEAT TREATMENT**

- 7.1 Preheat
  - 7.1.1 Preheat temperature for pressure retaining materials shall conform to ASME Section III, Appendix D.
  - 7.1.2 Preheat requirements shall apply to all welds, including tack, fillet, and attachment welds. Preheat shall also be applied prior to thermal arc gouging.

- 7.1.3 When thermal cutting is performed to prepare weld joints or edges, to remove attachments or defective material, or for any other purpose, consideration shall be given to preheating the material, using preheat schedules such as suggested in ASME Section III, Appendix D.
- 7.1.4 The minimum preheat temperature shall be specified on the WPS.
- 7.1.5 The preheat temperature shall be checked by suitable methods, such as temperatures-indicating crayons or thermocouple pyrometers, to ensure that the required temperature is uniformly maintained during the welding operation.
- 7.1.6 Prior to welding, thermal cutting/gouging, and/or grinding, the minimum preheat temperature for materials, not requiring an additional higher temperature, shall be 10 °C (50 °F).
- 7.1.7 When welding two different P-No. materials, the minimum preheat temperature required shall be the higher temperature for the material to be welded.
- 7.1.8 Austenitic stainless steels shall have a minimum preheat of 10 °C (50 °F).
- 7.2 Interpass Temperature
  - 7.2.1 The maximum interpass temperature of austenitic stainless steels shall be 177 °C (350 °F).
  - 7.2.2 The maximum interpass temperature shall be 260 °C (500 °F) for low alloy steels requiring impact test.
- 7.3 Postweld Heat Treatment (PWHT)
  - 7.3.1 PWHT for pressure retaining materials shall conform to ASME Section III and the requirements specified in this Appendix.
  - 7.3.2 Where PWHT on PQRs is performed, the total PWHT time at temperature shall be at least 80% of the total aggregate time at PWHT temperature to be applied to production welds.
  - 7.3.3 During PWHT, the metal temperature shall be maintained within the temperature range and per the minimum holding time specified per ASME Section III.
  - 7.3.4 PWHT shall be performed in temperature-surveyed and calibrated furnaces, or PWHT shall be performed with thermocouples in contact with the material.
  - 7.3.5 Time-temperature records of PWHT shall be maintained by the Supplier and shall be made available for review by the Buyer.
  - 7.3.6 When materials of two different P-No. groups are joined by welding, the applicable PWHT shall be used for the material requiring the higher temperature range.
  - 7.3.7 When nonpressure-retaining material is welded to pressure retaining material, PWHT

temperature range of the pressure retaining material shall control.

- 7.3.8 As a minimum, thermocouples shall be placed in the areas of highest and lowest anticipated temperatures on the run of pipe or vessel. For branch and nozzle connections, it is also necessary to attach thermocouples in the anticipated high and low temperature areas on the branch pipe or nozzle.

## **8.0 WORKMANSHIP**

- 8.1 The surface for welding shall be free of scale, rust, oil, grease, and other deleterious material. The work shall be protected from deleterious contamination and from rain, snow, and wind during welding.
- 8.2 If the surface of the weld requires grinding, care shall be taken to avoid reducing the weld or base material below the required thickness.
- 8.3 Tack welds used to secure alignment shall either be removed completely when they have served their purpose, or their starts and stops shall be properly prepared to be satisfactorily incorporated into the final weldment.
- 8.4 Any offset within the allowable tolerance shall be faired to at least a 3:1 taper over the width of the finished weld.
- 8.5 Butt welds shall be full penetration welds, unless otherwise specified by design drawings.
- 8.6 Socket welds shall have a gap of 1.5 mm (1/16 inch) minimum to 3 mm (1/8 inch) maximum between the bottom of the socket and the end of the pipe prior to welding.
- 8.7 In principle, socket welds are prohibited for dissimilar metals, i.e., different P-No. metals. However, socket weld connections may be used for dissimilar metal joints in the following cases; Austenitic stainless steel and ferritic steel joints with type 309 filler metal at operating temperature of 260 °C (500 °F) and below, and with inconel type filler metals ENiCrFe-2, ENiCrFe-3, or ERNiCr-3 at operating temperature exceeding 260 °C (500 °F).
- 8.8 Fillet welds shall be of the specified size per design drawings.
- 8.9 For weldments requiring special coatings, weld surface shall be finished in accordance with additional requirements specified in coating procedure.
- 8.10 The use of temporary welded attachments during fabrication shall be avoided whenever possible. However, if temporary attachments are used after the completion of the fabrication, they shall be removed flush with the base material without encroaching on the required minimum wall thickness. All areas from which temporary attachments have been removed shall be examined by the same methods required for permanent welds after the surface has been restored.



- 8.11 Prior to welding, all surfaces shall be cleaned thoroughly by filing, grinding, wire brushing, and/or with an approved cleaning solvent.
- 8.12 All full penetration butt joints which are accessible from both sides shall be back gouged or ground to sound metal after welding the first side and then back welded, unless the welding procedure otherwise assures that full penetration will be achieved.
- 8.13 The welding of butt welds in carbon or low alloy steel pipe with a wall thickness of 19 mm (3/4 inch) or greater, may only be interrupted provided a minimum of 10 mm (3/8 inch) thickness of weld deposit or 25 percent of welding groove, whichever is greater, is filled.
- 8.14 If the welding is interrupted, the weld shall be covered with adequate insulating material to ensure slow cooling. The partially completed weld shall be examined by magnetic particle or liquid penetration methods before resuming welding.

## **9.0 TUBE-TO-TUBESHEET WELDS**

- 9.1 All tube-to-tubesheet welding shall be qualified and performed according to this Appendix and the requirements of ASME Section III.
- 9.2 The procedure qualification shall be made on a test assembly which simulates the conditions to be used in production with respect to the joint design, tube and tubesheet material combination, tube hole pattern, ligament distance, tube diameter and tube wall thickness. The thickness of the tubesheet in the test assembly shall be as thick as the production tubesheet, except that it need not exceed 50 mm (2 inches). The minimum required number of weld joints shall be ten (10).
- 9.3 The test assembly shall be examined using a liquid penetrant method in accordance with Article 6 of ASME Section V. Following this, the assembly shall be sectioned longitudinally through each tube. The thickness of the assembly may be reduced to 13 mm (1/2 inch) prior to the sectioning. The four (4) faces of each tube exposed by sectioning shall be polished and etched with a suitable etchant, and shall be visually examined for cracks. The weld throat, minimum leakage path, shall not be less than two-thirds of the specified tube wall thickness, and the weld shall be free from cracks using visual examination of X 10 magnification.
- 9.4 All production heat exchanger overlay welds and tube-to-tubesheet welds shall be examined using solvent-removable liquid penetrant method. This shall be done after final machining and PWHT when machining and/or PWHT is required.

## **10.0 VISUAL EXAMINATION**

- 10.1 Visual examination consists of observation of whatever portion of a component of weld are exposed to such observation, either before, during, or after manufacture, fabrication,

assembly, or test.

- 10.2 All welds of components shall comply with the requirements specified below:
  - 10.2.1 Each weld shall be uniform in width and size throughout its full length.
  - 10.2.2 The surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, abrupt ridges and valleys.
  - 10.2.3 Each weld layer or pass shall be free of slag inclusions, cracks, porosity, and lack of fusion.
  - 10.2.4 The depth and length of undercut of weld surfaces shall comply with the following:
    - A. Undercut shall not exceed 0.8 mm (1/32 inch) depth regardless of the length;
    - B. Undercut over 0.4 mm (1/64 inch) through 0.8 mm (1/32 inch) depth, the aggregate length of undercut shall be less than 50 mm (2 inches) in a 500 mm (20 inches) successive welds at any location.
  - 10.2.5 The height of the reinforcement of each face of the weld shall not exceed the thickness of reinforcement given in ASME Section III.
  - 10.2.6 Fillet welds may vary from convex to slightly concave. The shape and size of fillet welds shall be of the specified size and profile in accordance with ASME Section III.

## **11.0 REPAIR**

- 11.1 Defects in weld metal and base metal detected by methods required by the applicable Code shall be eliminated and, when necessary, repaired.
- 11.2 Weld metal surface defects may be removed by grinding or machining and not repaired by welding provided that the following requirements are met:
  - 11.2.1 The remaining thickness of the section is not below the required thickness;
  - 11.2.2 The area is examined after blending by a magnetic particle or liquid penetrant method to ensure that the defect has been removed or the indication reduced to an acceptable limit. Defects detected by visual or volumetric method and located on an interior surface need only be reexamined by the method which initially detected the defect when the interior surface is inaccessible for surface examination.
- 11.3 Defects shall be removed by mechanical means or by thermal gouging process. Weld repairs shall be made in accordance with the same procedure used for original welds or by another applicable welding process. The types, extent, and method of examination and limits of imperfections of weld repairs shall be the same as the original weld.

- 11.4 Weld repairs shall be made using welding materials, welders, and welding procedures qualified in accordance with the applicable Code.
- 11.5 After repair, the surface shall be blended uniformly into the surrounding surface.
- 11.6 The repaired areas shall be heat-treated in accordance with ASME Section III, if applicable.
- 11.7 Major repairs shall be made using a written procedure approved by the Buyer. Major repair is defined as the repair of defects that are indicative of a fundamental material problem or of a process out of control.
- 11.8 A detailed written record of major repairs shall be made. The record shall state the type, size, depth, location and extent of the defect, repair method, subsequent heat treatment and shall include copies of all examination records.
- 11.9 For pressure retaining items, no repairs of base metal shall be performed without prior written approval by the Buyer.

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## APPENDIX 4K4

### Welding Requirements for ASME B31.1, Power Piping

KEPCO E&C JOB No. : 1229L



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## **1.0     SCOPE**

- 1.1     This Appendix describes welding requirements for ASME B31.1, Power Piping.

## **2.0     CODES & STANDARDS**

- 2.1     Welding Procedure Specification (WPS) and the qualification of welding procedures, welders, and welding operators shall be in accordance with the rules of ASME B31.1 and ASME B&PV Code, Section IX.

## **3.0     GENERAL**

- 3.1     All welding shall conform to the requirements of this Appendix, the Technical Specification and the design drawings.
- 3.2     All welding procedures shall be approved by the Buyer prior to the commencement of any welding activities.
- 3.3     The Supplier shall be responsible for the welding performed by his organization. Qualification of welding procedures, welders, and welding operators by other organizations shall not be permitted.
- 3.4     The completed WPS shall describe all the essential and nonessential variables for each welding process used in the WPS. Ranges of these variables shall be correctly addressed.
- 3.5     The Supplier shall maintain a record of the results obtained in the WPS, Procedure Qualification Record (PQR), and Welder and Welding Operator Performance Qualification (WPQ).
- 3.6     Records of WPS, PQR, and WPQ shall be in reproducible form, as appropriate.
- 3.7     The WPS, PQR, and WPQ shall be certified by the Supplier.
- 3.8     The welder and welding operator shall be tested under the full supervision and control of the Supplier.
- 3.9     The Buyer or Buyer's Representative shall have the right of free access to the Supplier's facilities and equipment for the purpose of monitoring and witnessing welding activities performed by the Supplier.

## **4.0     SUBMITTAL AND APPROVAL**

- 4.1     In case of specific application other than those in this Appendix, the Supplier shall submit the complete details of the application to be used for the Buyer's review and approval.

Specific applications shall not be permitted without a written acceptance of the Buyer.

- 4.2 The Supplier shall demonstrate his capability to use specific application beyond this Appendix, if required. The Buyer shall be notified of the demonstration for witnessing purposes within a reasonable time.
- 4.3 The Supplier's submittals for the Buyer's review and approval are listed below, as applicable.
  - o Welding Procedure Specifications (WPS)
  - o Procedure Qualification Record (PQR)
  - o Heat Treatment Procedure, if Applicable
  - o Others, if requested by the Buyer

## **5.0 LIMITATIONS**

- 5.1 Welding processes to be used under this Appendix shall meet all the requirements of ASME Section IX.
- 5.2 Welding processes to be used shall be subject to the limitations mentioned herein.
- 5.3 Backing gas is required for all materials using consumable inserts, or in open-root joints, using the GTAW or GMAW process, on nickel-alloys, stainless steels, and low-alloy steels containing more than 2.25% Cr and for repairs to materials when remaining material is less than 5 mm (3/16 inch) thick. For austenitic stainless steel, nitrogen backing gas may be used, as applicable.
- 5.4 Gas Tungsten Arc Welding (GTAW) shall be used for:
  - A The root pass of all single welded circumferential butt joints in ASME B31.1 piping;
  - B. The root pass for the items other than piping where access is from one side only and radiographic examination is required.
- 5.5 Gas Metal Arc Welding (GMAW) in the short circuiting transfer mode is permitted for:
  - A. All ferrite materials with nominal thickness not greater than 6 mm (1/4 inch);
  - B. All austenitic stainless steel and nickel base alloys with nominal thickness not greater than 5 mm (3/16 inch);
  - C. The root pass for single welded butt joints in the flat and rotated (1GR) position;
  - D. Tack welds and other application with subsequent removal of weld metal deposited by GMAW short circuiting transfer mode.

- 5.6 Flux Cored Arc Welding (FCAW) shall be used under the following restrictions:
- A. For pressure retaining materials, a shielding gas shall be used except that corrosion-resistant weld metal overlays deposited without shielding gas in the flat position;
  - B. For structure and storage tanks, the use of shielding gas shall be optional.
- 5.7 Submerged Arc Welding (SAW) shall be used under the following restrictions:
- A. The maximum individual layer thickness shall be 12.5 mm (1/2 inch) for materials with thickness not less than 32 mm (1-1/4 inch), and 10 mm (3/8 inch) for materials with thickness less than 32 mm (1-1/4 inch);
  - B. 2.25Cr-1Mo and higher alloys shall be welded with alloy wire and a neutral flux.
- 5.8 Except for SAW, a minimum two weld layers shall be required on groove welds for thickness up to 6 mm (1/4 inch), two or three weld layers are required for thickness between 6 mm (1/4 inch) and 9 mm (11/32 inch), and at least three weld layers for thickness over 9 mm (11/32 inch).
- 5.9 Each weld layer shall be completed before subsequent layer is deposited, unless otherwise approved for special application.
- 5.10 Peening shall not be permitted without the prior written acceptance by the Buyer. Peening shall not be used on the initial layer nor on the final layer. The use of pneumatic tools for slag removal is not considered peening and is acceptable.
- 5.11 Alloy steels with nominal 2.25% Cr content or higher shall have the finished weld bevel surfaces machined or ground. If flame or arc cutting is used, sufficient metal of the cut surfaces shall be removed by machining or grinding to bright metal to ensure complete removal of surface contamination. Flame cutting on austenitic stainless steels shall not be permitted.
- 5.12 Run-off weld tabs, when used in production welding of longitudinal welds, shall be removed after weld completion.
- 5.13 For the SAW process, the flux and wire combination specified on the WPS shall be the same type qualified on the PQR. The flux manufacturer's trade name and wire trade name shall also be specified.
- 5.14 Unless specifically approved in writing by the buyer, nonremovable backing rings or strips shall not be used for groove welds.



## **6.0     WELDING MATERIAL**

- 6.1     Welding materials shall be selected such that:
- A.     The strength of weld metal shall be at least equal to the specified minimum tensile strength of the material being welded;
  - B.     When jointing similar materials, the chemical composition of the deposited weld metal shall match that of the base material as closely as possible.
- 6.2     Suitable storage and handling of electrodes, flux and other welding materials shall be maintained. Precaution shall be taken to minimize absorption of moisture by fluxes and cored, fabricated, and coated electrode.
- 6.3     A written procedure shall be established to provide the method used to control the receipt, storage, baking, drying, and disbursal of all welding materials.
- 6.4     Consumable inserts, when used, shall have same nominal chemical composition and mechanical properties as the filler metal.

## **7.0     HEAT TREATMENT**

- 7.1     Preheat
- 7.1.1     Preheat requirements specified in ASME B31.1, Paragraph 131 shall be considered as mandatory minimum values.
  - 7.1.2     When welding two different P-No. materials, the minimum preheat temperature required shall be the higher temperature for the material to be welded.
  - 7.1.3     Prior to welding, thermal cutting/gouging, and/or grinding, the minimum preheat temperature for materials not requiring an additional higher preheat temperature shall be 10 °C (50 °F).
  - 7.1.4     The minimum preheat temperature shall be as specified in the WPS.
  - 7.1.5     The preheat temperature shall be checked by use of temperature-indicating crayons, thermocouple pyrometers, or other suitable methods to assure that the required preheat temperature is obtained prior to and uniformly maintained during the welding operation.
- 7.2     Interpass Temperature
- 7.2.1     The maximum interpass temperature of austenitic stainless steels shall be 177 °C (350 °F).
  - 7.2.2     The maximum interpass temperature shall be 260 °C (500 °F) for low alloy steels

requiring impact test.

### 7.3 Postweld Heat Treatment (PWHT)

- 7.3.1 All welds in materials included in the P-No, listed in Appendix A of ASME B31.1 shall be given a PWHT within the temperature range specified in Table 132 of ASME B31.1. Welds of materials not included in Appendix A of ASME B31.1 shall be heat-treated in accordance with the qualified welding procedure.
- 7.3.2 During PWHT, the metal temperature shall be maintained with the temperature range and for a minimum holding time conforming to ASME B31.1.
- 7.3.3 PWHT shall be performed in temperature-surveyed and calibrated furnaces, or PWHT shall be performed with thermocouples in contact with material.
- 7.3.4 Time-Temperature records for all PWHT shall be maintained by the Supplier and shall be made available for review by the Buyer.
- 7.3.5 When parts of two different P-No. materials are jointed by welding, the PWHT shall be that specified for the material requiring the higher PWHT temperature.
- 7.3.6 When nonpressure-retaining material is welded to pressure retaining material, PWHT temperature range of the pressure retaining material shall control.

## 8.0 **WORKMANSHIP**

- 8.1 The surface for welding shall be free of scale, rust, oil, grease, and other deleterious material. The work shall be protected from deleterious contamination and from rain, snow, and wind during welding.
- 8.2 If the surface of the weld requires grinding to meet the requirements, care shall be taken to avoid reducing the weld or base material below the required thickness.
- 8.3 Tack welds used to secure alignment shall either be removed completely when they have served their purpose, or their starting and stopping ends shall be properly prepared by grinding or other suitable means so that they may be satisfactorily incorporated into the final weld.
- 8.4 Socket welds shall have a gap of 2 mm (1/16 inch) minimum to 3 mm (1/8 inch) maximum between the bottom of the socket and the end of the pipe prior to welding.
- 8.5 In principle, socket welds are prohibited for dissimilar metals, i.e. different P-No. metals. However, socket weld connections may be used for dissimilar metal joints in the following cases; Austenitic stainless steel and ferritic steel joints with type 309 filler metal at operating temperature of 260 °C (500 °F) and below, and with inconel type filler metals ENiCrFe-2, ENiCrFe-3 or ERNiCr-2, ERNiCr-3 at operating temperature exceeding

260 °C (500 °F).

- 8.6 The use of temporary attachments during fabrication shall be avoided whenever possible. However, if temporary attachments are used after the completion of the fabrication, they shall be removed flush with the base metal without encroaching on the required minimum wall thickness. All areas from which temporary attachments have been removed shall be examined by the same methods required for permanent welds after the surfaces have been restored.
- 8.7 Prior to welding all surfaces shall be cleaned thoroughly by filing, grinding, wire brushing and/or with an approved cleaning solvent.
- 8.8 All full penetration butt joints which are accessible from both sides shall be back gouged or ground to sound metal after welding the first side and then back welded on the reverse side, unless the welding procedure otherwise assures that full penetration will be achieved.
- 8.9 The welding of butt welds in carbon or low alloy steel pipe with a wall thickness of 19 mm (3/4 inch) or greater, may only be interrupted provided a minimum of at least 9.5 mm (3/8 inch) thickness of weld deposit or 25 percent of welding groove, whichever is greater, is filled.
- 8.10 If welding is interrupted, the weld shall be covered with adequate insulating material to ensure slow cooling. The partially completed weld shall be examined by magnetic particle or liquid penetration methods before resuming welding.

## **9.0 VISUAL EXAMINATION**

- 9.1 Visual examination consists of observation of whatever portion of a component or weld are exposed to such observation, either before, during, or after manufacture, fabrication, assembly, or test.
- 9.2 All welds shall comply with the acceptance standards specified below:
  - A. Each weld shall be uniform in width and size throughout its full length;
  - B. The surface of welds shall be sufficiently free from coarse ripple, grooves, overlaps, and abrupt ridges and valleys;
  - C. Each weld layer or pass shall be visually free from slag inclusions, cracks, porosity, and lack of fusion;
  - D. Undercut shall not exceed 1.0 mm (1/32 inch) depth regardless of the length;
  - E. All butt weld shall be flush with the base metal or have uniform crowns;
  - F. The height of the reinforcement on each face of the weld shall not exceed the

thickness of the reinforcement given in ASME B31.1;

- G. Fillet weld may vary from convex to slight concave. The shape and size of fillet welds shall be of the specified size and profile in ASME B31.1.

## **10.0 REPAIR**

- 10.1 Defects and weld metal and base metal detected by methods required by ASME B31.1 shall be eliminated and, when necessary, repaired.
- 10.2 Surface defects may be removed by grinding or machining and may not be repaired by welding provided that the following requirements are met:
  - A. The remaining thickness of the section is not below the required thickness;
  - B. The area is examined after blending by a magnetic particle or liquid penetrant method to ensure that the defect has been removed or the indication reduced to an acceptable limit. Defects detected by visual or volumetric method and located on interior surface need only be reexamined by the method which initially detected the defect when the interior surface is inaccessible for surface examination.
- 10.3 Defects shall be removed by mechanical means or by thermal gouging processes. Weld repairs shall be made in accordance with the same procedure used for original welds or by another applicable welding process. The types, extent, and method of examination and limits of imperfections of weld repairs welds shall be the same as for the original weld.
- 10.4 Weld repairs shall be made using welding materials, welders, and welding procedures qualified in accordance with the applicable codes.
- 10.5 After repair the surface shall be blended uniformly into the surrounding surface.
- 10.6 The repaired areas shall be heat treated in accordance with ASME B31.1 if applicable.
- 10.7 Major repairs shall be made using a written procedure approved by the Buyer. Major repair is defined as the repair of any crack other than crater cracks or the repair of defects which are indicative of a fundamental materials problem or of a process out of control.
- 10.8 A detailed written record of major repairs shall be made and copies furnished to the Buyer. The record shall state the type, size, depth, location and extent of the defect, repair method, subsequent heat treatment and shall include copies of all examination records.

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## APPENDIX 4R

### Chemical Requirements for Materials Used in Contact with Austenitic Stainless Steel or Nickel Base Alloys

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

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Preparer : 박병률, Tel : 054-421-4684

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## **1.0     SCOPE**

- 1.1     This Appendix describes the chemical requirements for lubricants and sealants, marking materials, temperature-indicating crayons, adhesive and tapes, liquid penetrant materials, desiccants, ultrasonic examination couplants, leak test solutions, packing materials, anti-spatter materials, cleaning agents, and water which are used in the fabricating, marking, cleaning, examination, testing and shipment of austenitic stainless steels or nickel base alloys.

## **2.0     GENERAL**

- 2.1     All limitations specified shall be by weight.
- 2.2     Where nuclear grades of materials are available, they shall be used in lieu of other grades.

## **3.0     MATERIALS**

### **3.1     LUBRICANTS AND SEALANTS**

- 3.1.1   Machining oils usually contain either sulfur based agents, sulfur-chloride agents, or chloride agents. The following shall apply when such machining oils are used:
- a.     Lubricants used for fabrication shall contain the minimum level of detrimental contaminants consistent with good machinability.
  - b.     Low melting point metals (i.e., lead, bismuth, zinc, mercury, antimony, cadmium and tin) shall not be added intentionally.
  - c.     Lubricants used during fabrication shall be completely removed after the fabrication process has been completed.
- 3.1.2   Permanent lubricants (i.e., those which are not removed) and sealants used during service shall meet the following requirements:
- a.     Sulfur : Max. 200 ppm
  - b.     Total organic and inorganic halogen : Less than 200 ppm
  - c.     Copper and silver shall not be added intentionally.
  - d.     Mercury : Max. 1 ppm
  - e.     Arsenic : Max. 2 ppm
  - f.     Lead : Max. 10 ppm

- g. Zinc : Max. 200 ppm

### 3.2 MARKING MATERIALS

3.2.1 Requirements for marking materials applied by the materials manufacturer shall be as specified in the applicable ASME Code or ASTM Standards.

3.2.2 Temporary marking materials, applied subsequent to shipment from the materials manufacturer's plant, shall meet the following requirements:

- a. Total halogen : Max. 1000 ppm
- b. Sulfur : Max. 1000 ppm
- c. Low melting point metals shall not be added intentionally.
- d. Mercury : Max. 1 ppm
- e. Arsenic : Max. 2 ppm
- f. Lead : Max. 10 ppm
- g. Zinc : Max. 200 ppm

3.2.3 Temporary marking materials shall be removed completely under the following conditions:

- a. Prior to heat treating.
- b. Within 2 inches of the weld region prior to local preheat or welding.
- c. Their presence is no longer required.

### 3.3 TEMPERATURE-INDICATING CRAYONS

3.3.1 Temperature-indicating crayons shall meet the following requirements:

- a. Total halogen : Max. 1% (Inorganic Halogen Max. 200 ppm)
- b. Sulfur : Max. 1%
- c. Mercury : Max. 1 ppm
- d. Arsenic : Max. 2 ppm
- e. Lead : Max. 10 ppm



- f. Zinc : Max. 200 ppm

### 3.4 ADHESIVES AND TAPES

- 3.4.1 Adhesives and tapes shall have the total halogen and sulfur content each less than 1000 ppm.

- a. Low melting point metals shall not be added intentionally.

- 3.4.2 Adhesives and tapes shall be removed completely under the following conditions:

- a. Prior to heat treating.
  - b. Within 300 mm (12 inches) of the weld region prior to local preheat, welding and postweld heat treatment except that during welding, tape used to seal purge dams and ceramic backing shall be permitted.
  - c. Their presence is no longer required.

- 3.4.3 Any residual adhesive shall be removed by wiping with an approved solvent.

### 3.5 LIQUID PENETRANT MATERIALS

- 3.5.1 The penetrant materials used shall be analyzed and meet the requirements of Article 6 of ASME Section V (T-641).

- a. Low melting point metals shall not be added intentionally.

- 3.5.2 Supplier shall obtain certification of content for all liquid penetrant materials. This certification shall include the penetrant manufacturer's lot number and test results.

- 3.5.3 All penetrant materials shall be removed completely from the surface immediately after examination.

- 3.5.4 Chemistry requirements shall apply to all liquid penetrant materials excluding aerosol propellants.

### 3.6 DESICCANT AND DESICCANT BAG

- 3.6.1 The desiccant and the bag material shall have a total halogen content not exceeding 2500 ppm, respectively.

- 3.6.2 Sulfur shall not exceed 1000 ppm.

- 3.6.3 Low melting point metals shall not be added intentionally.

### 3.7 PACKING MATERIALS

3.7.1 Total halogen shall not exceed 1000 ppm.

3.7.2 Sulfur shall not exceed 1000 ppm.

### 3.8 ULTRASONIC EXAMINATION COUPLANTS AND LEAK TEST SOLUTIONS

3.8.1 Ultrasonic examination couplants and leak test fluids shall be removed completely when their use in nondestructive examination is no longer required.

- a. Low melting point metals shall not be added intentionally.

### 3.9 CLEANING MATERIALS

#### 3.9.1 Mechanical cleaning

Mechanical cleaning of austenitic stainless steel parts or components may consist of very light ceramic abrasive blasting, vapor blasting using a fine ceramic abrasive suspended in water, grinding, filing or wire brushing, and may be used for removing lightly adhering surface contamination. Only stainless steel brushes, and aluminum oxide or silicon carbide grinding wheels shall be used. Tools or abrasives previously used on ferritic materials shall not be used on austenitic stainless steel.

#### 3.9.2 Organic solvents

Solvent cleaning is a process for removing contaminants from metal surfaces by immersion or by spraying or swabbing with common organic solvents. Acetone and alcohol are recommended for the cleaning of austenitic stainless steel. Chlorinated hydrocarbon solvents may be used as a final cleaning fluid provided the following requirements are met.

- a. Chlorinated hydrocarbon solvents shall be analyzed for total residual halogens and sulfur by evaporating a 100 gram sample of the material for 3 hours at a temperature of 100 °C (212 °F) or the boiling point of the materials, whichever is lower. The solvents shall be acceptable if the residue does not exceed 0.005 gram. If the residue exceeds 0.005 gram, it shall be analyzed for halogens in accordance with ASTM D808, E165 Annex 2 for chlorine, E165 Annex 3 for fluorine, and for sulfur in accordance with ASTM D129 or D1552. The total halogen content and sulfur content of the residue shall not exceed 1 percent each. The manufacturer (user) shall obtain certification of these tests for all solvents used on austenitic stainless steels, giving solvent batch number and test results. If an analysis is not required by the above rules, the manufacturer of the solvent shall certify the total amount of the residue.
- b. Chlorinated hydrocarbon solvents not meeting the requirements of paragraph 3.9.2.a may be used for cleaning austenitic stainless steel parts that are easily drainable and

contain no dead legs or crevices, provided that a final rinse is made with water containing less than 1 ppm of inorganic chlorides or with demineralized water when the component will handle water containing a maximum of 1 ppm inorganic chlorides during service.

3.9.3 Inorganic cleaning material

Because of the proprietary nature of many of the inorganic cleaners, the cleaning procedure and the chemical analysis of this material shall be submitted to the Buyer for approval.

3.10 INSULATION MATERIALS

Requirements for insulation materials shall be as specified in Regulatory Guide 1.36.

3.11 WATER QUALITY

Fresh water may be used for hydrostatic testing, leak testing and process. In case the operational fluid of the system is higher than that of fresh water, final cleaning, rinsing or flushing shall be performed with high quality water before the surface drying. The requirements for water quality shall be in accordance with ASME NQA-1, PART II, Subpart 2.1, Table 3.4.1.

**4.0 CERTIFICATION**

4.1 The Supplier shall certify each "lot" of material for compliance with the contaminant limits specified herein.

4.2 A "lot" shall consist of material manufactured in the same "batch" of a process.

4.3 The Sub-supplier shall obtain and maintain a Certificate with the requirements of this Appendix and submit to the Buyer when requested.

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**APPENDIX 4W**  
**Weld End Details**

KEPCO E&C JOB No. : 1229L



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4.0	INSERVICE INSPECTION	4W-2

## **1.0 SCOPE**

- 1.1 This Appendix provides the requirements for butt weld end preparation and transitions to be used on pipe, fitting or component and weld preparation for inservice inspection.
- 1.2 This Standard Appendix doesn't cover Automatic Narrow Gap Welding. Weld end details for Automatic Narrow Gap Welding shall be prepared under the responsibility of applicable contractors or suppliers.

## **2.0 GENERAL**

- 2.1 There shall be no welds included in pipe bends because the machining diameter "C" may remove the bending allowance. If available pipe lengths are not sufficient for a complete bend, the actual pipe diameter and wall dimensions shall be submitted to the Buyer with a request for a special welding end detail.
- 2.2 Plate piping shall be resized at the ends (for at least 100 mm (4 inches) from the end) prior to machining for welding to maximum out-of-round, such that the maximum or minimum O.D. shall not differ from the average by more than  $\pm 1.5$  mm (1/16 inch).
- 2.3 When machining weld ends, the pipe should be centered on the axis of the following diameter to insure against undercutting the minimum wall:
- |                           |                          |
|---------------------------|--------------------------|
| Forged & Bored ..... I.D. | Schedule Pipe ..... O.D. |
| Extruded ..... I.D.       | Hollow Forged ..... O.D. |
|                           | Plate ..... O.D.         |
- 2.4 For large diameter piping where the joint is readily accessible for welding, double welded joints may be used if the Buyer accepts. After welding the first side, the weld shall be back chipped or ground to sound metal from the second side, inspected by magnetic particle or liquid penetrant method and then welded to completion.

## **3.0 BUTT WELD END PREPARATION AND TRANSITIONS**

- 3.1 Butt weld end preparation and transitions shall be in accordance with Figure 1, 2, or Table 1, as applicable.
- 3.2 Schedule pipe (or standard wall, extra strong, or double extra strong pipe) per ASTM A106 and A335: Use details per Figure 1 or 2, as applicable, with dimensions A, B, C, and T as shown on Table 2.
- 3.3 Schedule pipe (or standard wall, extra strong, or double extra strong pipe) per ASTM A312 seamless and A376: Use details per Figure 1 or 2, as applicable, with dimensions A, B, C, and T as shown on Table 3.

- 3.4 All other pipes (forged and bored, hollow forged, extruded, welded plate, etc.): Use Details per Figure 1 or 2, as applicable, with dimensions A, B, C, and T as indicated on the applicable PDT or design drawings.
- 3.5 Pipe to component joints: Use details per Figure 1 or 2, as applicable, with dimensions as shown on Table 2 and 3.
- 3.6 Welding end transitions for component or fitting shall be in accordance with ASME Section III, Fig. NX-4250-1 or ASME B31.1, Fig. 127.4.2, as applicable. However when minimum wall thickness is specified in applicable PDTs,  $t_{\min}$  shall be as specified in the PDT.
- 3.7 Where  $t_{\min}$  specified in the paragraph 3.6 is not practicable, T (nominal wall thickness) may be used in lieu of  $t_{\min}$  for transition region and counterbore.

#### **4.0 INSERVICE INSPECTION**

- 4.1 The weld surface preparation for ASME Section III, Class 1 and 2 components shall meet the requirements of ASME Section XI and Figure 2. Weld end details not specified in Figure 2 shall be in accordance with Figure 1.
- 4.2 The surface finish shall be 250 rms or better for a distance of at least 2T (T = nominal wall thickness) plus 100 mm (4 inches) or 150 mm (6 inches), whichever is greater, from the edge of the weld crown on at least one side of the weld where an ultrasonic examination is required.
- 4.3 Caution shall be used during surface conditioning to avoid violating the minimum wall thickness requirement.

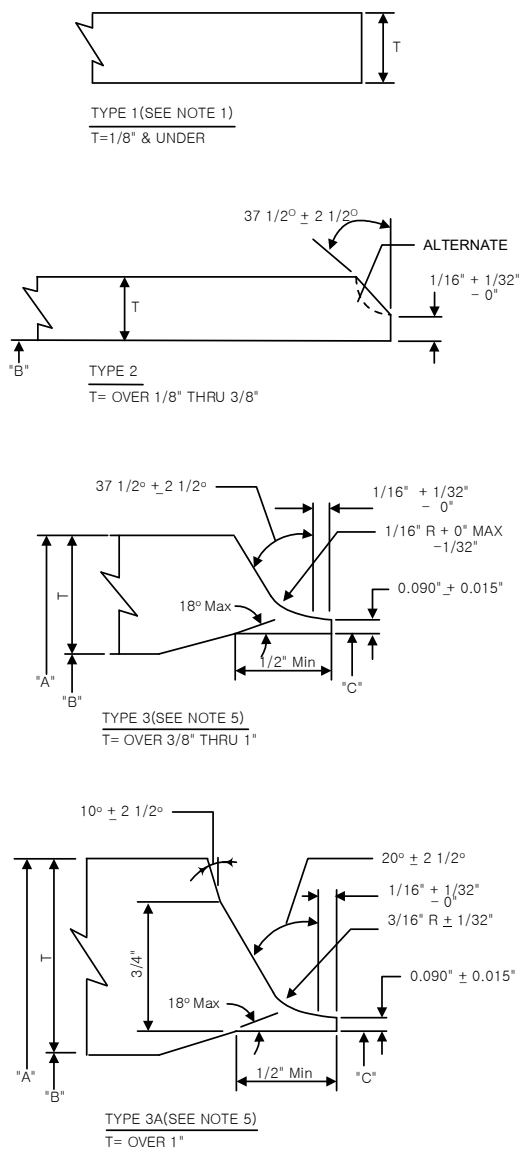
TABLE 1. GUIDE FOR SELECTION OF WELD END PREPARATION AND  
TRANSITIONS

GROUP	CODE JURISDICTION	WALL THICKNESS 1/8" AND UNDER	WALL THICKNESS OVER 1/8" THRU 3/8"	WALL THICKNESS OVER 3/8" THRU 1"	WALL THICKNESS GREATER THAN 1"
1	ASME III, CLASS 1 & 2				
	PIPE	Type 1	Type 2*	Type 3 and Fig.2 Detail A	Type 3A and Fig.2 Detail A
	COMPONENT	Type 1	Type 4*	Type 5 and Fig.2 Detail B	Type 6 and Fig.2 Detail B
2	ASME III, CLASS 3				
	PIPE	Type 1	Type 2	Type 3	Type 3A
	COMPONENT	Type 1	Type 4	Type 5	Type 6
3	CODES OTHER THAN ASME III				
	PIPE	Type 1	Type 2	Type 3	Type 3A
	COMPONENT	Type 1	Type 4	Type 5	Type 6

Note \* Volumetric inservice inspection shall be additionally performed for butt welds of NPS 2" and greater class 1 piping which are not isolated from reactor coolant system during normal operation in accordance with the requirements of NSSC Notice 2016-11. The weld end preparation and transitions are shown in Figure 2, as applicable.



PIPE WELDING END DETAILS



NOTES

- CUT SQUARE OR SLIGHT CHAMBER OPTIONAL
- A - NOMINAL O.D. OF PIPE  
B - NOMINAL I.D. OF PIPE  
C - I.D. OF PIPE AT LAND  
TOLERANCE + 0.010" - 0.040" (APPLICABLE FOR Fig 2.)  
T - NOMINAL WALL THICKNESS  
t<sub>min</sub> - MINIMUM WALL THICKNESS (See Para. 3.6 & 3.7)
- ALL COMPONENTS  
Y Min. = t<sub>min</sub>  
Y Max. = THE GREATER OF (t<sub>min</sub> + 0.150") OR 1.15 t<sub>min</sub>  
FOR PIPE ORDERED BY MINIMUM WALL.  
= THE GREATER OF (t<sub>min</sub> + 0.150") OR 1.10T  
FOR PIPE ORDERED BY NOMINAL WALL.
- 1/32" Max. UNIFORM MISMATCH AROUND JOINT.
- REFER TO APPENDIX 4W PARA.3.6, ALL WELD END PREPARATION CONDITIONS, OTHER THAN THIS APPENDIX REQUIREMENTS, SHALL COMPLY WITH APPLICABLE CODES AND STANDARDS.

COMPONENT WELDING END DETAILS

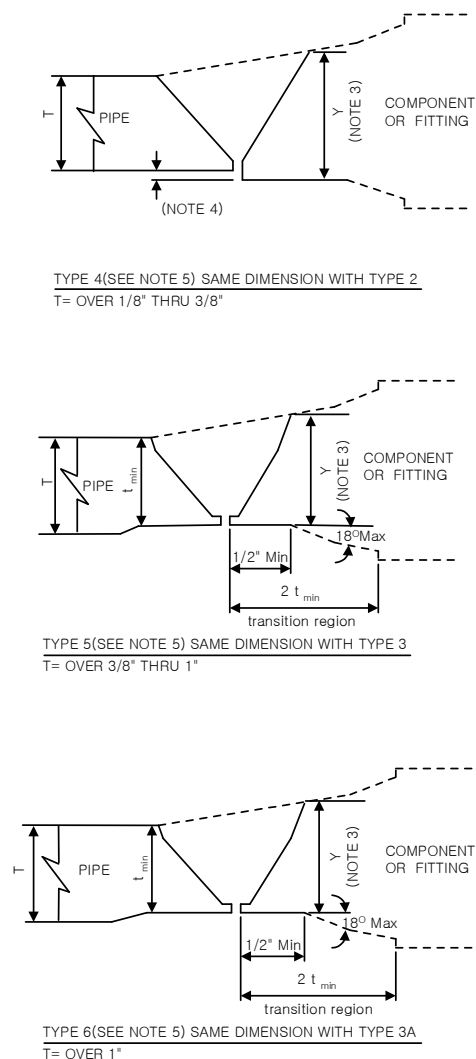
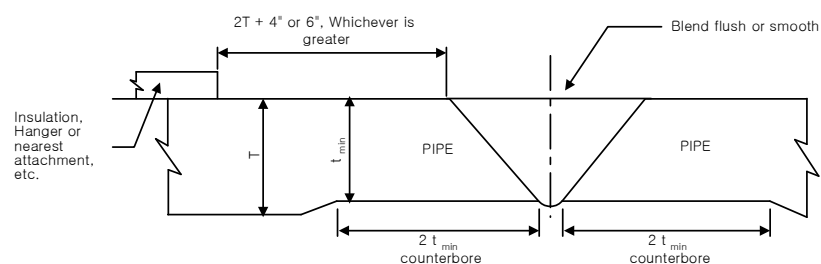
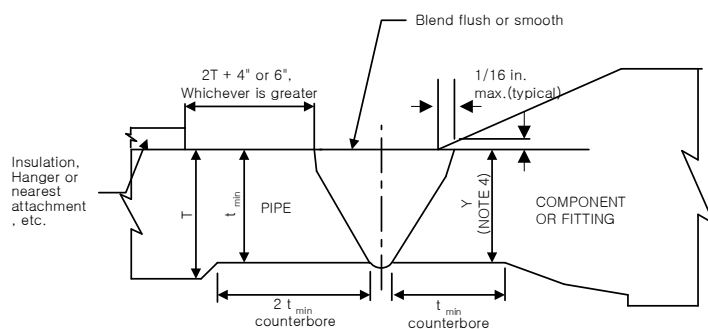


FIGURE 1. WELD END DETAILS FOR PIPE AND COMPONENTS

DETAIL A: PIPE TO PIPE WELDS



DETAIL B: PIPE TO COMPONENT WELDS



NOTES

1. NO UNDERCUTTING ALLOWED.
2. BREAK SHARP EDGES.
3. SEE FIGURES 1 FOR WELD END PREPARATION AND TRANSITION DETAILS.
4. Y Min. =  $t_{min}$   
Y Max. = THE GREATER OF ( $t_{min} + 0.150"$ ) OR  $1.15 t_{min}$   
FOR PIPE ORDERED BY MINIMUM WALL.  
= THE GREATER OF ( $t_{min} + 0.150"$ ) OR  $1.10T$   
FOR PIPE ORDERED BY NOMINAL WALL.

FIGURE 2. WELD PREPARATION FOR INSERVICE ULTRASONIC EXAMINATION  
ASME CLASS 1 AND 2

NOMINAL PIPE SIZE	SCHEDULE NO.	A	B	C	T
12"	(STD)	12.750	12.000		.375
18" O. D.	(STD)	18.000	17.250		.375
20" O. D.	20 (STD)	20.000	19.250		.375
22" O. D.	20 (STD)	22.000	21.250		.375
24" O. D.	20 (STD)	24.000	23.250		.375
8"	30	8.625	8.071		.277
10"	30	10.750	10.136		.307
12"	30	12.750	12.090		.330
14" O. D.	30 (STD)	14.000	13.250		.375
16" O. D.	30 (STD)	16.000	15.250		.375
18" O. D.	30	18.000	17.124	17.193	.438
20" O. D.	30 (XS)	20.000	19.000	19.084	.500
22" O. D.	30 (XS)	22.000	21.000	21.084	.500
24" O. D.	30	24.000	22.876	22.975	.562
2½"	40 (STD)	2.875	2.469		.203
3"	40 (STD)	3.500	3.068		.216
3½"	40 (STD)	4.000	3.584		.226
4"	40 (STD)	4.500	4.026		.237
5"	40 (STD)	5.563	5.047		.258
6"	40 (STD)	6.625	6.065		.280
8"	40 (STD)	8.625	7.981		.322
10"	40 (STD)	10.750	10.020		.365
12"	40	12.750	11.938	11.999	.406
14" O. D.	40	14.000	13.124	13.193	.438
16" O. D.	40 (XS)	16.000	15.000	15.084	.500
18" O. D.	40	18.000	16.876	16.976	.562
20" O. D.	40	20.000	18.812	18.919	.594
24" O. D.	40	24.000	22.624	22.755	.688
8"	60	8.625	7.813	7.874	.406
10"	60 (XS)	10.750	9.750	9.834	.500
12"	60	12.750	11.626	11.726	.562
14" O. D.	60	14.000	12.812	12.920	.594
16" O. D.	60	16.000	14.688	14.811	.656
18" O. D.	60	18.000	16.500	16.647	.750
20" O. D.	60	20.000	18.376	18.538	.812
22" O. D.	60	22.000	20.350	20.428	.875
24" O. D.	60	24.000	22.062	22.263	.969
2½"	80 (XS)	2.875	2.323		.276
3"	80 (XS)	3.500	2.900		.300
3½"	80 (XS)	4.000	3.364		.318
4"	80 (XS)	4.500	3.826		.337
5"	80 (XS)	5.563	4.813		.375
6"	80 (XS)	6.625	5.761	5.828	.432
8"	80 (XS)	8.625	7.625	7.709	.500
10"	80	10.750	9.562	9.670	.594
12"	80	12.750	11.374	11.505	.688
14" O. D.	80	14.000	12.500	12.647	.750
16" O. D.	80	16.000	14.312	14.482	.844
18" O. D.	80	18.000	16.124	16.318	.938
20" O. D.	80	20.000	17.938	18.155	1.031
22" O. D.	80	22.000	19.750	19.990	1.125
24" O. D.	80	24.000	21.562	21.826	1.219
8"	100	8.625	7.437	7.545	.594

NOMINAL PIPE SIZE	SCHEDULE NO.	A	B	C	T
10"	100	10.750	9.312	9.451	.719
12"	100	12.750	11.062	11.232	.844
14" O. D.	100	14.000	12.124	12.318	.938
16" O. D.	100	16.000	13.938	14.155	1.031
18" O. D.	100	18.000	15.688	15.936	1.156
20" O. D.	100	20.000	17.438	17.717	1.281
22" O. D.	100	22.000	19.250	19.553	1.375
24" O. D.	100	24.000	20.938	21.280	1.531
4"	120	4.500	3.624	3.693	.438
5"	120	5.563	4.563	4.647	.500
6"	120	6.625	5.501	5.601	.562
8"	120	8.625	7.187	7.326	.719
10"	120	10.750	9.062	9.232	.844
12"	120 (XXS)	12.750	10.750	10.959	1.000
14" O. D.	120	14.000	11.812	12.045	1.094
16" O. D.	120	16.000	13.562	13.826	1.219
18" O. D.	120	18.000	15.250	15.553	1.375
20" O. D.	120	20.000	17.000	17.334	1.500
22" O. D.	120	22.000	18.750	19.115	1.625
24" O. D.	120	24.000	20.376	20.788	1.812
8"	140	8.625	7.001	7.163	.812.
10"	140 (XXS)	10.750	8.750	8.959	1.000
12"	140	12.750	10.500	10.740	1.125
14" O. D.	140	14.000	11.500	11.772	1.250
16" O. D.	140	16.000	13.124	13.443	1.438
18" O. D.	140	18.000	14.876	15.226	1.562
20" O. D.	140	20.000	16.500	16.897	1.750
22" O. D.	140	22.000	18.250	18.678	1.875
24" O. D.	140	24.000	19.876	20.351	2.062
2½"	160	2.875	2.125		.375
3"	160	3.500	2.624	2.693	.438
4"	160	4.500	3.438	3.530	.531
5"	160	5.563	4.313	4.428	.625
6"	160	6.625	5.187	5.326	.719
8"	160	8.625	6.813	6.999	.906
10"	160	10.750	8.500	8.740	1.125
12"	160	12.750	10.126	10.413	1.312
14" O. D.	160	14.000	11.188	11.499	1.406
16" O. D.	160	16.000	12.812	13.170	1.594
18" O. D.	160	18.000	14.438	14.842	1.781
20" O. D.	160	20.000	16.062	16.513	1.969
22" O. D.	160	22.000	17.750	18.240	2.125
24" O. D.	160	24.000	19.312	19.857	2.344
12"	(XS)	12.750	11.750	11.834	.500
14" O. D.	(XS)	14.000	13.000	13.084	.500
18" O. D.	(XS)	18.000	17.000	17.084	.500
24" O. D.	(XS)	24.000	23.000	23.084	.500
2½"	(XXS)	2.875	1.771	1.868	.552
3"	(XXS)	3.500	2.300	2.409	.600
4"	(XXS)	4.500	3.152	3.279	.674
5"	(XXS)	5.563	4.063	4.209	.750
6"	(XXS)	6.625	4.897	5.072	.864
8"	(XXS)	8.625	6.875	7.053	.875

**LEGEND**

A – NOMINAL O.D. OF PIPE

B – NOMINAL I.D. OF PIPE

T – NOMINAL WALL THICKNESS

C – I.D. OF PIPE AT LAND

TOLERANCE + 0.010" – 0.040"

C = A – 0.031" – 1.75T – 0.010"

**TABLE 2. CARBON & LOW ALLOY STEEL PIPE DIMENSIONS**

NOMINAL PIPE SIZE	SCHEDULE NO.	A	B	C	T
1"	10S	1.315	1.097		.109
1-½"	10S	1.900	1.682		.109
2"	10S	2.375	2.157		.109
1"	40S	1.315	1.049		.133
1-½"	40S	1.900	1.610		.145
2"	40S	2.375	2.067		.154
1"	80S	1.315	0.957		.179
1-½"	80S	1.900	1.500		.200
2"	80S	2.375	1.939		.218
1"	40 (STD)	1.315	1.049		.133
1-½"	40 (STD)	1.900	1.610		.145
2"	40 (STD)	2.375	2.067		.154
1"	80	1.315	0.957		.179
1-½"	80	1.900	1.500		.200
2"	80	2.375	1.939		.218
1"	160	1.315	0.815		.250
1-½"	160	1.900	1.338		.281
2"	160	2.375	1.687	1.732 *	.344
3"	160	3.500	2.624	2.693	.438
1"	XXS	1.315	0.599		.358
1-½"	XXS	1.900	1.100	1.159	.400
2"	XXS	2.375	1.503	1.571	.436

NOMINAL PIPE SIZE	SCHEDULE NO.	A	B	C	T
2½"	10S	2.875	2.635		.120
3"	10S	3.500	3.260		.120
3½"	10S	4.000	3.760		.120
4"	10S	4.500	4.260		.120
5"	10S	5.563	5.295		.134
6"	10S	6.625	6.357		.134
8"	10S	8.625	8.329		.148
10"	10S	10.750	10.420		.165
12"	10S	12.750	12.390		.180
2½"	40S	2.875	2.469		.203
3"	40S	3.500	3.068		.216
3½"	40S	4.000	3.548		.226
4"	40S	4.500	4.026		.237
5"	40S	5.563	5.047		.258
6"	40S	6.625	6.065		.280
8"	40S	8.625	7.981		.322
10"	40S	10.750	10.020		.365
12"	40S	12.750	12.000		.375
2½"	80S	2.875	2.323		.276
3"	80S	3.500	2.900		.300
3½"	80S	4.000	3.364		.318
4"	80S	4.500	3.826		.337
5"	80S	5.563	4.813		.375
6"	80S	6.625	5.761	5.828	.432
8"	80S	8.625	7.625	7.709	.500
10"	80S	10.750	9.750	9.834	.500
12"	80S	12.750	11.750	11.834	.500

#### LEGEND

- A – NOMINAL O.D. OF PIPE  
B – NOMINAL I.D. OF PIPE  
C – I.D. OF PIPE AT LAND  
TOLERANCE +0.010" – 0.040"  
C = A - 0.031" – 1.75T – 0.010"  
T – NOMINAL WALL THICKNESS

#### NOTE :

1. SIZES 10S, 40S & 80S APPLY TO PIPE UP TO  
& INCLUDING 12" PIPE(ANSI/ASME B36.19M).  
FOR SIZES LARGER THAN 12" CARBON STEEL  
SCHEDULES WILL APPLY WITH DIMENSIONS AS  
SHOWN ON TABLE 2.

\* APPLICABLE FOR VOLUMETRIC INSERVICE INSPECTION  
(SEE NOTE OF TABLE 1)

TABLE 3. STAINLESS STEEL PIPE DIMENSIONS

ARA

## APPENDIX 4X

### Requirements for Part Classification

KEPCO E&C JOB No. : 1229L



#### ISSUE STATUS

0	03/06/23	Issue for Use	임정민	김익재	이선규	김정강
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**ATTACHMENT**

1	INSTRUCTIONS TO DETERMINE PART CLASSIFICATION FOR Q-CLASS EQUIPMENT
2	INSTRUCTIONS TO DETERMINE PART CLASSIFICATION FOR A-CLASS EQUIPMENT
3	PART LIST FORM

## **1.0     GENERAL**

### **1.1     Scope**

The Scope of this Appendix is to determine the quality classification of parts used in equipment. The purpose is to utilize the classification method practically and efficiently for the plant operation and management.

## **2.0     DEFINITIONS**

### **2.1     Equipment**

An assembly of components designed and manufactured to perform specific functions

### **2.2     Component**

An assembly of parts to have independent function (e.g., pump, motor)

### **2.3     Part**

Minimum unit of maintenance or replacement as a basic unit of equipment or component (e.g., gasket, relay, capacitor, switch, stem)

## **3.0     REQUIREMENTS FOR PART CLASSIFICATION**

3.1     The supplier shall identify and determine appropriate quality class of each part. Part classification depends on safety function (design function) and quality class of its parent equipment. Therefore, if the quality class of parent equipment is Q, parts shall be classified as Q (Q1, Q2, and Q3) or S in accordance with the classification methodology specified in Section 3.2. In case the quality class of equipment is A, the classification of the parts shall follow Section 3.3. The rest of equipment, which is considered as S, are not classified. All parts of S class equipment are also considered as quality class S. However, part list shall be prepared in accordance with Section 3.5.

### **3.2     Requirements of part classification for Q-Class equipment**

3.2.1   Parts used in Q-Class equipment (that is, safety-related component) can be classified by considering two conditions. One is whether the part is required for the component to carry out its safety-related functions. The other is to analyze whether the failure mechanism of the parts affects the safety-related functions of the component.

3.2.2   Suppliers shall identify the required information for all components and complete Form1 of attachment 1.

3.2.3   If the information on the parent components has been changed, the supplier should be informed about Attachment 1, Form 1 from A/E.

- 3.2.4 Supplier shall identify and evaluate the function of each part using Form2 of attachment 1. If a part is not related to the safety function directly, its failure modes and effects should be evaluated using Form3 of attachment 1.
- 3.2.5 All parts described in the part list shall be properly designated quality class with an alphanumeric character (Q1, Q2, Q3 or S) and the definition is as follows:
- A. Safety-Related ASME (Q1)

Q1 is assigned to those parts which are governed by Section III (NB, NC or ND) of the ASME B&PV Code. These are the pressure retaining items of ASME Section III components. They are purchased from an ASME certification holder (e.g., N-stamp) with an ASME QA program (per NCA-3800 or NCA-4000, as applicable) meeting the pertinent requirements of 10CFR50 Appendix B, 10CFR21 requirements are applicable to this type of procurement.
  - B. Safety-Related Basic Component (Q2)

Q2 is assigned to those parts which are purchased or manufactured as basic components from a vendor with an approved 10CFR50 Appendix B quality assurance program, excluding items classified as Q1, 10CFR21 requirements are applicable to this type of procurement.
  - C. Safety-Related Commercial Grade Item (Q3)

Q3 is assigned to those parts which are not provided as basic components. These items are purchased as commercial grade and dedicated by the utility or a dedicating entity under their QA program. 10CFR21 is not applicable.
  - D. Non-Safety-Related (S)

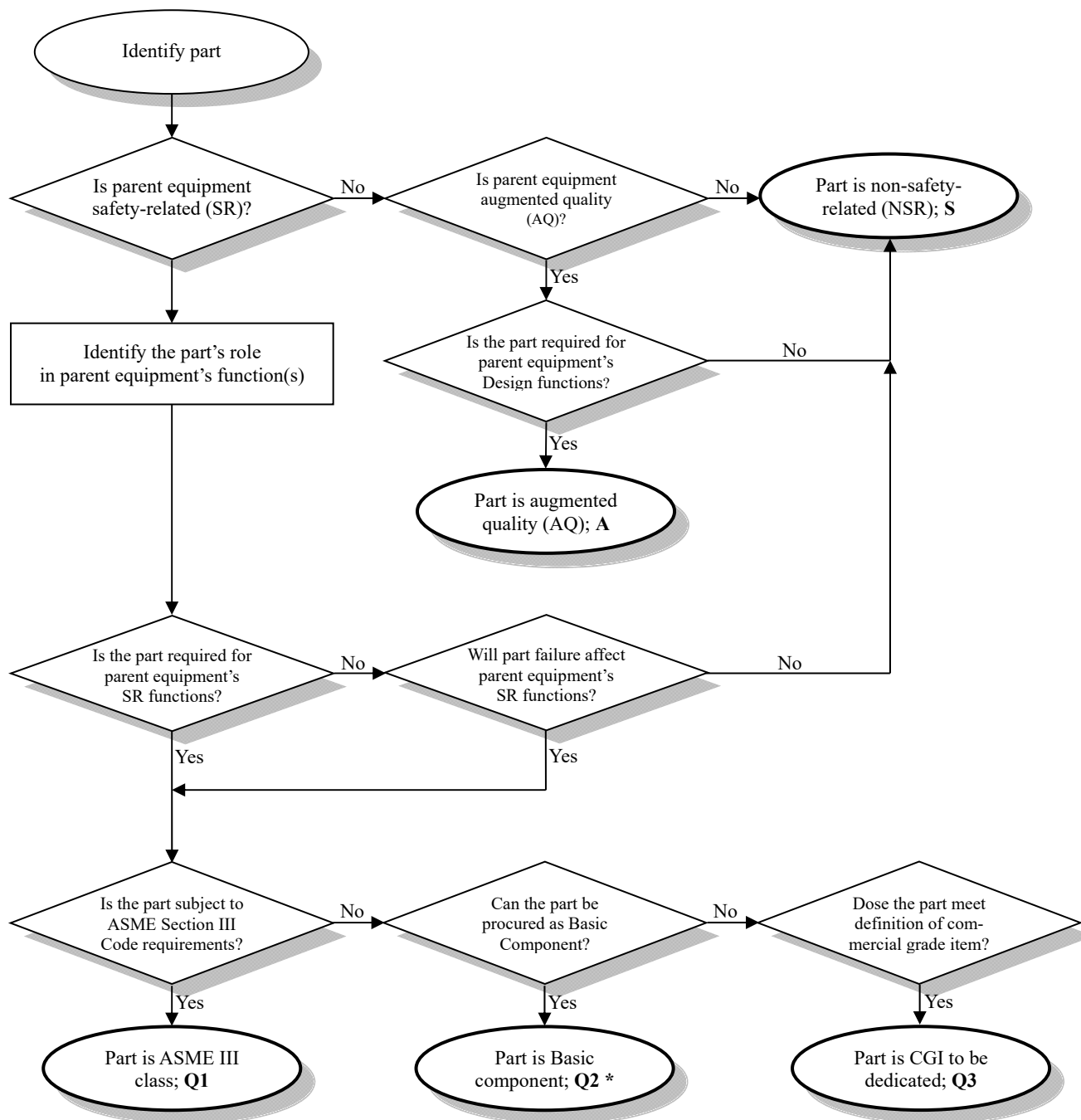
S is assigned to those parts that do not affect nor degrade the equipment/component safety function performance or availability. This category consists of non-safety-related items that are not subject to any special requirements. 10CFR21 is not applicable.
- 3.2.6 Based on the above classifications, supplier shall complete the part list using the Attachment 3.
- 3.3 Requirements of part classification for A-Class equipment
- 3.3.1 For the parts used in A-Class parent equipment (that is, augments-quality component), after confirming component's regulatory requirements or special requirement imposed by the utility, parts which perform or impact to their component (equipment)'s design functions are classified as quality class A.



- 3.3.2 Suppliers shall identify the required information for all components and complete Form1 of attachment 2.
- 3.3.3 If the information about parent components has been changed, the supplier should be informed about Attachment 2, Form 1 from A/E.
- 3.3.4 Supplier shall identify and evaluate the function of each part using Form2 of attachment 2. If a part is not required for design function of parent component directly, the quality class of part is determined as S.
- 3.3.5 All parts described in the part list shall be properly designated quality class with an alpha-numeric character (A or S) and the definition is as follows:
  - A. Augmented Quality  
A is assigned to those parts which are provided as non-safety-related items for which regulatory requirements or special requirements imposed by the utility exist that establish design, procurement, maintenance, or quality assurance requirements. None of these requirements constitutes a safety-related functions or classification. However, because of these requirements certain items are classified as A in order to ensure that these requirements are preserved while operating, maintaining, or modifying the items. 10CFR21 is not applicable.
  - B. Non-Safety-Related (S)  
S is assigned to those parts that do not effect nor degrade the equipment/component safety function performance or availability. This category consists of non-safety-related items that are not subject to any special requirements. 10CFR21 is not applicable.
- 3.3.6 Based on the above classifications, supplier shall complete the part list using the Attachment 3.
- 3.4 Requirements of part classification for S-Class equipment
  - 3.4.1 Supplier shall complete and submit the part list only using Part List Form of Attachment 3.
- 3.5 Part List
  - 3.5.1 The part list, using Microsoft Excel only, shall be prepared by referring Attachment3 for the classified parts of all equipment.
  - 3.5.2 Supplier who supplies Q or A class equipment shall submit the part list to owner including all completed forms of Attachment1 or Attachment2.

### 3.6 Work Flow

3.6.1 The work flow chart for overall part classification process is as follows.



\* Note: If the part can be procured as a Basic component which is designed and manufactured in accordance with vendor's 10CFR50 App.B QA program, supplier shall provide the part as Q2 class. CGI Dedication is not allowed.

**ATTACHMENT 1**

**INSTRUCTIONS TO DETERMINE PART CLASSIFICATION FOR  
Q-CLASS EQUIPMENT**

## **Table of Contents**

**Form 1. Parent Component Safety Functions and Classification Evaluation Sheet**

**Form 2. Part Classification Work Sheet**

**Form 3. Part Failure Modes and Effect Analysis (FMEA) Work Sheet**

**Table 1. Typical Safety Functions for Component**

**Table 2. Typical Failure Modes for Part**

### **Instructions**

1. Instructions for Evaluating Safety Functions and Classification for Parent Component
2. Instructions for Preparing Part Classification Work Sheet
3. Instructions for Preparing Failure Modes and Effect Analysis (FMEA) Work Sheet for Each Part

**Form 1. Parent Component Safety Functions and Classification Evaluation Sheet**

<b>1. Evaluation Sheet No.</b>		<b>2. Station/Unit(s)</b>	
<b>3. System/Component Identification</b>			
System			
Component		Component Tag No.	
Specification No.		Supplier/Manufacturer	
<b>4. Component Safety Functions Evaluation</b>			
Safety Function Code No. (CSF)	Safety Function Description		
<b>5. Component Classification</b>			
Safety Class(SC)	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> NNS	Quality Class	<input type="checkbox"/> Q <input type="checkbox"/> A <input type="checkbox"/> S
Electrical Class	<input type="checkbox"/> 1E <input type="checkbox"/> Non-1E <input type="checkbox"/> N/A	Seismic Category	<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III
Quality Group	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> N/A		
Safety Classification	<input type="checkbox"/> SR <input type="checkbox"/> AQ <input type="checkbox"/> NSR		
Environment Qualification	<input type="checkbox"/> EQ <input type="checkbox"/> N/A	Operational Mode	<input type="checkbox"/> Active <input type="checkbox"/> Passive <input type="checkbox"/> N/A
<b>6. References</b>			

## Form 2. Part Classification Work Sheet

1. Part Identification				
Part Classification Sheet No.		Part Description		
Part/Model No.		Part specification		
Manufacturer		Manufacturer's Identification No.		
2. Part Function				
3. Part Safety Evaluation				
1) Component Safety Functions	2) Is Item Required for Safety Function?  <input type="checkbox"/> Yes <input type="checkbox"/> No	3) Failure Mode and Effect Analysis(FMEA)		4) Will Item Failure Prevent Function?  <input type="checkbox"/> Yes <input type="checkbox"/> No
		Failure Modes	Failure Effects	
4. References				
5. Part Safety-Related Classification <input type="checkbox"/> Safety-Related(SR) <input type="checkbox"/> Non-Safety-Related(NSR)				
6. Part Classification Evaluation				
1) ASME B&PV Code Requirements: <input type="checkbox"/> Yes <input type="checkbox"/> No ASME Sec. III Class :                      Year :                      Addenda :				
2) Unless it is not subject to ASME Sec. III Class, Can it be supplied as a Basic Component? <input type="checkbox"/> Yes <input type="checkbox"/> No				
3) Does the item meet the definition of commercial grade items? <input type="checkbox"/> Yes <input type="checkbox"/> No				
7. Final Part Classification				
<input type="checkbox"/> Q1(ASME III) <input type="checkbox"/> Q2(Basic Component) <input type="checkbox"/> Q3(CGI) <input type="checkbox"/> S(NSR)				

### Form 3. Part Failure Modes and Effect Analysis (FMEA) Work Sheet

<b>1. Part Classification Sheet No.</b>				
<b>2. Part/Model No.</b>		<b>3. Manufacturer's Identification No.</b>		
<b>4. Component Safety Functions</b>				
<b>5. Failure Modes</b>				
Code	Checklist	Yes	No	Failure Modes
FM301	Is item in condition that can cause a crack along the boundaries such as tension, compression, or high/low temperatures?			Fracture
FM302	Is material of item under tension that can effect elastic limit and lead and overall deformation of item?			Rupture
FM303	Is item in a prolonged exposure to high temperature and stress, then can cause a slow change in its physical and mechanical characteristics?			Excess Creep
FM304	Is there a possibility to occur an unacceptable deformation from prolonged use such as friction or contact between parts?			Excess Wear
FM305	Can be deformed (distorted) under the action of excessive external forces?			Excess Strain
FM306	Is there a possibility to occur chemical processes between material and surrounded environment?			Corrosion
FM307	Is there a possibility to make an abnormal connection of relatively low impedance between two points of different potential?			Short Circuit
FM308	Is there a possibility to connect with the place of earth and result in excessive current flow?			Ground Fault
FM309	Is there no complete path for current flow caused by an unintentionally broken electric circuit?			Open Circuit
FM310	Is item in a prolonged exposure to a high temperature and/or radiation environment?			Loss of Material Property
FM311	Is there a possibility to occur an electric current deterioration of transistor rating due to sodium and water impurities in the silicon?			Trap
FM312	Is item under the force that can make an unacceptable change in the ratio between a set spring and the resulting spring displacement?			Loss of Spring Constant
FM313	Is there a possibility to occur a loss of clogging of a filtering medium resulting in the inability to perform its purification function?			Blockage
FM314	Is there a possibility to bind a item through excessive pressure, temperature, or friction?			Seizure
FM315	Is there a possibility to produce mechanical oscillations that are beyond the defined permissible limits due to unbalancing, poor support, or rotating?			Unacceptable Vibration
FM316	Is item used in a condition that include solid particles carded with the fluid?			Erosion
FM317	Is there a possibility to occur a permanent degradation of system efficiency or inadequate function of item due to electromagnetic interference or electromagnetic susceptibility?			Malfunction
<b>6. Result</b>				
<b>1) Failure Modes</b>	<b>2) Failure Effects</b>	<b>3) Applicable Safety Function</b>		

**Table 1. Typical Safety Functions for Component**

Code	Function	Definition/Remarks
CSF01	Maintain Pressure Integrity	Required to prevent the escape or entry of an excessive quantity of fluid between the working pressure boundary and the atmosphere. Applies to both active and passive equipment, inclusive of items containing fluid or gas.
CSF02	To Open	Active components normally closed and required to perform a mechanical movement to achieve and maintain an open position, thereby allowing the minimum design flow.
CSF03	Remain Open	Passive components normally open and required to maintain open position, thereby allowing the minimum design flow.
CSF04	To Close, Isolate	Active components normally open and required to perform a mechanical movement to achieve and maintain a closed position, thereby stopping process flow.
CSF05	Remain Closed, Isolate	Passive components normally closed and required to maintain a closed position.
CSF06	Provide Directional Control	Active and passive components required to govern the direction of process fluid or gas movement, determined by the operating parameters of the system.
CSF07	Actuate/Modulate	Active components required to perform continuing mechanical movement, e.g., a components that modulates position to regulate flow.
CSF08	Maintain Structural Integrity	Active and passive components required to maintain their structural form. Components do not collapse, disassemble, or disintegrate. Failure of a part confined internally to the component does not constitute a violation of structural integrity.
CSF09	Provide Pressure /Flow	Active components required to provide the minimum design pressure/flow of process fluid or gas through component movement.
CSF10	Containment Isolation	Active or passive components required to be closed for containment isolation.
CSF11	Provide Heat Control	Process of heating or cooling a fluid, gas or other component. Mechanically, a heat exchange or cooling coil typically accomplishes this function. Electrically, this function is accomplished by an electrical heater.
CSF12	Provide Filtering	Passive components required to remove particulate or debris from process fluid or gas.
CSF13	Provide Motive Force	Active components required to provide motive force, to start and commence operation, and continue operation as required.
CSF14	Transform/Supply Energy	Applies to those components required to provide voltage/current, at appropriate power levels, for use by other components.
CSF15	Provide Indication	Required to provide indication, either local or remote, to operations or maintenance.
CSF16	Maintain Circuit Integrity	Maintain intact electrical state such that design current flow is accomplished through component and excess current flow, caused by shorting, does not occur. Components that must distribute, allow, rated current flow included buses, distribution panels, fuses and circuit breakers. Function applies to all electrical components to prevent excess current flow, shorts.



Code	Function	Definition/Remarks
CSF17	Electrical Isolation	Electrical to those components that prevent excess current flow, usually caused by short circuit, from propagating through circuit and impairing the operation of other components. Components with this function are typically used to isolate NSR circuits from SR circuits.
CSF18	Change State	Changes in state to perform a control function. State changes include normally energized to de-energized state or the reverse, or modulate between states. Devices, which change state to perform their functions, include relays, circuit breakers, solenoid valve operators, etc.
CSF19	Provide Signal	Applies to components that generate or transmit a process signal used for control or indication purposes. Applies to transmitters, elements, signal conditioners and converters.
CSF20	Provide Control	Applies to those components whose primary function is to control other components. This function is typically accomplished through a change in contact position(s) and applies to switches.
CSF21	Associated with SR Circuit	Passive safety device that serves no safety-related function but is connected directly to a SR circuit without an isolation device.
CSF22	Provide Alarm	Provides an indication to warn operator or plant personnel in case of an abnormal condition.
CSF23	Provide Support/ Security	Required to restrict movement or provide damping to insure dynamic stability.
CSF24	Start & Operation	Required to start and commence performance of an operation, continuing such operation as required.
CSF25	Shut Down	Required to shut off and stop operation.
CSF26	Provide Cooling	Removes heat from a system.
CSF27	Voltage Regulation	Generally used for voltage regulator that provides voltage at desired level.
CSF28	Manually Actuate	Initiates and performs the required mechanical movement by operator action (local or remote).
CSF29	Restrict Flow	Passive flow elements (e.g., orifice, venturi) provide this function.
CSF30	Provide Recording	Recorders, as a part of SR display, provide this function.
CSF31	Provide Pressure Relief	Relieves excessive pressure (safety relief valves).
CSF32	Provide Water/ Diesel Fuel Oil Inventory	Passive devices such as tank and accumulator provide this function.
CSF33	Provide Radiation Detection	Radiation Monitoring
CSF34	Provide Leak Detection	Leakage Monitoring
CSF35	Pressure Regulation	Generally used for pressure regulator which controls air pressure at desired level
CSF36	Containment Isolation Valve Status	Applicable to limit switched that provides valve status input to indicating circuits.

**Table 2. Typical Failure Modes for Part**

Codes	Terms	Definitions
FM301	Fracture	Mechanical failure is separation of a material at the boundaries of molecules as a result of tension, compression, or high/low temperatures. It usually starts as a crack along the boundaries where stresses exceed the ultimate stress. This crack would grow (internally or externally) due to stress concentration, thus resulting in sudden and complete failure of the member.
FM302	Rupture	Mechanical failure as a result of excessive inelastic action in a material that is usually preceded by an overall deformation of the member shortly after “necking” for ductile material under tension where the member becomes considerably weakened.
FM303	Excess Creep	From prolonged exposure to high temperature and stress, the object will show a slow change in its physical (shape and dimension) and mechanical characteristics.
FM304	Excess Wear	From prolonged use, generally friction or contact between parts resulting in unacceptable deformation.
FM305	Excess Strain	Under the action of excessive external forces a material of the part has been deformed (distorted).
FM306	Corrosion	The gradual destruction of a material due to chemical processes such as oxidation or the action of a chemical agent.
FM307	Short Circuit	An abnormal connection (including an arc) of relatively low impedance between two points of different potential, usually resulting in excessive current flow.
FM308	Ground fault	A conducting connection, made accidentally, by which an electric circuit or equipment is connected to the earth, or to some conducting body of relatively large extent that serves in place of earth, usually resulting in excessive current flow.
FM309	Open Circuit	An electric circuit that may be unintentionally broken, so that there is no complete path for current flow.
FM310	Loss of Material Property	A loss of mechanical and physical properties of a material due to prolonged exposure to a high temperature and/or radiation environment.
FM311	Trap	Electric current deterioration of the transistor rating due to sodium and water impurities in the silicon.
FM312	Loss of Spring Constant	Unacceptable change in the ratio between a set spring force and the resulting spring displacement.
FM313	Blockage	Clogging of a filtering medium resulting in the inability to perform its purification function.
FM314	Seizure	Binding of a normally moving item through excessive pressure, temperature, or friction.
FM315	Unacceptable Vibration	Mechanical oscillations produced are beyond the defined permissible limits due to unbalancing, poor support, or rotating at critical speeds.
FM316	Erosion	Destruction of materials by the abrasive action of moving fluids. Usually accelerated by the presence of solid particles carded with the fluid.
FM317	Malfunction	A permanent degradation of system efficiency or inadequate function of item due to electromagnetic interference or electromagnetic susceptibility.

## 1. Instructions for Evaluating Safety Functions and Classifications for Parent Component

The classification and safety functions of the component are a prerequisite to the parts classification and must be established before proceeding to the parts classification.

Referring to following instructions supplier shall identify and provide the required information for all components using Form 1 of this attachment.

No.	Section Description	Instructions
1	Evaluation Sheet No.	Give the number of evaluation sheet as follows: Description Example: <u>F-134-UN205 - ES - 001</u> (Spec. No.) (Sheet Serial No. 001 thru 999)
2	Station/Unit(s)	Identify the station/unit(s) of installed item.
3	System/Component Identification	Identify the system/component identifications, including the following: System and Component Description Component Tag No. Technical specification No. of the parent component Supplier/Manufacturer of the parent component
4	Component Safety Functions Evaluation	Identify safety functions(dedicated functions of component) code no.(CSF) of the parent item referring to the purchase specification section 4 and above item 3 and describe each function, one function per line. See Table 1 “Typical Component Safety Functions” for details.
5	Component Classification	Identify the component classes as follows: 1) Safety Class: Safety class 1, 2, 3 or NNS 2) Quality Class: Q(safety-related), A(augmented-Q) or S(industrial standard) 3) Electrical Class: 1E or Non-1E 4) Seismic Category: Seismic category I, II or III 5) Quality Group: Quality group(A, B, C, D, E, G) or N/A 6) Safety Classification: Safety-Related(SR), Augmented Quality(AQ) or Non Safety-Related(NSR) 7) Environmental Qualification: EQ or Non-EQ 8) Operational Mode: Active, Passive or N/A
6	References	Identify the evaluation reports including environmental and seismic qualification reports or other related documents of parent item.

## 2. Instructions for Preparing Part Classification Work Sheet (for Q-Class Component)

If the parent component is Safety-related (Q-Class) then an evaluation is required to determine if the classification of the part should be Safety-related or Non-safety-related. Safety classification of part is based upon an item's function and those effects that impact the safety functions of the component.

Referring to following instructions supplier shall identify and provide the required information for all Parts using Form 2 of this attachment.

No.	Section Description	Instructions
1	Part Identification	<p>Identify the part identifications as follows:</p> <p>1) Give the number of Part Classification Work Sheet as follows: Description Example: <u>F-542-M-PP 01 A - 001</u> (Tag No.) (Part Serial No. 001 thru 999)</p> <p>2) Part Description: Identify the name or description of the part.</p> <p>3) Part/Model Number: Identify the identification number for the part. This might be a part number, model number, style number, type number or other unique identifier used by the manufacturer to uniquely identify the product.</p> <p>4) Specification: Provide a brief description of part specification.</p> <p>5) Manufacturer: Identify the manufacturer providing the item.</p> <p>6) Manufacturer's Identification No.: Number assigned to track item in the manufacturer inventory.</p>
2	Part Function	<p>Provide a description of the part design functions. Generally this will be the role or function as provided on the manufacturer's published description.</p>
3	Part Safety Evaluation	<p>Evaluate the part function and determine safety classification in accordance with the following sequence:</p> <p>1) Component Safety Functions: Identify safety functions code no.(CSF) of the parent item. Refer to the Component Safety Functions and Classification Evaluation Sheet item no. 4.</p> <p>2) Is Item Required for Safety Function? : Answer this question "Yes" or "No" for the component function on the same line. If the answer is "Yes", item is determined to be SR and the following items no. 3) and 4) can be skipped.</p> <p>3) Failure Modes and Effects Analysis (FMEA): If the answer to the questions in items no. 2) and 4) are both "No" then the basis must be justified by reviewing the failure modes and effects. Identify the potential credible failure modes for the item. Use the "Part Failure Modes And Effects Analysis (FMEA) Work Sheet".</p> <p>4) Will Item Failure Prevent Function?: Based on the result of "Part Failure Modes And Effects Analysis(FMEA) Work Sheet", answer this question "Yes" or "No" for the component function on the same line.</p>
4	References	<p>Identify the reference documents including the title, revision number and other information.</p>

No.	Section Description	Instructions
5	Part Safety-Related Classification	<p>Select the part safety classification based on the item no. 3 above.</p> <p>If the one of the answer to the questions in item no. 2) or 4) is “Yes”, item is determined to be SR. Otherwise, item is NSR and the FMEA Work sheet shall be prepared.</p>
6	Part Classification Evaluation	<p>Identify the following items no. 1) through 3) to determine the part safety classification:</p> <p>1) ASME B&amp;PV Code Requirements: Identify the ASME Code requirements of the part. Identify the applicable ASME Sec. III class, Year and Addenda, as documented on the components Code data report or drawings. Review the applicable portions of the Code to determine the requirements for documentation.</p> <p>2) In case that is not subjected ASME Sec. III Class, can be supplied as a Basic Component? : If the item is designed and manufactured specifically for the nuclear safety-related application then it is a basic component. Otherwise it is a commercial grade item and shall be dedicated.</p> <p>3) Does item meet definition of commercial grade item? :</p> <p>Commercial grade item is a structure, system, component, or part thereof that affects its safety function and that was not designed and manufactured as a basic component, Commercial-grade items do not include items where the design and manufacturing process require in-process inspections and verifications to ensure that defects or failures to comply are identified and corrected (that is, one or more critical characteristics of the item cannot be verified).</p>
7	Final Part Classification	<p>Select the final part classification based on the preceding evaluation.</p> <p>When the part is classified as SR, consider the above questions items no. 6-1) through 6-3). If the answer of item no. 6-1) is “Yes”, the part is determined to be Q1. If the answer of item no. 6-2) is “Yes”, the part is determined to be Q2. If the answer of item no. 6-3) is “Yes”, the part is determined to be Q3.</p>

### 3. Instructions for Preparing Failure Modes and Effect Analysis (FMEA) Work Sheet for Each Part

For the parts that are not required for safety function of parent component, the potential failures and the effect of such failures on the parent component safety functions shall be evaluated by performing a Failure Modes and Effects Analysis (FMEA).

Referring to following instructions supplier shall identify the required information and evaluate the results for the questions using Form 3 of this attachment.

No.	Section Description	Instructions
1	Part Classification Work Sheet No.	Identify the number of Part Classification Work Sheet.
2	Part/Model Number	Identify the identification number for the part. This might be a part number, model number, style number, type number or other unique identifier used by the manufacturer to uniquely identify the product.
3	Manufacturer's Identification No.	Identify the number assigned to track item in the manufacturer inventory.
4	Component Safety Functions	Identify safety functions code no.(CSF) of the parent item. Refer to the Component Safety Functions and Classification Evaluation Sheet item no. 4.
5	Failure Modes	Referring to Table 2 "Typical Failure Modes for Parts" answer each question item no. FM301 through FM317 to identify possible failure modes relative to component safety function. Any failure mode that has been marked 'Yes' shall be evaluated in below item no. 6. Results.
6	Results	Evaluate the result about each effect of the failure on the performance of the components safety functions and describe as follows: 1) Failure Modes: Failure mode that has been marked 'Yes' 2) Failure Effects: Effects of the failure on the performance of the system or parent components. The reason whether this failure can impact or not shall be described in this section. 3) Applicable Safety Functions: If the failure effect impact the safety functions of the parent component, identify the applicable safety functions (CSF). Otherwise, mark N/A.

**ATTACHMENT 2**

**INSTRUCTIONS TO DETERMINE PART CLASSIFICATION FOR  
A-CLASS EQUIPMENT**

## **Table of Contents**

**Form 1. Parent Component Design Functions and Classification Evaluation Sheet**

**Form 2. Part Classification Work Sheet**

### **Instructions**

1. Instructions for Evaluating Design Functions and Classification for Parent Component
2. Instructions for Preparing Part Classification Work Sheet



**Form 1. Parent Component Design Functions and Classification Evaluation Sheet**

<b>1. Evaluation Sheet No.</b>		<b>2. Station/Unit(s)</b>	
<b>3. System/Component Identification</b>			
System			
Component		Component Tag No.	
Specification No.		Supplier/Manufacturer	
<b>4. Component Design Functions Evaluation</b>			
Design Function	Design Function Description		
<b>5. Component Classification</b>			
Safety Class(SC)	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> NNS	Quality Class	<input type="checkbox"/> Q <input type="checkbox"/> A <input type="checkbox"/> S
Electrical Class	<input type="checkbox"/> 1E <input type="checkbox"/> Non-1E <input type="checkbox"/> N/A	Seismic Category	<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III
Quality Group	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> N/A		
Safety Classification	<input type="checkbox"/> SR <input type="checkbox"/> AQ <input type="checkbox"/> NSR		
Environment Qualification	<input type="checkbox"/> EQ <input type="checkbox"/> N/A	Operational Mode	<input type="checkbox"/> Active <input type="checkbox"/> Passive <input type="checkbox"/> N/A
<b>6. References</b>			

## Form 2. Part Classification Work Sheet

<b>1. Part Identification</b>				
Part Classification Work Sheet No.		Part Description		
Part/Model No.		Specification		
Manufacturer		Manufacturer's Identification No.		
<b>2.PartFunction</b>				
<b>3. Part Safety Evaluation</b>				
<b>No.</b>	<b>Questions</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
1)	Is the part required for design function(s) of the component?			
2)	(Only for Seismic Category II component) Is the part required for maintaining structural integrity of the component?			
<b>4. References</b>				
<b>5. Part Safety-Related Classification</b>				
<input type="checkbox"/> Augmented-Quality(AQ) <input type="checkbox"/> Non-Safety-Related(NSR)				
<b>6. Part Classification Evaluation</b>				
(Document a Basis or References)				
<b>7. Final Part Classification</b>				
<input type="checkbox"/> A(AQ) <input type="checkbox"/> S(NSR)				

## 1. Instructions for Evaluating Safety Functions and Classifications for Parent Component

The classification and safety functions of the component are a prerequisite to the parts classification and must be established before proceeding to the parts classification.

Referring to following instructions supplier shall identify and provide the required information for all components using Form 1 of this attachment.

No.	Section Description	Instructions
1	Evaluation Sheet No.	Give the number of evaluation sheet as follows: Description Example: <u>F-134-UN205</u> – ES - <u>001</u> (Spec. No.) (Sheet Serial No. 001 thru 999)
2	Station/Unit(s)	Identify the station/unit(s) of installed item.
3	System/Component Identification	Identify the system/component identifications, including the following: <ul style="list-style-type: none"> <li>• System and Component Description</li> <li>• Component Tag No.</li> <li>• Technical specification No. of the parent component</li> <li>• Supplier/Manufacturer of the parent component</li> </ul>
4	Component Design Function Evaluation	Identify design functions of component item referring to the purchase specification section 4 and above item 3 and describe each function, one function per line.
5	Component Classification	Identify the component classes as follows: <ol style="list-style-type: none"> <li>1) Safety Class: Safety class 1, 2, 3 or NNS</li> <li>2) Quality Class: Q(safety-related), A(augmented-Q) or S(industrial standard)</li> <li>3) Electrical Class: 1E or Non-1E</li> <li>4) Seismic Category: Seismic category I, II or III</li> <li>5) Quality Group: Quality group(A, B, C, D, E, G) or N/A</li> <li>6) Safety Classification: Safety-Related(SR), Augmented Quality(AQ) or Non Safety-Related(NSR)</li> <li>7) Environmental Qualification: EQ or Non-EQ</li> <li>8) Operational Mode: Active, Passive or N/A</li> </ol>
6	References	Identify the evaluation reports including environmental and seismic qualification reports or other related documents of parent item.

## 2. Instructions for Preparing Part Classification Work Sheet

If the parent component is Augment-quality(AQ) the associated function of parts shall be evaluated to determine whether any special regulatory or site specific requirements apply which would require classification of the part as AQ. Referring to following instructions supplier shall identify the required information and evaluate the results for the questions using Form 2 of this attachment.

No.	Section Description	Instructions
1	Part Identification	<p>Identify the part identifications as follows:</p> <ol style="list-style-type: none"> <li>1) Give the number of Part Classification Work Sheet as follows: Description Example: F-542-M-PP 01 A - 001 (Tag No.) (Part Serial No. 001 thru 999)</li> <li>2) Part Description: Identify the name or description of the part.</li> <li>3) Part/Model Number: Identify the identification number for the part. This might be a part number, model number, style number, type number or other unique identifier used by the manufacturer to uniquely identify the product.</li> <li>4) Specification: Provide a brief description of part specification.</li> <li>5) Manufacturer: Identify the manufacturer providing the item.</li> <li>6) Manufacturer's Identification No.: Number assigned to track item in the manufacturer inventory.</li> </ol>
2	Part Function	Provide a description of the part design functions. Generally this will be the role or function as provided on the manufacturer's published description.
3	Part Safety Evaluation	<p>Answer the following questions no. 1) and 2) to determine the part safety classification in consideration of part function.</p> <ol style="list-style-type: none"> <li>1) Is the part required for design function(s) of the component? : Confirm the design functions of the parent component and determine whether the part is required for that function of component. Refer to the item no.4 of Form 1.</li> <li>2) Is the part required for maintaining structural integrity of the component? : Answer only when the Seismic category of parent component is II.</li> </ol>
4	References	Identify the reference documents including the title, revision number and other information.
5	Part Safety-Related Classification	Select the part safety classification based on the item no. 3 above. If one of the answer of above questions is 'yes', the part should be classified AQ.
6	Part Classification Evaluation	Describe the basis or references about part classification.
7	Final Part Classification	Select the final part classification based on the preceding evaluation. Generally, part is determined to be A when the item has been classified Augmented Quality (AQ).

**ATTACHMENT 3**

**PART LIST FORM**

**Attachment 3**  
**Part List**

1. PO No.	2. PO Item No.	3. Equipment No.	4. Equipment Description	5. Equipment Model No.	6. Component No.	7. Component Manufacturer

8. Component Model No.	9. Part No.	10. Part Description	11. Material	12. Quantity	13. Unit	14. Shelf Life

15. Replacement Cycle	16. Part Manufacturer	17. Supplier Drawing No.	18. Revision No.	19. Instruction Manual No.	20. Volume No.	21. Safety Classification

22. Quality Class.	23. CGID Report No.	24. Revision No.	25. Page No.	26. EQ Report No.	27. Revision No.	28. Page No.

29. SQ Report No.	30. Revision No.	31. Page No.	32. QVD No.	33. Page No.

**Instruction for Completing Part List**

No.	Entry Information								
1	PO No.(Purchase Order Number) : Number of Purchase Specification <ul style="list-style-type: none"><li>Example) UC208, UE207, UJ210, UN204, UP209...</li></ul>								
2	PO Item No.(Purchase Order Item Number) : Number specified in the Section 3. Attachment 3-1 (Pricing and Schedule Data) <ul style="list-style-type: none"><li>Example) F-UE207-1.09, F-UN204-1.03A, F-UP209-B.0001...</li></ul>								
3	Equipment No. : Tag number, Name or Mark number specified in the Section 3. Attachment 3-1 (Pricing and Schedule Data) PO Item No. <ul style="list-style-type: none"><li>① Identified in Name, not Tag No., Equipment No. should be described as the Name<ul style="list-style-type: none"><li>Example) Equipment Hatch Body</li></ul></li><li>② In case both Tag and Name are not identified, Mark No. should be described as the Name<ul style="list-style-type: none"><li>Example) 2550-A-CKB-D</li></ul></li></ul>								
4	Equipment Description : <ul style="list-style-type: none"><li>① If the Equipment is Tag No.,<ul style="list-style-type: none"><li>Example) PO No. UN204 – Description of Equipment No. 1.03.A</li></ul><table><tr><th>Section 3. Attachment 3-1</th><th>Equipment Description in 1.03.A</th></tr><tr><td>1.03 Component Cooling Water Hear Exchanger A. F-461-M-HE01A B. F-461-M-HE01A</td><td>“Component Cooling Water Heat Exchanger”</td></tr></table></li><li>② If the Equipment No. is Name,<ul style="list-style-type: none"><li>Example) PO No. UC208 – Description of Equipment No. 1.09A</li></ul><table><tr><th>Section 3. Attachment 3-1</th><th>Equipment Description in 1.09.A</th></tr><tr><td>1.09 Test Specimen of Mechanical Rebar A. Floor &amp; Sump B. Shell &amp; Dome Liner</td><td>“Floor &amp; Sump for Test Specimen of Mechanical Rebar”</td></tr></table></li><li>③ In case of instruments and valve items, Description specified in Data Sheet should be used.</li><li>④ In case of Bulk materials (e.g., Bulk valves, pipes), Description specified in Suppliers’ Drawing as a Title should be used.<ul style="list-style-type: none"><li>Example) In case of 2550-A-CKB-D, Class 2500 Y-Piston Check Valve</li></ul></li></ul>	Section 3. Attachment 3-1	Equipment Description in 1.03.A	1.03 Component Cooling Water Hear Exchanger A. F-461-M-HE01A B. F-461-M-HE01A	“Component Cooling Water Heat Exchanger”	Section 3. Attachment 3-1	Equipment Description in 1.09.A	1.09 Test Specimen of Mechanical Rebar A. Floor & Sump B. Shell & Dome Liner	“Floor & Sump for Test Specimen of Mechanical Rebar”
Section 3. Attachment 3-1	Equipment Description in 1.03.A								
1.03 Component Cooling Water Hear Exchanger A. F-461-M-HE01A B. F-461-M-HE01A	“Component Cooling Water Heat Exchanger”								
Section 3. Attachment 3-1	Equipment Description in 1.09.A								
1.09 Test Specimen of Mechanical Rebar A. Floor & Sump B. Shell & Dome Liner	“Floor & Sump for Test Specimen of Mechanical Rebar”								
5	Equipment Model No. : Equipment Model No. assigned be manufacturer <ul style="list-style-type: none"><li>Example) MD 308, MDG 286D, APT3700N</li></ul>								
6	Component No. : If the Equipment can be divided in several assemblies, supplier can assign the component number by adding 2 digits(alphabet + numeric number) <ul style="list-style-type: none"><li>Example) F-542-M-PP02A-A1(Pump), F-542-M-PP02A-A2(Motor)</li></ul>								
7	Component Manufacturer : Name of Component Manufacturer <ul style="list-style-type: none"><li>Example) HHI(Hyundai Heavy Industries CO. LTD)</li></ul>								
8	Component Model No. : Component Model No. <ul style="list-style-type: none"><li>Example) MD 308(S), HIMF-V11F</li></ul>								
9	Part No. : Part Identification number such as Model No., of Catalog No., of Serial No. <ul style="list-style-type: none"><li>Example) SD11046-01, KVAH7250M</li></ul>								
10	Part Description : Part name and specification <ul style="list-style-type: none"><li>Example) Vacuum Circuit Breaker – 4.16kV, 2000A, 60Hz, 50kA</li></ul>								
11	Material : Material code name <ul style="list-style-type: none"><li>Example) ASTM A217 Gr.WC9, JIS G4051, S45C</li></ul>								

12	Quantity : Quantity of part
13	Unit : Unit of part
14	Shelf Life : Maximum time to preserve function of part • Example) X months or X years
15	Replacement Cycle : Recommended replacement period • Example) X months or X years
16	Part Manufacturer : Name of part manufacturer • Example) ABB, MERSEN, YONGSUNG
17	Supplier Drawing No. : Drawings submitted to KHNP according to PNS(Project numbering system) • Example) ① 1 page of drawing: [UM206-DG-B02-01] ③ more than 1 pages: describe just one page to identity applicable item [UM206-DB-B02-01(X/N)]
18	Revision No. : Revision number of supplier's drawing document • Example) 0, 1, 2, 3...
19	Instruction Manual No. : Instruction manual number
20	Volume No. : Number of instruction manual(in case of several books, specify the number as X/N)
21	Safety Classification : Safety classification of part • Example) Safety-related(SR), Augmented Quality(AQ), or Non-safety Related(NSR)
22	Quality Class : Quality class of part • Example) Safety-related ASME Sec.III (Q1), Safety-related Basic Component (Q2), Safety-related Commercial Grade Item (Q3), Augmented Quality(AQ), or Non-safety-related(NSR)
23	CGID(Commercial Grade Item Dedication) Report No. : CGID Report No. • Example) UM206-DR-A01-01
24	Revision No. : Revision number of CGID Report • Example) 0, 1, 2, 3...
25	Page No. : CGID Report Page number that identifies applicable part • Example) 3 of 100(Page of Total Page)
26	EQ(Environmental Qualification) Report No. : EQ Report No. • Example) UM206-ER-B01-01
27	Revision No. : Revision number of EQ Report • Example) 0, 1, 2, 3...
28	Page No. : EQ Report Page number that identifies applicable part • Example) 3 of 100(Page of Total Page)
29	SQ(Seismic Qualification) Report No. : SQ Report No. • Example) UM206-ER-A01-01
30	Revision No. : Revision number of SQ Report • Example) 0, 1, 2, 3...
31	Page No. : SQ Report Page number that identifies applicable part • Example) 3 of 100(Page of Total Page)
32	QVD(Quality Verification Document) No. : QVD No. • Example) UM206-VR-A01-01
33	Page No. : QVD Page number that identifies applicable part • Example) 3 of 100(Page of Total Page)

Note: 1) Every data shall be entered in every cell to prevent an error during the uploading and downloading to the computational program even for the identical information (do not merge the cell).

2) Use left-aligned text for the input data to easily identify the information and prevent an error.

3) Place "N/A" if the entry is not applicable during the data entry.