

**SKN 3 & 4**



**KOREA HYDRO & NUCLEAR POWER CO., LTD.**

## **PURCHASE SPECIFICATION**

**Title : ELECTRIC ELEVATORS**

**Spec. No. : 9-125-A203**



**KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

## SKN 3 & 4

### SPECIFICATION ISSUE SUMMARY

Title : ELECTRIC ELEVATORS

Spec. No. : 9-125-A203

• Safety Category : Non-Safety Related

• Quality Class : S

• Safety Class : NNS

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

#### ISSUE STATUS

1	2006.9.28	Reissue for Invitation to Tender
0	2003.10.28	Issue for Invitation to Tender
ISSUE NO.	DATE	DESCRIPTIONS

## SKN 3 & 4

Spec. : 9-125-A203

### SPECIFICATION ISSUE SUMMARY

DESCRIPTION		REVISION
This specification for furnishing Electric Elevators consists of :		
Section 1	General Conditions	-
Section 2	Special Conditions	-
Section 3	Material Description and Pricing Data	1
Section 4	Technical Specification	1
<b><u>ATTACHMENTS</u></b>		
4-1	Witness Point	1
4-2	Hold Point	1
4-3	Cross - Reference Table between KEPIC and Referenced Codes and Standards	1
4-4	Reference Drawings	1
<b><u>APPENDICES</u></b>		
4A1	Quality Assurance Program Requirements	2
4B	Quality Surveillance Requirements	2
4C		2
4D	Drawing and Document Submittal Requirements	1
4E	Quality Verification Documentation List	1
4H	Documentation Requirements of Supplier Deviations and Non-conformances	0
4N	Standard Specification for Alternating Current Motors-Squirrel Cage Type	0
4P	Standard Specification for Electrical Apparatus	0
4R	Chemical Requirements for Materials Used in Contact with Austenitic Stainless Steel or Nickel Base Alloys	0
4S	General Requirements for Instrumentation & Control	0

## **SECTION 1 – GENERAL CONDITIONS**

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



## **SECTION 2 – SPECIAL CONDITIONS**

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

**FORM OF PROPOSAL**

SECTION 3, MATERIAL DESCRIPTION AND PRICING DATA

FOR

**ELECTRIC ELEVATORS**

SPECIFICATION NUMBER : 9-125-A203  
SAFETY CATEGORY : Non-Safety Related  
QUALITY CLASS : S  
SAFETY CLASS : NNS

FOR  
KOREA HYDRO & NUCLEAR POWER CO., LTD.  
SHIN-KORI NUCLEAR POWER PLANT # 3,4

PROPOSAL NO. :

TENDERER'S NAME :

BUSINESS ADDRESS :

TEL NO. :

FAX NO. :

E-MAIL ADDRESS :

SKN 3 & 4

SECTION 3

MATERIAL DESCRIPTION AND PRICING DATA

Title : Electric Elevators

Spec. No. : 9-125-A203

- Safety Category : Non-Safety Related
- Safety Class : NNS
- Quality Class : S

KOPEC JOB NO. : 2L179



KOPEC KOREA POWER ENGINEERING COMPANY, INC.

ISSUE STATUS

1	06/09/28	Reissue for Invitation to Tender	김은실	김수광	홍대익 김종현	김인등
0	03/10/28	Issue for Invitation to Tender	김은실	김수광	이용구	박상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

Preparer : 김 은 실, Tel : 031-899-2344

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

**TABLE OF CONTENTS**

<b><u>SECTION</u></b>	<b><u>TITLE</u></b>
<b><u>PART A - TECHNICAL INFORMATION</u></b>	
3A.1.0	GENERAL TECHNICAL DATA
3A.2.0	EVALUATION DATA REQUIRED
<b><u>PART B - COMMERCIAL INFORMATION</u></b>	
3B.1.0	TENDER PRICE
3B.2.0	DELIVERY SCHEDULE
3B.3.0	PAYMENT METHOD
3B.4.0	POINT(S) OF ORIGIN
3B.5.0	PORT OF EXPORT
3B.6.0	PROPOSAL VALIDITY
3B.7.0	AUTHORIZED REPRESENTATIVE
3B.8.0	SEAL TO BE USED (For Domestic Tenderer only)
3B.9.0	TENDERER'S DEFINITE STATEMENT
ATTACHMENT 3-1	PRICING AND SCHEDULE DATA
ATTACHMENT 3-2	EXCEPTIONS

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

**3A.1.0 GENERAL TECHNICAL DATA**

3A.1.1 NET WEIGHTS (Not Shipping Weight), (lb/kg), as follows :

a. Weight per ft/m car guides :

- Auxiliary Building Passenger-Freight Elevator AB-E1 .....	lb/ft kg/m
- Auxiliary Building Passenger-Freight Elevator AB-E2 .....	lb/ft kg/m
- Auxiliary Building Passenger-Freight Elevator AB-E3 .....	lb/ft kg/m
- Auxiliary Building Passenger-Freight Elevator AB-E4 .....	lb/ft kg/m
- Auxiliary Building Observation Elevator AB-E5 .....	lb/ft kg/m
- Compound Building Passenger-Freight Elevator CP-E1 .....	lb/ft kg/m
- Compound Building Passenger-Freight Elevator CP-E2 .....	lb/ft kg/m
- Compound Building Passenger-Freight Elevator CP-E3 .....	lb/ft kg/m
- Turbine Generator Building Passenger-Freight Elevator TB-E1 .....	lb/ft kg/m
- Reactor Containment Building Passenger-Freight Elevator CB-E1 .....	lb/ft kg/m

b. Weight per ft/m counterweight guides :

- Auxiliary Building Passenger-Freight Elevator AB-E1 .....	lb/ft kg/m
- Auxiliary Building Passenger-Freight Elevator AB-E2 .....	lb/ft kg/m

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

**3A.1.0 GENERAL TECHNICAL DATA (CONT.)**

- Auxiliary Building Passenger-Freight Elevator AB-E3 .....	lb/ft kg/m
- Auxiliary Building Passenger-Freight Elevator AB-E4 .....	lb/ft kg/m
- Auxiliary Building Observation Elevator AB-E5 .....	lb/ft kg/m
- Compound Building Passenger-Freight Elevator CP-E1 .....	lb/ft kg/m
- Compound Building Passenger-Freight Elevator CP-E2 .....	lb/ft kg/m
- Compound Building Passenger-Freight Elevator CP-E3 .....	lb/ft kg/m
- Turbine Generator Building Passenger-Freight Elevator TB-E1 .....	lb/ft kg/m
- Reactor Containment Building Passenger-Freight Elevator CB-E1 .....	lb/ft kg/m

c. Net weight of car (not shipping weight)

- Auxiliary Building Passenger-Freight Elevator AB-E1 .....	lb kg
- Auxiliary Building Passenger-Freight Elevator AB-E2 .....	lb kg
- Auxiliary Building Passenger-Freight Elevator AB-E3 .....	lb kg
- Auxiliary Building Passenger-Freight Elevator AB-E4 .....	lb kg
- Auxiliary Building Observation Elevator AB-E5 .....	lb kg
- Compound Building Passenger-Freight Elevator CP-E1 .....	lb kg

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

**3A.1.0 GENERAL TECHNICAL DATA (CONT.)**

- Compound Building Passenger-Freight Elevator CP-E2 .....	lb kg
- Compound Building Passenger-Freight Elevator CP-E3 .....	lb kg
- Turbine Generator Building Passenger-Freight Elevator TB-E1 .....	lb kg
- Reactor Containment Building Passenger-Freight Elevator CB-E1 .....	lb kg

**3A.1.2 OVERALL DIMENSIONS (in/cm)**

	<u>LENGTH</u>	<u>WIDTH</u>	<u>HEIGHT</u>
- Auxiliary Building Passenger-Freight Elevator AB-E1 .....	_____	_____	_____
- Auxiliary Building Passenger-Freight Elevator AB-E2 .....	_____	_____	_____
- Auxiliary Building Passenger-Freight Elevator AB-E3 .....	_____	_____	_____
- Auxiliary Building Passenger-Freight Elevator AB-E4 .....	_____	_____	_____
- Auxiliary Building Observation Elevator AB-E5 .....	_____	_____	_____
- Compound Building Passenger-Freight Elevator CP-E1 .....	_____	_____	_____
- Compound Building Passenger-Freight Elevator CP-E2 .....	_____	_____	_____
- Compound Building Passenger-Freight Elevator CP-E3 .....	_____	_____	_____
- Turbine Generator Building Passenger-Freight Elevator TB-E1 .....	_____	_____	_____
- Reactor Containment Building Passenger-Freight Elevator CB-E1 .....	_____	_____	_____

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

**3A.1.0 GENERAL TECHNICAL DATA (CONT.)**

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

	<u>SHIPPING WEIGHT</u>	<u>SHIPPING VOLUME</u>
a. Unit 3 .....	_____(lb/kg)	_____(ft <sup>3</sup> /m <sup>3</sup> )
b. Unit 4 .....	_____(lb/kg)	_____(ft <sup>3</sup> /m <sup>3</sup> )
c. Common .....	_____(lb/kg)	_____(ft <sup>3</sup> /m <sup>3</sup> )
d. Total .....	_____(lb/kg)	_____(ft <sup>3</sup> /m <sup>3</sup> )

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

The drawing and data submittals required by the Specification are summarized in Appendix 4D and 4E.

Electronic media submittals for drawings and documents are required by Appendix 4C and 4D.

**3A.2.0 EVALUATION DATA REQUIRED**

**3A.2.1 TECHNICAL DATA**

a. Equipment load on pit floor (including impact) in lb/kg :

- Auxiliary Building Passenger-Freight Elevator AB-E1 .....	lb kg
- Auxiliary Building Passenger-Freight Elevator AB-E2 .....	lb kg
- Auxiliary Building Passenger-Freight Elevator AB-E3 .....	lb kg
- Auxiliary Building Passenger-Freight Elevator AB-E4 .....	lb kg
- Auxiliary Building Observation Elevator AB-E5 .....	lb kg
- Compound Building Passenger-Freight Elevator CP-E1 .....	lb kg



**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

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

- Compound Building Passenger- Freight Elevator CP-E2 ..... lb  
kg
- Compound Building Passenger- Freight Elevator CP-E3 ..... lb  
kg
- Turbine Generator Building Passenger- Freight Elevator TB-E1 ..... lb  
kg
- Reactor Containment Building Passenger- Freight Elevator CB-E1 ..... lb  
kg

b. Lateral loads at guide rail bracket supports (lb/kg) :

- Auxiliary Building Passenger- Freight Elevator AB-E1 .....
- Auxiliary Building Passenger- Freight Elevator AB-E2 .....
- Auxiliary Building Passenger- Freight Elevator AB-E3 .....
- Auxiliary Building Passenger- Freight Elevator AB-E4 .....
- Auxiliary Building Observation Elevator AB-E5 .....
- Compound Building Passenger- Freight Elevator CP-E1 .....
- Compound Building Passenger- Freight Elevator CP-E2 .....
- Compound Building Passenger- Freight Elevator CP-E3 .....
- Turbine Generator Building Passenger- Freight Elevator TB- E1 .....
- Reactor Containment Building Passenger- Freight Elevator CB-E1 .....

Front to Back	Side to Side

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

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

c. Number of machine beams for the following :

- Auxiliary Building Passenger-Freight Elevator AB-E1 ..... units
- Auxiliary Building Passenger-Freight Elevator AB-E2 ..... units
- Auxiliary Building Passenger-Freight Elevator AB-E3 ..... units
- Auxiliary Building Passenger-Freight Elevator AB-E4 ..... units
- Auxiliary Building Observation Elevator AB-E5 ..... units
- Compound Building Passenger-Freight Elevator CP-E1 ..... units
- Compound Building Passenger-Freight Elevator CP-E1 ..... units
- Compound Building Passenger-Freight Elevator CP-E3 ..... units
- Turbine Generator Building Passenger-Freight Elevator TB-E1 ..... units
- Reactor Containment Building Passenger-Freight Elevator CB-E1 ..... units

d. Total weight of equipment on each beam (including impact) in lb/kg.  
(Identify each beam sketch)

- Auxiliary Building Passenger-Freight Elevator AB-E1 ..... lb/kg
- Auxiliary Building Passenger-Freight Elevator AB-E2 ..... lb/kg
- Auxiliary Building Passenger-Freight Elevator AB-E3 ..... lb/kg

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

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

- Auxiliary Building Passenger-  
Freight Elevator AB-E4 ..... lb/kg
- Auxiliary Building Observation  
Elevator AB-E5 ..... lb/kg
- Compound Building Passenger-  
Freight Elevator CP-E1 ..... lb/kg
- Compound Building Passenger-  
Freight Elevator CP-E2 ..... lb/kg
- Compound Building Passenger-  
Freight Elevator CP-E3 ..... lb/kg
- Turbine Generator Building Passenger-  
Freight Elevator TB-E1 ..... lb/kg
- Reactor Containment Building Passenger-  
Freight Elevator CB-E1 ..... lb/kg

Spec. : 9-125-A203  
Rev. : 0SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA  
PART A - TECHNICAL INFORMATION

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

( Insert all data in these columns )																			
AC Motor										Car Door Motor									
AB-E1	AB-E2	AB-E3	AB-E4	AB-E5	CP-E1	CP-E2	CP-E3	TB-E1	CB-E1	AB-E1	AB-E2	AB-E3	AB-E4	AB-E5	CP-E1	CP-E2	CP-E3	TB-E1	CB-E1
2.0 EVALUATION DATA REQUIRED(CONT.)																			
Electrical equipment																			
Motor																			
Manufacturer .....																			
• Type(Vertical or Horizontal).....																			
• Enclosure(describe protection and cooling method) .....																			
• Frame number .....																			
• Horsepower rating ..... (hp/kW)																			
• Voltage, phase and frequency ..... (V, hp, Hz)																			
• Motor rated speed ..... (rpm)																			
• Bearings :																			
- Type .....																			
- Expected life of the bearing..(hr)																			
• Insulation :																			
- Class and type (Full description is required) .....																			
- Allowable total temperature..... (°F/°C)																			
• Temperature rise of the windings when operating continuously at rated hp and service factor load, respectively(by resistance).(°F/°C)																			
• Service factor-based on rated hp .....																			
• NEMA design letter .....																			
• Break horse power (bhp) :																			
- Calculated bhp required at the specified (required) driven equipment output .....(bhp/kW)																			
- Calculated bhp required to operate the driven equipment at its maximum capability ..(bhp/kW)																			

Spec. : 9-125-A203  
Rev. : 0

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A - TECHNICAL INFORMATION**

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

( Insert all data in these columns )

( Insert all data in these columns )																			
AC Motor										Car Door Motor									
AB-E1	AB-E2	AB-E3	AB-E4	AB-E5	CP-E1	CP-E2	CP-E3	TB-E1	CB-E1	AB-E1	AB-E2	AB-E3	AB-E4	AB-E5	CP-E1	CP-E2	CP-E3	TB-E1	CB-E1
2.0 EVALUATION DATA REQUIRED(CONT.)																			
Current :																			
- Current input at rated hp output .....(A)																			
- Locked rotor current (% of rated full load current at rated motor voltage and frequency) .....(%)																			
• Efficiency at full load.....(%)																			
• Power factor at full load .....(%)																			
• Torque :																			
- Full load torque.....(ft-lb/kg-m)																			
- Locked rotor(starting) torque in percent of full load torque... (%)																			
- Breakdown torque in percent of full load torque .....(%)																			
- Pull-up torque in percent of full load torque .....(%)																			
• Total time to accelerate the full load motor rated voltage.....(sec)																			
• Space heaters :																			
- Watts at operating voltage....(W)																			
- Rated voltage, operating voltage and phase .....(V, V, ph)																			
- Operation period (running/stand-by/storage and construction).....																			
• Warranted maximum A-weighted sound level (re: 0.0002 microbar) at any point one meter from the major motor surface under any/all operating conditions.....(dBA)																			
• Net weight .....(lb/Kg)																			
• Frame material .....																			
- Transient Requirement																			
Tenderer certifies that the motor he proposed to furnish meet or exceeds requirement of App. 4N, para. 2.9.....(Yes or No)																			
- If response to above requirement is No, Tenderer shall provide a detailed response. Response is on Tenderer's proposal page .....																			

SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA

PART A - TECHNICAL INFORMATION

Name of Tenderer :																					
( Insert all data in these columns )																					
AC Motor											Car Door Motor										
AB-E1	AB-E2	AB-E3	AB-E4	AB-E5	CP-E1	CP-E2	CP-E3	TB-E1	CB-E1	AB-E1	AB-E2	AB-E3	AB-E4	AB-F5	CP-E1	CP-E2	CP-E3	TB-E1	CB-E1	CB-E1	
SA 2.0 EVALUATION DATA REQUIRED(CONT.)																					
Miscellaneous																					
Manufacturer of starting and operating equipment .....																					
Specific type of control and number of acceleration and deceleration step (if of step type control) .....																					
Elevator machine room ambient conditions																					
- Maximum .....(°F/°C)																					
- Minimum .....(°F/°C)																					
g. Molded case circuit breakers																					
Manufacturer .....																					
Type/Model No. ....																					
Maximum voltage rating.....(volts)																					
Ampere frame.....(A)																					
Interrupting rating at operating voltage (480Vac, 120Vac or 125Vdc), rms, sym .....(kA)																					
Continuous current rating (or ampere trip).....(A)																					
h. Starters(excluding circuit breaker)																					
Manufacturer .....																					
NEMA size and type/model No. ....																					
Maximum voltage rating.....(volts)																					
Ampere rating .....(A)																					
Short-circuit withstand rating at operating voltage (480Vac, 120Vac or 125Vdc), rms, sym ... (kA)																					
Coil pick-up voltage .....(volts)																					
Drop-out voltage .....(volts)																					
Control transformer rating.....(VA)																					

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

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

**3A.2.2 SPECIAL TOOLS / TEST EQUIPMENT LIST AND THEIR DATA**

In addition to the list submitted as per para. 4.0 of Attachment 3-1, the Tenderer shall submit the following technical information in its proposal for each item of the above special tool/test equipment list.

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

**3A.2.3 SPARE PARTS LIST AND THEIR DATA**

In addition to the list submitted as per para. 5.0 of Attachment 3-1, the Tenderer shall submit the following technical information in its proposal for each item of the above special tool/test equipment list.

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

**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

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

Codes	Description
A	Non-standard Items. (Code 'A' is assigned to those parts which are of a unique design and can be obtained only as direct replacement for the specific components.)
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.)
C	Environmental Qualification Required
D	UL Listed Items

**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. Detailed specifications covering construction and materials used in the equipment .....	_____
B. Drawings showing general arrangement and principal dimensions of equipment .....	_____
C. Completed technical data sheets showing all vendor data. The data sheets are attached to Section 3 of this Spec. ....	_____
D. Description of any variance between this Specification and any code requirement .....	_____
E. Any exceptions to the requirements of this Specification, Appendices, and Codes and Standards .....	_____
F. List of the Certificate and copy of each Certificate according to applicable Codes and Standards (KEPIC/ASME/ISO, etc.) .....	_____



**SECTION 3 - MATERIAL DESCRIPTION AND PRICING DATA**  
**PART A- TECHNICAL INFORMATION**

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

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

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

Local Tenderer of ROK(Republic of Korea) shall apply KEPIC 2000 Edition for the supply of Goods and Services specified in this specification.

**3A.2.6 ADDENDA**

Tenderer represents that this proposal includes provisions for following Addenda

---

---

---

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.  
**입찰설명서 제14편 입찰서 양식 준용**

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 be also 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 remittance to the Supplier's bank account (Bank account No. shall be presented to Buyer at the time of the demand for payment).

입찰설명서 제3편 입찰서 양식 준용

Payment for foreign Tenderer's on-shore portion shall be made directly to the Subsupplier upon Supplier's request for payment. If applicable, the 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).

**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)	Manufacture
(Major Items & No.)		

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

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

**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.

입찰설명서 세칙편 입찰서 양식 준용

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.

입찰설명서 제3편 입찰서 양식 준용

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 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.

PRICE TENDER		
ITT No.		
Tendering Date		
Goods		
Tender Price (DDP/ Shin-Kori 3&4, Unloaded)	On-shore Portion	Say Won (₩ ) ※ Including V.A.T.
	Off-shore Portion	Say U.S. dollars (US\$ ) ※ 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="text-align: right;">Date :</p> <p style="text-align: right;">Authorized Signature : or Seal</p> <p style="text-align: right;">Print Name :</p> <p style="text-align: right;">Print Title :</p> <p style="text-align: right;">Tenderer :</p> <p style="text-align: right;">Address :</p> <p>Note: If the affixed signature or seal is not identical to the presented, the tender will become nullified.</p> <p style="text-align: center;"><b>KOREA HYDRO &amp; NUCLEAR POWER CO., LTD.</b></p>		

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

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

**PRICING DATA SUMMARY**

No.	Description	On-shore(W)	Off-shore(US\$)
1	Equipment & Material		
	- Unit 3	_____	_____
	- Unit 4	_____	_____
	- Common	_____	_____
2	Special Tools	_____	_____
3	Spare Parts	_____	_____
4	Sub-Total (Sum of Items 1 through 3)	_____	_____
		(Jobsite Unloaded Price)	(FCA Price)
5	All Charges for Off-shore Portion;	N/A	_____
	- Overseas and inland freight, insurance premium, customs duties and other charges from FCA to Jobsite Unloaded		
6	Installation Work	_____	_____
		[By Domestic (sub)Supplier]	[By Foreign (sub)Supplier]
7	Total (Sum of Items 4 and 5)	_____	_____
		(Jobsite Unloaded Price)	(Jobsite Loaded Price)
8	Technical Supervisory Service	_____	_____
		[By Domestic (sub)Supplier]	[By Foreign (sub)Supplier]
9	Total (Sum of Items 7 and 8)	_____	_____
10	Value-Added Tax	_____	_____
11	Grand Total (Sum of Items 9 and 10)	₩ _____	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**

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

Item No.	Description	Quantity	Unit Price (W/ US\$)	Extension (W/US\$)	Required Site Delivery Date
----------	-------------	----------	----------------------	--------------------	-----------------------------

**1.0 UNIT 3**

1.01	Auxiliary Building Passenger-Freight Elev. AB-E1 3-683-A-EL01	1	_____	_____	<u>2010.11.15</u>
1.02	Auxiliary Building Passenger-Freight Elev. AB-E2 3-683-A-EL02	1	_____	_____	<u>2010.11.15</u>
1.03	Auxiliary Building Passenger-Freight Elev. AB-E3 3-683-A-EL03	1	_____	_____	<u>2010.11.15</u>
1.04	Auxiliary Building Passenger-Freight Elev. AB-E4 3-683-A-EL04	1	_____	_____	<u>2010.11.15</u>
1.05	Turbine Generator Building Passenger-Freight Elev. TB-E1 3-683-A-EL05	1	_____	_____	<u>2010.04.03</u>
1.06	Reactor Containment Building Passenger-Freight Elev. CB-E1 3-683-A-EL06	1	_____	_____	<u>2011.07.31</u>
1.07	Sub-Total (Sum of Items 1.01 through				
	- On- shore, Jobsite Unloaded	N/A	N/A	W_____	
	- Off-shore, FCA	N/A	N/A	US\$_____	
1.08	All Charges for Off-shore Portion;				
	- Overseas and inland freight, insurance premium, customs duties and other charges from FCA to JobsiteUnloaded	N/A	N/A	US\$_____	
1.09	Sub-Total (Sum of Items 1.07 and 1.08), Excluding V.A.T.				
	- On- shore, Jobsite Unloaded	N/A	N/A	W_____	
	- Off-shore, Jobsite Unloaded	N/A	N/A	US\$_____	



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

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

Item No.	Description	Quantity	Unit Price (W/ US\$)	Extension (W/US\$)	Required Site Delivery Date
----------	-------------	----------	----------------------	--------------------	-----------------------------

**2.0 UNIT 4**

2.01	Auxiliary Building Passenger-Freight Elev. AB-E1 4-683-A-EL01	1	_____	_____	<u>2011.11.15</u>
2.02	Auxiliary Building Passenger-Freight Elev. AB-E2 4-683-A-EL02	1	_____	_____	<u>2011.11.15</u>
2.03	Auxiliary Building Passenger-Freight Elev. AB-E3 4-683-A-EL03	1	_____	_____	<u>2011.11.15</u>
2.04	Auxiliary Building Passenger-Freight Elev. AB-E4 4-683-A-EL04	1	_____	_____	<u>2011.11.15</u>
2.05	Auxiliary Building Observation Elev. AB-E5 4-683-A-EL07	1	_____	_____	<u>2011.11.15</u>
2.06	Turbine Generator Building Passenger-Freight Elev. TB-E1 4-683-A-EL05	1	_____	_____	<u>2011.04.03</u>
2.07	Reactor Containment Building Passenger-Freight Elev. CB-E1 4-683-A-EL06	1	_____	_____	<u>2012.07.31</u>
2.08	Sub-Total (Sum of Items 2.01 through 2.07)				
	- On- shore, Jobsite Unloaded	N/A	N/A	W/_____	
	- Off-shore, FCA	N/A	N/A	US\$_____	
2.09	All Charges for Off-shore Portion;				
	- Overseas and inland freight, insurance premium, customs duties and other charges from FCA to Jobsite Unloaded	N/A	N/A	US\$_____	

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

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

Item No.	Description	Quantity	Unit Price (W/ US\$)	Extension (W/US\$)	Required Site Delivery Date
----------	-------------	----------	----------------------	--------------------	-----------------------------

2.10 Sub-Total (Sum of Items 2.08 and 2.09),  
Excluding V.A.T.

- On- shore, Jobsite Unloaded	N/A	N/A	W_____
- Off-shore, Jobsite Unloaded	N/A	N/A	US\$_____

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

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

Item No.	Description	Quantity	Unit Price (W/ US\$)	Extension (W/US\$)	Required Site Delivery Date
----------	-------------	----------	----------------------	--------------------	-----------------------------

**3.0 COMMON**

3.01 Compound Building Passenger-Freight Elev. CP-E1 0-683-A-EL01	1	_____	_____	2011.07.15
---	---	-------	-------	------------

3.02 Compound Building Passenger-Freight Elev. CP-E2 0-683-A-EL02	1	_____	_____	2011.07.15
---	---	-------	-------	------------

3.03 Compound Building Passenger-Freight Elev. CP-E3 0-683-A-EL03	1	_____	_____	2011.07.15
---	---	-------	-------	------------

## 3.04 Sub-Total (Sum of Items 3.01 through 3.03)

- On- shore, Jobsite Unloaded	N/A	N/A	W_____
- Off-shore, FCA	N/A	N/A	US\$_____

## 3.05 All Charges for Off-shore Portion;

- Overseas and inland freight, insurance premium, customs duties and other charges from FCA to Jobsite Unloaded	N/A	N/A	US\$_____
--	-----	-----	-----------

3.06 Sub-Total (Sum of Items 3.04 and 3.05),  
Excluding V.A.T.

- On- shore, Jobsite Unloaded	N/A	N/A	W_____
- Off-shore, Jobsite Unloaded	N/A	N/A	US\$_____

---

Total of Equipment & Materials, Excluding  
V.A.T. (Sum of Items 1.09, 2.10 and 3.06)

- On- shore, Jobsite Unloaded	N/A	N/A	W_____
- Off-shore, Jobsite Unloaded	N/A	N/A	US\$_____

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

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

**4.0 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. Qty/Unit	Unit Price (W/US\$)	Extension (W/US\$)	Site Delivery Date
	Description Material Specification (Rating, Grade, Type, etc.) Part No. / Orig. Mfr's Part No. Mfr's Name				2010.04.03

**A. Sub-Total of Special Tools**

- On-shore, Jobsite Unloaded
- Off-shore, FCA

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

**B. All charges for Off-shore portion:**

- Overseas and inland freight, insurance premium, customs duties and other charges from FCA to Jobsite Unloaded

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

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

- On-shore, Jobsite Unloaded
- Off-shore, Jobsite Unloaded

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

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

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

**5.0 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- Qty/Unit	Unit Price (W/US\$)	Extension (W/US\$)	Site Delivery Date
	<ul style="list-style-type: none"> <li>· Description</li> <li>· Material Specification (Material, Size, Rating, Grade or Type, etc.)</li> <li>· Part No./Orig. Mfr's Part No.</li> <li>· Mfr's Name</li> <li>· Period of Replacement</li> <li>· Code No., etc.</li> </ul>				2011.04.03

**A. Sub-Total of Spare Parts**

- On-shore, Jobsite Unloaded

W \_\_\_\_\_

- Off-shore, FCA

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

**B. All charges for Off-shore portion:**

- Overseas and inland freight, insurance premium, customs duties and other charges from FCA to Jobsite Unloaded

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

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

- On-shore, Jobsite Unloaded

W \_\_\_\_\_

- Off-shore, Jobsite Unloaded

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

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

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

## 6.0 DELIVERY

### 6.1 Delivery Required

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

- A. Can Tenderer meet the delivery set forth in Item 1.0 through 5.0?..... \_\_\_\_\_
- B. If the answer to Item 6.1, A is "No", Tenderer shall give schedule of earliest dates possible ..... \_\_\_\_\_
- C. Shipping shall not be made earlier than one (1) month prior to the delivery date set forth in item 1.0 through 5.0 without written approval of the Buyer.

### 6.2 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 Item 1.0 through 5.0? (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.) ..... \_\_\_\_\_

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

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

**6.0 DELIVERY(CONT.)**

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

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

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

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

**7.0 TECHNICAL SUPERVISORY SERVICES(IF REQUIRED)**

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

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

**A. For Unit 3**

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

**B. For Unit 4**

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

**C. For Common**

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

**D. 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.

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

	<u>Supervisory</u>	<u>Technician</u>
A. Basic rate per day for a normal working day	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\$ _____



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

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

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

## D. Travel expense for 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.

**7.3 Estimated Amount of Technical Supervisory Services**

## A. Unit 3

W \_\_\_\_\_

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

## B. Unit 4

W \_\_\_\_\_

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

## C. Common

W \_\_\_\_\_

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

## D. 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 : \_\_\_\_\_

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

7.4 Detailed Calculation Sheet

Unit No.	Grade	Unit 3			Unit 4			Common			Total
		Supervisor	Technician	Sub-Total	Supervisor	Technician	Sub-Total	Supervisor	Technician	Sub-Total	
	Man-Days										
	Rate (W/US\$)										
	Services Fee										
	Expansion (W/US\$)										
	Rate (W/US\$)										
	Sojourn Allow-ance (W/US\$)										
	Expansion (W/US\$)										
	Travel Expenses of Round Trip (W/US\$)										
	Air Fares of Round Trip (W/US\$)										
	Total (W/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 and the exceptions to Tendering Instructions and Terms and Conditions of the ITT will not be accepted, in principle.
- B. If no exceptions are taken by the Tenderer, "No Exceptions" shall be indicated below.

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

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

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

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

**SKN 3 & 4**

**SECTION 4**

**TECHNICAL SPECIFICATION**

**Title : Electric Elevators**

**Spec. No. : 9-125-A203**

- Safety Category : Non-Safety Related
- Safety Class : NNS
- Quality Class : S

**KOPEC JOB NO. : 2L179**



**KOPEC KOREA POWER ENGINEERING COMPANY, INC.**

**ISSUE STATUS**

1	'06/09/28	Reissue for Invitation to Tender	김은실	김수광	박상욱	김인동
0	'03/10/28	Issue for Invitation to Tender	김은실	김수광	이용구	박상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

Form 6.10-10, Rev.0

Preparer : 김 은 실, Tel : 031-899-2344

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **TABLE OF CONTENTS**

<b><u>SECTION</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
4.01	SCOPE .....	4-1
4.02	ABBREVIATIONS AND DEFINITIONS .....	4-4
4.03	QUALITY STANDARDS .....	4-4
4.04	SUBMITTALS .....	4-7
4.05	DESIGN CONDITIONS .....	4-9
4.06	MATERIALS AND FABRICATION .....	4-16
4.07	SURFACE PREPARATION AND COATING .....	4-24
4.08	NAME PLATES .....	4-25
4.09	INSPECTION AND TESTING .....	4-27
4.10	SHIPPING REQUIREMENTS .....	4-28
4.11	INSTRUCTION MANUALS .....	4-28
4.12	INSTALLATION .....	4-30

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **TABLE OF CONTENTS(CONT.)**

<b><u>SECTION</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
-----------------------	---------------------	--------------------

#### **ATTACHMENTS**

4 – 1	WITNESS POINT .....	4-1-1
4 – 2	HOLD POINT .....	4-2-1
4 – 3	CROSS - REFERENCE TABLE between KEPIC and Referenced Codes and Standards .....	4-3-1
4 – 4	REFERENCE DRAWINGS.....	4-4-1

#### **APPENDICES**

4A1	Quality Assurance Program Requirements .....	4A-1
4B	Quality Surveillance Requirements.....	4B-1
4C	General Requirements for Submittal of Documents .....	4C-1
4D	Drawing and Document Submittal Requirements.....	4D-1
4E	Quality Verification Documentation List .....	4E-1
4H	Documentation Requirement of Supplier Deviation and Nonconformances .....	4H-1
4N	Standard Specification for Alternating Current Motors-Squirrel Cage Type .....	4N-1
4P	Standard Specification for Electrical Apparatus .....	4P-1
4R	Chemical Requirements for Material Used in Contact with Austenite Stainless Steel .....	4R-1
4S	General Requirements for Instrumentation and Control .....	4S-1

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.01 SCOPE**

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

1. The Supplier shall furnish all labor, materials, tools and equipment, and the performance of the supervision, designing, fabricating, documenting, deliver to jobsite, unloading, storage, installation for the following.
  - a. Six (6) general purpose geared-traction and overhead mounted type electric elevators for each unit, with selective-collective automatic operation, consisting of the following:

Location	Equip. Name	Q'ty/ Unit	Type of Service
Auxiliary Bldg.	AB-E1~E4	4	Passenger-Freight Elevator
Turbine Generator Bldg.	TB-E1	1	Passenger-Freight Elevator
Reactor Containment Bldg.	CB-E1	1	Passenger-Freight Elevator

- b. Three (3) general purpose geared-traction and overhead mounted type electric elevators for common use for both units, with selective-collective automatic operation, consisting of the following :

Location	Equip. Name	Q'ty	Type of Service
Compound Bldg. (Unit 3,4 common)	CP-E1	1	Passenger-Freight Elevator
	CP-E2	1	Passenger-Freight Elevator
	CP-E3	1	Passenger-Freight Elevator

- c. One (1) geared-traction and overhead mounted type observation elevator AB-E5 for Fuel Handling Area of Aux. Bldg. of unit 4, with selective-collective automatic operation.
  - d. Appurtenances
    - d1. Driving machine motors and complete control apparatus.
    - d2. Machinery support beams and braces.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4. 01 SCOPE (CONT.)**

- d3. Guide rails, buffers, hoisting and hoistway equipment, counterweight rails.
- d4. Hoistway doors, entrance frames and sills.
- d5. Door hanger cover plates, fascia plates and dust covers.
- d6. Elevator machinery and control apparatus.
- d7. Elevator cars and doors.
- d8. Shop painting.
- d9. Wiring from elevator main disconnect switch to controller, elevator machinery, and control apparatus.
- d10. Traveling cable for elevator car instruments, controls, and telephone.
- d11. Safety devices.
- d12. Wiring and cabinet for car telephone.
- d13. Elevator car position indicators.
- d14. Elevator car enclosures protective pads.
- d15. Elevator main disconnect switch including housing.
- d16. Elevator car telephone instrument
- d17. All mounting brackets required for guide and counterweight rails.
- d18. Field erection and testing of elevators.



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

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

d19. Adjustment and maintenance service for one year after equipment has been installed, tested and accepted by Buyer. Maintenance service shall include all necessary adjustments, greasing, oiling and parts repairing and replacing, in order to keep the elevator in satisfactory operation, except parts damaged by misuse, accidents or negligence of others.

d20. Air Conditioner (for observation elevator only)

d21. Ladder in pit

2. The Supplier shall furnish one (1) lot of Spare Parts required during installation, start-up, and 2 years of normal operation.  
All requirements that apply to the original parts of the specified equipment shall apply equally to the spare parts of the specified equipment. All documentation for spare parts shall be submitted in the same manner as for original parts.
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.

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

The following work will be performed by others :

1. Hoistway structure, hoistway enclosure, pit and machinery room enclosure including structural steel, and ventilation.
2. Supports at each landing
3. Machinery room floor.
4. Lighting and convenience outlets in the hoistway, machinery room, and pit.
5. Conduit and wiring from the Buyer's MCC to Supplier's disconnect switch.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

6. Temporary electric power for erecting, testing and adjusting the elevator equipment as well as permanent external power.

### **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 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. Shall; Mandatory requirement.
4. Should/May; Recommendation or action which is advised but not required.
5. Will; "Will" is used for all actions to be performed by the Buyer or others.
6. KEPIC; Korea Electric Power and Industry Code

### **4.03 QUALITY STANDARDS**

#### **A. GENERAL**

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

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

1. KEPIC 2000 Edition on the cross-reference table in the Attachment 4-3 shall be applied instead of the referenced Codes and Standards for Local Supplier. All other codes and standards shall be the edition in effect as of December 31, 2001 unless otherwise indicated.
2. Should conflict exist between KEPIC and the referenced codes and standards, the referenced codes and standards take precedence over KEPIC for Local Supplier.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4. 03 QUALITY STANDARDS (CONT.)**

3. Codes and standards mentioned in Attachments and Appendices of this specification shall be read to mean the equivalent Article or Subarticle of KEPIC code for Local Supplier.
4. The Work performed shall comply with the applicable codes, standards and regulations, and in particular the following:

<u>SPONSOR</u>	<u>NUMBER</u>	<u>SUBJECT</u>
ASME	A17.1	Safety Code for Elevators and Escalators
ANSI	C80.1	Rigid Steel Conduit – Zinc Coated
ANSI	C80.3	Electrical Metallic Tubing - Zinc Coated
ASME	NQA-1	Quality Assurance Requirements for Packaging,
[KEPIC QAP]	Subpart 2.2	Shipping, Receiving, Storage and Handling of
	(94ed. & 95add)	Items of Nuclear Power Plants.
ASTM	A36/ A36M	Standard Specification for Carbon Structural Steel
ASTM	A123/ A123M	Standard Specification for Zinc(Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM	A153/ A153M	Standard Specification for Zinc Coating(Hot-Dip) on Iron and Steel Hardware
ASTM	A240/ A240M	Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
ASTM	E84	Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM	E2074	Standard Test Methods for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies

## SECTION 4 - TECHNICAL SPECIFICATION

### 4. 03 QUALITY STANDARDS (CONT.)

<u>SPONSOR</u>	<u>NUMBER</u>	<u>SUBJECT</u>
ASTM	F1066	Standard Specification for Vinyl Composition Floor Tile
IEEE [ KEPIC EEB ]	112	Standard Test Procedure for Polyphase Induction Motors and Generators
IEEE	250	Enclosure for Electrical Equipment (1000 Volt Maximum)
IEEE [ KEPIC END ]	383	Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations.
NEMA [ KEPIC EEB ]	MG 1 (1993)	Motors and Generators
NEMA [ KEPIC ECB ]	WC 55	Standard for Instrumentation Cables and Thermocouple Wire(ICEA S-82-552)
NEMA	WC 57	Standard for Control Cables (ICEA S-73-532)
NEMA	WC 70	Standard for Nonshielded Power Cables rated 2000Volts or less for the Distribution of Electrical Energy (ICEA S-95-658)
UBC	Division IV	Uniform Building Code - Earthquake Design
UL	10B	Safety Fire Tests of Door Assemblies
NEI/NUSMG	97 - 07	Nuclear Utility Year 2000 Readiness

### C. QUALITY REQUIREMENTS

1. This specification covers Goods and Services that have non-safety related functions in a nuclear power plant. The Supplier shall meet the specific requirements of App. 4A1, 4B and 4H as applicable.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

2. A distinct quality class(es) is assigned to all work within this specification. Unless specifically noted otherwise in this specification, the following quality class(es) shall be applied to the specified work.

Quality class

Item I.D

S

All work within this specification.

#### **D. CONFLICT**

Should conflict exist among codes, standards and the technical specification including Attachments & Appendices, the Supplier shall notify the Buyer for clarification prior to proceed with the work.

### **4.04 SUBMITTALS**

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

1. Drawings and data shall be submitted in accordance with Appendix 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 drawing 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. All electrical control and piping interfaces with the Buyer shall be clearly identified and appears on the first certified issue of each drawing.

#### **B. DRAWINGS AND DATA**

1. Outline drawings and shop detail drawings for the elevator pits, hoistway and guide rail supports, machine room arrangement with floor openings/suspension hook location and machinery supports, hoistway doors and frames, door operators, car construction and safety devices, etc.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

2. Weights of car and machinery, and imposed forces on hoistway structure, machine room floor and elevator pits.
3. Detailed wiring, schematic and control logic diagrams of all electrical equipment shall be in accordance with Appendix 4C. Unless otherwise specified, the logic diagrams shall be a primary source document for all control, interlocks and alarms.
4. Drawings indicating location of incoming and outgoing panel connections, panel outline drawings, and one line diagram.
5. Supplier shall provide the Supplier's standard model information for the following items so that the Buyer will select.
  - a. Car operating panel
  - b. Car position indicator
  - c. Corridor pushbutton stations
  - d. Car handrail
  - e. Car inside wall plate and floor pattern
  - f. Door pattern
  - g. Car ceiling type
  - h. Finish and material of car cage for observation elevator(Inside and Outside)
6. Supplier's work schedule including engineering, procurement, manufacturing, fabrication & delivery.
7. Monthly progress report including the status of all work.
8. Supplier shall submit the drawings and data for motors in accordance with Appendices 4N and 4P.
9. Motor test procedure and test report.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

#### **C. INSTRUCTION MANUALS**

Refer to Paragraph 4.11.

#### **D. QUALITY VERIFICATION REPORTS AND RECORDS**

1. Certificate of conformance in accordance with this Specification.
2. Material Test Reports including fire test (If applicable)

### **4.05 DESIGN CONDITIONS**

#### **A. GENERAL**

1. Elevators and appurtenances shall be designed in accordance with the requirements of ASME A17.1.
2. Supplier shall review the design data figures in regard to the installation and structural requirements for openings, supports, clearance, shaft and machine room dimension, with Supplier's requirements and with all governing codes, regulations, and authorities having jurisdiction.
3. All equipment shall be of rugged construction, suitable for power plant use, and built so as to insure safety, long life, maximum reliability, and minimum maintenance. All parts of the equipment shall be readily accessible for inspection, adjustment and repairs.
4. Hoistway Tolerances: Tolerances for plumbness, levelness and alignment of hoistway structural steel by others, will not exceed the requirements of the AISC code of standard practice, with the further restriction that the deviation from plumb will not exceed 1" for the entire height of the hoistway.
5. Electric Service, Conduits and Boxes
  - a. Supplier shall furnish a suitable circuit breaker for the main power feed to each elevator and dumbwaiter equipment. The circuit breaker shall be of the load break type and shall have the trip rating of at least 150% of the full load current and shall have an interrupting capacity of 30,000 rms symmetrical amperes at 480V. The location for this circuit breaker shall be as directed by Buyer. Buyer will provide the main power feed which will be 480V, 3 phase 60Hz.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- b. Supplier shall furnish the step-down transformer for permanent service of elevator and dumbwaiter such as alarm bell, car fan, lighting and other electrical devices.
- c. Supplier shall utilize rigid steel hot-dipped galvanized conduit and seal-tight only. Suitable drains shall be provided to avoid accumulation of moisture in conduits or boxes.
- d. Supplier shall furnish the grounding provision for all motor, control panel, and main disconnect switch box in accordance with the requirements of App.4N and 4S.
- e. Supplier shall furnish a junction box in machine room or other location to suit Supplier's requirements for terminating Supplier's wiring for car lighting and receptacle outlets.

#### **6. Electrical Requirements**

- a. Wiring : Wiring shall conform to applicable requirements of Appendix 4P and 4S as applicable and the followings.
  - a1. All necessary wiring for proper operation of the equipment, including power and light outlets shall be furnished by the Supplier.
  - a2. Traveling cables shall be of the best grade for the service and shall meet the flame test requirements of IEEE Std. 383.  
They shall be hung so that the proper size loop may be obtained. Steel supporting strands shall be used where the rise exceeds 175 feet. Electrical traveling cables shall have conductors included for station telephone service, elevator alarms, elevator car lighting and elevator car receptacle outlets.
  - a3. The entire system shall be tested for insulation to ground by application of 1500 volts, AC, phase-to-ground for 1 minute for all power and control wiring 120 volts and above.
- b. Control system : Control system shall confirm to applicable requirements of Appendix 4S as applicable and the followings.



## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- b1. Control equipment shall be full magnetic, shall be suitable for the AC elevator hoist motor specified and the type of operation hereinafter specified and shall provide smooth acceleration and deceleration. All elevator control equipment shall be properly shielded from Electro Magnetic Interference(EMI) and shall meet the requirements of current FCC/IEEE EMI emissions filtration and sensitivity guidelines.
- b2. A time limit relay shall be furnished so that car arriving at landing will not travel toward another call before waiting passengers have had time to enter car and press floor selection button .
- b3. The car door and hoistway doors shall have a suitable interlocking arrangement that will prevent the doors from being opened before car has stopped at a landing. Car shall be inoperative unless all doors are closed.
- b4. In stopping, the elevator shall be slowed down by regenerative or dynamic braking before the brake is applied.
- b5. Elevator shall be equipped with a leveling device which, when a stop is initiated within a definite range of distance in advance of a floor, will bring car automatically to a stop at floor level regardless of load or direction of travel. Device shall correct overtravel and undertravel.
- b6. Car shall have a safety arrangement that will shut off the power and apply the brakes in case of excessive descending speed.
- c. The indicating lighting shall be LED type.

#### **7. Elevator Hoistway Motors**

Each motor shall conform to applicable requirements of Appendix 4N and 4P unless otherwise specified herein and the followings :

- a. Type ..... Horizontal, squirrel cage induction where applicable.
- b. NEMA design letter ..... Design B

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- c. Molded case circuit breakers
    - c1. The circuit breakers for 480V ac circuits shall be 600volt, 60Hz, 3 pole, and minimum 30KA interrupting rating with auxiliary contacts and bell alarm contacts. The breakers shall be built and tested in accordance with UL-489.
    - c2. For motor circuit control, adjustable magnetic only type shall be used. For other use thermal magnetic type shall be used.
  - d. Motor shall be equipped with two sleeve type or ball bearings with automatic lubrication and properly designed seals to prevent oil leakage.
  - e. Motor shall be mounted on rubber isolation pads to minimize transmission of vibration to building.
  - f. The controller shall be designed to give the required operation. Panels, when used, shall be manufacturer's standard design, and shall be securely mounted on a substantial self-supporting steel frame designed for floor mounting.
  - g. Control and position indicator circuits shall be supplied from a 120 volt AC control transformer to be furnished by Supplier.
  - h. AC controls shall operate positively and without injury to equipment if the voltage at the terminals varies as much as 10% above or 10% below specified voltage.
  - i. Electrical contacts for purchaser's alarm circuits shall be rated for 0.5 Amperes at 250V DC inductive load, 5A at 120V AC, 60Hz resistive load.
  - j. If motors are supplied with its control panels which require inputs of motor current or terminal voltage for process control, current transformers or voltage transformers shall be provided by the Supplier in the motor terminal boxes or Supplier's control panel.
8. The ambient air temperature in the elevator machinery room of all elevators shall be 50°F - 104°F except for elevator CB-E1(50°F ~ 120°F).

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

9. The elevator drive motor shall be fully capable of vector inverter operation. The vector inverter elevator drive system shall be fully compatible with all elevator control systems, and shall be of a design that is in routine and customary use by the supplier for the types and configurations of elevator designs to be furnished and installed as a part of this work.
10. All elevator door motors, shall be smooth with continuous speed adjustment capability. The elevator door motor shall be fully compatible with all associated elevator control systems, and shall be of a design that is in routine and customary use by the elevator supplier for the types and configurations of elevator doors being furnished and installed as a part of this work.
11. The elevator control system shall be digital, microprocessor-based and shall feature the capability to incorporate Insulated Gate Bipolar Transistors(IGBT) as a part of the electronics used in those systems. Such control systems shall be fully compatible with all associated elevator systems and mechanical apparatus and shall be of a design that is in routine and customary use by the elevator supplier for the types and configurations of elevator doors being furnished and installed as a part of this work.
12. All elevator electrical and electronic systems shall be designed to resist exposure to electro magnetic radiation and shall be equipped with Electro Magnetic Interference (EMI) filtration to meet current IEEE regulations and standards.
13. All elevator doors shall be equipped with multiple photocells to detect the location of an obstruction in the hoistway door opening. Such multiple photocells shall cause the operation of the doors to retract from the location of the object. Such control systems shall be fully compatible with all associated elevator systems and mechanical apparatus and shall be of a design that is in routine and customary use by the elevator supplier for the types and configurations of elevator doors being furnished and installed as a part of this work.

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

1. Elevators
  - a. Type of operation : As specified in Paragraph 4.01.A.1.a, b & c.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- b. Design data figure : See design data figures for the following data for each elevator :
  - b1. General arrangement.
  - b2. Type of service.
  - b3. Capacity.
  - b4. Speed.
  - b5. Type of loading.
  - b6. Total car travel
  - b7. Number of landings, and floor designations and elevations of each landing.
  - b8. Inside dimensions of car platform.
  - b9. Clear inside height of car.
  - b10. Location, number, type and clear opening dimensions of car door.
  - b11. Clear inside hoistway dimensions.
  - b12. Pit dimensions.
  - b13. Location, number, type and clear opening dimensions of hoistway door.
  - b14. Location and size of machine room.
  - b15. Location and size of structural/support steels & embedded plates to be supplied/installed by Buyer.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- c. Car and hoistway door data
  - c1. Type of car and hoistway doors:  
  
Horizontal sliding bi-parting door, flush panel.
  - c2. Car and hoistway door operation : Automatic power operated doors for all elevators.
  - c3. Type of hoistway sills : See Paragraph 4.06.B.2.f.
  - c4. Provide unlocking devices conforming to the requirements of ASME A17.1, to permit authorized persons to gain emergency entry into elevators.
- d. Automatic leveling : Two-way automatic maintaining, with 3/8 inch leveling zone.
- e. Load-weighing device: Provide a load-weighing device for all elevators that will prevent operation of the elevator if load is in excess of 110 percent of rated load. Device shall operate an audible alarm in the car and shall also illuminate a red warning jewel on the car operating panel, as specified in paragraph 4.06.B.5.f.
- f. Top of car operating device : As specified in Paragraph 4.06.B.6.
- g. Car top operator switch: Provide key operated switch to immobilize car operator panel during use of car top panel.
- h. Car top warning: Provide an illuminating type red jewel when car top panel is in use.
- i. Telephone conductors: Supplier shall provide 3/C No. 14 trailing telephone cable from telephone cabinet in each car to a suitable junction box on inside of each hoistway. Also see paragraph 4.06.B.4.i

### **C. SEISMIC LOADS**

Elevator components and their assembled installation shall be designed for seismic loads determined in accordance with the UBC for coefficient  $Z = 1.00$ .

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.06 MATERIALS AND FABRICATION**

#### **A. GENERAL**

1. Material and Fabrication shall be suitable for the design and operating conditions specified in this specification.
2. Materials and fabrication not specifically covered by this specification shall be manufacturer's standard, suitable for the application.
3. When specifically requested, certified copies of the chemical analysis and mechanical properties of the materials provided shall be furnished to Buyer.
4. The buyer has the right to select any additional test specimens of material being provided and to require tests to be made by Supplier. If the test prove to be satisfactory, the associated costs will be paid by Buyer. If the tests prove unsatisfactory, the associated costs will be paid by Supplier.
5. Elevator components shall conform to the design requirements of Article 4.05.

#### **B. ELEVATORS**

##### **1. Hoistway Equipment**

- a. Counterweights shall be steel plate weights restrained within a steel frame and the frame within its guide shoes, and shall be equal to the weight of the complete elevator car plus 35 to 45 percent of the specified load capacity. Steel frame of all elevators shall be galvanized in accordance with ASTM A123.

Counterweight frame for all elevators except for CB-E1 shall be Supplier's standard finish.

Counterweight frame for elevator CB-E1 shall be galvanized in accordance with ASTM A153 or ASTM A123.

- b. Guides for car and counterweight shall be planed steel tees conforming to ASTM A36; erected plumb and securely fastened to the hoistway framing or embedments using ASTM A36 steel brackets spaced at 2.5 meters max. Steel shall be galvanized in accordance with ASTM A153. Guide rail deflection for car and counterweight shall not exceed 1/4 inch from non-loaded centerline position when elevator is at maximum loading and under the seismic acceleration forces, specified in Paragraph 4.05.C.

**SECTION 4 - TECHNICAL SPECIFICATION****4.06 MATERIALS AND FABRICATION (CONT.)**

Ends of guides shall be tongued and grooved connections with steel plates. Guides shall be equipped with galvanized clamps, brackets, fasteners, and other necessary accessories. All elevators shall be equipped with guide shoes.

All necessary rail backing fillers shall be provided.

- c. Lubricators shall be provided for car guide rails.
- d. Spring buffers shall be used with necessary blocking and supports provided. Detail construction and requirements for buffers shall conform to ASME A17.1.
- e. Hoist and governor ropes shall be traction steel wire ropes and shall conform to ASME A17.1 Section 212 requirements.

2. Hoistway Doors and Frames

- a. Type of doors and operation : See Paragraph 4.05.B.1.c.
- b. Door construction and accessories for all elevators;
  - b1. Hoistway doors shall be flush hollow construction and each door panel shall be not less than 1-1/4" (30mm) thick and made of stainless steel sheet not lighter than 0.06" (1.5mm) thick reinforced with continuous vertical members ; and shall be reinforced as required for hangers, interlock, door operation, key ways, etc. Each door panel shall contain sound-deadening material, and shall have a removable nonmetallic guide which rides in a groove in the door sill.
  - b2. Stainless steel sheet of hoistway door shall be type 304 conforming to ASTM A240 with 3S vibration color finish for AB-E3, AB-E4, TB-E1, CP-E2 and CP-E3, stainless 2B finish for AB-E1, AB-E2, CB-E1, CP-E1 and 3S vibration color finish for observation elevator AB-E5. The pattern and color of 3S vibration color finish shall be selected by Buyer in the manufacturer's standard types.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- b3. Hoistway doors except for CB-E1 shall have 1-1/2 hour fire rating in accordance with UL 10B or ASTM E152.
  - c. Location marking on doors : Painted or self-adhesive floor number marking shall be provided on the meeting edge of each hoistway door panel at 5 feet 6 inches above top of sill, to identify the floor as doors open. Also, floor elevation markings upon the fascia and/or doors of the hoistway, shall be provided at 6 feet 0 inches intervals. Marking shall correspond to landing designations indicated on the elevator control panel. Height of markings shall be 4 inches.
  - d. Door unlocking devices :
    - d1. At each hoistway door, unlocking devices shall be provided, to permit authorized persons to gain entry into the hoistway when the elevator car is away from the landing.
    - d2. An emergency key box shall be provided at the ground/grade floor landing adjacent to corridor call button station, as approved by Buyer.
  - e. Door frames shall be pressed metal type, with integral trim, made from full finished furniture steel of not lighter than 0.06" (1.5mm) thickness. Frame shall be set flush with edge of sill on the hatchway side, and shall be mortised and reinforced for all necessary hardware, interlocking devices, etc.
  - f. Sills: Sills for all elevators shall be stainless steel of the same material as car floors.
  - g. Dust covers, fascia plates, toe guide, hanger for doors shall be of manufacturer's standard.
3. Car Floors
- a. Car floors for AB-E1, AB-E2, CB-E1 & CP-E1 shall be composed as minimum 3/16"(4.5mm)thk. stainless steel plate. Stainless steel sheet shall be type 304 conforming to ASTM A240.



**SECTION 4 - TECHNICAL SPECIFICATION****4.06 MATERIALS AND FABRICATION (CONT.)**

- b. Car floors for AB-E3, AB-E4, TB-E1, CP-E2 & CP-E3 shall be min. 1/8" (3mm)thk. vinyl composition tile flooring over min. 3/16"(4.5mm)thk. type 304 stainless steel plate conforming to ASTM A240. Vinyl composition tile shall be heavy duty type conforming to ASTM F1066.
- c. Car floors of observation elevators AB-E5 shall be min. 3/4"(20mm) thk. artificial marble flooring over min. 3/16"(4.5mm) thk. type 304 stainless steel plate conforming to ASTM A240. Artificial marble flooring shall be in accordance with manufacturer's standard or recommended by the elevator manufacturer.
- d. The color, style and patterns of car floor finish shall be selected by Buyer from manufacturer's standard types.

**4. Car Enclosure**

- a. Workmanship: All finished work for the car enclosure walls, ceilings and doors shall be smooth and free from warps and buckles. All miters shall be well formed and in true alignment. All exposed joints shall be smooth with no marks showing in the completed work.
- b. Walls:
  - b1. Walls of all elevators shall be sound-deadened, with all joints light proofed and be of stainless steel, not lighter than 0.06" (1.5mm) thick. Stainless steel sheet shall be type 304 conforming to ASTM A240 with 3S vibration color finish for AB-E3, AB-E4, TB-E1, CP-E2 & CP-E3, stainless 2B finish for AB-E1, AB-E2, CB-E1 & CP-E1 and 3S vibration color finish for observation elevator AB-E5 with necessary cut-outs and reinforcement for car operation panel, car position indicator, telephone cabinet, wall receptacle, etc. The pattern and color of 3S vibration color finish shall be selected by Buyer in the manufacturer's standard types.
  - b2. All elevators shall be provided with stainless steel hooks, on the inside face of the car walls, for protective padding.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- b3. Protective pads for elevator car interiors shall be made the full height of car to line the wall finish. The pads shall have openings to expose the telephone cabinet and car control panel to allow the operation of the elevator. The protective pads shall be removable, suspended from stainless steel wall hooks. The pads shall have a maximum flame spread rating of 20, conforming to ASTM E84.
- c. Ceilings :
  - c1. Elevator ceiling shall be 0.06" (1.5mm) thk. stainless steel sheet with limelight, flat type ceiling in reinforced stainless steel frame, with all joints lightproofed, and complete with hinged top emergency exit.
  - c2. Elevator ceilings except for CB-E1 shall be double ceiling. The type/pattern for bottom ceiling shall be selected by Buyer in the manufacturer's standard types.
  - c3. Stainless steel sheet shall be type 304 conforming to ASTM A240, 3S vibration color finish for AB-E3, AB-E4, TB-E1, CP-E2, CP-E3 & AB-E5 and stainless 2B finish for AB-E1, AB-E2, CB-E1 & CP-E1.
- d. Car doors and frames :
  - d1. Each door panel shall be not less than 1-1/4" (30mm) thick and contain sound-deadening material and shall have a removable nonmetallic guide which rides in a groove in the door sill.
  - d2. Car doors and frames shall be 0.06" (1.5mm) thk. minimum stainless steel sheet with 3S vibration color finish for AB-E3, AB-E4, TB-E1, CP-E2 & CP-E3, stainless 2B finish for AB-E1, AB-E2, CB-E1 & CP-E1 and 3S vibration color finish for observation elevator AB-E5 with stainless steel frame, suitable for the service, and complete with enclosed counterweights, electric interlocks, etc., required for automatic power operation. The pattern and color of 3S vibration color finish shall be selected by Buyer in the manufacturer's standard types.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- d3. Safety edges: Each door leaf shall be equipped with multiple photocell array.
- d4. Sills: Same material as hoistway sills, and with fluted or abrasive surface and precision grooves for door guides.
- e. Ceiling fixture:
  - e1. Ceiling fixture of CB-E1 shall be semirecessed, fluorescent type, stainless steel frame, with not less than 2 lamps, to furnish not less than 25-foot candles illumination at car floor level.
  - e2. Ceiling fixture of all elevators except for CB-E1 shall be selected by Buyer in the manufacturer's standard types, to furnish not less than 25-foot candles illumination at car floor level.
  - e3. Switch: See Paragraph 4.06.B.5.e.
- f. Emergency lighting for all elevators:
  - f1. Provide self contained battery-operated unit, with not less than two lamps. Battery shall be readily accessible for servicing and replacement.
  - f2. Emergency lighting shall be in accordance with ASME A17.1 requirements.
- g. Wall receptacle for all elevators: Provide one (1) grounded 220 V wall receptacle in base area, for operating small tools.
- h. Handrail: Provide for all elevators.
- i. Telephone cabinet for all elevators: Recessed box, manufacturer's standard size, with stainless steel, type 304, 3S vibration color or stainless 2B front, for telephone provided by Supplier. Locate below car operating panel. Also see Paragraph 4.05.B.1.i for telephone cable provided by Supplier.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- j. Capacity plate for all elevators: In accordance with Rule 207.3 of ASME A17.1.
- k. Certificate frame for all elevators: 0.06" (1.5mm) thick stainless steel, type 304, 3S vibration color or stainless 2B finish.
- l. Lights and receptacles on hoistway side of car for all elevators: Provide one (1) socket and 150 watt incandescent lamp in guarded enclosure, and one (1) duplex grounded 220 V receptacle for small tools, above top of car and also below car platform. Lamps shall be kept illuminated at all times.

#### **5. Car Operating Panels**

- a. General: Provide for all elevators, as indicated on design data figures and as hereinafter specified.
- b. Location: As indicated on the elevator design data figures.
- c. Panel plates: Stainless steel, type 304, 3S vibration color or stainless 2B finish, flush mounted.
- d. Control buttons: As indicated on the elevator design data figures and as follows:
  - d1. All control buttons shall have the reset function with braille and shall be Manufacturer's standard design selected by Buyer.
  - d2. Alarm bell & interphone : Manufacturer's standard design selected by Buyer. Pushbutton shall have an additional normally open contact for operation of a control room annunciator (annunciator by others) and the contact shall be wired to terminal box for external connections.
  - d3. Fire service bypass: Provide in accordance with the requirements of Section 2.27 of ASME A17.1.
  - d4. Location marking : Painted or self-adhesive floor elevation marking shall be provided beside each floor number button on the car operation panel plate as indicated on design data figures.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- e. Light and fan switches for all elevators: Provide snap switch for car ceiling light.
- f. Overload warning for all elevators: Provide an illuminating type red jewel and audible alarm for load-weighing device specified in Paragraph 4.05.B.1.e.

#### **6. Top of Car Operating Device**

An operating station, in conformance with ASME A17.1, shall be mounted on top of elevator and the details, function indications, etc., of the direction buttons and emergency stop button shall be similar to the applicable requirements specified herein for the car operating panel, as approved. Provision shall be made to make the normal in car or floor operating device inoperative while the top of car operating device is in use.

#### **7. Car Position Indicators**

- a. A car position indicator showing elevation or floor landing shall be provided in the car as follows.
- b. Type : Horizontal, electric, flush mounted inside of car over car door. Manufacture's standard design selected by Buyer.
- c. Panel plate : Stainless steel, type 304, stainless 2B finish.
- d. CPI lanterns : Manufacture's standard design selected by Buyer.

#### **8. Corridor Pushbutton Stations**

- a. Provide for all elevators, as indicated on elevator design data figure, and as hereinafter specified.
- b. Type : Vertical, electric, flush mounted(with Braille and reset function) in concrete walls and metal siding. Manufacturer's standard design selected by Buyer.
- c. Location : At side of each hoistway door, on right or left as indicated on the elevator design data figures.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- d. Panel plate : Stainless steel, stainless 2B finish, except signal fixtures which must be waterproof shall be gasketed cast iron construction.

#### **9. Car Cage of Observation Elevator**

- a. Window in observation elevator shall be minimum 13/32" (10.3mm) thk. laminated glass and conforming to ASTM C1172. A pane shall not exceed 5'-7"(1,700mm) high.
- b. Glass window shall not be provided below the level of 1'-8"(500mm) above the car floor. And provide handrail between 2'-8"(800mm) and 4'-0"(1,200mm) high in the cage in case that the window is below 2'-6"(750mm) above the car floor.
- c. Outside cage of observation elevator shall be pressed metal type, with painting finish and not lighter than 0.06" (1.5mm) thickness steel.
- d. Lighting fixture of inside and outside car cage shall be provided as manufacturer's standard type selected by Buyer.

#### **10. Air Conditioner of Observation Elevator**

Provide an air conditioner for car air conditioning and cooling capacity of air conditioner shall be 4,800 kcal/hr, and an air conditioner shall be mounted on top of elevator.

#### **11. Information panel of observation Elevator**

- a. Location : Above the elevator hoistway door at 1st floor
- b. Transmit Control System : LAN Transmit Control System

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

#### **A. GENERAL**

The surface preparation and painting of electric elevators shall be as follows.

- 1. Stainless steel surfaces shall not be painted.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.07 SURFACE PREPARATION AND COATING (CONT.)**

2. Ceiling exposed on inside of all cars, except stainless steel surfaces, shall be thoroughly cleaned, primed and given sufficient coats of manufacturer's standard to insure a smooth, durable finish.
3. All exposed ferrous metal surfaces and rough steel surfaces other than use for elevator CB-E1 such as guides, counterweight frames, etc. shall be prepared and painted in accordance with the manufacturer's standard.  
The guides, counterweight frame and all other miscellaneous steels for elevator CB-E1 shall be galvanized in accordance with ASTM A153 or ASTM A123.
4. For the surfaces which will be concealed or inaccessible after final installation, minimum of two coats of manufacturer's standard paint shall be applied to insure a durable finish.

#### **B. FINISH COLOR**

Finish color will be selected by the Buyer from sample color chips submitted by the Supplier.

#### **C. TOUCH UP PAINTING**

After installation work has been completed, Supplier shall touch-up the painted surfaces which are marred, scratched or damaged due to shipping or installation, with the same color and texture paint.

### **4.08 NAMEPLATES**

- A. Each elevator shall be fitted with a permanent corrosion-resistant metal nameplate containing the following information:
  1. Purchase Contract Number
  2. Equipment Title and Tag Number
  3. Manufacturer's Name
  4. Manufacturer's Serial Number

**SECTION 4 - TECHNICAL SPECIFICATION**

**4.08 NAMEPLATES (CONT.)**

B. The equipment shall be titled and numbered as follows:

	<u>Title</u>	<u>Equipment Number</u>
Unit 3	Auxiliary Bldg. Elevator (AB-E1)	3-683-A-EL01
Unit 3	Auxiliary Bldg. Elevator (AB-E2)	3-683-A-EL02
Unit 3	Auxiliary Bldg. Elevator (AB-E3)	3-683-A-EL03
Unit 3	Auxiliary Bldg. Elevator (AB-E4)	3-683-A-EL04
Unit 3	Turbine Generator Bldg. Elevator (TB-E1)	3-683-A-EL05
Unit 3	Reactor Containment Bldg. Elevator (CB-E1)	3-683-A-EL06
Unit 4	Auxiliary Bldg. Elevator (AB-E1)	4-683-A-EL01
Unit 4	Auxiliary Bldg. Elevator (AB-E2)	4-683-A-EL02
Unit 4	Auxiliary Bldg. Elevator (AB-E3)	4-683-A-EL03
Unit 4	Auxiliary Bldg. Elevator (AB-E4)	4-683-A-EL04
Unit 4	Auxiliary Bldg. Observation Elevator (AB-E5)	4-683-A-EL07
Unit 4	Turbine Generator Bldg. Elevator (TB-E1)	4-683-A-EL05
Unit 4	Reactor Containment Bldg. Elevator (CB-E1)	4-683-A-EL06
	Common Compound Bldg. Elevator (CP-E1)	0-683-A-EL01
	Common Compound Bldg. Elevator (CP-E2)	0-683-A-EL02
	Common Compound Bldg. Elevator (CP-E3)	0-683-A-EL03

C. Motor nameplate shall be in accordance with Appendix 4N.



## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.09 INSPECTION AND TESTING**

#### **A. GENERAL**

1. Inspection of the materials/equipment shall be at the Supplier's or Manufacturer's factory. Materials/equipment shall not be prepared for shipment or shipped before the Buyer has either inspected the materials/equipment or waived inspection. The inspection or waiving of inspection by the Buyer at the factory shall in no way relieve Supplier of the responsibility of furnishing materials/equipment in accordance with this specification.
2. The Buyer's shop inspector shall have access to the work specified herein. He shall have authority to refuse release for shipment, if, in his opinion, the design, intent, or requirements of the specifications have not been fulfilled, or certified copies of required inspection and test data are not available for review. He shall indicate tests and inspections he intends to witness or perform after a review of the Supplier's work plan. Suppliers shall give the Buyer's inspector seven working days advance notice on schedule dates for performance of tests to be witnessed and on final inspection for shipment.
3. The motor 200hp and smaller shall be factory tested in accordance with NEMA MG 1 and IEEE 112. The test shall include all items of IEEE 112 excluding shaft current. The single phase motor may be exempt from temperature test and airborne sound test.

#### **B. FIELD PERFORMANCE TEST**

1. After the installation is completed, Supplier shall conduct a complete acceptance tests for approval as directed by the elevator inspection authority (Korea Elevator Safety Institute) and Buyer. The tests shall be performed in accordance with Part X of ASME A17.1.
2. The Supplier shall obtain and pay for any necessary inspection and permits as required by the elevator inspection authority, and make such tests as called for by the regulations of such authority.

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

The items covered by this specification shall be subject to at least the minimum level of quality surveillance actions as indicated the witness and hold point lists attached to this specification.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.10 SHIPPING REQUIREMENTS**

#### **A. GENERAL**

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

<u>Item</u>	<u>Level</u>
Electrical Equipment	B
All Other Items	C

2. Instruction covering handling, storage, installation, and maintenance at construction site shall be prepared and submitted by the Supplier.
3. Where product require a special storage environment, Supplier shall so label the package.

### **4.11 INSTRUCTION MANUALS**

#### **A. GENERAL**

1. The Supplier shall furnish twenty (20) bound sets to the Buyer's site and six(6) bound sets to the A/E of instruction manual for all equipment furnished by Supplier. Such instruction books shall include, but are not limited to, manufacturers' instruction books and leaflets, and other instruction literature containing the following information:
  - a. Handling and storage instructions
  - b. Installation instructions.
  - c. Disassembly and assembly procedure(s).
  - d. Test procedures and results for all moving parts and operable equipment.
  - e. Operating and maintenance procedures.
  - f. Outline drawings(s)

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

- g. Assembly drawing(s)
  - h. Erection drawing(s)
  - i. Wiring diagrams
  - j. Schematic diagrams
  - k. Material data sheets including performance data.
  - l. Complete material/Parts list(s).
- 2. Parts List : The instruction manual shall include a complete parts listing for the equipment. This listing, 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 drawing references. The following information shall be provided for each part:
  - a. Indicate if a spare part should be maintained in stock by Buyer and/or recommended frequency of replacement, if applicable.
  - b. Fabrication and material requirements including ASTM and/or other specification numbers.
  - c. Manufacturer's detail and dimensional drawing number(s), fabrication procedure number(s), and quality control procedure number(s), Buyer reserves the right to obtain these drawings and procedures at such time that the Supplier ceases manufacture of the parts or at such time that the Supplier terminates business.
  - d. Identify expiration dates for the supplied parts/spare parts with limited shelf life if parts have shelf life limitation.
- 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.

## **SECTION 4 - TECHNICAL SPECIFICATION**

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

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.

#### **B. ERECTION INFORMATION**

1. Supplier shall, when requested, furnish to the 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.

### **4.12 INSTALLATION**

#### **A. GENERAL**

1. The Supplier shall install the electric elevators and the accessories furnished by this Specification and installation work shall be performed in accordance with the requirement of Quality Class "S".
2. The installation work include the field test after installation completion and shall provide spare parts and consumables required for the proper installation and field test of the electric elevators and the accessories. The Supplier shall also furnish and/or install equipment, miscellaneous hardware and materials required to properly install and test the electric elevators and the accessories.
3. The installation work shall be performed as a schedule consistent with the requirement of the Buyer's schedule and the schedule may be changed according to the overall construction schedule of the power plant.

#### **B. SERVICE CONDITION/REQUIREMENT**

1. The Supplier shall perform the installation work in a manner consistent with recognized good practice for power plant service.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.12 INSTALLATION (CONT.)**

2. Electrical connections or equipment shall be installed only when connection equipment is de-energized and grounded. The Supplier shall cooperate with the Buyer when arranging for outages, and he shall perform installation so as to keep the number and duration of outages to a minimum. The Supplier shall arrange in advance for any power outages with the Buyer who will schedule any such outages. The Supplier shall provide adequate protection, and he shall take necessary precautions when doing installation in the vicinity of energized equipment.
3. If interferences or obstructions occur to cables, conduits, and other electrical items either prior to or subsequent to their installation, the Supplier shall relocate such items at the direction of the Buyer.
4. The Supplier shall provide and maintain suitable warning and/or protection around temporary openings, open manholes, removed section of grating, exposed high voltage equipment, or other hazardous areas or conditions.
5. The Supplier shall notify to the Buyer all special procedure, recommendations or conflicts before proceeding with equipment installation.
6. The Supplier shall be responsible for the integrity of all connection and installations which shall be performed by this specification.
7. The Supplier shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades.

### **C. RECEIVING, HANDLING AND STORAGE**

1. Material shall be delivered in the manufacturer's original, unopened, protective packaging, with intact and legible manufacturer's labels indicating brand name and other relevant information.
2. Material shall be stored in accordance with the manufacturer's instructions, and in their original packaging to prevent soiling, wetting, breakage, or other damage.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.12 INSTALLATION (CONT.)**

#### **D. FIELD OPERATIONS**

1. Installation and assembly of electric elevators shall be performed under the supervision of the Buyer. The installation shall be accomplished by workmen skilled in this of work.
2. Before the start of installation work, the Supplier shall verify that hoistway, pit, machine room are ready for work of this Section, and that shaft/openings are of correct size and within tolerance. And the Supplier shall verify location and size of machine foundation, steel supports, etc. Any adverse conditions found shall be corrected before proceeding with the work.
3. The Supplier shall confirm electrical power is available and of correct characteristics. Arrange for temporary electrical power to be available for installation work and testing of elevator components.
4. Material and equipment shall be installed in accordance with ASME A17.1, the approved drawings, the recommendations of the manufacturer, and specified hereinafter.
  - a. Install hoistway and machine room components. Connect equipment to building utilities.
  - b. Provide conduit, boxes, wiring and accessories within machine room, hoistway and signal outlets.
  - c. Mount machine on vibration and acoustic isolators, on bed plate and concrete pad. Place machine on structural supports and bearing plates. Securely fasten to building supports. Prevent lateral displacement.
  - d. Arrange equipment in machine room so rotating elements, sheaves and other equipment can be removed for repairs or replaced without dismantling or removing other equipment components. Arrange equipment for clear passage to access door. Accommodate equipment in space indicated.
  - e. Install guide rails using threaded bolts with metal shims and lockwashers under nuts. Compensate for expansion and contraction movement of guide rails.

## **SECTION 4 - TECHNICAL SPECIFICATION**

### **4.12 INSTALLATION (CONT.)**

- f. Accurately machine and align guide rails. Form smooth joints with machined splice plates.
  - g. Guide rail brackets shall be welded directly to structural steel hoistway framing or steel plate on concrete hoistway wall.
  - h. Welding shall be performed only by qualified welders skilled in welding of material. Visible welds shall be dressed smooth.
  - i. Coordinate installation of hoistway wall construction.
5. The Supplier shall perform field test according to Subsection 4.09.B, "Field Performance Test"

**ATTACHMENT 4-1**

**WITNESS POINT**

Page 1 of 1

The following tests / operations are to be witnessed by Buyer's representative on 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 Inspection and Review of MTR</li><li>2. Fit-up and Weld Inspection</li><li>3. NDE When Required</li><li>4. Spring Buffer Test</li><li>5. Dimensional Inspection</li><li>6. Surface Preparation and Painting Inspection</li><li>7. Inprocess Inspection During Device Installation and Wiring</li></ol>	



**ATTACHMENT 4-2**

**HOLD POINT**

Page 1 of 1

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

Hold Point(s)	Sample Size Alternative
<ol style="list-style-type: none"><li>1. Final Inspection.</li><li>2. Packing Inspection.</li><li>3. Review and sign-off Quality Verification Documentation.</li><li>4. Release for shipment.</li></ol>	

**ATTACHMENT 4-3**

**CROSS-REFERENCE TABLE**

**Between KEPIC and Referenced Codes & Standards**

**ATTACHMENT 4-3**

**TABLE OF CONTENT**

<u>No.</u>	<u>KEPIC DISCIPLINE</u>	<u>DISCIPLINE CODE</u>	<u>PAGE</u>
1	Quality Assurance	QA .....	2
2	Nuclear Mechanical Components	MN .....	2
3	General Mechanical Components	MG .....	2
4	Heating, Ventilation, and Air Conditioning	MH .....	3
5	Materials	MD .....	3
6	Nondestructive Examination	ME .....	3
7	Welding and Brazing Qualifications	MQ .....	3
8	Inservice Inspection of Nuclear Power Plant Components	MI .....	4
9	Inservice Testing of Nuclear Power Plant Components	MO .....	4
10	Qualification of Mechanical Equipment	MF .....	5
11	Boilers	MB .....	5
12	Nuclear Electric	EN .....	5
13	Measuring & Control Equipment	EM .....	9
14	Electric Equipment	EE .....	10
15	Cable & Raceways	EC .....	12
16	Transmission, Transformation & Distribution	ET .....	13
17	Nuclear Structures	SN .....	16
18	General Structures	SG .....	16
19	Extra Provisions for Structures	ST .....	17
20	Fire Protection	FP .....	17
21	Structural Welding	SW .....	17

### ATTACHMENT 4-3

#### 1. Quality Assurance (QA)

Designation	Title	Referenced Codes and Standards(Edition)
<b>QAP</b>	Nuclear Quality Assurance	ASME NQA-1 (94ed., 95add.)
<b>QAI</b>	Authorized Inspection	ASME QAI-1 (95ed., 96add.)
<b>QAR</b>	Qualification of Registered Engineers	ASME III Appendix XXIII (96add.)

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

Designation	Title	Referenced Codes and Standards(Edition)
<b>MNA</b>	General Requirements	ASME Sec.III NCA (95ed., 95 ~ 97add.)
<b>MNB</b>	Class 1 Components	ASME Sec.III Div.1 NB (95ed., 95 ~ 97add.)
<b>MNC</b>	Class 2 Components	ASME Sec.III Div.1 NC (95ed., 95 ~ 97add.)
<b>MND</b>	Class 3 Components	ASME Sec.III Div.1 ND (95ed., 95 ~ 97add.)
<b>MNE</b>	Metal Containment Components	ASME Sec.III Div.1 NE (95ed., 95 ~ 97add.)
<b>MNF</b>	Supports	ASME Sec.III Div.1 NF (95ed., 95 ~ 97add.)
<b>MNG</b>	Core Support Structures	ASME Sec.III Div.1 NG (95ed., 95 ~ 97add.)
<b>MNZ</b>	Appendices	ASME Sec.III Div.1 Appendix (95ed., 95 ~ 97add.)

#### 3. General Mechanical Components (MG)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MGA</b>	General Requirements	ASME Sec.III NCA (95ed., 95 ~ 97add.), ISO 9000 (94ed.), KS A 9000 (98ed.)
<b>MGB</b>	Pressure Vessels	ASME Sec.VIII Div.1 (95ed., 95 ~ 97add.)
<b>MGC</b>	Heat Exchangers	HEI (90ed.), TEMA (88ed.)
<b>MGD</b>	Storage Tanks	API 650 (93ed., 94 ~ 97add.)
<b>MGE</b>	Power Piping	ASME B 31.1 (95ed., 95 ~ 97add.)
<b>MGF</b>	Pumps	HI (94ed.)

### ATTACHMENT 4-3

#### 3. General Mechanical Components (MG) -(Continued)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MGG</b>	Valves	ASME B 16.34 (96ed.)
<b>MGH</b>	Condensers	HEI (95ed.)
<b>MGI</b>	Feedwater Heaters	HEI (92ed.)

#### 4. Heating, Ventilation, and Air Conditioning (MH)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MHA</b>	General Requirements	ASME AG-1 Div. I (97ed.)
<b>MHB</b>	Ventilation Air Cleaning and Ventilation Air Conditioning	ASME AG-1 Div. II (97ed.)
<b>MHD</b>	Testing Procedures	ASME AG-1 Div. IV (97ed.)

#### 5. Materials (MD)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MDF</b>	Ferrous Material Specifications	ASME Sec. II Part A (95ed., 95 ~ 97add.)
<b>MDN</b>	Nonferrous Material Specifications	ASME Sec. II Part B (95ed., 95 ~ 97add.)
<b>MDW</b>	Welding Material Specifications	ASME Sec. II Part C (95ed., 95 ~ 97add.)
<b>MDP</b>	Material Properties	ASME Sec. II Part D (95ed., 95 ~ 97add.)

#### 6. Nondestructive Examination (ME)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MEN</b>	Nondestructive Examination	ASME Sec. V (95ed., 95 ~ 97add.)

#### 7. Welding and Brazing Qualifications (MQ)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MQW</b>	Welding Qualification	ASME Sec. IX Part QW (95ed., 95 ~ 97add.)
<b>MQB</b>	Brazing Qualification	ASME Sec. IX Part QB (95ed., 95 ~ 97add.)

### **ATTACHMENT 4-3**

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

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>MIA</b>	General Requirements	ASME Sec. XI Div.1 IWA (95ed., 95 ~ 97add.)
<b>MIB</b>	Class 1 Components	ASME Sec. XI Div.1 IWB (95ed., 95 ~ 97add.)
<b>MIC</b>	Class 2 Components	ASME Sec. XI Div.1 IWC (95ed., 95 ~ 97add.)
<b>MID</b>	Class 3 Components	ASME Sec. XI Div.1 IWD (95ed., 95 ~ 97add.)
<b>MIE</b>	Metal Containment Components and Metal Liners	ASME Sec. XI Div.1 IWE (95ed., 95 ~ 97add.)
<b>MIF</b>	Supports	ASME Sec. XI Div.1 IWF (95ed., 95 ~ 97add.)
<b>MIL</b>	Concrete Containment	ASME Sec. XI Div.1 IWL (95ed., 95 ~ 97add.)
<b>MIZ</b>	Appendices	ASME Sec. XI Div.1 App. (95ed., 95 ~ 97add.)

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

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>MOA</b>	General Requirements	ASME OM Subsec. ISTA (95ed., 95 ~ 97add.)
<b>MOB</b>	Inservice Testing of Pumps	ASME OM Subsec. ISTB (95ed., 95 ~ 97add.)
<b>MOC</b>	Inservice Testing of Valves	ASME OM Subsec. ISTD (95ed., 95 ~ 97add.)
<b>MOD</b>	Inservice Testing of Pressure Relief Devices	ASME OM Mandatory App.1 (95ed., 95 ~ 97add.)
<b>MOE</b>	Inservice Testing of Dynamic Restraints	ASME OM Subsec. ISTD (95ed., 95 ~ 97 add.)
<b>MOF</b>	Performance Testing of Cooling Water Systems	ASME OM S/G Part 2 (94ed.)
<b>MOG</b>	Preoperational and Initial Start-Up Testing of Piping Systems	ASME OM S/G Part 3 (97ed.)
<b>MOH</b>	Performance Testing of Power Operated Relief Valve Assemblies	ASME OM S/G Part 13 (94ed.)
<b>MOI</b>	Inservice Testing of Diesel Drives	ASME OM S/G Part 16 (94ed.)

### ATTACHMENT 4-3

#### 10. Qualification of Mechanical Equipment (MF)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MFA</b>	General Requirements	ASME QME-1 Sec. QR (97ed.)
<b>MFB</b>	Qualification of Active Pump Assemblies	ASME QME-1 Sec. QP (97ed.)
<b>MFC</b>	Qualification of Active Valve Assemblies	ASME QME-1 Sec. QV (97ed.)

#### 11. Boilers (MB)

Designation	Title	Referenced Codes and Standards(Edition)
<b>MBB</b>	Power Boilers	ASME Sec. I (98ed.)

#### 12. Nuclear Electric (EN)

Designation		Title	Referenced Codes and Standards(Edition)
<b>ENA</b>	-	General Requirements	ASME Sec. III NCA (95ed., 95 ~ 97add.) ANS 51.1 (83ed.) IEEE 379 (88ed.) IEEE 603 (91ed.)
<b>ENB Design</b>	1100	Criteria for Safety Systems for Nuclear Power Generating Stations	IEEE 603 (91ed.)
	1200	Method for Identification of Documents Related to Class 1E Equipment and Systems for Nuclear Power Generating Stations	IEEE 494 (74ed., Reaff. 90)
	2000	Criteria for Independence of Class 1E Equipment and Circuits	IEEE 384 (92ed.)
	3000	Application of the Single-Failure Criterion to Nuclear Power Generating Safety Systems	IEEE 379 (94ed.)
	4100	Guide for General Principles of Reliability Analysis of Nuclear Power Generating Station Safety Systems	IEEE 352 (87ed.)
	4200	Requirements for Reliability Analysis in the Design and Operation of Safety Systems for Nuclear Power Generating Stations	IEEE 577 (76ed., Reaff. 93)
	5000	Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations	IEEE 741 (90ed.)
	6210	Criteria for Class 1E Power Systems for Nuclear Power Generating Stations	IEEE 308 (91ed.)

**ATTACHMENT 4-3**

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

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>ENB Design</b>	6220	Preferred Power Supply (PPS) for Nuclear Power Generating Stations	IEEE 765 (95ed.)
	6230	Recommended Practice for the Design of DC Auxiliary Power Systems for Generating Stations	IEEE 946 (92ed.)
	6240	Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations	IEEE 387 (95ed.)
	6310	Criteria for the Design of the Control Room Complex for Nuclear Power Generating Stations	IEEE 567 (80ed.)
	6320	Criteria for Remote Shutdown for Light Water Reactors	ANS 58.6 (96ed.)
	6330	Criteria for Accident Monitoring Functions in Light-Water-Cooled Reactors	IEEE 497 (81ed.) ANS 4.5 (80ed., Reaff. 86) Reg. Guide-1.97 (83ed.)
	6340	Design and Qualification of Class 1E Control Boards, Panels, and Racks Used in Nuclear Power Generating Stations	IEEE 420 (82ed.)
	6350	Setpoints for Nuclear Safety-Related Instrumentation	ISA S67.04 (94ed.)
	6360	Guide for the Application of Human Factors Engineering to Systems, Equipment and Facilities of Nuclear Power Generating Stations	IEEE 1023 (88ed., Reaff. 95)
	6370	Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations	IEEE 7-4.3.2 (93ed.)
	6380	Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents	IEEE N42.18 (80ed., Reaff. 91)
	6410	Design and Installation of Cable Systems for Class 1E Circuits in Nuclear Power Generating Stations	IEEE 690 (84ed., Reaff. 96)
	6420	Criteria for the Design, Installation, and Qualification of Raceway Systems for Class 1E Circuits for Nuclear Power Generating Stations	IEEE 628 (87ed., Reaff. 93)
	6430	Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations	IEEE 317 (83ed., Reaff. 96)
	6500	Recommended Practice for the Design and Installation of Electric Heat Tracing Systems for Nuclear Power Generating Systems	IEEE 622 (87ed., Reaff. 94)



**ATTACHMENT 4-3**

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

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>END Qualification</b>	1100	Qualifying Class 1E Equipment for Nuclear Power Generating Stations	IEEE 323 (83ed., Reaff. 96)
	1200	Standard Requirements for the Organizations that Conduct Qualification Testing of Safety Systems Equipment for Use in Nuclear Power Generating Stations	IEEE 600 (83ed.)
	2000	Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations	IEEE 344 (87ed., Reaff. 93)
	3100	Design Qualification of Safety Systems Equipment Used in Nuclear Power Generating Stations	IEEE 627 (80ed., Reaff. 96)
	3211	Qualification of Switchgear Assemblies for Class 1E Applications in Nuclear Power Generating Stations	IEEE C37.82 (87ed., Reaff. 93)
	3212	Guide for Seismic Qualification of Class 1E Metal-Enclosed Power Switchgear Assemblies	IEEE C37.81 (89ed., Reaff. 95)
	3220	Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations	IEEE 649 (91ed.)
	3230	Design and Qualification of Class 1E Control Boards, Panels, and Racks Used in Nuclear Power Generating Stations	IEEE 420 (82ed.)
	3300	Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations	IEEE 334 (94ed.)
	3400	Qualifying Class 1E Protective Relays and Auxiliaries for Nuclear Power Generating Stations	IEEE C37.105 (87ed.)
	3500	Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations	IEEE 535 (86ed., Reaff. 94)
	3600	Qualification of Class 1E Static Battery Chargers and Inverters for Nuclear Power Generating Stations	IEEE 650 (90ed.)
	3700	Qualification of Actuators for Power-Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants	IEEE 382 (85ed.)
	3810	Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations	IEEE 383 (74ed., Reaff. 92)

**ATTACHMENT 4-3**

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

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>END</b> Qualification	3820	Criteria for the Design, Installation, and Qualification of Raceway Systems for Class 1E Circuits for Nuclear Power Generating Stations	IEEE 628 (87ed., Reaff. 93)
	3830	Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations	IEEE 572 (85ed., Reaff. 93)
	3900	Criteria for Type Tests of Class 1E Modules Used in Nuclear Power Generating Stations	IEEE 381 (77ed.)
<b>ENE</b> Installation	1100	Installation, Inspection and Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities	IEEE 336 (85ed., Reaff. 91)
	2100	Design and Installation of Cable Systems for Class 1E Circuits in Nuclear Power Generating Stations	IEEE 690 (84ed.)
	2200	Criteria for the Design, Installation, and Qualification of Raceway Systems for Class 1E Circuits for Nuclear Power Generating Stations	IEEE 628 (87ed., Reaff. 93)
	2300	Transducer and Transmitter Installation For Nuclear Safety Applications	ISA S67.01 (94ed.)
	2420	Sample-Line Piping and Tubing Standard for Use in Nuclear Power Plants	ISA S67.10 (94ed.)
<b>ENF</b> Test & Inspection	1100	Installation, Inspection, and Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities	IEEE 336 (85ed., Reaff. 91)
	2000	Guide for Planning of Pre-operational Testing Programs for Class 1E Power Systems for Nuclear Power Generating Stations	IEEE 415 (86ed., Reaff. 93)
	3100	Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems	IEEE 338 (87ed., Reaff. 94)
	3400	Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications	IEEE 450 (95ed.)
	3500	Requirements for Replacement Parts for Class 1E Equipment in Nuclear Power Generating Stations	IEEE 934 (87ed., Reaff. 93)

**ATTACHMENT 4-3**

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

Designation		Title	Referenced Codes and Standards(Edition)
ENF Test & Inspection	3610	Requirements for Calibration and Control of Measuring and Test Equipment Used in Nuclear Facilities	IEEE 498 (90ed.)
	3620	Radiation Protection Instrumentation Test and Calibration	IEEE N 323 (78ed., Reaff. 83)

**13. Measuring & Control Equipment (EM)**

Designation		Title	Referenced Codes and Standards(Edition)
EMA	-	General Requirements	ASME Sec. III NCA (95ed., 95~97년 add.), ISO 9000 (94ed.), KS A 9000 (98ed.)
EMB Measuring Equipment	1200	Industrial Platinum Resistance Thermometer Sensors	IEC 60751 (95ed.)
	4100	Vibration, Axial Position, and Bearing Temperature Monitoring Systems	API 670 (93ed.)
	4200	Accelerometer-Based Vibration Monitoring System	API 678 (81ed.)
	5100	Requirements for Instrument Transformers	IEEE C 57.13 (93ed.)
EMC Control Equipment	1100	Industrial Control and Systems General Requirements	NEMA ICS 1-Part 8 (93ed.)
	2100	Manual & Magnetic Controllers Rated Not More Than 2000 V AC or 750 V DC	NEMA ICS 2-Part-1,2,3,5,6, Annex(A) (93ed.), ICS 2-234 & 325 (88ed.)
	2200	Magnetic Lighting Contactor Rated Not More Than 2000 V AC or 750 V DC	NEMA ICS 2-Part 7 (93ed.)
	2300	Industrial Control Devices- Connectors, Contact and Semiconductor Switching Element	NEMA ICS 2-120, 125, 126, 221 (88ed.)
	2400	Control Relays Rated Not More Than 2000 V AC or 750 V DC	NEMA ICS 2-Part 4 (93ed.), ICS 2-212 & 218 (88ed.)
	2500	Industrial Control Devices- Resistors, Auto-Transformer and Rheostats	NEMA ICS 2-213, 214 (88ed.)
	2600	Industrial Control Devices- Control Switches, Indicating Lights	NEMA ICS 2-216, 447, 219, 225, 226, 227, 228, 229 (88ed.)
	3000	Enclosures for Electrical Equipment	NEMA ICS 6 (93ed.) NEMA 250 (91ed.)

**ATTACHMENT 4-3**

**13. Measuring & Control Equipment (EM) -(Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>EMD</b> Indication & Recording Instruments	1100	Requirements for Electrical Analog Indicating Instruments	ANSI C39.1 (81ed., Reaff. 92)
	2100	Annunciators Sequences and Specifications	ISA S18.1(79ed, Reaff. 92)
<b>EMF</b> Measurement Method of Process Variable & General of Process Control	1100	Temperature Measurement Instruments and Apparatus	ASME PTC 19.3 (74ed., Reaff. 85)
	1200	Pressure Measurement Instruments and Apparatus	ASME PTC 19.2 (87ed.)
	1300	Application of Fluid Meters-Especially Differential Pressure Type	ASME PTC 19.5 (72ed.)
	2100	Requirements for Compatibility of Analog Signals for Electronic Industrial Process Instruments	ISA S50.1 (82ed., Reaff. 92)

**14. Electric Equipment (EE)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>EEA</b>	-	General Requirements	ASME Sec. III NCA (95ed., 95~97년 add.), ISO 9000 (94ed.), KS A 9000 (98ed.)
<b>EEB</b> Rotating Machinery	1000	General Requirements for Rotating Electric Machines	NEMA MG 1 Section I Part 1 (93ed., R97)
	2110	Small and Medium Induction Motors	NEMA MG 1 Section II (93ed., R97)
	2120	Large Induction Motors	NEMA MG 1 Section II Part 20 (93ed., R97)
	2200	Test Procedure for Polyphase Induction Motors and Generators	IEEE 112 (96ed.)
<b>EEC</b> Transformer	1000	General Requirements for Distribution and Power Transformers	JEC 2200 (95ed.) ANSI C57.12.70 (78ed.) IEEE C57.12.80 (78ed.)
	2200	Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers	IEEE C57.12.90 (93ed.)
	3200	Test Code for Dry-Type Distribution and Power Transformers	IEEE C57.12.91 (95ed.)

**ATTACHMENT 4-3**

**14. Electric Equipment (EE)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>EED</b> Protection Equipment	1100	AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis	ANSI C37.06 (97ed.) IEEE C37.04 (79ed.) IEEE C37.04f (90ed.), IEEE C37.09 (79ed.)
	1200	Low-Voltage AC Power Circuit Breakers Used in Enclosures	IEEE C37.13 (90ed.) ANSI C37.50 (89ed.) ANSI C37.16 (97ed.)
	2000	Requirements, Terminology, and Test Procedures for Neutral Grounding Devices	IEEE 32 (72ed.)
<b>EEE</b> Switchgear & Panelboard	1000	Motor Control Centers	UL 845 (95ed.) NEMA ICS 3 Part 1 (93ed.)
	2000	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear	IEEE C37.20.1 (93ed.)
	3000	Metal-Clad Switchgear	IEEE C37.20.2 (93ed.)
	4000	Panelboards	NEMA PB 1 (95ed.)
	5000	Guide for Metal-Enclosed Bus and Calculating Losses in Isolated-Phase Bus	IEEE C37.23 (87ed., Reaff. 91)
<b>EEF</b> Relay	1000	Relays and Relay Systems Associated with Electric Power Apparatus	IEEE C37.90 (89ed., Reaff. 94) IEEE C37.100 (92ed.) IEC 60050-446 (84ed.)
	2000	Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems	IEEE C37.90.1 (89ed., Reaff. 94)
<b>EEG</b> Battery	1000	Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications	KS C 8505 (95ed.) IEEE 450 (95ed.) IEEE 535 (85ed., Reaff. 94)
	1100	Recommended Practice for Design and Installation of Vented Lead-Acid Batteries for Stationary Applications	IEEE 484 (96ed.) IEEE 485 (97ed.)
<b>EEH</b> Battery Charger	1000	Utility Type Battery Chargers	NEMA PE-5 (96ed.)
<b>EEI</b> Electromagnetic Compatibility	1000	Methods of Measurement For Radio Influence Voltage (RIV) of High-Voltage Apparatus	NEMA 107 (87ed., Reaff. 93)
<b>EEJ</b> Heat Tracing System	1000	Recommended Practice for the Design and Installation of Electric Heat Tracing Systems for Nuclear Power Generating Systems	IEEE 622A (84ed.) IEEE 622B (88ed.)

**ATTACHMENT 4-3**

**14. Electric Equipment (EE) - (Continued)**

Designation		Title	Referenced Codes and Standards(Edition)
<b>EEK</b> Anti-corrosion Equipment	1000	Control of External Corrosion on Underground or Submerged Metallic Piping Systems	NACE RP0169 (96ed.)
	1100	Design, Installation, Operation, and Maintenance of Impressed Current Deep Groundbeds	NACE RP0572 (95ed.)
<b>EEL</b> Uninterruptible Power Supply System	1000	IEEE Recommended Practice for the Application and Testing of Uninterruptible Power Supplies for Power Generating Stations	IEEE 944 (86ed., Reaff. 96) IEC 60146 (73ed.) IEC 60146-2 (74ed.)

**15. Cable & Raceways(EC)**

Designation		Title	Referenced Codes and Standards(Edition)
<b>ECA</b>	-	General Requirements	ASME Sec. III NCA (95ed., 95~97년 add.), ISO 9000 (94ed.), KS A 9000 (98ed.)
<b>ECB</b> Wire & Cable	1100	Standard Specification for Soft or Annealed Copper Wire	ASTM B 3 (95ed.)
	1200	Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes	ASTM B 33 (94ed.)
	1300	Standard Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes	ASTM B 189 (95ed.)
	1400	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft	ASTM B 8 (95ed.)
	3000	Instrumentation Cables and Thermocouple Wire	NEMA WC 55 (92ed.)
	5100	Test Procedure for Impulse Voltage Tests on Insulated Conductors	IEEE 82 (94ed.)
	5200	Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field	IEEE 400 (91ed.)
	6000	Binational Wire and Cable Packaging Standard	NEMA WC 26 (96ed.)
<b>ECC</b> Cable Fitting	1100	Test Procedures and Requirements for High Voltage Alternating-Current Cable Terminations	IEEE 48 (96ed.)
	1200	Cable Joints for Use with Extruded Dielectric High Voltage Cable	IEEE 404 (93ed.)

**ATTACHMENT 4-3****15. Cable & Raceways (EC)- (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>ECC</b> Cable Fitting	2100	Plugs, Receptacles, and Cable Connectors Pin and Sleeve Type for Industrial Use	NEMA PR 4 (83ed., R89)
<b>ECD</b> Line Apparatus	1100	Zinc Coated Rigid Steel Conduit	ANSI C80.1 (94ed.)
	2100	Electrical Polyvinyl Chloride (PVC) Tubing Conduit	NEMA TC 2 (90ed.)
	3100	Metal Cable Tray Systems	NEMA VE 1 (91ed.)

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

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>ETA</b>	-	General Requirements	ASME Sec. III NCA (95ed., 95~97년add.), ISO 9000 (94ed.), KS A 9000 (98ed.)
<b>ETB</b> Overhead Raceway	2131	Test Method for Evaluating Resistance to Tracking and Erosion of Electrical Insulating Materials Used under Severe Ambient Conditions	IEC 60587 (84ed.)
	2210	Construction of Composite Fiber Optic Groundwire (OPGW) for Use on Electric Utility Power Lines	IEEE 1138 (94ed.)
	3210	Insulators for Overhead Lines with a Nominal Voltage Above 1000 V-Part 1 : Ceramic or Glass Insulator Units for AC Systems Definitions, Test Methods and Acceptance Criteria	IEC 60383 (93ed.)
	3220	Artificial Pollution Tests on High-Voltage Insulators to be Used on AC Systems	IEC 60507 (91ed.)
	3310	Guide for Cleaning Insulators	IEEE 957 (95ed.)
	3410	Characteristics of Line Post Insulators	IEC 60720 (81ed.)
	3421	Ceramic or Glass Insulator Units for AC Systems Characteristics of Insulator Units of the Cap and Pin Type	IEC 60305 (95ed.)
	3422	Dimensions of Ball and Socket Couplings of String Insulator Units	IEC 60120 (84ed.)
	3423	Locking Devices for Ball and Socket Couplings of String Insulator Units - Dimensions and Tests	IEC 60372 (84ed., amd.1-91)

### ATTACHMENT 4-3

#### 16. Transmission, Transformation & Distribution (ET)- (Continued)

Designation		Title	Referenced Codes and Standards(Edition)
<b>ETB</b> Overhead Raceway	3431	Characteristic of Indoor and Outdoor Post Insulators for Systems with Nominal Voltages Greater Than 1000V	IEC 60273 (90ed.)
	3432	Test of Indoor and Outdoor Post Insulators with Nominal Voltages Greater Than 1000 V	IEC 60168 (94ed., amd.1-97)
	4110	Guide to the Assembly and Erection of Metal Transmission Structures	IEEE 951 (96ed.)
<b>ETC</b> Pad Mounted Raceway	2110	Conductors of Insulated Cables	IEC 60228 (78ed., amd.1-93)
	2120	Tests on Cable Oversheaths which have a Special Protective Function and are Applied by Extrusion	IEC 60229 (82ed.)
	2132	Common Test Methods for Insulating and Sheathing of Electric Cables-Methods Specific to PVC Compounds	IEC 60811-3-1 (85ed., amd.1-94) IEC 60811-3-2 (85ed., amd.1-93)
	2133	Common Test Methods for Insulating and Sheathing Materials of Electric Cables-Methods Specific to Polyethylene and Polypropylene Compounds	IEC 60811-4-1 (85ed., amd.1-93) IEC 60811-4-2 (90ed.)
	2141	Extruded Solid Dielectric Insulated Power Cables for Rated Voltages from 1 kV upto 3 kV	IEC 60502-1 (97ed., amd.1-98)
	2142	Extruded Solid Dielectric Insulated Power Cables for Rated Voltages from 6 kV up to 30 kV	IEC 60502-2 (97ed., amd.1-98)
	2143	Test Requirements on Accessories for Extruded Solid Dielectric Insulated Power Cables with Rated Voltages from 6 kV up to 30 kV	IEC 60502-4 (97ed.)
	2150	Test Methods and Requirements for Cables with Extruded Insulation and Their Accessories for Rated Voltages Above 30 kV up to 150 kV	IEC 60840 (88ed., amd.2-93)
<b>ETD</b> Machinery Apparatus	1001	High-Voltage Test Techniques-General Definitions and Test Requirements	IEC 60060-1 (89ed.)
	1002	High-Voltage Test Techniques-Measuring Systems	IEC 60060-2 (94ed., amd. 1-96)
	1003	Partial Discharge Measurements	IEC 60270 (81ed.)
	1004	Insulation Co-ordination-Definitions, Principles and Rules	IEC 60071-1 (93ed.)
	1020	Supervision and Maintenance Guide for Insulating Oils in Electrical Equipment	IEC 60422 (89ed.)



**ATTACHMENT 4-3**

**16. Transmission, Transformation & Distribution (ET) - (Continued)**

<b>Designation</b>		<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>ETD Machinery Apparatus</b>	1021	Guide for the Sampling of Gases and of Oil from Oil-filled Electrical Equipment and for the Analysis of Free and Dissolved Gases	IEC 60567 (92ed.)
	1031	Specification and Acceptance of New Sulphur Hexafluoride	IEC 60376 (71ed.), 60376A (73ed.), 60376B (74ed.)
	1032	Guide to the Checking of Sulphur Hexafluoride (SF <sub>6</sub> ) Taken from Electrical Equipment	IEC 60480 (74ed.)
	1040	Insulating Bushings for Alternating Voltages Above 1000 V	IEC 60137 (95ed.)
	1041	Tests on Hollow Insulators for Use in Electrical Equipment	IEC 60233 (74ed., amd.1-88)
	1051	Metal Oxide Surge Arresters without Gaps for AC Systems	IEC 60099-4 (91ed.)
	1060	Current Transformers	IEC 60044-1 (96ed.)
	1061	Voltage Transformers	IEC 60186 (87ed., amd.2-95)
	2012	Power Transformers-Temperature rise	IEC 60076-2 (93ed.)
	2021	Determination of Transformer and Reactor Sound Levels	IEC 60551 (87ed., amd.1-95)
	2022	Guide to the Lightning Impulse and Switching Impulse Testing of Power Transformers and Reactors	IEC 60722 (82ed.)
	2030	Loading Guide for Oil-Immersed Power Transformers	IEC 60354 (91ed.)
	2050	On-Load Tap-Changers	IEC 60214 (89ed.)
	2051	Application Guide for On-Load Tap-Changers	IEC 60542 (76ed., amd.1-88)
	2060	Reactors	IEC 60289 (88ed.)
	3110	High-Voltage Alternating-Current Circuit-Breakers	IEC 60056 (87ed., amd.3-96)
	3210	Switches for Rated Voltages Above 1 kV and less than 52 kV	IEC 60265-1 (98ed.)
	3220	Alternating Current Disconnectors and Earthing Switches	IEC 60129 (84ed., amd.2-96)
	3310	Common Specifications for High-Voltage Switchgear and Controlgear Standards	IEC 60694 (96ed.)
	3330	Gas-Insulated Metal-Enclosed Switchgear for Rated Voltages of 72.5 kV and Above	IEC 60517 (90ed.,amd.1-94) IEC 60859 (86ed.)

**ATTACHMENT 4-3**

**16. Transmission, Transformation & Distribution (ET) - (Continued)**

Designation		Title	Referenced Codes and Standards(Edition)
<b>ETD</b> Machinery Apparatus	3410	Requirements for Overhead, Pad Mounted, Dry Vault, and Submersible Automatic Circuit Reclosers and Fault Interrupters for AC Systems	IEEE C37.60 (81ed.) IEC 60694 (96ed.)
	3420	Requirements for Overhead, Pad-Mounted, Dry-Vault and Submersible Automatic Line Sectionalizers for AC Systems	IEEE C37.63 (97ed.)
	3430	High-Voltage Expulsion Type Distribution Fuses and Cutout Switches	IEEE C37.41 (94ed.) ANSI C37.42 (96ed.)
<b>ETE</b> System Protection Apparatus & Measuring & Control Equipment	2200	Definition, Specification, and Analysis of Systems Used for Supervisory Control, Data Acquisition, and Automatic Control	IEEE C37.1 (94ed.)

**17. Nuclear Structures (SN)**

Designation	Title	Referenced Codes and Standards(Edition)
<b>SNA</b>	General Requirements	ASME Sec. III NCA (95ed., 95 ~ 97add.)
<b>SNB</b>	Concrete Containment	ASME Sec. III Div.2 (95ed., 95 ~ 97add.)
<b>SNC</b>	Reinforced Steel Concrete Structures	ACI 349 (97ed.)
<b>SND</b>	Steel Structures	AISC-N690 (94ed.)

**18. General Structures (SG)**

Designation	Title	Referenced Codes and Standards(Edition)
<b>SGA</b>	General Requirements	ASME Sec. III NCA (95ed., 95 ~ 97년 add.), ISO 9000 (94ed.), KS A 9000 (98ed.)
<b>SGC</b>	Steel Structures-ASD	AISC-ASD (89ed.)
<b>SGD</b>	Steel Structures-LRFD	AISC-LRFD (93ed.)

**ATTACHMENT 4-3**

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

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>STB</b>	Seismic Analysis of Nuclear Structures	ASCE 4 (86ed.) IEEE 344 ('87) ASME QME-1 ('97) ANSI/ANS 2.2 ('88)

**20. Fire Protection (FP)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>FPN</b>	Fire Protection of Nuclear Power Plants	NFPA 803 ('93) NFPA 804 ('95)

**21. Structural Welding (SW)**

<b>Designation</b>	<b>Title</b>	<b>Referenced Codes and Standards(Edition)</b>
<b>SWS</b>	Structural Welding-Steel	AWS D 1.1 (96ed.)
<b>SWT</b>	Structural Welding-Sheet Steel	AWS D 1.3 (89ed.)

**ATTACHMENT 4-4****REFERENCE DRAWINGS**Page 1 of 2

<b>No.</b>	<b>Figure No./ Drawing No.</b>	<b>Title</b>	<b>Rev.</b>
4-4-1	GD-1	Design Data Summary & Figures	-
4-4-2	GD-2	Typical Elevator Hoistway Detail	-
4-4-3	9-320-A115-022	Aux. Bldg. Elevator AB-E1 Plan and Section Sht.1	0
4-4-4	9-320-A115-023	Aux. Bldg. Elevator AB-E1 Plan and Section Sht.2	0
4-4-5	9-320-A115-024	Aux. Bldg. Elevator AB-E2 Plan and Section Sht.1	0
4-4-6	9-320-A115-025	Aux. Bldg. Elevator AB-E2 Plan and Section Sht.2	0
4-4-7	9-320-A115-026	Aux. Bldg. Elevator AB-E2 Plan and Section Sht.3	0
4-4-8	9-320-A115-027	Aux. Bldg. Elevator AB-E3 Plan and Section Sht.1	0
4-4-9	9-320-A115-028	Aux. Bldg. Elevator AB-E3 Plan and Section Sht.2	0
4-4-10	9-320-A115-029	Aux. Bldg. Elevator AB-E3 Plan and Section Sht.3	0
4-4-11	9-320-A115-030	Aux. Bldg. Elevator AB-E4 Plan and Section Sht.1	0
4-4-12	9-320-A115-031	Aux. Bldg. Elevator AB-E4 Plan and Section Sht.2	0
4-4-13	9-320-A115-032	Aux. Bldg. Elevator AB-E4 Plan and Section Sht.3	0
4-4-14	4-320-A115-033	Aux. Bldg. Elevator AB-E5 Plan and Section Sht.1	0
4-4-15	4-320-A115-034	Aux. Bldg. Elevator AB-E5 Plan and Section Sht.2	0
4-4-16	9-370-A115-011	Turbine Bldg. Elevator TB-E1 Plan and Section Sht.1	0
4-4-17	9-370-A115-012	Turbine Bldg. Elevator TB-E1 Plan and Section Sht.2	0
4-4-18	9-310-A115-006	Reactor Containment Bldg. Elevator CB-E1 Plan and Section Sht.1	0
4-4-19	9-310-A115-007	Reactor Containment Bldg. Elevator CB-E1 Plan and Section Sht.2	0

**ATTACHMENT 4-4**

**REFERENCE DRAWINGS**

Page 2 of 2

No.	Figure No./ Drawing No.	Title	Rev.
4-4-20	0-330-A115-008	Compound Bldg. Elevator CP-E1 Plan and Section Sht.1	0
4-4-21	0-330-A115-009	Compound Bldg. Elevator CP-E1 Plan and Section Sht.2	0
4-4-22	0-330-A115-010	Compound Bldg. Elevator CP-E2, CP-E3 Plan and Section Sht.1	0
4-4-23	0-330-A115-011	Compound Bldg. Elevator CP-E2, CP-E3 Plan and Section Sht.2	0

ELEVATOR AB-E1 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-10 3/4"	8'-2 1/2"	-	INSIDE
2 CLEAR HOISTWAY	9'-6"	10'-6"	-	
3 MACHINE RM. SIZE	18'-0"	10'-6"	8'-2"	OVERHEAD
4 PIT SIZE	9'-6"	10'-6"	-	6'-0" DEEP
5 COUNTERWT. LOC.	REAR			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	6,000 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	82'-6"			

ELEVATOR AB-E2 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-10 3/4"	8'-2 1/2"	-	INSIDE
2 CLEAR HOISTWAY	9'-6"	10'-6"	-	
3 MACHINE RM. SIZE	24'-0"	10'-6"	8'-2"	OVERHEAD
4 PIT SIZE	9'-6"	10'-6"	-	6'-0" DEEP
5 COUNTERWT. LOC.	REAR			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	6,000 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	117'-0"			

ELEVATOR AB-E3 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-11 1/4"	7'-10 1/2"	-	INSIDE
2 CLEAR HOISTWAY	8'-6"	11'-0"	-	
3 MACHINE RM. SIZE	21'-0"	11'-0"	8'-2"	OVERHEAD
4 PIT SIZE	8'-0"	11'-0"	-	6'-0" DEEP
5 COUNTERWT. LOC.	SIDE			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	6,000 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	135'-0"			

ELEVATOR AB-E4 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-11 3/4"	7'-10 1/2"	-	INSIDE
2 CLEAR HOISTWAY	8'-6"	11'-0"	-	
3 MACHINE RM. SIZE	21'-0"	11'-0"	8'-2"	OVERHEAD
4 PIT SIZE	8'-0"	11'-0"	-	6'-0" DEEP
5 COUNTERWT. LOC.	SIDE			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	6,000 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	135'-0"			

ELEVATOR AB-E5 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	-	-	-	INSIDE
2 CLEAR HOISTWAY	9'-7"	10'-2"	-	SEMICIRCULAR VIEW
3 MACHINE RM. SIZE	27'-1"	11'-2"	8'-4"	OVERHEAD
4 PIT SIZE	9'-7"	10'-2"	-	7'-10" DEEP
5 COUNTERWT. LOC.	SIDE			
6 TYPE OF SERVICE	PASSENGER			FOR OBSERVATION
7 CAPACITY	3,000 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	69'-0"			

(FOR DETAILED DIMENSION OF OBSERVATION  
ELEVATOR, SEE DESIGN DWG.)

ELEVATOR TB-E1 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-8 1/4"	8'-2 3/4"	-	INSIDE
2 CLEAR HOISTWAY	9'-6"	10'-6"	-	
3 MACHINE RM. SIZE	9'-6"	21'-6"	9'-0"	OVERHEAD
4 PIT SIZE	9'-6"	10'-6"	-	6'-0" DEEP
5 COUNTERWT. LOC.	REAR			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	6,000 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	91'-0"			

ELEVATOR CB-E1 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-0 1/2"	5'-11"	-	INSIDE
2 CLEAR HOISTWAY	5'-0 1/2"	5'-11"	-	STEEL STRUCTURE
3 MACHINE RM. SIZE	9'-10"	10'-4"	8'-2"	OVERHEAD
4 PIT SIZE	5'-0 1/2"	5'-11"	-	5'-0" DEEP
5 COUNTERWT. LOC.	REAR			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	1,000 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	7'-6 1/2"			
12 CAR TRAVEL	51'-0"			

ELEVATOR CP-E1 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-8 1/4"	6'-6 3/4"	-	INSIDE
2 CLEAR HOISTWAY	10'-0"	8'-6"	-	
3 MACHINE RM. SIZE	22'-6"	10'-6"	18'-3"	OVERHEAD
4 PIT SIZE	10'-0"	8'-6"	-	6'-0" DEEP
5 COUNTERWT. LOC.	REAR			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	3,500 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	57'-0"			

ELEVATOR CP-E2, E3 DATA				
DIMENSION	LNGT.	WTH.	HT.	REMARKS
1 CAR PLATFORM	5'-3"	7'-0 3/4"	-	INSIDE
2 CLEAR HOISTWAY	8'-3"	21'-0"	-	
3 MACHINE RM. SIZE	20'-6"	22'-0"	8'-9"	OVERHEAD
4 PIT SIZE	8'-3"	21'-0"	-	6'-0" DEEP
5 COUNTERWT. LOC.	REAR			
6 TYPE OF SERVICE	PASSENGER & FREIGHT			
7 CAPACITY	3,500 lbs			
8 SPEED	200 FT./MIN.			
9 TYPE OF CONTROL	VVVF			
10 TYPE OF LOADING	A			ASME A17.1
11 CAR CLEAR HEIGHT	8'-2 3/4"			
12 CAR TRAVEL	72'-9"			

INFORMATION ONLY

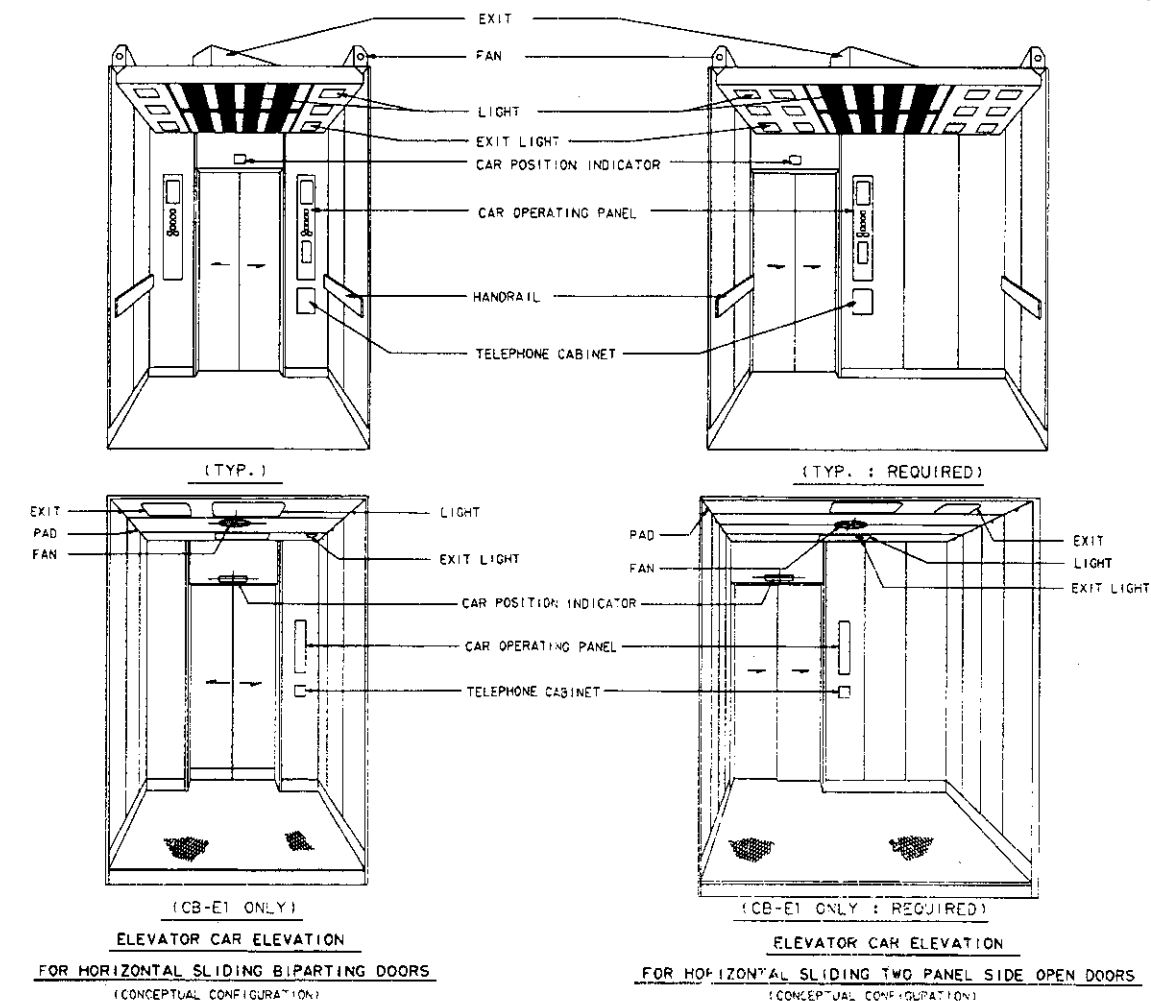
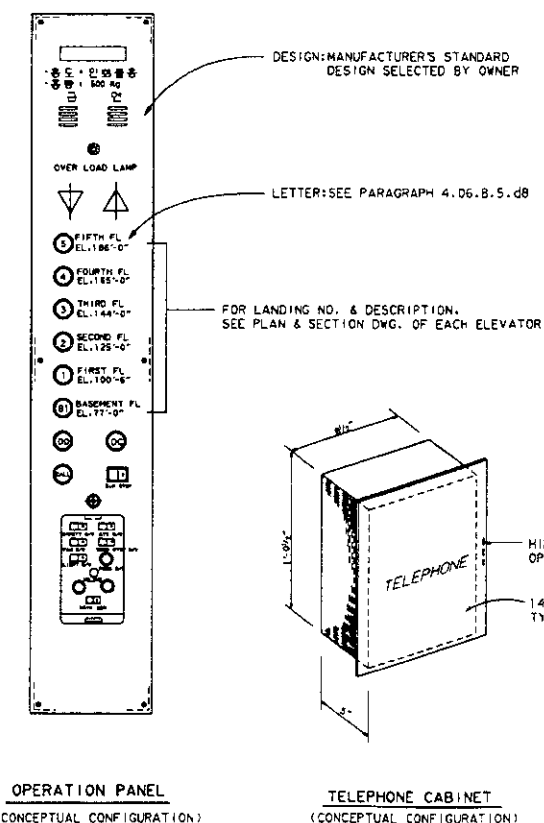
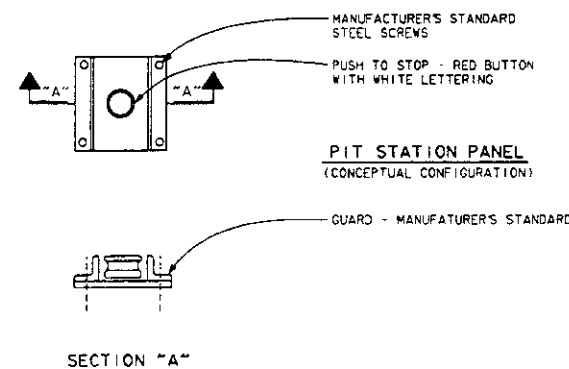
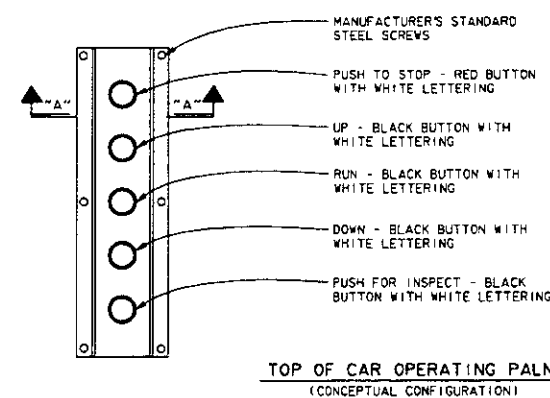
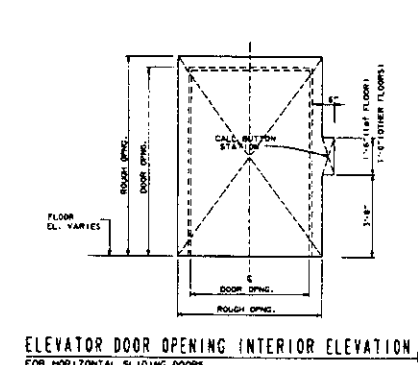
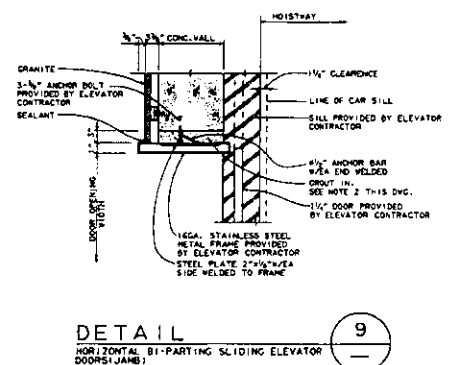
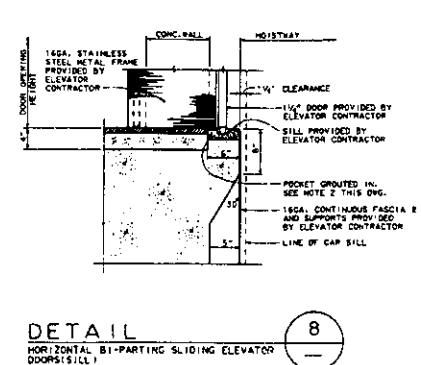
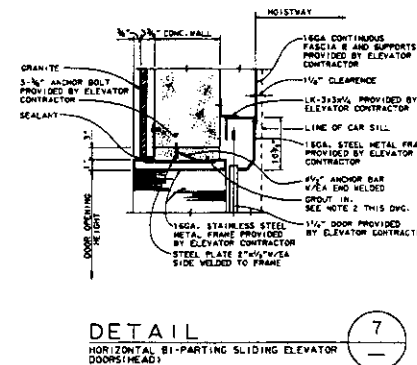
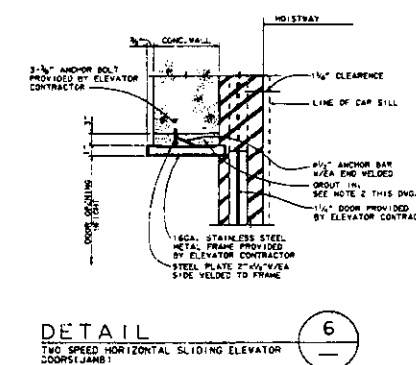
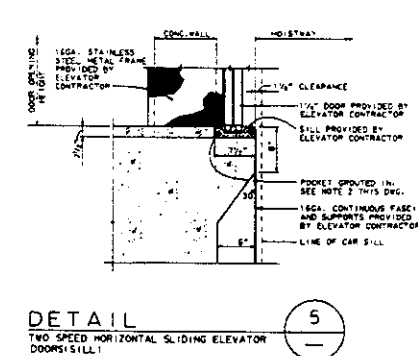
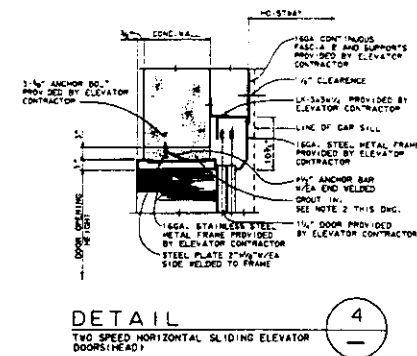
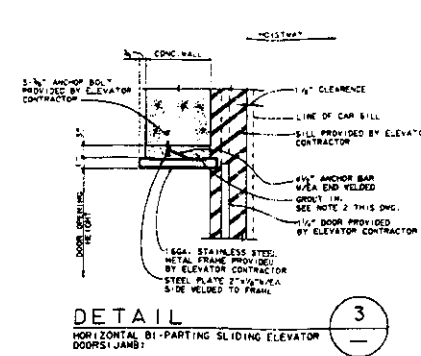
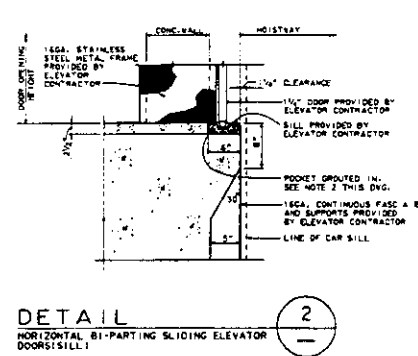
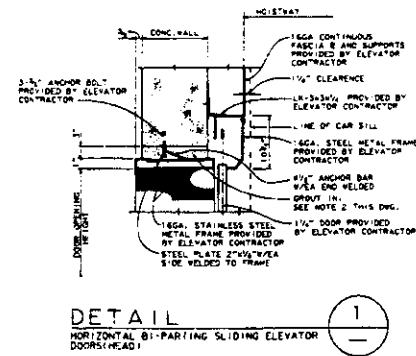


FIGURE NO.	TITLE
GD-1	DESIGN DATA SUMMARY & FIGURES

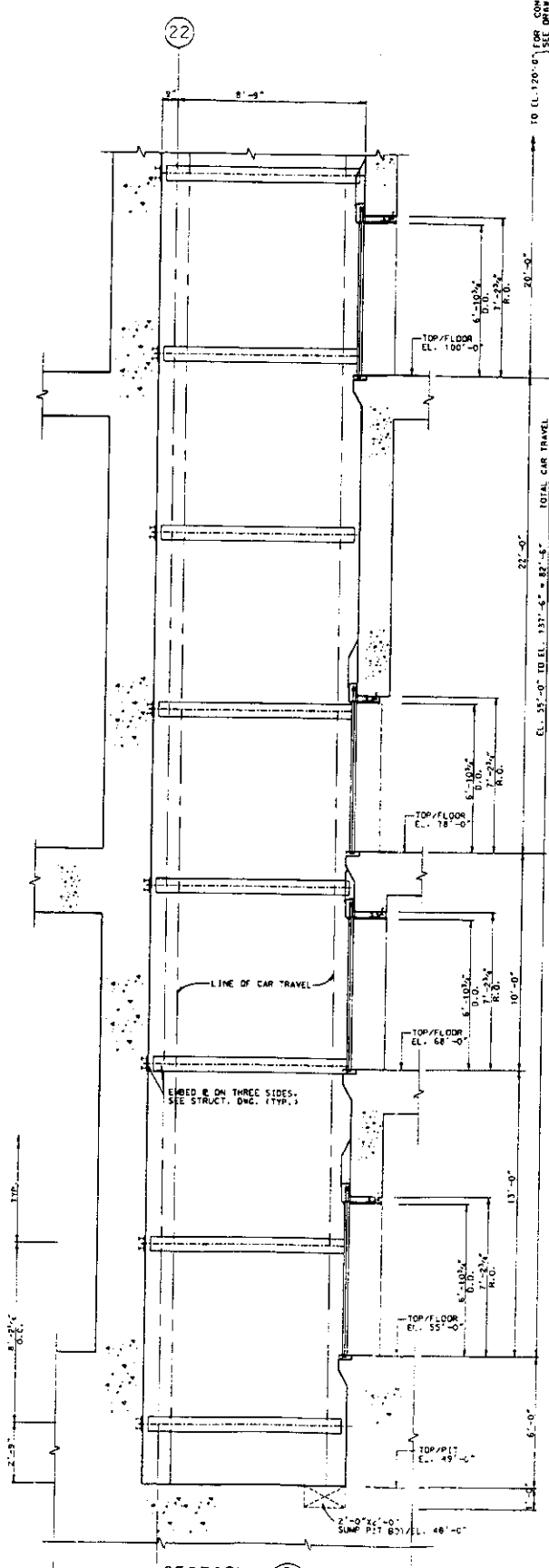
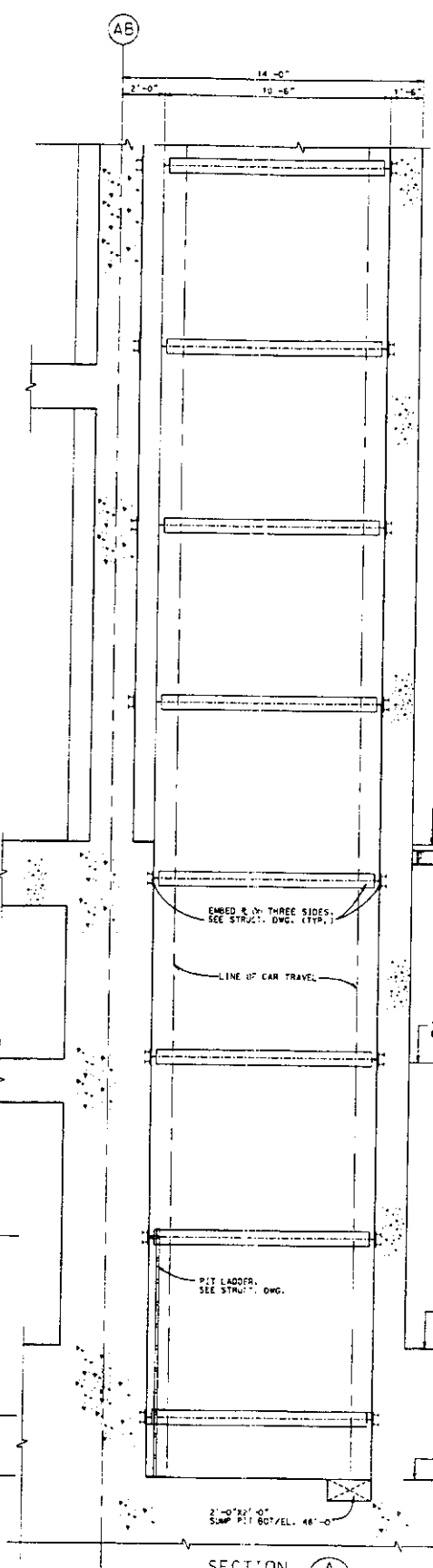
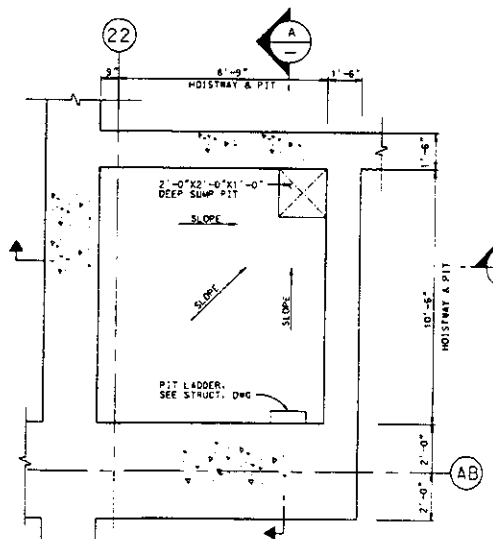
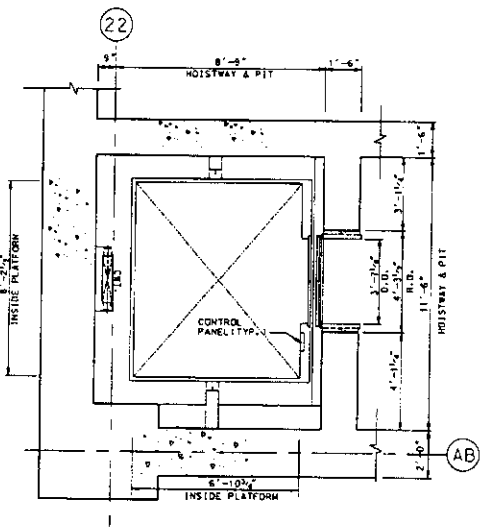
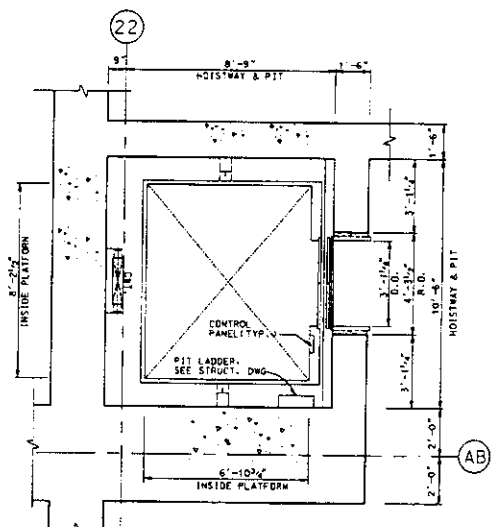
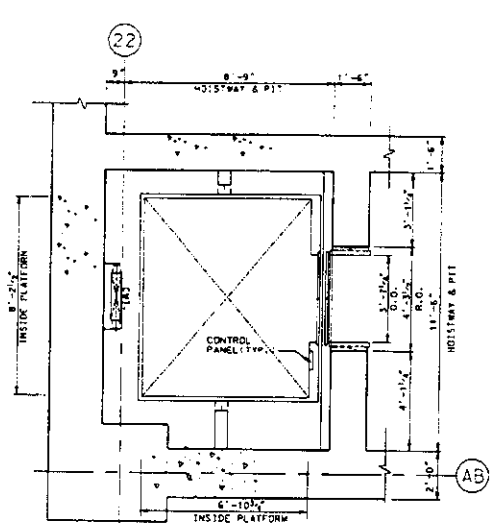
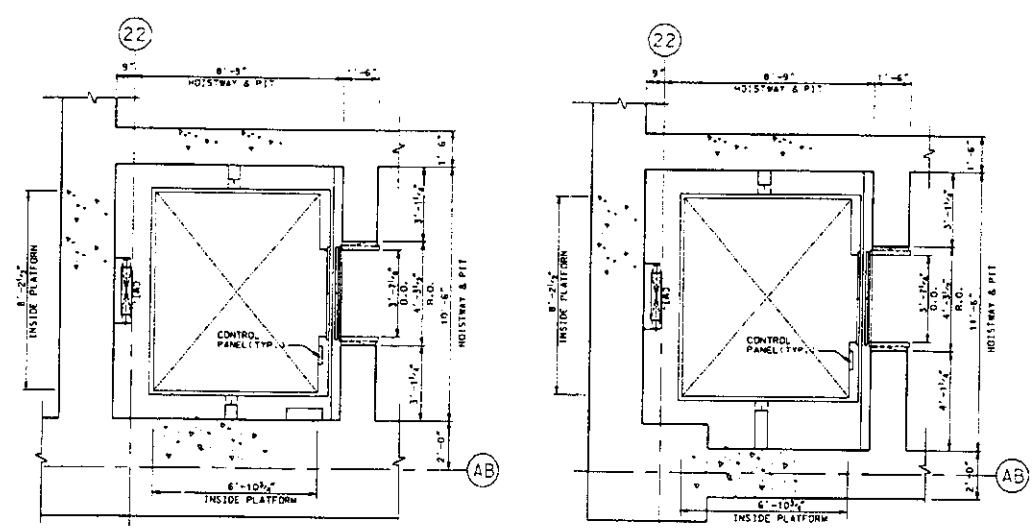
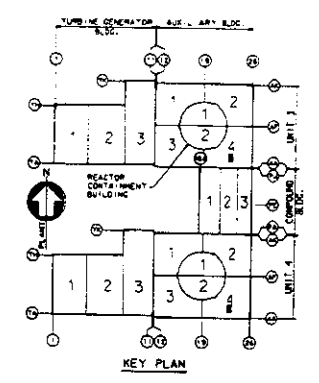


INFORMATION ONLY

FIGURE NO.	TITLE
GD-2	TYPICAL ELEVATOR HOISTWAY DETAIL

9-320-A115-022

INFORMATION ONLY



NOTES

1. FOR ARCHITECTURAL GENERAL NOTE: SEE DWG. 9-300-A101-001, 002.

2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203.

REFERENCE DRAWINGS

9-321-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 52'-0" AREA B

9-322-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-323-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-324-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-325-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-326-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-327-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-328-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-329-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

9-330-A112-080 AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED
1	04/20/04	ISSUE FOR CONSTRUCTION	장재영	김복영	김복영	김복영

**KOREA HYDRO & NUCLEAR POWER CO., LTD.**  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

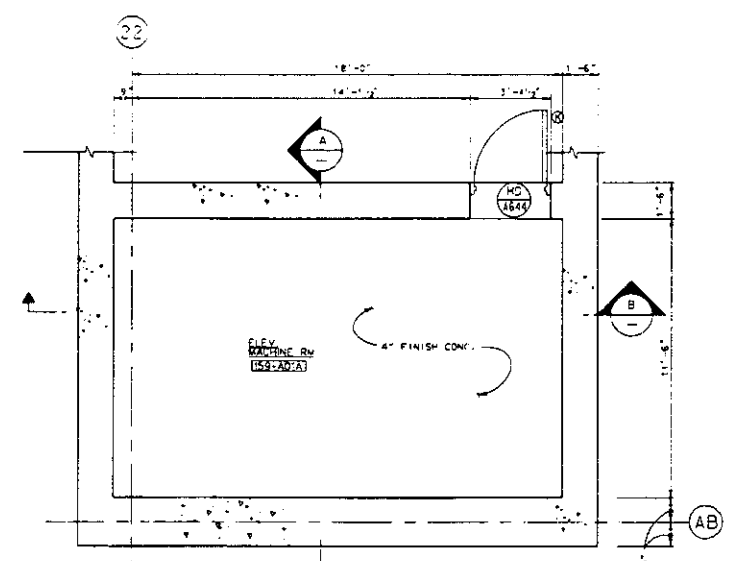
**KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

AUX. BLDG. ELEVATOR  
AB-E1 PLAN AND SECTION SH11

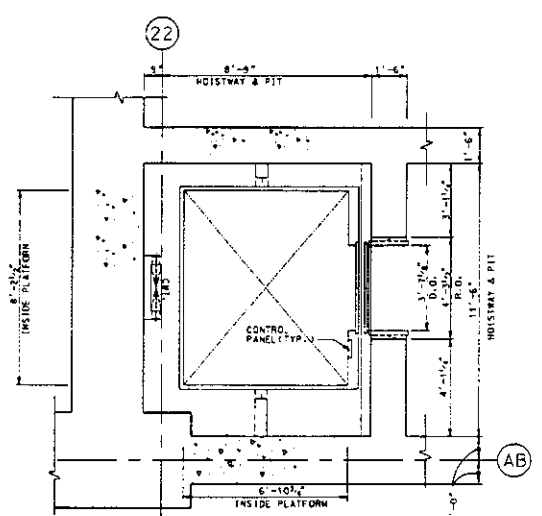
PROJECT DRAWING NUMBER	9-320-A115-022	SHEET	1/1
JOB NO.	2L179	SAFETY CATEGORY	S
AREA CODE	3200	SCALE	3/8"=1'-0"
REV.	0		



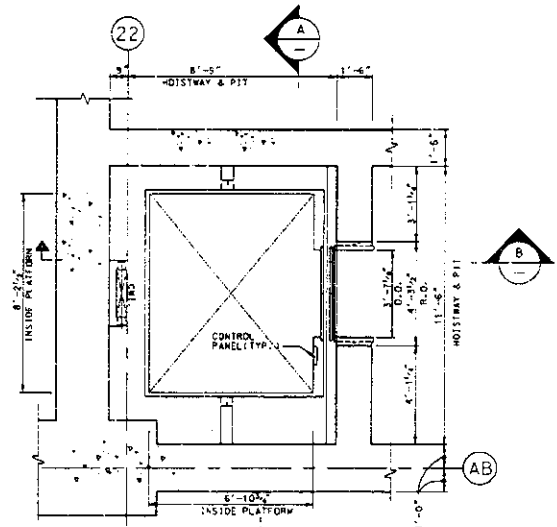
9-320-A115-023



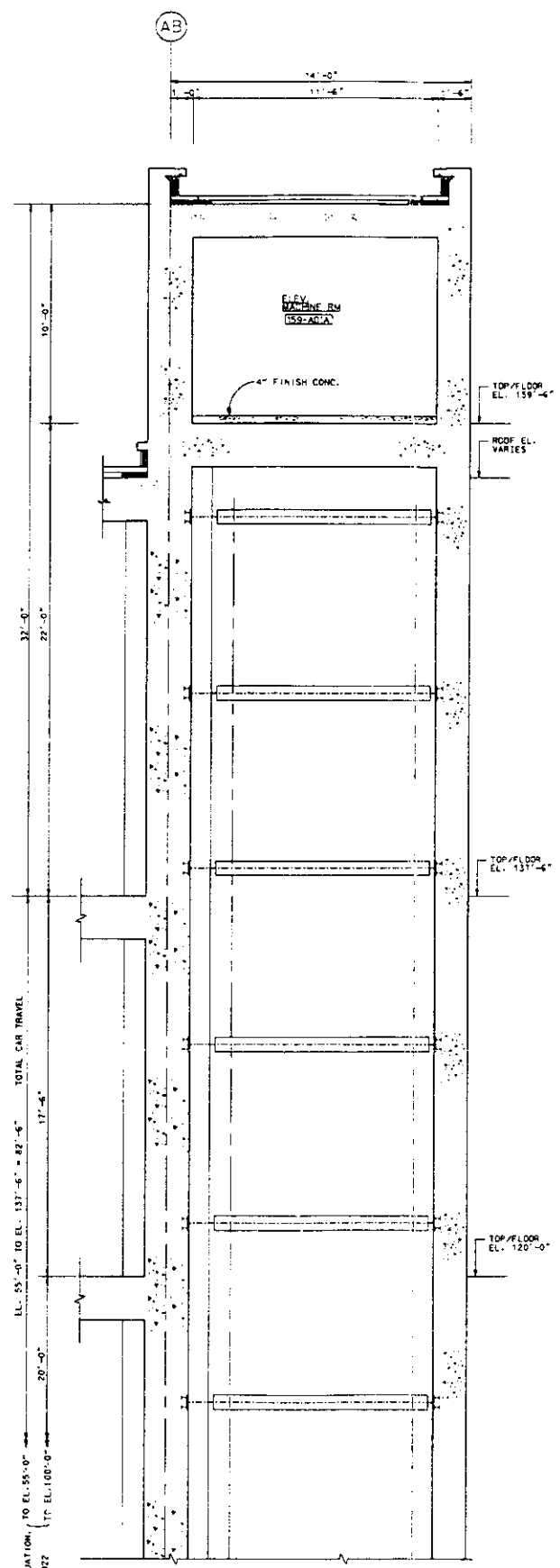
MACHINE ROOM FLOOR PLAN EL. 159'-6"



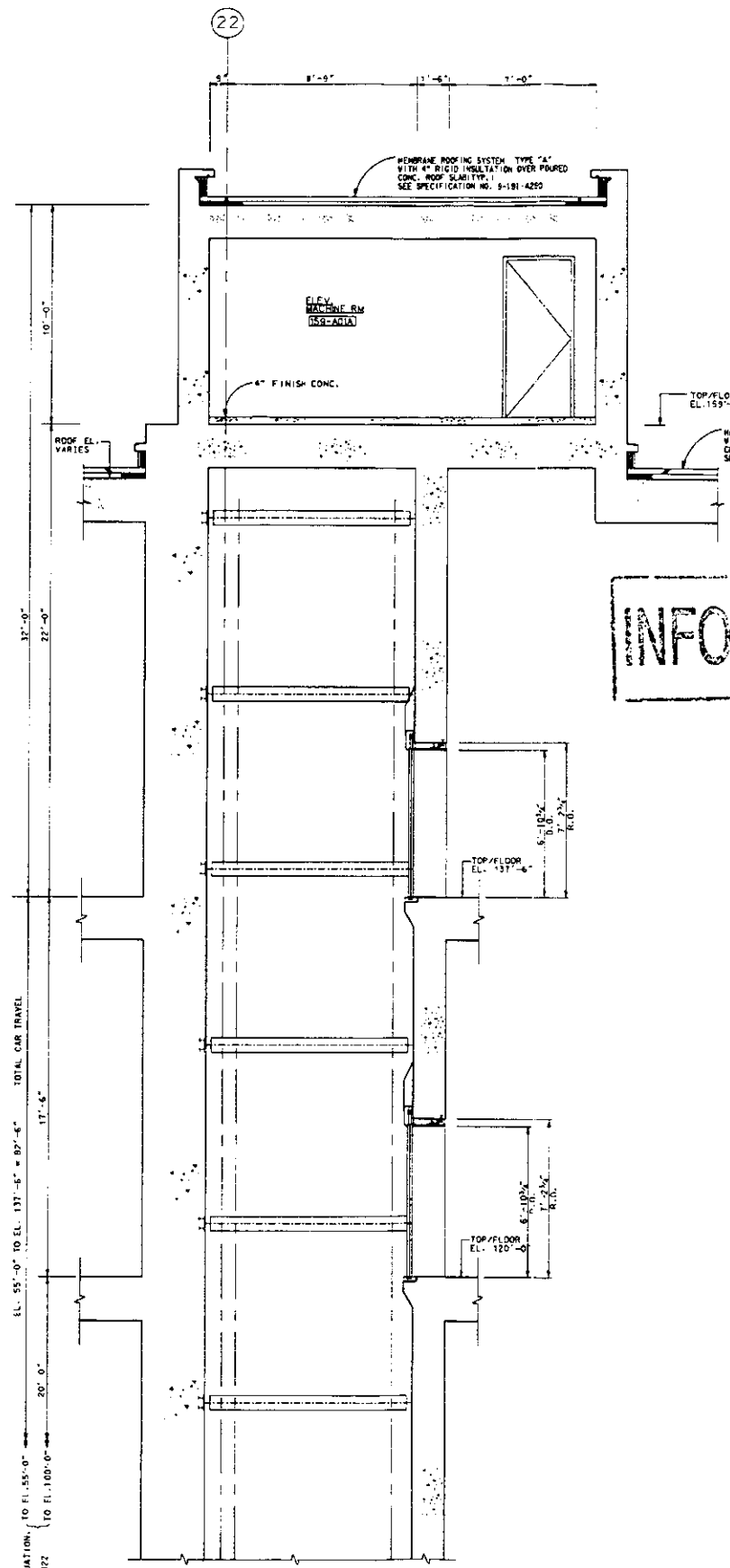
PLAN EL. 137'-6"



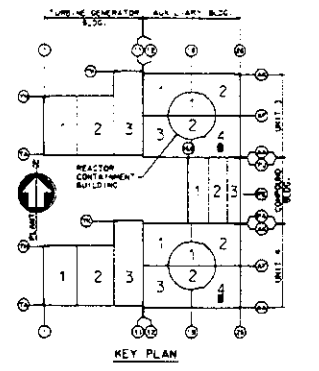
PLAN EL. 120'-0"



SECTION A



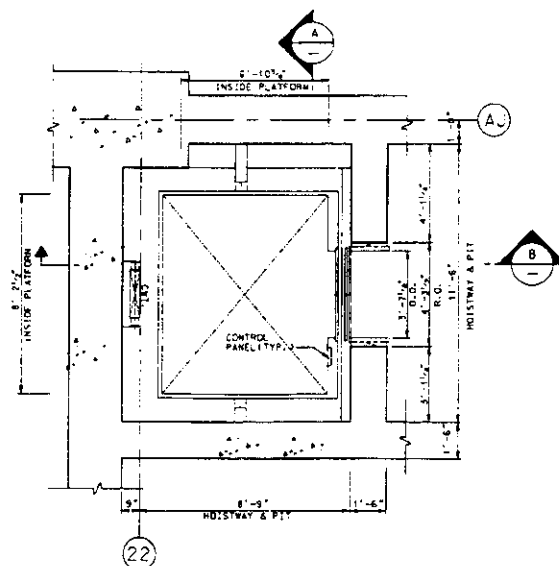
SECTION B



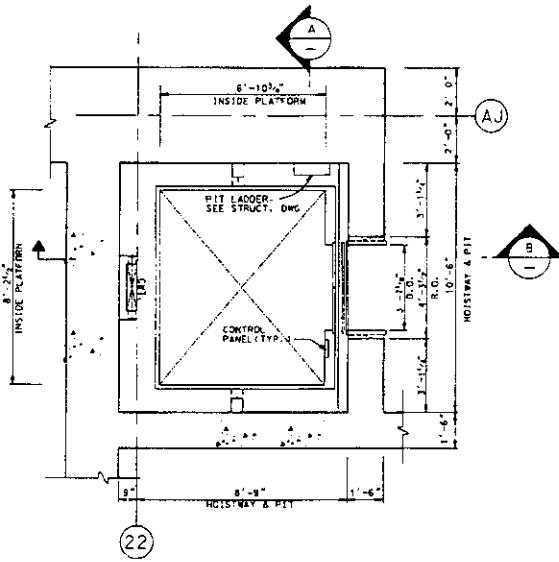
INFORMATION ONLY

NOTES				
1	FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A101-001, 002			
2	FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203			
REFERENCE DRAWINGS				
9-324-A112-080	AUXILIARY BUILDING FLOOR PLAN EL. 52'-0" AREA B			
9-325-A112-080	AUXILIARY BUILDING FLOOR PLAN EL. 78'-0" AREA B			
9-326-A112-080	AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA B			
9-324-C118-191	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 52'-0" AREA B			
9-325-C118-191	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 78'-0" AREA B			
9-326-C118-191	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 100'-0" AREA B			
REV.	DATE	DESCRIPTION	PREPARED	CHECKED
06/01/04		ISSUE FOR CONSTRUCTION	정지영	김복영
KOREA HYDRO & NUCLEAR POWER CO., LTD.				
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4				
KOPEC KOREA POWER ENGINEERING COMPANY, INC.				
AUX. BLDG ELEVATOR				
AB-E1 PLAN AND SECTION SH2				
PROJECT DRAWING NUMBER	9-320-A115-023			SHEET 1/1
JOB NO.	2-179	SAFETY CATEGORY	S	SCALE
AREA CODE	3200	REV.	0	REV.

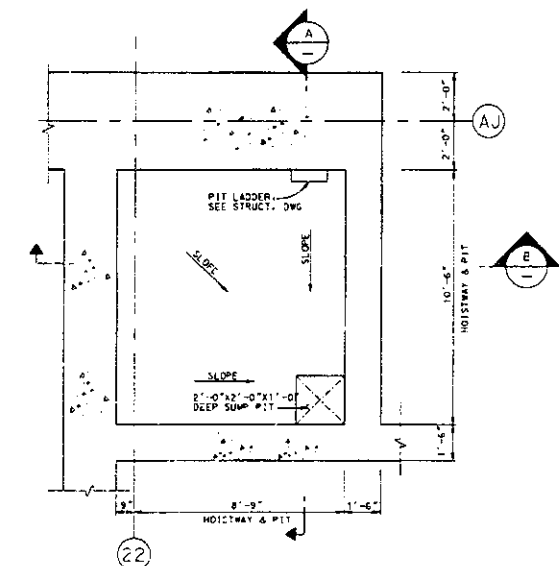
4-4-4



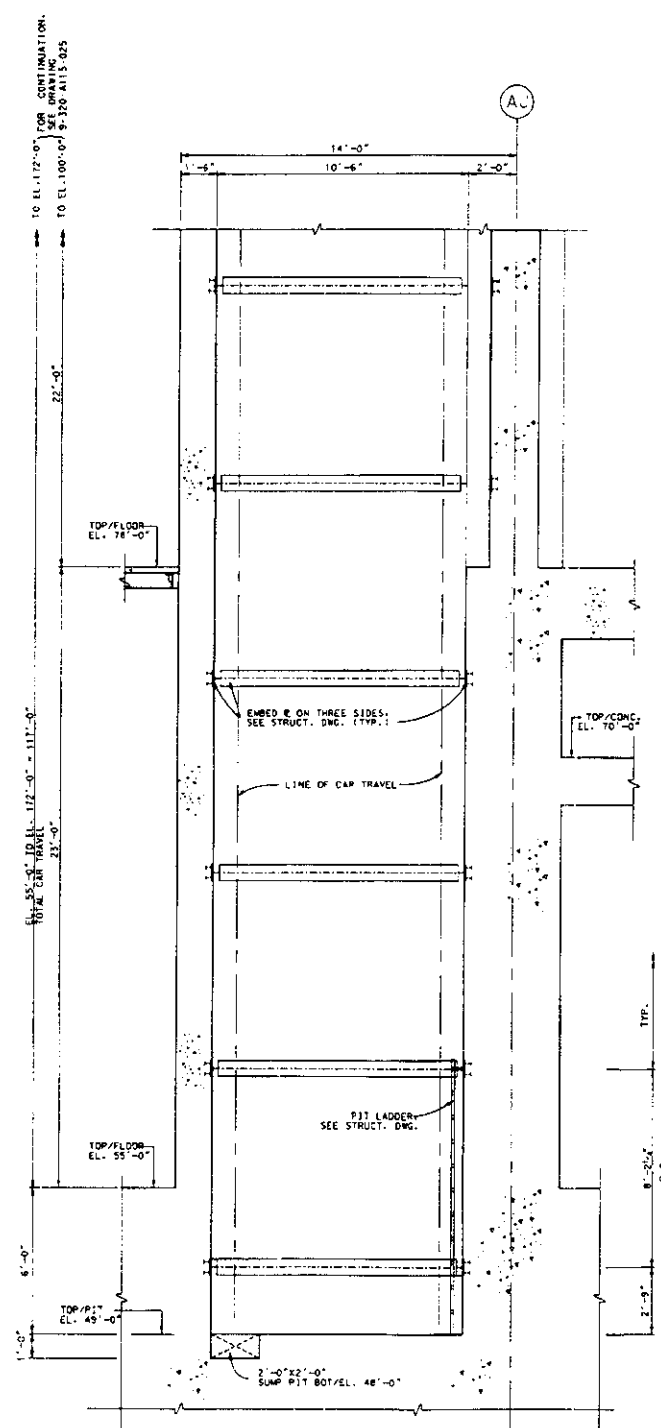
PLAN EL. 78'-0"



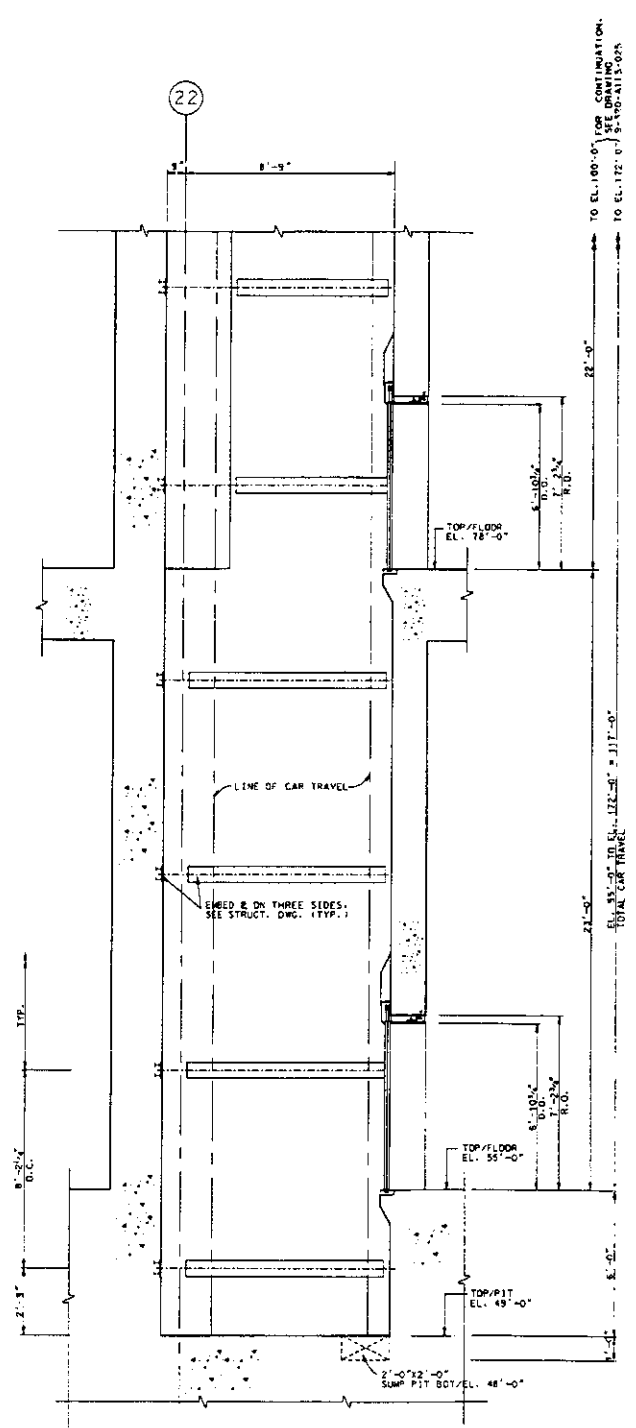
PLAN EL. 55'-0"



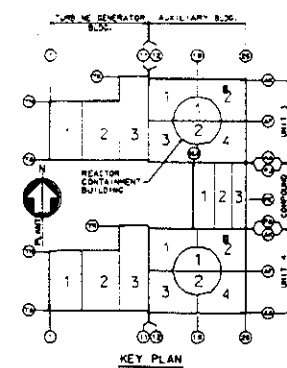
PIT FLOOR PLAN EL. 49'-0"



SECTION A



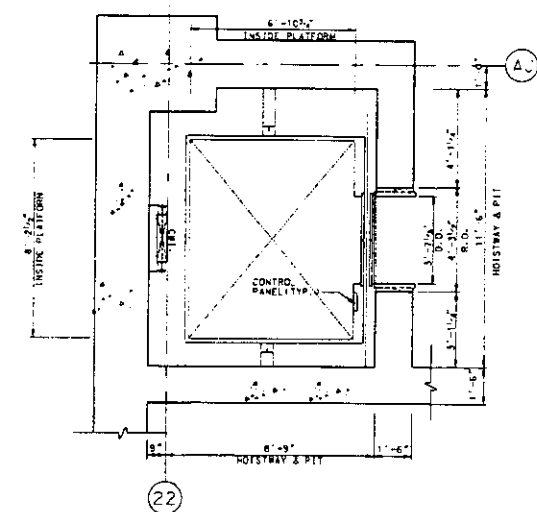
SECTION B



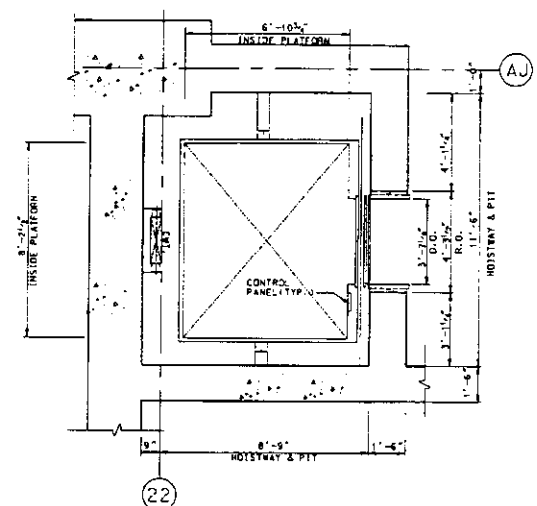
INFORMATION ONLY

NOTES				
1	FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A10'-001, 002			
2	FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203			
REFERENCE DRAWINGS				
9-321-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 52'-0" AREA 2			
9-322-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 78'-0" AREA 2			
9-321-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 52'-0" AREA 3			
9-322-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 78'-0" AREA 3			
REV.	DATE	DESCRIPTION	PREPARED	CHECKED
1	06/03/04	ISSUE FOR CONSTRUCTION	장영기	김성민
<b>KOREA HYDRO &amp; NUCLEAR POWER CO., LTD.</b> SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4				
<b>KOPCO</b> KOREA POWER ENGINEERING COMPANY, INC.				
AUX. BLDG. ELEVATOR AB-E2 PLAN AND SECTION SHT1				
PROJECT DRAWING NUMBER	9-320-A115-024			SHEET 1/1
JOB NO.	SAFETY CATEGORY	AREA CODE	SCALE	REV.
2L:79	S	3200	1/8"=1'-0"	0

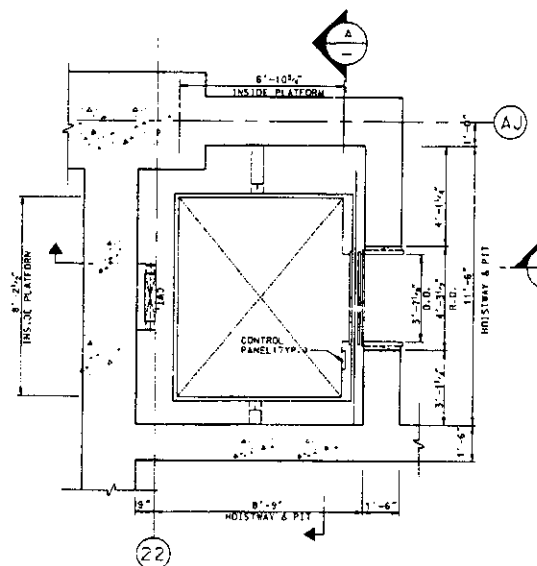
9-320-A115-025



PLAN EL. 137'-6"

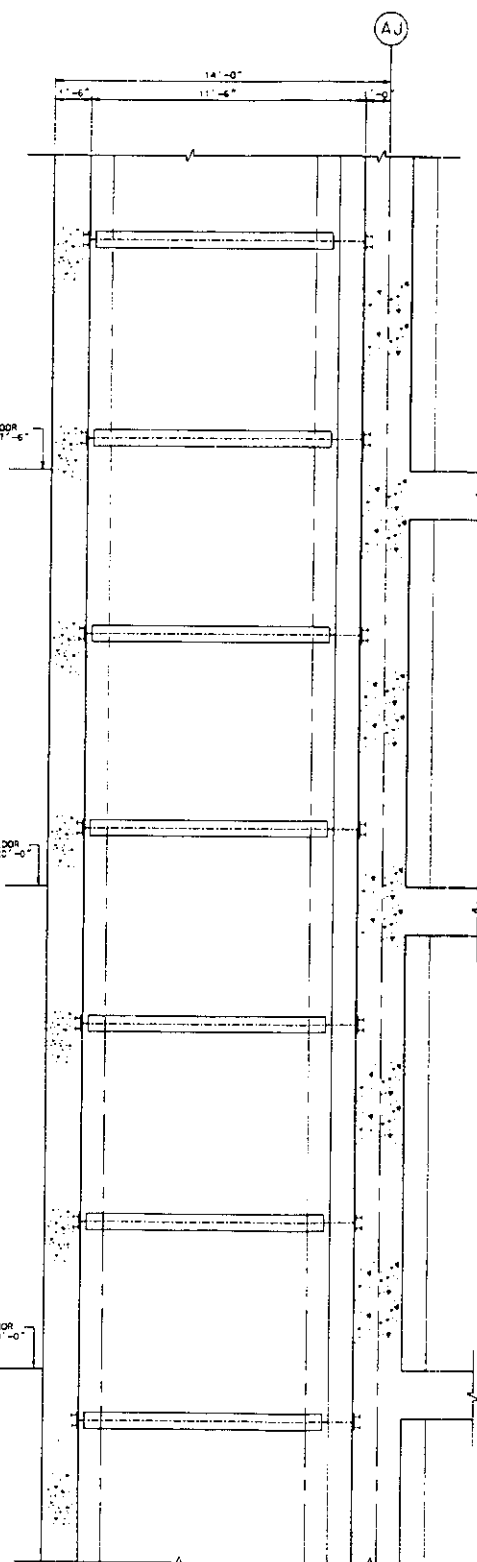


PLAN EL. 120'-0"

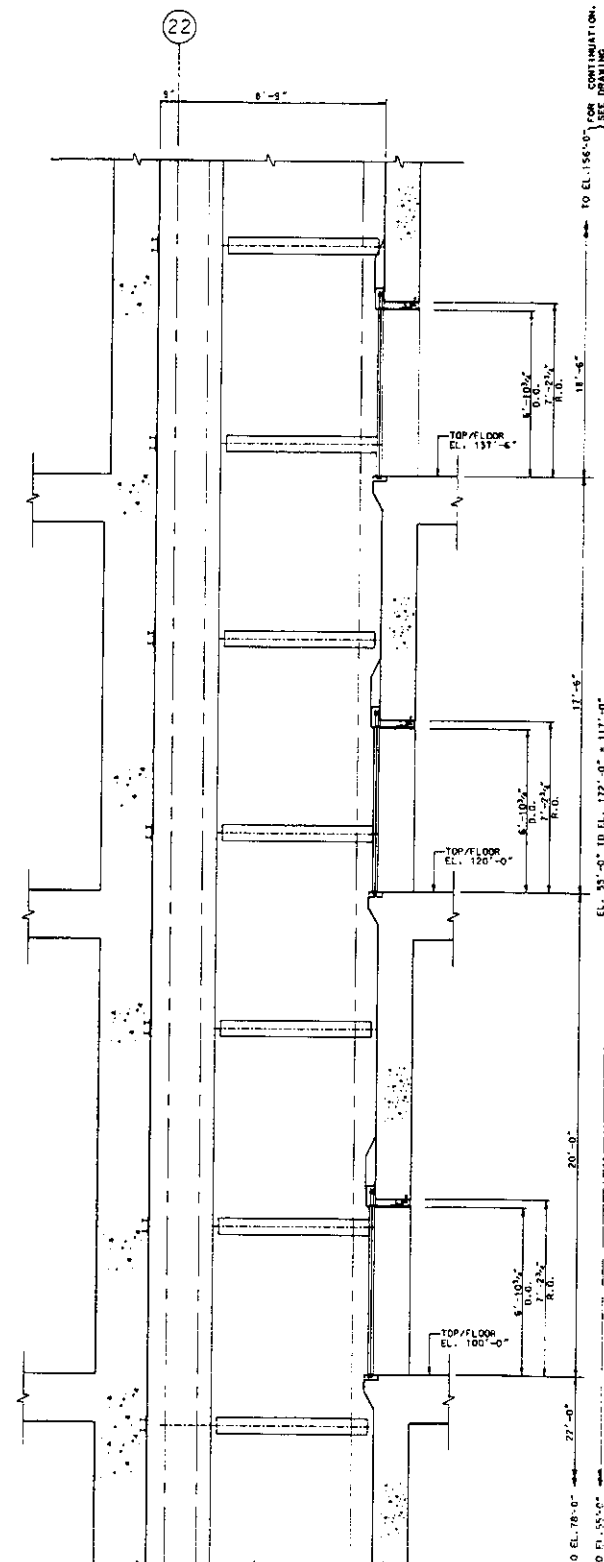


PLAN EL. 100'-0"

FOR CONTINUATION, SEE DRAWING 9-320-A115-024  
TO EL. 135'-0" TO EL. 120'-0" = 15'-0"  
TOTAL CAR TRAVEL 15'-0"

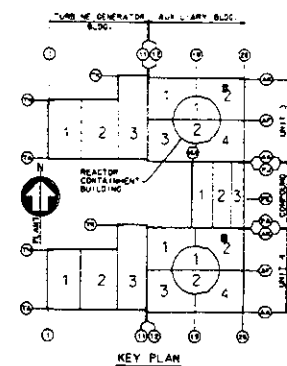


SECTION A



SECTION B

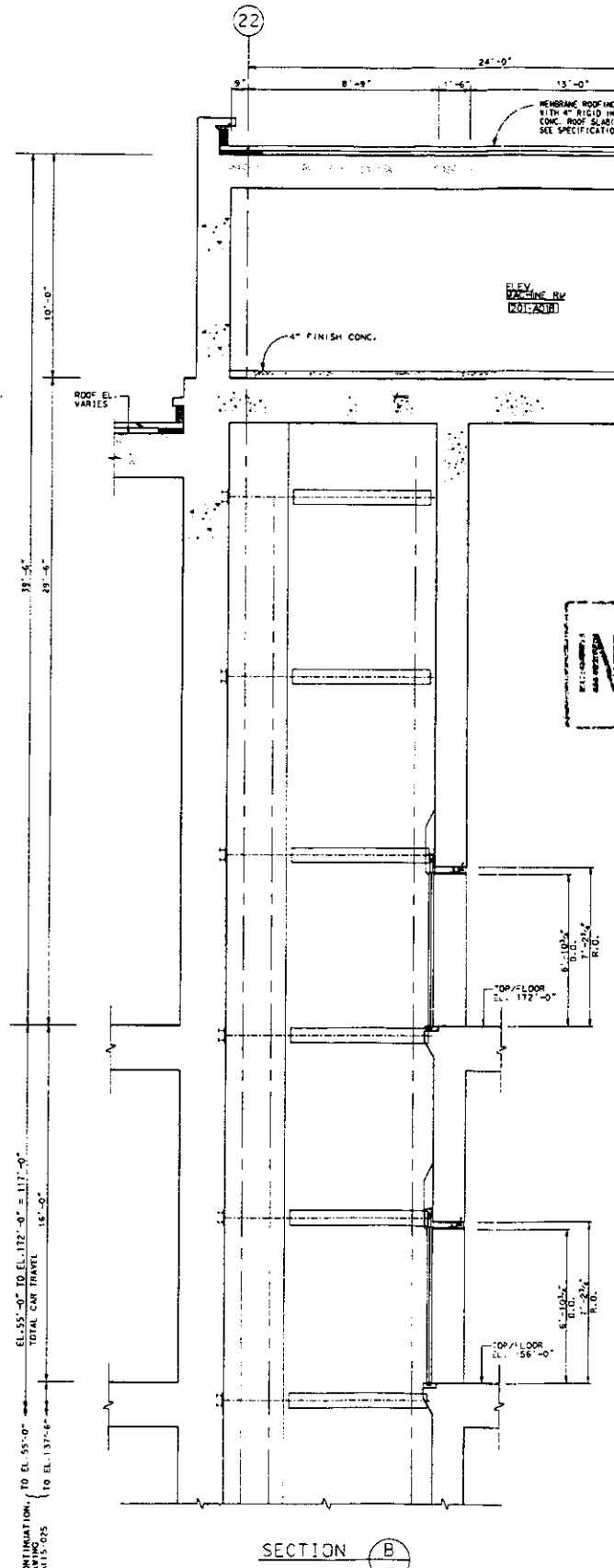
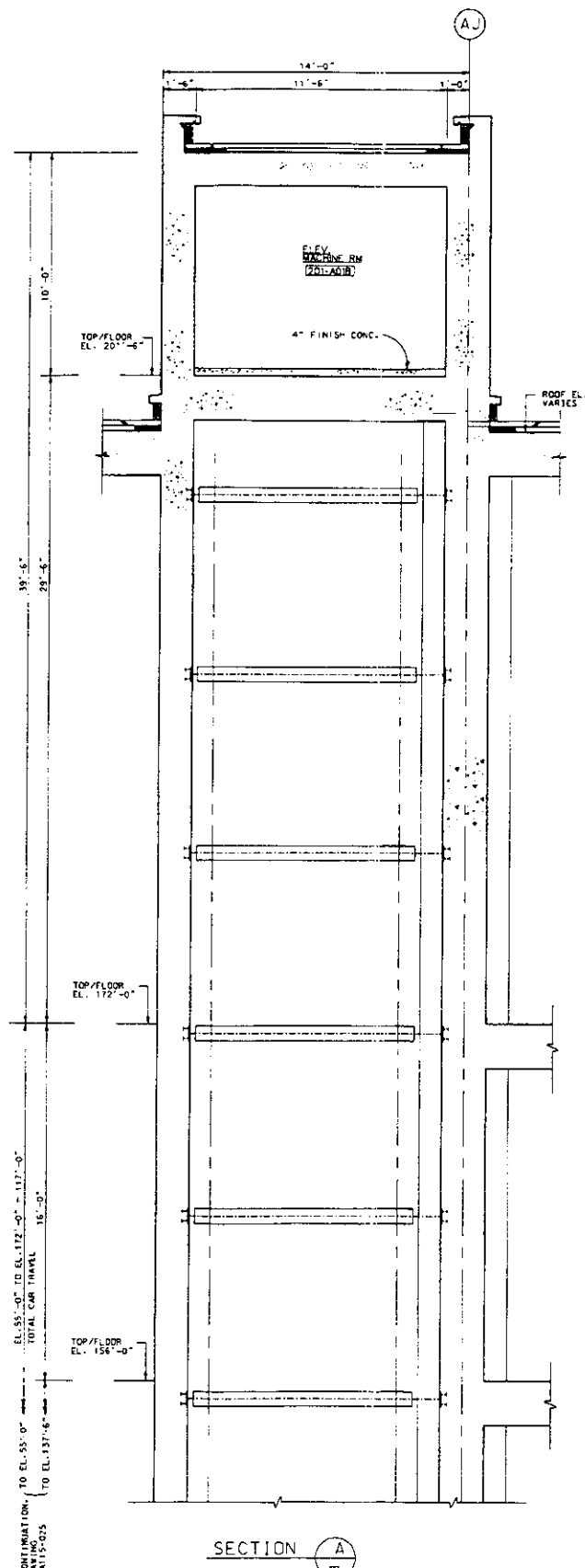
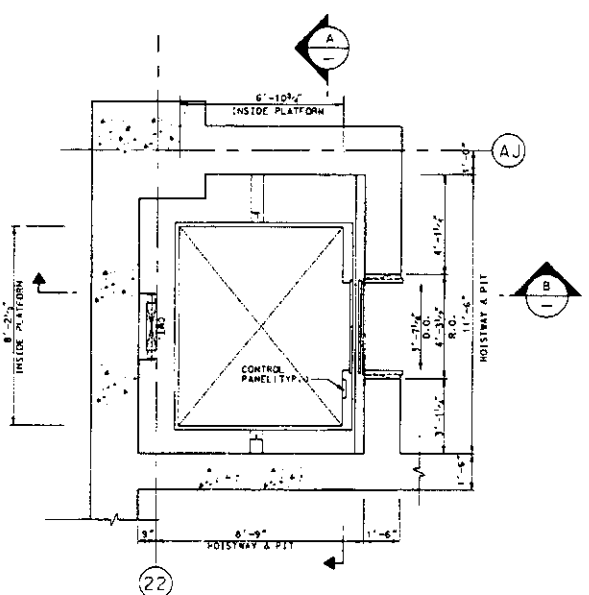
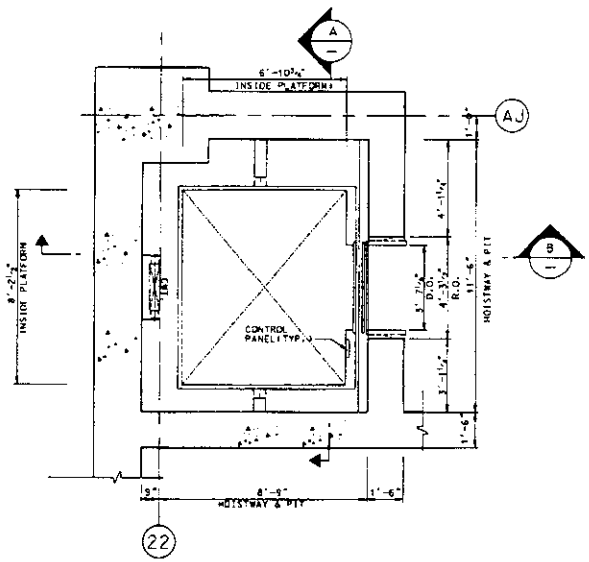
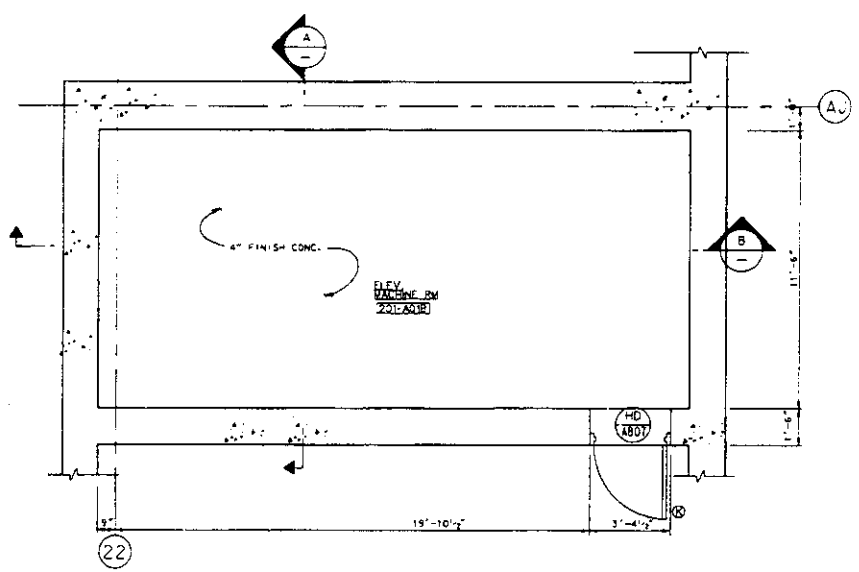
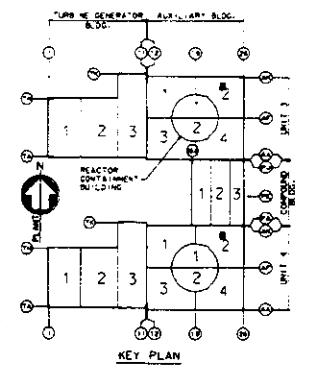
FOR CONTINUATION, SEE DRAWING 9-320-A115-026  
TO EL. 155'-0" TO EL. 137'-6" = 17'-6"  
TOTAL CAR TRAVEL 17'-6"



INFORMATION ONLY

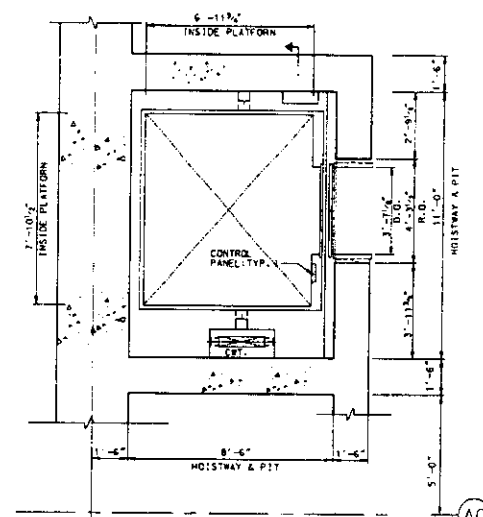
NOTES				
1. FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A101-001, 002				
2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203				
REFERENCE DRAWINGS				
9-323-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA 2			
9-324-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 120'-0" AREA 2			
9-325-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 137'-6" AREA 2			
9-323-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 100'-0" AREA 3			
9-324-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 120'-0" AREA 3			
9-325-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 137'-6" AREA 3			
REV.	DATE	DESCRIPTION	PREPARED	CHECKED
0	06/30/04	ISSUE FOR CONSTRUCTION	김복영	김복영
KOREA HYDRO & NUCLEAR POWER CO., LTD.				
SHIN-KORI NUCLEAR POWER PLANT UNITS 3 & 4				
KOPEC KOREA POWER ENGINEERING COMPANY, INC.				
AUX. BLDG ELEVATOR AB-E2 PLAN AND SECTION SHT 2				
PROJECT DRAWING NUMBER	9-320-A115-025			SHEET 1/1
JOB NO.	2L179	SAFETY CATEGORY	5	SCALE
		AREA CODE	3200	REV. C

PROJECT DRAWING NUMBER  
9-320-A115-026

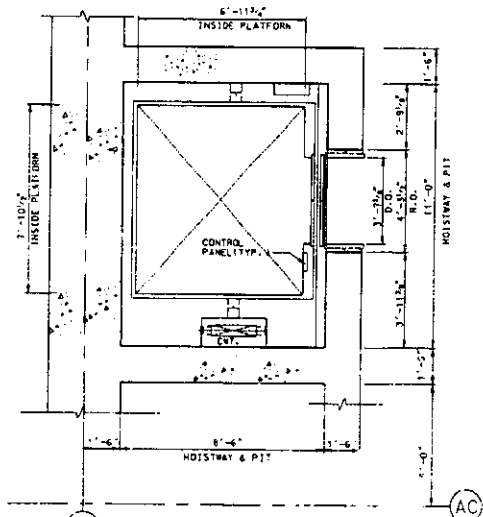


INFORMATION ONLY

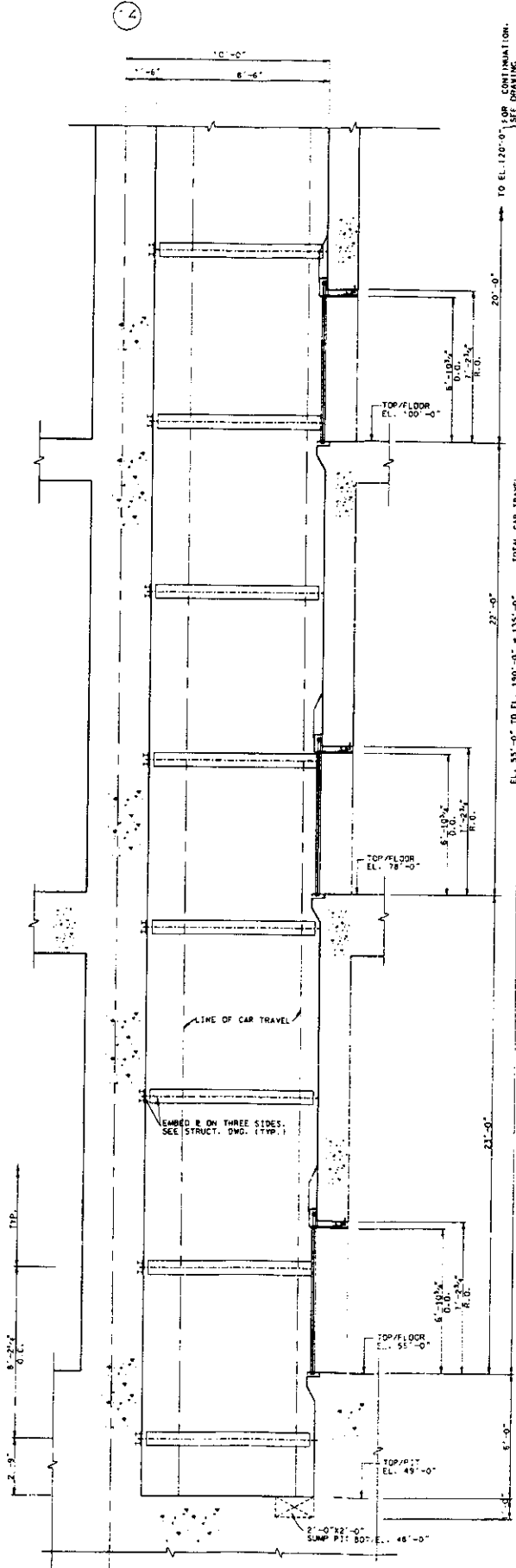
NOTES				
1. FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-320-A101-001, 002				
2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203				
REFERENCE DRAWINGS				
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 156'-0" AREA 2			
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 175'-6" AREA 2			
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 2			
9-320-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 156'-0" AREA 3			
9-320-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 175'-6" AREA 3			
9-320-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 191'-6" AREA 3			
REV. DATE DESCRIPTION PREPARED CHECKED REVIEWED APPROVED				
06/30/04	ISSUE FOR CONSTRUCTION	김대영	김복경	김성호
KOREA HYDRO & NUCLEAR POWER CO., LTD. SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4				
KOEPC KOREA POWER ENGINEERING COMPANY, INC.				
AUX. BLDG ELEVATOR AB-E2 PLAN AND SECTION SHT3				
PROJECT DRAWING NUMBER	9-320-A115-026			SHEET 1/1
JOB NO.	SAFETY CATEGORY	AREA CODE	SCALE	REV.
2L179	S	3200	3/8"=1'-0"	0



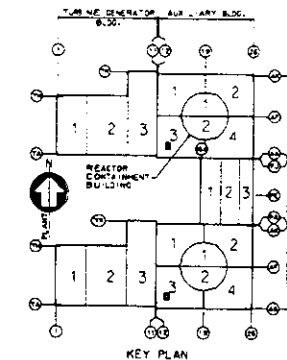
PLAN EL - 100' - 0"



PLAN EL. 78'-0"



SECTION (B)



NOTES


- 1 FOR ARCHITECTURAL GENERAL NOTE. SEE DWG. 9-300-A101-001. 00  
2 FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED  
BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION  
NO. 9-125-A203

### REFERENCE DRAWINGS

9-326-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 156'-0" AREA 2
9-327-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 173'-6" AREA 2
9-326-C118-031	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 2
9-327-C118-031	AUXILIARY BUILDING FLOOR PLAN EL. 156'-0" AREA 3
9-327-C118-031	AUXILIARY BUILDING FLOOR PLAN EL. 173'-6" AREA 3
9-326-C118-031	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 3

0	06/30/04	ISSUE FOR CONSTRUCTION	장태영	김복현	8월7	8			
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	AS			

**KOREA HYDRO & NUCLEAR POWER CO., LTD.**  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

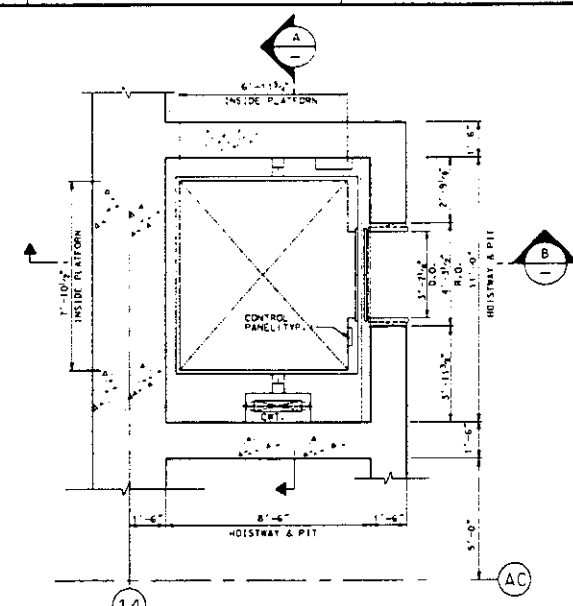
 **KOPEC** KOREA POWER ENGINEERING COMPANY, LTD.

AUX. BLDG ELEVATOR  
AB-E3 PLAN AND SECTION SHT1

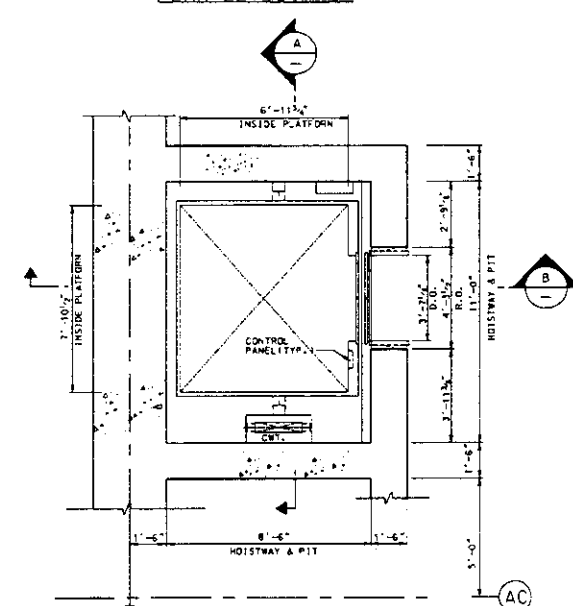
PROJECT DRAWING NUMBER	9-320-A115-027			SHEET 1
JOB NO.	SAFETY CATEGORY	AREA CODE	SCALE	REF.
2L'79	S	3200	3/4" = 1'-0"	

PROJECT DRAWING NUMBER  
9-320-A115-028

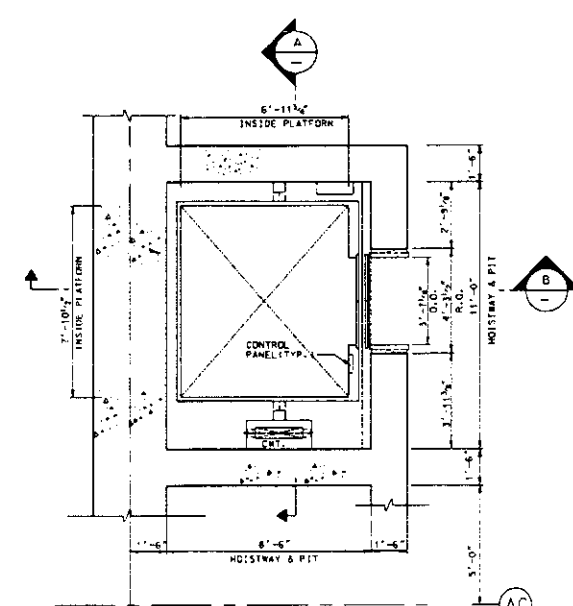
INFORMATION ONLY



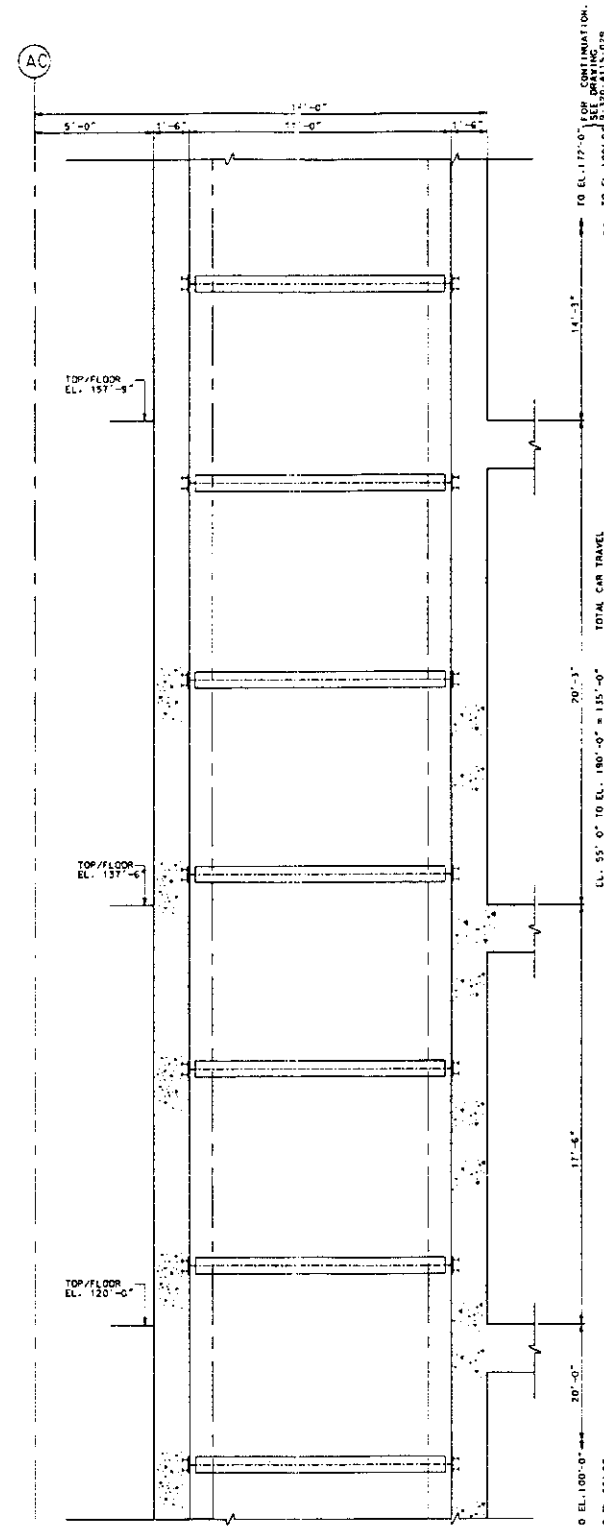
14 PLAN EL. 157'-9"



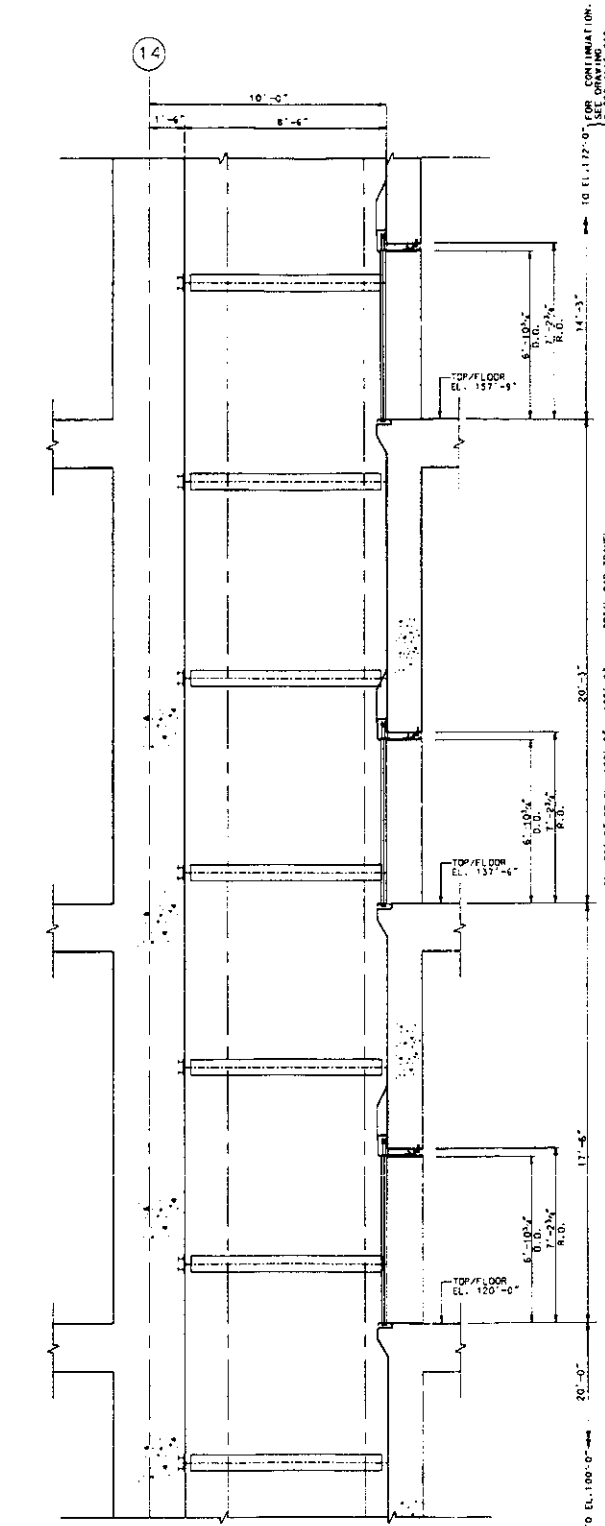
14 PLAN EL. 137'-6"



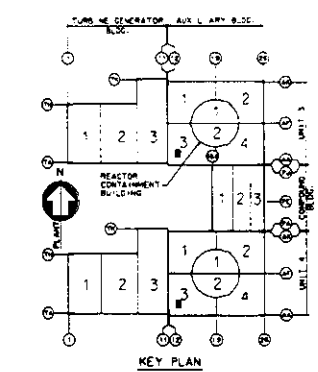
14 PLAN EL. 120'-0"



SECTION A

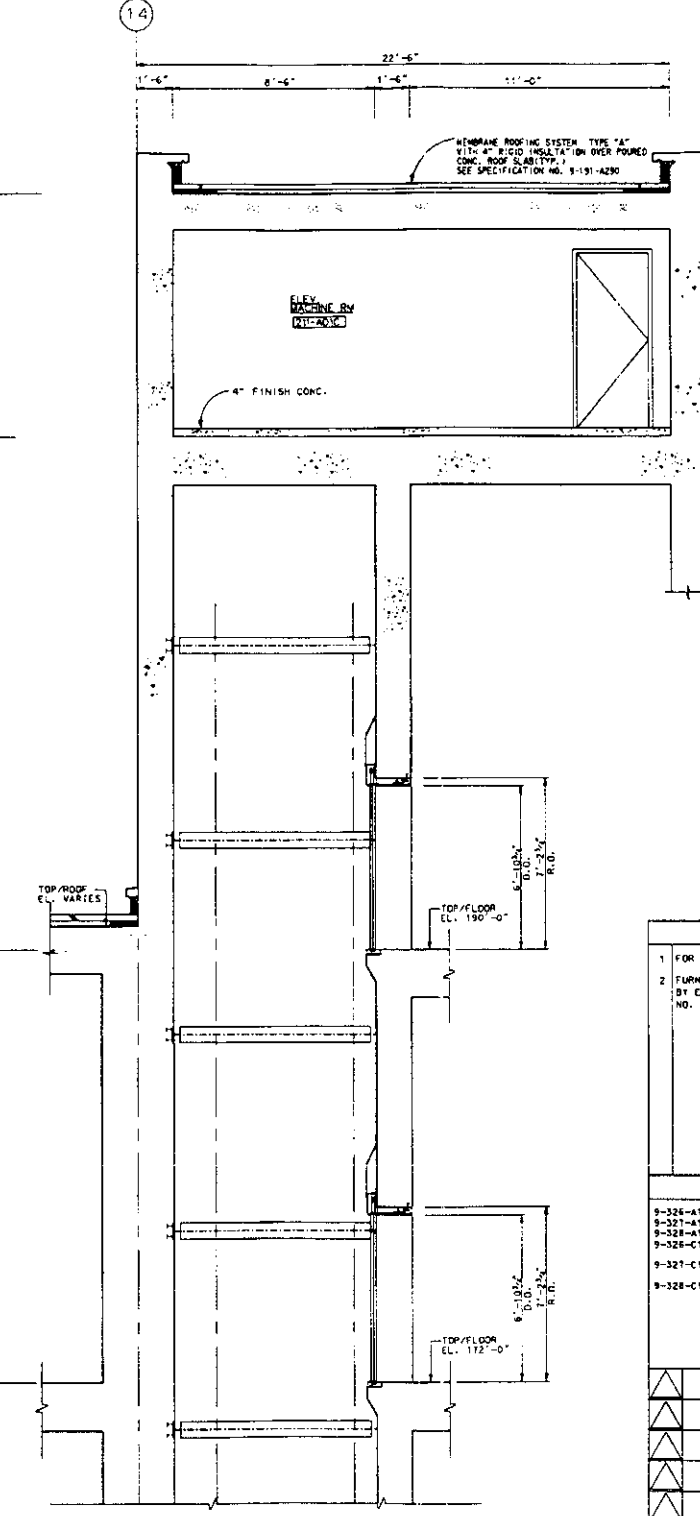
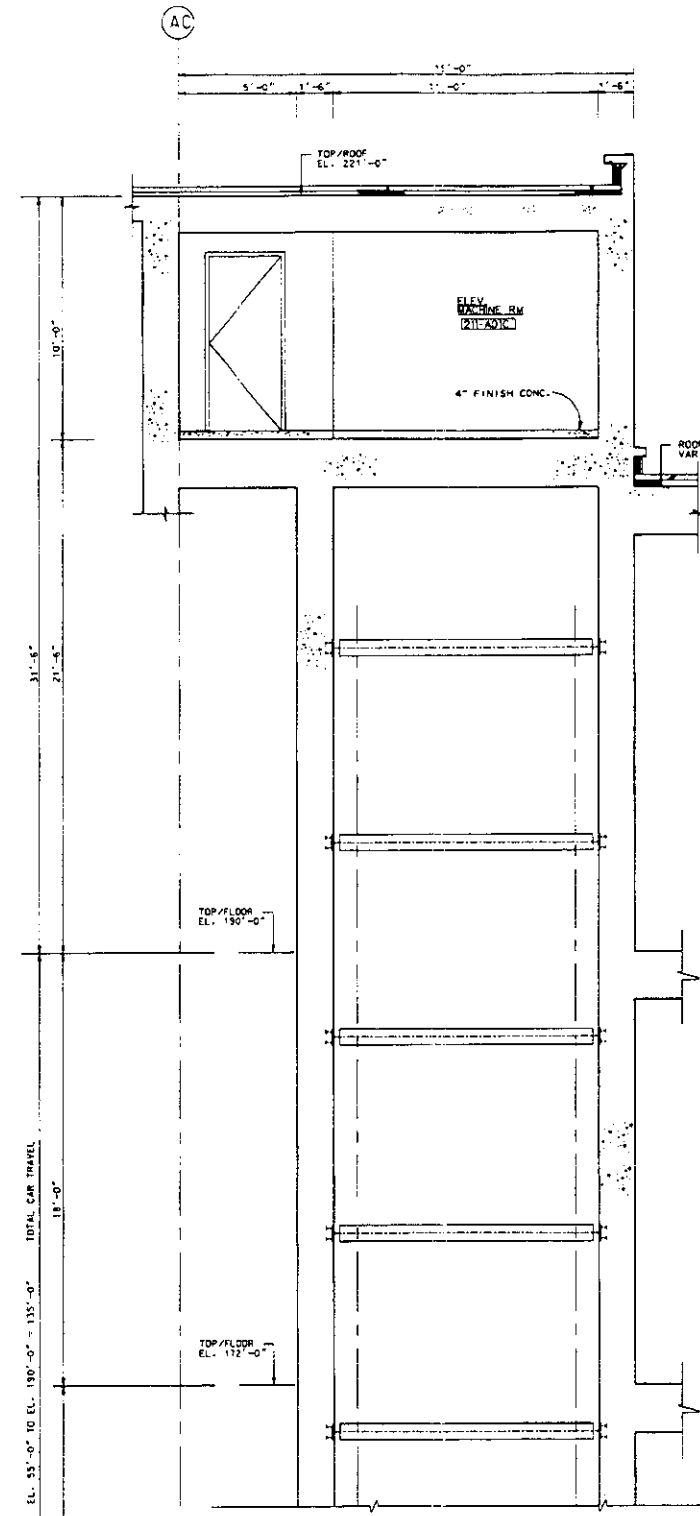
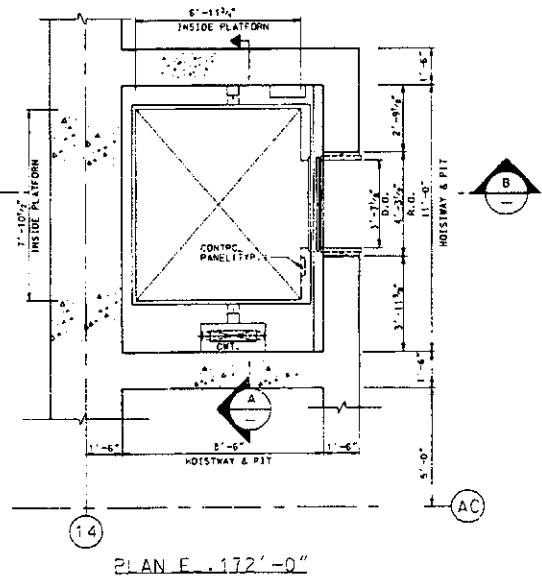
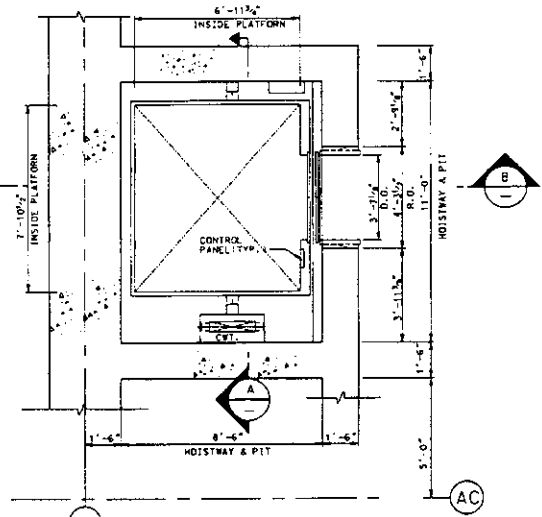
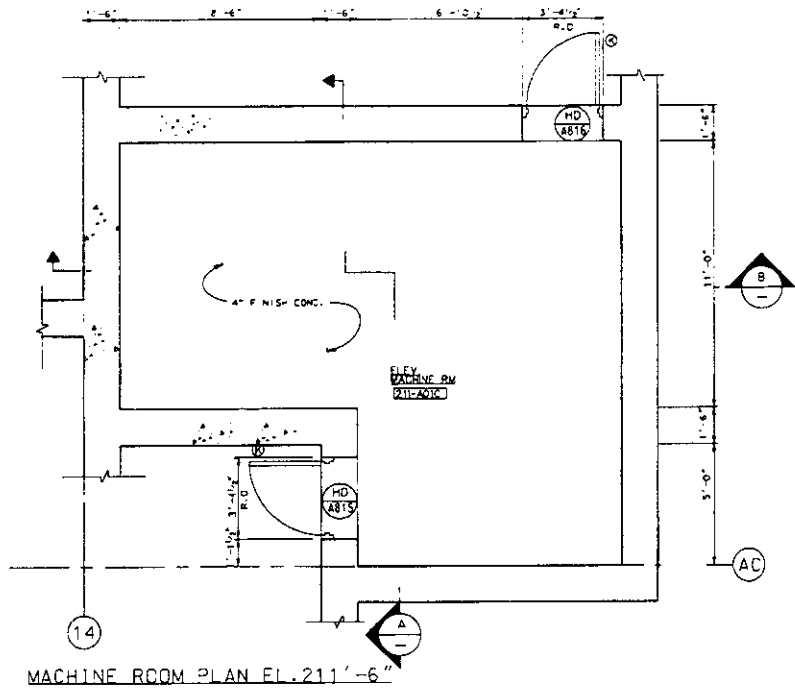
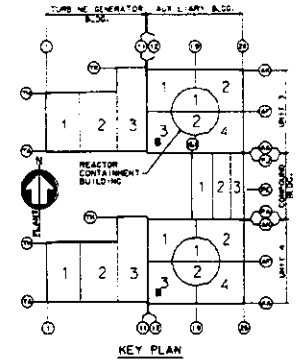


SECTION B



NOTES				
1. FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A101-001, 002				
2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203				
REFERENCE DRAWINGS				
9-326-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 156'-0" AREA 2			
9-327-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 175'-6" AREA 2			
9-328-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 2			
9-326-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 156'-0" AREA 3			
9-327-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 175'-6" AREA 3			
9-328-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 191'-6" AREA 3			
REV.	DATE	DESCRIPTION	PREPARED	CHECKED
1	06/30/04	ISSUE FOR CONSTRUCTION	김재영	김현정
2			김성기	김문희
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				
93				
94				
95				
96				
97				
98				
99				
100				

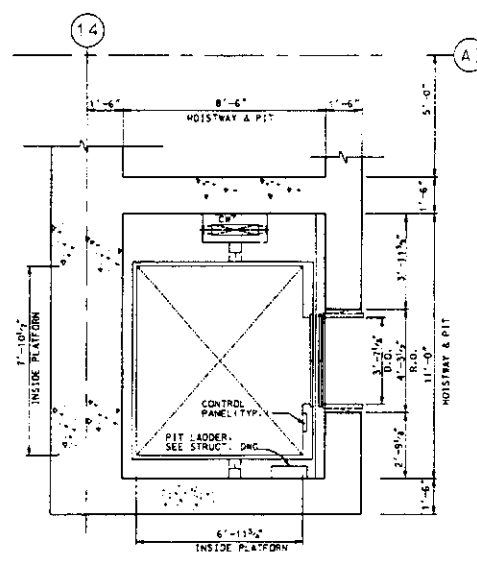
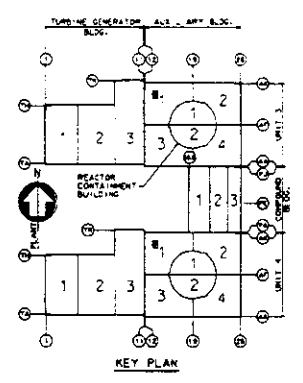
INFORMATION ONLY



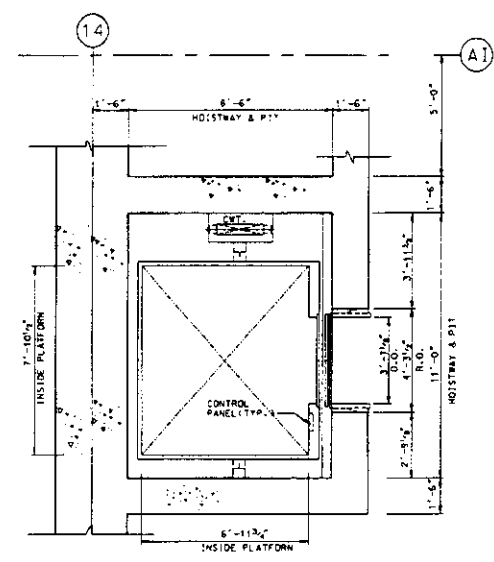
NOTES				
1. FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A101-001, 002				
2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203				
REFERENCE DRAWINGS				
9-328-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 155'-0" AREA 2			
9-327-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 173'-6" AREA 2			
9-328-A113-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 2			
9-328-C116-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 155'-0" AREA 2			
9-327-C116-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 173'-6" AREA 2			
9-328-C116-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 191'-6" AREA 2			
REVISIONS				
REV.	DATE	DESCRIPTION	PREPARED	CHECKED
0	04/30/04	ISSUE FOR CONSTRUCTION	정지영	김영하
APPROVED				
KOREA HYDRO & NUCLEAR POWER CO., LTD.				
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4				
KPOEC KOREA POWER ENGINEERING COMPANY, INC.				
AUX. BLDG ELEVATOR				
AB-E3 PLAN AND SECTION SH13				
PROJECT DRAWING NUMBER	9-320-A115-029			SHEET 1/1
JOB NO.	SAFETY CATEGORY	AREA CODE	SCALE	REV.
2L-79	S	3200	3/8"=1'-0"	0

INFORMATION ONLY

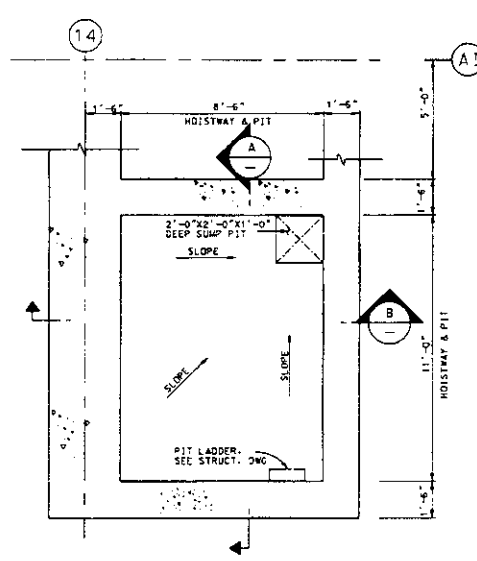
9-320-A115-030



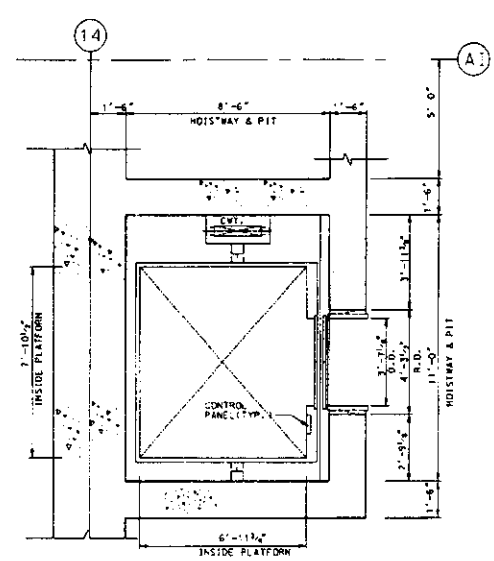
PLAN EL. 55'-0"



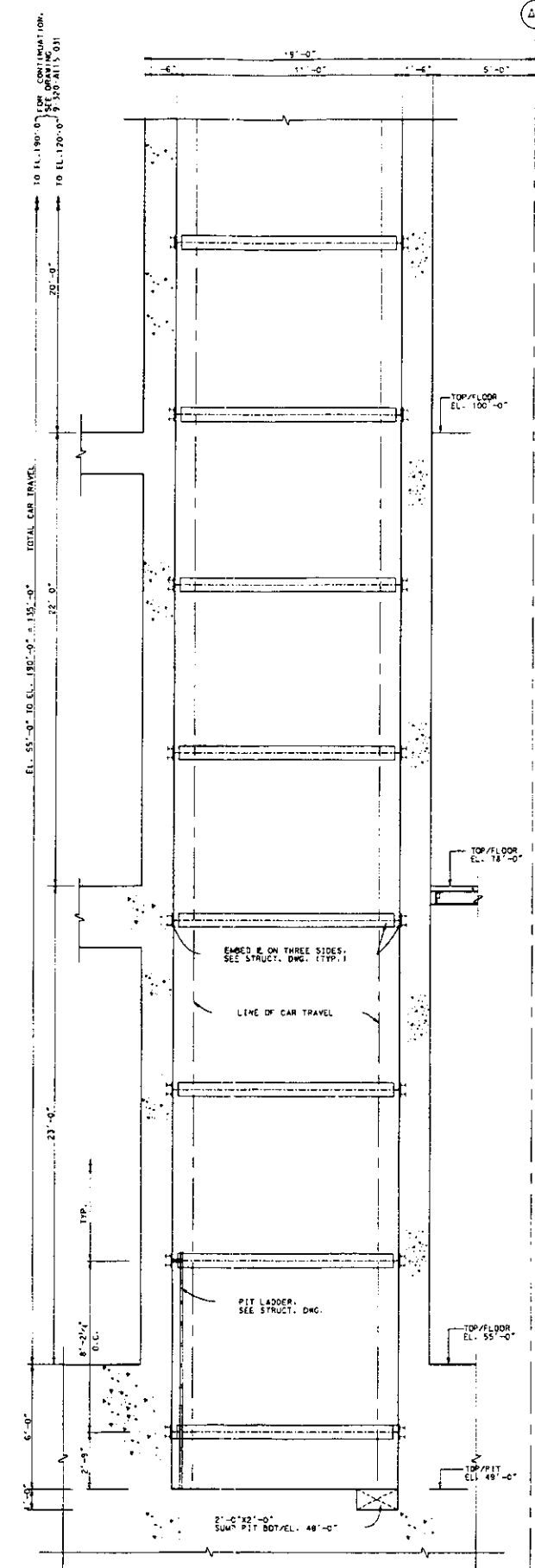
PLAN EL. 100'-0"



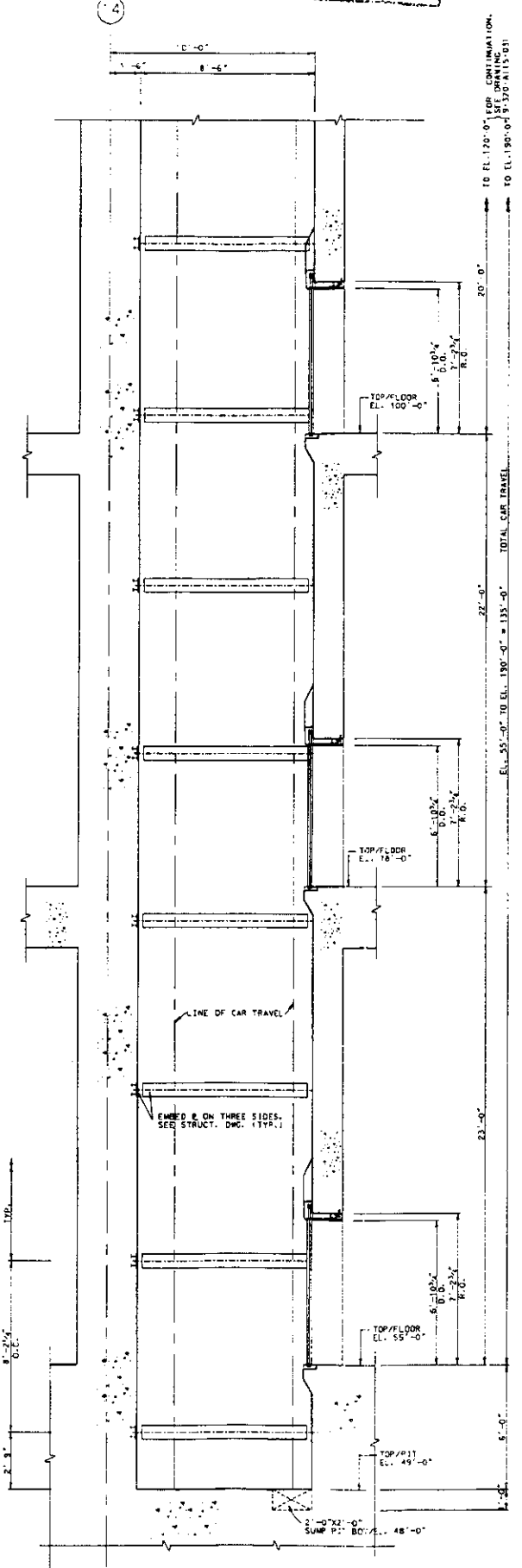
PIT FLOOR PLAN EL. 49'-0"



PLAN EL. 78'-0"



SECTION A



SECTION B

NOTES  
1. FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A101-001, 002.  
2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203.

REFERENCE DRAWINGS  
9-326-A112-020 AUXILIARY BUILDING FLOOR PLAN EL. 156'-0" AREA 2  
9-327-A112-020 AUXILIARY BUILDING FLOOR PLAN EL. 175'-6" AREA 2  
9-328-A112-020 AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 2  
9-326-C118-031 EL. 156'-0" AREA 3  
9-327-C118-031 AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 175'-6" AREA 3  
9-328-C118-031 AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 191'-6" AREA 3

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED
01/30/04		ISSUE FOR CONSTRUCTION	김재영	김영환	김영환	김영환

KOREA HYDRO & NUCLEAR POWER CO., LTD.  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

KOPEC KOREA POWER ENGINEERING COMPANY, INC.

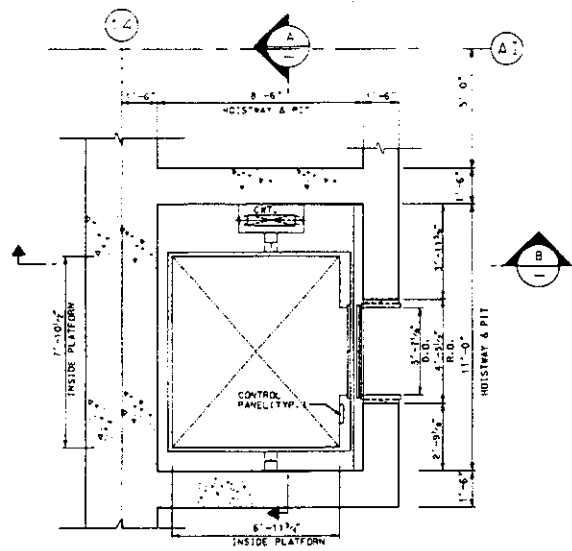
AUX. BLDG ELEVATOR  
AB-E4 PLAN AND SECTION SH1

PROJECT DRAWING NUMBER	9-320-A115-030	SHEET	1/1
JOB NO.	2L179	SAFETY CATEGORY	S
AREA CODE	320C	SCALE	3/8"=1'-0"
REV.	0		

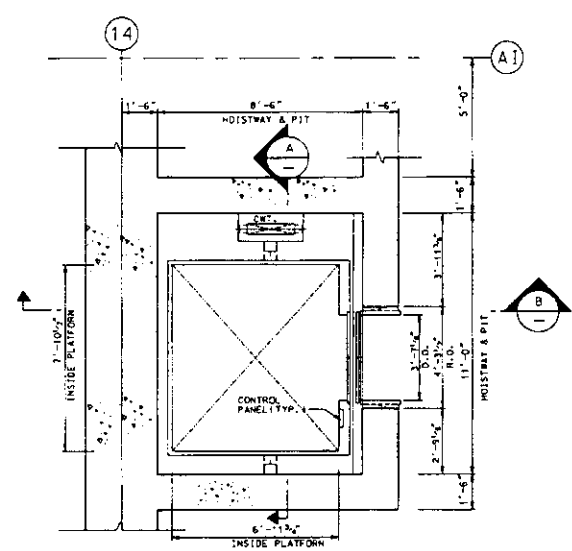
4-4-11



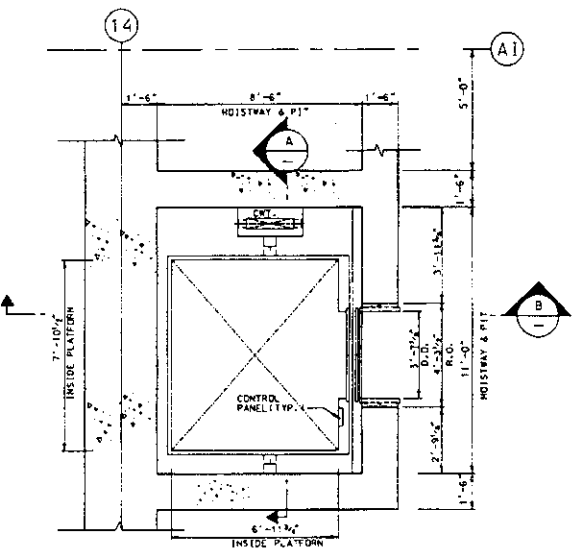
9-320-A115-031



PLAN EL. 157'-9"

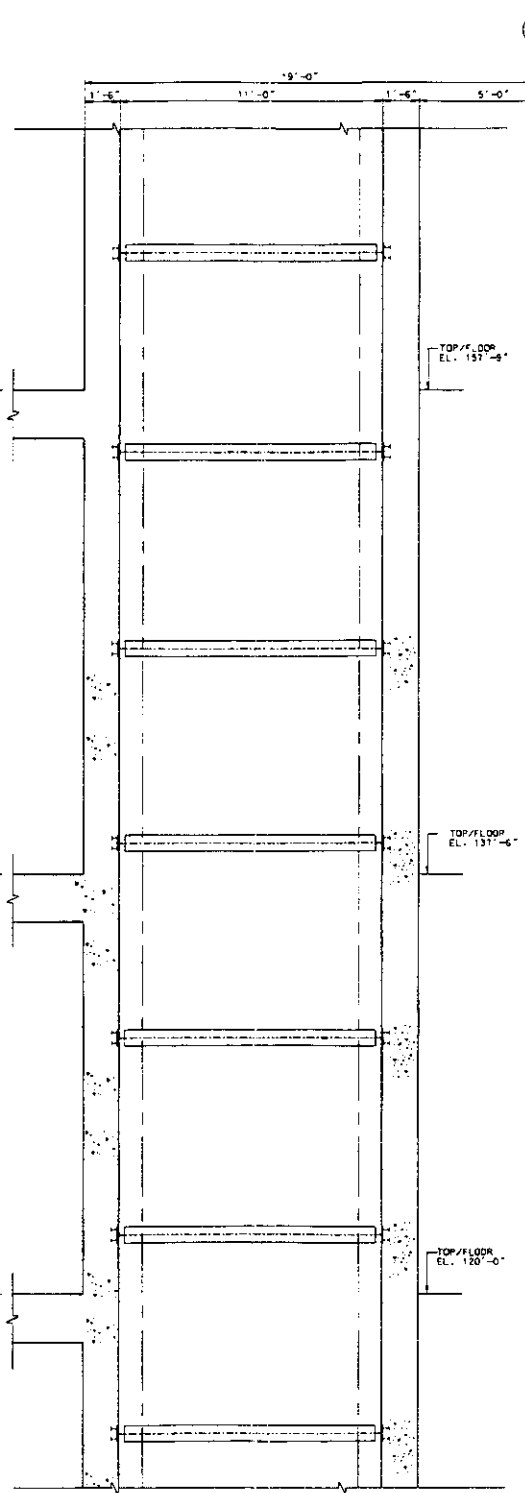


PLAN EL. 137'-6"



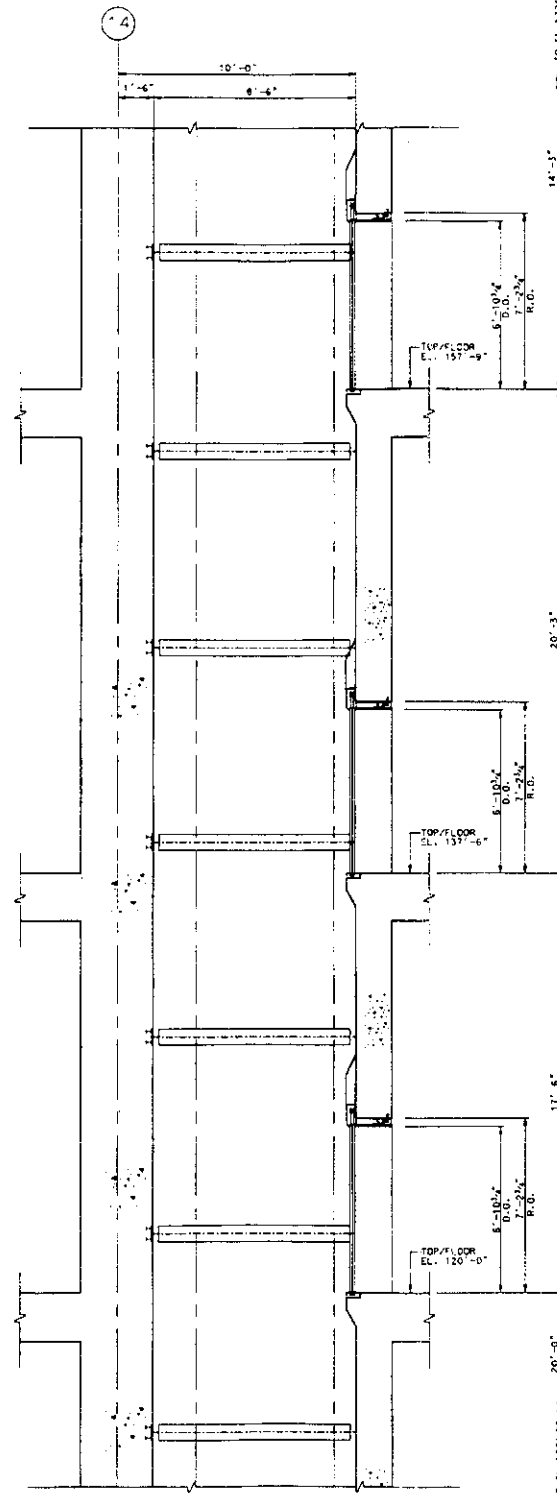
PLAN EL. 120'-0"

FOR CONTINUATION: TO EL. 150'-0" FOR CONFINEMENT SET DRAWING 9-320-A115-030  
TO EL. 137'-0" FOR CONFINEMENT SET DRAWING 9-320-A115-031  
TOTAL CAR TRAVEL 20'-0"



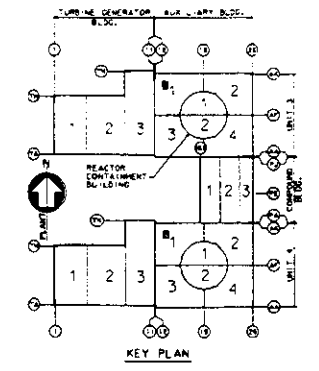
SECTION A-A

FOR INFORMATION ONLY



SECTION B-B

FOR CONTINUATION: TO EL. 137'-0" FOR CONFINEMENT SET DRAWING 9-320-A115-030  
TO EL. 130'-0" FOR CONFINEMENT SET DRAWING 9-320-A115-031  
TOTAL CAR TRAVEL 20'-0"



KEY PLAN

**NOTES**

- FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A01-001, 002
- FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-129-A203

**REFERENCE DRAWINGS**

9-326-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 156'-0" AREA 2
9-327-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 173'-6" AREA 2
9-328-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-4" AREA 2
9-326-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 156'-0" AREA 3
9-327-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 173'-6" AREA 3
9-328-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 191'-4" AREA 3

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED
01	06/30/04	ISSUE FOR CONSTRUCTION	김재영	김영환	김성기	김승호

**KOREA HYDRO & NUCLEAR POWER CO., LTD.**  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

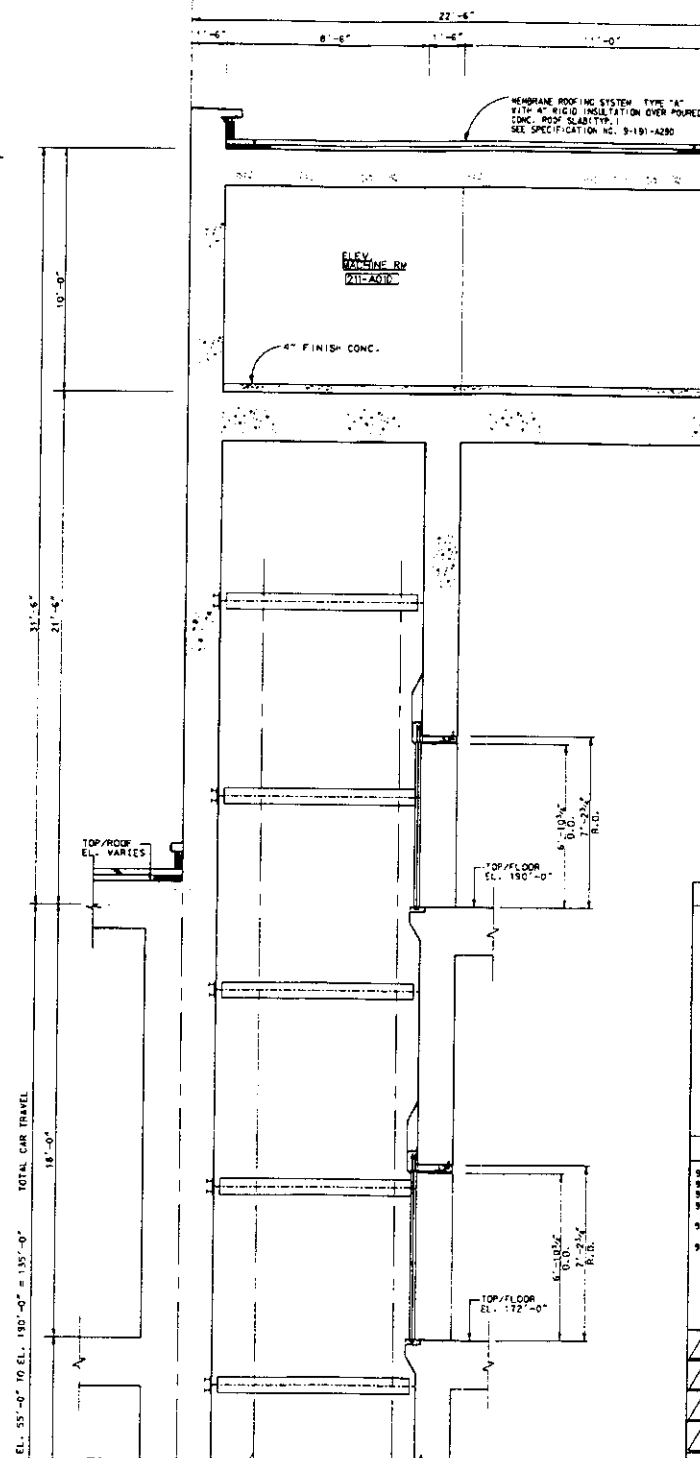
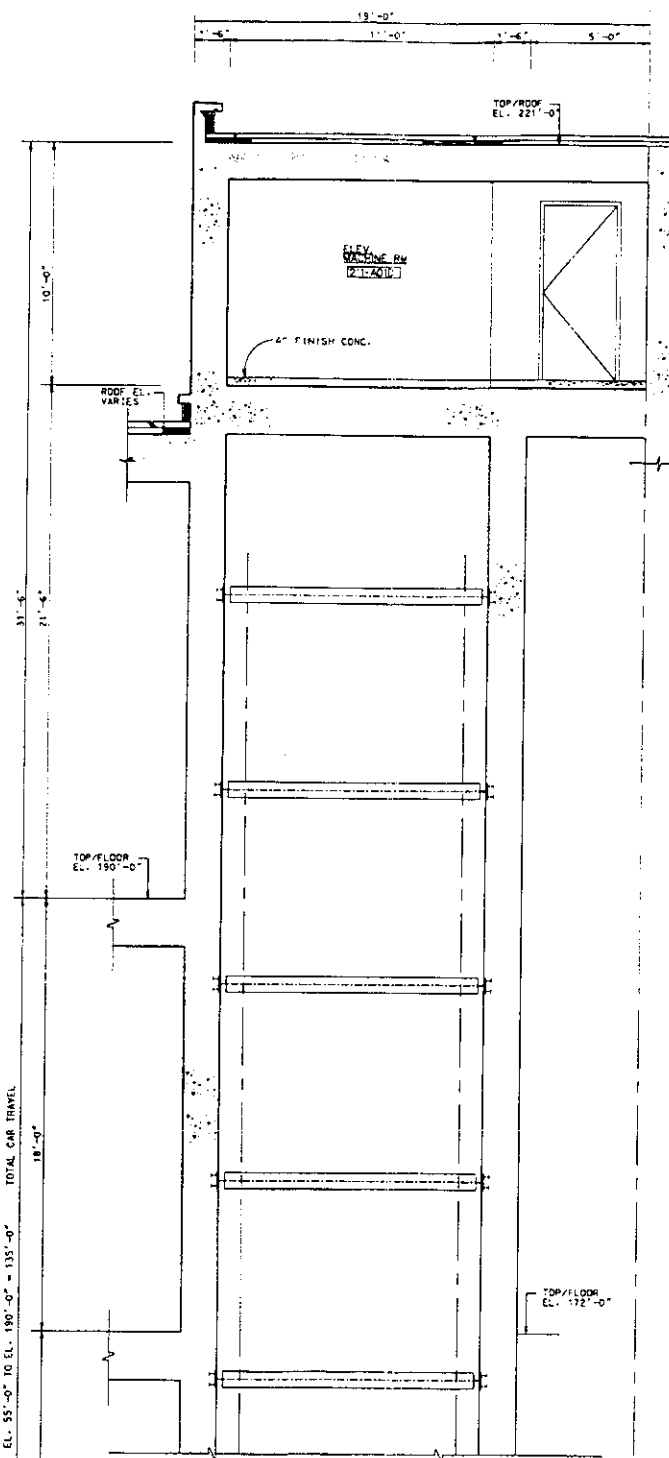
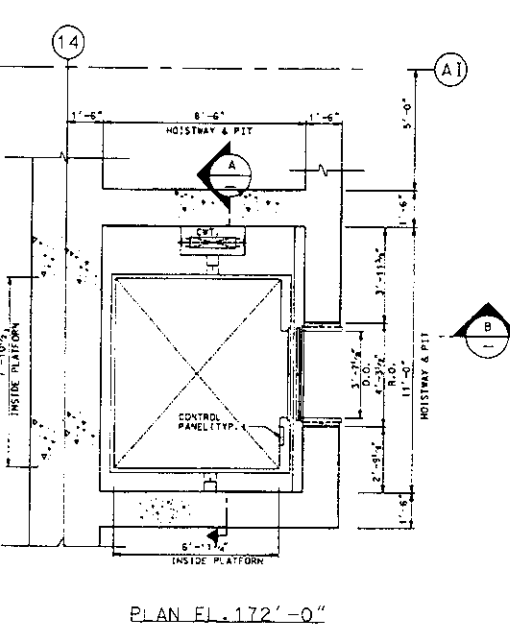
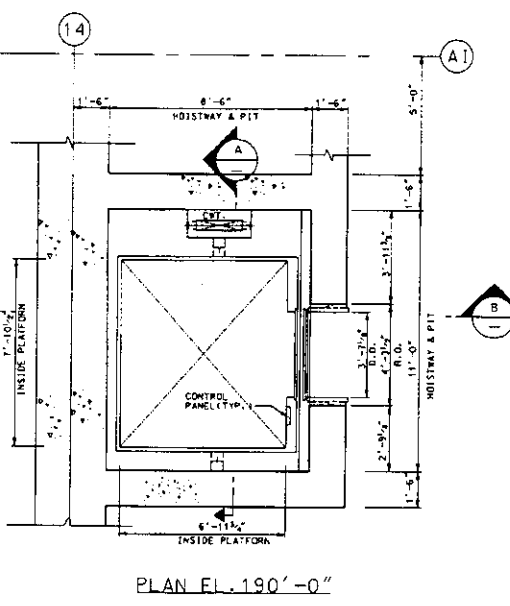
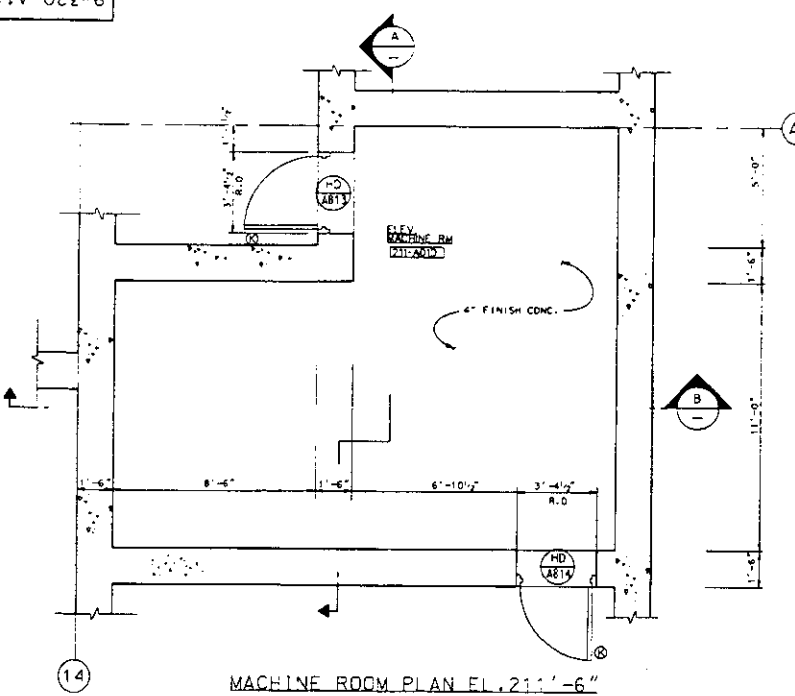
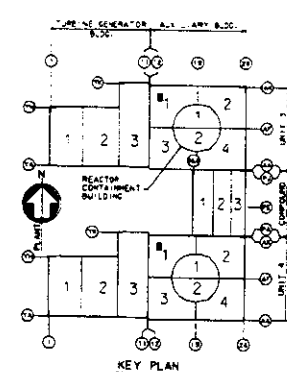
**KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

AUX. BLDG ELEVATOR  
AB-E4 PLAN AND SECTION SH2

PROJECT DRAWING NUMBER	9-320-A115-031	SHEET	1/1
JOB NO.	2L179	SAFETY CATEGORY	S
AREA CODE	3200	SCALE	3/8"=1'-0"
REV.	0		

9-320-A115-032

INFORMATION ONLY



NOTES

- FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-320-A101-001, 002
- FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203

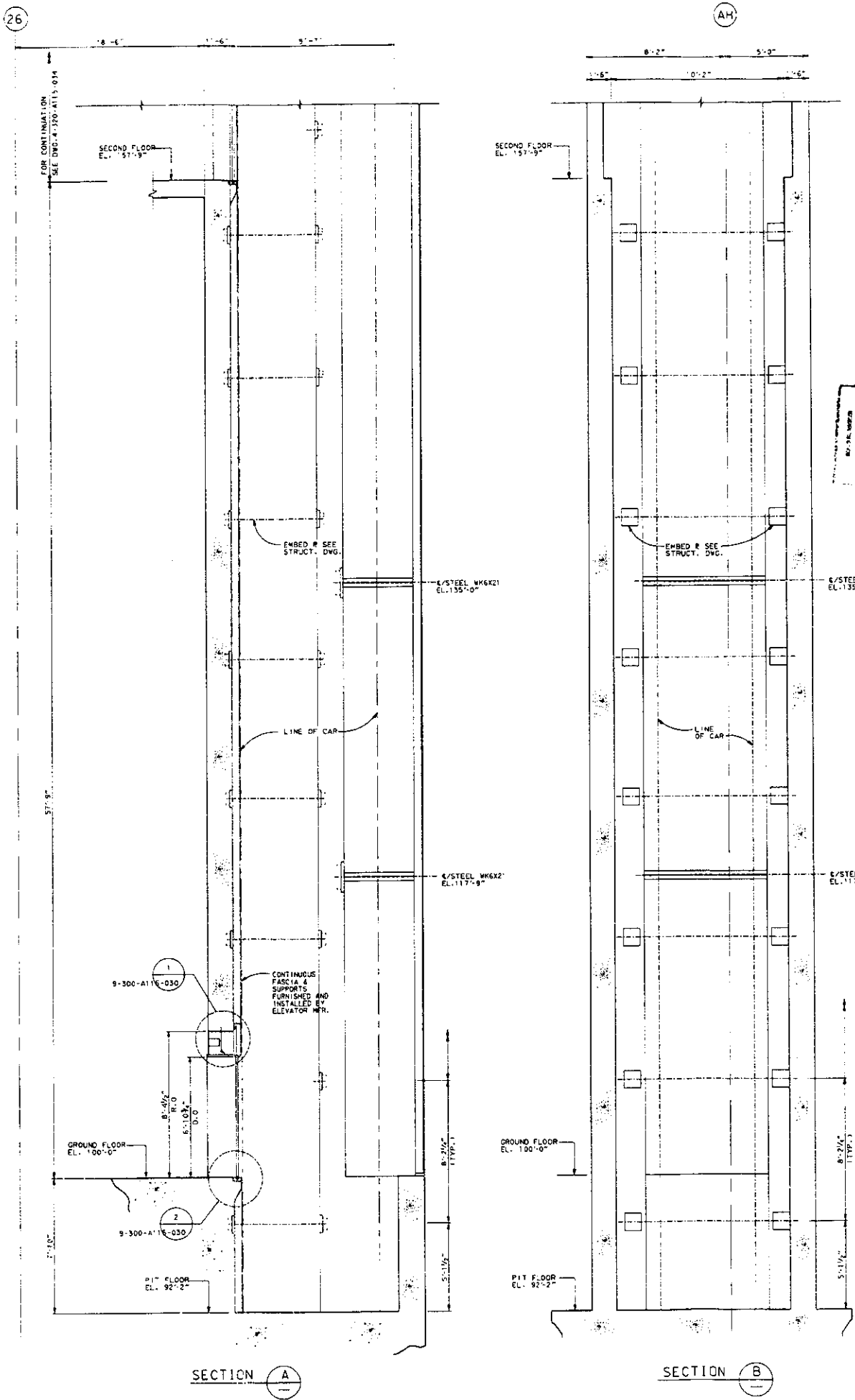
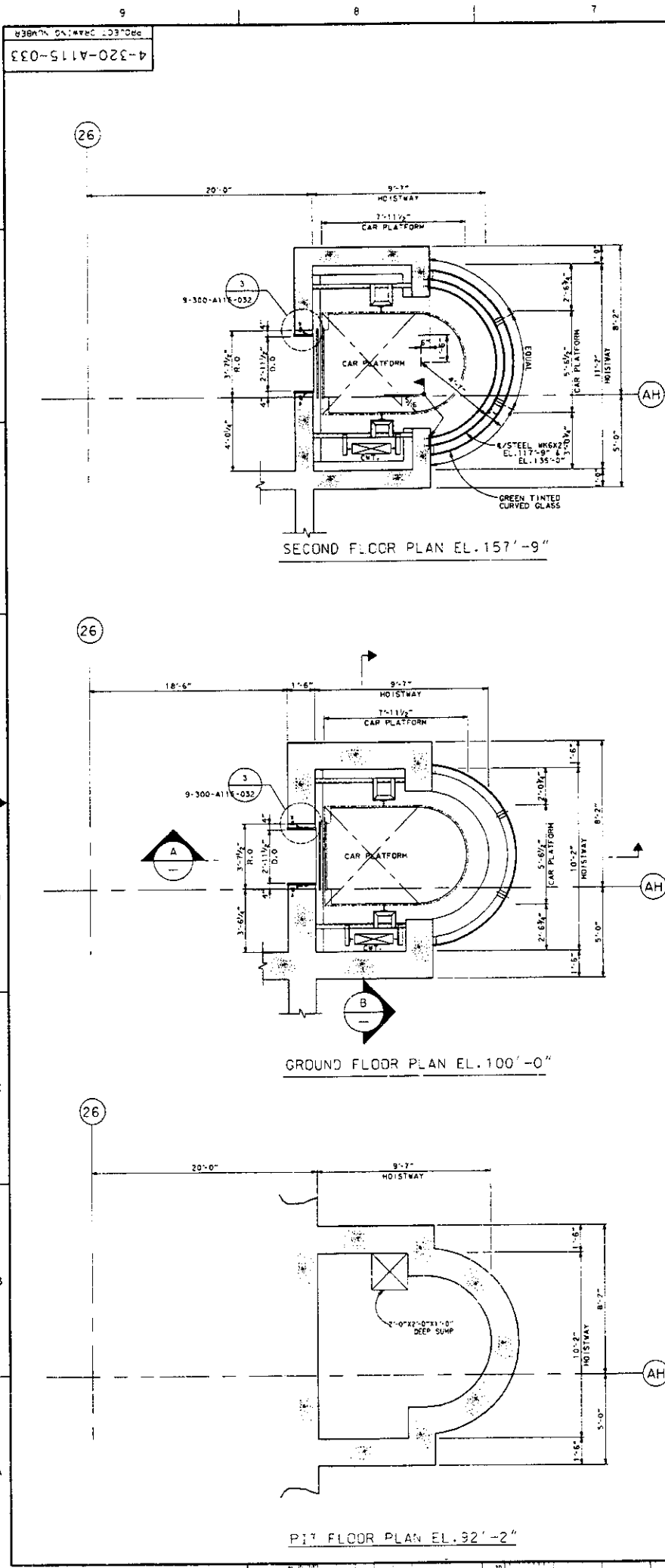
REFERENCE DRAWINGS

9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 156'-0" AREA 2
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 173'-6" AREA 2
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 2
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 3
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 4
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 5
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 6
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 7
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 8
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 9
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 10
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 11
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 12
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 13
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 14
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 15
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 16
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 17
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 18
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 19
9-320-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 191'-6" AREA 20

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED
0	06/30/04	ISSUE FOR CONSTRUCTION	장대영	김영철	박기원	김승현

<b>KOREA HYDRO &amp; NUCLEAR POWER CO., LTD.</b> SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4	
<b>KOPEC KOREA POWER ENGINEERING COMPANY, INC.</b>	
AUX. BLDG ELEVATOR AB-E4 PLAN AND SECTION SH13	
PROJECT DRAWING NUMBER	9-320-A115-032
JOB NO.	2L179
SAFETY CATEGORY	S
AREA CODE	3200
SCALE	3/8" = 1'-0"
SHEET	1/1

4-4-13

















INFORMATION ONLY

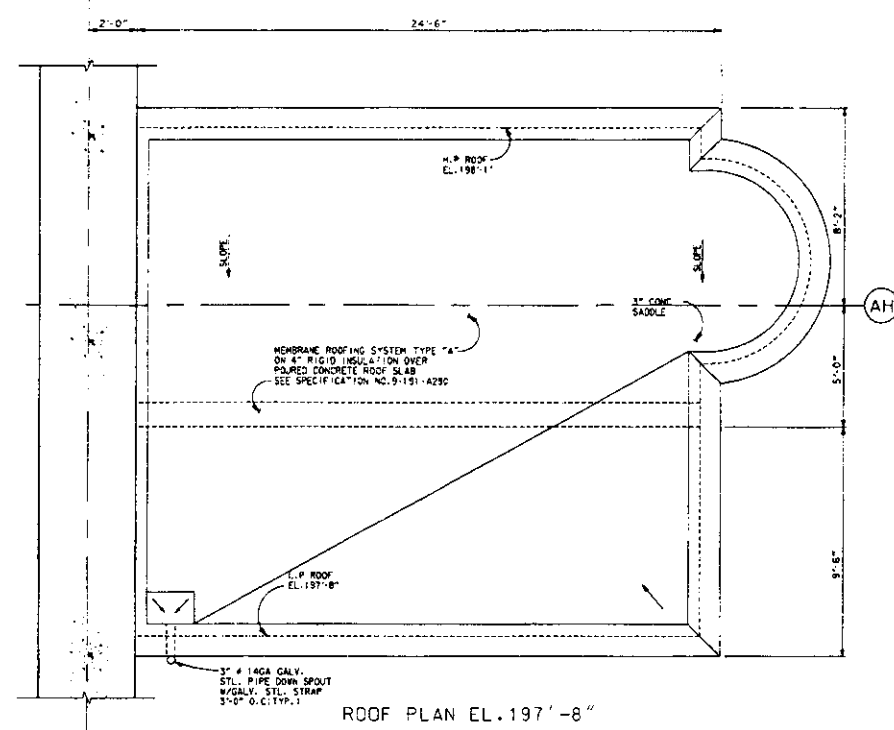
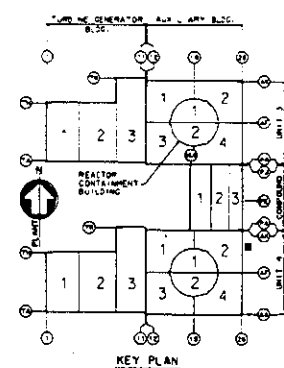
# NOTES

1. FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A101-001, 002
2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203

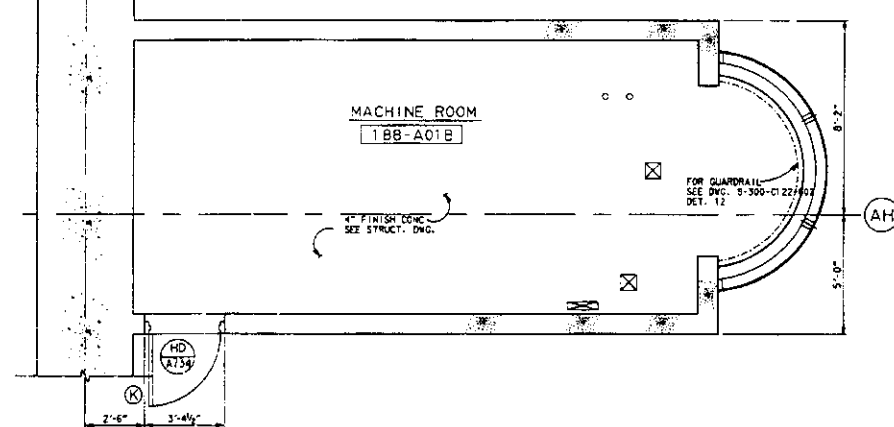
## REFERENCE DRAWINGS

9-323-A112-000	AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA 2
9-324-A112-000	AUXILIARY BUILDING FLOOR PLAN EL. 120'-0" AREA 2
9-323-C118-001	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 100'-0" AREA 3
9-324-C118-001	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 120'-0" AREA 3

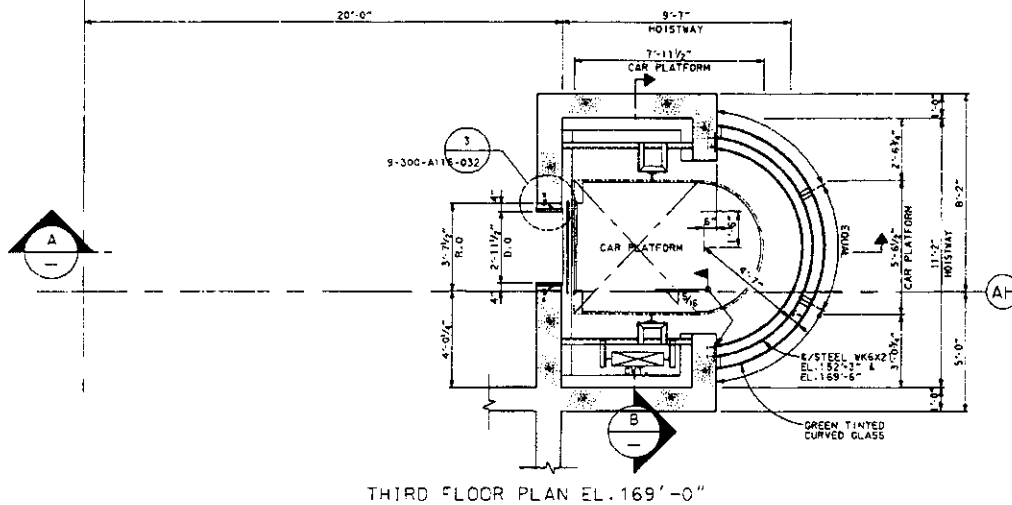
									
									
									
									
									
									
									
									
									
									
									
									
									
									



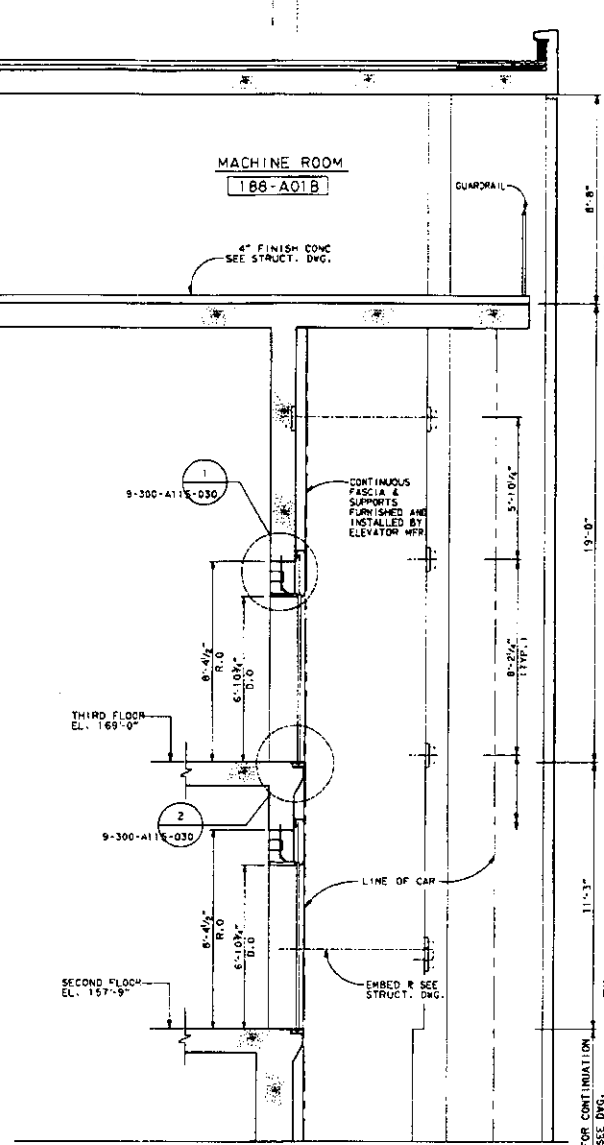
ROOF PLAN EL. 197'-8"



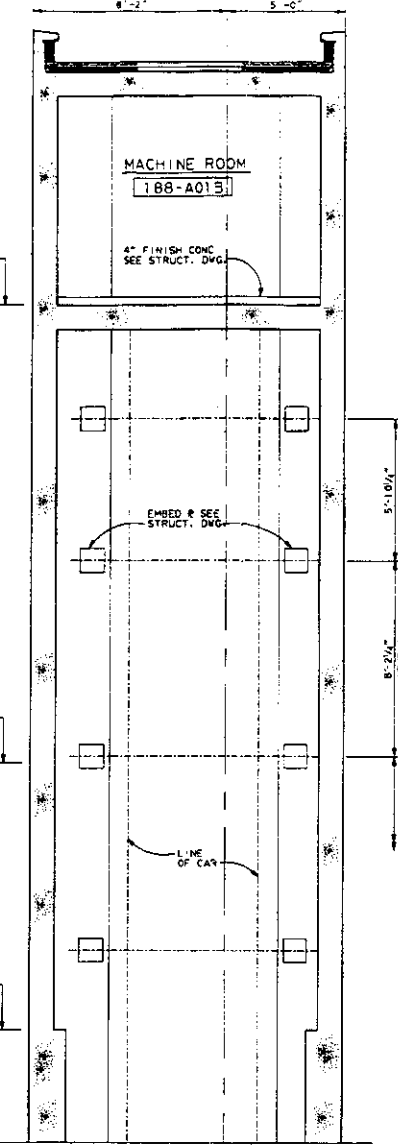
MACHINE ROOM FLOOR PLAN EL. 188'-0"



THIRD FLOOR PLAN EL. 169'-0"



SECTION A




SECTION B

INFORMATION ONLY

NOTES	
1	FOR ARCHITECTURAL GENERAL NOTE, SEE DWG. 9-300-A101-001, 002
2	FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203

REFERENCE DRAWINGS	
9-323-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 100'-0" AREA 2
9-324-A112-020	AUXILIARY BUILDING FLOOR PLAN EL. 120'-0" AREA 2
9-323-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 100'-0" AREA 3
9-324-C118-031	AUXILIARY BUILDING CONCRETE OUTLINE FLOOR PLAN EL. 120'-0" AREA 3

	06/30/04	ISSUE FOR CONSTRUCTION	장재영	김옥경	심상민	심승하
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED

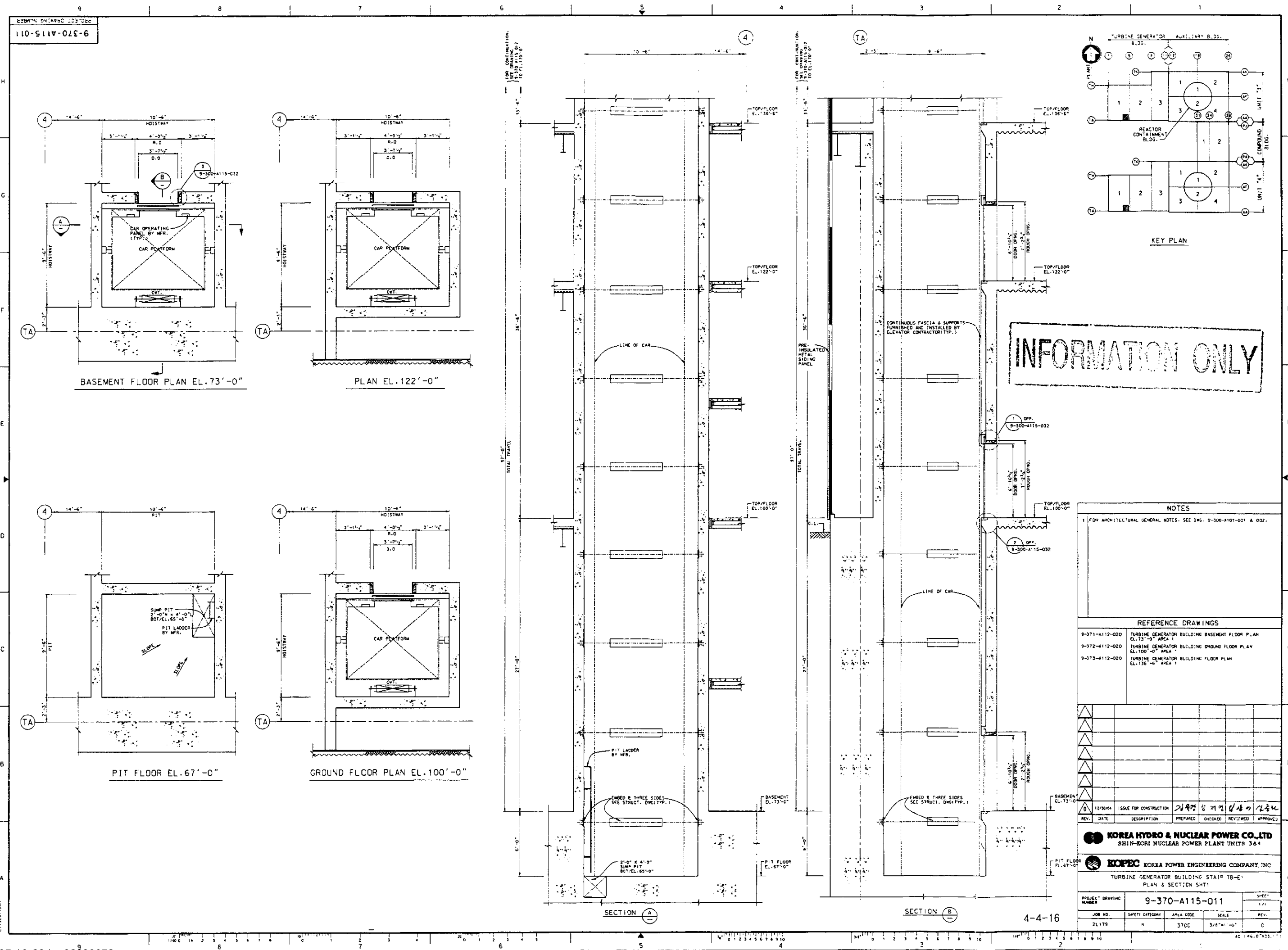


**KOREA HYDRO & NUCLEAR POWER CO., LTD**  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

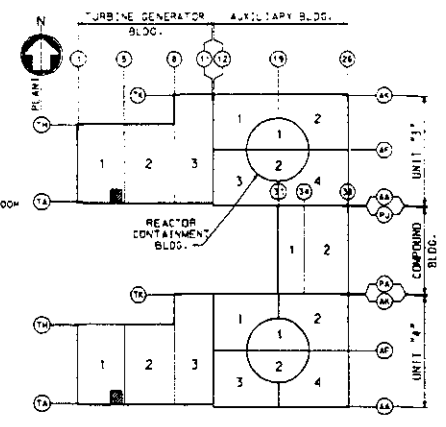
 **KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

AUX. BLOC ELEVATOR  
AB-E5 PLAN AND SECTION SHT2

PROJECT DRAWING NUMBER		4-320-A115-034		SHEET 1/1	
JOB NO.	SAFETY CATEGORY	AREA CODE	SCALE	REV.	
21,179	5	3200	3/8"=1'-0"	0	



9-370-A115-012



KEY PLAN

INFORMATION ONLY

NOTES

1. FOR ARCHITECTURAL GENERAL NOTES, SEE DWG. 9-300-A101-001 & 002.

REFERENCE DRAWINGS

9-373-A112-020 TURBINE GENERATOR BUILDING FLOOR PLAN EL. 136'-6" AREA 1  
9-374-A112-020 TURBINE GENERATOR BUILDING HEAT EXCHANGER FLOOR PLAN EL. 170'-0" AREA 1

12/30/04 ISSUE FOR CONSTRUCTION

REV. DATE DESCRIPTION PREPARED CHECKED REVIEWED APPROVED

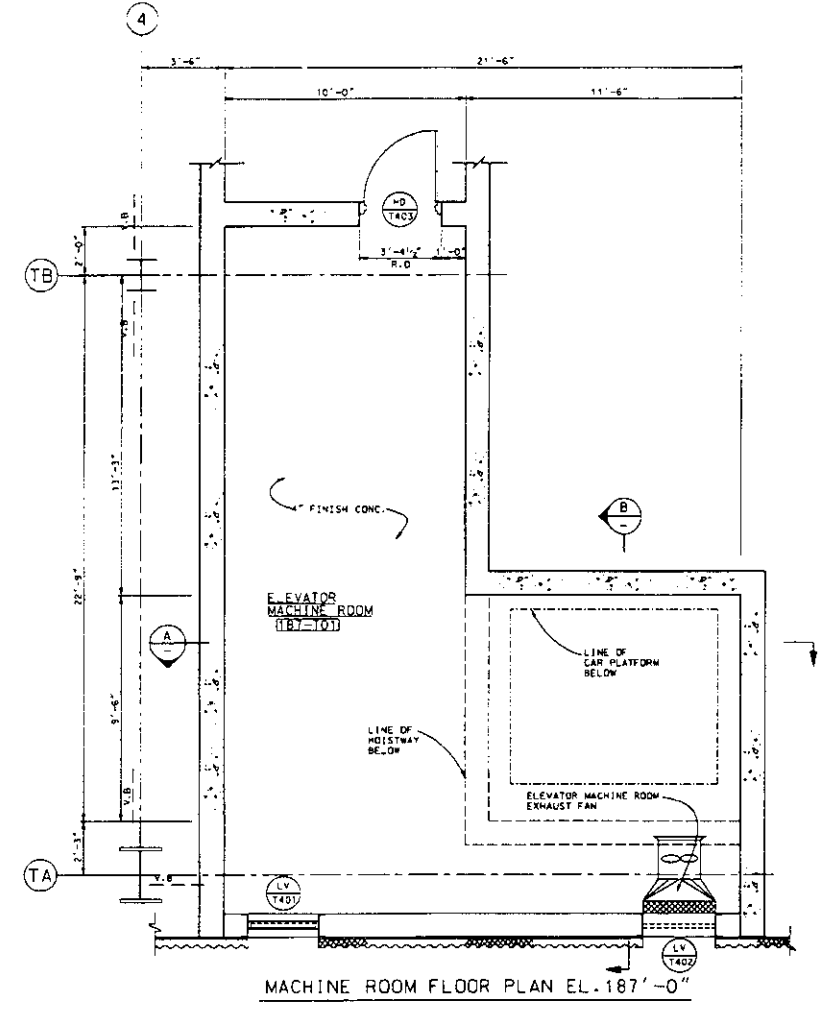
KOREA HYDRO & NUCLEAR POWER CO., LTD.  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

KOPEC KOREA POWER ENGINEERING COMPANY, INC.  
TURBINE GENERATOR BUILDING STAIR T8-E1  
PLAN & SECTION SH12

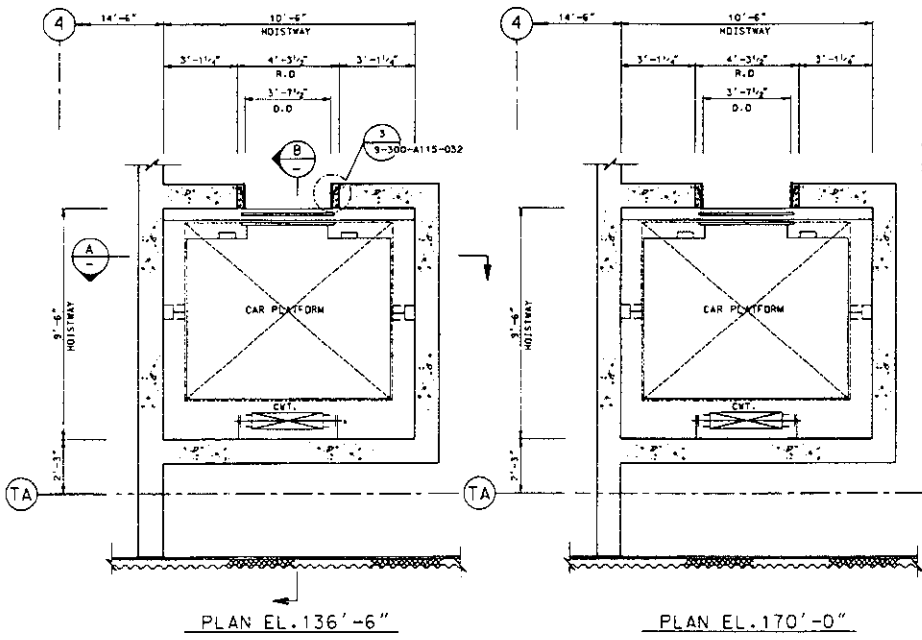
PROJECT DRAWING NUMBER 9-370-A115-012 SHEET 1/1

JOB NO. 2L179 SAFETY CATEGORY N AREA CODE 3700 SCALE 3/8"=1'-0" REV. C

AN 146.8733.1

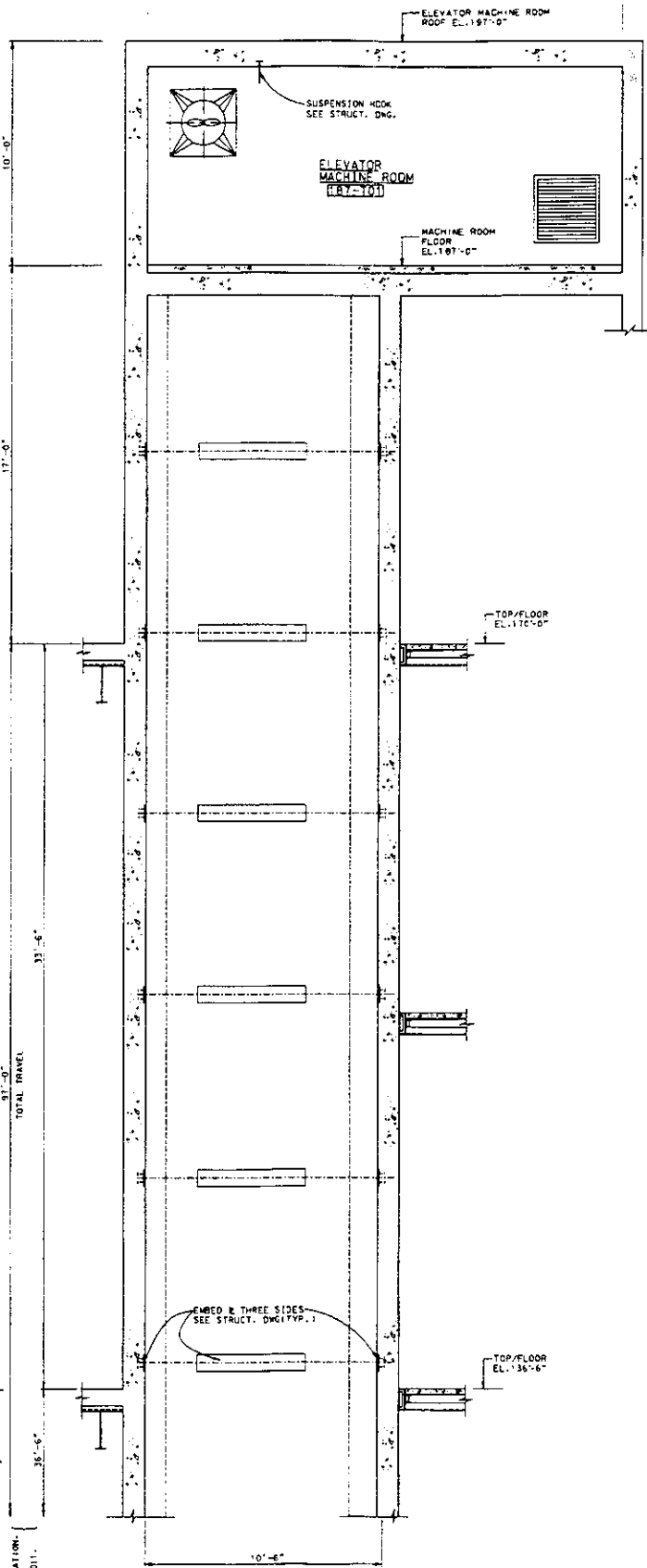


MACHINE ROOM FLOOR PLAN EL. 187'-0"

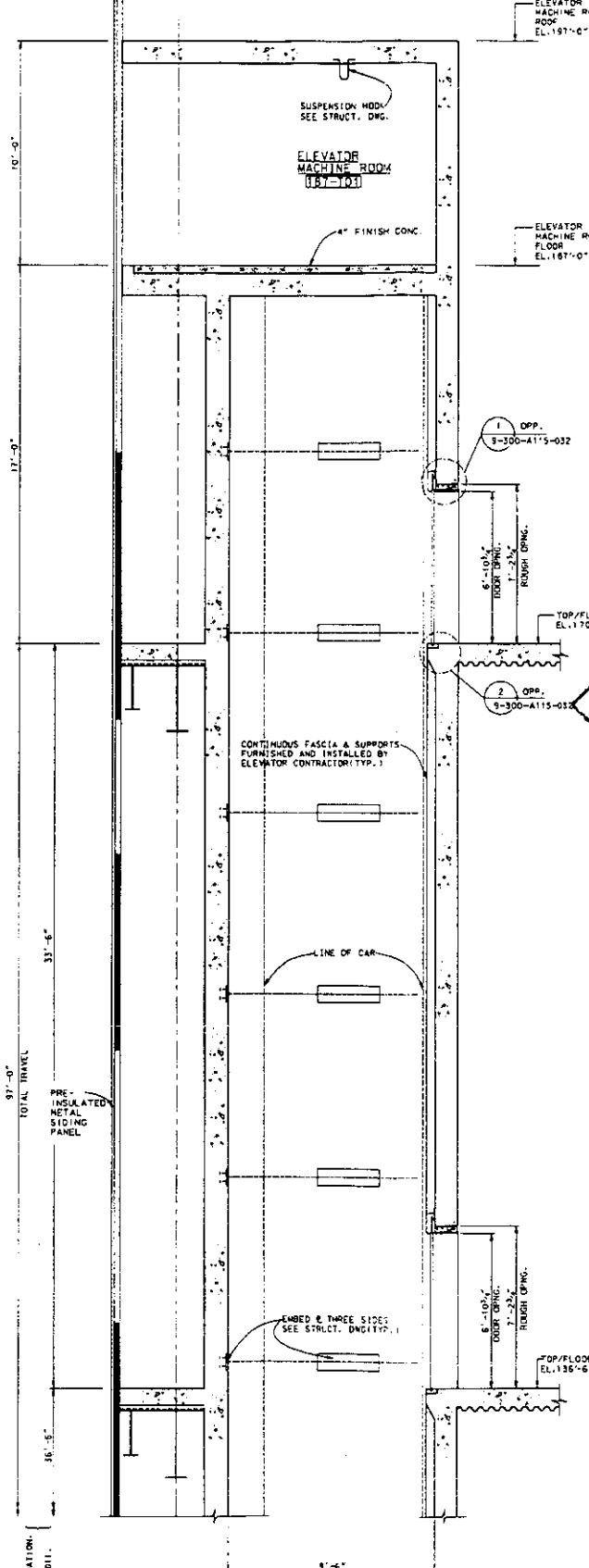


PLAN EL. 136'-6"

PLAN EL. 170'-0"

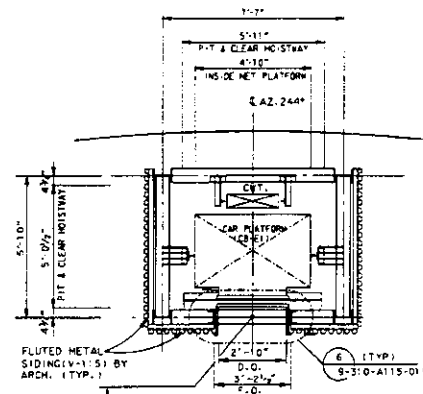


SECTION A

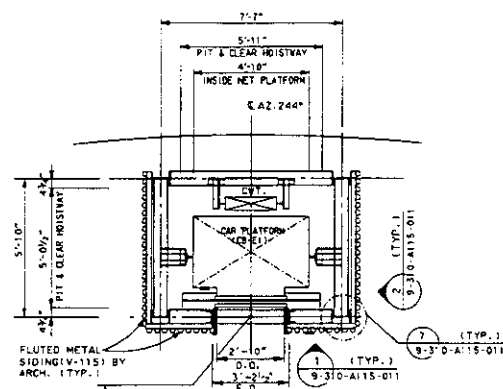


SECTION B

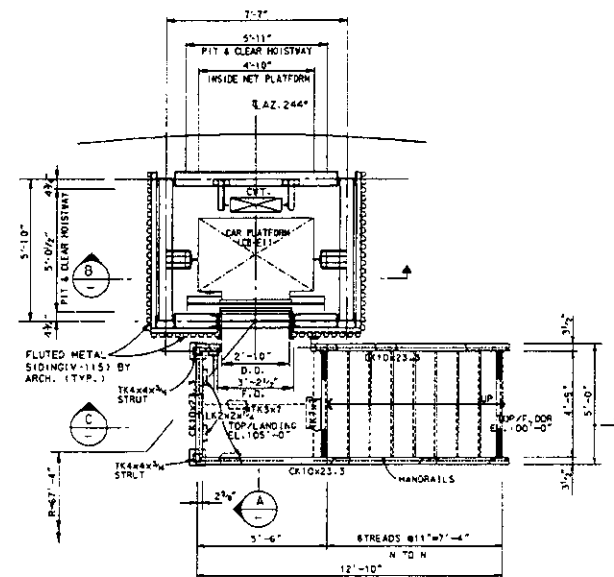
4-4-17



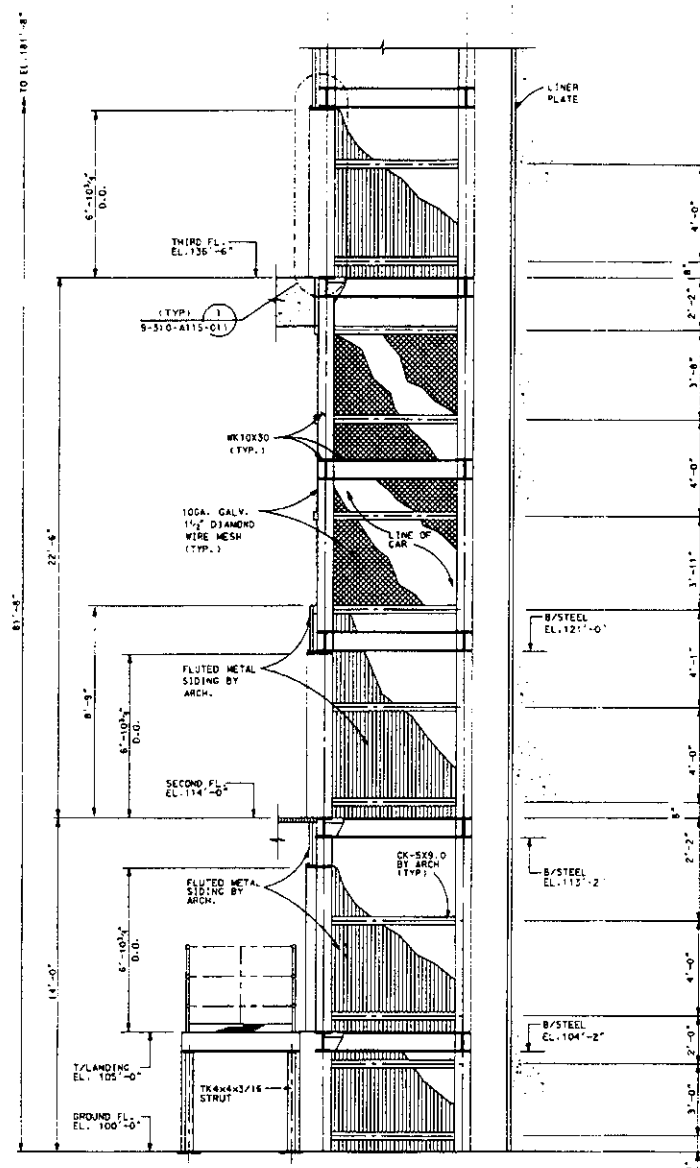
FLOOR PLAN EL.136'-6"



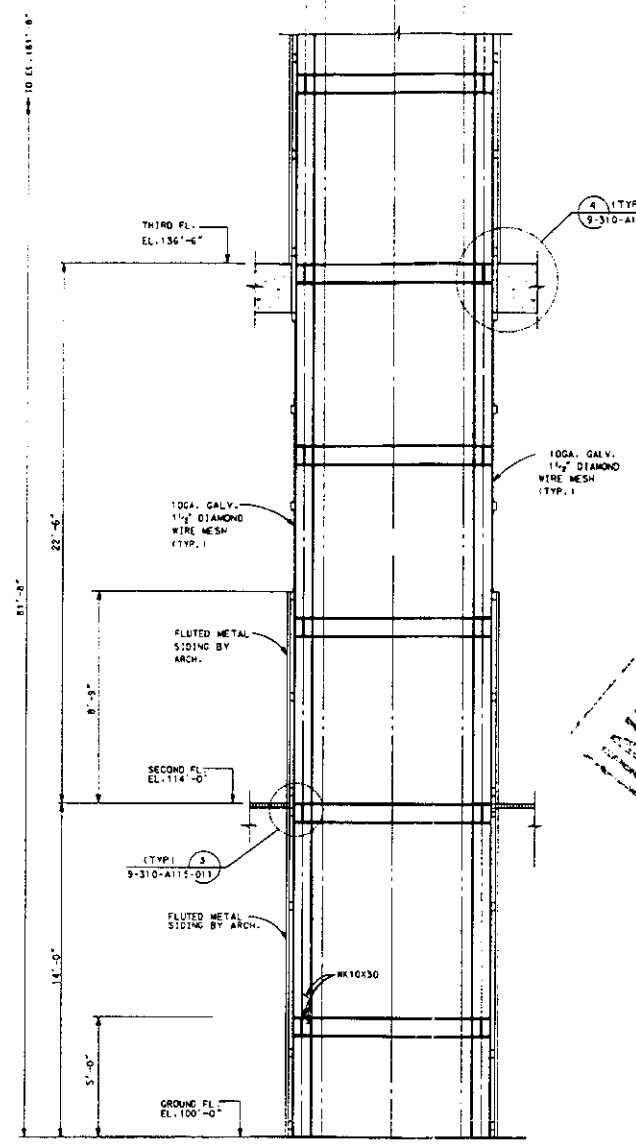
FLOOR PLAN EL.114'-0"



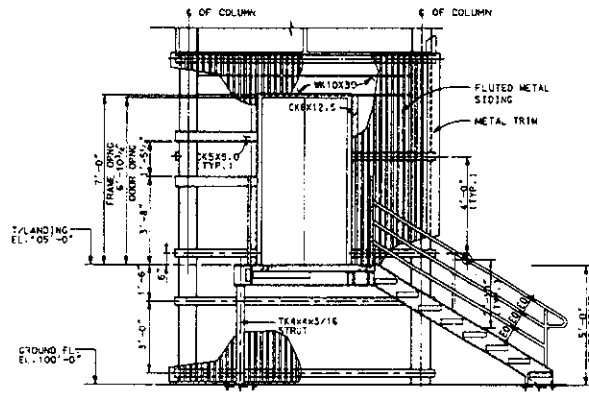
FLOOR PLAN EL.100'-0"



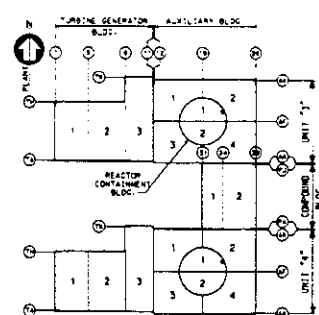
SECTION A



SECTION B



SECTION C



KEY PLAN

INFORMATION ONLY

NOTES

1. FOR ARCHITECTURAL GENERAL NOTES, SEE DWG. 9-300-A101-001/002.
2. FURNISHING & INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION 9-125-A203.
3. FOR SAFETY CATEGORY OF ARCHITECTURAL MATERIAL SHOWN ON THIS DWG. SEE GENERAL NOTE NO.13 ON DWG. 9-300-A101-001.

REFERENCE DRAWINGS

- 9-312-C121-021 C/B STEEL STRUCT. FLOOR PLAN EL. 100'-0" (AREA2)
- 9-313-C121-021 C/B STEEL STRUCT. FLOOR PLAN EL. 114'-0" (AREA2)
- 9-314-C118-021 C/B CONC. STRUCT. FLOOR PLAN EL. 136'-6" (AREA2)
- 9-315-C118-021 C/B CONC. STRUCT. FLOOR PLAN EL. 156'-0" (AREA2)

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED
1	11/20/04	ISSUE FOR CONSTRUCTION	김기영	김기영	김기영	김기영

**KOREA HYDRO & NUCLEAR POWER CO., LTD.**  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

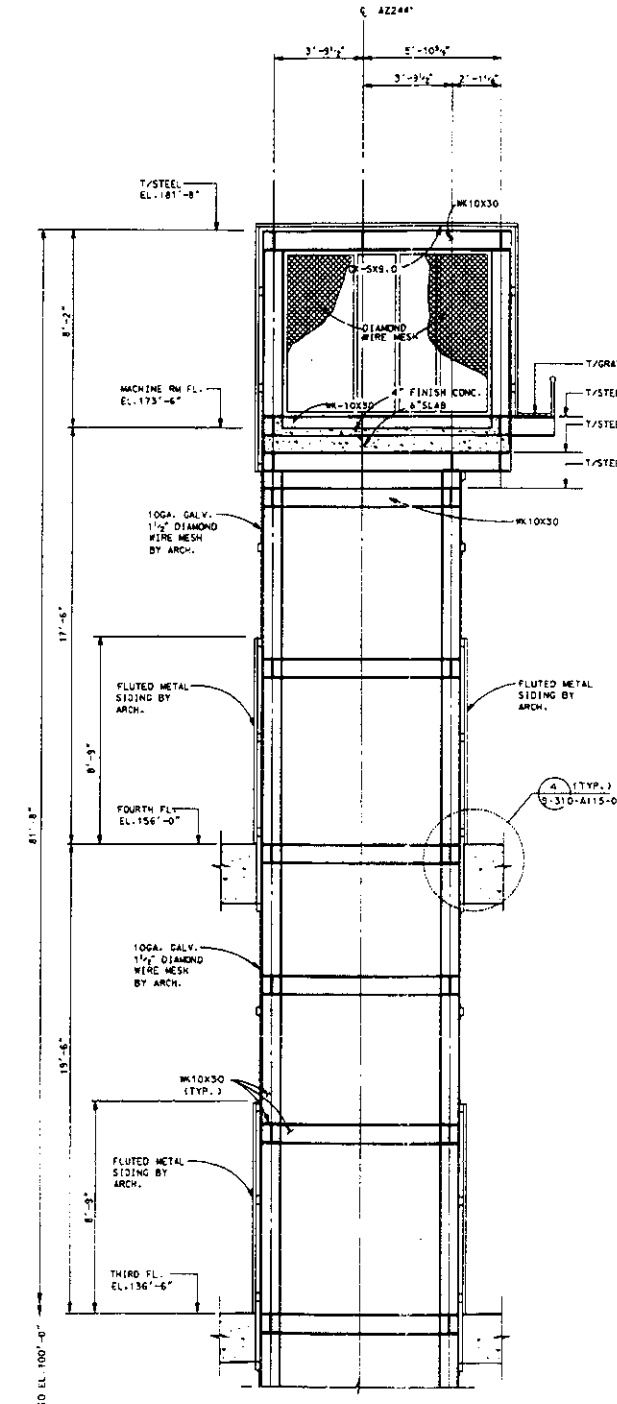
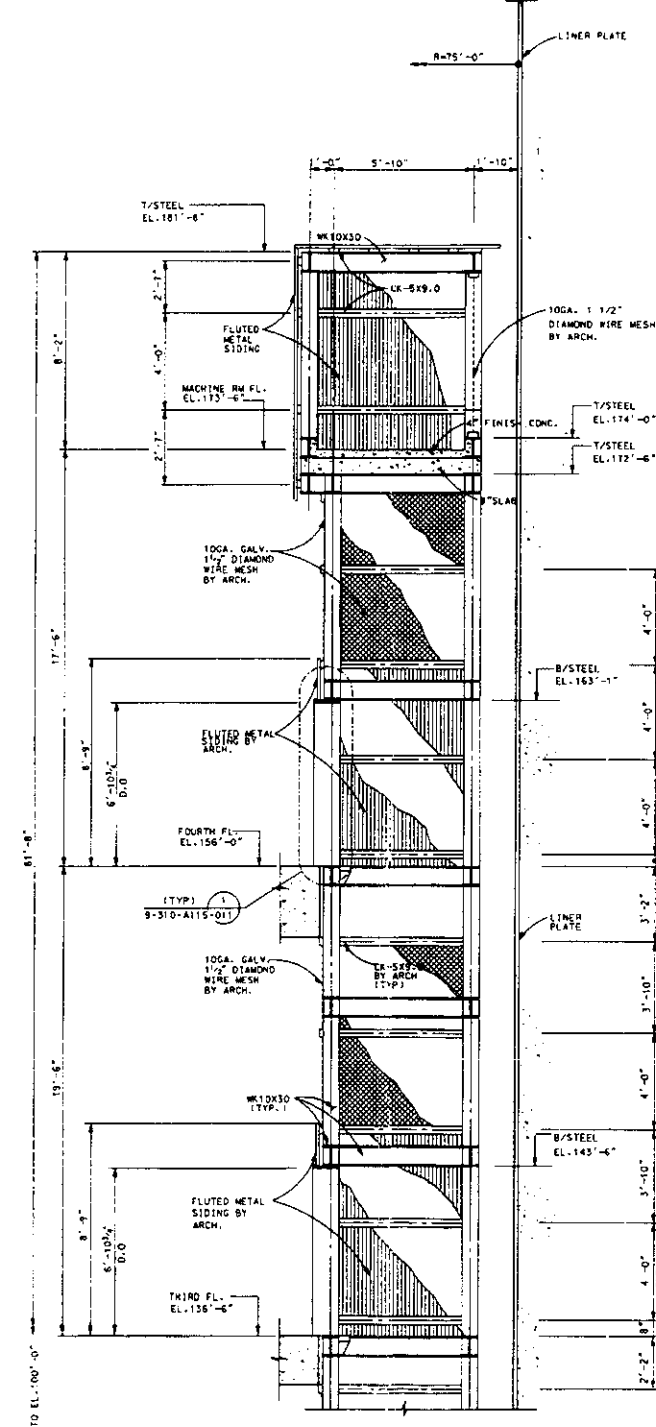
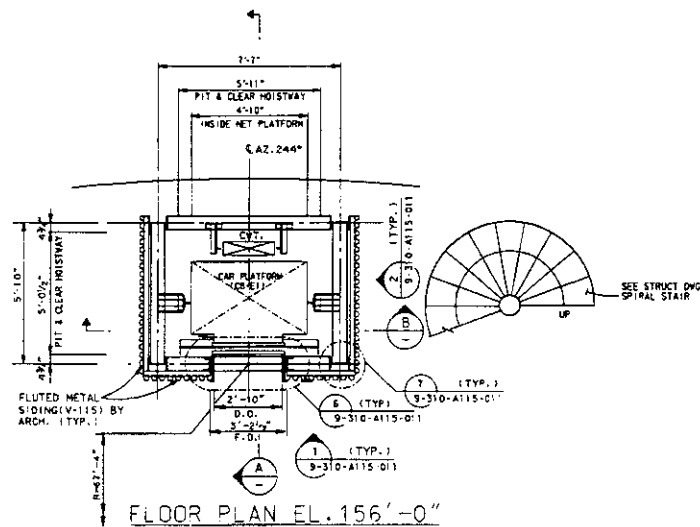
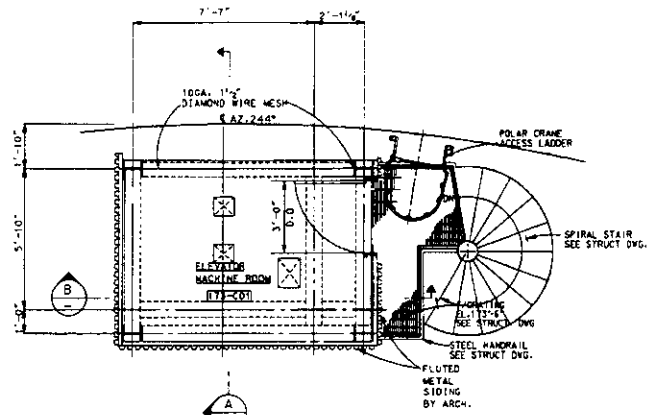
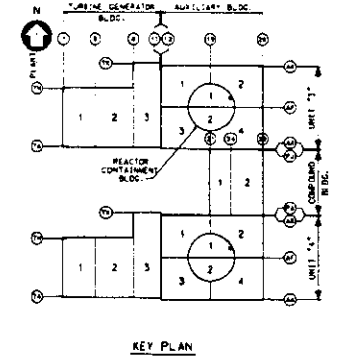
**KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

REACTOR CONTAINMENT BLDG ELEVATOR  
CB-E1 PLAN AND SECTION SH1

PROJECT DRAWING NUMBER	9-310-A115-006	SHEET	1/1
JOB NO.	2L173	SAFETY CATEGORY	S
AREA CODE	3100	SCALE	3/8"=1'-0"
REV.	0		

9-310-A115-007

INFORMATION ONLY



- NOTES
- FOR ARCHITECTURAL GENERAL NOTES, SEE DWG. 9-300-A101-001&002.
  - FURNISHING & INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR MANUFACTURER IN ACCORDANCE WITH SPECIFICATION 9-125-A203.
  - FOR SAFETY CATEGORY OF ARCHITECTURAL MATERIAL SHOWN ON THIS DWG, SEE GENERAL NOTE NO.13 ON DWG. 9-300-A101-001.

- REFERENCE DRAWINGS
- |                |  |
|----------------|--|
| 9-312-C121-021 | C/B STEEL STRUCT. FLOOR PLAN EL. 100'-0" (AREA2) |
| 9-313-C121-021 | C/B STEEL STRUCT. FLOOR PLAN EL. 114'-0" (AREA2) |
| 9-314-C118-021 | C/B CONC. STRUCT. FLOOR PLAN EL. 136'-6" (AREA2) |
| 9-315-C118-021 | C/B CONC. STRUCT. FLOOR PLAN EL. 156'-0" (AREA2) |

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED
1	11/29/04	ISSUE FOR CONSTRUCTION	김재영	김희정	김성기	김승호

**KOREA HYDRO & NUCLEAR POWER CO., LTD.**  
SHIN-BORI NUCLEAR POWER PLANT UNITS 3&4

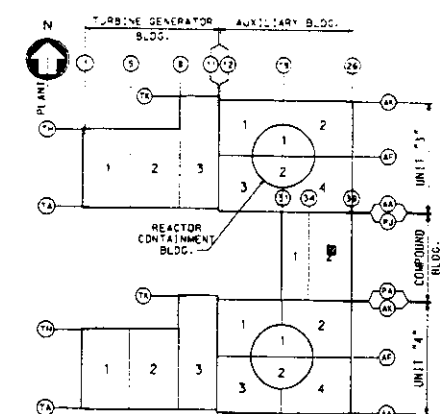
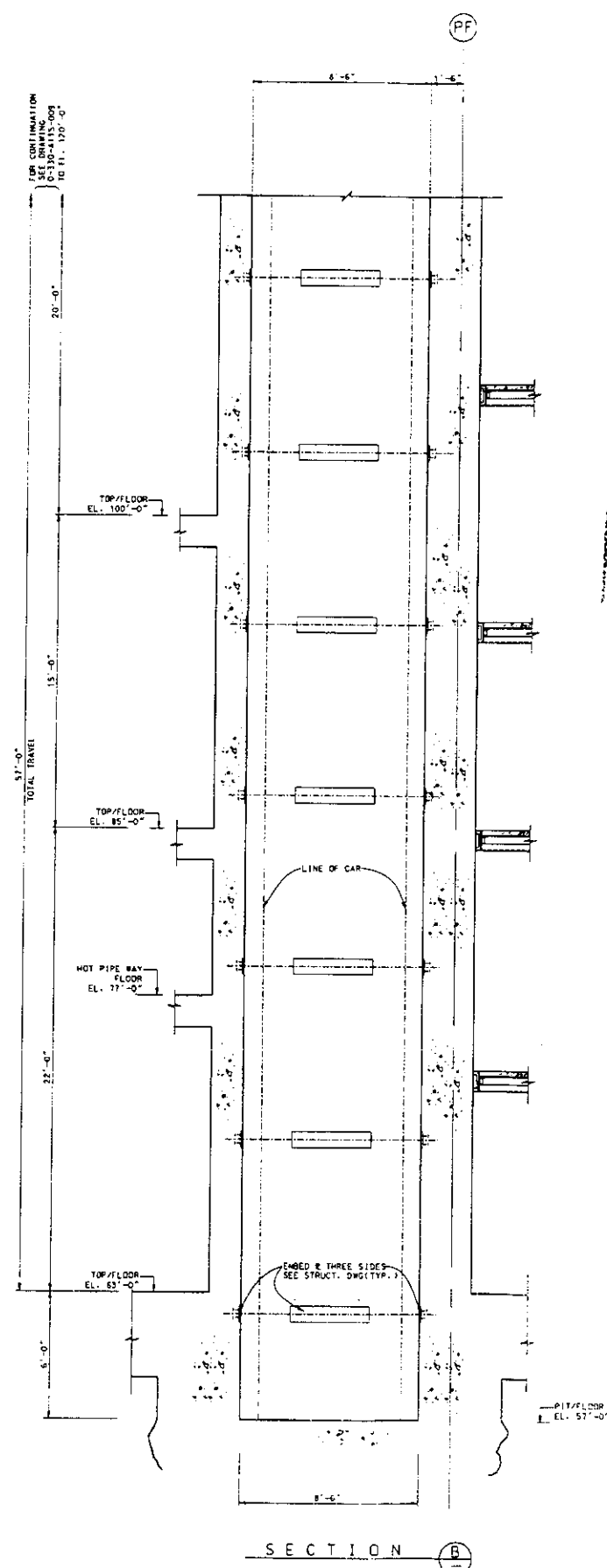
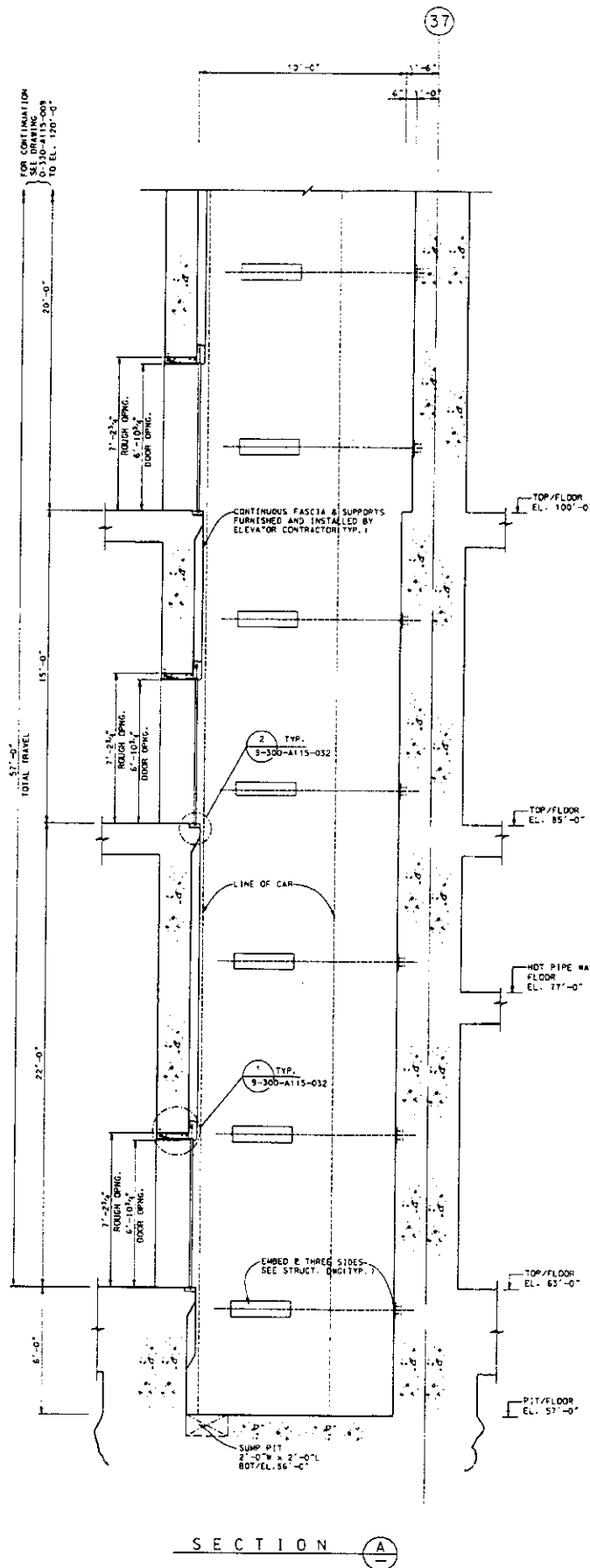
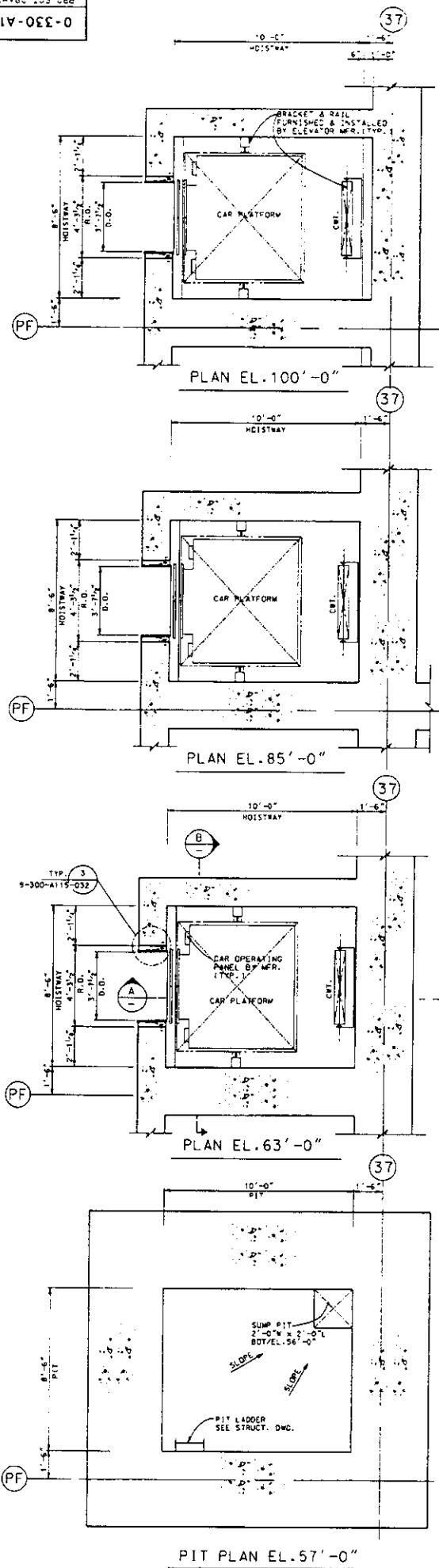
**KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

REACTOR CONTAINMENT BLDG ELEVATOR  
CB-E1 PLAN AND SECTION SH2

PROJECT DRAWING NUMBER	9-310-A115-007	SHEET	1/1
JOB NO.	2L179	SAFETY CATEGORY	S
AREA CODE	3100	SCALE	3/8"=1'-0"
			C



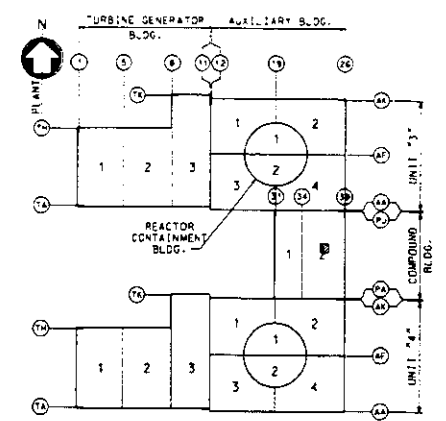
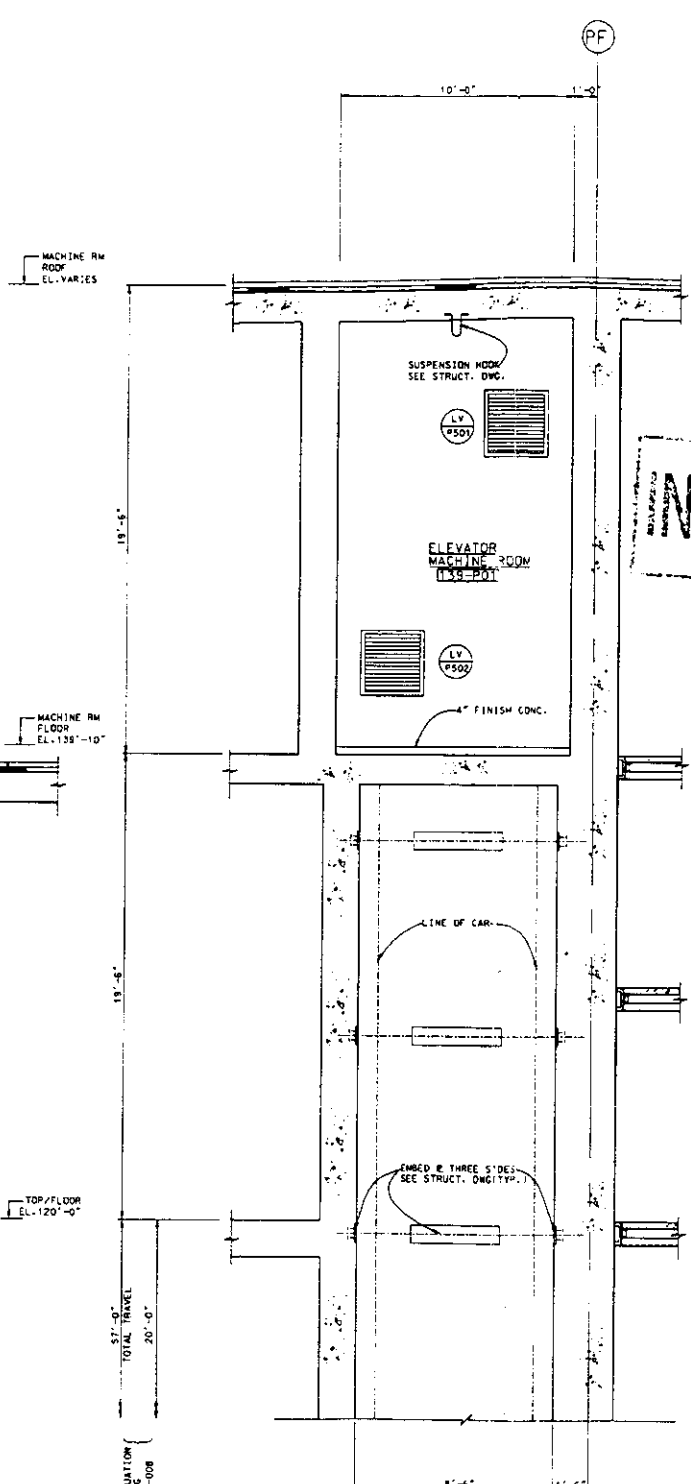
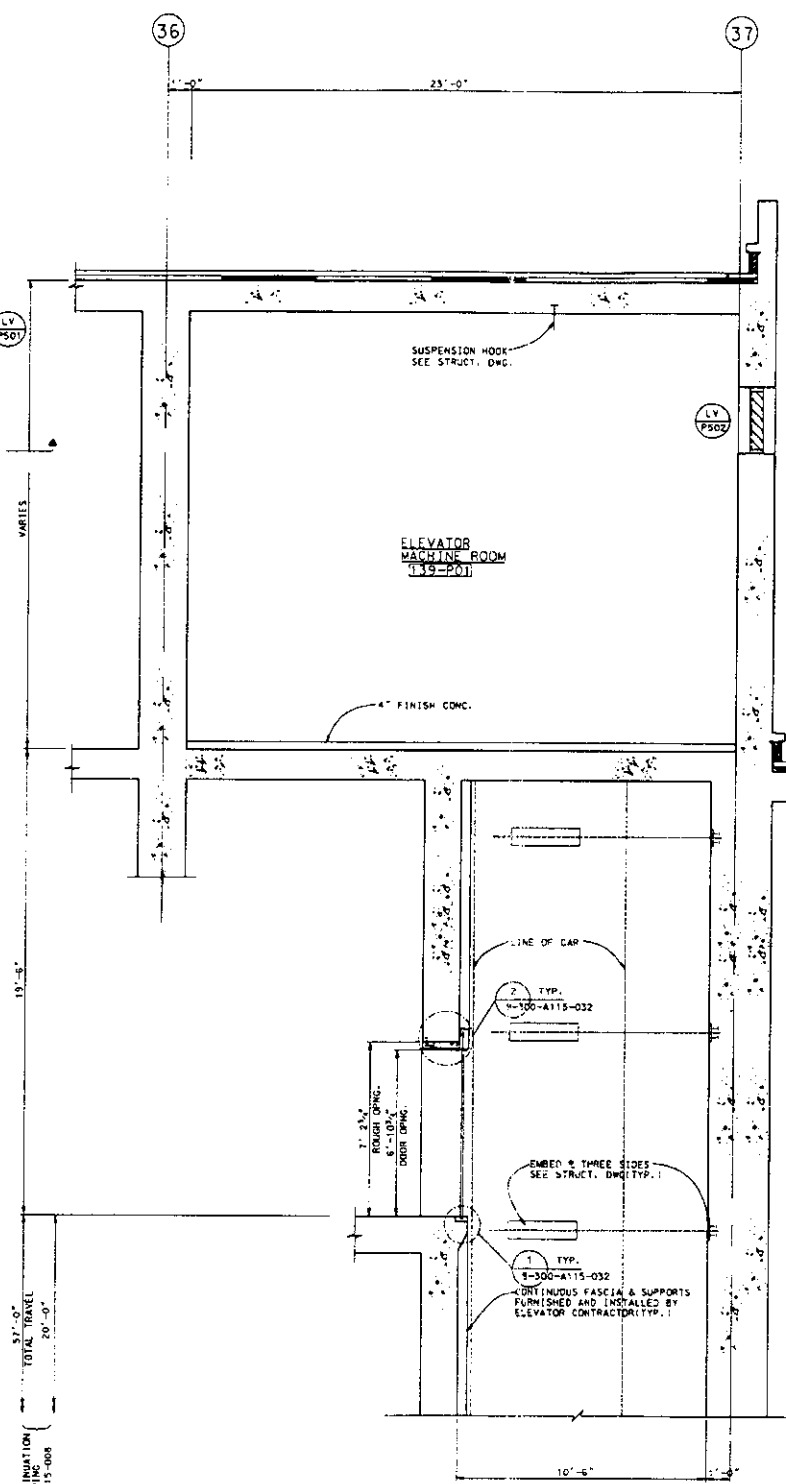
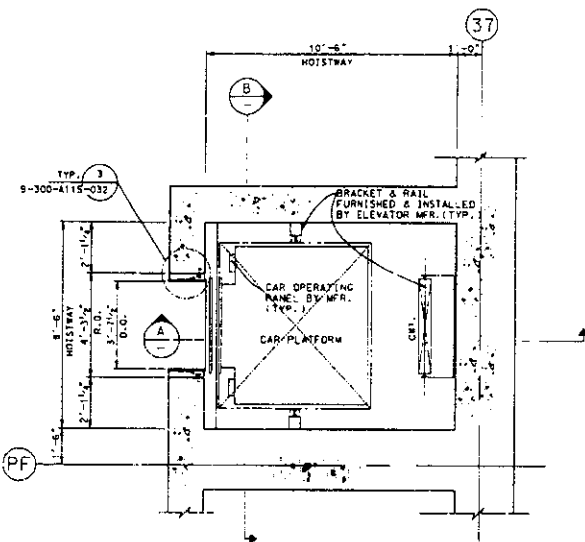
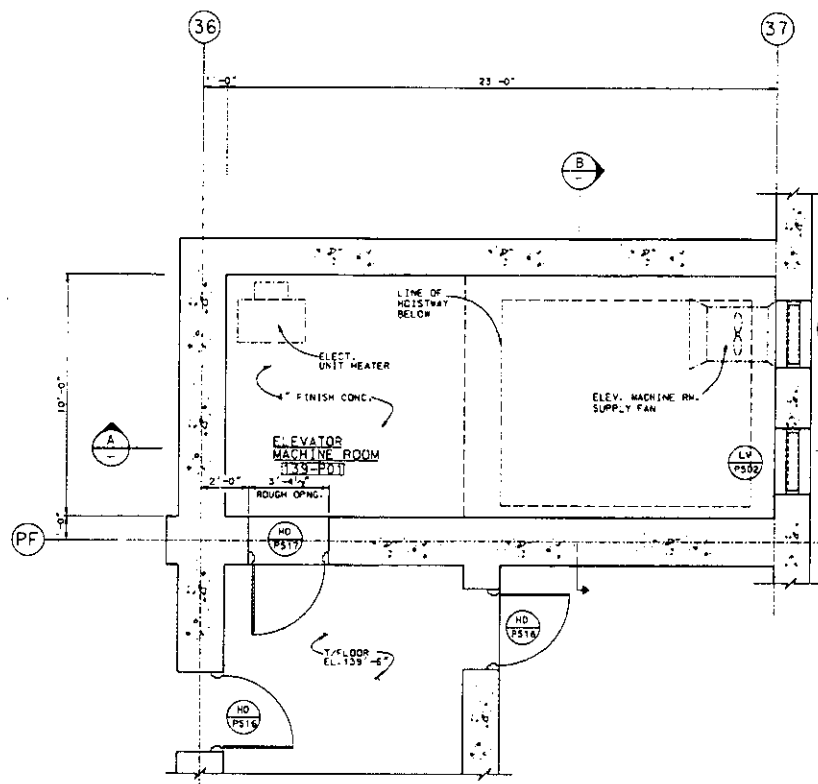
PROJECT NUMBER  
0-330-A115-008



INFORMATION ONLY

NOTES				
1. FOR ARCHITECTURAL GENERAL NOTES, SEE DWG. 9-300-A101-001 & 002.				
2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR CONTRACTOR IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203.				
REFERENCE DRAWINGS				
0-331-A112-030	COMPOUND BLDG. FLOOR PLAN EL. 63'-0" AREA 2			
0-332-A112-030	COMPOUND BLDG. FLOOR PLAN EL. 85'-0" AREA 2			
0-333-A112-030	COMPOUND BLDG. FLOOR PLAN EL. 100'-0" AREA 2			
REV.	DATE	DESCRIPTION	PREPARED	CHECKED
0	01/25/04	ISSUE FOR PRELIMINARY USE	김복경	정재영
<b>KOREA HYDRO &amp; NUCLEAR POWER CO., LTD.</b> SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4				
<b>KOPEC KOREA POWER ENGINEERING COMPANY, INC.</b> COMPOUND BUILDING ELEVATOR (P&E) PLAN & SECTION SH-1				
PROJECT DRAWING NUMBER		0-330-A115-008		SHEET 1/1
JOB NO.	SHEET CATEGORY	AREA CODE	SCALE	DATE
24179	N	3300	3/8"=1'-0"	4-4-20

600-S11V-000-0



INFORMATION ONLY

- NOTES
1. FOR ARCHITECTURAL GENERAL NOTES, SEE DWG. S-300-A101-001 & 002.
  2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR CONTRACTOR IN ACCORDANCE WITH SPECIFICATION NO. S-125-A203.

REFERENCE DRAWINGS

D-334-A112-030	COMPOUND BLDG. FLOOR PLAN EL. 120'-0" AREA 2
D-335-A112-030	COMPOUND BLDG. FLOOR PLAN EL. 139'-6" AREA 2

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED
0	07/20/04	ISSUE FOR PRELIMINARY USE	김영환	김재영	김성민	김성민

**KOREA HYDRO & NUCLEAR POWER CO., LTD.**  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

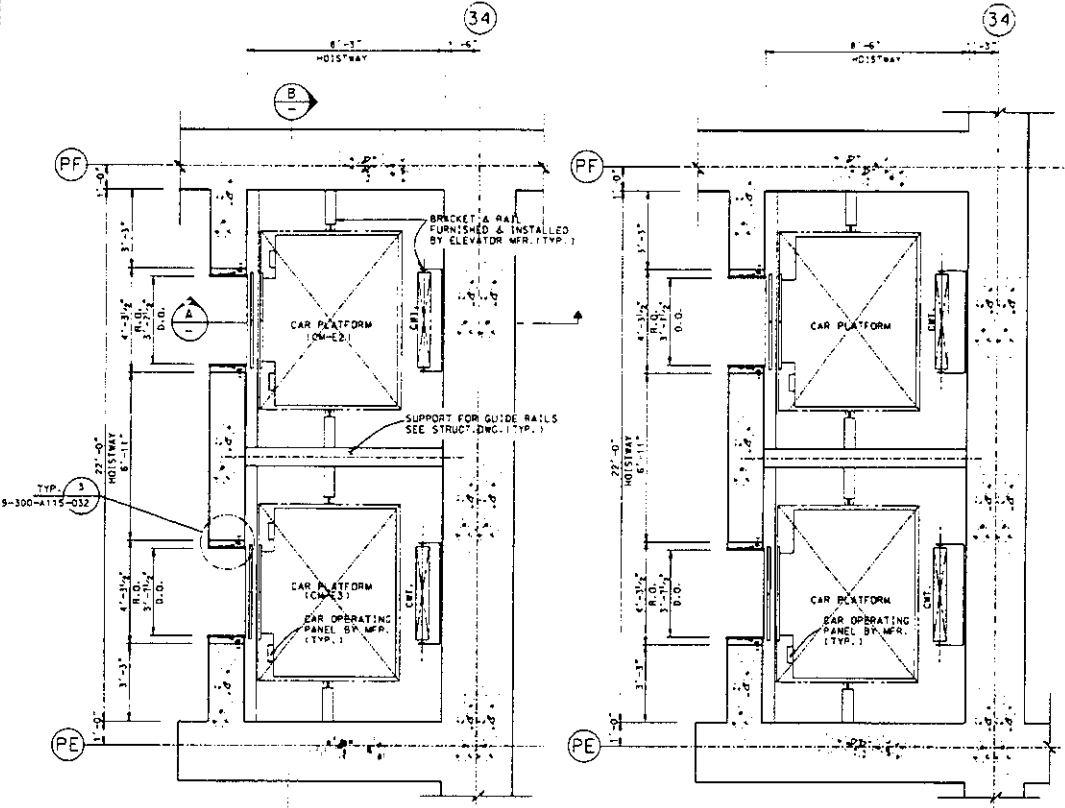
**KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

COMPOUND BUILDING ELEVATOR CP-E1  
PLAN & SECTION SH12

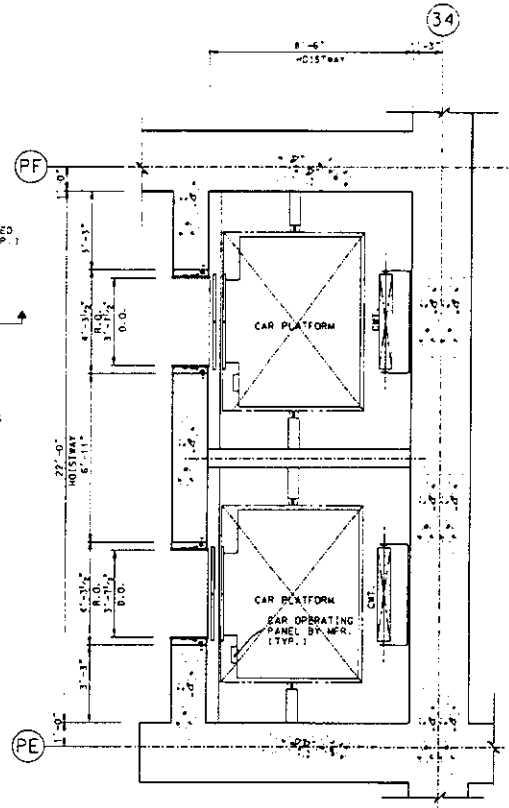
PROJECT DRAWING NUMBER	0-330-A115-009			SHEET
JOB NO.	SAFETY CATEGORY	AREA CODE	SCALE	REV.
21179	N	3300	3/8"=1'-0"	0

4-4-21

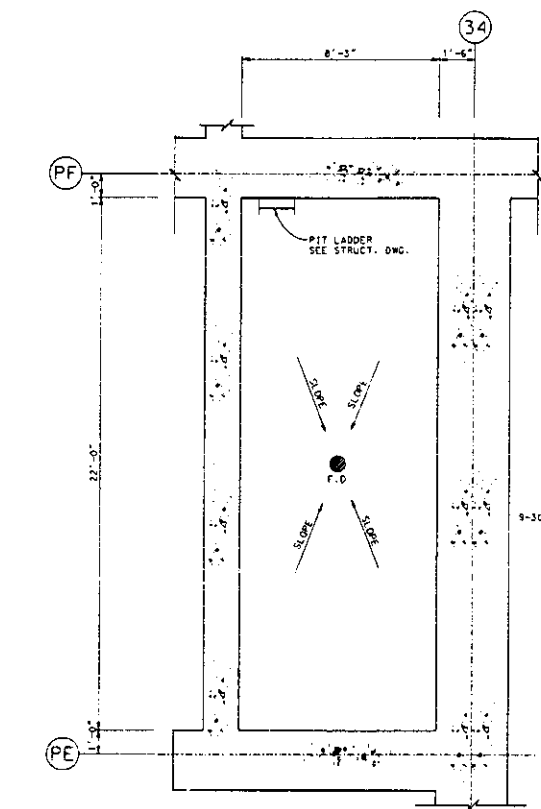
0-330-A115-010



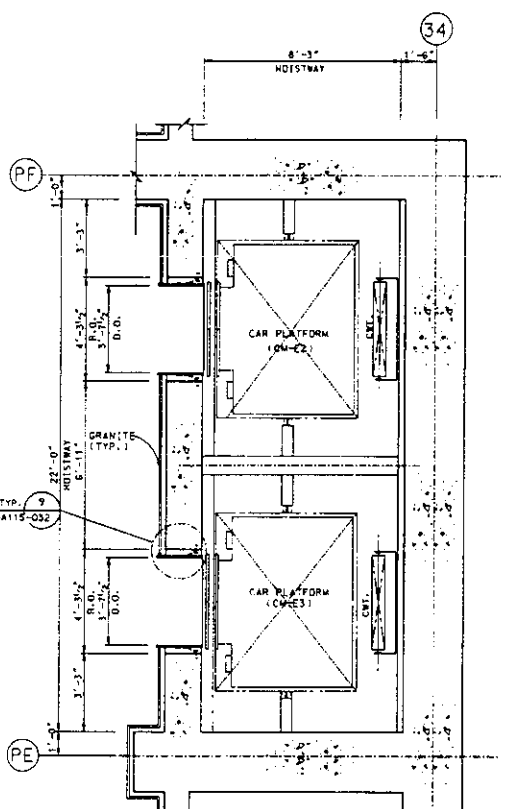
PLAN EL. 85'-0"



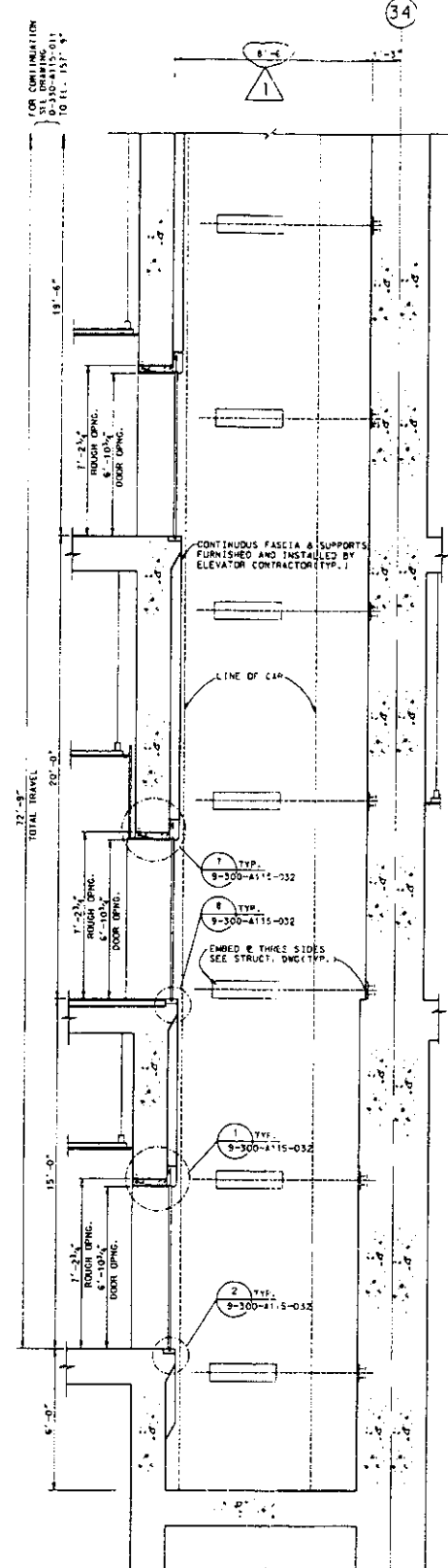
PLAN EL. 120'-0"



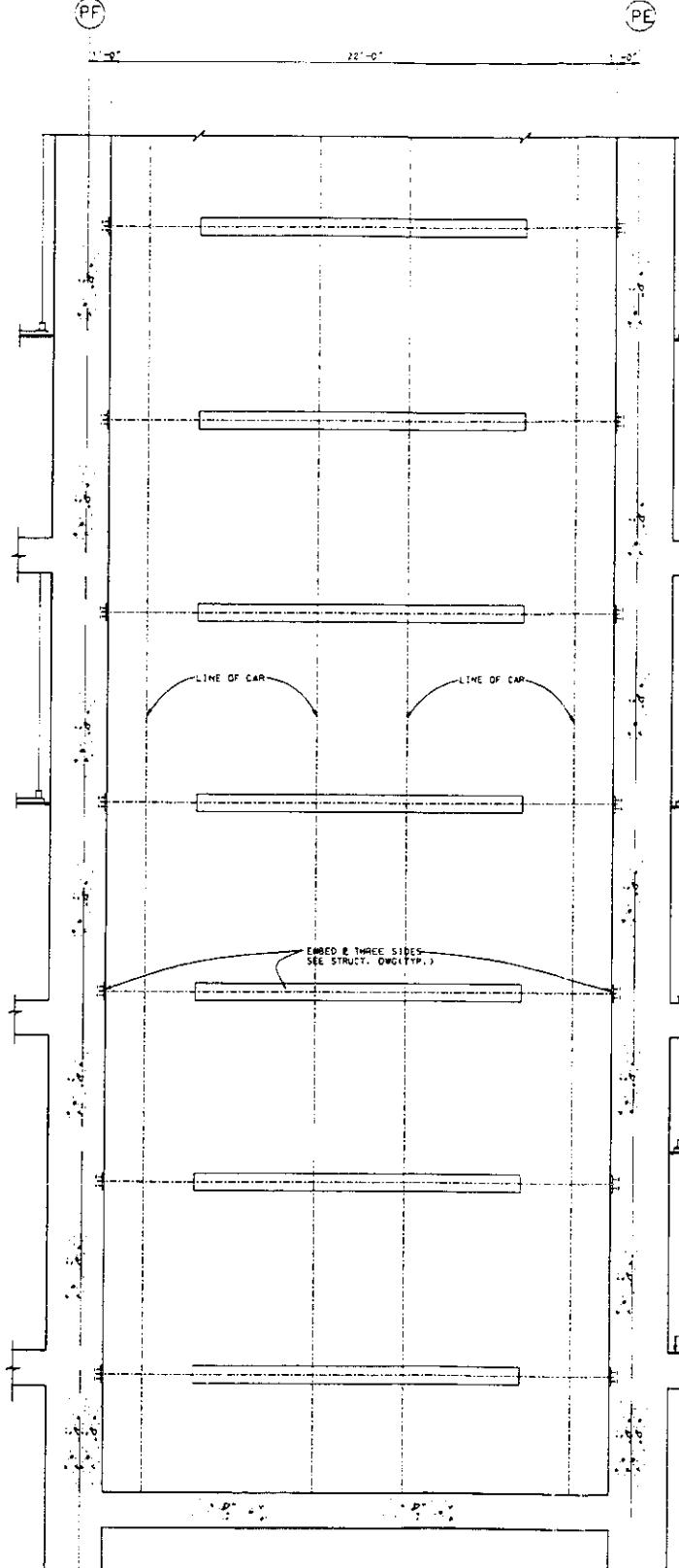
PIT PLAN EL. 79'-0"



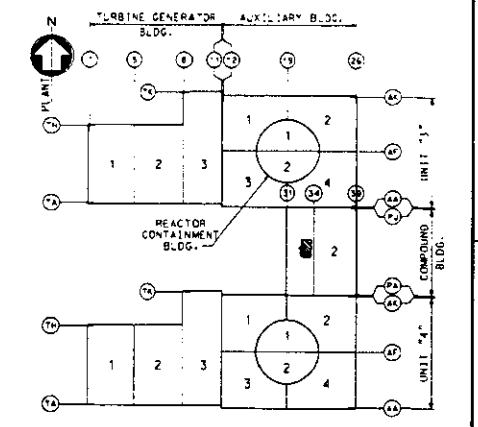
PLAN EL. 100'-0"



SECTION A



SECTION B



KEY PLAN

INFORMATION ONLY

- NOTES
1. FOR ARCHITECTURAL GENERAL NOTES, SEE DWG. 9-300-A101-001 & 002.
  2. FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR CONTRACTOR IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203.

- REFERENCE DRAWINGS
- |                |  |
|----------------|--|
| 0-331-A112-010 | COMPOUND BLDG. FLOOR PLAN EL. 63'-0" AREA 1  |
| 0-332-A112-010 | COMPOUND BLDG. FLOOR PLAN EL. 85'-0" AREA 1  |
| 0-333-A112-010 | COMPOUND BLDG. FLOOR PLAN EL. 100'-0" AREA 1 |
| 0-334-A112-010 | COMPOUND BLDG. FLOOR PLAN EL. 120'-0" AREA 1 |

01/20/04	ISSUE FOR PRELIMINARY USE	김복영	김재영	김성기	김승호
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	REVIEWED

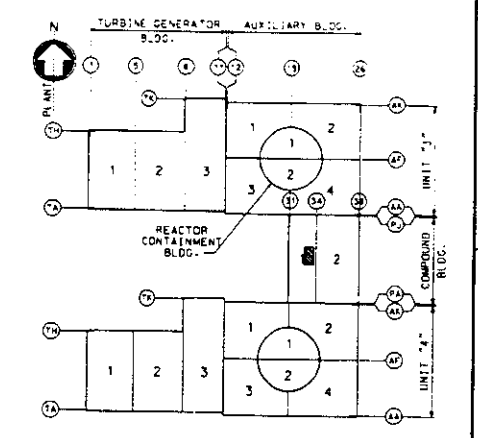
KOREA HYDRO & NUCLEAR POWER CO., LTD.  
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4

KOPEC KOREA POWER ENGINEERING COMPANY, INC.  
COMPOUND BUILDING ELEVATOR CP-E2&3  
PLAN & SECTION SH1

PROJECT DRAWING NUMBER	0-330-A115-010	SHEET	1/1
JOB NO.	26179	SCALE	3/8"=1'-0"
DATE	01/20/04	REV.	

4-4-22

0-330-A115-011



KEY PLAN

INFORMATION ONLY

MACHINE ROOM FLOOR PLAN EL. 174'-6"

PLAN EL. 139'-6"

PLAN EL. 157'-9"

SECTION A

SECTION B

- NOTES
- FOR ARCHITECTURAL GENERAL NOTES, SEE DWG. 0-330-A101-001 & 002.
  - FURNISHING AND INSTALLATION OF ELEVATOR SHALL BE PERFORMED BY ELEVATOR CONTRACTOR IN ACCORDANCE WITH SPECIFICATION NO. 9-125-A203.

REFERENCE DRAWINGS

0-335-A112-010	COMPOUND BLDG. FLOOR PLAN EL. 139'-6" AREA 1
0-336-A112-010	COMPOUND BLDG. FLOOR PLAN EL. 157'-9" AREA 1
0-339-A112-010	COMPOUND BLDG. ROOF PLAN

KOREA HYDRO & NUCLEAR POWER CO., LTD.	
SHIN-KORI NUCLEAR POWER PLANT UNITS 3&4	
KOPEC KOREA POWER ENGINEERING COMPANY, INC.	
COMPOUND BUILDING ELEVATOR CP-02&3	
PLAN & SECTION 5472	
PROJECT DRAWING NUMBER	0-330-A115-011
DATE	2007.10.22
REVISION	1
DESCRIPTION	ISSUE FOR PRELIMINARY USE
PREPARED	김정민
CHECKED	김정민
REVIEWED	김정민
APPROVED	김정민

SKN 3&4

## APPENDIX 4A1

### Quality Assurance Program Requirements

KOPEC JOB NO. : 2L179



**KOPEC** KOREA POWER ENGINEERING COMPANY, INC.

#### ISSUE STATUS

REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED
2	'04.06.30	Incorporated Client's the revised QPS	S.C. Doo	J.W. Lee	N.N. Heo	D.J. Choi
1	'03.04.30	Incorporated Client's Survey Results	S.C. Doo	T.U. Kang	N.N. Heo	D.J. Choi
0	'02.09.10	Issue for Use	S.C. Doo	J.W. Lee	N.N. Heo	E.J. Kim

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
1.0	SCOPE	4A1-1
2.0	TERMINOLOGY	4A1-1
3.0	QUALITY ASSURANCE PROGRAM CRITERIA	4A1-2
4.0	QUALITY ASSURANCE MANUAL SUBMITTAL REQUIREMENT	4A1-3
5.0	QUALITY ASSURANCE PROGRAM REQUIREMENTS	4A1-4

## **1.0 SCOPE**

- 1.1 This appendix applies to the supplier of items and services and the construction contractor(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, 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 relevant activities only after obtaining the Buyer's acceptance.
- 1.6 The supplier may delegate any or all activities to the sub-supplier, but in this case, the supplier shall assure that the sub-supplier is subjected to the applicable quality assurance requirements of this appendix.

## **2.0 TERMINOLOGY**

- 2.1 Buyer: Korea Hydro & Nuclear Power Co., Ltd.(KHNP) and his authorized agents
- 2.2 Supplier: An entity which provides services, equipment, components, fabrication, construction, etc. to the Buyer in accordance with contract requirements. As all-inclusive term used in place of any of the following: vendor, seller, construction contractor, fabricator, consultant and their sub-tier levels.
- 2.3 Controlled Copy: A copy of the supplier's documents which is marked with a controlled copy number through which 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 assign 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 Atomic Energy Laws: Korea Atomic Energy Act, the Enforcement Decree of the Korean Energy Act, the Enforcement Regulations of the Korea Atomic Energy Act, MOST Ordinances and MOST Notices.
- 2.7 Regulatory Body: The Korea Ministry of Science and Technology(MOST) or his 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 the power plant, and whose failure could impact the environment (e.g., radiation damage) and public safety.
- 2.9 T-class Items: Items, portions of structures, systems or equipment or related services whose failure could reduce the functioning of any safety-related plant features(Q-class) to an unacceptable level.
- 2.10 R-class Items: Items, related services which are identified as reliability critical to achieve a high plant availability of the power generating function of the plant.
- 2.11 S-class Items: Non-safety-related items that are not quality class Q, T or R.

### **3.0 QUALITY ASSURANCE PROGRAM CRITERIA**

#### **3.1 General**

- 3.1.1 The Regulatory requirements and applicable codes and standards effective as of December 31, 2001 shall be used except 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.



- 3.1.4 In case of QA Program that is based on ISO 9001, 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.

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

- 3.2.1 The supplier who performs safety-related works (relevant to Q-class) shall establish a QA program to meet criteria of Korea Atomic Energy Laws and Enforcement Decree of Korea Atomic Energy Laws, 10 CFR 50 App. B, KEPIC-QAP(Korea Electric Power Industry Code-Nuclear QA)(2000 edition)/ASME NQA-1(1994 edition and 1995 addenda) and Reg. Guide 1.28(Rev. 3).

#### **3.2.1.1 Domestic supplier(including sub-supplier)**

- A. MOST Notice 2000-17
- B. MOST Ordinance No. 31(28 July, 2001)
- C. KEPIC MN/SN/EN Items
  - Component : KEPIC MNA/SNA/ENA 4200, and KEPIC- QAP(2000 edition)
  - Material : KEPIC MNA/SNA 4300
- D. Items except KEPIC-MN/SN/EN : KEPIC-QAP(2000 edition) or ASME NQA-1(1994 edition and 1995 addenda)

#### **3.2.1.2 Foreign supplier(including sub-supplier)**

- A. 10 CFR 50 App. B
- B. ASME B&PV Code Sec. III Items
  - Component : ASME B&PV Code Sec. III, NCA 4000, and ASME NQA-1(1994 edition and 1995 addenda)
  - Material : ASME B&PV Code Sec. III, NCA 3800
- C. Items except ASME B&PV Code Sec. III : ASME NQA-1(1994 edition and 1995 addenda)

### **3.3 T, R-class Quality Assurance Program Criteria**

The supplier who supplies T and R-class items shall establish and implement a QA Manual, and this QA Manual shall contain the requirements described in section 5.0 of this appendix depending on applicable contract requirements.

### **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 a QA Manual voluntarily to meet those quality requirements.

#### **4.0 QUALITY ASSURANCE MANUAL SUBMITTAL REQUIREMENT(Q,T,R-class)**

- 4.1 Tenderers/Contractors shall submit QA Manual with Tender or after Award in accordance with this appendix. The Tenderer/Contractor, who has submitted a controlled copy of his QA Manual for the same quality class, previously in this project, which has been accepted by the Buyer in accordance with this appendix, need only submit documented evidence to provide commitment that the controlled copy is applicable to the scope of the work involved in the Tender/Contract.

Documented evidence shall also address the current revision number, and identify the procurement specification number for which the Tenderer/Contractor had submitted the previously approved QA Manual.

- 4.2 The Tenderer who holds any certificate according to applicable code and standard, such as a KEPIC / ASME Certificate of Authorization, ISO Certificates and other accredited authorization, submits a copy of his current certificates.

#### **5.0 QUALITY ASSURANCE PROGRAM REQUIREMENTS(T and R Class)**

The following quality assurance program criteria identify the minimum essential elements of a quality assurance program. 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 requirement may be tailored in accordance with item's characteristics.

##### **5.1 Organization**

- 5.1.1 The organizational structure, functional responsibilities, levels of authority, lines of communication for activities affecting quality, and implementation of QA Manual shall be documented.
- 5.1.2 The responsibilities and authorities of persons or organizations responsible for establishing appropriate QA Manual and for verifying that activities affecting quality have been correctly performed shall be documented.
- 5.1.3 Persons or organizations responsible for verifying that activities affecting quality have been correctly performed shall have sufficient authority to identify quality problems, provide solutions, and assure that unsatisfactory conditions are controlled until appropriate actions have been taken.

- 5.1.4 Persons and organizations performing quality assurance functions shall have sufficient authority and freedom from cost and schedule considerations and shall report quality problems to a management at a level where appropriate action can be affected.
- 5.1.5 Where more than one organization is involved in the execution of activities covered by the contract, the division of responsibility for each organization shall be clearly established and procedures for exchanging information among organizations shall be prepared and all important information shall be documented.

## **5.2 Quality Assurance Program**

- 5.2.1 The supplier shall establish and implement a QA program in accordance with requirements in this appendix.
- 5.2.2 The QA Program shall assure that activities affecting quality shall be performed in accordance with written instructions, procedures, or drawings of a type appropriate to the circumstances.
- 5.2.3 Organizations responsible for establishing and executing the QA Program, and the responsibility and authority of relevant personnel and/or organizations shall be clearly prescribed.
- 5.2.4 The QA Program shall include consideration of the technical aspects that the supplier should implement, and the QA Program shall cover all comprehensive contract requirements.
- 5.2.5 The QA Program shall provide for the planning and accomplishment of activities affecting quality under suitably controlled conditions. Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity and assurance that prerequisites for the given activity have been satisfied.
- 5.2.6 The QA Program shall provide for indoctrination and training, as necessary, of personnel performing activities affecting quality, and the records of indoctrination, training, and qualification shall be maintained.
- 5.2.7 The QA Program shall be periodically reviewed, evaluated in adequacy and effectiveness, and revised as necessary.
- 5.2.8 Items, services, and processes to which the QA Program will apply shall be identified, and the QA Program shall provide control over activities affecting quality of the identified item and services to an extent consistent with their importance and characteristics.
- 5.2.9 Computer programs(verification of computer program to produce valid solution and identification

of computer program used in applicable documents) and fire protection system whose failure could affect quality of NPP shall be applied with the QA requirements of applicable quality class.

### **5.3 Design Control**

#### **5.3.1 Design procedure**

- 5.3.1.1 Procedure shall be established to assure that design and QA requirements of technical specification are incorporated into supplier's instruction, procedure and drawing, etc..
- 5.3.1.2 The preparation, review, approval, issue, revision, distribution, and control of design documents (drawing, design specification, etc.) shall be performed in accordance with established procedures.
- 5.3.1.3 Design procedures shall include requirements for analysis (stress, heat, pressure, and vibration analysis, etc.), material fitness evaluation, accessibility for in-service inspection and maintenance, acceptance criteria for test and inspection, etc.

#### **5.3.2 Design input control**

- 5.3.2.1 Applicable design inputs such as design bases, design requirements, codes and standards shall be documented, and their selection shall be reviewed and approved by the responsible design organization.
- 5.3.2.2 Changes from approved design inputs, including the reasons for the changes, shall be approved and the changes shall be identified, documented, and controlled.

#### **5.3.3 Design process control**

- 5.3.3.1 Design activities shall be performed in accordance with approved procedures to assure that design inputs are correctly incorporated into specifications, drawings, procedures, and instructions.
- 5.3.3.2 Appropriate quality standards shall be incorporated into design documents, and their changes shall be reviewed, approved, and controlled.
- 5.3.3.3 The final design shall be related and reviewed with the design input.
- 5.3.3.4 Design activities shall be documented to permit adequate evaluation and audit by personnel other than those who performed the original design.

#### **5.3.4 Design verification**

- 5.3.4.1 The supplier shall establish and implement the design verification plan, including design reviews, alternate calculations, qualification tests, or combination of methods.
- 5.3.4.2 Design verification shall be performed by any competent individuals or groups other than those who performed the original design, and if the verification is performed by qualification test, the tests shall be performed under conditions that simulate the most adverse design conditions.
- 5.3.5 Design interface control
  - 5.3.5.1 Design interface shall be identified, documented and controlled. Interface control shall include the division of responsibility and establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces.
- 5.3.6 Design change control
  - 5.3.6.1 Design changes shall be processed in accordance with approved procedures, in which the review process relating to change and documentation requirements, etc. shall be prescribed.
  - 5.3.6.2 Design change shall be approved by the same groups or organizations which reviewed and approved the original design document, and affected groups shall be notified of these changes.
- 5.3.7 Design documents and review records shall be maintained and controlled as quality assurance records.

#### **5.4 Procurement Document Control**

- 5.4.1 A control measure shall be established to assure that applicable regulatory requirements, design bases, technical and quality requirements are suitably included or referenced in the procurement documents.
- 5.4.2 The procurement requirements shall require to establish and provide a QA Manual consistent with the pertinent provisions of this appendix.
- 5.4.3 The procurement document shall include the followings:
  - A. Quality assurance program requirements
  - B. Technical requirements
  - C. Supplier's right to inspect and audit the subcontractor
  - D. Document submittal requirements
  - E. QA records submittal requirements
- 5.4.4 Procurement documents shall be reviewed by the quality organization to assure that the

procurement document includes appropriate quality assurance requirements.

- 5.4.5 The supplier, when purchasing items which this appendix is applied to, shall procure them from a selected supplier who has sufficient capability to observe technical and QA requirements.

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

- 5.5.1 Activities affecting quality shall be prescribed by and documented in accordance with written instructions, procedures, or drawings of a type appropriate to the circumstances.
- 5.5.2 These documents shall include or reference appropriate quantitative or qualitative acceptance criteria in order to determine that prescribed activities have been satisfactorily accomplished.
- 5.5.3 The instructions, procedures, and documents to be prepared for implementing the QA Manual shall be identified.

## **5.6 Document Control**

- 5.6.1 A control measure for preparation, issuance, and change of documents(instructions, drawings, or procedures, etc.) that specify quality requirements or prescribe activities affecting quality shall be established and documented.
- 5.6.2 The provisions for document control shall include the followings:
- A. Selection of individuals or organization responsible for preparation, review, approval and issuance of relevant documents (including revisions)
  - B. Document changes, including major and minor changes
  - C. Selection and use of quality documents applicable to relevant activities
  - D. Control and cooperation of interfacing documents
  - E. The use of the latest documents
  - F. Preparation and maintenance of document distribution lists for maintaining the latest issues

## **5.7 Control of Purchased Materials, Equipment, and Services**

- 5.7.1 A control measure to assure that purchased materials, equipment, and services, whether purchased directly by the supplier or through a lower-tier sub-supplier, comply with the procurement requirements shall be established and documented in accordance with contract requirements.
- 5.7.2 Procurement plan shall be established prior to implementing activity, and this planning may include classification of purchasing items, scheduling, etc.

- 5.7.3 Measures for control of purchased items and services shall include the following requirements as appropriate:
- A. Source evaluation and selection
  - B. Quality verification documents to be submitted by the sub-supplier
  - C. Inspection and QA audit to sub-supplier
  - D. Receiving inspection and acceptance criteria

## **5.8 Identification and Control of Materials, Parts, and Components**

- 5.8.1 A measure for the control and identification of materials, parts, and components shall be established and documented.
- 5.8.2 The QA Manual shall be established and implemented to provide traceability of records for design, manufacturing, test, inspection and relevant material, parts, and components.
- 5.8.3 The QA Manual shall be established and implemented to provide identification of storage items, such as materials, parts, and equipment, in accordance with item number (part, batch, lot and heat number). If nonconforming items are found, their use shall be stopped.
- 5.8.4 Deleted

## **5.9 Process Control**

- 5.9.1 Process shall be controlled by procedures, instructions, drawings, checklists, travelers, or other appropriate means.
- 5.9.2 A measure shall be established and documented to assure that special processes such as welding, heat treatment, flushing, painting, and non-destructive examination are accomplished by qualified personnel using qualified procedures.
- 5.9.3 Qualification for personnel, process, and equipment of each special process shall be performed, and qualification procedures and records shall be prepared and maintained.

## **5.10 Inspection**

- 5.10.1 A plan for inspection of activities affecting quality shall be established and implemented by qualified personnel or groups responsible for verifying that the items or activities are in compliance with the requirements of procedures, instructions, and drawings.
- 5.10.2 Inspection shall be performed by individuals other than those who performed the activities being

inspected and the inspector shall not report directly to the immediate supervisors who are responsible for performing the work being inspected.

- 5.10.3 Inspector shall be qualified, records for personnel qualification and qualification procedures shall be prepared and maintained.
- 5.10.4 Inspection activities shall be performed in accordance with the inspection plan(or quality plan), which shall be reviewed by the Buyer prior to commencement of work.
- 5.10.5 The inspection plan shall include at least the followings:
  - A. Item to be inspected
  - B. Work process and the step to be inspected
  - C. Documents applicable to each inspection process
  - D. Witness point and hold point
  - E. Quality assurance record submittal for each process
- 5.10.6 The supplier shall evaluate the inspector's ability and workmanship to assure that he is able to perform his assignment which verifies that the item or activities meet applicable quality requirements.

## **5.11 Test Control**

- 5.11.1 Tests necessary to demonstrate that the items will perform satisfactorily in actual service shall be selected and implemented by the documented procedures or test plan, as required by the contract.
- 5.11.2 Test procedures or test plan shall include test requirements and acceptance criteria, provisions for assuring that prerequisites for the given tests have been met, and that adequate instrument is selected and used and that suitable environmental conditions are maintained.
- 5.11.3 Prerequisites for tests shall include the following:
  - A. Instrument calibration status
  - B. Appropriate equipment
  - C. Item to be tested
  - D. Acceptance criteria
- 5.11.4 Test results shall be documented and evaluated by a responsible authority to assure that the test has been performed satisfactorily, and that acceptance criteria has been observed.
- 5.11.5 Test personnel shall be qualified, and qualification procedures and qualification records shall be prepared and maintained.



## **5.12 Control of Measuring and Test Equipment**

- 5.12.1 Calibration plan, procedures, records for tools, gages, instruments and other measuring and test equipment used for activities affecting quality shall be prepared and implemented to assure that these items are of proper type, range, and accuracy, and meet relevant requirements.
- 5.12.2 The method and interval of calibration for each equipment shall be defined at appropriate procedures, based on the type of equipment, stability, characteristics, required accuracy, intended use, and other conditions affecting measurement control. Calibration status shall be identified on equipment, using appropriate methods.
- 5.12.3 When measuring and test equipment are found to be out of calibration, an evaluation shall be made and documented of the validity of previous inspection/test results and of the acceptability of items previously inspected/tested.
- 5.12.4 The measuring and test equipment shall be stored in appropriate environmental condition to maintain accuracy.

## **5.13 Handling, Storage, and Shipping**

- 5.13.1 A control measure for handling, storage, cleaning, packaging, preservation, and shipping of items shall be established and documented to prevent damage or loss and to minimize deterioration.
- 5.13.2 When required for critical, sensitive, perishable, or high-value articles, specific procedures for handling, storage, packaging, shipping, and preservation shall be used. Special handling tools and equipment shall be provided and utilized as necessary to ensure safe and adequate handling.
- 5.13.3 Instructions for marking and labeling for packaging, shipment, handling, and storage of items shall be established as necessary to adequately identify, maintain, and preserve the item. When a special item is treated, the presence of special environments or the need for special control shall be indicated.
- 5.13.4 Operator of special handling and lifting equipment shall be experienced or trained in use of the equipment.

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

- 5.14.1 The status of inspection and test activities shall be identified either on the items or in documents traceable to the items where it is necessary to assure that required activities are performed and to assure that items which have not passed the required inspections and tests are not inadvertently

installed, used, or operated.

## **5.15 Nonconforming Materials, Parts, or Equipments**

- 5.15.1 A measure to control items or activities that do not conform to specified requirements shall be established to prevent inadvertent installation or use. This measure shall provide for identification, documentation, evaluation, segregation, disposition of nonconforming items, and notification to affected organizations. Nonconformance Report(NCR) shall be issued in accordance with procedures, and nonconforming items shall be reviewed and properly dispositioned as to use-as-is, reject, repair, or rework in accordance with documented procedures.
- 5.15.2 When segregation for nonconforming items is impractical, a measure to prevent use of the rejected/nonconforming item shall be prescribed, using appropriate identification method such as marking and tagging.
- 5.15.3 Nonconformances which are found during the manufacturing process shall be notified immediately to the Buyer verbally, and shall be documented using a NCR, and shall be immediately given to the Buyer's representative.
- 5.15.4 Technical justification for the acceptability of a nonconforming items, dispositioned repair or use-as-is shall be performed by the supplier and the results shall be submitted for the Buyer's approval.
- 5.15.5 A copy of the NCR shall be submitted to the Buyer as necessary.
- 5.15.6 The supplier shall submit to the Buyer a copy of the closed NCR with being attached to quality verification document.
- 5.15.7 If the Buyer finds nonconformances when performing surveillance, audit or other oversight activity at the supplier's facilities, the Buyer may request a corrective action or stopwork as necessary.

## **5.16 Corrective Action**

- 5.16.1 A measure shall be established and implemented to identify and correct any condition adverse to quality, such as failures, malfunctions, deficiencies, defective materials and equipment, and nonconformance.
- 5.16.2 Corrective action shall be implemented comprehensively enough to cover all affected activities or equipment.

- 5.16.3 In the case of a significant condition adverse to quality, the cause of the condition shall be determined and corrective action taken to preclude recurrence.
- 5.16.4 The identification, cause, and corrective action for any condition adverse to quality shall be documented and reported to appropriate levels of management.
- 5.16.5 If a significant deficiency to quality occurs or a similar condition adverse to quality occurs repeatedly, it is required to stop the related work as necessary.

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

- 5.17.1 Documented records for evidence of activities affecting quality shall be prepared and maintained to provide identification and traceability.
- 5.17.2 Responsibility and requirements for document transmittal, retention, and maintenance after completion of work shall be documented in accordance with contract requirements. The records which are not submitted to the Buyer shall be appropriately maintained and controlled.
- 5.17.3 The records shall include the results of inspection, test, design, procurement, monitoring of work performance, audit, and material analysis as specified in the procurement document.
- 5.17.4 The procedures or instructions for record storage shall be established to prevent damage from moisture, temperature, and pressure.

#### **5.18 QA Audit**

- 5.18.1 Planned and scheduled audits by the supplier's QA organization shall be performed to verify compliance with all aspects of the QA Manual and to determine its effectiveness, and the results shall be documented.
- 5.18.2 Audits shall be performed in accordance with written procedures or checklists by qualified personnel who do not have direct responsibility for performing the activities being audited.
- 5.18.3 Audit results shall be documented by the auditors and reviewed by management having responsibility for the area audited. The audited organization shall take any corrective action immediately and report its results to the management.
- 5.18.4 Follow-up action, including a follow-up audit or document verification, shall be taken to verify that corrective action has been accomplished.

SKN 3&4

## APPENDIX 4B

### Quality Surveillance Requirements

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

#### ISSUE STATUS

2	'05. 9. 21	General Revision	이관구	손익수	정재호	박상욱
1	'04.4.28	Incorporated Client's QPS Revision	이관구	김형규	손익수 최성표	박상욱
0	'02.9.17	Issue for Use	탁성현	김열훈	손익수 최성표	박상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

**TABLE OF CONTENTS**

<b><u>SECTION</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
1.0	SCOPE	4B-1
2.0	TERMINOLOGY	4B-1
3.0	CONTRACTOR'S QUALITY INSPECTION REQUIREMENTS	4B-2
4.0	QUALITY PLAN SUBMITTAL REQUIREMENTS	4B-2
5.0	BUYER'S QUALITY SURVEILLANCE REQUIREMENTS	4B-3
6.0	NONCONFORMANCE CONTROL	4B-5
7.0	SUPPLIER DEVIATION CONTROL	4B-5
8.0	QUALITY PROGRAM VERIFICATION (QPV)	4B-6

**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 : Korea Hydro & Nuclear Power Co., Ltd. (KHNP) 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 sub-tier 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's 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 traveller 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)

Form App. 4B, Rev.2

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

Form App. 4B, Rev.2

<u>Quality Plan Detail</u>							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

Shin-Kori 3&4

## APPENDIX 4C

### General Requirements for Submittal of Documents

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

#### ISSUE STATUS

2	'04.04.26	Incorporated Client's QPS Revision	권동식	김형국	<del>김세원</del>	박상욱
1	'03.05.28	General Revision	권동식	김열훈	김세원 최성표	박상욱
0	'02.09.18	Issue for Use	권동식	김열훈	김세원 최성표	박상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

## TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	GENERAL	4C-1
2.0	SUBMITTAL OF DRAWING AND DOCUMENT	4C-4
3.0	PERMISSION TO PROCEED	4C-6
4.0	DRAWING AND DOCUMENT CONTENTS	4C-8
5.0	QUALITY REQUIREMENTS	4C-11
6.0	SAMPLES	4C-11
7.0	QUALITY VERIFICATION DOCUMENTATION	4C-11
8.0	AS-BUILT DRAWINGS	4C-13
9.0	REQUIREMENTS FOR ELECTRONIC MEDIA	4C-14
10.0	STORAGE AND INSPECTION REQUIREMENTS FOR ELECTRONIC MEDIA	4C-18
11.0	ELECTRICAL DRAWING REQUIREMENTS	4C-20

## ATTACHMENTS

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



## 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 "DXF (Drawing Exchange Format)"- The interface file format between different CAD software.

1.2.7 "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)

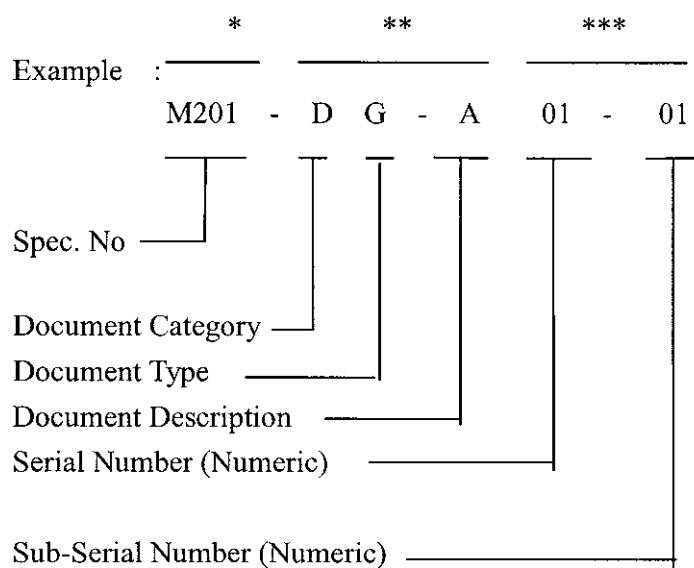
1.3.1 In addition to the Supplier's own document number, the Supplier shall assign, for each document to be submitted to the Buyer in accordance with Appendix 4D, an identification number based upon the Buyer's Project Numbering System (PNS) as set forth in Section 1.3.3 of the Appendix.

- 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 : M201 - 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 1)
- \*\*\* 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

## 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(inches)
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 & 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 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 Supplier shall include, as a minimum, the following information :
- a. Project Name & Unit Number : SKN 3&4 or Shin-Kori Nuclear Power Plant #3,4
  - b. The Buyer's Name : KOREA HYDRO & NUCLEAR POWER CO., LTD.
  - 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, T, R, or 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 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 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 maximum shear and tension load acting on bolt for bolted mounting type, or
- b. Welding plan, size, start and ending point for welded mounting type

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 Deleted

4.6.7 Equipment or anchor bolt installation tolerance shall be included in the drawing when required.

4.6.8 Equipment Configuration 3D CAD Model

- a. Equipment Configuration 3D CAD Model shall be developed and submitted to Buyer including all sub-assembly parts which comprise the whole equipment.
- b. The Equipment Configuration 3D CAD Model electronic file shall be submitted with native CAD file format and DXF (Data Exchange Format) to Buyer when the equipment outline drawing is submitted.
- c. The equipment parts list index shall be developed and submitted to Buyer in conjunction with Configuration 3D CAD Model.
- d. The database format of equipment parts list shall be in accordance with Buyer's requirements after contract award.

#### 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 1/2 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 subsupplier's) failure to initially satisfy the legibility quality requirements herein set forth, shall not relieve the Supplier (or his subsuppliers) 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 it's 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 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
- e. Final signed-off quality plan
- f. Test reports of the production tests specified in the specification
- g. 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**

8.1 All as-built drawings in a 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 to the Buyer, if the Buyer so requests. The Supplier shall deliver the drawings 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 it is the intent of the Supplier to destroy these 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 98 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

File format shall be either DGN (Microstation CAD file) or DWG (AutoCAD file). Microstation CAD file is recommended.

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

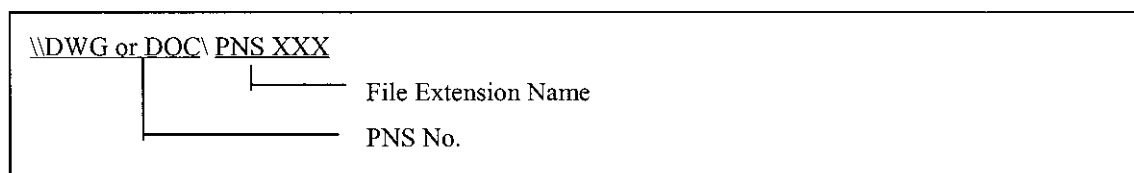
File format may be either the MS word file or HWP file.

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

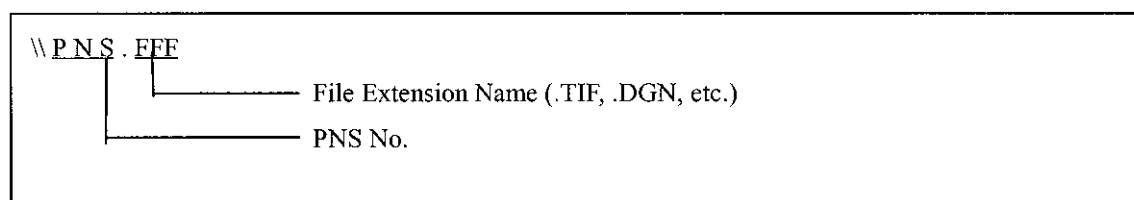
- a. Image file shall be in PDF (Portable Document Format) or TIFF format per CCITT Group 4 .
- b. 200 DPI (dots per inch) or greater is required as a scanning resolution.
- c. 1 to 1 is required as a scanning reduction ratio.

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

- a. Directory structure shall be as follows :



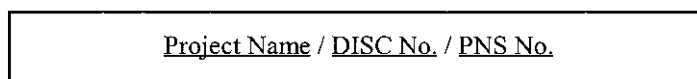
- b. An example of the file name structure is as follows :



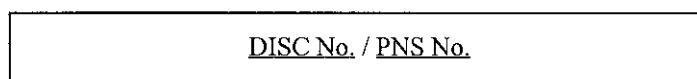
#### 9.5.7 File Storage Structure and Label Attachment

- 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



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





- 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 100ft 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 an electronic signals.
- d. The temperature of 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. 62 ~ 68°F and 35 ~ 45% humidity, etc.

#### 10.3.3 Storage conditions for optical media

- a. 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. 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.

## 11.2 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 four (4) inches of space shall be furnished on the terminal block drawings for each row of terminals on the drawings (8 inches 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 is 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.

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

CC :

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

[illegible]

**ATTACHMENT 1**  
**SUPPLIER'S TRANSMITTAL**

SUPPLIER DOCUMENT LIST (CONTINUED)

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

[illegible]



(RETURN COPY)

SKN 3&amp;4

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

To :

From : A/E DDCC

CC:

ZIP CODE 449-713, 360-9,  
MABUK-RI, GUSEONG-EUP  
YONGIN-SI, GYEONGGI-DO,  
REPUBLIC OF KOREA

Supplier

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

## A/E Transmittal

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

Date \_\_\_\_\_

Date\_\_\_\_\_

\* 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.	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)

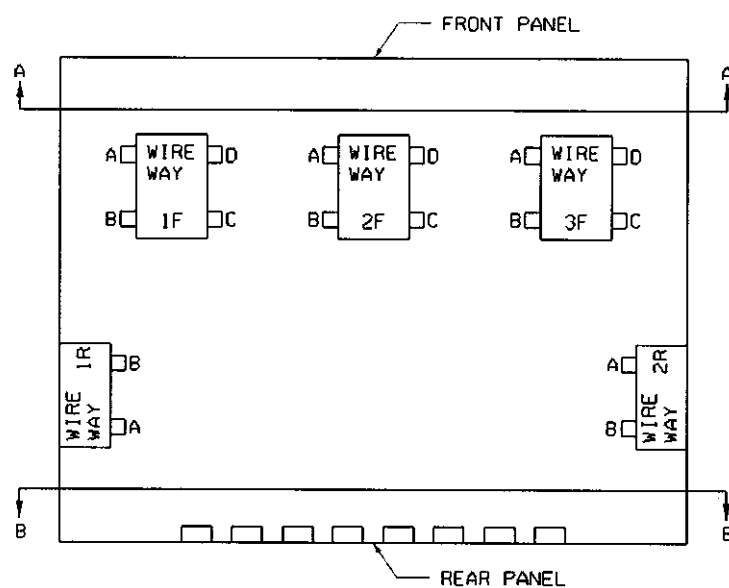
Page        of       [illegible]

**ATTACHMENT 2**  
**DRAWING AND DOCUMENT SUBMITTAL SCHEDULE LIST**

Supplier Name \_\_\_\_\_

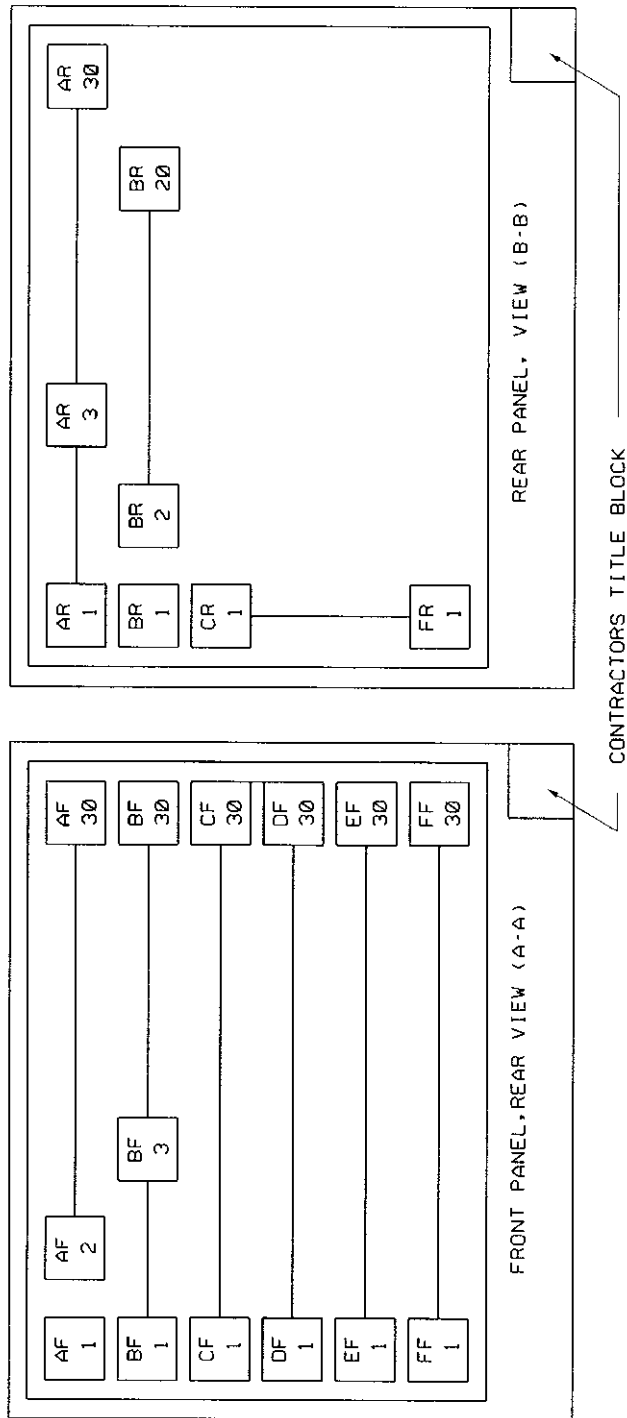
[illegible]

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

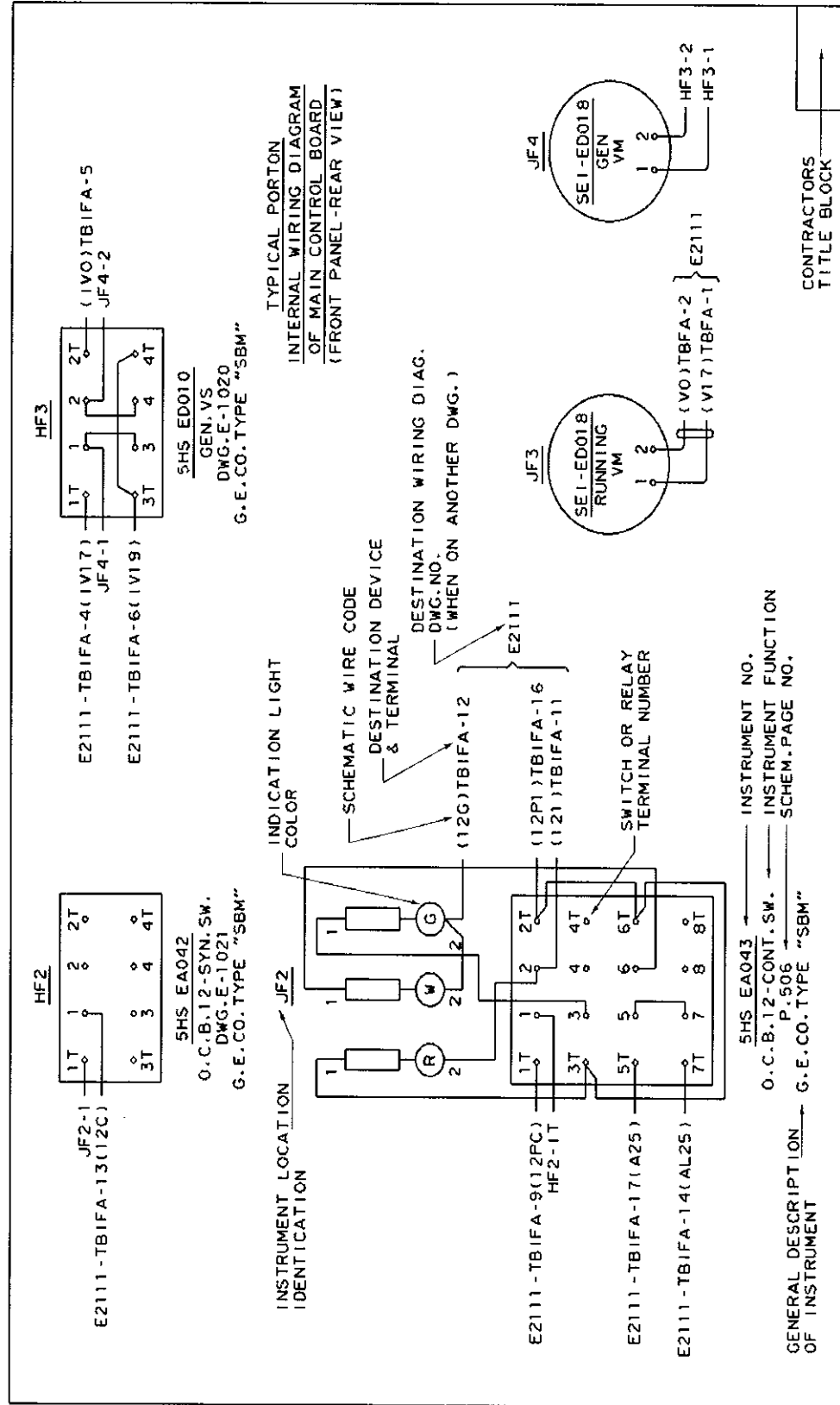
ATTACHMENT 4  
INSTRUMENT LOCATION GRID  
ASSIGNMENT METHOD



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

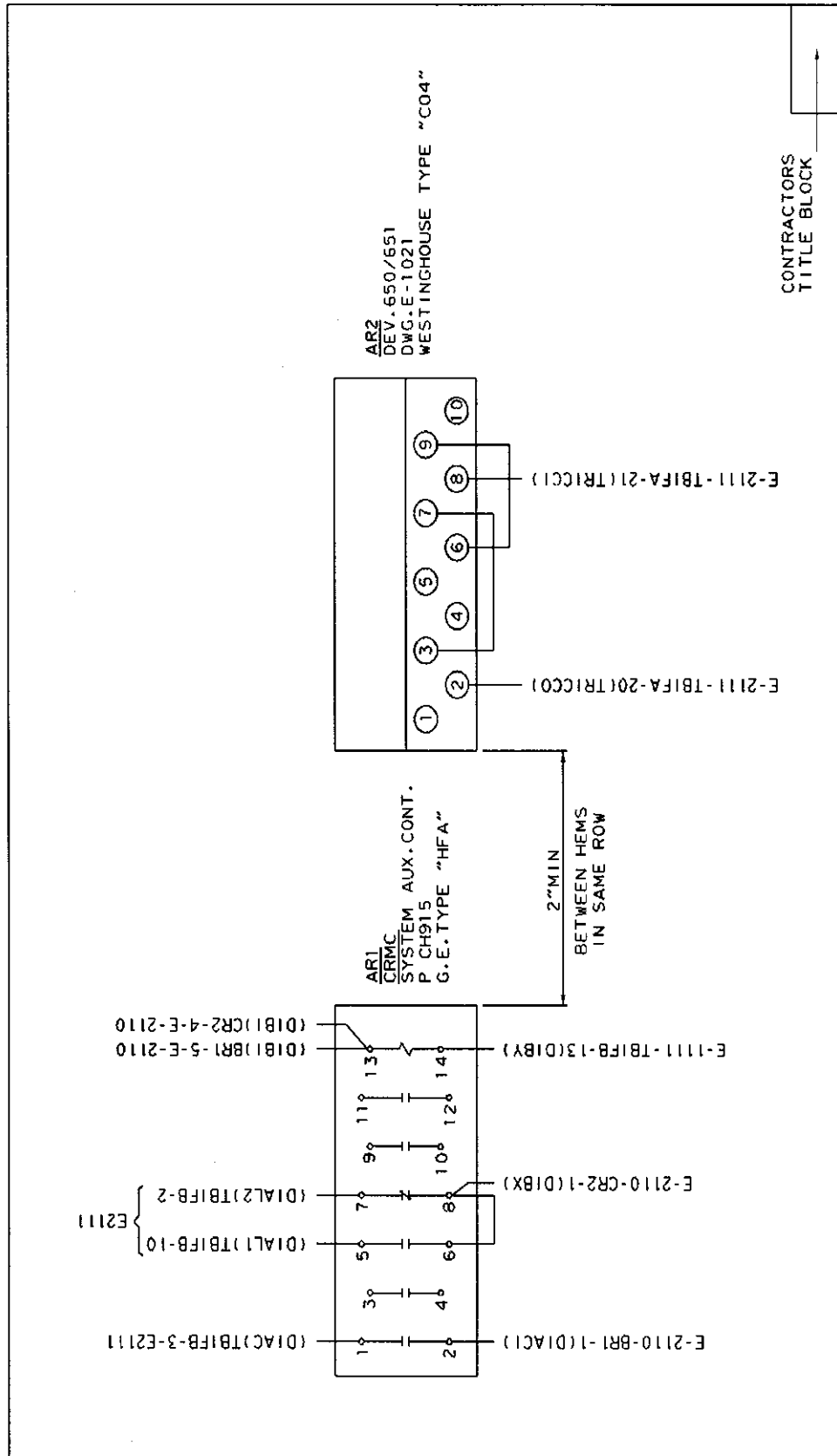
**ATTACHMENT 5**

**TYPICAL PORTION INTERNAL WIRING DIAGRAM CONTROL BOARD (FRONT PANEL, REAR VIEW)**



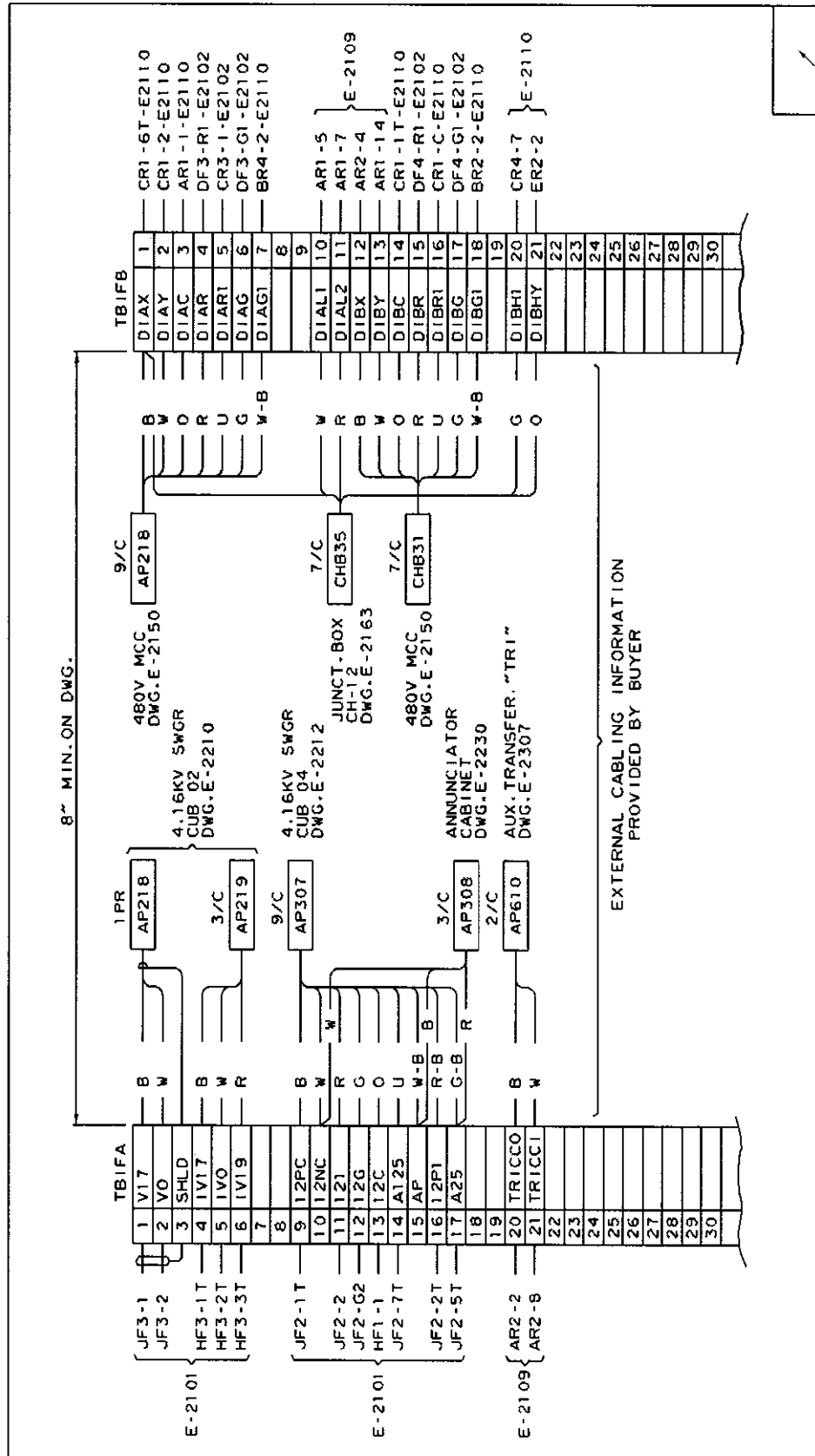
ATTACHMENT 6

TYPICAL PORTION INTERNAL WIRING DIAGRAM RELAY CABINET OR REAR PANEL OF CONTROL BOARD



ATTACHMENT 7

TYPICAL PORTION INTERNAL-EXTERNAL WIRING DIAGRAM TERMINAL BLOCKS ON WIREWAY OF CONTROL BOARD OR PANEL



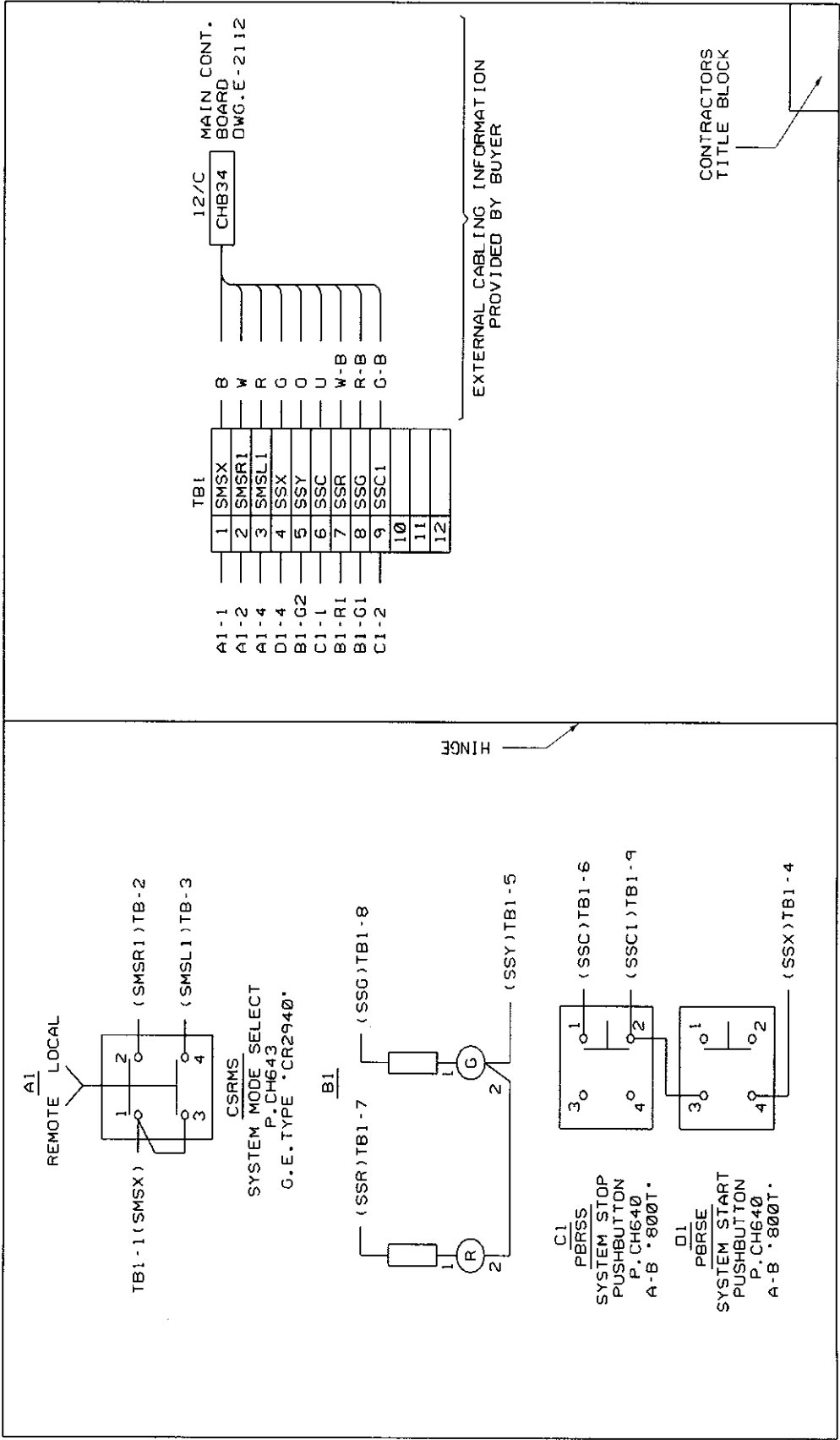
CONTRACTORS  
TITLE BLOCK



ATTACHMENT 8  
TYPICAL INTERNAL-EXTERNAL WIRING DIAGRAM  
OF LOCAL CONTROL CABINET

DOOR-REAR VIEW

REAR-FRONT VIEW



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.				
<div style="text-align: right;">             _____              Certified by Buyer           </div>				

**DRAWING AND DOCUMENT SUBMITTAL REQUIREMENTS**Spec. No. : 9-125-A203Spec. Rev. No.: 1Page 1 of 3

SUBMIT FOR		PNS GUIDE (1)	DOCUMENT DESCRIPTION	SPECIFICATION PARA. NO.	REQUIREMENTS		REMARKS (4)
R E V I S I O N	I N F O				QTY & TYPE (2)	SUBMITTAL WEEKS (3)	
			<b>D0. <u>Submittal With Proposal</u></b>		*		*One Copy Per Each Proposal
			• Spare Parts List			PR	
			• KEPIC/ASME/ISO Certificate, etc.	3A.24F		PR	
			<b>D1. <u>Quality Assurance/Quality Surveillance</u></b>				
×		QL-A	• Supplier's Quality Plan	App.4B,4.1	3P+ 1ENor1EP	AW+4	
			<b>D2. <u>Schedule &amp; Progress</u></b>				
×		CL-A	• Drawing and Data Submittal Schedule	App.4C,2.3.2	3P+1EX	AW+4	
	×	CL-B	• Supplier's Work Schedule Including Engineering, Procurement, Fabrication and Delivery	4.04.B.6	5P	AW+4	To KHNP
	×	CR-A	• Work Progress Report	4.04.B.7	5P	AW+8 & *	*Monthly ToKHNP
			<b>D3 <u>Design and Engineering</u></b>				
×		DG-A	• Outline Drawings	4.04.B.1	5P+ 1ENor1ET	AW+8	
×		DG-B	• Shop Drawings	4.04.B.1	5P+ 1ENor1ET	AW+8	
×		DG-C	• Wiring Diagram	4.04.B.3	3P+ 1ENor1ET	AW+8	
×		DG-D	• Schematic Diagram	4.04.B.3	3P+ 1ENor1ET	AW+8	
×		DE-A	• Logic Diagram	4.04.B.3	3P+ 1ENor1ET	AW+8	
×		DG-E	• Location of Incoming and Outgoing Panel Connections	4.04.B.4	3P+ 1ENor1ET	AW+8	
×		DT-A	• Motor outline drawing including Terminal Box	App.4N,5.1	3P+ 1ENor1ET	AW+8	
×		DT-B	• Motor Design Data	4.04.B.8	3P+ 1ENor1ET	AW+4	

(1) Refer to Appendix 4C, Para. 1.3 for detail explanations.

(2) Quantity: In numeral, Type: P=Paper Printing/Photocopy, M=Wash-Off Mylar,  
E= Electronic Files (N:NATIVE, P:PDF, T:TIF, V:VECTOR)

(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) .

**DRAWING AND DOCUMENT SUBMITTAL REQUIREMENTS**Spec. No. : 9-125-A203Spec. Rev. No.: 1Page 2 of 3

SUBMIT FOR		PNS GUIDE (1)	DOCUMENT DESCRIPTION	SPECIFICATION PARA. NO.	REQUIREMENTS		REMARKS (4)
REV W	INFO				QUANTITY & TYPE (2)	SUBMITTAL WEEKS (3)	
x		DT-C	<ul style="list-style-type: none"> <li>Motor Performance Curve</li> </ul>	App.4N	3P+ 1EN or 1EP	AW+4	
×		MR-A	<b>D4. <u>Manufacturing and Fabrication</u></b> <ul style="list-style-type: none"> <li>Nameplate Drawings</li> </ul>	4.08	3P+ 1EN or 1EP	SH-30	*1 : Two Sample Color Chip Per Each proposed Color *2 : Manufacturing *3 : Two Model Catalogue
	×	MZ-A	<ul style="list-style-type: none"> <li>Sample Color Chip</li> </ul>	4.07B	*1	*2-8	
	×	MZ-B	<ul style="list-style-type: none"> <li>Model Information</li> </ul>	4.04.B.5	*3	AW+4	
×			<ul style="list-style-type: none"> <li>Motor Nameplate Drawings</li> </ul>	4.08.C	3P+ 1EN or 1EP	AW+20	
			<b>D5. <u>Test and Examination</u></b>				
×			<ul style="list-style-type: none"> <li>Motor Test Procedure</li> </ul>	4.04.B.9	3P+ 1EN or 1EP	AW+16	
	×		<ul style="list-style-type: none"> <li>Motor Test Report</li> </ul>	4.04.B.9	3P+ 1EN or 1EP	AW+16	
			<b>D6. <u>Packing and Shipping</u></b>				
	×	SP-A	<ul style="list-style-type: none"> <li>Packing Procedure</li> </ul>	4.10.A	3P+ 1EN or 1EP	SH-20	
	×	SP-B	<ul style="list-style-type: none"> <li>Shipping &amp; Transportation and Storage Procedure</li> </ul>	4.10.A	3P+ 1EN or 1EP	SH-20	
			<b>D7. <u>Site Instruction and Guide</u></b>				
	×	IM-A	<ul style="list-style-type: none"> <li>Instruction Manual</li> </ul>	4.11.A	26P+1EP	SH	20 Copies with Shipment to Site & 6 Copies to the A/E
			<b>D8. <u>Quality verification Document</u></b>				
×		VL-A	<ul style="list-style-type: none"> <li>QVDL and It's Sample Forms Listed in Appendix 4E</li> </ul>	App.4C, 7.3	3P+ 1EN or 1EP	AW+4	
	×	VR-A	<ul style="list-style-type: none"> <li>Quality Verification Documents</li> </ul>	App.4C, 7.0	3P+1EP	SH	Two Copies With Shipment to Site & One Copy to the A/E

(1) Refer to Appendix 4C, Para. 1.3 for detail explanations.

(2) Quantity: In numeral, Type: P=Paper Printing/Photocopy, M=Wash-Off Mylar,  
E= Electronic Files (N:NATIVE, P:PDF, T:TIF, V:VECTOR)

(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) .

**DRAWING AND DOCUMENT SUBMITTAL REQUIREMENTS**Spec. No. : 9-125-A203Spec. Rev. No.: 1Page 3 of 3

SUBMIT FOR		PNS GUIDE (1)	DOCUMENT DESCRIPTION	SPECIFICATION PARA. NO	REQUIREMENTS		REMARKS (4)
R E V W	I N F O				QUANTITY & TYPE (2)	SUBMITTAL WEEKS (3)	
			<b>D9. <u>3D CAD Electronic File</u></b> <ul style="list-style-type: none"> <li>Native 3D CAD File Format &amp; DXF</li> <li>Index of Equipment Part List</li> </ul>	App. 4C, 4.6.8  App. 4C, 4.6.8	1EN+1ED  1EN	AW+16  AW+16	
			<b>D10. <u>AS-BUILT Drawing &amp; Document</u></b> <ul style="list-style-type: none"> <li>All As-Built Drawings</li> <li>All As-Built Documents</li> </ul>	App. 4C, 8  App. 4C, 8	IP+ 1EN & 1ET  IP+ 1EN or 1EP	*  *	* After Installation

(1) Refer to Appendix 4C, Para. 1.3 for detail explanations.

(2) Quantity: In numeral, Type: P=Paper Printing/Photocopy, M=Wash-Off Mylar,  
E= Electronic Files (N:NATIVE, P:PDF, T:TIF, V:VECTOR)

(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) .

## QUALITY VERIFICATION DOCUMENTATION LIST

Supplier \_\_\_\_\_ Spec. No. 9-125-A203 Spec. Title ELECTRIC ELEVATORS Page 1 of 1  
 Spec. Rev. No. 1 Packing List No. \_\_\_\_\_

IDENTIFICATION AND DESCRIPTION OF EQUIPMENT		QUALITY PROGRAM DOCUMENT				CERTIFIED BY	Buyer'S	
PROJECT IDENTIFICATION		EQUIPMENT DESCRIPTION	DESCRIPTION OF REQUIRED DOCUMENTS	PARA. NO.	SERIAL NO. *	PROVIDED BY ATTACH. NO.*	SUPPLIER SIGNATURE/DATE	REPRESENTATIVE SIGNATURE/DATE
ITEM NO.	EQUIP. NO./TAG NO.		E1. <u>CERTIFICATE OF CONFORMANCE</u>  E2. <u>MATERIAL TEST PROPERTIES</u> <ul style="list-style-type: none"> <li>Material Test Report (including fire test)</li> <li>Certificate of Compliance</li> </ul> E3. <u>INSPECTION AND TEST REPORTS</u>  E4. <u>FINAL SIGNED – OFF QUALITY PLAN</u>  E5. <u>SDDR/NCR/CAR(close-out), IF ANY</u>  E6. <u>OTHERS</u>	4.04.D.1 App. 4C   4.04.D.2   4.09.A  App. 4C 7.6.1  App.4H/ App.4B, 7.0 App.4C, 7.6.1				
* SUPPLIER to show identification of individual documents								
<b>SUPPLIER CERTIFICATION</b> We certify that the listed documentation meets the requirements of the Purchase Contract and applicable specifications.  Supplier : _____  Title : _____ Date : _____				<b>BUYER'S REPRESENTATIVE ACCEPTANCE</b> Buyer's Representative shall indicate acceptance. When inspection is no required at the shop, Buyer's review will be made at the job site after material or equipment has been shipped. Accepted by : _____ <div style="display: flex; justify-content: space-between;"> <span>Buyer's REP. &amp; Title</span> <span>Date</span> </div>				

Form Appendix 4E, Rev.0

4E-1 (Final)

SKN 3&4

## APPENDIX 4H

Documentation Requirements of Supplier Deviations and Non-Conformances

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

### ISSUE STATUS

0	'02. 9. 18	Issue for Use	권 동식	김민준	김민준	박 상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

**TABLE OF CONTENTS**

<b><u>SECTION</u></b>	<b><u>TITLE</u></b>	<b><u>PAGE</u></b>
1.0	SCOPE .....	4H-1
2.0	DEFINITION .....	4H-1
3.0	REQUIREMENTS FOR SUPPLIER DEVIATION DISPOSITION REQUEST .....	4H-2

**ATTACHMENT**

1. Supplier Deviation Disposition Request Form



## **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 of 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 the 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.

**SKN 3&4**

## 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 an KHNP 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 KHNP 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)

SKN 3&4

## APPENDIX 4N

### Standard Specification for Alternating Current Motors - Squirrel Cage Type

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

#### ISSUE STATUS

0	2002/9/16	Issue for Use	이원희	박상욱	박상욱	박상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

## TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
1.0	SPECIFICATIONS	4N-1
2.0	ELECTRICAL CHARACTERISTICS	4N-1
3.0	STRUCTURAL CHARACTERISTICS	4N-3
4.0	PACKING AND STORAGE	4N-5
5.0	DRAWINGS AND DATA(SUPPLIER'S)	4N-6

### Attachments

- A. Type I Motor Terminal Housing - Unsupported Terminations
- B. Type II Motor Terminal Housing - Insulator Supported Terminations
- C. Copper Plate Detail for Motor Grounding

## **1.0     SPECIFICATIONS**

- 1.1     Motors shall conform to this Appendix, except where they may be modified by section 4.0 of the Purchase Specification. Requirements for specific application are stated in Section 4.0 of the Purchase Specification.
- 1.2     Motors 225hp and smaller shall conform to, and tests shall be conducted in accordance with NEMA MG 1 "Motors and Generators" in effect as of December 31, 2001 unless indicated otherwise. Motors 250hp and larger shall conform to, and tests shall be conducted in accordance with ANSI C50.41 "Polyphase Induction Motors for Power Generating Stations" in effect as of December 31, 2001 unless otherwise stated herein.

## **2.0     ELECTRICAL CHARACTERISTICS**

- 2.1     All motors 1200 rpm and above shall be the energy efficient type, and motors below 1200 rpm shall have standard efficiency.
- 2.2     Unless otherwise specified in Section 4.0 of the Purchase Specification, voltage ratings of AC motors shall be as follows:
  - a.    1/3 hp and below                      115 volts, 1 phase, 60 Hz
  - b.    1/2 hp through 225 hp                460 volts, 3 phase, 60 Hz
  - c.    250 hp through 2750 hp               4,000 volts, 3 phase, 60 Hz
  - d.    3000 hp and above                    13,200 volts, 3 phase, 60 Hz
- 2.3     Motor horsepower rating shall not be less than 115 percent of the requirements of the driven equipment when operating under design requirements and not be less than 100 percent of the horsepower required to operate the driven equipment at its maximum capability with 1.0 service factor. For other motors with service factor of 1.15, the horsepower rating shall be equal to, or greater than, the requirements of the driven equipment when operating at design conditions and they shall be able to handle the maximum capability of driven equipment within their service factor rating. All motors 250hp and larger shall have 1.0 service factor.
- 2.4     Motors 60hp and larger shall be designed such that the locked rotor current shall not exceed 6.5 times rated full load current (FLC) when tested at rated voltage and frequency. Motors less than 60hp shall be in accordance with Table 1.
- 2.5     Torques for motors 225hp and smaller shall be in accordance with standard NEMA MG 1.
- 2.6     Motors 250hp and larger shall have torques whose minimums shall be in accordance with ANSI C50.41, Table 2, except locked rotor torques and pull-up torques for NT type motors shall not be less than 80% of full load torque.



- 2.7 Motor insulation for random wound motors, 225hp and smaller shall be Class F rated non-hygroscopic premium type system designed to be moisture-resistant and to withstand the conditions existing in a generating station environment. Motors 250hp and larger shall have form wound insulation systems. All form wound insulation systems shall be Class F, Vacuum Pressure Impregnated (VPI), with epoxy resins. All form wound insulation systems shall be sealed systems as defined in NEMA MG 1-1.27.2 with sufficient moisture resistance to withstand an immersion test as covered in NEMA MG 1-20.18. All temperature rises shall be Class B. Class B temperature rises shall be in accordance with ANSI C50.41 for motors 250hp and larger, and NEMA MG1-12.43 for motors 225hp and smaller.
- 2.8 Motors designated for Class 1E service shall be designed to accelerate with 75 percent rated voltage at the motor terminals throughout the starting period and shall be capable of accelerating their connected loads without overheating. All other motors shall be designed to accelerate to the rated speed with 80 percent rated voltage at the motor terminal throughout the starting period and shall be capable of accelerating their connected loads without exceeding the thermal limits specified by the motor manufacturer.
- 2.9 Each motor shall be designed to successfully withstand without damage, the power frequency transient and voltage transient as shown on Fig.1 which may take place during the initial stage of house load or islanded operation which will be initiated by power grid faults or disturbances.
- 2.10 Motors shall be capable of withstanding without injury, transient voltage of at least 1.33 per unit volts per hertz on the motor rated voltage and frequency bases, which is the resultant vectorial volts per hertz between the motor residual volts per hertz and the incoming source volts per hertz at the instant of bus transfer. The bus transfer time is approximately 12 cycles on a 60 Hz base.
- 2.11 Motors 250hp and larger shall have sufficient insulation strength to be able to withstand the voltage impulses that occur when the motor is energized without the use of surge protection equipment at the motor terminals. Testing procedure and test level (applied impulses) shall be in accordance with IEEE 522.
- 2.12 For Class 1E motors 250hp and larger, the starting(accelerating) time at 75% rated voltage shall not be greater than 3 seconds.
- 2.13 For motors 250hp and larger, the allowable locked-rotor thermal-limit time shall be greater than the time required to accelerate the ANSI load  $Wk^2$  value to rated speed at 75% and 80% rated voltage for Class 1E and non-Class 1E motors, respectively, and the minimum margin between allowable locked-rotor thermal limit time and the starting(accelerating) time at hot condition shall be 10 seconds.
- 2.14 Nameplate shall state the service factor and comply with ANSI C50.41 for motors 250hp and larger, and NEMA MG 1 for 225hp and smaller.  
Nameplates on motors 250hp and larger shall specify the limitations on frequency of motor starting and shall specify the cooling periods between starts under conditions of (a) cold rotor and (b) warm rotor (after running continuously at full load for a period of one hour).

Motors shall have the direction of rotation marked on the nameplate, for the supply voltage sequence of T1-T2-T3.

- 2.15 All motors 250hp and larger shall be provided with 100 ohm Pt at 0°C stator winding RTD's.
- 2.16 Where specified in Section 4.0 of the Purchase Specification, bearing temperature thermocouples or RTD's and vibration detectors shall be furnished. The elements shall be installed as close as possible to sleeve bearing surfaces, and shall be located preferably in the bottom half of the bearing housing. See subsection 3.11 for termination requirements.
- 2.17 Where filters are provided on air intakes, a differential pressure switch shall be located across the filters. The switch shall close its contacts upon high differential pressure across the filter due to a clogged filter. The switch shall be sealed against dirt, have accessible terminals and contacts rated 0.5A at 250V dc with inductive load and 5A at 120V ac, 60Hz with resistive load. See subsection 3.11 for termination requirements.
- 2.18 Motor sound level shall be in accordance with ANSI C50.41 for motors 250hp and larger. And for motors 225hp and smaller, certified maximum A-weighted sound level shall not exceed 85dBA(reference:0.0002- microbar) at any point one meter from motor surfaces. Measurement shall be in accordance with NEMA MG1-Part 9.
- 2.19 For motors 250hp and larger, motor vibration shall be in accordance with ANSI C50.41. And, for motors 225hp and smaller, motor vibration at rated speed shall be in accordance with NEMA MG1-Part 7, unless a lower value is required by the driven equipment.
- 2.20 Motor tests shall be performed with the motor terminal housing installed on motor.
- 2.21 Space heaters shall be provided for indoor motors, 10hp and larger (3hp and larger for outdoor motors). Heaters rated more than 2000 watts in capacity shall be rated at 600V for 480V, 3 phase operation and heaters rated not more than 2000 watts in capacity shall be rated at 240V for 120V, 1 phase operation. Supplier shall clearly indicate that space heaters are Class 1E or non-Class 1E and also indicate whether space heaters are required during normal operation or only during stand-by, storage and construction. Space heaters shall be readily accessible for inspection, maintenance, and removal without disconnecting the motor from its driven load or moving the motor from its fixed operating position.
- 2.22 Class 1E motors shall be qualified in accordance with IEEE 323 and IEEE 334 by type testing.

### **3.0 STRUCTURAL CHARACTERISTICS**

- 3.1 Motors shall be designed, built and adequately braced for starting with full rated voltage applied at the motor terminals.

- 3.2 Enclosures for motors 225hp and smaller shall be TEFC (IP44, IC411), which is standard for mill and chemical duty type motors. Enclosures for motors 250hp and larger shall be of the type specified in Section 4.0 of the Purchase Specification. All TEFC (IP44, IC411) motors shall be equipped with shaft and termination box(es) seals and shall be classified water-proof.
- 3.3 Horizontal motors, equipped with sleeve bearings and end shields or self-contained bearing brackets in sizes larger than NEMA 505 shall have horizontal split end shield or bracket bearing housings and bearing on the coupling end, except that belted motors and explosion-proof motors shall have solid end shields on both ends. A removable bearing supporting plate attached to the end shield, providing an opening through which rotor and coupling may be withdrawn, is acceptable.
- 3.4 Where insulated bearings are required, or specified in Section 4.0 of the Purchase Specification, one or both bearings shall be insulated. The manufacturer's motor drawings shall clearly indicate when piping and conduit to bearings must be insulated to protect against the occurrence of shaft currents.
- 3.5 Unless otherwise Specified in section 4.0 of the Purchase Specification, bearings shall have a minimum L-10 life of 100,000 hours per AFBMA.
- 3.6 Horizontal motors shall be provided with approximately 1/2 inch (13mm) mesh screens on all openings at the end shields or brackets.
- 3.7 Motors with sleeve bearings and end shields, exclusive of explosion-proof motors, shall be provided with two access holes in at least one end shield, located near the bottom and opposite the air gap, to permit insertion of an air gap or feeler gauge between the rotor and stator.
- 3.8 Where applicable, the front end of the shaft (opposite the drive end) shall be accessible for taking speed readings with a portable tachometer.
- 3.9 Horizontal motors with sleeve bearings shall have bearing housings large enough to hold sufficient lubricant to minimize the need for frequent lubrication and shall have convenient facilities for filling and draining. Sleeve bearings shall be ring lubricated, and furnished with oil ring sight opening and with suitable oil gauges or sight glasses. Covers for oil wells and overflows shall be attached with chains or be hinged. Motors that have a forced oil lubrication system shall have oil rings that provide for short time operation without the lubrication system in operation. Specific recommendations shall be given by the motor manufacturer regarding lubricants and lubrication.
- 3.10 Sight glasses shall be furnished in place of oil cups on oil filled bearings on motors rated 100hp or larger where applicable.
- 3.11 Terminal leads to windings shall be brought out to terminal housings sized essentially in accordance with the following:  
Attachment A Type I motor terminal housing - Unsupported Terminations

**Attachment B    Type II motor terminal housing - Insulator Supported Terminations**

4,000V and 13,200V motor terminal housings shall be in accordance with Attachment B. Accessory leads shall be terminated in separate auxiliary boxes. Leads of accessory items normally operating at voltages of 50 volts (rms) or less shall be separated from other accessory leads by a suitable barrier or be terminated in a separate auxiliary box. All boxes for Class 1E motors shall be provided with isolation means such as barriers or physical isolations between the wiring and/or components classified as Class 1E and the ones not classified as Class 1E in accordance with IEEE 384 and IEEE 420. All isolation means shall be verified by the supplier and submitted to the A/E for review.

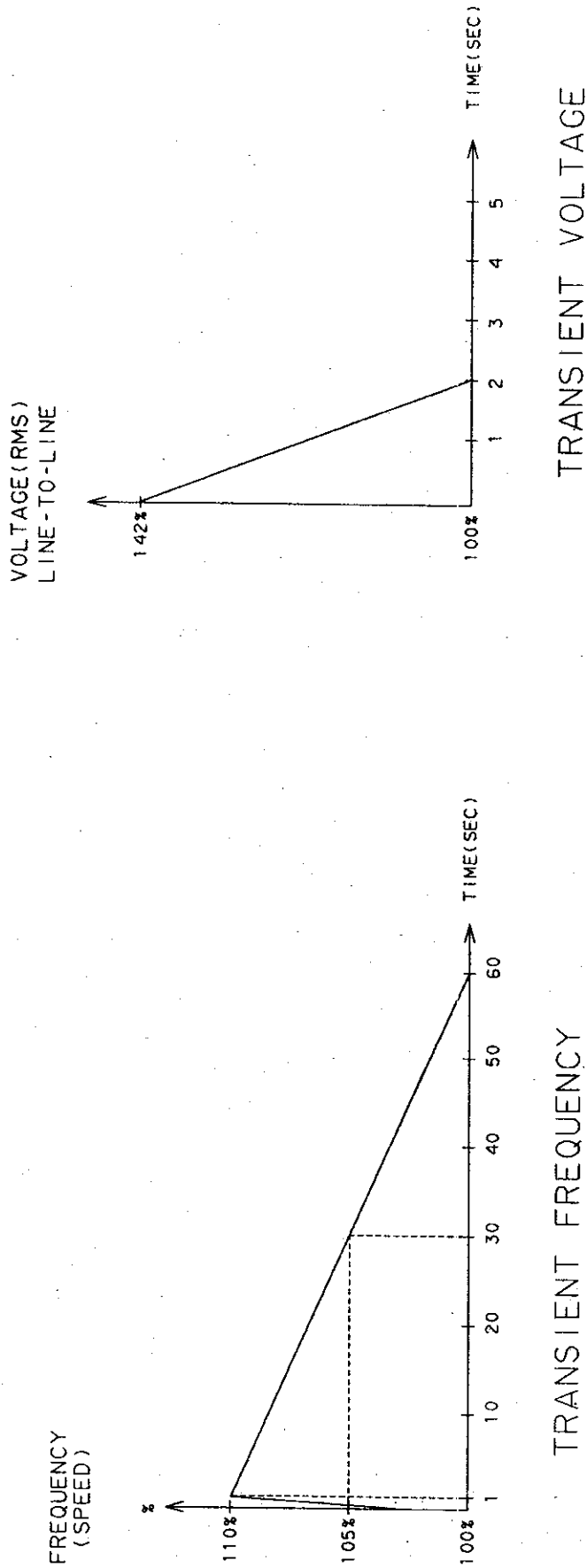
- 3.12    One hole compression type terminal lugs shall be attached to the winding terminal leads for connection to the buyer's cable smaller than 1/0 AWG. Two-hole compression type terminal lugs shall be attached to the winding terminal leads for connection to the buyer's 1/0 AWG or larger cable. Lugs for the buyer's cable will be furnished by others. The opening in the motor frame through which the winding terminal leads pass shall be rounded off and smoothly finished or provided with a suitably protected conduit passageway that will not cause an abrasive action on the motor lead insulation.
- 3.13    Screws for # 18 AWG wire lugs shall be provided for the buyer's cable shield grounding for RTD/thermocouple circuits in the terminal boxes.
- 3.14    Class 1E motor leads which need terminal splicing shall be suitable to the splice materials for the field cables in order to meet the environmental qualification requirements in IEEE 323 and IEEE 383.
- 3.15    Metal covers, screws, bolts, nuts, springs, studs, along with other miscellaneous fittings and hardware shall be stainless steel or corrosion-resistant plated.
- 3.16    For motors with sleeve bearings, the motor manufacturer shall:
  - a)    Indicate on the motor outline drawing the minimum rotor end-play.
  - b)    Mark rotor end-play limits on motor shaft.
  - c)    Include means for indicating the shaft magnetic center position.
- 3.17    Suitable lifting lugs shall be provided for hoisting motors during installation and for maintenance purposes.
- 3.18    For the 5hp and above motors, the supplier shall provide two(2) copper ground pads as shown on the Attachment C, One on each side of the motor frame with drilled and tapped holes suitable for attaching the buyer's two-hole NEMA grounding lugs. Ground lugs will be provided by the buyer.

#### **4.0 PACKING AND STORAGE**

- 4.1 Apparatus shall be substantially packaged and otherwise protected for shipment. Special care shall be taken to prevent exposure of windings and connections to weather during shipment.
- 4.2 Motors shall be prepared for extended outdoor storage by protecting the motor bearings with either a protective grease covering or liquid preservative. The motors shall be tagged to show that a preservative has been used. The procedure to be followed before motors are placed in operation shall also be indicated on the tag.

#### **5.0 DRAWINGS AND DATA (SUPPLIER'S)**

- 5.1 The supplier shall submit to the buyer, for review, before fabrication and assembly of the equipment, the following :
- a. Outline drawings of each motor, showing location and sizes of terminal box and conduit entrances, size and type of terminals provided by the motor manufacturer, and the total weight of the motor.
  - b. Complete wiring diagrams showing all wiring connections for all equipment furnished by the supplier.
  - c. Motor nameplate data
  - d. Performance Curves
    - d1. For motors 250hp and larger
      - Speed-torque curves at 80% (75% for Class 1E), 90% and 100% rated voltage
      - Speed-current curves at 80% (75% for Class 1E), 90% and 100% rated voltage
      - Speed-Power factor curve
      - Speed-load torque curves
      - Acceleration time-current curves at 80% (75% for Class 1E), 90% and 100% rated voltage with thermal limit curves including cold and hot thermal limit and locked rotor thermal limit
    - d2. For motors 225hp and smaller
      - Acceleration time-current curves at 80% (75% for Class 1E) and 100% rated voltage with thermal limit curves including cold and hot thermal limit and locked rotor thermal limit



NOTE

- BASED FREQUENCY : 60HZ
- BASED VOLTAGE : RATED LINE-TO-LINE VOLTAGE (RMS)
- TRANSIENT VOLTAGE RISE TIME IS ASSUMED ZERO(0) SEC.

FIG 1. HOUSE LOAD OPERATION TRANSIENT

Table 1. Allowable Locked Rotor Current and Starting Time for Small  
Motor

Rated Horse Power	Locked Rotor Current (LRC) (% of Full Load Current)	Allowable Starting (Accelerating) Time in Seconds
Less than 10hp	$LRC \leq 650$ $650 < LRC \leq 750$ $750 < LRC \leq 850$ $LRC > 850$	$\leq 9$ $\leq 7$ $\leq 5$ Not Acceptable
Not less than 10hp and less than 60hp	$LRC \leq 650$ $650 < LRC \leq 750$ $LRC > 750$	$\leq 9$ $\leq 7$ Not Acceptable

**Attachment A**

**Type I Motor Terminal Housing - Unsupported Terminations**



Type I Motor Terminal Housing  
Unsupported Terminations

Motor Voltage	Motor Horsepower	Opening-conduit size (Inches)	Min. Internal Dimension (Inches)	Min. Volume (Inches <sup>3</sup> )	Min. Distance (Inches) *
460	3-7.5	1 1/2	4	100	4
	7.6-20	2	5	180	5
	21-40	2	6	400	5
	41-75	2	6	600	5
	76-125	3	7	750	6
	126-300	4	8	900	8

\* Minimum distance is from the entrance plate for conduit entry to the centerline of motor leads leaving the motor housing.

Notes :

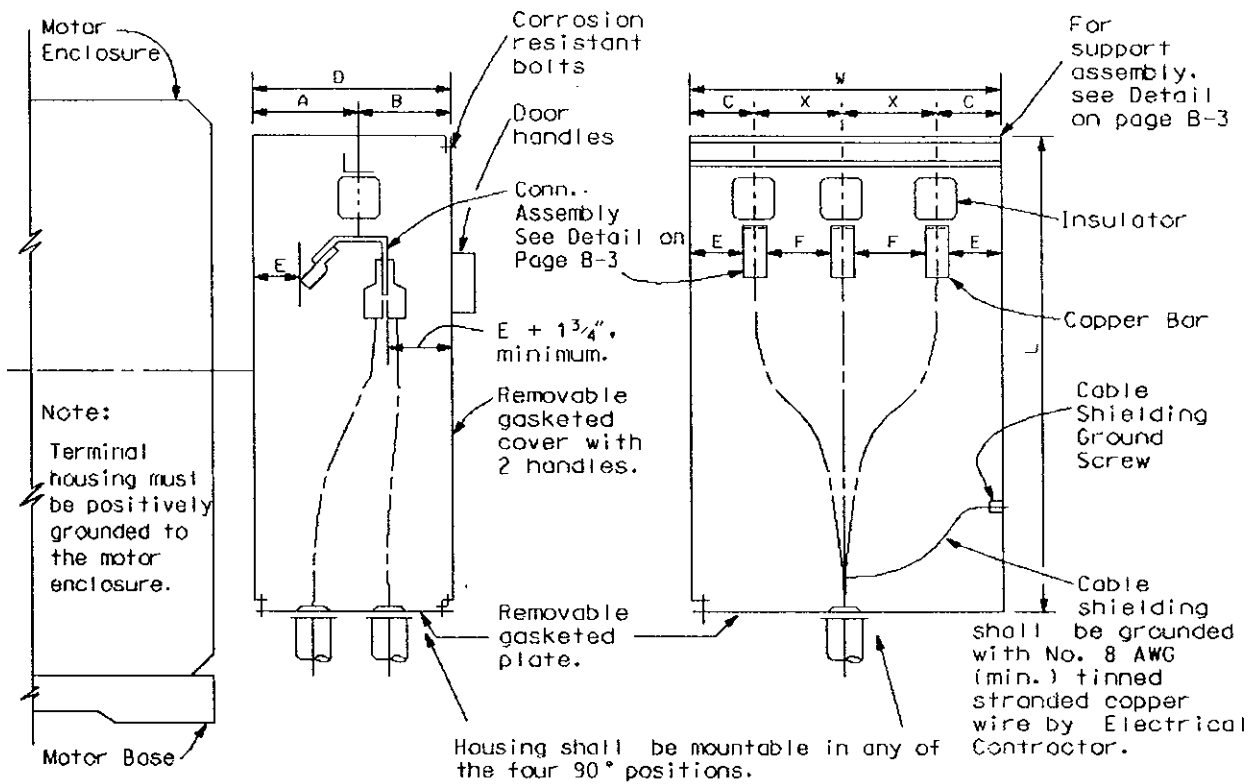
1. It is intended to allow the motor manufacturer to furnish his standard terminal housing if it meets the dimensions shown in the above table. Variances from the dimensions shown in the table shall be acceptable if in the opinion of the buyer, they do not affect the utility of the housing.
2. Each terminal housing shall be of cast iron or sheet metal. For sheet housings less than 12 inches (300 mm) long, the body of the housing shall be a minimum of 12 gauge. For housings more than 12 inches (300 mm) long, the body of the housing shall be a minimum of 10 gauge. The cover shall be steel or unpainted aluminum. The finish shall be in accordance with manufacturer's standard, or as specified. If a hot-dip galvanized finish is required, it will be indicated in Section 4.0 of the Purchase Specification.
3. For motors below 3 hp, the manufacturer's largest applicable standard size terminal housings shall be acceptable.
4. Terminal housings for outdoor service shall have gasketed covers or gasketed removable plates.
5. Each terminal housing shall be mountable in all 90° positions without alteration of the housing or bolting facilities, such that conduit may enter from above, below, or from either side.
6. Each terminal housing shall be located such that conduit will clear the motor base by at least 3 inches (75mm), without bending the conduit, when the conduit enters the housing from below.

7. Motor terminal housings for outdoor installations or areas where condensation of moisture is likely to be a problem, shall have a 1/2" (13mm) diameter drain hole covered with an insect-proof screened grommet provided at the bottom front corner in the lowest part of the housing. The location of the buyer's conduit entrance will be furnished at the time of the supplier's drawing review.

**Attachment B**

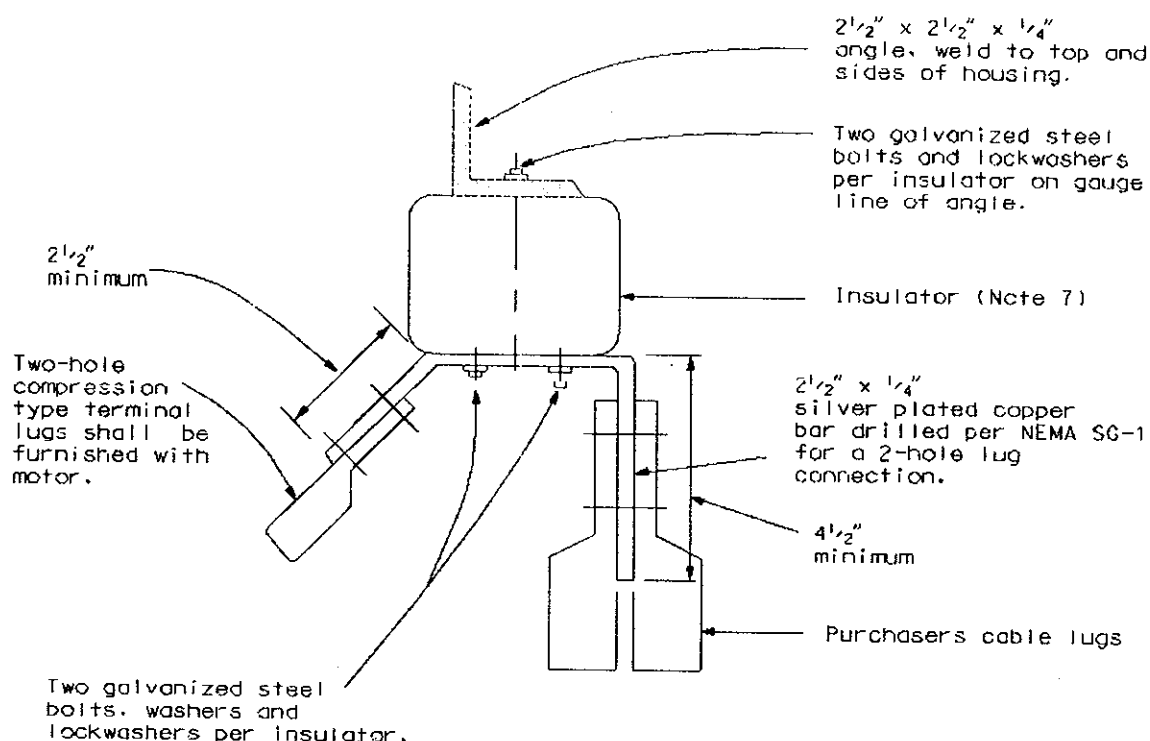
**Type II Motor Terminal Housing – Insulator Supported Terminations**

Appendix 4N  
Rev. 0



Motor voltage	Minimum dimension - Inches									Min. insulator withstand impulse voltage rating
	Terminal housing dimensions			Location of insulators				Electrical Clearance		
	L	W	D	A	B	C	X	E Live parts to ground	F Between live parts	
460 (150hp & above)	24	18	18	9 1/2	8 1/2	4	5	2	3	45kV
4000	36	27	18	9 1/2	8 1/2	5 1/2	8	3 1/2	5	60kV
13200	48	48	25	13 1/2	11 1/2	8 1/2	13 1/2	6 3/4	9 1/2	95kV

• See Page B-3 & B-4 for detail and notes.



#### DETAIL OF CONNECTION ASSEMBLY

#### Notes :

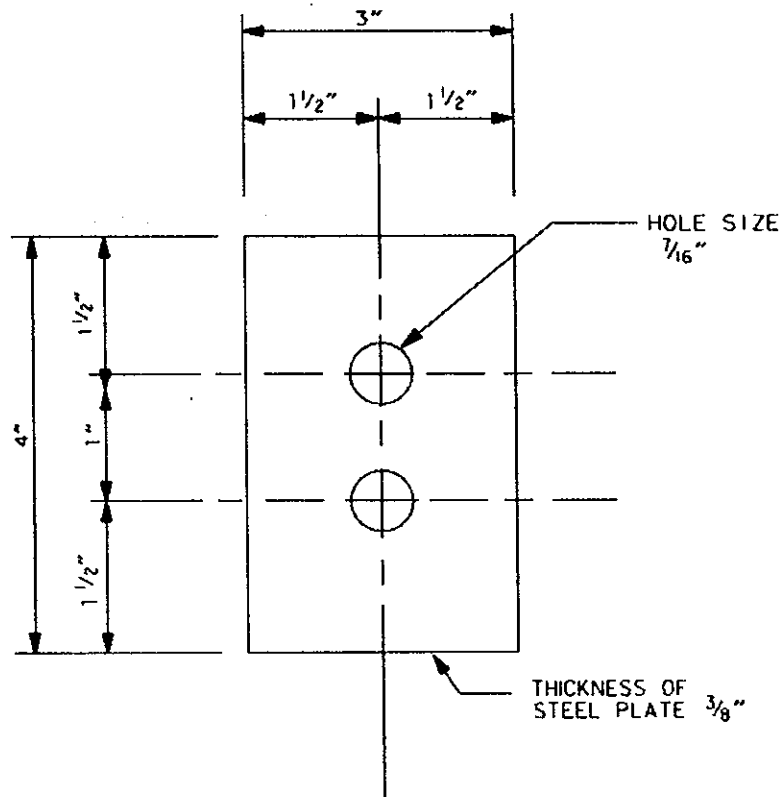
1. The above connection assembly indicates suggested construction details for Type II (insulator supported) Motor Terminal Housing internal connections, but is not intended to exclude the manufacturer's standard construction (if acceptable to the buyer) or to relieve the manufacturer from responsibility for proper design.
2. Terminal housings shall be manufactured per dimensions shown on page B-2, equipped with insulators, mounting assemblies, and copper bar lug supports, essentially in accordance with the tabulation and details shown in this standard.
3. Each terminal housing shall be made from No. 10 USS gauge sheet steel. The cover shall be gasketed, constructed of sheet or unpainted aluminum, with integral handles. The finish shall be in accordance with the manufacturer's standard or as specified. If a hot-dip galvanized housing is required, it will be indicated in Section 4.0 of the Purchase Specifications.

4. Each terminal housing shall be supported by the motor housing if possible, and shall be constructed so that it will not be damaged by a load of up to 300 pounds in any direction.
5. Each conduit entrance for motors shall be through a bolted and gasketed removable plate, that will be drilled for the conduits by others. The location of the buyer's conduit entrance will be furnished at the time of the supplier's drawing review. A 1" (25mm) diameter drain hole covered with an insect-proof screened grommet shall be provided at the bottom front corner in the lowest part of the housing.
6. A 3/8" -16 machine screw shall be provided inside each terminal housing for grounding the buyer's cable shielding.
7. Insulators shall be high quality porcelain bus insulators as manufactured by Westinghouse Electric Co., Lapp Insulator Co., or equivalent. Single hole insulators shall not be acceptable. Two or four hole insulators shall be used, and each insulator shall be affixed to both the insulator angle support and the copper bar lug support in at least two places, to prevent any twisting or movement of the cable lugs.

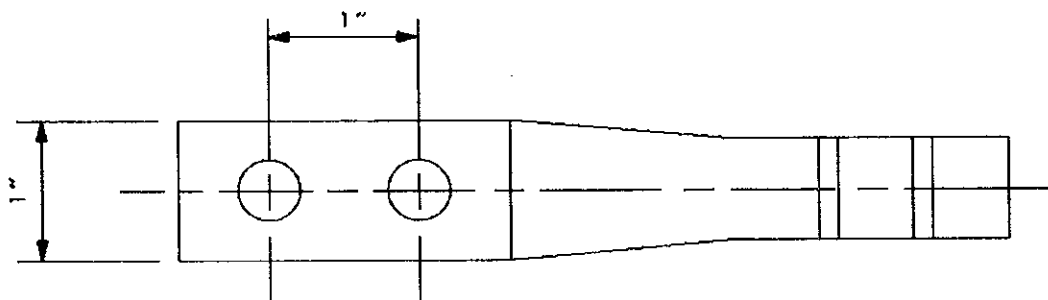
**Attachment C**

**Copper Plate Detail For Motor Grounding**

## COPPER PLATE DETAIL FOR MOTOR GROUNDING



COPPER PLATE  
(SUPPLIED BY SUPPLIER)



GROUNDING LUG  
(SUPPLIED BY KEPCO)



SKN 3&4

## APPENDIX 4P

### Standard Specification for Electrical Apparatus

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

#### ISSUE STATUS

0	'02/9/16	Issue for Use	이경준	김종만	이원익	박상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

TABLE OF CONTENTS

<u>SECTION.</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	SCOPE .....	4P-1
2.0	ATTACHMENTS	
	A. INSULATED TERMINAL LUGS FOR CONTROL AND INSTRUMENTATION WIRING	
	B. COMPRESSION COPPER POWER LUGS	
	C. TERMINATION OF CONTROL AND INSTRUMENTATION CABLES AND WIRES	
	D. CONDUIT TERMINATIONS AT THERMOCOUPLES, TRANSMITTERS, SOLENOIDS, ETC.	
	E. TERMINATION OF CONDUIT AND CABLES AT MOTOR DRIVE UNITS, VALVES, ETC.	
	F. HINGED COVER CABINETS WITH REMOVABLE PANEL FOR TERMINAL BLOCK MOUNTING	
	G. CABLE REQUIREMENT FOR SUPPLIER FURNISHED CABLE	

## **1.0     SCOPE**

This Appendix provides design requirements and general information to be used by the Supplier for electrical equipment design. Refer to each individual attachment for specific information regarding the scope of each one.

The products listed herein are proven to be adequate for the intended uses specified by the buyer. Other brands may be substituted where the Supplier demonstrates that the substitute product is adequate for the intended use.

**ATTACHMENT A**

**INSULATED TERMINAL LUGS FOR  
CONTROL & INSTRUMENTATION WIRING**

Attachment A

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	SPECIFICATIONS .....	A-3

Attachment A

**1.0      SPECIFICATIONS**

- 1.1      All terminal lugs shall be screw-compression ring tongue type.
- 1.2      All connections to terminal blocks, instrument, etc., shall be made with following tin plated compression type ring tongue terminal lugs according to the location or Electrical Classification of systems, equipment or components as specified in Section 4 of the specification.
- Electrical Class 1E or   : Terminal lugs of "AMP" as listed on page A-4, or equivalent in Containment Building
- Electrical Non-Class 1E : Terminal lugs of "Thomas & Betts", "Burndy", "Panduit", or "3M" as listed on page A-4, KS Marked or equivalent
- 1.3      The wire insulation shall be removed without nicking the conductor. The wire shall be firmly inserted into the lug and crimped with a ratchet type, or positive action air/hydraulic tool as listed on Page A-4, or as recommended by the lug manufacturer.
- 1.4      Manufacturer's standard insulating sleeve for listed terminals are Polyvinylidene Fluoride (PVF<sub>2</sub>) for terminal lugs of "Amp Special Industries" and Polyvinyl-Chloride (PVC) for terminal lugs of "Thomas & Betts", "Burndy", "Panduit", or "3M". The Supplier shall obtain the buyer's prior approval for furnishing insulated lugs with other than Manufacturer Standard insulation on them. Acceptable manufacturers and specific catalog numbers of acceptable insulating lugs are listed on Page A-4.
- 1.5      Part numbers specified in this attachment are for use with AWG conductors. If metric conductors are to be furnished by the Supplier, the appropriate lug from the same manufacturer and of the same type shall be used.
- 1.6      Terminal lugs of KS marked or equivalent shall be made of Oxygen Free High-Conductivity Copper (OFHC) and shall meet the KSC2620.

Attachment A

WIRE SIZE (AWG)	STUD SIZE	RECOMMENDED MANUFACTURER											
		CLASS 1E						NON-CLASS 1E					
		AMP		THOMAS & BETTS		BURNDY		PANDUIT		3M			
		CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL
22-18	6	53407-1	47386	18RA-6X	WT 145C	TP16-6	MR8-89-1	PV18-6R	CT-400	MV18-6R/S	TH 482 or TH 484		
22-18	8	53408-1	47386	18RA-8X	WT 145C	TP16-8	MR8-89-1	PV18-8R	CT-400	MV18-8R/L	TH 482 or TH 484		
22-18	10	53409-1	47386	18RA-10X	WT 145C	TP16-10	MR8-89-1	PV18-10R	CT-400	MV18-10R/L	TH 482 or TH 484		
16-14	6	53416-1	47387	14RB-6X	WT 145C	TP14-6	MR8-89-1	PV14-6RX	CT-400	MV14-6R/S	TH 482 or TH 484		
16-14	8	53417-1	47387	14RB-8X	WT 145C	TP14-8	MR8-89-1	PV14-8RX	CT-400	MV14-8R/L	TH 482 or TH 484		
16-14	10	53418-1	47387	14RB-10X	WT 145C	TP14-10	MR8-89-1	PV14-10RX	CT-400	MV14-10R/L	TH 482 or TH 484		
16-14	1/4"	53984-1	47387	14RB-14X	WT 145C	TP14-14	MR8-89-1	PV14-14RX	CT-400	MV14-14R/S	TH 482 or TH 484		
12-10	6	53423-1	59239-4	10RC-6X	WT 145C or WT 2130	TP10-6	MR8-89-1	PV10-6RX	CT-460	MV10-6R	TH 482 or TH 484		
12-10	8	53424-1	59239-4	10RC-8X	WT 145C or WT 2130	TP10-8	MR8-89-1	PV10-8RX	CT-460	MV10-8R	TH 482 or TH 484		
12-10	10	53425-1	59239-4	10RC-10X	WT 2130	TP10-10	MR8-89-1	PV10-10RX	CT-460	MV10-10R	TH 482 or TH 484		

A-4

Attachment A

WIRE SIZE (AWG)		STUD SIZE		RECOMMENDED MANUFACTURER									
				CLASS 1E					NON-CLASS 1E				
				AMP		THOMAS & BETTS		BURNDY		PANDUIT		3M	
				CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALLA- TION TOOL	CATALOG NUMBER	INSTALL- ATION TOOL
12-10	1/4"			53426-1	59239-4	10RC-14X	WT 145C or WT 2130	TP10-14	MR8-89-1	PV10-14RX	CT-460	MV10-14R/S	TH 482 or TH 484
8	10			53978-1	69061 WITH 48752-1 DIE					PV8-10RX	CT-720		
8	1/4"			53943-1	69061 WITH 48752-1 DIE					PV8-14RX	CT-720		



**ATTACHMENT B**

**COMPRESSION COPPER POWER LUGS**

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	SCOPE ... ..	B-3
2.0	SPECIFICATIONS .....	B-3

Attachment B

**1.0      SCOPE**

- 1.1      This Attachment provides specifications and general information for copper compression terminal lugs to be used for terminating stranded insulated and uninsulated copper conductors.

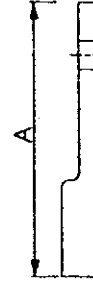
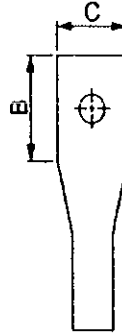
**2.0      SPECIFICATIONS**

- 2.1      Lugs shall be color keyed or coded, tool applied compression type (hexagonal or circumferential), tin plated made of high conductivity copper and be listed by the Underwriters Laboratories for use with copper cable or KS marked(only for one-hole lugs) or equivalent.
- 2.2      Lugs shall be applied in accordance with the following instructions:
- a. The installation tools and dies shall be of either hexagonal or circumferential compression type as recommended by the lug manufacturer. The tooling shall be color coded or color keyed with the lugs.
  - b. For inspection purposes, the manufacturer's die code shall be embossed upon the applied compressed connection on lugs.
- 2.3      The bolt holes of the lugs shall be drilled and spaced in accordance with the latest NEMA Standards Publications No. CC-1 "Electric Power Connection for substations". The bolt holes of KS marked one-hole lugs shall be drilled in accordance with the KSC2620.
- 2.4      Lugs listed are long barrel type for maximum current-carrying requirements and have barrels that are blind ended.
- 2.5      Lugs shall meet the performance requirements of Underwriters Laboratories Test of UL486 except the heating or current cycling tests shall be performed for a minimum of 500 cycles.
- 2.6      Part numbers specified in this attachment are for use with AWG conductors. If metric conductors are to be furnished by the Supplier, the appropriate lug from the same manufacturer and of the same type shall be used.
- 2.7      KS marked(only for one-hole lugs) or equivalent shall be made of Oxygen Free High-Conductivity Copper (OFHC) and shall meet the KSC2620.

Attachment B

AMP  
ONE-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			DIE CODE	HYDRAULIC INSTALLING HEAD & DIE CODE PART NO.	
			A	B	C		69065	69099
#2	325211	5/16 (7.9)	2-3/64 (51.9)	27/32 (21.4)	11/16 (17.5)	2	46321-2	46765-1
#1	325211	5/16 (7.9)	2-3/64 (51.9)	27/32 (21.4)	11/16 (17.5)	2	46321-2	46765-2
1/0	325317	3/8 (9.5)	2-31/64 (63.0)	1-3/64 (26.6)	27/32 (21.4)	1/0	46322-2	46766-2
2/0	325410	3/8 (9.5)	2-11/16 (68.3)	1-3/32 (27.8)	61/64 (24.2)	2/0	46323-2	46767-2
3/0	325513	3/8 (9.5)	2-15/16 (74.7)	1-9/64 (29.0)	1-1/16 (27.0)	3/0	46324-2	46747-2
4/0	325613	1/2 (12.7)	3-9/64 (79.8)	1-13/64 (30.6)	1-11/64 (29.8)	4/0	46325-2	46750-2
250 MCM	325718	1/2 (12.7)	3-21/64 (84.6)	1-1/4 (31.8)	1-17/64 (32.1)	250	-	46751-2



ONE HOLE LUG  
DIMENSION DETAIL

Attachment B

AMP  
TWO-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			DIE CODE	HYDRAULIC INSTALLING HEAD & DIE CODE PART NO.	
			A	B	C		69065	69082
1/0	53680-2	1/2 (12.7)	4-1/4 (107.9)	2-51/64 (71.0)	27/32 (21.4)	1/0	46322-2	46766-2
2/0	53681-2	1/2 (12.7)	4-7/16 (112.7)	2-27/32 (72.2)	61/64 (24.2)	2/0	46323-2	46767-2
3/0	53682-2	1/2 (12.7)	4-21/32 (118.3)	2-57/64 (73.4)	1-1/16 (27.0)	3/0	46324-2	46747-2
4/0	53683-2	1/2 (12.7)	4-57/64 (124.2)	2-31/32 (75.4)	1-11/64 (29.8)	4/0	46325-2	46750-2
250 MCM	53640-2	1/2 (12.7)	5-5/64 (129.0)	3 (76.2)	1-17/64 (32.1)	250	-	46751-2
300 MCM	53684-2	1/2 (12.7)	5-17/64 (133.7)	3 (76.2)	1-3/8 (34.9)	300	-	46752-2
350 MCM	53641-2	1/2 (12.7)	5-27/64 (137.7)	3 (76.2)	1-1/2 (38.1)	350	-	46753-2
400 MCM	53685-2	1/2 (12.7)	5-37/64 (141.7)	3 (76.2)	1-19/32 (40.5)	400	-	46754-2
500 MCM	53642-2	1/2 (12.7)	5-33/64 (148.0)	3 (76.2)	1-25/32 (45.2)	500	-	46755-2
600 MCM	P75-1727	1/2 (12.7)	6-5/64 (154.4)	3 (76.2)	1-61/64 (49.6)	600	-	46756-2
700 MCM	53686-2	1/2 (12.7)	6-9/32 (159.5)	3 (76.2)	2-3/32 (53.2)	700*	-	46757-2
1000 MCM	53687-2	1/2 (12.7)	7-3/64 (179.0)	3 (76.2)	2-1/2 (63.5)	1000	-	46760-2

\*Range from 650 to 750 MCM.



TWO HOLE LUG DIMENSION DETAIL

Attachment B

**BURNDY**  
**ONE-HOLE TERMINAL LUGS**

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			COLOR KEY	DIE INDEX NO.	HYDRAULIC INSTALLING HEAD & DIE CODE PART NO.		
			A	B	C			Y39	Y46	Y48B
#6	YA6C	1/4 (6.4)	2-1/64 (51.2)	21/32 (16.7)	13/32 (10.4)	BLUE	1 374 2 7	U8CABT U5CRT	U8CABT U5CRT	-
#4	YA4C	1/4 (6.4)	2-7/64 (53.6)	11/16 (17.4)	1/2 (12.7)	GRAY	1 346 2 8	U6CABT U4CRT	U6CABT U4CRT	-
#2	YA2C	5/16 (7.9)	2-27/64 (61.5)	45/64 (17.9)	19/32 (15.0)	BROWN	1 10 2 10	U2CRT U2CRT	U2CRT U2CRT	-
#1	YA1C	5/16 (7.9)	2-3/8 (60.5)	11/16 (17.4)	43/64 (17.0)	GREEN	1 375 2 11	U4CABT U1CRT	U4CABT U1CRT	-
1/0	YA25- TC38	3/8 (9.5)	2-21/32 (67.5)	53/64 (21.0)	3/4 (19.1)	PINK	1 348 2 12	U2CABT U25RT	U2CABT U25RT	-
2/0	YA26	3/8 (9.5)	2-51/64 (71.0)	51/64 (20.2)	13/16 (20.6)	BLACK	1 13 2 13	U26RT U26RT	U26RT U26RT	-
3/0	YA27	1/2 (12.7)	3-7/32 (81.8)	1-3/16 (30.2)	29/32 (23.1)	ORANGE	1 14 2 14	U27RT U27RT	U27RT U27RT	-
4/0	YA28	1/2 (12.7)	2-31/32 (75.4)	1-3/64 (26.6)	1 (25.4)	PURPULE	1 15 2 15	U28RT U28RT	U28RT U28RT	C28R C28R
250 MCM	YA29	1/2 (12.7)	3-3/16 (81.0)	1-3/32 (27.8)	1-3/32 (27.7)	YELLOW	1 16 2 16	U29RT U29RT	U29RT U29RT	C29R C29R

NOTE: For the die index, 1 means that die is color coded and 2 means that die is not color coded.

Attachment B

BURNDY  
TWO-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			COLOR KEY	DIE INDEX NO.	HYDRAULIC INSTALLING HEAD & DIE CODE PART NO.		
			A	B	C			Y39	Y46	Y48B
1/0	YA25- 2N	1/2 (12.7)	4-51/64 (121.8)	3-1/16 (77.8)	13/16 (20.8)	PINK	1 348 2 12	U2CABT U25RT	U2CABT U25RT	-
2/0	YA26- 2N	1/2 (12.7)	5-1/32 (127.8)	3-1/32 (77.0)	13/16 (20.8)	BLACK	1 13 2 13	U26RT U26RT	U26RT U26RT	-
3/0	YA27- 2N	1/2 (12.7)	5-1/16 (128.6)	3-1/32 (77.0)	15/16 (23.8)	ORANGE	1 14 2 14	U27RT U27RT	U27RT U27RT	-
4/0	YA28- 2N	1/2 (12.7)	5-1/16 (128.6)	3-1/32 (77.0)	1 (25.4)	PURPLE	1 15 2 15	U28RT U28RT	U28RT U28RT	C28R C28R
250 MCM	YA29- 2N	1/2 (12.7)	5-5/16 (134.9)	3-1/32 (77.0)	1-1/32 (26.2)	YELLOW	1 16 2 16	U29RT U29RT	U29RT U29RT	C29R C29R
300 MCM	YA30- 2N	1/2 (12.7)	5-3/4 (146.1)	3-1/32 (77.0)	1-7/32 (31.0)	WHITE	1 298 2 17	U28ART U30RT	U28ART U30RT	C28AR C30R
350 MCM	YA31- 2N	1/2 (12.7)	5-23/32 (145.2)	3 (76.2)	1-9/32 (32.5)	RED	1 324 2 18	U29ART U31RT	U29ART U31RT	C29AR C31R
400 MCM	YA32- 2N	1/2 (12.7)	5-7/8 (149.2)	3-1/32 (77.0)	1-13/32 (35.8)	BLUE	1 470 2 19	U30ART U32RT	U30ART U32RT	C30AR C32R
500 MCM	YA34- 2N	1/2 (12.7)	5-31/32 (151.6)	3-1/32 (77.0)	1-17/32 (38.9)	BROWN	1 299 2 20	U31ART U34RT	U31ART U34RT	C31AR C34

NOTE: For the die index, 1 means that die is color coded and 2 means that die is not color coded.

Attachment B

**BURNDY**  
**TWO-HOLE TERMINAL LUGS**

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			COLOR KEY	DIE INDEX NO.	HYDRAULIC INSTALLING HEAD & DIE CODE PART NO.		
			A	B	C			Y39	Y46	Y48B
600 MCM	YA36-2N	1/2 (12.7)	6-5/8 (168.3)	3-1/32 (77.0)	1-23/32 (43.7)	GREEN	1 472 2 22	U32ART U36RT	U32ART U36RT	C32AR C36R
750 MCM	YA39-2N	1/2 (12.7)	6-3/4 (171.5)	3-1/32 (77.0)	1-29/32 (48.4)	BLACK	1 473 2 24	U36ART U39RT	U36ART U39RT	C36AR C39R
1000 MCM	YA44-2N	1/2 (12.7)	7 (177.8)	3-1/32 (77.0)	2-3/16 (55.6)	WHITE	1 27 2 27	- -	P44RT P44RT	C44R C44R

NOTE: For the die index, 1 means that die is color coded and 2 means that die is not color coded.

**PANDUIT**  
**ONE-HOLE TERMINAL LUGS**

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			COLOR KEY	HYDRAULIC INSTALLING HEAD & DIE CODE NO.		
			A	B	C		T&B 13642	T&B TBM15	BURNDY Y39
1/0	LCB 1/0-56	5/16 (7.9)	2-49/64 (70.3)	29/32 (23.1)	3/4 (19.1)	PINK	42	42H	U25RT
2/0	LCB 2/0-38	3/8 (9.5)	2-57/64 (73.4)	29/32 (23.1)	13/16 (20.6)	BLACK	45	45	U26RT
3/0	LCB 3/0-12	1/2 (12.7)	3-9/64 (79.7)	1-7/64 (28.2)	29/32 (23.1)	ORANGE	50	50	U27RT
4/0	LCB 4/0-12	1/2 (12.7)	3-15/64 (82.0)	1-7/64 (28.2)	1 (25.4)	PURPLE	54	54TH	U28RT
250 MCM	LCB 250-12	1/2 (12.7)	3-25/64 (86.1)	1-7/64 (28.2)	1-9/64 (29.0)	YELLOW	62	62	U29RT

B-8



Attachment B

PANDUIT  
TWO-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			COLOR KEY	HYDRAULIC INSTALLING HEAD & DIE CODE NO.		
			A	B	C		T&B 13642	T&B TBM15	BURNDY Y39
1/0	LCC 1/0-12	1/2 (12.7)	4-7/8 (125.0)	3 (76.2)	3/4 (19.1)	PINK	42	42H	U25RT
2/0	LCC 2/0-12	1/2 (12.7)	5-1/32 (127.7)	3 (76.2)	57/64 (22.6)	BLACK	45	45	U26RT
3/0	LCC 3/0-12	1/2 (12.7)	5-1/8 (130.3)	3 (76.2)	29/32 (23.1)	ORANGE	50	50	U27RT
4/0	LCC 4/0-12	1/2 (12.7)	5-3/16 (131.8)	3 (76.2)	1-1/32 (26.2)	PURPLE	54	54H	U28RT
250 MCM	LCC 250-12	1/2 (12.7)	5-3/8 (136.7)	3 (76.2)	1-7/32 (31.0)	YELLOW	62	62	U29RT
300 MCM	LCC 300-12	1/2 (12.7)	5-3/4 (146.1)	3 (76.2)	1-7/32 (31.0)	WHITE	66H	66	U30RT
350 MCM	LCC 350-12	1/2 (12.7)	5-3/4 (146.1)	3 (76.2)	1-5/16 (33.3)	RED	71H	71H	U31RT
400 MCM	LCC 400-12	1/2 (12.7)	6 (152.4)	3 (76.2)	1-13/32 (35.8)	BLUE	76H	76	U32RT
500 MCM	LCC 500-12	1/2 (12.7)	6-1/16 (153.9)	3 (76.2)	1-17/32 (38.9)	BROWN	87H	87H	U34RT
750 MCM	LCC 750-12	1/2 (12.7)	7 (177.8)	3 (76.2)	1-3/4 (44.5)	BLACK	106H	106H	U39RT
1000 MCM	LCC 1000-12	1/2 (12.7)	7-1/4 (184.2)	3 (76.2)	2-1/32 (54.9)	WHITE	125H	125H	-

Attachment B

3M COMPANY  
ONE-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			DIE CODE	HYDRAULIC INSTALLING HEAD & DIE CODE INDEX NO.		
			A	B	C		T&B 13246	T&B TBM15	BURNDY Y39
2/0	31036	3/8 (9.5)	2-27/32 (72.2)	29/32 (23.1)	13/16 (20.6)	2/0	42	42H	U28RT
3/0	31041	1/2 (12.7)	3-1/8 (79.2)	1-5/32 (29.4)	29/32 (23.1)	3/0	45	45	U27RT
4/0	31045	1/2 (12.7)	3-5/16 (84.1)	1-5/32 (29.4)	1 (25.4)	4/0	50	50	U28RT
250 MCM	31049	1/2 (12.7)	3-3/8 (85.7)	1-3/32 (27.7)	1-1/8 (28.4)	250	54	54H	U29RT

B-10

Attachment B

3M COMPANY  
TWO-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			DIE CODE	HYDRAULIC INSTALLING HEAD & DIE CODE INDEX NO.		
			A	B	C		T&B 13246	T&B TBM15	BURNDY Y39
4/0	31145	1/2 (12.7)	5-5/32 (131.0)	3 (76.2)	1 (25.4)	4/0	54	54H	U28RT
250 MCM	31149	1/2 (12.7)	5-5/16 (134.9)	3 (76.2)	1-1/8 (28.4)	250	62	62	U29RT
300 MCM	31153	1/2 (12.7)	5-3/4 (146.1)	3 (76.2)	1-7/32 (31.0)	300	66H	66	U30RT
350 MCM	31156	1/2 (12.7)	5-3/4 (146.1)	3 (76.2)	1-9/32 (32.5)	350	71H	71H	U31RT
500 MCM	31166	1/2 (12.7)	6-5/32 (156.4)	3 (76.2)	1-17/32 (38.9)	500	87H	87H	U34RT
750 MCM	31172	1/2 (12.7)	7 (177.8)	3 (76.2)	1-29/32 (48.4)	750	106H	106H	U39RT
1000 MCM	31178	1/2 (12.7)	7-9/32 (185.0)	3 (76.2)	2-3/16 (55.6)	1000	-	125H	-

Attachment B

THOMAS & BETTS CO.  
ONE-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			COLOR KEY	HYDRAULIC INSTALLING HEAD & DIE CODE INDEX NO.		
			A	B	C		13642	TBM15	21940
#8	54930	1/4 (6.4)	1-15/32 (37.3)	9/16 (14.3)	15/32 (11.9)	RED	21	21	-
#6	54905	1/4 (6.4)	1-1/2 (38.1)	9/16 (14.3)	7/16 (11.1)	BLUE	24	24	24
#4	54906	1/4 (6.4)	1-17/32 (38.9)	9/16 (14.3)	9/16 (14.3)	GRAY	29	29	29
#2	54942	5/16 (7.9)	1-27/32 (46.8)	23/32 (18.6)	21/32 (16.7)	BROWN	33	33	33
#1	54947	5/16 (7.9)	2-1/16 (52.4)	13/16 (20.6)	43/64 (17.1)	GREEN	37	37	37
1/0	54909	3/8 (9.5)	2-3/32 (53.2)	13/16 (20.6)	3/4 (19.1)	PINK	42	42H	42
2/0	54910	3/8 (9.5)	2-3/32 (53.2)	1-1/16 (27.0)	13/16 (20.6)	BLACK	45	45	45
3/0	54965	1/2 (12.7)	2-17/32 (64.3)	1-1/16 (27.0)	15/16 (23.8)	ORANGE	50	50	50
4/0	54970	1/2 (12.7)	2-11/16 (68.3)	1-1/16 (27.0)	1-1/32 (26.2)	PURPLE	54	54H	54
250 MCM	54913	1/2 (12.7)	3-1/32 (77.0)	1-1/16 (27.0)	1-1/16 (27.0)	YELLOW	62	62	62

Attachment B

THOMAS & BETTS CO.  
TWO-HOLE TERMINAL LUGS

WIRE SIZE	CAT. NO.	BOLT SIZE INCH(MM)	DIMENSION INCHES (MILLIMETERS)			COLOR KEY	HYDRAULIC INSTALLING HEAD & DIE CODE INDEX NO.		
			A	B	C		13642	TBM15	21940
2/0	54862	1/2 (12.7)	4-5/16 (109.5)	2-15/16 (74.6)	13/16 (20.6)	BLACK	45	45	45
3/0	54864	1/2 (12.7)	4-13/32 (111.9)	2-15/16 (74.6)	15/16 (23.8)	ORANGE	50	50	50
4/0	54866	1/2 (12.7)	4-3/4 (120.7)	3 (76.2)	1-1/32 (26.2)	PURPLE	54H	54H	54
250 MCM	54868	1/2 (12.7)	4-27/32 (123.0)	3 (76.2)	1-3/32 (27.9)	YELLOW	62	62	62
300 MCM	54870	1/2 (12.7)	5-1/32 (127.8)	3 (76.2)	1-1/4 (31.8)	WHITE	66	66	66
350 MCM	54872	1/2 (12.7)	5-1/4 (133.4)	3 (76.2)	1-23/64 (34.5)	RED	71H	71H	71
400 MCM	54874	1/2 (12.7)	5-9/32 (134.1)	3 (76.2)	1-7/16 (36.5)	BLUE	76	76	76
500 MCM	54876	1/2 (12.7)	5-11/16 (144.5)	3 (76.2)	1-5/8 (41.3)	BROWN	87H	87H	87
600 MCM	54878	1/2 (12.7)	5-13/16 (147.6)	3 (76.2)	1-3/4 (44.5)	GREEN	94H	94H	94
750 MCM	54880	1/2 (12.7)	6 (152.4)	3 (76.2)	1-15/16 (49.2)	BLACK	106H	106	106
1000 MCM	54882	1/2 (12.7)	6-39/64 (167.9)	3 (76.2)	2-17/64 (57.5)	-	-	125H	125

B-13 (Final)

**ATTACHMENT C**

**TERMINATION OF CONTROL & INSTRUMENTATION CABLES AND WIRES**

Attachment C

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	SCOPE .....	C-3
2.0	PURPOSE.....	C-3
3.0	GENERAL.....	C-3
4.0	WIRE IDENTIFICATION.....	C-3
5.0	WIRE SUPPORT AT EQUIPMENT.....	C-3
6.0	TERMINATING WIRES.....	C-3
7.0	WIRING OF PANEL.....	C-5
8.0	SWINGING PANEL OR DOOR WIRING.....	C-6
9.0	TERMINATION OF TAPE-SHIELD DRAIN WIRE .....	C-7
10.0	TERMINATION OF METAL SHIELDING BRAID.....	C-9

Attachment C

**1.0     SCOPE**

- 1.1     The recommendations contained herein apply to all control, instrumentation and thermocouple cables and wires.

**2.0     PURPOSE**

- 2.1     The purpose of this Attachment is to identify methods of terminating control and instrumentation cables and wires.

**3.0     GENERAL**

- 3.1     The details shown in this Attachment are typical. They are intended to serve as a guide and reference and are supplemental to the Purchase Specification and Electrical Drawings.

**4.0     WIRE IDENTIFICATION**

- 4.1     Each wire shall be identified at both ends by securely fastening noncorrosive cable tags or markers around the wire. These tags or markers shall be imprinted with the wire numbers identified on the wiring diagrams.
- 4.2     Cable tags and markers shall be suitable for the wire and the environmental conditions mentioned in Section 4 of the specification.

**5.0     WIRE SUPPORT AT EQUIPMENT**

- 5.1     Supplier shall provide support to avoid stress on the individual wires. All wires terminating at control boards, logic cabinets, switchgear, motor control centers, etc., shall be supported with facilities furnished with the equipment.

**6.0     TERMINATING WIRES**

- 6.1     All individual wires shall be terminated on terminal blocks, fuse blocks, etc.. No more than two wires shall be connected to any one terminal point.
- 6.2     Only one wire per terminal will be used by the buyer on the field side of the terminal blocks. Any common connections required shall be provided by the Supplier on the panel side of the terminal block and the field side shall be left free for the buyer's wiring.



Attachment C

6. TERMINATING WIRES (CONT.)

- 6.3 Each terminal for the field side of the terminal block shall be the minimum width of 0.312" (See Detail A).
- 6.4 When cutting away the insulation, wire stripping tools shall be used. The length of insulation removed shall be as recommended by the terminal lug manufacturer. The bare wire must be completely covered by the ferrule on the lug.
- 6.5 Each wire (other than thermocouple extension wire) shall be terminated with a ring-tongue terminal lug which is to be fastened to the wire with the proper compression tools. Attachment A to this Appendix indicates the applicable ring-tongue terminal lug to be used, and also indicates other pertinent directions on the subject of terminations.
- 6.6 When grounding wires for potential or current transformer circuits are indicated, each grounding wire shall be insulated wire (Type SIS), be suitable for the environmental conditions mentioned in Section 4 of purchase specification, be 10 AWG (5.5 mm<sup>2</sup>) with Class B stranding and be terminated at both ends with the specified ring-tongue terminal lug.
- 6.7 When a grounding circuit for instrumentation cable shield and/or drain wire is indicated, the ground wire and jumper wires of the circuits shall be assembled so that both wires (to any indicated terminal block terminal) are terminated in a single ring-tongue terminal lug. This allows removal of the ground from a given terminal without interrupting the ground circuit to other terminals. The ground and jumper wires shall be 18 AWG (1.0 mm<sup>2</sup>) with Class B stranding, be suitable for the environmental condition mentioned in Section 4 of purchase specification and be insulated wire (600V, Type SIS). The grounding wire shall be terminated at the grounding point in a single ring-tongue terminal lug.
- 6.8 Wires requiring termination in either a plug or receptacle shall be terminated as the type plug or receptacle requires according to the proper Wiring Diagram.
- 6.9 Thermocouple extension wire terminations shall be made without the use of lugs. After stripping off sufficient insulation, each wire is terminated (in the case of machine screw terminals) by bending the wire in a "U" shape around the terminal screw in the same direction as the screw tightens and tightening the screw properly.
- 6.10 When thermocouple extension wire termination is made in the terminal block, bar conductor in the terminal block shall be of the same material as the thermocouple extension wire in order to have proper accuracy.
- 6.11 If connections are made with plug, connector, etc., both male and female of plug, connector, etc. shall be supplied with the equipment and/or cable.

Attachment C

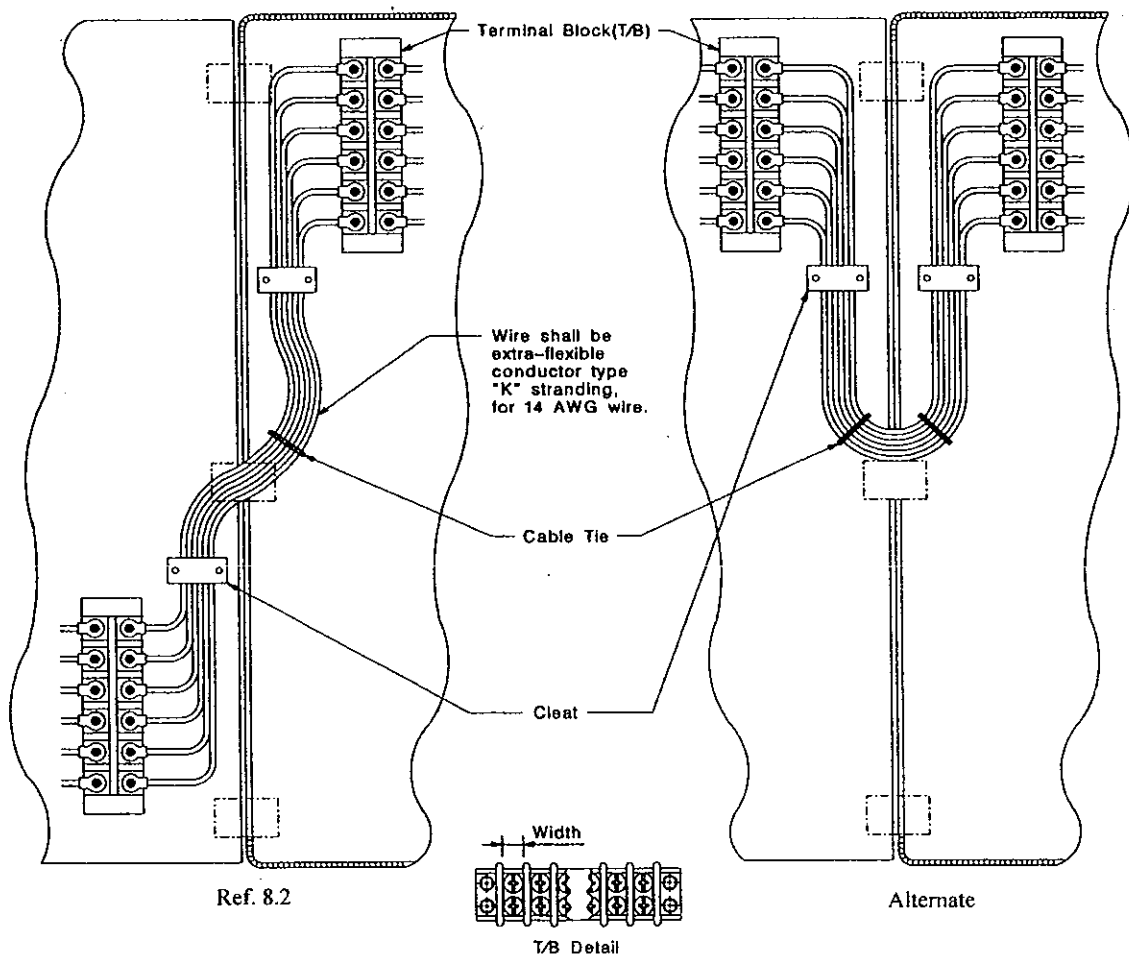
**7.0     WIRING OF PANEL**

- 7.1     Control wires shall be continuous between terminal points and be 14 AWG (2.08 mm<sup>2</sup>) with Class B stranding. Insulation shall be 600 volt, suitable for the environmental conditions mentioned in Section 4 of the specification and be of Type SIS. Terminations shall be as mentioned in Section 6 on this attachment.
- 7.2     Wiring shall be bundled, be run in straight lines without kinks and have uniform bends. Bends shall be of sufficient radius to avoid damage to the insulation. The wires shall be symmetrically arranged so as to avoid stress on the terminations. They shall be secured in position with bolted cleats and mounting plates or secured with cable ties and terminated in a good workmanlike manner.
- 7.3     Approved terminal blocks shall be furnished within suitable enclosures for cable connections to or between panels, racks or skid mounted units. Requirements for terminal blocks are identified in Attachment F to this Appendix.
- 7.4     Separate terminal blocks shall be provided for power, control and/or instrumentation cables, respectively. And if necessary for noise reduction, opening for power, control and/or instrumentation cable entrances shall be separated, respectively.

Attachment C

**8.0 SWINGING PANEL OR DOOR WIRING**

- 8.1 When connections are made from a fixed panel or box to a swinging panel or door, the conductors used across the hinge shall be 14 AWG with Class K stranding or as specified on the Electrical Drawings. These conductors shall have tinned copper wire with 600 volt, Type SIS and be suitable for the environmental conditions mentioned in Section 4 of the specification.
- 8.2 Conductors crossing a door hinge area shall be cleated on both sides of that area so that they rotate (instead of flexing) with the movement of the swinging panel or door. (See Detail A)

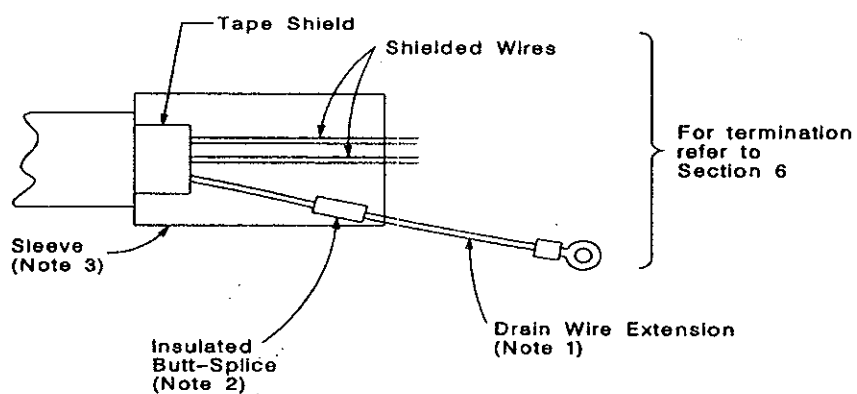


**DETAIL A**  
**METHOD OF INSTALLING HINGE WIRE ON SWINGING PANEL OR DOOR**

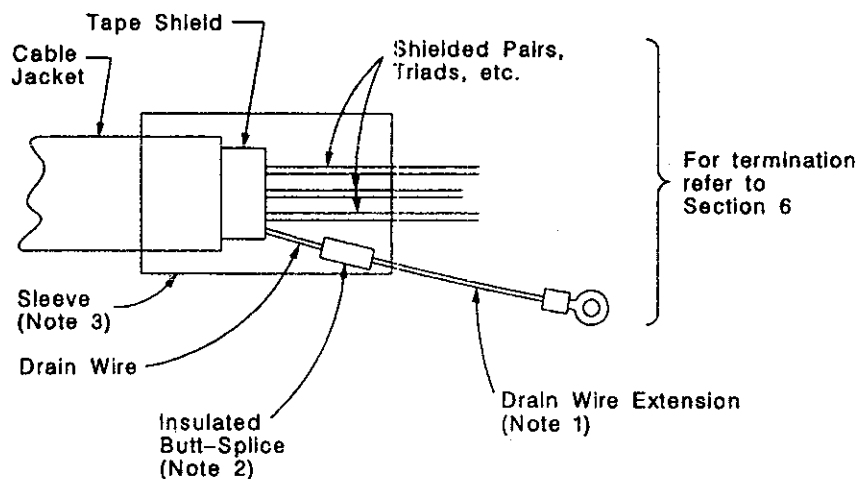
Attachment C

**9.0 TERMINATION OF TAPE-SHIELD DRAIN WIRE**

- 9.1 Each drain wire termination shall be made by using an insulated butt splice and insulated extension wire as indicated in the following details:

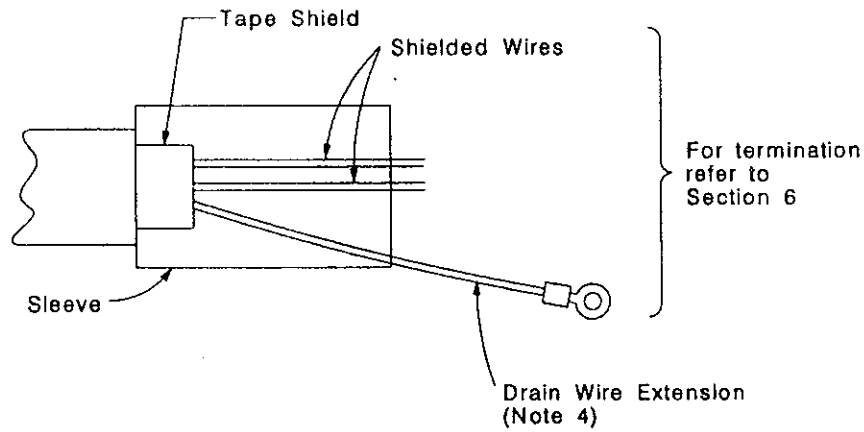


**DETAIL B**  
**INDIVIDUAL SHIELDED PAIRS, TRIADS, ETC.**

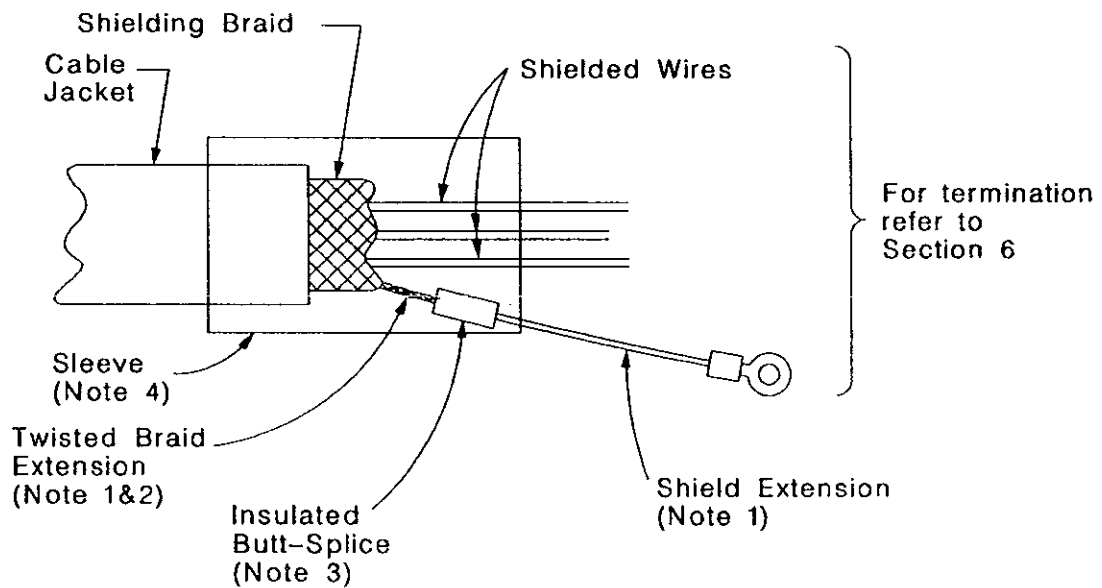


**DETAIL C**  
**OVERALL SHIELD DRAIN WIRE**

Attachment C



DETAIL D  
TAPE-SHIELD DRAIN WIRE EXTENSION WITHOUT  
USING INSULATED BUTT-SPLICE



DETAIL E  
SHIELD BRAID TERMINATION

Attachment C

Notes for Details B through D

1. The outer cable jacket shall only be removed for a distance necessary to expose sufficient lengths of individual conductors to make the proper connections to termination points. The drain wire extension shall be 18 AWG tinned copper with Class B stranding and cut to a length to reach its termination point. The insulation shall be 600V, Type SIS and suitable for the environmental conditions mentioned in Section 4 of the specification.
2. The insulated butt splice shall be crimped with the ratchet crimping tool recommended by the manufacturer of splicing material.
3. The sleeve shall be either heat shrinkable tubing or electrical tape, shall capture the tape shield and the insulation on the drain wire extension and shall be suitable for cable materials.
4. Detail D is an acceptable alternate termination of the tape-shield drain wire. When this method is used, an insulating sleeve shall be slipped over the drain wire before the lug is attached. The drain wire shall be made long enough to reach its termination point.

**10.0 TERMINATION OF METAL SHIELDING BRAID**

- 10.1 Each shielded braid terminal shall be terminated as described in the following paragraphs.
- 10.2 The ferrules and splices required for properly terminating cables and conductors which have braided shielding braid will depend on the diameters of the cables and conductors involved. This attachment will, therefore, recommend the ferrules and splices by manufacturers types rather than specific catalog numbers. The Supplier shall consult the hardware manufacturer for applicable catalog numbers of the complete splice and the crimping tool required to terminate each size cable.
- 10.3 The following methods are recommended for terminating the metal shielding braid:

Method 1 Shield Extension

This method uses a combed out and twisted wires of the braid as a conductor which is spliced with an insulated butt splice to an insulated wire as shown in Detail E.

Notes for Detail E

1. The outer cable jacket shall only be removed for a distance necessary to expose sufficient lengths of individual conductors to make the proper connections to termination points. The drain wire extension shall be 18 AWG tinned copper with Class B or Class K stranding and cut to a length to reach its termination point. The insulation shall be 600V, Type SIS and suitable for the environmental conditions mentioned in Section 4 of the specification.

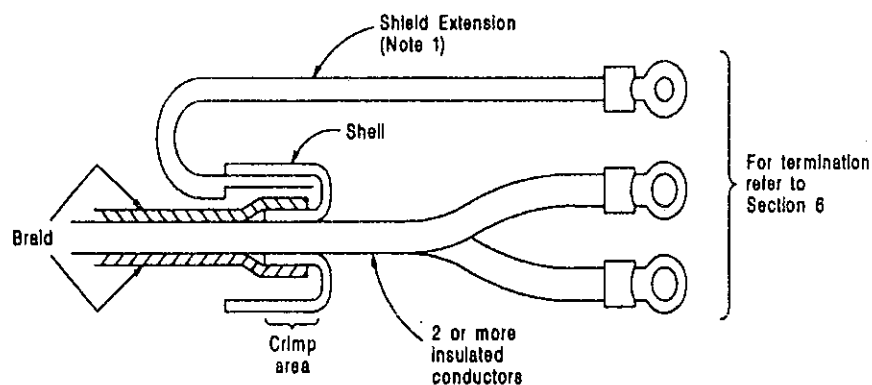
Attachment C

10. TERMINATION OF METAL SHIELDING BRAID (CONT.)

2. The shielded braid should be combed out and twisted to size 12 AWG conductor.
3. The insulated butt splice shall be crimped with the crimping tool recommended by the splice manufacturer.
4. The sleeve shall be either heat shrinkable tubing or tape, shall capture the cable jacket, shielding braid and lead wire insulation and shall be suitable for the cable materials.

Method 2 Single Piece

The single piece termination contains a tinned metallic shell which protects the inner conductor(s) during the crimping of a shield extension to the metal shielding braid as detailed in principle by Detail F.



DETAIL F  
1 PIECE TERMINATION TO SHIELD (SH)

Attachment C

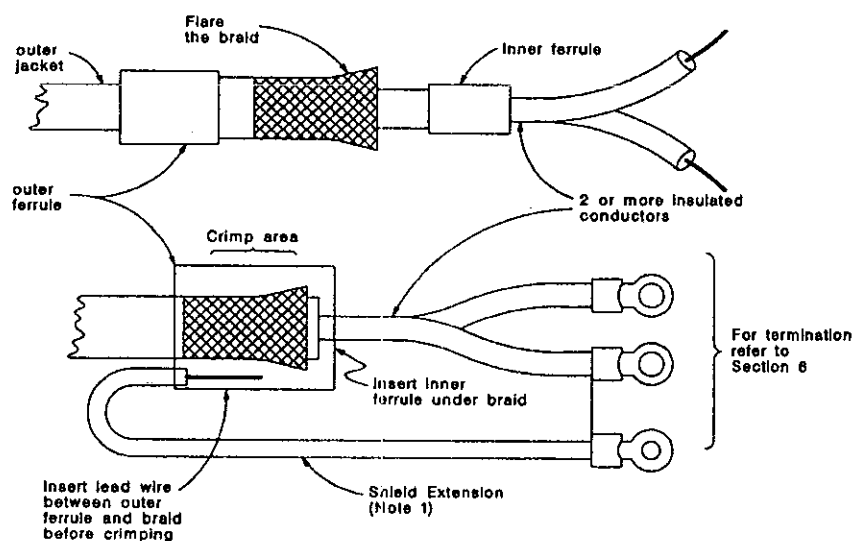
10. TERMINATION OF METAL SHIELDING BRAID (CONT.)

Notes for Detail F

1. The shield extension shall be 18 AWG tinned copper with Class B or Class K stranding. The insulation shall be 600V, Type SIS and suitable for the environmental conditions mentioned in Section 4 of the specification. The extension shall be trimmed so that the shielded conductors are shielded until nearing their termination points.
2. Recommended manufacturers of the shell termination piece are:  
  
AMP - "Termashield"  
  
Burndy - "Uniring"  
  
Thomas & Betts - "STA-KON"
3. The one piece termination may be of the preinsulated kind or be insulated with either manufacturers insulating sleeve or heat shrinkable tubing.

Method 3 Two Piece

The two piece termination consists of a harder inner and softer outer ferrule which allows crimping of the shield extension to the braid without distortion of the inner conductor(s) as detailed in Detail G.



DETAIL G  
2 PIECE TERMINATION TO SHIELD (SH)



Attachment C

10. TERMINATION OF METAL SHIELDING BRAID (CONT.)

Notes for Detail G

1. The shield extension shall be 18 AWG tinned copper with Class B or Class K stranding. The insulation shall be 600V crosslinked polyethylene (Type SIS). The shield extension shall be tinned so that the shielded conductors are shielded until nearing their termination points.
2. Recommended manufacturers of the two piece terminations are:  
  
    Burndy - "Hyring"  
  
    Thomas & Betts - "STA-KON"
3. The two piece termination may be of the preinsulated kind or be insulated with either manufacturers insulating sleeve or heat shrinkable tubing.

**ATTACHMENT D**

**CONDUIT TERMINATIONS AT THERMOCOUPLES,  
TRANSMITTERS, SOLENOIDS, ETC.**

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	SCOPE .....	D-3
2.0	GENERAL INSTRUCTIONS .....	D-3

Attachment D

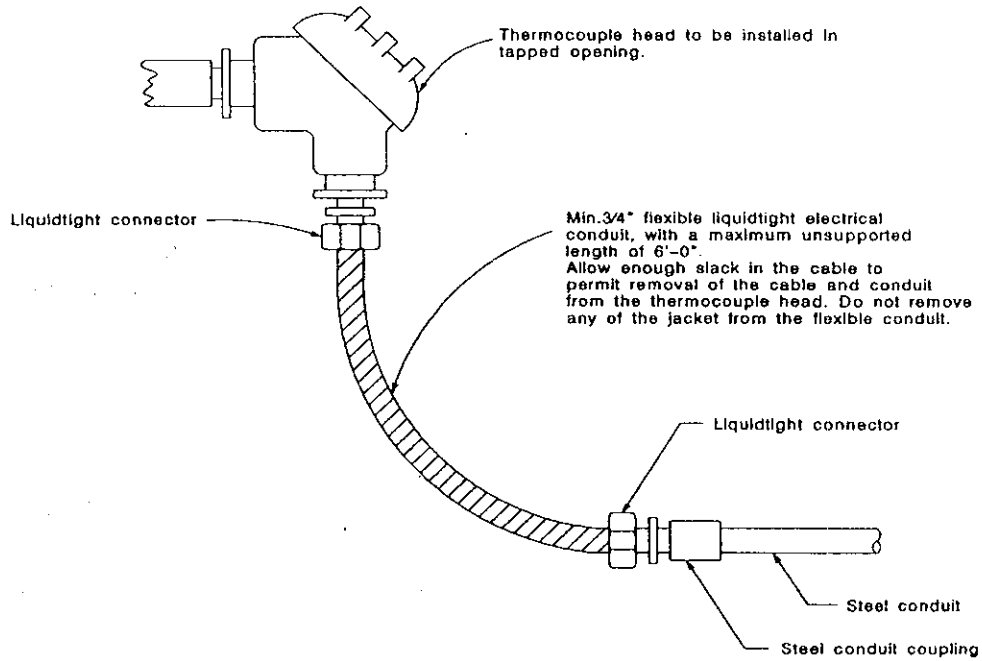
**1.0     SCOPE**

- 1.1     This attachment outlines the method of terminating conduits at thermocouples, transmitters, solenoids, etc. This information is being supplied to the manufacturer for information to illustrate the field installation detail.

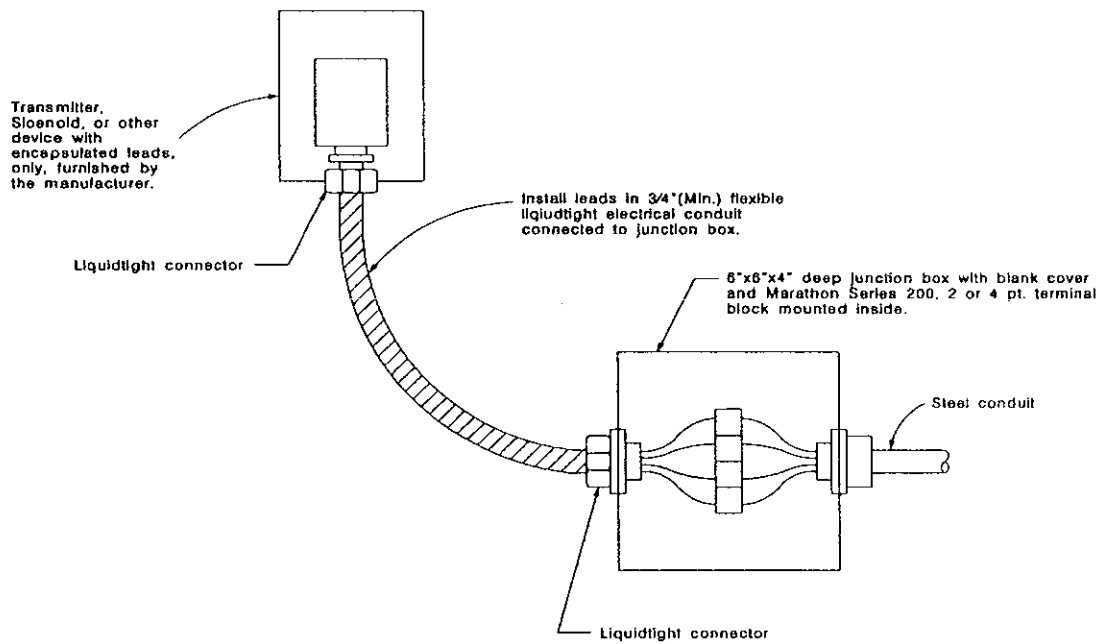
**2.0     GENERAL INSTRUCTIONS**

- 2.1     Unless otherwise specified on the Construction Drawings, conduit terminations at thermocouples, transmitters and solenoids shall be made with liquid-tight flexible conduit.
- 2.2     Minimum one foot length of liquid-tight flexible conduit will be used for terminating of rigid steel conduit to the equipment.
- 2.3     See following typical detail installations as shown below.

Attachment D



CONDUIT CONNECTION AT THERMOCOUPLE



Conduit Connection at Thermocouples, Transmitters, Solenoids,  
Etc. (in Mild Environment)

**ATTACHMENT E**

**TERMINATION OF CONDUIT  
AND CABLES AT MOTORS DRIVE UNITS, VALVES, ETC.**

Attachment E

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	SCOPE .....	E-3
2.0	GENERAL INSTRUCTIONS .....	E-3

Attachment E

**1.0     SCOPE**

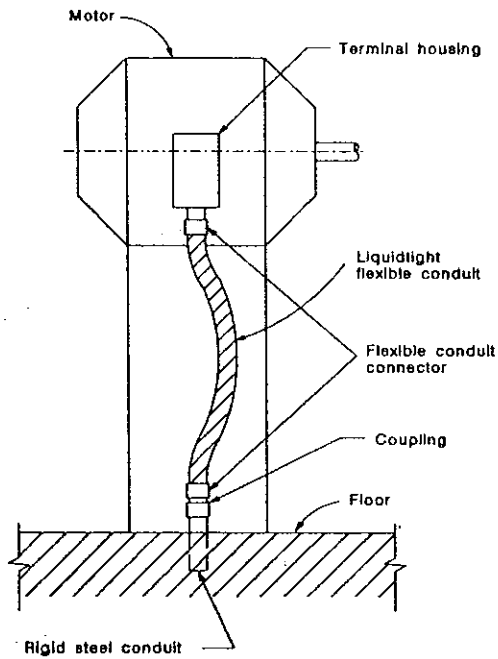
- 1.1     This attachment outlines the method of terminating conduits at motors, damper drive units, motor operated valves, and other equipment. This information is being supplied to the manufacturer to identify the field installation detail.

**2.0     GENERAL INSTRUCTIONS**

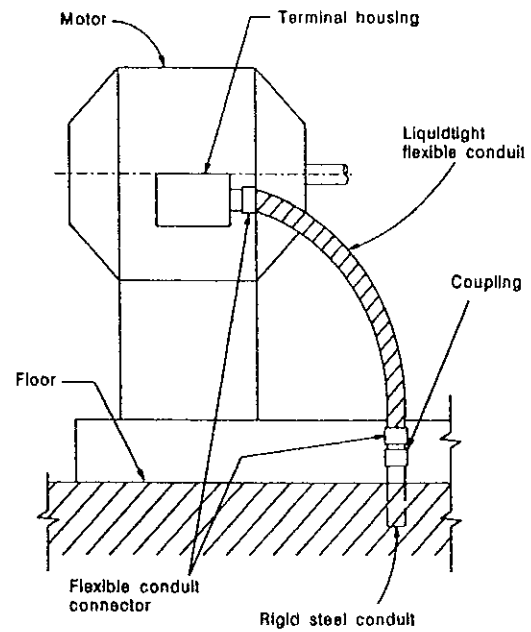
- 2.1     Unless otherwise specified on the Construction Drawings, conduit terminations at motors and other electrically driven equipment shall be made with liquid-tight flexible conduit.
- 2.2     Minimum one foot length of liquid-tight flexible conduit will be used for terminating of rigid steel conduit to the equipment.
- 2.3     Motors and drives located outdoors shall have terminal housings that can be oriented to allow conduit entrance from the bottom or either sides.
- 2.4     See following typical detail installations as shown below.



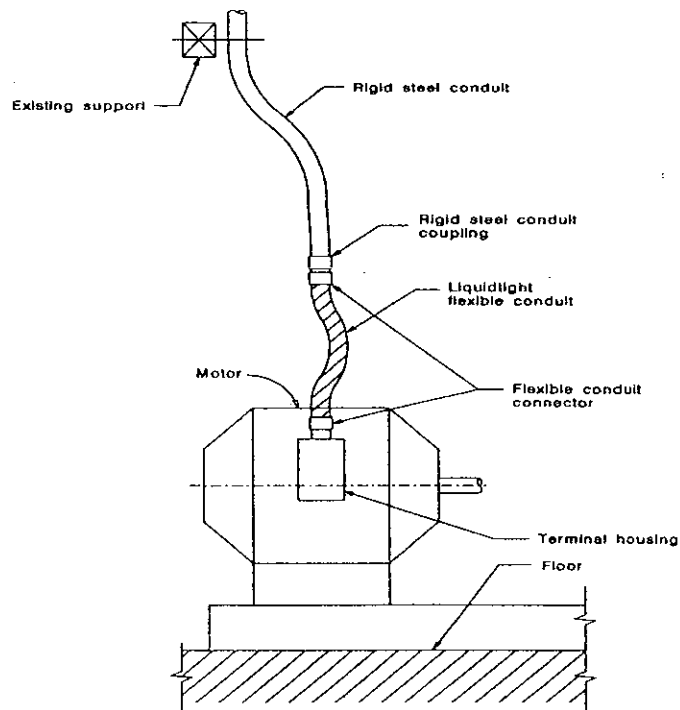
Attachment E



DETAIL A



DETAIL B



DETAIL C

E-4 (Final)

**ATTACHMENT F**

**HINGED COVER CABINETS WITH REMOVABLE PANEL  
FOR TERMINAL BLOCK MOUNTING**

Attachment F

1. Hinged cover cabinets with non-locking handles and latches, with panels mounted on studs in rear for installation indoors in dry, non-hazardous locations, shall be 14 gauge sheet steel and shall conform to the National Electrical Manufacturers' Association (NEMA) Standard for Type 1 enclosures.
2. Cabinet sizes, except for Detail A, are based on minimum spacing required for the installation and wiring of 12 point molded bakelite terminal blocks with washer head screw contacts as follows:

A. Control Terminations (10-32 Screw, 600V Rated or above)

Series 1500, Catalog No. 1512ST  
Series 1600, Catalog No. 1612ST  
Marathon Special Products Co.

Type EB-25, Catalog No. EB25A12W  
General Electric Co.

Catalog No. TBU-12  
Westinghouse Electric Corp.

Series NCB100  
Buchanan

B. Instrumentation Terminations (8-32 Screw) for low level signals

Series 300, Catalog No. 312  
Marathon Special Products Co.

Type CR151, Catalog No. CR151B2  
General Electric Co.

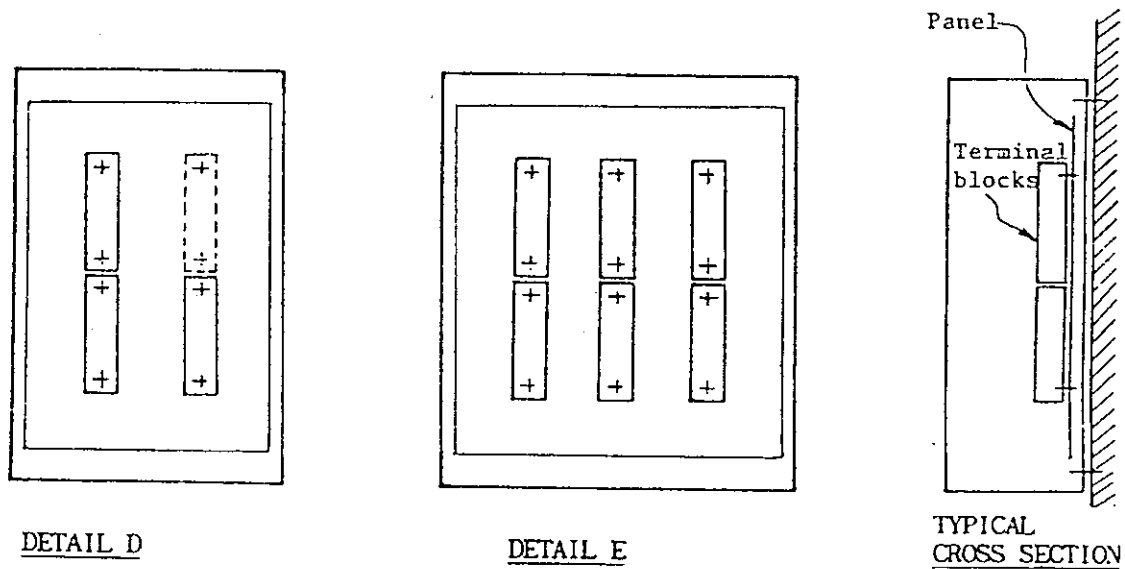
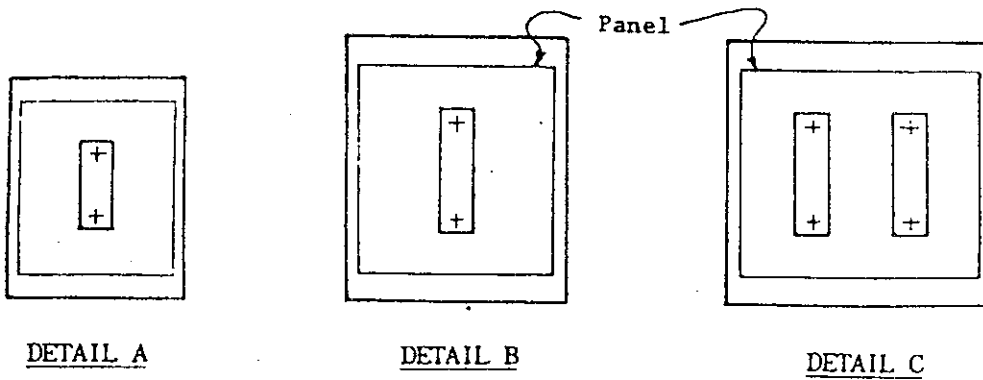
Terminal Blocks shall be suitable to the size of external wiring which will be decided by the buyer. Therefore, terminal blocks rating and dimension shall be provided to the buyer for review.

3. Detail A shows the cabinet arrangement for mounting a single 8 point Marathon Special Products Co's series 1600 terminal block, or equivalent.
4. Cabinet sizes shown are typical sizes

Attachment F

5. The quantity, size and position of conduit or cable openings in the cabinets shall be determined from Electrical Installation Drawings (where applicable ) and punched by the Construction Contractor.
6. Hinged cover cabinets that are to be installed outdoors shall be 12 gauge, they shall be galvanized without knockouts, and the cover shall be suitably gasketed. If galvanized finish is damaged by welding, drilling or cutting, the exposed metal shall be repaired with a zinc-rich paint or a galvanized repair stick. Cabinet shall conform otherwise to NEMA Standard for Type 4X enclosures.
7. Cabinets shall have a 1" diameter drain hole provided in a bottom front corner with a bronze screen or mesh spot-brazed on the inside surface over the opening.
8. Terminal blocks shall be mounted to the panel at the rear of the cabinet.
9. Terminal block number plate shall be attached near each terminal block within cabinet.
10. All terminal blocks shall be marked in a permanent manner with the name of the manufacturer, the identification or serial no., etc and these information shall be provided to the buyer for review.

Attachment F



DETAIL NUMBER	TERMINAL BLOCKS		CABINET DIMENSIONS		
	QUANTITY	MAX. NO. OF POINTS	HEIGHT	WIDTH	DEPTH
A	1	8	16"	12"	6-5/8" TO 7"
B	1	12	20"	16"	6-5/8" TO 7"
C	2	24	20"	20"	6-5/8" TO 7"
D	4	48	30"	20"	6-5/8" TO 7"
E	6	72	30"	24"	6-5/8" TO 7"

**ATTACHMENT G**

**CABLE REQUIREMENT FOR SUPPLIER FURNISHED CABLE**

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	SPECIFICATIONS .....	G-3

Attachment G

**1.0     SPECIFICATIONS**

**1.1     Cable Requirements**

The external cable supplied by Vendor shall meet the following requirements unless otherwise specified in Section 4.0 of the Purchased Specification.

**1.1.1   Class 1E cable**

- a.   Class 1E cable shall be suitable and qualified for the environmental condition mentioned in Section 4.0 of the Purchased Specification.
- b.   Class 1E cable shall meet the following Code and STD :
  - IEEE 323, 383 and Reg. Guide 1.131
  - NEMA WC55 (ICEA S82-552), NEMA WC57(ICEA S73-532), NEMA WC70, NEMA WC74.

**1.1.2   Non-Class 1E cable**

- a.   Non-class 1E cable shall be suitable for the environmental condition mentioned in Section 4.0 of the Purchased Specification.
- b.   Non-class 1E cable shall meet the following Code and STD :
  - IEEE 383, Section 2.5
  - NEMA WC55 (ICEA S82-552), NEMA WC57(ICEA S73-532), NEMA WC70, NEMA WC74

**1.1.3   Insulation and jacket material**

- a.   Insulation – EPR, XLPE or equivalent
- b.   Jacket – Neoprene, Hypalon or equivalent
- c.   PVC is not acceptable for insulation or jacket material.

**1.2     Supplier furnished cable shall have the following identifications on the outer surface of the cable and Supplier shall submit the detail method of each cable identification for the buyer's review.**



### 1.2.1 Cable Color Code

- b. Non-Class 1E : Black

1.2.3 The Buyer's Cable number (If required)

1.2.4 The following information shall be printed on the outer surface of the cable

- 1.3 The following cable data shall be supplied by the Supplier for the Buyer 's review and approval.

### 1.3.1 Copper cable for power, control and instrument

- Class 1E/Non 1E
- Number of conductors
- Conductor size
- Overall diameter

Attachment G

**1.0      SPECIFICATIONS (CONT.)**

- e.    Shield material (If required)
- f.    Voltage rating
- g.    Temperature rating (°C)
- h.    Insulation/Jacket material
- i.    Jacket color
- j.    Weight/Foot (lb) (Note 1)
- k.    BTU/ft for fire loading
- l.    AC Ohm/100' (Note 2)
- m.    DC Ohm/100' (Note 2)
- n.    Rated ampacity in air (Note 2)
- o.    Min. pulling temperature(°C)
- p.    Radiation Rating (Gy)
- q.    Bend radius (Pulling/Training) (Note 1)
- r.    Allowable sidewall pressure (lb/ft) (Note 1)
- s.    Max tension (lb) (Note 1)
- t.    Cable length (ft) (Include length limitation, if any)
- u.    Overall diameter of connectors (for cables furnished with connector)
- v.    Has cable been qualified to IEEE 383 vertical tray flame test? (Yes/No)

Note. 1 It is not applicable for pigtails.

2 It is applicable for power cable only.

Attachment G

**1.0      SPECIFICATIONS (CONT.)**

**1.3.2      Fiber Optic cable**

- a.      Number of fibers
- b.      Fiber type (Singlemode or Multimode, etc.)
- c.      Core/Clad size
- d.      Attenuation (dB/km) @850nm and @1300nm
- e.      Bandwidth(Mhz-km) @850nm and @1300nm
- f.      Jacket material/color
- g.      F.O Cable type (Loose or Tight Tube)
- f.      Radiation rating (Gy)
- h.      Overall diameter (inch)
- i.      Weight per feet (lb/ft)
- j.      Max. tension (lb)
- k.      Sidewall pressure (lb/ft)
- l.      Bend radius (Pulling/Training)
- m.      Cable length of limitation to assure the acceptable range of the signal (ft)  
            (If required)
- n.      Has cable been qualified to IEEE 383 vertical tray flame test? (Yes/No)

SKN 3&4

## APPENDIX 4R

Chemical Requirements for Materials Used in  
Contact with Austenitic Stainless Steel or Nickel Base Alloys

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

### ISSUE STATUS

0	'02.9.17	Issue for Use	탁 성현	이 대우	김대우	박 상우
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

## TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
1.0	SCOPE	4R-1
2.0	GENERAL	4R-1
3.0	MATERIALS	4R-1
3.1	LUBRICANTS AND SEALANTS	4R-1
3.2	MARKING MATERIALS	4R-2
3.3	TEMPERATURE-INDICATING CRAYONS	4R-3
3.4	ADHESIVE AND TAPES	4R-3
3.5	LIQUID PENETRANT MATERIALS	4R-4
3.6	DESICCANT AND DESICCANT BAGS	4R-4
3.7	PACKING MATERIALS	4R-4
3.8	ULTRASONIC EXAMINATION COUPLANTS AND LEAK TEST SOLUTIONS	4R-4
3.9	CLEANING MATERIALS	4R-5
3.10	INSULATION MATERIALS	4R-6(Final)
3.11	WATER QUALITY	4R-6(Final)
4.0	CERTIFICATION	4R-6(Final)

## **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 in. 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 12 in. of the weld region prior to local preheat, welding and



postweld heat treatment except that during welding, tape used to seal purge dams 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).

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.

### 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, SE-165 Annex 2 for chlorine, SE-165 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.

SKN 3&4

## APPENDIX 4S

### General Requirements for Instrumentation & Control

KOPEC JOB NO. : 2L179



**KOPEC**

KOREA POWER ENGINEERING COMPANY, INC.

#### ISSUE STATUS

0	9-24-2002	Issue for Use	조/진웅	고상규	박기남	박상욱
REV. NO.	DATE	DESCRIPTIONS	PREPARED	CHECKED	REVIEWED	APPROVED

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Title</u></b>	<b><u>Page</u></b>
1.0	GENERAL.....	4S-1
2.0	CODE & STANDARDS.....	4S-1
3.0	GENERAL DESIGN REQUIREMENTS .....	4S-3
4.0	HUMAN FACTORS ENGINEERING DESIGN REQUIREMENTS .....	4S-31
 <b><u>Attachment</u></b>		
A	Standard Abbreviation List	A-1
B	Demarcation and Mimic Guidelines for Hardwired Panel	B-1
C	Statistical Basis of the Uncertainties	C-1
D	Instrument List	D-1(Final)
E	Instrument Numbering System	E-1(Final)

**1.0 GENERAL**

- 1.1 This appendix is applicable to furnishing instrumentation components, associated piping or tubing, and wiring within a package specification.
- 1.2 All field-mounted instruments and associated electrical devices shall be NEMA Type 4 rated or located in NEMA Type 4 or Type 12 enclosure.
- 1.3 Instrument classified as electrical Class 1E, located inside the Reactor Containment Building and MSIV room shall be furnished with electrical conduit seal assembly when required. The conduit seal assemblies shall meet the environmental and dynamic qualification requirements specified in the Technical Specification.
- 1.4 All control panels and associated panel mounted devices shall be designed to meet the Human Factors Engineering design requirements specified in Section 4.0.

**2.0 CODE & STANDARDS**

- 2.1 Supplier shall control the quality and services to meet the requirements of this Appendix, applicable codes and standards, but not limited to those listed in Section 2.2.
- 2.2 Referenced Codes and Standards

<u>Sponsor</u>	<u>Number</u>	<u>Subject</u>
ANSI/ASME	B1.20.1	Pipe Threads , General Purpose (INCH)
ANSI	C84.1	Electric Power Systems and Equipment-Voltage Rating (60Hz)
ANSI/ISA	7.0.01	Quality Standard for Instrument Air (ISA : Instrument Society of America)
ASME	B16.5	Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24
ASME	B16.11	Forged Fittings, Socket-Welding and Threaded
ASME	B31.1	Power Piping
ASME	PTC19.5	Application Part II of Fluid Meters
IEEE	384	Standard Criteria for Independence of Class 1E Equipment and Circuits

**Appendix 4S****Rev. 0**

<u>Sponsor</u>	<u>Number</u>	<u>Subject</u>
IEEE	420	Standard for the Design and Qualification of Class 1E Control boards, Panels, and Racks used in for Nuclear Power Generating Stations
IEEE	383	Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations
IEEE	946	Recommended Practice for the Design of DC Auxiliary Power System for Generating Stations
IEEE	C37.90.1	Standard Surge Withstand Capability(SWC) Test for Protective Relay and Relay Systems
ISA	5.1	Instrumentation Symbols and Identification
ISA	67.02.01	Nuclear-Safety-Related Instrument Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants
ISA	67.04.01	Setpoints for Nuclear Safety-Related Instrumentation
NEMA	WC-55/ ICEA S82-552	Instrumentation Cables and Thermocouple Wire
NEMA	WC-57/ ICEA S73-532	Standard for Control Cables
NEMA	WC-70/ICEA S-95-658	Nonshielded Power Cables Rated 2000 volts or less for the Distribution of Electrical Energy
NEMA	250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA	ICS	Industrial Controls and Systems
UL	3	Standard for Safety Flexible Nonmetallic Tubing for Electric Wiring
UL	4	Standard for Safety Armored Cable
UL	83	Standard for Safety Thermoplastic-Insulated Wires and Cables
UL	467	Standard for Safety Grounding and Bonding Equipment
UL	486A	Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors

USNRC	RG 1.75	Physical Independence of Electric Systems
USNRC	RG 1.105	Instrument Setpoint for Safety-Related System

### 3.0 GENERAL DESIGN REQUIREMENTS

#### 3.1 General

1. The following requirements generally are applicable only to larger custom-built package systems. Package systems, especially those that have been built in a particular configuration through several units of manufacture, will normally be purchased on the standardized version. The Buyer reserves the right to evaluate and approve system drawings before fabrication.
2. Equipment shall be arranged to prevent hazard to personnel or damage to major equipment in the event of mechanical failure or loss of power.
3. Adequate spacing shall be provided for personnel performing operating or maintenance procedures and for servicing, maintaining, removing, and replacing components.
4. Local indicating instrumentation shall be visible to the operator at the normal floor level. Where instrumentation is elevated or arranged such that it is not accessible from a floor or a major structure, Supplier shall supply permanent platforms, ladders, or other access.
5. Supplier shall furnish the instrument data using Attachment D, Instrument List. The required data and general device information shall be provided via data base or text file which is a PC compatible magnetic or optical media. The data shall be in an EXCEL or ACCESS format.

#### 3.2 Installation

Instrumentation and control equipment shall be furnished and installed in accordance with the following requirements. In case not specified herein, Supplier's standard practice shall be applied following the Buyer's approval:



1. Package system control panels or cabinets will be located in the vicinity of the related equipment so that easy operation and/or monitoring can be made.
2. The materials used in fabrication or installation shall be as follows:
  - Sensing lines
    - o General
      - . tubing : seamless austenitic stainless steel
      - . fittings : austenitic stainless steel
      - . valve/manifold valves : austenitic stainless steel
    - o Sea Water Service
      - . tubing : seamless monel
      - . fittings : monel
      - . valves/manifold valves : monel
  - Air distribution / pneumatic signal lines
    - . tubing : seamless austenitic stainless steel
    - . fittings : austenitic stainless steel
    - . valves : austenitic stainless steel
  - Tubing clamps : stainless steel
  - Process tap and root valves : main line class
3. Root valve shall be located as close to the process tap as practical but they shall be accessible.
4. The type and size of process taps shall be as follows. Root valve size shall be the same as the process tap size:
  - Pressure (including differential pressure) : 3/4" S.W. or Flange as applicable
  - Temperature : 1-1/4" S.W or Flange as applicable
  - Orifice flange.

- . 900 PSIG or greater / 800 °F or greater : 3/4"
- . Less than 900 PSIG / Less than 800 °F : 1/2"
- Averaging Pitot Tube : depend on type and size
- Sampling probe : S.W type, size to be dependent on probe size
- 5. Sensing tubing shall be of 3/8" O.D x 0.065t and shall not be over 50 feet long. Sensing tubing run shall be continuously sloped by 1 inch per 1 foot. Reversal slope without a separate drain or vent valve shall be avoided.
- 6. Sensing lines shall be as short as practical.
- 7. The discharge points of vents or drains shall be away from electrical equipment or operational areas. In case of hazardous fluid, the discharge lines of drains and vent shall be connected to a safe disposal point.
- 8. Instruments shall be located in accessible areas where they will be free from vibration, missile, or jet-impingement, and rigidly mounted with 33Hz of natural frequency, and protected against physical damage, shock, high temperature, freezing, or adverse effect on the process fluid.
- 9. Preferred instrument elevations relative to process taps shall be as follows :

<u>FLUID</u>	<u>PREFERRED INSTRUMENT ELEVATION</u>
LIQUID	BELOW PROCESS CONNECTION
SLURRY	BELOW PROCESS CONNECTION
STEAM ABOVE 20 PSIA	BELOW PROCESS CONNECTION
STEAM BELOW 20 PSIA	ABOVE PROCESS CONNECTION
GAS OR AIR	ABOVE PROCESS CONNECTION

- 10. A pair of differential-pressure sensing lines shall have an equalizing manifold with bleed valves.
- 11. The flow tap should be located in a straight run of the pipe line according to the ASME PTC 19.5-72 "Application Part II of Fluid Meters".

**3.3 Control Panels, Cabinets, and Racks**

1. All enclosed control panels shall be NEMA Type 12 for indoor use and NEMA Type 4 for outdoor use. Control panels shall be freestanding, unless provided as integral parts of a prewired, skid-mounted package. Each panel, cabinet and rack shall be rigid, suitably braced, stiffened, and reinforced to withstand all stresses incidental to shipping, installation and operation without warping or twisting.
2. Control panels, cabinets, and racks shall be completely tubed, wired, and assembled with all instruments, devices, and controls installed so that the assembly is an operating unit ready for installation.
3. Each freestanding control panel/cabinet shall be provided with sufficient interior lighting and duplex, grounded type 120 Vac 1 $\phi$  receptacles. Control panel/cabinet heater when required during construction stage and during long storage shall also be provided. Heaters rated more than 2000 watts in capacity shall be rated at 600V for 480V, 3 phase operation and heaters rated less than 2000 watts in capacity shall be rated at 240V for 120V, 1 phase operation.
4. Supplier shall provide circuit breakers or fuse for the incoming power circuit and the branch power feeder. There shall be a proper protective coordination between incoming circuit breakers and branch circuit breakers or fuses where the control panels are provided with the feeder circuit breakers or fuses. Fuses shall be nonreusable cartridge type with indication when blown and shall be assembled in NEMA 1 type enclosure with adequate lighting for maintenance and service. Supplier shall provide the documents showing the characteristics of the incoming circuit breaker for coordination with the Buyer's upstream circuit breakers and coordination verification documents of the feeder circuit breakers or fuses for the Buyer's approval.
5. Each control panel shall be provided with a loss of control voltage relay for the Buyer's alarm.
6. Each control panel load shall be limited to 2KVA at 120Vac. For higher control panel loads, the panel shall be provided with a step down transformer 480-120V of adequate capacity with incoming circuit breakers.

7. Piping, tubing, fittings, and wiring shall be arranged such that instruments or devices may be removed or serviced without disturbing piping, tubing, or wiring.
8. Instruments exerting strong cantilever forces on the panel surface shall be adequately supported to remain plumb and true within 1/16 inch of vertical and horizontal alignment.
9. Wiring

Control panel wiring shall be performed in accordance with Appendix 4P and the following:

- Low level analog type instrumentation wiring shall be 2/c or 3/c twisted and shielded (i.e. copper mylar tape with stranded copper drain wire) cable not less than No. 16 AWG (1.25 mm<sup>2</sup>), Class B stranded copper with an insulation/jacketing system.
- Current transformer circuit leads shall not be less than No. 10 AWG, (5.5 mm<sup>2</sup>), and shall be terminated at separate short circuiting type terminal blocks.
- Extra flexible wiring shall be provided over door hinges or other locations where leads may be subject to flexing.
- Interconnecting wiring between components mounted on packaged (skid mounted) units shall be run in rigid steel galvanized metallic conduit except where vibratory conditions require the use of flexible metal conduit or where galvanized steel is prohibited. For outside containment applications, flexible metal conduits shall be liquidtight galvanized steel flexible conduits covered with a synthetic outer jacket such as ELECTRIC FLEX CO. "LIQUATITE", ANACONDA METAL HOSE CO. "SEALTITE", or approved equivalent. For inside containment applications flexible metal conduits shall be CONAX BUFFALO CO. "N43012", or approved equivalent.
- Conductor insulation shall be cross-linked polyethylene or ethylene propylene rubber compound. Cable Jacket shall be Neoprene, Hypalon or equivalent, if required. PVC is not acceptable for insulation or Jacket material.

- Terminal blocks shall be suitable for external wires and shall be approved by the Buyer.
- All cables shall be capable of passing the tests indicated in NEMA Standard WC-55/ICEA S82-552, WC-57/ICEA S73-532 and WC-70, as well as the flame test in IEEE 383.
- Wires shall be identified by individual wire numbers or letters at all terminal points. Wires shall be identified by individual sleeve-type wire markers slipped over the ends of and fastened to wires at each termination. Sleeves shall be flame-resistant, non-conducting, a minimum of 1 inch in length, lettered length-wise. PVC sleeves are not acceptable.
- All control panels and cabinets shall be completely wired at the factory prior to shipment in a manner to ensure satisfactory and reliable operation. Particular attention shall be given to factors such as vibration, temperature, ease of installation, testing, and routine maintenance. All wiring shall be protected from sharp edges and corners.
- External wire entrances shall be in accordance with the Buyer's standard for wiring segregation.
- All electrical equipment and instruments which require external connections shall be prewired to terminal boxes mounted on skids.
- Control panels containing both Class 1E and Non-Class 1E devices and wires shall follow the separation and isolation requirements identified in IEEE-384 and USNRC RG 1.75.
- Supplier shall provide enough space in each control panel for cable training bend radii.

10. Connections and Terminations

- Circuits connecting to the Buyer's external equipment shall be terminated at heavy duty terminal blocks including shield wires for instrumentation cable.

Instruments interfaced with the Buyer's equipment shall be wired to a centralized terminal block. Supplier's wiring shall not have more than two wires connected to any terminal point.

- Wiring connections shall be made with compression crimp-on type ring-tongue terminals with insulated ferrules.
- Any electronic components, which are arranged in sliding drawers for rack mounting shall be provided with quick disconnect type connectors for ease of removing the drawers. Mating connectors shall be supplied with an apparatus where such terminations are provided as manufacturer's standard.
- Provisions shall be made for the entrance of all power cables to the cabinets with adequate space provided for termination. Supplier shall furnish cable supports with a flame-resistant nonhygroscopic material suitable to withstand the maximum short circuit stresses.
- Terminal block bars for thermocouple circuits shall be of appropriate material such as chromel or constantan for signal continuity.
- Supplier shall furnish terminal blocks with a minimum of 25 percent spare terminals for each panel.

#### **11. Insulation**

- All insulation and clearances to ground shall be designed such that the live parts will withstand a high potential test of not less than 2500 volts at 60 hertz for 1 minute (except for solid state equipment).
- The insulation of all control device coils shall be impervious to moisture and suitable for operation in a salt laden air. The insulation shall completely seal the conductors to prevent penetration of moisture or other contaminants and shall be suitable for continuous operation at a rated total temperature of 130 °C (266 °F) (Class B). The type of insulation desired shall be one in which the coil windings are fully encapsulated with an epoxy resin, resulting in a homogeneous watertight seal.

#### **12. Insofar as practical, arrangement of instruments and conduits on panels, cabinets**

and racks shall place the electrical devices out of likely paths of condensate or water drains that may occur during testing or calibrating of instruments.

**13. Ground Bus**

A ground bus of 1-inch by 1/4-inch thick copper bar shall be installed to extend the length of each cabinet at a convenient location just above the mounting base. Each section of the cabinet and all instrument and device grounds shall be grounded directly to this bus. Supplier shall drill two NEMA standard 9/16-inch holes on 1-3/4-inch centers spacing at each end of the ground bus for connection of the Buyer's ground cable. Where signal ground isolated from equipment ground is required, a separate ground bus shall be installed in each equipment for analog/digital signal ground.

- 14. With the multiple instrument arrangement, the panels, cabinets and racks shall be arranged so any instrument can be serviced without taking the other instruments out of service.
- 15. Panels, cabinets and racks, when requested, shall have hinged, gasketed, removable doors. The doors shall be equipped with handles.
- 16. Instruments with pigtail electrical connections, such as solenoid valves, shall have all pigtails terminated with ring tongue-type lugs adjacent to the device in lieu of spliced connections.
- 17. All instrument piping, tubing, valves, and fittings shall be installed and securely fastened to the panels, grouped in an orderly manner, and terminated with fittings and plugs at points located at the top or bottom of each panel. Each terminal point shall be identified by a stainless steel tag bearing the number of the instrument associated with the sensing line. All clamps, pads, and supports in direct contact with stainless steel pipe or tubing shall be of stainless steel material.
- 18. All process-sensing line piping, tubing, fittings, and welding within the panels, unless otherwise noted, shall conform to the ASME B31.1 Code for Power Piping. Supplier shall certify that the design, materials, fabrication, construction, and testing of all piping provided by Supplier conforms to the ASME B31.1 Code.

19. Test connections shall be provided such that each device can be calibrated and checked without its removal from the panel.
20. All valves located within tubing runs (tube connection at inlet and outlet) shall be mechanically supported from the panel structure. Valves in piping runs may be supported by the pipe, provided adequate pipe supports are utilized.
21. All process-sensing line fittings and connections shall be of welded construction except final connections to the instruments and test connections at the instruments, which shall be threaded.
22. Connections from control devices shall be terminated in bulkhead fittings unless specified otherwise.
23. Tubing runs shall be continuous from equipment to terminal area except where tees are required or where tubing cannot properly be formed, attached, or removed in one piece without deformation.
24. Each air supply stop valve and tube terminal connection shall be identified by a stainless steel tag stamped with a Buyer's tag number of the connecting instrument on the instrument panel.
25. Control switches, indicating instruments, annunciators and alarm lamps shall be located in front of the panel. Relays, contactors, etc., shall be located on the inside of the rear and side panels. The arrangements of equipment inside the panel shall be such as to provide ample access and meet applicable separation requirements as called in the Technical Specification.
26. Control panels, cabinets and racks shall be designed to receive cables from above and below unless otherwise specified. Top cover plates shall be removable in sections for the Buyer's drilling of conduit and cable entrance fittings. The top of the panel shall be designed for attaching and supporting the Buyer's cable trays with space allowed for cable entry.
27. An internally mounted motor-driven blower, if required, shall be provided complete with intake filter and necessary grills. The blower shall be of sufficient flow capacity to limit the air temperature rise of 10 ° F.



28. Supplier shall supply all necessary power sources for the components which are operated or controlled by and/or through the control panel. Supplier shall also supply adequate terminal blocks for external wirings for the components. Supplier shall also supply suitable voltage regulating transformers for instrumentation when required.
29. If plug-in relays are used, a plug-in test device shall be furnished.
30. Timers, relays, stepping switches, logic controllers and other similar devices shall be provided with dust-tight enclosures.
31. All recorders and indicators shall be arranged for optimum viewing by the operator and ease of chart removal. In no case shall recorders be mounted that maintenance and chart changing will require ladders or foot stools.
32. Control and instrument wiring running inside the panels shall be installed in raceways having removable covers.

### 3.5 Small Air Systems

If instrument air consumption to the package system is less than 600 scfh, individual combination filter reducers shall be used with each instrument or with a panel or rack header using less than 600 scfh for the complete panel.

### 3.6 Large Air Systems

1. On large systems, Supplier shall provide a dual instrument air regulator filter station to reduce the nominal 100 psig instrument air to 20 psig.
2. The valve and manifold arrangement shall permit removal of one reducing valve and one filter from service without disturbing the other or affecting its operation.
3. A minimum 4-1/2 inch diameter, 0 to 30 psig pressure gauge shall be provided downstream of each reducing regulator but ahead of manifold valves.
4. If instruments requiring air pressures different from those described here are

furnished, Supplier shall supply an additional filter/reducing station for each different system.

5. All filter/reducing stations shall be furnished with a separate relief valve downstream of the reducing valve.
6. On panels, individual air supply takeoffs for an instrument shall be made from the top of a brass air header through 1/4 inch brass packless valves attached to 1/4 inch brass nipples brazed into the header.
7. Each instrument and valve shall be tagged with the instrument number in accordance with the Buyer's Numbering System.
8. Supplier shall furnish 20 percent extra valve-branches on each header installed.

### 3.7 Calibration

1. The following shall be considered the measurement reference data for this specification :
  - Normal barometric pressure : 14.7 psia
  - Pressure base for gas-flow measurement : 14.7 psia
  - Temperature base for gas-flow measurement : 15.6 °C (60 °F)
  - Temperature base for liquid-flow measurement : 15.6 °C(60 °F)

### 2. Performance

The Following are minimum acceptable performance requirements for instruments of package systems, all expressed as percentages of instrument operating span.

#### a. Panel mounted indicator (Electrical Type):

<u>Accuracy(%)</u>	<u>Repeatability(%)</u>
± 1.5	± 0.2

## b. Field mounted instrument (Electrical &amp; Pneumatic)

<u>b1. Transmitter Input</u>	<u>Accuracy(%)</u>	<u>Repeatability(%)</u>
- Gage Pressure	$\pm 0.5$	$\pm 0.2$
- Absolute Pressure		
Spans to 50 mmHg	$\pm 1.0$	$\pm 0.5$
Spans exceeding 50 mmHg	$\pm 0.5$	$\pm 0.1$
- Diff. Pressure		
Spans to 500 in H <sub>2</sub> O	$\pm 0.5$	$\pm 0.2$
Spans 500 to 850 in H <sub>2</sub> O	$\pm 0.75$	$\pm 0.2$
- Resistance	$\pm 0.5$	$\pm 0.15$
- Millivolts	$\pm 0.5$	$\pm 0.15$
- Level		
Displacer	$\pm 0.5$	$\pm 0.2$
Flanged Diff. Pressure	$\pm 1.0$	$\pm 0.1$
- Current/Pneumatic	$\pm 0.5$	$\pm 0.2$

## b2. Local Indicator/Switches Accuracy(%)

- Differential Indicator Switch	$\pm 1.5\%$ of F.S
- Differential Pressure Indicator	$\pm 0.75\%$ of F.S
- Pressure Switch	$\pm 0.5\%$ of F.S
- Pressure Gauges	$\pm 0.5\%$ of F.S
- Temperature Indicator	$\pm 1\%$ of F.S
- Temperature Switches	$\pm 1\%$ of F.S

- Flow Indicator  $\pm 5\%$  of F.S
- Flow Switch  $\pm 2\%$  of F.S
- Level Indicator  $\pm 1\%$  of F.S
- Level Switch  $\pm 1/4$  inch

c. Instrument Loop Setpoint Uncertainty and Calculation:

- Supplier shall perform a setpoint uncertainty calculation for all safety-related instruments and devices which Supplier is furnishing with the equipment. The setpoint uncertainty calculation shall be performed in accordance with USNRC RG 1.105 and ISA Std. 67.04.01. Supplier shall include in performing the setpoint uncertainty calculation the instrument accuracy, calibration accuracy, drift, repeatability, temperature effect, seismic effect, cycling, aging, etc. Any other effect on instrument accuracy shall also be included. Supplier's setpoint uncertainty calculation methodology shall be submitted for review prior to completion of the calculation. Certified copies of the calculation shall be submitted to the Buyer.
- Supplier shall furnish all relevant data in performing the setpoint uncertainty calculation required by USRG 1.105 and ISA Std. 67.04.01 using ATTACHMENT C, statistical basis of accuracy limits, based on two sigma values.

3.8 Electronic Field-Mounted Instruments

The following features shall be incorporated as applicable into all electronic field-mounted instruments included in this specification :

- Signals : 4 to 20 mA dc, two-wire
- Electronic circuitry : solid-state
- Power Supply : 24 V dc (remotely mounted)

- Electrical connection : 3/4 inch conduit
- Non-interacting zero and span adjustments
- Diaphragm seals shall be provided for pressure, flow, and level transmitters in application such as acid, caustic, radioactive fluids, etc.
- Transmitters shall be provided with shop-filled capillaries where required.

1. Pressure Transmitters (gauge, absolute and differential)

- Type : 2 wire
- Wetted parts : Type 316 stainless steel (except body, gaskets, and seals)
- Amplifier : integral
- Housing : suitable for specified service environment
- Junction box : integral, with wiring terminals
- Elevation and suppression capability : as required
- Mounting : surface
- Process connections : 1/4" NPT preferred

2. Temperature Transmitters (resistance to current)

- Sensor : RTD, platinum, 100 ohm rating at 0 °C base Temp. with Temp. coefficient of exactly 0.00385 ohm/°C three or four wire ungrounded.
- Range and span : field adjustable
- Output : linear with resistance

- Housing : suitable for specified service environment
- Adaptability to : 3 or 4 wire system
- Mounting : surface

3. Temperature Transmitters (mV to current)

- Sensor : thermocouple (E Type)
- Range and span : field adjustable
- Output : linear with mV
- Housing : suitable for specified service environment
- Mounting : surface

4. Temperature Transmitters (filled-system type)

- Output : 4 - 20 mA
- Others : Refer to Paragraph 3.9.2.

5. Level Transmitters (displacer type)

- Displacer length : to suit application range
- Displacer material : Type 304 or 316 stainless steel
- Hanger rod : 300 series stainless steel
- Mounting Type : external cage type (preferred) or internal displacer
- Mounting orientation and connections : to suit application
- Housing : suitable for specified service environment.

**6. Level Transmitters (differential-pressure type, flanged or extended diaphragm)**

- Mounting : side of vessel
- Flange : material, size and rating to match application
- Wetted parts : Type 316 stainless steel
- Housing : suitable for specified service environment

**7. Converters (current to pneumatic)**

- Input/Output : 4 to 20 mA dc/3 to 15 psig
- Housing : suitable for specified service environment
- Air line connection : 1/4" NPT
- Mounting : surface
- Accessories : pressure reducing valve with filter and gauge

**8. Thermocouples**

- Type : Refer to Paragraph 3.8.3.
- Installation : Thermowells shall be provided with thermocouples.

**9. RTD's**

- Type : Refer to Paragraph 3.8.2.
- Installation : Thermowells shall be provided with RTD's.

**3.9 Pneumatic Field-Mounted Instruments**

The following features shall be incorporated as applicable into all pneumatic field-mounted instruments included in this specification :

- Output Signals : 3 to 15 psig
- Accessories : pressure reducing valve with filter and gauge.
- Zero adjustment : accessible without removing cover
- Mounting : surface
- Output and air supply connections : 1/4 inch NPT
- Style : indicating type or with output gauge.

1. Pressure Transmitters (gauge, absolute and differential)

- Wetted parts : Type 316 stainless steel
- Elevation and suppression capability : as required
- Gaskets : TFE or silicone elastomer for nonradioactive services and suitable material for radio-active services.

Process connections : 1/4" NPT preferred

2. Temperature Transmitters ( filled-system type)

- Bulb : furnished with a companion thermowell .
- Ambient temperature compensation : for Class II thermal systems without compensation ( bulb elevation calibration correction may be required), all other system classes with compensation either fully compensated or easily compensated as suited for the accuracy requirements.

3. Level Transmitters (displacer type)



- Displace length : to suit application range
- Displace material : Type 304 or 316 stainless steel
- Hanger rod : 300 series stainless steel
- Mounting : external cage (preferred) or internal displace
- Mounting connection and orientation : to suit application
- Gauges : supply and output air

#### 4. Level Controllers (displacer type)

- Control modes : proportional (plus integral if application requires)
- Setpoint knob : external (preferred) or inside case door
- Control action : reversible
- Displace length : to suit application range
- Displace material : Type 304 or 316 stainless steel
- Hanger rod : 300 series stainless steel
- Mounting : external cage (preferred) or internal displace
- Connection and orientation : to suit application
- Gauges : supply and output air

#### 3.10 Panel Mounted Instruments

The following features, as applicable, shall be incorporated into all panel mounted instruments included in this specification :

- Signal transmission : 4 to 20 mA or 3 to 15 psig

- Electronic circuitry : microprocessor based solid-state or equivalent.
- Scale : white with black numerals.
- Panel mounting : flush or semiflush
- Bezel : black
- Accessories : mounting hardware and shelves.

1. Elect. Indicators :

- Size : nominal 3 inch width X 6 inch height
- Terminal connections : studs on rear of instrument
- Ganging : capability for horizontal array
- Engineering units and scaling factors : Metric unit shall be applied for all indicating. But especially for pressure and volumetric flow, the following engineering units should be applied.
  - . For pressure, metric unit such as mmH<sub>2</sub>O (or cmH<sub>2</sub>O) or kg/cm<sup>2</sup> should be used.
  - . For volumetric flow , metric unit such as L/s or L/min should be used.
- Zero adjustment : front of instrument
- Display : LED bargraph with 4 digit numeric.
- Display color : green
- Scale : printed, engineering units and scaling factors

- Mounting Method : From the front of the panel.

2. Recorders (miniature strip chart) :

- Size : 6 X 6 inch nominal
- Pens : color coded in multi pen units
- Chart capacity : For 30 days
- Inking system : capsule
- Ink and chart supply : For 2 years plant normal operation
- Chart speed : variable speed
- Chart drive : 120 Vac, 60 Hz
- Display : LCD, LED or VFD(Vacuum Fluorescent Display)
- Display Color : green

3. Indicating Controllers :

- Control modes : non interactive and to suit application
- Control action : reversible
- Indicators : setpoint, controlled variable, and output
- Scale : fixed
- Display : LED or VFD
- Display Color : green
- Size : 3 inch width by 6 inch height, nominal.

- Chassis : slideout for adjustment or servicing in place
  - Servicing : provision for maintaining manual control.
4. Manual Control Station :
- Setting device : thumbwheel, knob, or pushbuttons
  - Scale : calibrated 0 to 100 percent unless otherwise required by application
  - Output indicator : if furnished, scaled 0 to 100 percent
  - Measured variable indication : when required by application
5. Manual/Automatic Transfer Stations :
- Scale : calibrated 0 to 100 percent
  - Indication : measured variable and output
  - Switch : manual/automatic transfer
  - Signal biasing : when required by application
  - Manual/automatic transfer : bumpless and balanceless
6. Signal Comparators (electronic receiver switches) :
- Setpoint capability : 0 to 100 percent of input
  - Adjustable deadband
  - Output relay : SPDT
  - Relay contact rating : 0.5 A, at 250 Vdc inductive load, and 5A, at 120Vac, 60 Hz resistive load.

7. Signal Selectors (high-low) :

- Capability : select on 1 percent difference
- Type : nonindicating
- Field convertible : on high or low signal

3.11 Alarm Contacts and Annunciation :

1. Local annunciators and alarms shall include dual "trouble alarm" contacts for transmission of a combined common signal to the MCR alarm system.
2. Annunciator field trouble contacts shall be normally open and shall close to alarm.
3. The annunciator shall incorporate the momentary acknowledge and test pushbuttons.
4. Annunciators
  - Solid state type annunciators shall be used and all logic cards shall be plug-in type.
  - Response time shall be less than 50 msec.
  - All logic cards shall be tested for surge withstand capability per IEEE C37.90.1 and annunciator system shall operate reliably in ambient temperature up to 148 °F.
  - Aux. relay contacts shall be rated for 0.5Amp at 125Vdc inductive load, 1A at 120 Vac, 60 Hz resistive load.
5. Twenty five percent spare active windows complete with logic circuits shall be provided for the Buyer's future use.
6. Annunciators shall follow the sequence below :

**Appendix 4S**  
**Rev. 0**

<u>Condition</u>	<u>Operator Action</u>	<u>Field Contact</u>	<u>Window</u>	<u>Audible</u>	<u>Alarm Contact to remote Annunciator</u>
Normal	None	Open	Off	Silent	Open
Alarm (abnormal)	None	Close	Flashing	Sounding	Close
Return to normal before acknowledge	None	Open	Flashing	Sounding	Close
Alarm + 20 seconds	None	Closed or Open	Flashing	Silent	Close
Alarm (abnormal)	Acknowledge	Close	On	Silent	Open
Alarm (normal)	Acknowledge	Open	Off	Silent	Open
Normal after acknowledge	None	Open	Off	Silent	Open

7. Annunciator Cabinet :

- The local annunciator cabinet shall be Ronan series X12 series or Hathway EL series or approved equivalent.
- Local annunciator horns shall be adjustable such that they will sound 10 db above local ambient noise levels.
- There shall be an alarm contact closing on loss of voltage to the local annunciator to be transmitted to the remote annunciator.

3.12 Miscellaneous Instrument and Hardware

The following are miscellaneous instruments and hardware, so defined because they do not specifically fall into any of the previously defined categories. However, they are part of many package systems and therefore must meet the following specifications. With regards to process related switches, high setpoint contact shall be energized to

close on process rising action while low setpoint contact be energized to close on process falling action.

**1. Control Valves :**

- Minimum body size : 1 inch, with reduced trim as required
- Use of butterfly or ball valves : for special applications
- Valve sizing : Valve sizing and Cv rating shall be specified based on minimum and maximum pressure drop, pressure, and flow requirement of the system. Valve shall be 70 to 85 percent open during rated maximum process condition.
- Positioners, with gauges and bypass : on all butterfly valves, valves 2 inches and larger, and on cases of seat unbalance when needed for exact positioning, split ranging (do not use bypass) characterizing, and for flow deemed critical by Supplier.

**2. Solenoid Valves :**

- Coil insulation : Class H
- Solenoid valve enclosures : suitable for specified service environment with 3/4 inch threaded conduit hub
- Elastomers : Seals, Disc. Or Diaphragm material to be fluorocarbon elastomer(VITON, FLLIOREL, etc) or equivalent
- DC solenoids : rated 125Vdc, for continuous operation range at 90 to 140 Vdc
- Solenoid coil leads : run in conduit to terminal boxes
- Solenoid valves : mounted such that conduit and cable may be connected without causing misalignment or incorrect operation

- Solenoid valves shall be as manufactured by ASCO or approved equivalent
- Each solenoid valve shall be supplied with 15 Ft pigtails having insulation temperature ratings of 200 °C (392 °F).
- Class 1E qualified pigtails shall be suitable to the splicing kit for field wire connection in terms of environmental qualification.

3. Pressure, Temperature and Flow Switches :

- Enclosures : suitable for specified service environment
- Switches : rigidly fastened to panel, rack, or cabinet such that removal of tubing, piping, and wiring may be accomplished without dismounting of the instrument.
- Contact rating : 5A, 120 Vac, 60 Hz resistive load and 0.5A, 250 Vdc inductive load.
- Pressure, temperature and flow switches : installed such that the Buyer's connections are to terminal blocks.

4. Level Switches :

a. Displace type

- Contact rating : 5A, 120 Vac, 60 Hz resistive load 0.5A, 250 Vdc inductive load
- Switch type : 2-DPDT
- Others : refer to Paragraph 3.8.5

b. Electronic type (ultrasonic, capacitance, etc)

- Enclosures : Suitable for specified service environment
- Mounting connections : 3/4" NPT



- Switch contact rating and type : See Paragraph 3.12.4.a

**5. Limit Switches :**

- Enclosures : suitable for specified service environment
- Contacts : 2-DPDT
- Contact rating : 5A, 120 Vac, 60Hz resistive load and 0.5A, 250 Vdc inductive load.

**6. Auxiliary Relays :**

- Auxiliary relays shall be rated 600 Vac self-reset front connected surface mounted with cover, coil rated for 5 Amp 120 Vac 60Hz and 0.5A 125Vdc continuous duty.
- Contact rating : 5A, 120 Vac, 60Hz resistive load and 0.5A, 250 Vdc inductive load.

**7. (Differential) Pressure Gauges including flow indicator:**

- Pressure gauges : Minimum 4-1/2 inch diameter dial (white face with black graduations), phenol turret case, and blowout protection
- Dial inscriptions shall not be used : the service shall be indicated by a permanent label attached to the gauge case.
- Diaphragm seals : on instruments used for handling viscous liquids or liquids with suspended solids. Means shall be provided for on site calibration of all instruments furnished with diaphragm seals.
- Engineering units and scaling factors : Metric unit shall be applied for all indicating. But especially for pressure and volumetric flow, the following engineering units should

be applied.

- . For pressure, metric unit such as mmH<sub>2</sub>O (or cmH<sub>2</sub>O) or Kg/cm<sup>2</sup> should be used.
- . For volumetric flow, metric unit such as ℓ/s or ℓ/min should be used.

**8. Thermowells :**

- Type : socket weld ( 1 1/4"), thread ( 1 1/4" or 1" NPT), or Flange (3")
- Location : after fluid mixing but not in the minimum straight run of pipe upstream or downstream of a flow element.
- Material : to suit application service

**9. Thermometers :**

- Dial type : bimetallic with 5 inch diameter dial
- Orientation type : as required for unobstructed viewing
- Stem : 1/4 inch stainless steel

**10. Averaging Pitot Tubes :**

- Averaging pitot tubes shall provide suitable signal for proper recording, totalizing or control of complex systems.
- The sensing probes shall be designed to sense flow velocity in each of several equal annular cross-sectional areas of the flow stream and provide an output signal proportional to the average flow.
- Material : to suit application service

**11. Timers :**

- The type of timers shall be timer selector switch, reset timer or program timer as required.

- Each timer shall have proper adjustable range and 120Vac 60Hz continuous duty coils.
- Contact rating : 5A, 120 Vac, 60Hz resistive load and 0.5A, 250 Vdc inductive load.

**12. Control Switches, Pushbuttons, Selector Switches :**

- The number of stages and contacts, number of switch positions, and handle style and color shall be specified or reviewed by the Buyer.
- All contacts shall have contact rating designations of A600 and P300 as defined in NEMA ICS-2.
- Removable handles or keys for control switches shall not be interchangeable with other switches. Supplier shall furnish two handles per unit for use with all control switches.

**13. Indicating Lights :**

- Indicating lights shall be complete with bulb, translucent lens, and suitable resistor for the service required. Lens color shall be either as specified or reviewed by the Buyer.
- Indicating lights for dry, indoor applications shall be Master Specialties Series-10E or approved equivalent.
- LED's are preferred and shall be used whenever available, for the indicating lights in the control panels and boards. LED's shall be of equivalent brightness to incandescent lamps. LED's shall be as manufactured by Master Specialties, Ledtronics, Oshino or approved equivalent.

**14. Uninterrupted Power Supply System**

All equipment are subject to short period of power interruption during the fast bus transfer from normal power source to standby power source. Standby power source is supplied approximately 5 to 10 cycle after initiation of bus transfer.

All equipment shall continue to operate without any degradation of performance during or after bus transfer. If uninterrupted performance of equipment can not be guaranteed, uninterrupted power supply system which consists of inverter, battery, battery charger and any other necessary devices shall be provided by the supplier.

3.13 Instrument Numbering and Tagging

1. Supplier shall assign instrument number in accordance with Attachment E for all instrumentations and controls supplied with associated mechanical equipments.
2. Instrument tagging shall be in accordance with Appendix 4T, "Requirements for Instrument Tagging."

3.14 Unless otherwise specified, the ac equipment fed from system nominal voltage of 120 Vac or 480 Vac shall rated in accordance with ANSI C.84.1, and be able to normally operate at the steady state voltage variation of  $\pm 10\%$ . The operating voltage ranges of 125 Vdc and 250 Vdc equipment shall be in accordance with IEEE 946 Table 1.

**4.0 HUMAN FACTORS ENGINEERING DESIGN REQUIREMENTS**

4.1 General

1. Control panels and associated panel mounted devices to be furnished within this package specification shall be designed to meet the following human factors engineering design requirements for consistent design to minimize operator errors.

4.2 Annunciators

1. Control panel annunciators shall follow good human factors engineering design criteria in order to be immediately and correctly noticed, accurately responded to in a timely fashion, and easily discriminable.

2. Functional Grouping

Annunciators shall be grouped by function and system.

3. Alarm Controls

- The control panel alarm system shall have 2 discriminable controls. (acknowledge and test buttons)
- Control Type : The two controls shall be pushbuttons of large (2cm or greater) diameter.

**4. Dark at Power**

Control panel annunciators shall adhere to the "dark board" concept.

**5. Out-Of-Service (OOS) and Blank Windows**

Out-Of-Service (OOS) and blank windows shall be set up such that the operators will not receive spurious alarms.

**6. Alarm Matrix**

Alarms shall be identified by their positions in the row by column matrix. The matrix rows and columns shall reflect information on the system and problem. Columns shall reflect systems when possible and rows common trouble types. For example, A and B train alarm for a system would be in adjacent columns with alarms for identical pump trips in a row.

**7. Labeling & Nomenclature**

Alarm legends shall be unambiguous and easy to read.

- Abbreviations - Only abbreviations from the standard list of abbreviations and table of system mnemonics (Attachment A) shall be used. Abbreviations shall be consistent for component types, system names, and trouble types.
- Labeling

Engraving and tile setup

Wording shall be set up on each alarm tile in this order : first - Alarm

Source (e.g. - pump A, EFW) second - Problem (e.g. - open, power lost, pressure, flow) third - Degree of severity, if needed (e.g. - Lo-Lo)

- . If a three line format is not needed, a 2 line tile shall be acceptable. More than 3 lines per tile shall be avoided.
- . Lettering height shall be such that 14 characters may fit per line.
- . Character font shall be Gothic, such as Bold Boston (sans serif) for maximum viewability, Stroke width shall be wider than that traditionally used, with a 3:8 ratio to height. Hence letter height shall be 1/4 inch.
- . Lettering shall be accomplished by the following method : Engraving plastic diffuser tile and filling the engraving with black paint or ink.

## 8. Multi - Input Windows

In many cases, an alarm window will have multiple inputs. The general principle governing this is that multiple inputs may be used only when the operator's response to the inputs is the same. For instance, if the operator's response to the alarm would be to dispatch someone to a local panel, regardless of what input, the inputs would be appropriate on one window. However, if the operator must perform different actions, separate windows should be used. In order to limit the number of control panel alarms, multi-input windows shall be used when appropriate.

### 4.3 Panel Layout

#### 1. Consistency and Standardization

- Layouts shall be consistent and instrumentation types standard for similar systems and functions.
- For each type of control function or indicator function, only one hardware type shall be used where practical. For example, all controls for breakers should be the same model. This does not mean, for instance, that all recorders shall be the same. It means that all recorders which perform similar functions (e.g. - trend data for a linear variable from 5 input points, over a certain range and

frequency of reading) should be the same model.

## 2. Panel Size & Shape

For location of components above the floor, vertical panels shall adhere to the following I&C height guidelines:

	<u>Controls</u>	<u>Displays</u>
	Min. - Max.	Min. - Max.
Major	86 – 135 cm ( 34 – 53 inch)	127 – 165 cm (50 – 65 inch)
Normal	86 – 178 cm ( 34 – 70 inch)	104 – 178 cm (41 – 70 inch)

"Major" means that controls and display are used frequently or precisely by the operator.

## 3. Display and Control Groups

Related instruments and controls shall be grouped together and arranged to reflect system process.

### - Grouping

Controls and indicators for each system shall be integrated and grouped below relevant alarms. In general, annunciators shall be at the highest panel elevation, status lights and LED meters below them (but above 170 cm height) and other controls and indications either on the bench section of the panel or located below the 170 cm elevation on the vertical-board. The vertical-board shall contain predominantly indication devices such as analog meters with controls, especially those with handles being located primarily on the bench section. However, controls and indications shall be integrated to reflect process flow as described below.

### - Hardware Layout Mimic

Hardware shall be arranged on the control panels so as to blend instrumentation and control in a manner that reflects process flow through the system. For example, pump and valve controls should reflect their relative locations in the

flow paths in the plant with relevant indicators such as discharge pressure, and flow located adjacently. This type of arrangement need not be done for small, uncomplicated systems with only a few controls and indicators.

#### **4.4 Visual Displays (Indicators and Lights)**

Visual displays shall be easy to read, unambiguous, easy to maintain, and provide needed, relevant information. Glare should be kept low enough so that visual displays may be easily read.

##### **1. Color Coding**

Color coding shall provide clear status information on lights without being overused.

Color coding for indicator lights shall, in general, be as follows:

- Red : Equipment or process operating (open, running, on) or for immediate operator information/attention.
- Green : Equipment or process not operating (close, stop, off)
- White : Equipment with trouble/disabled condition, general information or status. If LED's are used in lieu of bulbs, yellow may be substituted (white and yellow are indiscriminable to the human eye).
- Amber : Not to be used as a warning. May be used for "Auto" as needed, or for less critical operator information/ attention.

##### **2. Lettering and Wording**

Lettering and wording shall be clear, consistent, and readable under all conditions.

- Consistency

Nomenclature shall be consistent for units, system names, and other standard words on all indicators.



- Legends on Lights

Legends and component names shall not be engraved only on indicators. A label shall also be provided in all cases, such that control names shall be visible even when bulbs are burned out or power is lost.

Lettering on visual displays shall adhere to the same general principles as in Section 4.7 (labeling). The only exception is that lettering shall be of smaller size (actual size depends on hardware dimensions).

### 3. Lights

Indicator lights shall be easy to maintain and easy to see against background lighting and glare.

- Color on backlite pushbuttons shall be derived from LED's, not plastic boots placed over lightbulbs.
- Engraving of identification information (such as valve number, pump name, etc.) shall be placed on labels and not lenses. However, status information (such as trip bypass, trouble, etc.) can be placed on lenses.

### 4. Meters and Recorders

Meters shall be easy to use; accurate and unambiguous under all conditions. Recorders shall be easy to use and maintain and shall contain features allowing precise readings.

- Meter Scales

Meter Scales shall have clear divisions, which are non-logarithmic and utilize major, intermediate and minor scale divisions. All scale divisions shall be in 1's, 2's, 5's or 10's (preferably 1's or 10's). Scales shall be in units preferred by operators for interpreting the variable. Metric units shall be used on all meters and indicators. Scales shall begin and end at major scale divisions and be consistent with range limits. Log scales are permissible for certain power meter

applications. Exceptions to this practice may be individually evaluated based on technical considerations.

- In the event of a power loss, meters shall have provisions to indicate the power loss.

#### **4.5 Controls**

All controls shall be easily discriminable, standardized across function, grouped according to function and generally within system, and chosen with good human factors incorporated into the hardware.

##### **1. Control Type**

Control types shall be standardized for function and shall reflect good human factors practice. Each type of control shall be readily discernable from the other.

Controls with handles shall not be located within 10cm (from the bottom of the control handle) of the edge of the benchboard panel (to prevent inadvertent activation).

##### **- Pushbutton Controls**

As a general practice, pushbutton control shall be vertically aligned.

Pushbutton legend shall be readable under ambient light conditions, regardless of internal illumination.

##### **- Rotary Controls**

All rotary control knobs shall incorporate the following features:

- . Good Control Resistance
- . Grooved or textured edge and a 2.5 cm minimum diameter
- . Clear linear scale markings - a detent at each position if possible

- Bright orange or red pointer on control bezel or comparable position indicator

- All control types shall be standardized relative to function. That is, if a pushbutton control switch is used for one type of task such as valve operation, it should be used for that task in all instances.

## **2. Administrative Controls**

Restricted use of controls shall have barriers to inappropriate actuation. These may be protective housings, hinged shields or keylocks, in this order of preference.

- Protective housings are type of controls in which a round pushbutton has a guard on its side but not top. This prevents inadvertent actuation but does not cause the operator to take extra action or pause.
- Keylocks shall be used only when access must be absolutely restricted and there is a real danger of unauthorized use of the controls. Keylocks shall use double sided teeth on keys and shall have "up" as the locked position for the control. Keys shall only be removable when the switch is locked. Keys shall be available at all necessary times in a timely fashion from a well-marked controlled repository.

## **3. Control Discrimination**

All possible cues shall be used to aid operators in discriminating between different control types.

Tactile cues (different shape, feel, and resistance) and visual cues (size, shape, color, style) can be used.

### **4.6 CRT Displays**

Computer displays shall be designed for clarity, rapid error-free interpretation, and accurate presentation of information. Computer hardware shall be designed to support this principle.

**1. Display Format**

Displays shall be formatted to avoid clutter, be easy to use and avoid being "busy"

- Layout of displays shall be done by the computer system supplier. The criteria mentioned below are general guidelines intended to assure compliance with NUREG-0800 and NUREG-0700.
- Display clutter shall be avoided. All screens shall be at least 50% white space. To avoid "busy" screens, data shall not change more often than 1 time a second and rapidly oscillating data shall be smoothed out.

**2. Use of Graphs**

Graphs, when used, shall have clear information in a format familiar to operators.

**Scales and Units :** Graphs on computer generated displays shall use the same scales and units that operators are familiar with, from MCR instrumentation and plant procedures.

**3. Color**

Chosen colors shall be discrete, readily visible, and enhance operator processing of displayed information.

**4. Menus**

All computer displays shall be menu-driven and shall provide paging cues.

Menus shall be hierarchical in nature and each option shall be assigned a number. Multi-page menus and displays shall be avoided.

**5. Hardware**

**Glare :** All MCR CRT's shall be fitted with glare shields or antiglare screens and mounted at an angle empirically determined to minimize glare.

- CRTs shall be capable of high resolution graphics and, at a minimum, the 7

colors described previously.

- Diagonal resolution shall exceed 800 pixels for a 19 inch screen.
- Data refresh rates shall not exceed once per second ; as this would be meaningless to the operator.
- Computer response time shall be fast enough not to impact operator performance.

#### **6. Highlighting**

Highlighting shall be used but not overused to emphasize key information. Blinking (Flashing) Displays can be used for transition to computer alarm state (and suppressed when acknowledged) and for graphic displays where plant parameters exceed the setpoint and are shown out of bounds. Blink rates for these should not detract from readability.

#### **7. Lettering and Messages**

Messages shall be concise but complete. Lettering shall be easily discriminable and readable.

- Alpha numeric character size shall be a minimum of 7 pixels by 9 pixels.

Graphic lines shall have a minimum density of 40 pixels per inch.

- Prompt messages shall provide direction to the operator and shall display required action or options.

**8. Guidelines**

All CRT displays shall use format, units and limits (scale range) that correspond to control board Instrumentation and Control.

- In tabular data, decimals shall be aligned: whole numbers shall be right justified.
- Data flow shall mimic normal plant flow relations.

**4.7 Labeling, Demarcation, and Mimic**

Hierarchical labeling employing clearly visible lettering shall be employed. Labels shall conform to good human factors practices in general, as outlined in EPRI NP-3659, and NUREG-0700.

**1. Hierarchical Labeling**

To prevent panel clutter and unnecessary repetition, a hierarchical labeling scheme shall be used.

- System or subsystem name shall be presented on an overall label for groups of controls and indications within these demarcated areas, and the system name should not be repeated on each individual identifying label.
- As labels go up the hierarchy, letter height and stroke width shall increase.

**2. General labeling and Demarcation Guideline**

General labeling guideline (e.g. label colors, letter heights, stroke widths etc.) shall be in accordance with Appendix 4U. Demarcation and mimic shall be designed in accordance with Attachment B.

**3. Nomenclature and Style**

Labels shall use plant standard nomenclatures and abbreviations as delineated in Attachment A.

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>A</u>		ALTERNATE	ALTE
ABNORMAL	ABNL	ALTERNATE AC	AAC
ABOVE	ABOV	ALTERNATING CURRENT	AC
ABSOLUTE	ABS	ALTERNATOR	ALT
ABSORBER	ABSR	ALUMINIUM	AL
ACCELERATE	ACCEL	AMBIENT	AMB
ACCEPTABLE QUALITY LEVEL	AQL	AMERICAN NATIONAL STANDARD INSTITUTE	ANSI
ACCESS	ACCS	AMERICAN SOCIETY FOR TESTING AND MATERIALS	ASTM
ACCIDENT	ACC	AMERICAN SOCIETY OF MECHANICAL ENGINEERS	ASME
ACCUMULATED	ACUMD	AMMETER	AM
ACCUMULATOR	ACUM	AMMONIA	AMMON, NH3
ACKNOWLEDGE	ACK	AMPERE(S)	AMP(S)
ACOUSTIC LEAK MONITORING SYSTEM	ALMS	AMPERE TRANSFER	A/T
ACTIVATED	ACTVD	AMPLIFIER	AMPL
ACTIVE	ACTV	ANALOG	ANLG
ACTUATION	ACT	ANALOG TO DIGITAL	AE, A/D
ADDITIVE	ADD	ANALOG TO DIGITAL CONVERTER	ADC
ADJACENT	ADJCNT	ANALYSIS	ANAL
ADJUST	ADJ	ANALYSIS INDICATOR	AI
ADMINISTRATION	ADMIN	ANALYSIS RECORDER	AR
ADSORBER	ADSR	ANALYSIS LIGHT INDICATION	AL
AFTER	AFT	ANALYZER	ANZR
AIR CIRCUIT BREAKER	ACB	AND	&
AIR CLEANING UNIT	ACU	ANION	ANI
AIR HANDLING UNIT	AHU	ANNUNCIATOR	ANN
AIR HEATER	AH	ANTICIPATED OPERATIONAL OCCURRENCE	AOO
AIR QUALITY CONTROL SYSTEM	AQCS	ANTICIPATED TRANSIENT WITHOUT SCRAM	ATWS
AIR SUPPLY UNIT	ASU	APPROVED VENDOR LIST	AVL
ALARM	ALM		
ALGORITHM	ALGO		

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>A</u> (Cont.)		AUXILIARY PROTECTION CABINET	APC
APPROXIMATELY	APPROX	AUXILIARY PROTECTION SYSTEM	APS
ARCHITECT ENGINEER	AE, A/E	AUXILIARY RELAY CABINET	ARC
AREA RADIATION	AR	AUXILIARY STEAM	AUX STM
AREA RADIATION MONITOR (ING)	ARM	AUXILIARY TRANSFORMER	AUXT
ARGON	ARG	AVAILABLE	AVAIL
AS LOW AS REASONABLY ACHIEVABLE	ALARA	AVERAGE	AVG
ASSEMBLY	ASSY	AVERAGE POWER RANGE	APR
ATMOSPHERE	ATMOS	AXIAL	AX
ATMOSPHERIC DUMP VALVE	ADV	AXIAL FLUX DIFFERENCE	AFD
AUCTIONEERED	AUCTD	AXIAL POWER DISTRIBUTION	APD
AUDIBLE	AUD	AXIAL SHAPE INDEX	ASI
AUTOMATIC	AUTO	AZIMUTHAL	AZ
AUTOMATIC BUS TRANSFER	ABT		
AUTOMATIC MOTION INHIBIT	AMI	<u>B</u>	
AUTOMATIC WITHDRAWAL DEMAND	AWD	BACK	BCK
AUTOMATIC WITHDRAWAL PROHIBIT	AWP	BACK-UP	BCKUP
AUTOSTART	AUTOST	BACKWASH	BKWH
AUXILIARY	AUX	BALANCE	BAL
AUXILIARY BUILDING	AB	BALANCE OF PLANT	BOP
AUXILIARY BUILDING FLOOR DRAINS	ABFD	BALANCE OF PLANT PROCESS CABINET	BOPPC
AUXILIARY ELECTRIC EQUIPMENT ROOM	AEER	BANK	BNK
AUXILIARY FEEDWATER	AF	BARRIER	BARR
AUXILIARY FEEDWATER PUMP	AFP	BASIN	BSN
AUXILIARY FEEDWATER ACTUATION SIGNAL	AFAS	BATTERY	BATT
AFAS SIGNAL PERTAINING TO STEAM GENERATOR 1	AFAS-1	BEARING	BRG
AFAS SIGNAL PERTAINING TO STEAM GENERATOR 2	AFAS-2	BEFORE	BFR
AUXILIARY OIL PUMP	AOP	BETWEEN	BTWN
AUXILIARY POWER	AP	BISTABLE	BISTAB
		BLEED	BLD
		BLEED TRIP VALVE	BTV
		BLOCKED	BLKD



**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>B</u> (Cont.)		BYPASS FEEDWATER VALVE	BFWV
BLOWDOWN	BLOWDN	BYPASS FEEDWATER VALVE POSITION DEMAND	BVPD
BLOWDOWN SYSTEM	BDS	BYPASS FEEDWATER VALVE POSITION SIGNAL	BVPS
BLOWER	BLWR		
BLOWING	BLWG	<u>C</u>	
BOILER	BLR	CABINET	CAB
BOOSTER	BSTR	CABINET WIRING DIAGRAM	CWD
BORIC ACID	BA	CABLE	CBL
BORIC ACID CONCENTRATOR	BAC	CALCULATION	CALC
BORIC ACID CONDENSATE ION EXCHANGER	BACIX, BACIE	CALIBRATION	CALB, CALIB
BORIC ACID MAKEUP PUMP	BAMP	CALCIUM	CA
BORIC ACID STORAGE TANK	BAST	CAPACITY	CAPY
BORON	BOR, B	CAPACITY BLOWDOWN	CBD
BORON DILUTION ALARM SYSTEM	BDAS	CARBON	C
BORON INJECTION	BI	CARBON DIOXIDE	CO2
BORON INJECTION TANK	BIT	CASING	CSG
BORON MANAGEMENT SYSTEM	BMS	CATEGORY	CAT
BORONOMETER	BOR	CATHODE RAY TUBE	CRT
BORON THERMAL REGENERATION SYSTEM	BTRS	CATHODIC PROTECTION	C PROT
BOTTLED GAS	BG	CATION	CAT
BOTTOM	BOT	CAUSTIC	CAUS
BOX	BX	CAVITY	CVTY
BREAKER	BRKR	CELSIUS	C
BREATHING	BR	CENTER	CTR
BRIDGE	BRDG	CENTIMETER	CM
BRITISH THERMAL UNIT	BTU	CENTRAL ALARM STATION	CAS
BUILDING	BLDG	CENTRAL PROCESS UNIT	CPU
BURNER	BNR	CENTRIFUGAL	CENT
BYPASS	BYP	CHAMBER	CHMB
BYPASSED INOPERABLE STATUS INDICATION	BISI	CHANGE	CHNG
		CHANNEL	CH

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>C</u> (Cont.)		CLOSED CIRCUIT TELEVISION	CCTV
CHARCOAL	CHAR	COAGULANT	COAG
CHARGER	CHR	COALESCER	CLSCR
CHARGING	CHRG	CODE OF FEDERAL (UNITED STATES) REGULATIONS	CFR
CHECK	CHK, CK	COEFFICIENT	COEFF
CHECK VALVE	CK VLV	COLLECTION	COLLN
CHEMICAL	CHEM	COLLECTOR	COLL
CHEMICAL ADDITION UNIT	CAU	COLUMN	COL
CHEMICAL ADDITION TANK	CAT	COMBUSTION ENGINEERING	CE
CHEMICAL VOLUME AND CONTROL SYSTEM	CVCS	COMBUSTIBLE	COMB
CHEMICAL WASTE DRAIN HEADER	CWDH	COMBUSTIBLE GAS CONTROL SYSTEM	CGCS
CHEMICAL WASTE DRAIN	CHWD	COMMON	CMN
CHEST	CHST	COMMON MODE FAILURE ANALYSIS	CMFA
CHILLED	CHLD	COMMUNICATION	COM
CHILLED WATER	CH WTR	COMPARTMENT	COMP
CHILLED WATER COIL	CWC	COMPENSATED	CMPN
CHILLER	CHLR	COMPENSATED IONIZATION CHAMBER	CIC
CHLORIDE	CHLOR	COMPONENT	CMPNT
CHLORINE	CL	COMPONENT CONTROL SYSTEM	CCS
CHLORINATION	CHLORTN	COMPONENT COOLING WATER (SYSTEM)	CCW(S)
CIRCUIT(S)	CKT(S)	COMPOUND BUILDING	CPB
CIRCULATING	CIRC	COMPRESSOR	COMR
CIRCULATING WATER PUMP	CWP	COMPUTED	CMPTD
CIRCULATING WATER (SYSTEM)	CW(S)	COMPUTER	CPTR
CLARIFIER	CLRF	COMPUTER AIDED DESIGN	CAD
CLEAING	CLNG	CONCENTRATION	CONC
CLEAN UP	CU	CONDENSATE	COND
CLOSE	CLS	CONDENSATE STORAGE TANK	CST
CLOSED	CLSD	CONDENSER	CNDSR
		CONDITION	CONDN

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>C</u> (Cont.)		CONTROLLED	CTRLD
CONDUCTIVITY	CDTY	CONTROL LOGIC DIAGRAM	CLD
CONDUCTIVITY RACK	CDTY RK	CONTROL ROOM	CR
CONNECTION	CONN	CONTROL ROOM EMERGENCY VENT ACTUATION SYSTEM	CREVAS
CONSTRUCTION	CONSTR	CONTROL VALVE	CV
CONSTRUCTION PERMIT	CP	CONTROL WIRING DIAGRAM	CWD
CONTAINMENT	CNMT	CONVECTION	CONV
CONTAINMENT ISOLATION	CI	CONVERTER	CVTR
CONTAINMENT ISOLATION ACTUATION SIGNAL	CIAS	CONVEYER	CNVR
CONTAINMENT ISOLATION VALVE	CIV	COOLANT	CLNT
CONTAINMENT PURGE ISOLATION ACTUATION SIGNAL	CPIAS	COOLER	CLR
CONTAINMENT SPRAY ACTUATION SIGNAL	CSAS	COOLING	CLG
CONTAINMENT SPRAY (SYSTEM)	CS(S)	COOLING WATER TREATMENT	CWT
CONTAINMENT SPRAY PUMP	CSP	CORE EXIT THERMOCOUPLE	CET
CONTAINMENT VENT HEADER	CVH	CORE OPERATING LIMIT SUPERVISORY SYSTEM	COLSS
CONTROL AND INSTRUMENTATION DRAWING	C&ID	CORE POWER MONITOR	CPM
CONTROL (LER)	CTRL(R)	CORE PROTECTION CALCULATOR (SYSTEM)	CPC(S)
CONTROL ELEMENT ASSEMBLY (CALCULATOR)	CEA(C)	CORRECTED	CORR
CONTROL ELEMENT ASSEMBLY MOTION INHIBIT	CMI	COST SCHEDULE	C/S
CEA POSITION DISPLAY SYSTEM	CEAPDS	COUNTS PER MINUTE	CPM
CEA POSITION ISOLATION ASSEMBLY	CPIA	COUNTS PER SECOND	CPS
CEA WITHDRAWAL PROHIBIT BYPASS	CWP/B	COUPLING	CPLG
CONTROL ELEMENT DRIVE MECHANISM (CONTROL SYSTEM)	CEDM(CS)	COVER	CVR
		CREW TASK ANALYSIS	CTA
		CRITICAL FUNCTION MONITORING (SYSTEM)	CFM(S)
		CRITICAL HEAT FLUX	CHF
		CRITICAL HEAT FLUX RATIO	CHFR
		CRITICAL PATH METHOD	CPM
		CROSSCONNECT	XCON

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREV- IATION	STANDARD SERVICE DESIGNATION	ABBREV - IATION
<u>C</u> (Cont.)		DEPARTURE FROM NUCLEATE BOILING RATIO	DNBR
CROSSTIE	XTIE	DNBR PRETRIP SETPOINT	DNBRPT
CROSSOVER	XOVER	DEPENDENT	DEP
CUBICLE	CUB	DESIGN BASIS ACCIDENT	DBA
CURIE	CI	DESIGN BASIS EARTHQUAKE	DBE
CURRENT	CURR	DESIGN CHANGE NOTICE	DCN
CURRENT INDICATOR	II	DESIGN CRITERIA MANUAL	DCM
CURRENT RECORDER	IR	DESIGN DOCUMENT CONTROL CENTER	DDCC
CURRENT TRANSFORMER	CT	DESIGN INFORMATION TRANSMITTAL	DIT
CUTOUT	CTOUT	(DETAIL) CONTROL ROOM DESIGN REVIEW	(D)CRDR
CYLINDER	CYL	DETECTOR	DET
<u>D</u>		DETECTION	DETN
DAMPER	DMPR	DEVIATION	DEV
DATA ACQUISITION SYSTEM	DAS	DEWATERING	DEWATER
DATA LINK	DL	DIESEL	DSL
DEAERATOR	DEAER	DIESEL OIL	DO
DECARBONATOR	DECAR	DIESEL GENERATOR	DG
DECADES PER MINUTE	DPM	DIFFERENTIAL	DIFF
DECONTAMINATION	DECON	DIFFERENTIAL PRESSURE	D P, P, DIFF PRESS
DECONTAMINATION FACTOR	DF	DIFFERENTIAL PRESSURE CONTROL STATION	PDK
DECREASE	DECR	DIFFERENTIAL PRESSURE INDICATOR	PDI
DEENERGIZE	DENERG	DIGITAL	DIG
DEGASIFIER	DEGAS	DIGITAL CONTROL AND MONITORING	DCM
DEGRESS	DEG	DIGITAL DATA PROCESSING SYSTEM	DDPS
DELAY	DLY	DIGITAL ELECTROHYDRAULIC	DEH
DEMAND	DEM	DIGITAL TO ANALOG	D/A
DEMINERALIZER	DEMI, DEMIN		
DENSITY	DNS		

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>D</u> (Cont.)		DURATION	DURAT
DILUTE	DIL	<u>E</u>	
DILUTION	DILU	EAST	E
DIRECT CURRENT	DC	ECCENTRICITY	ECC
DIRECT DIGITAL CONTROL	DDC	EFFECTIVE FULL POWER HOURS	EFPH
DISABLED	DIS	EFFICIENCY	EFF
DISCHARGE	DSCH	EFFLUENT	EFLU
DISCHARGE FLUME	DSCH FLM	ELECTRICAL	ELECT
DISCONNECT	DISCON	ELECTRICAL EQUIPMENT CLASSIFICATION OF 1E	1E
DISENGAGE	DISENG	ELECTRICAL EQUIPMENT CLASSIFICATION OF NOT BEING 1E	NON-1E
DISPLAY	DISP	ELECTRICAL TO PNEUMATIC	E/P
DISSOLVED OXYGEN	DO2	ELECTRICAL TRIP SOLENOID	ETS
DISTRIBUTION	DISTR	ELECTRIC POWER RESEARCH INSTITUTE	EPRI
DIVERSE PROTECTION SYSTEM	DPS	ELECTROHYDRAULIC	EH
DIVERSION	DIVE	ELECTROHYDRAULIC CONTROL	EHC
DIVISION	DIV	ELECTROMAGNETIC INTERFERENCE	EMI
DUCT	DCT	ELETRONIC	ELECTRN
DIVISION OF RESPONSIBILITY	DOR	ELECTRONIC OVERSPEED SYSTEM	EOS
DOCUMENT REVIEW NOTICE	DRN	ELECTRONIC PRIVATE AUTO BRANCH EXCHANGE	EPABX
DOMESTIC	DOMES	ELECTRO PNEUMATIC	E/P
DOWNCOMMER FEEDWATER BYPASS VALVE	DFBV	ELEMENTARY WIRING DIAGRAM	EWD
DOWNCOMMER FEEDWATER CONTROL VALVE	DFCN	ELEVATION	ELEV
DOWNSTREAM	DNSTRM	ELEVATOR	ELVTR
DOOSAN HEAVY INDUSTRIES AND CONSTRUCTION COMPANY		EMERGENCY	EMRG
DRAIN	DRN	EMERGENCY BEARING OIL PUMP	EBOP
DRAIN PUMP	DRNP	EMERGENCY CORE COOLING SYSTEM	ECCS
DRAIN TANK	DT	EMERGENCY DIESEL GENERATOR	EDG
DRAIN VALVE	DV		
DRAWING COMMENT DISTRIBUTION FORM	DCDF		
DRIVE	DRV		
DRUM	DRM		
DUPLEX	DPLX		

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>E</u> (Cont.)		EQUIPMENT DRAIN TANK	EDT
EMERGENCY OIL PUMP	EO PMP	EQUIPMENT QUALIFICATION	EQ
EMERGENCY OPERATING PROCEDURE	EOP	EQUIPMENT VIBRATION MONITORING SYSTEM	EVMS
EMERGENCY OPERATIONS FACILITY	EOF	ESSENTIAL	ESSEN
EMERGENCY PROCEDURE GUIDELINES	EPG	ESSENTIAL COMPONENT COOLING	ESCC
EMERGENCY RESPONSE CAPABILITY	ERC	ESSENTIAL SERVICE WATER (SYSTEM)	ESW(S)
EMERGENCY RESPONSE FACILITIES	ERF	EVACUATION	EVAC
EMERGENCY SEAL OIL PUMP	ESOP	EVAPORATOR	EVAP
EMERGENCY TRIP	ET	EXCESS	EXCS
ENCAPSULATION	ENCAPS	EXCESS FLOW CHECK VALVE	EFCV
ENCLOSURE	ENCLSR	EXCESS STEAM DEMAND EVENT	ESDE
END OF CYCLE	EOC	EXCHANGER	EXCH
ENERGIZE	ENERG	EXCITER	EXC
ENERGY MANAGEMENT SYSTEM	EMS	EX-CORE NEUTRON FLUX MONITORING SYSTEM	ENFMS
ENGAGED	ENGD	EXHAUST	EXH
ENGINE	ENG	EXHAUSTER	EXHSTR
ENGINEERED SAFETY FEATURE (SYSTEM)	ESF(S)	EXHAUSR HOOD	EXHD
ESF SIGNAL CANNOT BE OVERRIDEN	ESF-1	EXPANSION	EXP
ESF SIGNAL CAN BE OVERRIDEN	ESF-2	EXTERNAL	EXTER
ENGINEERED SAFETY FEATURES ACUTATION SYSTEM	ESFAS	EXTRACTION	EXT
ENGINEERING CHANGE NOTICE	ECN	EXTRAXTOR	EXTRR
ENGINEERING GROUP LEADER	EGL	<u>F</u>	
ENGINEERING GROUP SUPERVISOR	EGS	FACILITY	FAC
ENVIRONMENTAL MONITORING	EM	FAHRENHEIT	F
EQUIPMENT	EQUIP, EQ, EQPT	FAILED AS IS	F.A.I
		FAILED CLOSED	F.C.
		FAILED OPEN	F.O.
		FAILURE	FAIL
		FAILURE MODE AND EFFECTS ANALYSIS	FMEA
		FAULT	FALT

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>F</u> (Cont.)		FLOW RECORDER	FR
FEEDER	FDR	FLOW TRANSMITTER	FT
FEEDWATER	FW	FLUE GAS	FG
FEEDWATER CONTROL (SYSTEM)	FWC(S)	FLUID	FLU
FEEDWATER FLOW	FWF	FLUORIDE	FLUO
FEEDWATER HEATER	FW HTR	FLUSH WATER SUPPLY HEADER	FWSH
FEEDWATER ISOLATION VALVE	FIV	FOULING	FLG
FEEDWATER REGULATING SYSTEM	FRS	FREQUENCY	FREQ
FEET	FT	FREQUENCY INDICATOR	SI
FIELD	FLD	FREQUENCY RECORDER	SR
FIELD CHANGE NOTICE	FCN	FRESH WATER STORAGE TANK	FWST
FIELD CHANGE REQUEST	FCR	FROM	FR
FILTER	FLTR	FRONT	FRNT
FIRE PROTECTION (PANEL)	FP(P)	FRONT FACE	FF
FIRST	1ST	FUEL CYCLE ANALYSIS	FCA
FINAL SAFETY ANALYSIS REPORT	FSAR	FUEL HANDLING AREA	FHA
FIXED IN-CORE DETECTOR AMPLIFIER SYSTEM	FIDAS	FUEL HANDLING AREA EMERGENCY VENTILATION ACTUATION SIGNAL	FHEVAS
FLAME	FLM	FUEL HANDLING SYSTEM	FHS
FLANGE	FLNG	FUEL MANAGEMENT	FM
FLASH	FLSH	FUEL OIL	FO
FLOOR	FLR	FUEL POOL CLEANING AND CLEANUP	FPCC
FLOW	FLO	FULL LENGTH CEA	FLCEA
FLOW CALIBRATION CONSTANT	FCL	FUNCTION	FUNC, FUNCT
FLOW CONTROLLER	FC	FUNCTIONAL ANALYSIS SUMMARY	FAS
FLOW CONTROL VALVE	FCV	FUNCTIONAL CONTROL LOGIC DIAGRAM	FCLD
FLOW INDICATOR	FI	FUNCTIONAL INTERCONNECTION DIAGRAM	FID
FLOW INDICATING CONTROL STATION	FIK	FUNCTIONAL RECOVERY GUIDELINES	FRG
FLOW INTEGRATOR INDICATOR	FQI	FUTURE	FUT
FLOW INTEGRATOR SWITCH	FQS		

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<b><u>G</u></b>		GLYCOL	GLY
GALLONS PER MINUTE	GPM	GOVERNOR	COV
GAS ANALYZER	GA	GOVERNOR END	GOE
GAS COLLECTION HEADER	GCH	GOVERNOR VALVE	GV
GAS DECAY TANK	GDT	GRAM	GM
GASEOUS RADWASTE SYSTEM	GRS	GRAVITY	GRAV
GASEOUS WASTE MANAGEMENT SYSTEM	GWMS	GROUND	GND
GAS INSULATED BUS	GIB	GROUP	GRP
GAS INSULATED SUBSTATION	GIS	<b><u>H</u></b>	
GAS MONITOR	GM	HAND CONTROLLER	HC
GAS RECIRCULATION	GAS RECIRC	HAND INDICATING CONTROLLER	HIC, HIK
GAS STRIPPER	GS	HANDLE	HDL
GAS STRIPPER EFFLUENT	GSE	HANDLING	HDLG
GAS SURGE TANK	GST	HANDSWITCH	HS
GATEHOUSE	GH	HAND SYNCHRONIZE SWITCH	HSS
GEARBOX	GRBX	HAND TRANSFER SWITCH	HTS
GEIGER-MUELLER	G-M	HANDWHEEL	HNDWHL
GENERAL	GNRL	HEADER	HDR
GENERAL ARRANGEMENT CHANGING REQUEST	GACR	HEALTH	HLTH
GENERAL DESIGN CRITERIA	GDC	HEAT	HT
GENERAL ELECTRIC COMPANY	GE	HEATED JUNCTION THERMOCOUPLE (SYSTEM)	HJTC(S)
GENERATOR	GEN	HEATER (S)	HTR(S)
GENERATOR CIRCUIT BREAKER	GCB	HEATER DRAIN	HD
GENERATOR END	GNE	HEAT EXCHANGER	HX
GENERATOR STATOR COOLING	GC	HEATING	HTG
GENERATOR STATOR COOLING EXHAUSTER	GSCE	HEATING, VENTILATING AND AIR CONDITIONING	HVAC
GLAND	GLND	HEAT LOSS	HL
GLAND SEAL STEAM	GSS	HEAT TRACING	HT TRAC
GLAND STEAM CONDENSER	GSC	HERTZ	HZ
		HIGH	HI



**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>H</u> (Cont.)		HYDRAULIC	HYD
HIGH CAPACITY BLOWDOWN	HCBD	HYDRAULIC CONTROL UNIT	HCU
HIGH EFFICIENCY PARTICULATE AIR (abs)	HEPA	HYDRAULIC FLUID PUMP	HFP
HIGH ENERGY LINE BREAK	HELB	HYDRAZINE	HYDZ
HIGH-HIGH	HI-HI, HH	HYDROGEN	H, H2
HIGH-HIGH-HIGH	HI-HI-HI	HYDROGEN MONITORING SYSTEM	HMS
HIGH LEVEL OVERRIDE	HLO	HYDROGEN PURGE EXHAUST SYSTEM	HPS
HIGH LEVEL WASTE	HLW	HYDROGEN RECOMBINER SYSTEM	HRS
HIGH OR LOW	HI/LO	HYDROXIDE	HYDROX
HIGH PRESSURE	HP	HYPOCHLORITE	HYCO
HIGH PRESSURE SAFETY INJECTION	HPSI		
HIGH PRESSURE STOP VALVE	HPSV	<u>I</u>	
HIGH SOLIDS DRAIN HEADER	HSDH	IGNITER, IGNITION	IGN
HIGH SOLIDS WASTE HEADER	HSWH	IMPULSE	IMP
HIGH VOLTAGE	HV	INACCESSIBLE	INACCES
HOIST	HST	INACTIVE	INACT
HOLD (ING)	HLD (G)	INADEQUATE CORE COOLING MONITORING SYSTEM (RECORDER)	ICCMS(R)
HOLDUP TANK	HT	INBOARD	INBD
HORIZONTAL	HOR	INCH	IN
HORIZONTAL MULTICELL PRESSURE FILTER	HMPF	INCOMING	INC
HOTWATER	H/W	IN CORE	ICO
HOTWELL	HW	IN CORE INSTRUMENTATION	ICI
HOUR	HR	INCREASE	INCR
HOUSE	HSE	INDEPENDENT	INDP
HOUSING	HSNG	INDICATOR	IND
HUMAN FACTORS ENGINEERING	HFE	INDIVIDUAL	INDVL
HUMAN FACTORS GROUP	HFG	INDUCTION	INDN
HUMIDIFIER	HUMF	INERTING	INRT
HUMIDITY	HUMID	INFLUENT	INFLU
		INITIATE	INIT

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>I</u> (Cont.)		INTERMEDIATE RANGE MONITOR	IRM
INITIATED	INTD	INTERMEDIATE RANGE MONITOR SUBSYSTEM	IRMS
INJECTION	INJ	INTERNAL	INT
INLET	INLT	INTERNALS VIBRATION MONITORING SYSTEM	IVMS
INNER	INR	INTEROFFICE MEMORANDUM	IOM
ISOLATION	ISOL	INTERPOSING LOGIC SYSTEM	ILS
INOPERABLE	INOP	IODINE	IOD, I
INPUT/OUTPUT	I/O	ION EXCHANGER DRAIN HEADER	IEDH
INSERTION	INSERT	ION EXCHANGER	IX
INSIDE DIAMETER	ID	IRON	FE
INSPECTION	INSP	ISOLATED PHASE BUS	IPB
INSTITUTE FOR NUCLEAR POWER OPERATIONS	INPO	ISOLATION	ISOL
INSTITUTE OF ELECTRIC AND ELECTRONIC ENGINEERS	IEEE	ISOLATION VALVE	IV
INSTRUMENT	INST	ISOMETRIC DRAWING	ISO
INSTRUMENT AIR	IA	ISOTOPE	ISOTPE
INSTRUMENT ARRANGEMENT DISTRIBUTION DRAWING	IAD		
INSTRUMENTATION AND CONTROL	I&C	<u>J</u>	
INSTRUMENT INSTALLATION DETAILS	IID	JOINT	JT
INSTRUMENT LOCATION DRAWING	ILD	JOINT SYSTEM DESIGN	JSD
INTAKE	INTK	JOURNAL	JRNL
INTEGRATED LEAK RATE TEST	ILRT	JUNCTION	JUNC
INTEGRATED PROJECT SCHEDULE	IPS	JUNCTION BOX	JB
INTERCEPT	INTCP	<u>K</u>	
INTERCONNECTION WIRE DIAGRAMS	IWD	KILOGRAMS	KG
INTERFACE REQUIREMENT	IRQ	KILOGRAMS PER CENTIMETER SQUARED ABSOLUTE	KG/CM2A
INTERMEDIATE	INTERM	KILOGRAMS PER CENTIMETER SQUARED GAUGE	KG/CM2G
INTERMEDIATE PRESSURE	IP	KILOVAR	KVAR
INTERMEDIATE RANGE	IR	KILOVOLTS	KV

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>K</u> (Cont.)		LEVEL INSTRUMENT BRIDLE DRAWING	LBD
KILOWATTS	KW	LEVEL SETTING DIAGRAM	LSD
KOREA ATOMIC ENERGY RESEARCH INSTITUTE	KAERI	LEVEL TRANSMITTER	LT
KOREA ELECTRIC POWER CORPORATION	KEPCO	LICENSEE EVENT REPORT	LER
KOREA HYDRO & NUCLEAR POWER COMPANY	KHNP	LIGHT	LGT
KOREA INSTITUTE FOR NUCLEAR SAFETY	KINS	LIGHT EMITTING DIODE	LED
KOREA NUCLEAR FUEL COMPANY	KNFC	LIGHTER	LGTR
KOREA POWER ENGINEERING COMPANY	KOPEC	LIGHTING	LTG
KOREA STANDARDS INSTITUTE	KSI	LIGHTING ARRESTER	LA
KOPEC INTERACTIVE DOCUMENT SYSTEM	KIDS	LIGHT WATER REACTOR	LWR
		LIMIT	LMT
		LIMITING	LMTNG
		LIMITING CONDITIONS OF OPERATION	LCO
		LIMITING SAFETY SYSTEM SETTING	LSSS
<u>L</u>		LINE	LN
LABORATORY	LAB	LINE OF SIGHT	LOS
LEAD	LD	LINEAR	LNR
LEAK	LK	LINEAR VARIABLE DIFFERENTIAL TRANSFORMER	LVDT
LEAK DETECTION SYSTEM	LDS	LIQUID	LIQ
LEAK OFF	LKOFF	LIQUID CRYSTAL DISPLAY	LCD
LEAVING	LVNG	LIQUID RADWASTE SYSTEM	LRS
LEFT HAND	LH	LIQUID WASTE MANAGEMENT SYSTEM	LWMS
LETDOWN	LTDN	LITER	L
LEVEL	LVL, L	LOAD CENTER	LDC
LEVEL CONTROL VALVE	LCV	LOCAL	LCL
LEVEL CONTROLLER	LC	LOCAL CONTROL PANEL (S)	LCP
LEVEL INDICATING CONTROL STATION	LIK	LOCAL CONTROL STATION	LCS
LEVEL INDICATOR	LI	LOCALLY MOUNTED	LM
LEVEL MULTIPOINT RECORDER	LJR	LOCAL POWER RANGE MONITOR	LPRM
LEVEL RECORDER	LR		

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>L</u> (Cont.)		LUBRICATING	LUB
LOCAL POWER DENSITY	LPD	LUBRICATING OIL	LUBO
LOCAL SAMPLE	LS		
LOCAL SAMPLING SYSTEM	LSS	<u>M</u>	
LOCAL TEST SWITCH	LTS	MACHINE	MACH
LOCKED	LKD	MAIN	MN
LOCKED CLOSED	L.C.	MAIN CONTROL BOARD (S)	MCB
LOCKED OPEN	L.O.	MAIN CONTROL ROOM	MCR
LOCKED-OUT	L-O	MAIN FEED WATER ISOLATION VALVE	MFIV
LOGARITHMIC	LOG	MAIN FEED WATER PUMP	MFP
LOOSE PARTS MONITORING SYSTEM	LPMS	MAIN FEED WATER PUMP TURBINE	MFPT
LOSS OF COOLANT ACCIDENT	LOCA	MAIN OIL PUMP	MOP
LOSS OF COOLANT FLOW	LOF	MAIN POWER	MP
LOSS OF FEEDWATER RECOVERY	LOFR	MAIN TRANSFORMER	MTR
LOSS OF FORCED CIRCULATION	LOFC	MAIN STEAM (SYSTEM)	MS (S)
LOSS OF OFFSITE POWER	LOOP	MAIN STEAM ATMOSPHERIC DUMP VALVE	MSADV
LOSS OF VOLTAGE	LOV	MAIN STEAM ISOLATION (ACTUATION) SIGNAL	MSI(A)S
LOW	LO	MAIN STEAM ISOLATION VALVE	MSIV
LOW-LOW	LO-LO, LL	MAIN STEAM LINE	MSL
LOW-LOW-LOW	LO-LO-LO	MAIN STEAM LINE BREAK	MSLB
LOW BEARING	LBRNG	MAIN STEAM SAFETY VALVE	MSSV
LOWER	LWR	MAIN STOP VALVE	MSV
LOW POWER RANGE	LPR	MAINTENANCE	MAINT
LOW POPULATION ZONE	LPZ	MAKEUP	MU
LOW PRESSURE	LP	MAKEUP SUPPLY HEADER	MSH
LOW PRESSURE SAFETY INJECTION	LPSI	MALFUNCTION	MALF
LOW TEMPERATURE OVERPRESSURE PROTECTION	LTOP	MANAGER	MANGR
LOW VOLTAGE	LV	MANIFOLD	MFLD
		MANIPULATOR	MANIP

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>M</u> (Cont.)		MILLIMETERS MERCURY ABSOLUTE	MM HGA
MANPOWER	MP	MINIMUM	MIN,MINI
MANUAL	MAN	MINIMUM CRITICAL HEAT FLUX RATIO	MCHFR
MANUAL/AUTOMATIC	M/A	MINUTE	MINU,MIN
MANUAL/AUTOMATIC INDICATOR CONTROL	MAIC	MISCELLANEOUS	MISC
MANUAL INDIVIDUAL	MI	MISCELLANEOUS LIQUID WASTE MANAGEMENT SYSTEM	MLWMS
MANUFACTURING	MFG	MODULATION	MOD
MANUFACTURING LICENSE	ML	MOISTURE	MOIST
MANUFACTURER	MFR	MOISTURE INDICATOR	MI
MASTER	MAST	MOISTURE SEPARATOR REHEATER	MSR
MASTER DIAGRAM	MD	MONITOR	MON
MATERIAL TRACKING SYSTEM	MTS	MONTHLY PROGRESS REPORT	MPR
MAXIMUM	MAX	MOTOR	MTR
MAXIMUM PERMISSIBLE CONCENTRATION	MPC	MOTOR CONTROL CENTER	MCC
MEASUREMENT CHANNEL BLOCK DIAGRAM	MCBD	MOTOR DRIVEN FEED PUMP	MDFP
MEAN TIME BETWEEN FAILURE	MTBF	MOTOR GENERATOR (SETS)	MG(SETS)
MEAN TIME TO FAILURE	MTTF	MOTOR INBOARD BEARING	MIBRG
MEAN TIME TO REPAIR	MTTR	MOTORING	MTRG
MECHANICAL	MECH	MOTOR OPERATED VALVE	MOV
MECHANICAL OVERSPEED TRIP	MOST	MOTOR OUTBOARD BEARING	MOBRG
MEGAVARS	MVAR	MOUNTED	MTD
MEGAWATTS ELECTRIC	MWE	MOUNTING HEIGHT	MH
MAGAWATTS THERMAL	MWT	MULTIPERIPHERAL CONTROLLER	MPC
MEMORY ADDRESS TRANSLATOR	MAT	MULTIPLEXER	MUX,MX
MERCURY	HG	MULTIVARIABLE INDICATOR	UI
MEZZANINE	MEZ	MULTIVARIABLE LIGHT INDICATION	UL
MICROPROCESSOR	MPROCES	MULTIVARIABLE MULTIFUNCTION	UU
MIDSPAN	MDSP		
MILLIMETERS	MM		

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>N</u>		NUCLEAR INSTRUMENTATION SYSTEM	NIS
NARROW	NAR	NUCLEAR POWER STATION	NPS
NARROW RANGE	NR	NUCLEAR REGULATION	NUREG
NATURAL	NAT	NUCLEAR REGULATORY COMMISSION (UNITED STATES)	NRC
NEGATIVE	NEG	NUCLEAR STEAM SUPPLY SYSTEM	NSSS
NET POSITIVE SUCTION HEAD	NPSH	NSSS INTEGRITY MONITORING SYSTEM	NIMS
NEUTRAL GROUND	NEUT GND	NUCLEATE BOILING RATIO	NBR
NEUTRON	NEUT	NUMBER	NUM,#, NO.
NEUTRON FLUX	NF	<u>O</u>	
NEUTRON MONITORING SYSTEM	NMS	OBSTRUCTION	OBSTR
NITROGEN	N2	OFF GAS	OG
NOBLE	NBL	OFFICE	OFC
NONCONFORMANCE REPORT	NCR	OFFSHORE TECHNICAL SUPPORT	OTS
NON-POST ACCIDENT	NPA	OIL CIRCUIT BREAKER	OCB
NON-REGENERATIVE	NON-REGEN	OKAY	OK
NON-SAFETY RELATED DESIGNATION	NSR	ON LOAD TAP CHANGE	OLTC
NORMAL	NORM	OPEN	OPN
NORMAL OPERATING GUIDELINES	NOG	OPEN/CLOSE	O/C
NORMAL PRIMARY SAMPLE SINK	NPSS	OPERATING	OPER
NORMAL PRIMARY SAMPLE VALVE AND COOLER RACK	NPSVCR	OPERATING BASIS EARTHQUAKE	OBE
NORTH	N	OPERATING LICENSE	OL
NOT APPLICABLE	N/A	OPERATION	OP
NOT FULLY CLOSED	NFC	OPERATION BASIS ACCIDENT	OBA
NOT FULLY OPEN	NFO	OPERATION BASIS INCIDENT	OBI
NOZZLE	NOZ	OPERATIONS SUPPORT CENTER	OSC
NUCLEAR	NUC	OPERATOR	OPR
NUCLEAR COOLING WATER SYSTEM	NCWS	OPERATOR INTERFACE UNIT	OIU
NUCLEAR DATA LINK	NDL		

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>O</u> (Cont.)		PART STRENGTH CONTROL ELEMENT ASSEMBLY	PSCEA
OPERATOR'S MODULE	OM	PEGGING	PEG
ORGANIC CARBON	C	PENDANT	PNDT
ORIFICE	ORIF	PENETRATION	PEN
OUNCE	OZ	PENETRATION PRESSURIZATION	PP
OUTBOARD	OUTBD	PERCENT	%, PCT
OUTBOARD BEARING	OBRNG	PERFORMANCE	PERF
OUTER	OUTR	PH NUMBER (EFFECTIVE HYDROGEN ION CONCENTRATION, MEASURES ACIDITY/ALKALINITY)	PH
OUTLET	OTLT	PHASE	PHAS
OUTLET HEADER	OHDR	PHOSPHATE	PHOS
OUT-OF-SEQUENCE	OUT-OF SEQ	PILOT	PLT
OUT OF SERVICE	OOS	PIPING & INSTRUMENTATION DIAGRAM	P&ID
OUTSIDE	OUTS	PIPING DESIGN TABLE	PDT
OUTSIDE AIR	OA	PIPING SYSTEM DESIGN SPECIFICATION	PSDS
OUTSIDE DIAMETER	OD	PLANT CONTROL SYSTEM	PCS
OVER	OVR	PLANT DATA ACQUISITION SYSTEM	PDAS
OVERCURRENT	OC	PLANT MONITORING SYSTEM	PMS
OVERFLOW	OVERFLO	PLANT MONITORING AND ANNUNCIATOR SYSTEM	PMAS
OVERLOAD	OVRLD	PLANT MONITORING COMPUTER SYSTEM	PMCS
OVERSPEED	OVRSP	PLANT PROTECTION SYSTEM	PPS
OXYGEN	O2	PLATE	PLTE
<u>P</u>		PLATEN	PLTN
PACKING	PKG	PLENUM	PLEN
PANEL	PNL	PNEUMATIC	PNEU
PARTICLE	PART	POINT	PNT
PART LENGTH CONTROL ELEMENT ASSEMBLY	PLCEA	POLISHER	PLSHR
PART NUMBER	P/N	POLISHING	PLSHNG
PARTS PER MILLION	PPM	POSITION INDICATOR	ZI
PART STRENGTH	PTS	POSITION LIGHT INDICATION	ZL

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>P</u> (Cont.)		PRE HOLD-UP ION EXCHANGER	PHIX
POSITIVE	POS	PRELIMINARY SAFETY ANALYSIS REPORT	PSAR
POSITIVE DISPLACEMENT	PD	PRELIMINARY TASK ANALYSIS	PTA
POST ACCIDENT	PA	PRE-POWER DEPENDENT INSERTION LIMIT	PPDIL
POST ACCIDENT MONITORING SYSTEM	PAMS	PRESSURE	PRESS, P
POST ACCIDENT PRIMARY SAMPLE COOLER RACK	PPSCR	PRESSURE CONTROLLER	PC
POST ACCIDENT PRIMARY SAMPLE SINK	PPSS	PRESSURE CONTROL OR REGULATING VALVE	PCV
POTENTIAL POWER TRANSFORMER	PPT	PRESSURE DROP	PD
POTENTIOMETER	POT	PRESSURE INDICATING CONTROLLER	PIK
POUND	LB	PRESSURE INDICATOR	PI
POUND PER SQUARE INCH ABSOLUTE	PSIA	PRESSURE MULTIPOINT RECORDER	PJR
POUND PER SQUARE INCH GAUGE	PSIG	PRESSURE RECORDER	PR
POWER	PWR	PRESSURE RELIEF VALVE	PRV
POWER DEPENDENT INSERTION LIMIT	PDIL	PRESSURE TRANSMITTER	PT
POWER RATE CHANGE INDICATOR	JKI	PRESSURIZER	PZR
POWER CIRCUIT BREAKER	PCB	PRESSURIZER LEVEL CONTROL SYSTEM	PLCS
POWER INTEGRATOR INDICATOR	JQI	PRESSURIZER LEVEL SETPOINT	PLS
POWER INDICATOR	JI	PRESSURIZER PRESSURE CONTROL SYSTEM	PPCS
PILOT OPERATED SAFETY RELIEF VALVE	POSRV	PRESSURIZER PRESSURE & LEVEL CONTROL SYSTEM	PPLCS
POWER OPERATING LIMIT	POL	PRESSURIZED WATER REACTOR	PWR
POWER RECORDER	JR	PREVENTION	PREV
POWER SPECTRAL DENSITY	PSD	PRIMARY	PRIM
PRECIPITATOR	PCP	PRIMARY SAMPLE CONTROL PANEL	PSCP
PREFERRED	PRFD	PRIMARY WATER	PW
PRE-FILTER	PRE-FLTR	PROBE	PROB
PREHEATER	PHTR		
PREHEATING	PHTG		



**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>P</u> (Cont.,)		QUALITY ASSURANCE REPRESENTATIVE	QAR
PROCEDURE REVIEW NOTICE	PRN	QUALITY CONTROL	QC
PROCESS	PROC	QUALITY SURVEILLANCE	QS
PROCESS AND EFFLUENT RADIATION MONITORING	PRM	QUANTITY	QNTY
PROCESS CONTROL CABINET	PCC	<u>R</u>	
PROCESSING UNIT	PU	RACKED IN	R/I
PROCESS INSTRUMENTATION	PI	RACKED OUT	R/O
PROCESS PROTECTION CABINET	PPC	RADIATION/RADIOACTIVE	RAD
PROCESS SAMPLING	PS	RADIATION DESIGN GUIDE	RDG
PROGRAM	PROG	RADIATION MONITORING CABINET	RMC
PROGRAMMABLE LOGIC CONTROLLER	PLC	RADIATION MONITORING SYSTEM	RMS
PROGRAMMED ACTION LIST	PAL	RADIOACTIVE CONCENTRATION GUIDE	RCG
PROJECT DISTRIBUTION LIST	PDL	RADIOACTIVE LAUNDRY SYSTEM	RLS
PROJECT MANAGER	PM	RADIOACTIVE WASTE	RADWASTE
PROJECT NUMBERING SYSTEM	PNS	RADIOACTIVITY LIGHT INDICATION	RL
PROPORTIONAL	PROP	RADIOACTIVITY RECORDER	RR
PROTECTION	PROT	RANGE	RNG
PUMP (S)	PMP(S)	RATE	RT
PURGE	PRG	RATIO	RATO
PURIFICATION ION EXCHANGER	PIX, PUR. EX.	REACTIVITY	REACT
PURIFIER	PURF	REACTOR	RX
PURITY	PRTY	REACTOR AUXILIARY BUILDING	RAB
PUSHBUTTON	PB	REACTOR CAVITY COOLING SYSTEM	RCCS
PUBLIC ADDRESS SYSTEM	PAS	REACTOR CONTAINMENT FAN COOLER	RCFC
<u>Q</u>		REACTOR COOLANT DRAIN TANK	RCDT
QUADRANT	QUAD	REACTOR COOLANT GAS VENT (SYSTEM)	RCGV(S)
QUALITY	QTY	REACTOR COOLANT PRESSURE BOUNDARY	RCPB
QUALITY ASSURANCE	QA		
QUALITY ASSURANCE OF DESIGN PROCEDURE	QADP		

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>R</u> (Cont.)		RECIRCULATION	RECIRC
REACTOR COOLANT PUMP	RCP	RECOMBINER	RCOMB
REACTOR COOLANT PUMP SHAFT SPEED SENSING SYSTEM	RCPSSSS	RECORE (ER)	RCD(R)
REACTOR COOLANT (SYSTEM)	RC(S)	RECYCLE	RECY
REACTOR CONTAINMENT BUILDING CHILLED WATER SYSTEM	RCBCWS	RECYCLE DRAIN HEADER	RDH
REACTOR DRAIN	RD	REED SWITCH POSITION SYSTEM	RSPS
REACTOR DRAIN PUMP	PDP	REED SWITCH POSITION TRANSMITTER	PSPT
REACTOR DRAIN TANK	RDT	REFERENCE	REF
REACTOR LEVEL MONITORING SYSTEM	RLMS	REFUELING SHUTDOWN TANK	RST
REACTOR MAKEUP WATER (PUMP)	RMW(P)	IN-CONTAINMENT REFUELING WATER STORAGE TANK	IRWST
REACTOR MAKEUP WATER TANK	RMWT	REGENERATIVE	REGEN
REACTOR POWER (SYSTEM)	RP(S)	REGENERATOR	REGN
REACTOR POWER CUTBACK (SYSTEM)	RPC(S)	REGION	RGN
REACTOR POWER CUTBACK CONTROL PANEL	RPCCP	(REGISTERED) PROFESSIONAL ENGINEER	(R)PE
REACTOR PRESSURE VESSEL	RPV	REGULATE	REG
REACTOR PROTECTION (SYSTEM)	RP(S)	REGULATOR	REGR
REACTOR REGULATING SYSTEM	RRS	REGULATORY GUIDE	RG
REACTOR TRIP OVERRIDE	RTO	REHEAT	RH
REACTOR TRIP SWITCHGEAR	RTSG	REHEATER	RHTR
REACTOR TRIP SWITCHGEAR SYSTEM	RTSS	REINJECTION	REINJ
REACTOR TRIP SYSTEM	RTS	RELATED	RLTD
REACTOR VESSEL	RV	RELATIVE	REL
REACTOR VESSEL HEAD	RVH	RELATIVE HUMIDITY	RH
REACTOR VIBRATION MONITORING SYSTEM	RVMS	RELAY	RLY
REAR FACE	RF	RELIEF	RLF
RECEIVER	RCVR	REMOTE	RMT
RECIRCULATION ACTUATION SIGNAL	RAS	REMOTE CONTROL MODULE	RCM
		REMOTE SAMPLING SYSTEM	RSS
		REMOTE SHUTDOWN CONSOLE	RSC
		REMOTE SHUTDOWN ROOM	RSR
		REMOTE TERMINAL UNIT	RTU
		REMOVAL	RMVL
		REMOVE	RMV

**ATTACHMENT A**  
**STANDARD ABBREVIATION LIST**

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u><b>R</b></u> (Cont.)		SAFETY SHUTDOWN EARTHQUAKE	SSE
REPRESENTATIVE	REP	SAFETY	SAF
REPUBLIC OF KOREA-ATOMIC ENERGY BUREAU	ROK-AEB	SAFETY ANALYSIS REPORT	SAR
RESERVE	RES	SAFETY DEPRESSURIZATION AND VENT SYSTEM	SDVS
RESERVOIR	RSVR	SAFETY INJECTION ACTUATION SIGNAL	SIAS
RESET	RSET	SAFETY INJECTION (SYSTEM)	SI(S)
RESIN	RSN	SAFETY INJECTION TANK	SIT
RESIN ADDITIVE TANK	RAT	SAFETY PARAMETER DISPLAY	SPD
RESIN SLUICE HEADER	RSH	SAFETY RELATED DESIGNATION	SR
RESIN SLUICE SUPPLY HEADER	RSSH	SAFETY-RELIEF VALVE	SRV
RESISTANCE TEMPERATURE DETECTOR	RTD	SAMPLE	SAMP
RESPONSIBLE ENGINEER	RE	SATURATED	SAT
RESTRICTING	RSTRCTING	SATURATION MARGIN MONITORING	SMM
RETURN	RTRN	SCANNER	SCAN
REVOLUTIONS PER MINUTE	RPM	SCAVENGING	SCAV
RIGHT SIDE	RS	SCHEDULED	SCHED
RISER	RISR	SCREEN	SCRN
ROD BLOCK MONITOR	RBM	SCREENWASH	SW
ROENTGEN	R	SEAL	SL
ROENTGEN ABSORBED DOSE	RAD	SEAL OIL	SO
ROENTGEN EQUIVALENT MAN	REM	SEAL OIL COOLER	SOC
ROOM	RM	SEALING STEAM	SSTM
ROOT MEAN SQUARE	RMS	SECOND (time)	SEC
ROOT SUM SQUARE	RSS	SECOND (after first)	2ND
ROTOR	RTR	SECONDARY	SECD
RUNBACK	RUNBK	SECONDARY CHEMICAL CONTROL SYSTEM	SCCS
RUNNING	RUN	SECTION	SECT
<u><b>S</b></u>		SECURITY	SECUR
SAFEGUARD	SFGD		

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>S</u> (Cont.)		SOLENOID	SLND
SEISMIC	SEIS	SOLENOID VALVE	SOV
SELECTION	SEL	SOLID RADWASTE SYSTEM	SRS
SELECTOR SWITCH	SEL SW	SOLID STATE ACTUATION SYSTEM	SSAS
SEPARATOR	SEP	SOLID WASTE MANAGEMENT SYSTEM	SWMS
SEQUENCE	SEQ	SOLUTION	SOLN
SEQUENCE OF EVENTS	SOE	SOURGE	SRCE
SERVICE	SERV	SOURGE RANGE	SR
SERVICE BUILDING	SB	SOUTH	S
SERVICE WATER	SW	SOUTH/NORTH	S/N
SETPOINT	SETPT	SPARGING	SPRG
SEWAGE	SEW	SPECIAL LIGHT INDICATION	XL
SHAFT	SHFT	SPECIFIC	SPCF
SHALLOW	SHAL	SPECIFICATION	SPEC
SHEEL	SHL	SPECIFIC GRAVITY	SPGR
SHIFT SUPERVISOR	SS	SPECIFIC VOLUME	SPVOL
SHIFT TECHNICAL ADVISOR	STA	SPEED	SPD
SHINKORI NUCLEAR POWER PLANT	SKN	SPENT FUEL	SF
SHUTDOWN	S/D	SPENT FUEL POOL	SFP
SHUTDOWN COOLING (SYSTEM)	SDC(S)	SPRAY ADDITIVE	SADD
SHUTDOWN COOLING HEAT EXCHANGER	SDCHX	SPREADING	SPRDG
SIDE	SD	SPRINKLER	SPKLR
SIDEWALL	SWL	STAGE	STG
SIGNAL	SIG	STAIRWAY	STRWY
SILICA	SI	STANDARD	STD
SILICON CONTROLLED RECTIFIER	SCR	STANDARD POST TRIP ACTIONS	SPTA
SKIMMER	SKIM	STANDARD REVIEW PLAN	SRP
SLUDGE	SLUG	STANDBY	STBY
SLUICE	SLU	STANDBY AUXILIARY TRANSFORMER	SAT
SMOKE	SMK	STANDBY LIQUID CONTROL	SLC
SNUBBER	SNUB	START	STRT
SODIUM	NA		

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>S</u> (Cont.)		STREAM	STRM
STARTED	STRD	STRIPPER	STRIPR
START-UP	S/U	STRUCTURE	STRUC
STATIC	STAC	STUCK	STK
STATIC PRESSURE	SP	SUBCOOLING	SUBCOOL
STATION	STA	SUBCOOLING MARGIN MONITOR	SMM
STATION AIR	SA	SUBSTATION	SUBSTA
STATION AIR COMPRESSOR	SAC	SUCTION	SUCT
STATOR	STR	SUDDEN	SUD
STATUS	STAT	SULFATE	SO4
STEAM	STM	SUMP	SMP
STEAM BYPASS CONTROL SYSTEM	SBCS	SUPERVISORY	SUPV
STEAM CHEST	SC	SUPPLEMENTARY PROTECTION LOGIC ASSEMBLY	SPLA
STEAM FEED BYPASS VALVE	SBV	SUPPLIERS'S DEVIATION DISPOSITION REQUEST	SDDR
STEAM GENERATOR	SG	SUPPLIER DOCUMENT REVIEW FORM	SDRF
SYSTEM GENERATOR BLOWDOWN	SGBD	SUPPLY	SUP
STEAM GENERATOR FEEDWATER PUMP	SGFP	SUPPORT	SUPRT
STEAM GENERATOR FEEDWATER PUMP TURBINE	SGFPT	SUPPRESSION	SUPP
STEAM GENERATOR TUBE RUPTURE	SGTR	SURFACE	SURF
STEAM JET AIR EJECTOR	SJAE	SURGE	SRGE
STEAM PACKING EXHAUSTER	SPE	SURVEILLANCE	SURV
STEAM REHEAT HEADER DRAINS	SRHD	SUSPENDED SOLID	SS
STEAM SEAL FEED	SSF	SWITCH	SWCH, SW
STEAM SEAL HEADER	SSH	SWITCHGEAR	SWGR
STOP	ST	SWITCHYARD	SWYD
STOPPED	STOP	SWITCHYARD RELAY AND CONTROL BUILDING	SRCB
STOP VALVE	SV	SYNCHRONIZE	SYNC
STORAGE	STOR	SYSTEM	SYS
STRAINER	STRN	SYSTEM DESIGN CRITERIA	SDC
		SYSTEM FUNCTIONAL DESCRIPTION	SFD

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>T</u>		THRESHOLD	THRSHD
TACHOMETER	TACH	THROTTLE	THROT
TANK (S)	TK(S)	THRUST	TRST
TASK ANALYSIS	TA	THRUST BEARING	TBRNG
TECHNICAL	TECH	TIME	TM
TECHNICAL SUPPORT CENTER	TSC	TIME INDICATOR	KI
TELEVISION	TV	TIMER	TMR
TEMPERATURE	TEMP, T	TOTAL	TOT
TEMPERATURE AVERAGE	TAVG, T/AVG	TOTAL DISSOLVED SOLID	TDS
TEMPERATURE CONTROLLER	TC	TOTAL INTEGRATED DOSE	TID
TEMPERATURE INDICATING CONTROL STATION	TIK	TOWER	TWR
TEMPERATURE INDICATOR	TI	TRAIN	TRN
TEMPERATURE CONTROL VALVE	TCV	TRANSDUCER	XDCR
TEMPERATURE MULTIPOINT RECORDER	TJR	TRANSDUCER POWER SUPPLY CABINET	TPSC
TEMPERATURE RECORDER	TR	TRANSFER	XFER
TEMPERATURE REFERENCE	TREF,T/REF	TRANSFORMER	XFMR
TEMPERATURE SHADOWING REFERENCE TEMPERATURE	TCREF	TRANSMITTER	XMTR
TEMPERATURE TRANSMITTER	TT	TRAVELLING	TRAV
TEMPERING	TMPG	TRAVELLING SCREEN	TRSC
TEMPORARY	TMPRY	TREATMENT	TREAT
TERMINAL	TERM	TRIP	TRP
TERMINAL TEMPERATURE DIFFERENCE	TTD	TRIP CIRCUIT BREAKER	TCB
TERTIARY	TERT	TRIPPED	TRPD
TEST	TST	TRI-SODIUM PHOSPHATE	TSP
TEST SIGNAL POSITION	TSP	TROUBLE	TRBL
THERMAL	THERM	TURBID	TRBD
THERMAL POWER CALIBRATION CONSTANT	TPC	TURBIDITY	TBDT
THERMOCOUPLE	T/C, TC	TURBINE	TBN
		TURBINE GENERATOR BUILDING	TGB
		TURBINE GENERATOR BUILDING CLOSED COOLING WATER	TGBCCW
		TURBINE GENERATOR BUILDING OPEN COOLING WATER	TGBOCW

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>T</u> (Cont.)		UPPER BEARING	UBRNG
TURBINE BYPASS ATMOSPHERIC VALVE	TBAV	UPPER CABLE SPREAD ROOM	UCSR
TURBINE BYPASS CONDENSER VALVE	TBCV	UPSTREAM	UPSTRM
TURBINE BYPASS VALVE	TBV	UTILITY	ULTY
TURBINE CONTROL VALVE	TCV	<u>V</u>	
TURBINE DRAINS	TD	VACUUM	VAC
TURBINE FIRST STAGE PRESSURE	TFSP	VARIABLE OVER POWER TRIP	VOPT
TURBINE GENERATOR SUPERVISORY INSTRUMENTATION	TGSI	VALID	VLD
TURBINE GEAR	TRGR	VALIDATION AND VERIFICATION	V/V
TURBINE GENERATOR	TG, T/G	VALVE (S)	VLV(S)
TURBINE GLAND STEAM SEAL SYSTEM	TGSSS	VAPOR	VAP
TURBINE OIL	TO	VAPORIZER	VAPZ
TURBINE SIDE	TS	VARHOUR METER	VARHM
		VARIABLE	VAR
<u>U</u>		VAULT	VLT
ULTRASONIC RESIN CLEANER	URC	VENTILATION	VENT
UNBALANCE	UNBAL	VENT (TO ATMOSPHERE)	V
UNCERTAINTIE(S)	UNCERT(S)	VERIFICATION	VERF
UNCOMPENSATED	UCMPN	VERTICAL	VERT
UNDER FLOW FRACTION	UFF	VESSEL	VESS
UNDERVOLTAGE	UV, UNDERVOLT	VESSEL AND CLOSURE HEAD SEATING SURFACE	VSS
UNINTERRUPTABLE POWER SUPPLIER	UPS	VIA (THROUGH, BY MEANS OF, BY WAY OF)	VIA
UNIT AUXILIARY TRANSFORMER	UAT	VIBRATION	VIB
UNLOAD	UNLD	VIBRATION MONITORING SYSTEM	VMS
UPDATE TIME DEPENDENT VARIABLES	UTDV	VITAL BUS POWER SUPPLY SYSTEM	VBPSS
UPPER	UPPR	VOLTAGE ALTERNATING CURRENT	VAC
		VOLTAGE DIRECT CURRENT	VDC
		VOLTAGE	VTG
		VOLTAMPERE	VA

ATTACHMENT A  
STANDARD ABBREVIATION LIST

STANDARD SERVICE DESIGNATION	ABBREVIATION	STANDARD SERVICE DESIGNATION	ABBREVIATION
<u>V</u> (Cont.)		<u>XYZ</u>	
VOLTMETER	VM	ZERO PERIOD ACCELARATION	ZPA
VOLT-OHM METER	VOM		
VOLTAGE TO CURRENT	E/I		
VOLTAGE TO FREQUENCY CONVERTER	VFC		
VOLTAGE TO PULSE RATE CONVERTER	VPRC		
VOLTAGE TRANSFORMER	VT		
VOLTS	VOLT, V		
VOLUME	VOL		
VOLUME CONTROL TANK	VCT		
<u>W</u>			
WAREHOUSE	WH		
WARM-UP	WMUP		
WASTE	WSTE		
WASTE CONDENSATE TANK	WCT		
WASTE MANAGEMENT (SYSTEM)	WM(S)		
WATCHDOG TIMER	WDT		
WATER	WTR		
WATERBOX	WTRBX		
WATTHOUR METER	WHM		
WATTS PER CENTIMETER	W/CM		
WEIGHT	WT		
WEST	W		
WET LAY-UP SUBSYSTEM	WLS		
WIDE RANGE	WR		
WIDE RANGE BORONOMETER	WRB		
WINDBOX	WDBX		
WINDING	WDG		
WINDOW	WDW		
WITHDRAW	WITHDRA		
WITHOUT	W/O		



## ATTACHMENT B

### DEMARCATION AND MIMIC GUIDELINES FOR HARDWIRED PANEL

#### 1.1 General

Proper demarcation and mimic can significantly improve an operator's ability to use a set of controls and/or displays. Demarcation of functionally grouped controls and displays reduces operator search time. Demarcation also aids in defining or reinforcing the relationship between controls and their displays. Labeling the functionally grouped and demarcated controls/displays can reduce the wordiness of individual component labels and can increase information transfer.

Groups of functionally similar controls/displays shall be enclosed by demarcation lines. The demarcated area shall be labeled with a descriptive title as to the system or function of the demarcated controls. Each individual component shall be labeled with its alpha-numeric designator and/or its descriptive name. The descriptive title of the demarcated group shall not be repeated in the individual component labels.

#### 1.2 Abbreviations

Refer to Attachment A for preferred abbreviations.

#### 1.3 Component Designations

1.3.1 Nomenclature shall be consistent with procedures and flow diagrams.

1.3.2 Controls and displays shall be identified by a descriptive name and alpha-numeric designation where available.

1.3.3 Controls and displays in a mimic may be identified by its alpha-numeric designator if its position in the mimic describes its function.

#### 1.4 Demarcation

Demarcation can be used on control panel to designate system boundaries and component groups.

Demarcation material shall be autostripping tape (Manufacturer: 'Trim' or equivalent). Chartpack-style (Paper-Backed) tape shall not be used as it is not durable.

Width = 0.48cm(0.19 inch)  
{0.2cm (0.078 inch) may be used for subsystem delineation}

Color: black

Group Labels shall be centered on the demarcation line.

#### 1.5 Material

Label plates and mimic lines shall be made of low glare material. In areas where the plate may be abused, stronger, less scratchable material is recommended.

#### 1.6 Mimics

A mimic is the use of lines to show the relationship between system components or to show the direction of fluid flow or electrical distribution. Arrows, whose base is wider than the mimic line, shall be used to show the direction of the fluid or electrical flow. Arrows shall be used only when the flow is in one direction.

Fluid mimic lines shall be black. Electrical mimic lines shall conform to the following convention:

765 KV	- silver
154 KV	- white
13.8 KV	- red
4.16 KV	- blue
480 V	- yellow

Symbols may be used to represent components in the system.

The start and end of each mimic shall be identified; and if it connects to another mimic or extends to another panel, this shall be indicated. Mimics shall be made (cut) from the same 0.16 cm (0.06 inch) thick material as labels.

## ATTACHMENT C

### STATISTICAL BASIS OF UNCERTAINTIES

#### 1.0 General

Supplier shall furnish the relevant data required for instrument setpoint uncertainty calculations in compliance with USNRC RG 1.105 and ANSI/ISA-S67.04 ; such as reference accuracy, drift/stability, temperature effect, seismic effect, static pressure effects, and power supply variation effects. Supplier shall also provide data regarding the uncertainties of each device on a statistical basis of accuracy limits, based on 2 sigma value.

- 1.1 All of the safety-related instruments and devices uncertainty information. Supplier shall submit this information in the format of table 1 described in sections 2.0 and 3.0.
- 1.2 Supplier shall provide data for both normal and accident conditions if the devices require post accident operation according to Reg. Guide 1.97.

#### 2.0 Description of Uncertainties

##### 2.1 Instrument Range

Supplier shall specify the instrument input, output range. If the instrument range is adjustable, Supplier shall provide the reference accuracy in terms of upper range.

##### 2.2 Reference Accuracy (RV)

The overall effect of hysteresis, repeatability and linearity : expressed as percentage of instrument range or as an absolute value.

##### 2.3 Drift(DV)

Supplier shall specify the drift or stability value as percentage of Upper Range Limit (URL) over a period of time.

##### 2.4 Temperature Effect(TV)

Specify uncertainty for change is normal temperature and/or accident temperature as a percentage of absolute values. The errors caused by temperature can be stated as a percentage of instrument span and percentage of instrument Upper Range Limit.

For example a device has a temperature effect of :

$$TV = (0.5\% \text{ URL} + 0.25\% \text{ of span}) \text{ per } 100^\circ\text{F}$$

## 2.5 Static Pressure Effect (SP)

Identify the zero/span effect and span for instruments applied for greater than 200 psig. Supplier shall specify static pressure effect as percentage of Upper Range Limit.

If Supplier states the SP in terms of basis accuracy changes, they shall be noted in table 1.

## 2.6 Power Supply Effect (PS)

Identify changes in output for 1 volt variation in power supply : also those for 1 Hz variation.

## 2.7 Radiation Effect (RE)

Supplier shall provide the radiation effect, if the device is located in radiation zone in terms of percentage of TID (Total Integrated Dose).

## 2.8 Seismic Effect (SE)

If the instrument is located around the equipment which causes vibration, or the instrument is classified as seismic category I, Supplier shall provide the SE in terms of percentage to URL and "g" values in specification requirement.

## 2.9 Other Effects

The uncertainties listed above may not be all-inclusive. Additional uncertainties that may apply to a particular device shall be included under this column. Provide a brief description.

# 3.0 DESIGN MAXIMUM OR DESIGN BASIS EVENTS

3.1 For design basis events associated with radiation, temperature and seismic effects, Supplier shall provide values obtained by tests or analytical qualification.

3.2 For pressure effects, Supplier shall provide the change in accuracy for specified change in the normal process or ambient pressures.

# 4.0 DATA TRANSMITTAL

The required data and general device information shall be provided through a copy of any existing data base or text file to a PC compatible magnetic or optical media. The data shall be in an EXCEL or ACCESS format.



ATTACHMENT D  
INSTRUMENT LIST (SPEC. NO. : \_\_\_\_\_)

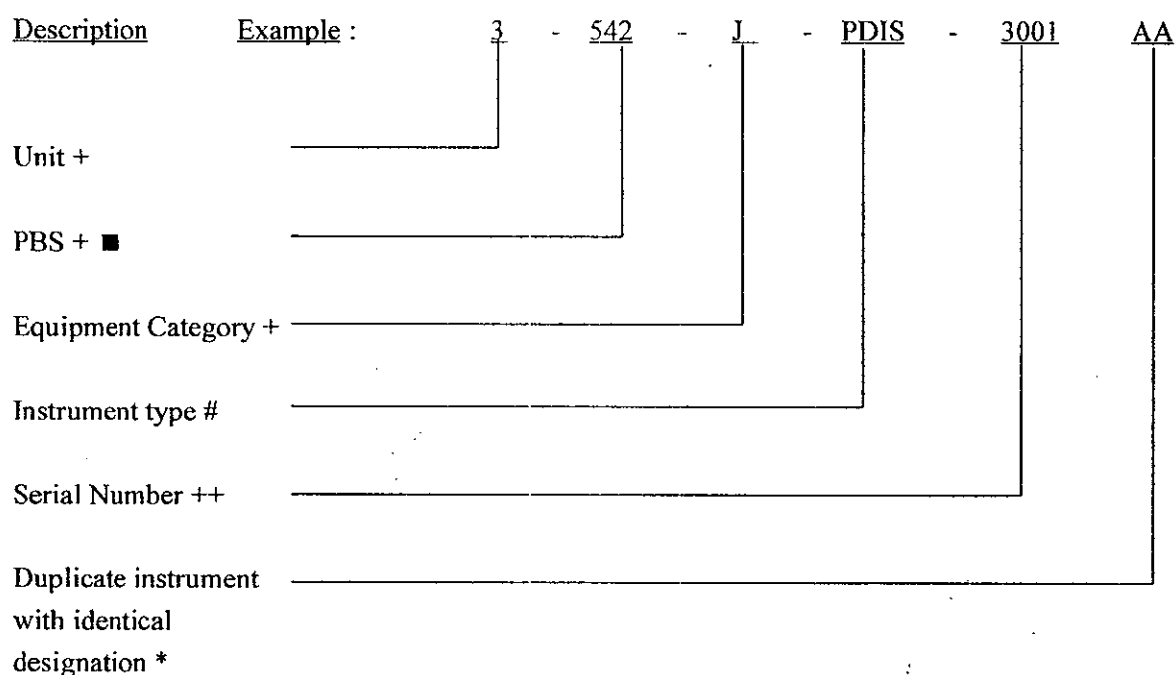
SHEET : OF

KHP'S TAG NO.	INSTRUMENT TYPE	INPUT RANGE	SETPoint (ALARM OR TRIP)	SWITCH TYPE	SCALE RANGE	MANUFACTURER	SUPPLIER'S TAG NO.		LOOSE PART (YES/NO)	REMARK
		OUTPUT RANGE					SAFETY CAT/ SEISMIC CAT	REFERENCE DWG NO.		

D-1 (Final)

ATTACHMENT E  
INSTRUMENT NUMBERING SYSTEM

Instrument No.



+ Optional on Drawing (If this common part of component tag no. is separately identified as a drawing note)

# Two, three or four letters are used

++ For safety instruments, the odd number for train A or C is for the same function, and also the even number for train B or D. Even number is larger than the odd. Numbering of the system shall generally be upper left across to lower right, but also take the process flow path into account. The first digit of 3 is mandatory.

\* Optional

■ The PBS shall be identified from the specifications. Otherwise, the Supplier shall request the Buyer's assistance.

Note : The solenoid-operated air valves are numbered by the above numbering system.