

# MAKER STANDARD ECS-450B 1.1 X 1

ECS COMPONENTS LIST		
ITEM	DESCRIPTION	CONNECTION SIZE
CPC	Control PC	NON PIPE CONNECTION
PDE	Power Distributor Equipment	NON PIPE CONNECTION
ECU	Electro Chamber Unit	450B   INLET/OUTLET JIS 10K-250A, DRAIN : 10K-25A
PRU	Power Rectifier Unit	INLET/OUTLET SUS TUBE Ø12
EPJ	ECU Power Junction Box	NON PIPE CONNECTION
ESJ	ECU Signal Junction Box	NON PIPE CONNECTION
ANU-S	Auto Neutralization Unit	INLET/OUTLET FLANGE JIS 10K-15A (DRAIN SUS316L TUBE Ø12)
TSU-S	TRO Sensor Unit & TSU-S Control Unit	INLET SUS TUBE Ø6 / OUTLET SUS TUBE Ø10
APU	Air Pump Unit	INLET/OUTLET FLANGE JIS 10K-15A (AIR LINE Ø12/Ø10)
FMU	Flow Meter Unit	INLET/OUTLET FLANGE JIS 5K-150A
FTS	F.W Temperature Sensor	INLET/OUTLET FLANGE PT 1/2"
CSU	Conductivity Sensor Unit	INLET/OUTLET FLANGE JIS 5K-50A
GDS	Gas Detection Sensor	NON PIPE CONNECTION
EWU	EM Washing Unit	INLET/OUTLET FLANGE JIS 10K-25A
PS&PI	Pressure Switch & Pressure Indicator	FLANGE JIS 10K-25A
TS&TI	Temperature Switch & Temperature Indicator	FLANGE JIS 10K-40A
T-STR	T-Strainer	INLET/OUTLET FLANGE JIS 5K-250A
(OPTION)	FTU	INLET/OUTLET FLANGE JIS 5K-40A
		F.W SUPPLY INLET JIS 5K-25A
	HEU	INLET/OUTLET FLANGE JIS 5K-50A
	COOL.S.W.PUMP	
	INLET/OUTLET FLANGE JIS XX K-XXX A	
	PCU	NON PIPE CONNECTION
	FCV	INLET/OUTLET FLANGE JIS 5K-50A
MIXING S.W. PUMP		INLET/OUTLET FLANGE JIS XX K-XXX A
 THE DRAWING IS BASED ON THE POS AND MAKER STANDARD. IF ANY ADDITIONAL EQUIPMENT IS REQUIRED BY SHIPYARD OR SHIP'S OWNER REQUIREMENTS, THE EXTRA COST CAN BE OCCURED.		

SYMBOL	
ITEM	DESCRIPTION
*	MAKER (TECHCROSS) SUPPLY
	BUTTERFLY VALVE
	REMOTE BUTTERFLY VALVE
	THROTTLING VALVE
	GLOBE VALVE
	CHECK VALVE
	CHECK VALVE WITHOUT HANDLE
	BALL VALVE
	DIAPHRAGM VALVE
	ANGLE VALVE
	SOLENOID VALVE
+	CROSSING PIPES CONNECTED
⤒	CROSSING PIPES NOT CONNECTED
⊥	BRANCH PIPES
	TEE PIECE (FLANGE END)
	REDUCER
	EDUCTOR
—II	BLIND FLANGE
—□	CLOSED PIPE CONNECTION
—□	BOSS WITH BLANK FLANGE
	PUMP
	STRAINER
	Y-STRAINER
	FILTER
	SIGNAL
	SCUPPER
	PRESS REGULATOR
	LIMIT SWITCH
	PUMP MOTOR
	RECEPTACLE
---□	PLUG
	PRESSURE INDICATOR
	PRESSURE SWICH
	LEVEL SWITCH
	THERMOMETER (TEMPERATURE INDICATOR)
	TEMPERATURE SWITCH
N.O.	TO BE OPENED ALWAYS EXCEPT MAINTENANCE OF ECU

# NOTE OF P&ID FOR BWTS

## 1. SYSTEM

1) VALVE SIGNAL IS USED TO OPERATE ELECTRO CLEEN SYSTEM.

## 2. G-2 SAMPLING PORT

1) G-2 SAMPLING PORT SHALL BE COMPLIED WITH IMO REGULATION.  
2) G2 SAMPLING PORT(S) MUST BE PLACED AT HORIZONTAL OR UP-STREAM OF VERTICAL MAIN BALLAST WATER PIPE. IT SHALL NOT BE INSTALLED AT THE DOWN-STREAM OF VERTICAL MAIN BALLAST WATER PIPE.

## 3. ECU

1) ECU OUTLET PIPE SHOULD BE ARRANGED HIGHER THAN ECU IN ORDER TO KEEP FULL WATER INSIDE ECU.  
2) PS&PI AND TS&TI FOR ECU SHALL BE PROVIDED BY MAKER, BUT THE INSTALLATION WORK SHALL BE CARRIED OUT BY YARD. (IF NECESSARY)  
3) EXCESSIVE VACUUM MAY BE FOUND IN THE BALLAST PIPES WHEN SHIFTING THE BALLAST WATER DOWNSTREAM FROM AN Elevated PLACE, HENCE COUNTERMEASURES SUCH AS INSTALLATION OF VACUUM VALVES SHOULD BE CONSIDERED.

## 4. TSU

1) BETWEEN TSU SAMPLING PORT AND APU TO BE ARRANGED AS SHORT AS POSSIBLE(WITHIN 5M).  
2) TSU SAMPLING PORT(S) MUST BE PLACED AT HORIZONTAL OR UP-STREAM OF VERTICAL MAIN BALLAST WATER PIPE. IT SHALL NOT BE INSTALLED AT THE DOWN-STREAM OF VERTICAL MAIN BALLAST WATER PIPE.  
2-1) THE ECUS OUTLET PIPING IS INSTALLED OF VERTICAL DOWNSTREAM WITH LONG DISTANCE, THERE IS A HIGH POSSIBILITY OF VACUUM. TRO SAMPLING PORT SHOULD BE INSTALLED AFTER VERTICAL DOWNSTREAM.  
3) KEEP MIN' 5D INSTALLATION POSITION DISTANCE BETWEEN TSU PORT AND ANU PORT.  
4) FLUSHING AND DRAIN NEED TO BE IMPLEMENTED BEFORE USING TRO SENSOR(FOR SPARE)  
5) THE VALVE OF TSU SAMPLING LINE SHOULD BE ARRANGED NEAR TSU.  
6) THE MATERIAL FOR PIPE AND VALVE OF TSU SAMPLING LINE SHOULD BE SUS316L.

## 5. ANU

1) BETWEEN ANU INJECTION PORT AND ANU TO BE ARRANGED AS SHORT AS POSSIBLE(WITHIN 10M).  
1-1) IF ANU DOSING LINE IS FAR(ABT.10M) FROM THE ANU, THE "PREPARATION" BUTTON IN ANU ICON OF HMI SHALL BE CLICKED BY THE CREW TO FILL THE NEUTRALIZING AGENT IN THE DOSING LINE.  
2) ANU INJECTION PORT(S) MUST BE PLACED AT HORIZONTAL OR UP-STREAM OF VERTICAL MAIN BALLAST WATER PIPE. IT SHALL NOT BE INSTALLED AT THE DOWN-STREAM OF VERTICAL MAIN BALLAST WATER PIPE.  
3) KEEP MIN' 5D INSTALLATION POSITION DISTANCE BETWEEN TSU PORT AND ANU PORT.  
4) THE VALVE OF ANU INJECTION PIPE SHOULD BE ARRANGED NEAR ANU.  
5) IN CASE OF EACH OF THE ANU INJECTION PIPE IS CONNECTED TO ONE, THIS SHOULD BE INCLINED AS SHOWN IN THE DETAIL "D". (IF NECESSARY)  
6) EXCESSIVE VACUUM MAY BE FOUND IN THE ANU PIPES WHEN SHIFTING THE NEUTRALIZATION REAGENT DOWNSTREAM FROM AN Elevated PLACE, HENCE COUNTERMEASURES SUCH AS INSTALLATION OF VACUUM VALVES SHOULD BE CONSIDERED.  
7) THE MATERIAL FOR PIPE AND VALVE OF ANU DOSING LINE SHOULD BE SUS316L.  
8) MINIMUM TEMPERATURE OF F.W. TO BE SECURED ABOVE 20°C. IF THE TEMPERATURE OF F.W. IS ALWAYS MORE THAN 20°C, THE HOT WATER LINE COULD BE DELETED. IT SHOULD BE ABOVE 20°C, EVEN IN WINTER.

## 6. EWU

1) FRESH WATER SUPPLY LINE AND DRAIN CONNECTION LINE FOR EWU(EM WASHING UNIT) SHOULD BE ARRANGED WITHIN APPROXIMATELY 3 METER AROUND ECU.

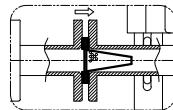
2) THE USED EM CLEANING WATER CONTAINING CHEMICAL AGENT SHOULD BE STORED IN EWU TANK AND DISCHARGED AT SEA MORE THAN 12 NAUTICAL MILES AND 25M IN DEPTH.

## 7. GDS

1) GDS SHOULD BE INSTALLED ABOVE THE ECU.

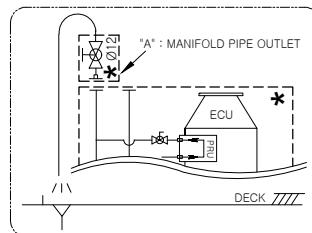
## 8. PRU COOLING MANIFOLD STRAINER

1) STRAINER HAVE BEEN INSTALLED TO PREVENT THE BLOCKAGE OF COOLING WATER LINE FROM PRU. CREW SHOULD BE CHECK THE CONDITION ONCE EVERY QUARTER.

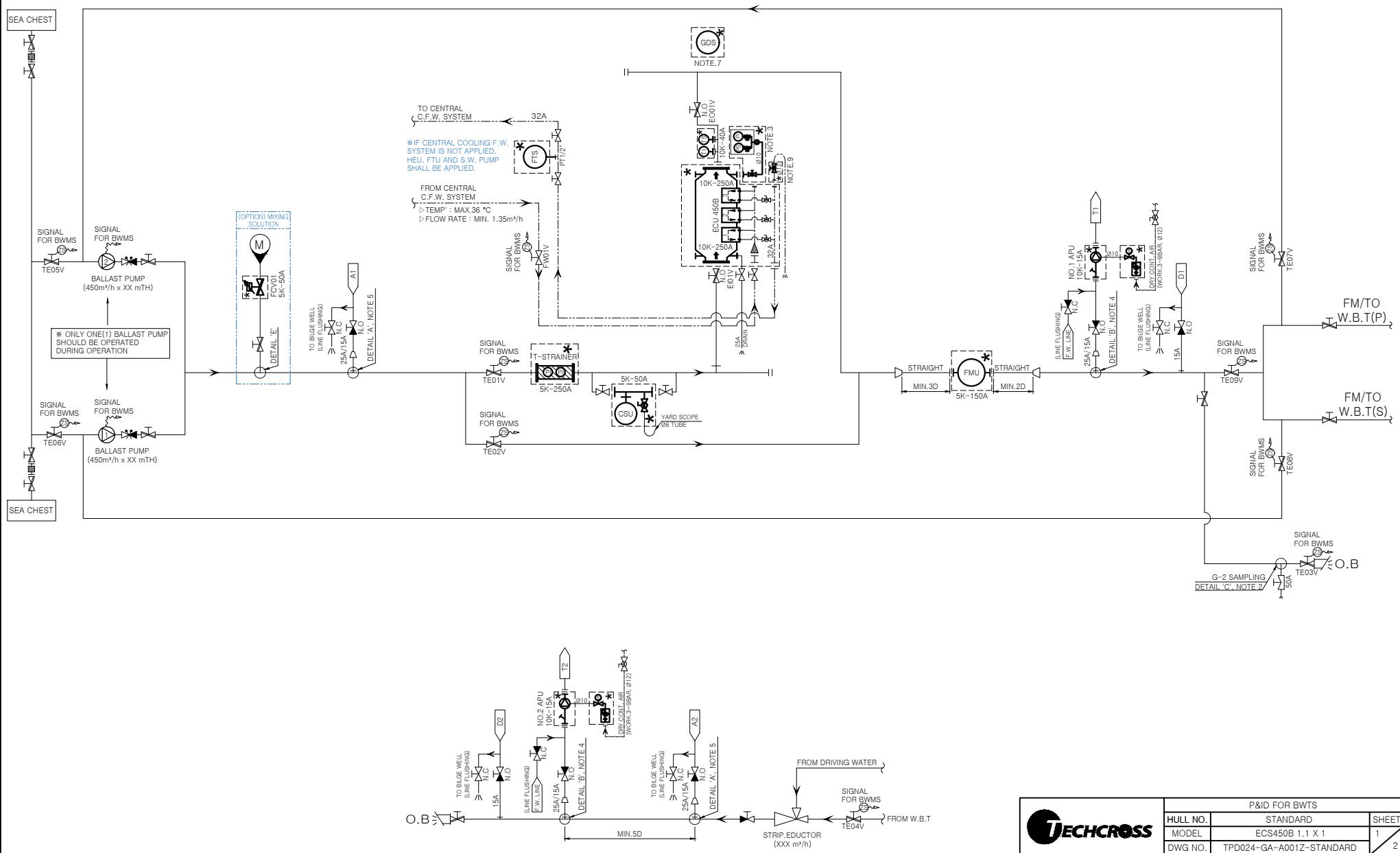


## 9. COOLING F.W CONDITION FOR PRU

1) COOLING S.W TEMPERATURE (INLET) : +32°C  
2) COOLING F.W TEMPERATURE (INLET) : +36°C  
3) COOLING F.W PRESSURE DROP : 0.5BAR  
4) FLOW RATE VOLUME : 0.45m³/h (PER PRU)  
5) INLET VALVE SHOULD BE PLACED NEAR THE ECU.  
6) AIR VENT AND VALVE MUST BE INSTALLED AT COOLING WATER PIPE COMMON OUTLET. ("A" POSITION)  
AIR VENT AND VALVE ONLY REQUIRED FOR THE VERTICAL TYPE OF ECU (MAKER STANDARD), NOT FOR HORIZONTAL TYPE OF ECU.

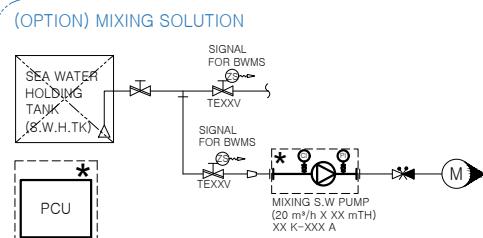
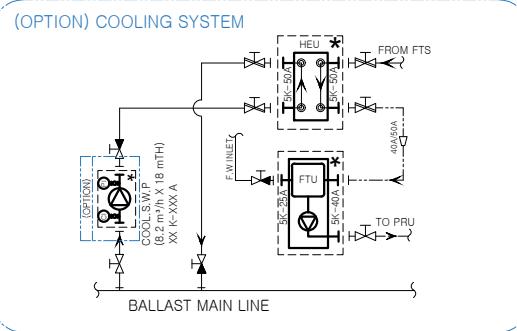
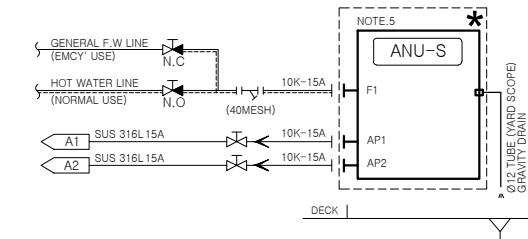
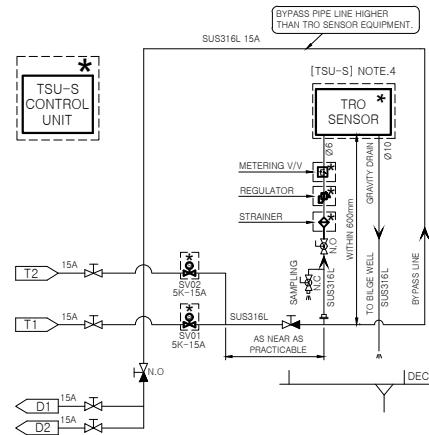
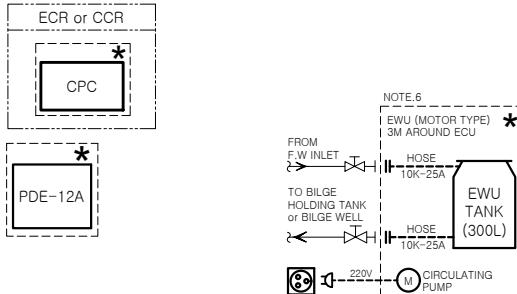


## ENGINE ROOM (SAFETY AREA)



P&ID FOR BWTS		
HULL NO.	STANDARD	SHEET
MODEL	ECS450B 1.1 X 1	1
DWG NO.	TPD024-GA-A001Z-STANDARD	2

## ENGINE ROOM (SAFETY AREA)



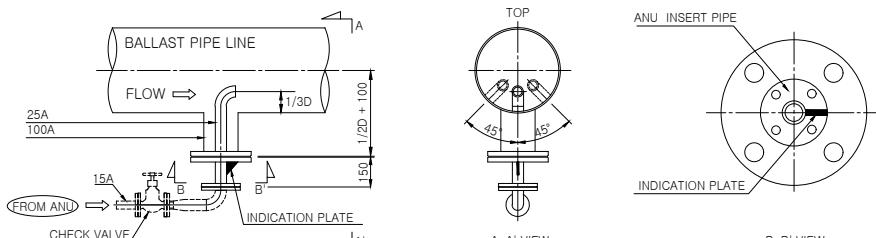
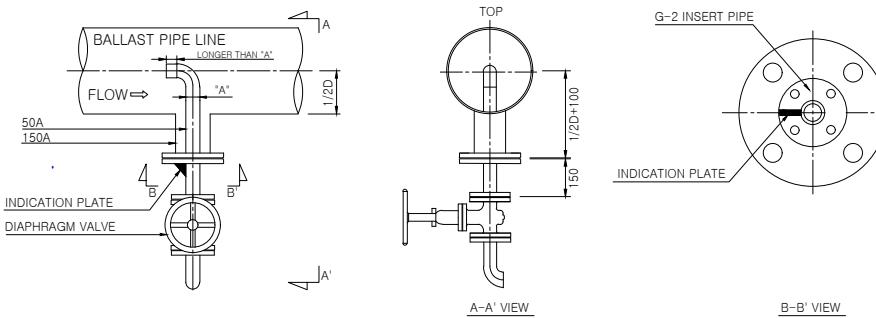
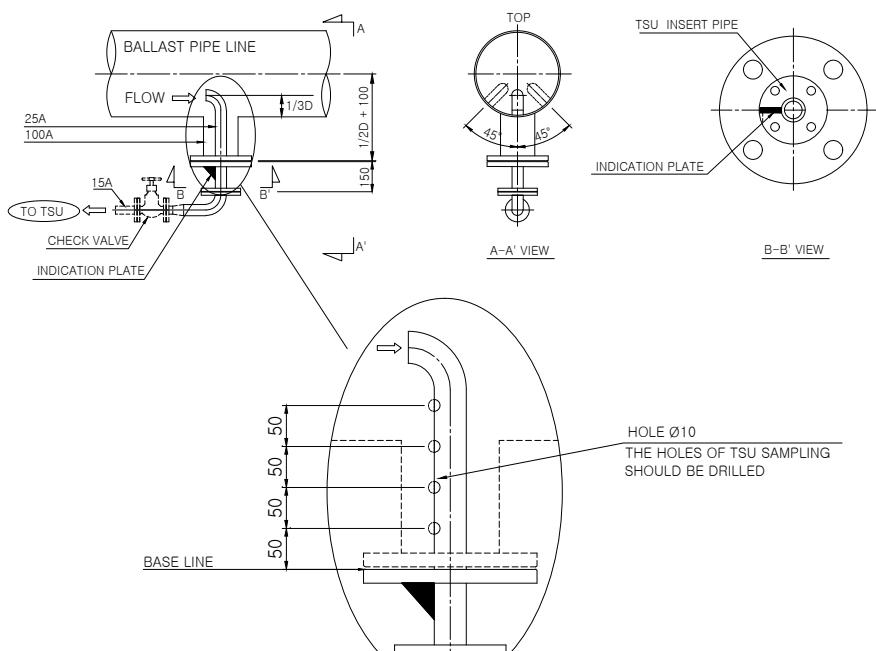
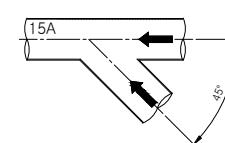
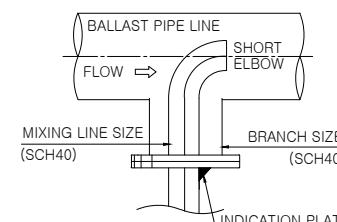
### [MIXING OPERATION]

- 1) THE VOLUME OF SEA WATER HOLDING TANK SHALL BE MINIMUM 4.3% OF TOTAL BALLASTING CAPACITY.  
[S.W.(34.7 PSU) : 4.3% + F.W.(0 PSU) : 95.7 % = MIXING (1.5 PSU)]
- 2) IF A.P.TK IS USED FOR MIXING SEA WATER HOLDING TANK.  
- BALLAST WATER CAN BE TREATED ABT. XXX m3.  
- THIS AMOUNT IS APPROX. XX % OF TOTAL BALLAST VOLUME.  
- IN VIEW OF SUCTION CAPABILITY AT RATED FLOW RATE,  
THE SUCTION CENTER OF MIXING PUMP SHOULD BE POSITIONED LOWER THAN THE LEVEL OF BOTTOM PLATE OF A.P.TK.
- 3) IF ONE OF W.B.TK IS USED FOR MIXING SEA WATER HOLDING TANK.  
- AIR EJECTOR AT MIXING S.W.PUMP SHALL BE ADDITIONALLY APPLIED. (AKER SCOPE)  
- THE MIXING PUMP SHOULD BE OPERATED CONSIDERING THE VALUE OF NPSH.  
- IF THE SEAWATER LEVEL OF D.B.W.TANK IS LOW, SEA WATER SUCTION WILL BE DIFFICULT AND THE MECHANICAL SEAL OF MIXING PUMP WILL BE DAMAGED.
- 4) WHEN THE MIXING OPERATION, THE SUCTION LINE OF MIXING PUMP SHOULD BE ARRANGED TO BE FULL FILL SEAWATER CONDITION.



P&ID FOR BWTS

HULL NO.	STANDARD	SHEET
MODEL	ECS450B 1.1 X 1	2
DWG NO.	TPD024-GA-A001Z-STANDARD	2

DETAIL 'A'	ANU DOSING PORT (YARD/OWNER SUPPLY)	DETAIL 'C'	G2 SAMPLING PORT (YARD/OWNER SUPPLY)																		
1) ANU DOSING PORT SHOULD BE INSTALLED AT THE BOTTOM OF BALLAST PIPE LINE. 2) THE INDICATION PLATE IS FOR INDICATION OF INSERT PIPE DIRECTION. THIS SHOULD BE INSTALLED IN THE SAME DIRECTION WITH DOSING PORT.			1) WHEN THE SIZE OF G-2 SAMPLING PORT PIPE IS 50A, THE SIZE OF BRANCH PIPE FROM BALLAST PIPE LINE SHOULD BE MORE THAN 150A. 2) G2 SAMPLING PORT SHOULD BE INSTALLED AT THE BOTTOM OR SIDE OF BALLAST PIPE LINE. 3) THE INDICATION PLATE IS FOR INDICATION OF INSERT PIPE DIRECTION. THIS SHOULD BE INSTALLED IN THE SAME DIRECTION WITH SAMPLING PORT.																		
 <p>Detailed description: This section shows the ANU dosing port installation. It includes a top view of the ballast pipe line with a vertical dosing port at the bottom. An A-A' view shows the dosing port with a 15A valve, a check valve, and an indication plate. A B-B' view shows the dosing port with an ANU insert pipe and an indication plate. Dimensions include 25A, 100A, 15A, 1/2D + 100, and 150.</p>			 <p>Detailed description: This section shows the G2 sampling port installation. It includes a top view of the ballast pipe line with a sampling port at the bottom. An A-A' view shows the sampling port with a 50A valve, a diaphragm valve, and an indication plate. A B-B' view shows the sampling port with a G-2 insert pipe and an indication plate. Dimensions include 50A, 150A, 1/2D + 100, and 150.</p>																		
DETAIL 'B'	TSU SAMPLING PORT (YARD/OWNER SUPPLY)	DETAIL 'D'	PIPE CONNECTION PARTS (IF APPLICABLE)																		
1) TSU SAMPLING PORT SHOULD BE INSTALLED AT THE BOTTOM OF BALLAST PIPE LINE. 2) THE INDICATION PLATE IS FOR INDICATION OF INSERT PIPE DIRECTION. THIS SHOULD BE INSTALLED IN THE SAME DIRECTION WITH SAMPLING PORT.  [NOTE] THE ECUS OUTLET PIPING IS INSTALLED OF VERTICAL DOWNSTREAM WITH LONG DISTANCE, THERE IS A HIGH POSSIBILITY OF VACUUM. TRO SAMPLING PORT SHOULD BE INSTALLED AFTER VERTICAL DOWNSTREAM.			 <p>Detailed description: This section shows the TSU sampling port installation. It includes a top view of the ballast pipe line with a sampling port at the bottom. An A-A' view shows the sampling port with a 15A valve, a check valve, and an indication plate. A B-B' view shows the sampling port with a TSU insert pipe and an indication plate. Dimensions include 25A, 100A, 15A, 1/2D + 100, and 150. A note specifies that the ECU outlet piping is installed vertically downstream with a long distance, so the TRO sampling port should be installed after the vertical downstream.</p>																		
 <p>Detailed description: This section shows the mixing point connection parts. It includes a top view of the ballast pipe line with a mixing point. An A-A' view shows the mixing point with a 15A valve and a 45° bend. Dimensions include 15A and 45°.</p>			DETAIL 'E' MIXING POINT (IF APPLICABLE)																		
 <p>Detailed description: This section shows the mixing point installation. It includes a top view of the ballast pipe line with a mixing point. An A-A' view shows the mixing point with a short elbow and a branch size. A B-B' view shows the mixing point with a mixing line size (SCH40) and a branch size (SCH40). Dimensions include 50, 50, 50, 50, and 50. An indication plate is also shown.</p>			<table border="1"> <thead> <tr> <th>MIXING LINE</th> <th>BRANCH SIZE</th> </tr> </thead> <tbody> <tr> <td>50A</td> <td>100A</td> </tr> <tr> <td>65A</td> <td>125A</td> </tr> <tr> <td>80A</td> <td>150A</td> </tr> <tr> <td>100A</td> <td>200A</td> </tr> <tr> <td>125A</td> <td>250A</td> </tr> <tr> <td>150A</td> <td>300A</td> </tr> <tr> <td>200A</td> <td>350A</td> </tr> <tr> <td>250A</td> <td>400A</td> </tr> </tbody> </table>	MIXING LINE	BRANCH SIZE	50A	100A	65A	125A	80A	150A	100A	200A	125A	250A	150A	300A	200A	350A	250A	400A
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