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Proprietary Notice
This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 3, the balance of this letter may be considered non-proprietary.

MFN 07-295
June 8, 2007

Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **GE Response to NRC, *"Request For Additional Information Related To Advanced Boiling-Water Reactor Licensing Topical Report* (TAC NO. MD4025)," Regarding Alternate RCIC Turbine-Pump Design**

References: NRC to GE Letter, G. Wunder to T. O'Neill, dated May 3, 2007, *"Request For Additional Information Related To Advanced Boiling-Water Reactor Licensing Topical Report (TAC NO. MD4025)"*

GE Letter MFN 06-525, T. O'Neill to Document Control Desk, dated December 20, 2006, "Submittal of Licensing Topical Report NEDE-33329P, *"Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design"*

Enclosure 1 in this letter contains GE's response to the subject NRC RAIs. GE requests closure of the RAIs based on the supplemental information and approval of the requested amendment to the ABWR certified design material.

Enclosure 2 contains detailed engineering drawings of the alternate RCIC turbine-pump requested by RAI-7.

Enclosure 3 contains clear (large size) copies of proprietary drawings that were requested in RAI-14. Non-proprietary versions of these drawings are not provided in

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this letter as non-proprietary copies of these drawings have been previously submitted in MFN 06-525.

Enclosure 4 contains a recommended markup to NUREG-1503 as requested in RAI-15.

The affidavit contained in Enclosure 5 identifies that the information contained in Enclosure 3 has been handled and classified as proprietary to GE. GE hereby requests that the proprietary information in Enclosure 3 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

If you have any questions about the information provided here, or during the course of your reviews, please contact me at 910-602-1885.

Sincerely,

Joseph A. Savage
Project Manager, ABWR Licensing

Enclosure 1:	Response to NRC Request for Additional Information Related to ABWR Design Certification Application Licensing Topical Report NEDE-33329P, "Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design" - RAIs -1 through -16
Enclosure 2:	Response to "Request For Additional Information Related To Advanced Boiling-Water Reactor Licensing Topical Report NEDE-33329P, "Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design" – Drawings Requested by RAI-7
Enclosure 3:	Response to "Request For Additional Information Related To Advanced Boiling-Water Reactor Licensing Topical Report NEDE-33329P, "Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design" – Drawings Requested by RAI-14
Enclosure 4:	Response to "Request For Additional Information Related To Advanced Boiling-Water Reactor Licensing Topical Report NEDE-33329P, "Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design" - NUREG-1503 Markup Requested by RAI-15.
Enclosure 5	Affidavit.

cc:	BE Brown	GE (Wilmington w/o enclosure)
	GF Wunder	NRC (w/ enclosure)
	MA McBurnett	STP (w/ enclosure)
		eDRF 0000-0068-7980

ENCLOSURE 1

MFN 07-295

Response to NRC Request for

Additional Information

Related to ABWR Design Certification Application

Licensing Topical Report NEDE-33329P "Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design"

RAIs 1 through 16

NRC RAI-1

Section 3.0, "Description of Proposed Departure," in NEDE-33299P (Revision 0, December 2006), "Advanced Boiling Water Reactor (ABWR) with Alternate Reactor Core Isolation Cooling (RCIC) Turbine-Pump Design," states on page 2 that a small pump returns leakoff water to the main pump suction lines for the alternate RCIC turbine-pump design. Discuss this leakoff pump, and its design, qualification, and in-service testing (IST) provisions.

GE Response:

The term "leakoff line" refers to a drain line between the bearing and the drain tank, a nonsafety-related sub-system of the pump assembly. Except for valves that isolate the turbine drains sub-system from the RCIC system pressure boundary, the turbine drains sub-system is nonsafety-related.

The turbine drains sub-system function is to drain any leakage of process water providing turbine bearing lubrication and any condensate collecting in the turbine exhaust to the turbine drains tank. The bearings are lubricated by pressurized RCIC system process fluid that is fed into the bearing housing and onto bearing surfaces from a tap line in the first stage of the primary pump. The turbine drains tank collects any leakage from the bearings and condensate resulting from pump operation.

On RCIC system initiation, safety related valves in the drain line close to isolate the turbine exhaust line from the drain tank and drain pump. When the RCIC system pumping is stopped, the valves in the drain line are opened to allow the exhaust line to drain. The drain tank collects the gravity fed drain water and condensate and the tank mounted drain pump returns the water to the RCIC pump suction line. The drain tank is vented open to atmosphere, and is isolated from the RCIC pump safety related pressure boundary during operation. The drain tank has a level gauge to monitor tank water level with an overflow drain connection to low conductivity waste in an unlikely event of overflow control malfunction. Therefore, the turbine drains sub-system is classified as non-safety related.

Design and qualification of the turbine drains sub-system is in accordance with both commercial grade and seismic standards. The drains tank and drains pump are structurally qualified to safe shutdown earthquake (SSE) requirements by engineering analysis.

Since the drains pump does not perform a safety function, it is not included in the IST program.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-2

Section 3.3, "Bearings location," in NEDE-33299P states on page 3 that the shaft bearings in the alternate RCIC turbine-pump design are in the center between the pump and turbine rotors, and are completely within the single casings. Discuss the IST provisions and vibration monitoring for these bearings.

GE Response:

In-service testing provisions are established and implemented by the ABWR DCD Technical Specifications (TS) as well as the IST program requirements described in DCD Tier 2 Chapter 3. TS Surveillance Requirement 3.5.1.5 establishes performance testing requirements and frequency that ensure the operability of RCIC system. The TS bases describe the In-service Testing Program requirements for the RCIC system that confirm the ECCS design bases analyses. Pump test parameters include pump speed, discharge pressure, inlet pressure, flow rate, and peak vibration velocity.

RCIC system components including the turbine-pump are safety-related. In accordance with the requirements of 10 CFR 50.55a, the RCIC system design with the alternate turbine-pump includes provisions for testing of pumps and valves at the maximum flow specified in the plant accident analyses. The IST program is an operating plant program to be implemented by applicants referencing the ABWR DCD. (See DCD section 3.9.6 for a more detailed discussion). 10 CFR 50.55a(f) requires IST plans that meet code requirements in effect 12 months before the beginning of the plan interval to be submitted for NRC review.

Vibration can be monitored from the vendor-supplied accelerometer mounted on the bearing housing.

Acceptance criteria for monitoring bearing vibration levels are 4.5mm/s RMS. Factory testing results reveal vibration levels less than 2mm/s RMS. These low levels of vibration are due to the inherent stiffness of the rotor system design.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-3

Section 3.4, "Controls," in NEDE-33299P states on page 3 that control is completely internal to the pump and turbine with fewer control components for the alternate RCIC turbine-pump design. Describe the qualification and periodic testing of the control system.

GE Response:

The control system is an integral part of the turbine-pump assembly. Qualification was performed by factory testing of pump performance characteristics and seismic qualification including shaker table tests. Environmental qualification was performed by reference to generic data for non-metallic components. Environmental and seismic qualifications were performed in accordance with IEEE Standards 323 and 344 requirements respectively.

Periodic testing requirements and frequency are established by the TS surveillance requirements (reference RAI-2 response). Periodic testing establishes operability of the RCIC system including its control system.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-4

Section 3.6, "Lubrication," in NEDE-33299P states on page 4 that the pump main process water lubricates the bearings in the alternate RCIC pump and turbine. Discuss the qualification of the bearings for water coolant.

GE Response:

The source of cooling water for the pump bearings is the same water that flows through the pump. The condensate storage tank is the primary source of makeup water for the RCIC system. The suppression pool is the alternate source of RCIC makeup water during design basis events. Vendor certification of the turbine-pump assembly is consistent with water quality specifications identified by GE.

The pump and turbine bearings are manufactured from carbon materials that have been specifically designed for operation in process water. Qualification of the bearings for operation in the process fluid has been performed by a combination of factory testing and operability analysis performed by the vendor.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-5

Section 3.9, "Maintenance," in NEDE-33299P states on page 6 that the maintenance scope is reduced with less maintenance time required for the alternate RCIC turbine-pump set. Discuss the periodic maintenance provisions for the alternate design.

GE Response

The maintenance scope for the alternate turbine-pump design is reduced based on the fewer number of components, inherent in the simplified design compared to the original design. For example the DCD design pump has four oil lubricated and cooled bearings supplied by either a shaft driven or a motor driven pump with heat exchanger.

Licensees are required to comply with 10 CFR 50.65, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The operational program that implements 10 CFR 50.65 is out of the scope of the DCD and is described in the COLA. The STP 3&4 COLA will describe implementation and compliance with 10 CFR 50.65 in COLA FSAR 17.6. Procedures and instructions to implement those requirements shall be prescribed by documented instructions, procedures, or drawings, prior to authorization for fuel load. Appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished must be established.

10 CFR 50.65 is a performance-based rule. It is not desirable to add prescriptive requirements in a COLA. The excerpt from 10 CFR 50.65 that is applicable to preventive maintenance is:

> "Performance and condition monitoring activities and associated goals and preventive maintenance activities shall be evaluated at least every refueling cycle provided the interval between evaluations does not exceed 24 months. The evaluations shall take into account, where practical, industry-wide operating experience. Adjustments shall be made where necessary to ensure that the objective of preventing failures of structures, systems, and components through maintenance is appropriately balanced against the objective of minimizing unavailability of structures, systems, and components due to monitoring or preventive maintenance."

Preventive and predictive maintenance activities, if mandated by other regulations such as 10 CFR 50.49, 10 CFR 50.55a IST, will be performed.

Examples of preventive maintenance that will be considered for inclusion in the preventive maintenance program are turbine-pump bearing inspection and wear surface inspection of the turbine trip valve.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-6

Section 5.0, "Qualification Information," in NEDE-33299P provides on pages 6 and 7 a brief outline of the qualification of the alternate RCIC turbine-pump design. Describe the qualification of the alternate design for performance, and dynamic and seismic conditions. Also, describe the environmental qualification method and approach for the electrical and mechanical components (including non-metallic components) for the alternate design.

GE Response

Vendor qualification for performance in accordance with design basis conditions is established by factory testing and certified engineering analyses per the applicable ASME code requirements. The vendor's certification documentation will demonstrate compliance with design data in LTR Appendix A and DCD Table 5.4-2, Design Parameters.

Qualification for dynamic and seismic conditions is performed by design and operability analysis combined with shaker table testing.

Environmental qualification of pump and turbine non-metallic components is described in response to RAI-3 above. Environmental qualification of electrical components, such as solenoids for valve actuation, were performed in accordance with IEEE Standard 323 by a combination of similarity evaluations, testing, and analysis consistent with 10 CFR 50.49, "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants."

See DCD section 3.9 for a more detailed discussion of ABWR pump and valve qualification programs and requirements.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-7

Figure 1, "TWL Type Turbine-Pump Assembly," on page 11 in NEDE-33299P provides a rough drawing of the alternate RCIC turbine-pump design. Provide a more clear detailed diagram and/or photographs of the alternate design showing the inlet, outlet, connecting lines, and instrument locations.

GE Response:

To assist in NRC review, detailed engineering drawings of the alternate RCIC turbine-pump design are attached in Enclosure 2.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-8

Appendix A, "Description of TWL Type Alternate Design," to NEDE-33299P provides information on the design of the alternate RCIC turbine-pump design. Describe the quality assurance provisions for the design and manufacture of the alternate design.

GE Response:

The Alternate RCIC turbine-pump is designed and manufactured to the ASME Code section III Class II requirements following the vendor's NQA-1 (10CFR 50 Appendix B) Quality Assurance plan and program.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-9

Appendix A to NEDE-33299P indicates on page A-5 that a solenoid-operated valve (SOV) is connected between the steam pipe from the stop valve to the meter valve and the meter valve outlet to the steam exhaust in the alternate RCIC turbine-pump design. Describe the SOV and the meter valve, and their design, qualification, and IST provisions.

GE Response

Two separate types of over speed trip are provided for the safety of the turbine driven pump; a primary electronic over speed trip which operates via speed sensed by the electronic tachometer, and a secondary mechanical trip which is actuated by a trip bolt contained in the pump shaft. In each case, the trip operates by releasing the steam pressure on the underside of the stop valve piston, allowing the steam pressure on the upper side of the piston to close the valve, thus stopping the pump. The electronic over-speed trip operates independently from the mechanical trip by opening a solenoid-operated valve connected between the steam pipe from the stop valve to the meter valve and the meter valve outlet to the steam exhaust. When the electronic trip is actuated, the solenoid valve opens, thus allowing steam pressure to be released to exhaust, thus closing the stop valve and bringing the pump to rest.

The operation of the electronic trip is automatic by means of a signal from the electronic tachometer, and will trip the pump. Manual push-buttons under operator control are provided on the local control panel and main control room. Reset push-buttons are also provided at the local control panel and the main control room.

Qualification of this SOV is discussed in the response to RAI-6 above. Periodic maintenance considerations are discussed in response to RAI-5. The SOV is tested periodically during the turbine-pump functional testing required by Technical Specifications.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-10

Appendix A to NEDE-33299P on pages A-7 and A-8 discusses the steam stop valve and throttle valve for the alternate RCIC turbine-pump design. Discuss the manufacture, size, type, rating, actuator, qualification, setup, IST provisions, and periodic maintenance for these valves. Also, correlate these valves to the numbered valves in plant drawings and Table 3.9-8 on page C-16, "In-service Testing Safety-Related Pumps and Valves," and the text of the Design Control Document.

GE Response

The steam stop valve and throttle valve are integrally cast and form part of the turbine steam inlet assembly. The stop valve chest that also houses the throttle valve assembly is a subassembly welded to the nozzle box forming an integral part of the turbine cover; therefore, it is not shown in Table 3.9-8 or plant drawings. The stop and throttle valves provide the necessary steam pressure equilibrium to balance the governor valve pistons against the water side of the pump components. Qualification for the integral pump, turbine, and valves assembly is included in the response to RAI-6 above. The IST provisions are included in the response to RAI-1. The periodic maintenance requirements required for compliance with 10 CFR 50.65 are identified in the response to RAI-5.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-11

Appendix A to NEDE-33299P on page A-9 indicates that full pump discharge pressure is led through a solenoid-operated 4-way crossover valve when describing the differential pressure governor for the alternate RCIC turbine-pump design. Discuss the design, qualification, and IST provisions for this valve.

GE Response

The 4-way crossover solenoid operated valve (SOV) installed on the RCIC turbine-pump assembly establishes a specified partial flow point as an operating condition. This valve sets the position of the turbine governor. When the pump is required to give a reduced or partial flow, the crossover valve is activated from the main control room. The valve transfers full discharge pressure from the bottom of the upper piston to the top and the vent to the bottom. Downward thrust on the pressure governor spindle is increased causing the throttle valve spindle to rise and reduce the steam flow and turbine power. This results in a reduced output from the pump. Qualification and IST provisions are discussed in responses to RAI-3 and RAI-6 above.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-12

Appendix C, "ABWR DCD Tier 1 and Significant Tier 2 Marked Changes," to NEDE-33299P provides proposed changes to the inspections, tests, analyses, and acceptance criteria (ITAACs) to Table 2.4.4 on page C-4, "Reactor Core Isolation Cooling System," based on the alternate RCIC turbine-pump design. Discuss the establishment of ITAACs that reflect the alternate design, such as the design and qualification of the turbine-pump assembly, specific valves, and leakoff pump included in its design.

GE Response

Design and qualification of the alternate RCIC turbine pump are discussed in the response to RAIs -3, -4, -6 & -9. The ITAAC are developed to ensure pump performance based on system parameters that are included in DCD Tier 1, Section 2.4.4 markups, included as Appendix C of the LTR.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-13

Section 3.9.3.2.1.5, "RCIC Turbine," in Appendix C to NEDE-33299P states on page C-14 that operability under normal load conditions is assured by comparison to operability of similar turbines in operating plants. On page C-11, Appendix C indicates that this statement will be deleted from Section 3.9.2.2.2.7, "RCIC Pump and Turbine Assembly," because of the planned qualification test for the TWL type design. Discuss the plans for qualification of the alternate RCIC turbine-pump design in light of these differences in the DCD sections.

GE Response

Section 3.9.2.2.2.7 is intended to describe the dynamic qualification of the alternate turbine-pump assembly to show start up capability as well as operability under dynamic loading condition. Operability under normal load condition is discussed in Section 3.9.3.2.1.5.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-14

Appendix C to NEDE-33299P provides RCIC piping and instrumentation diagrams on pages C-23 and 24 (proprietary information). Provide diagrams of the RCIC system that are more clear regarding the locations of the specific components and instrumentation points.

GE Response

Clear diagrams of the RCIC piping and instrumentation diagrams are attached in Enclosure 3.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-15

On pages 5-20 to 22, Section 5.4.6, "Reactor Core Isolation Cooling System," in NRC Final Safety Evaluation Report on the ABWR (NUREG-1503) describes the NRC staff review of the RCIC system for the ABWR Design Certification. Identify any technical changes to the description of the RCIC system in this section necessary to reflect the alternate RCIC turbine-pump design.

GE Response:

See attached marked up NUREG-1503 (page 5-20) in Enclosure 4.

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

NRC RAI-16

Summarize the consideration of potential adverse flow effects from severe hydrodynamic and acoustic resonance loads on the reactor, steam, and feedwater systems and their components, including design, analysis, and monitoring approach. Discuss the evaluation of the potential impact of such loads on the alternate RCIC turbine-pump design.

GE Response

Acoustic resonance susceptibility is a function of piping system design and steam flow rate.

This LTR makes no change to RCIC, Main Steam, or Feedwater system steam or water flow rates and does not affect the piping connected to the Main Steam or Feedwater piping beyond the RCIC pump room.

The RCIC system duty cycle (hours per year of operation) is not affected by this LTR. Therefore, fatigue cycles are not increased in either intensity or frequency.

Even when RCIC is operating with the reactor at 100% rated power, the net main steam line flow rates are unchanged with operation of RCIC. The Steam Bypass and Pressure Control System would respond to the diversion of steam to the RCIC turbine by closing the main turbine control valves so that no change in steam flow upstream of the RCIC steam line tee would occur.

The RCIC turbine/pump assembly has been fully qualified to vibratory loads in excess of those currently to be applied in the USABWR. Those loads are a combination of seismic and hydrodynamic loads. For the latter, no increases are foreseen.

The piping systems are monitored during the startup test program in accordance with ABWR DCD Tier 2 Section 14.2.12.2.11. Details of the vibration monitoring program were submitted for NRC review in GE LTR NEDO-33316, Revision 0, "Advanced Boiling Water Reactor (ABWR) Vibration Assessment Program in compliance with The United States Nuclear Regulatory Commission Regulatory Guide 1.20," on May 1, 2007 in GE letter MFN 07-227 (NRC Accession ML071240089).

LTR Impact

No changes to the LTR will be made as a result of this RAI response.

ENCLOSURE 2

MFN 07-295

Response to NRC Request for

Additional Information

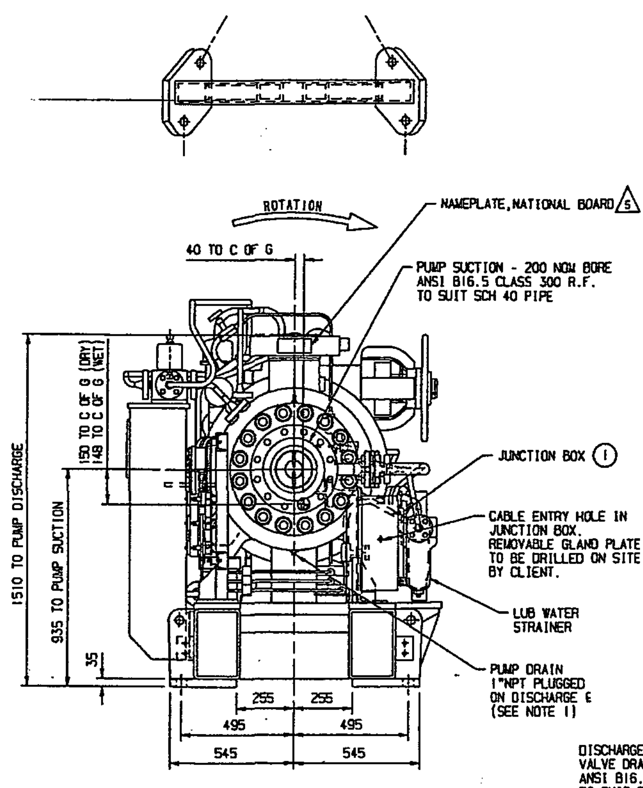
Related to ABWR Design Certification Application

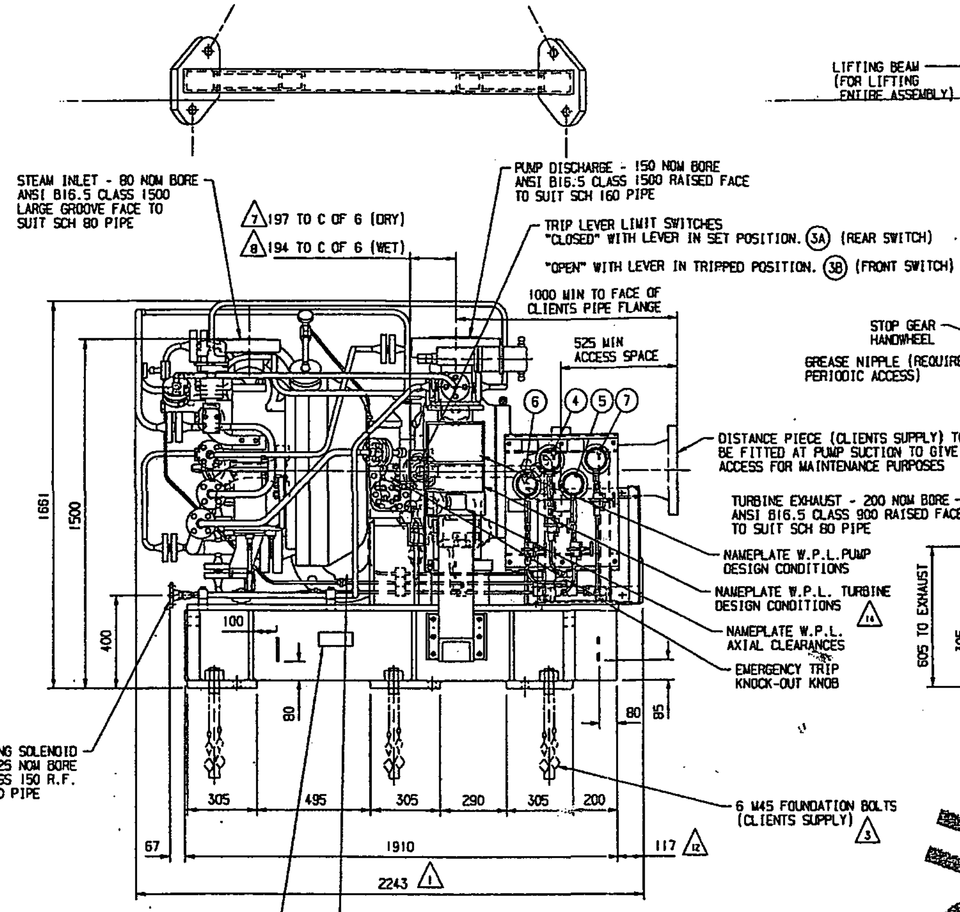
Licensing Topical Report NEDE-33329P, "Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design (TAC NO. MD4025)

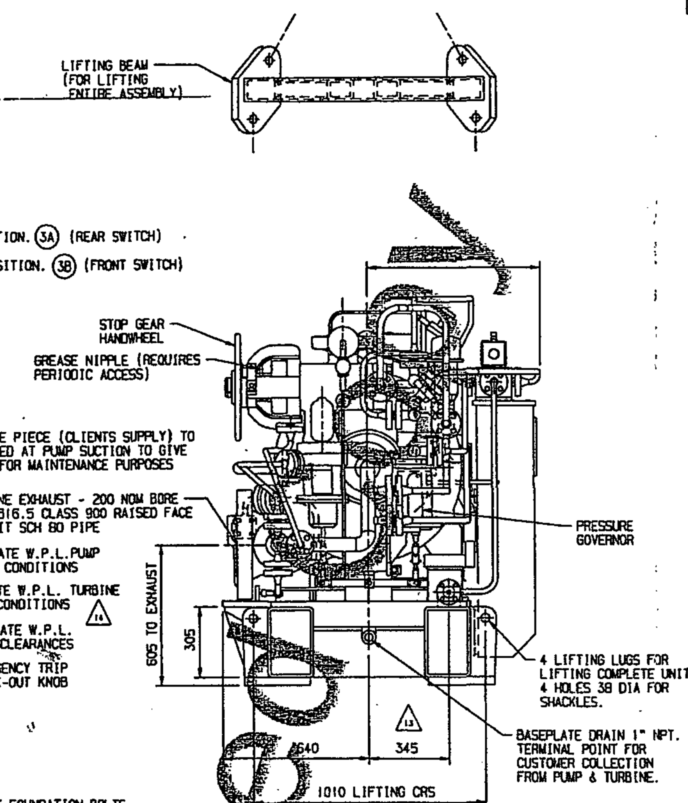
Drawings Requested by RAI-7

DRG NO.C.N0-000721

DO NOT SCALE DRAWING | IF IN DOUBT ASK | FIRST ANGLE PROJECTION





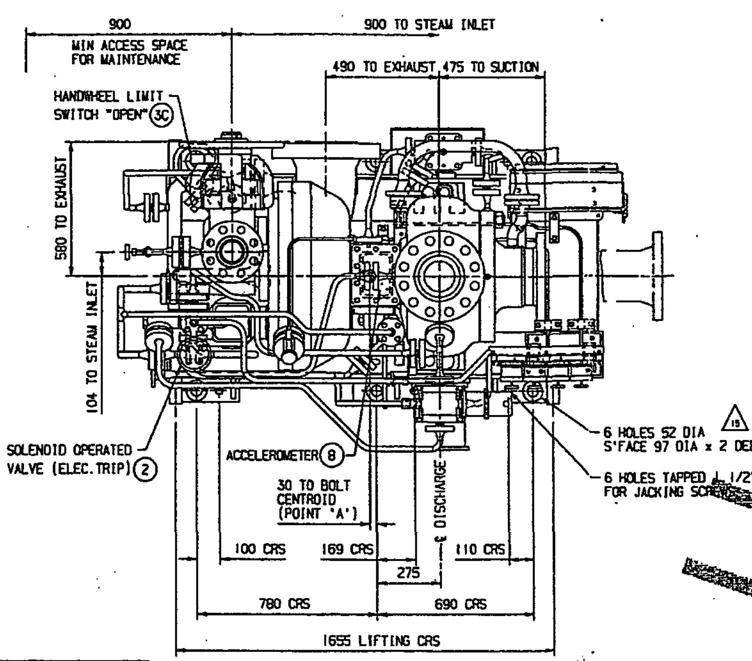


THE MAXIMUM ANCHOR BOLTS LOADS DUE TO SERVICE LEVEL A AND B NOZZLE LOADS PLUS SEISMIC AND OTHER DYNAMIC LOADS SHALL NOT EXCEED 164,272 N (36,928 lbs) /BOLT IN TENSION AND 108,535 N (24,399 lbs) /BOLT IN SHEAR.

THE MAXIMUM ANCHOR BOLT LOADS DUE TO SERVICE LEVEL C AND D NOZZLE LOADS PLUS SEISMIC AND OTHER DYNAMIC LOADS SHALL NOT EXCEED 164,272 N (36,928 lbs) /BOLT IN TENSION AND 108,535 N (24,399 lbs) /BOLT IN SHEAR

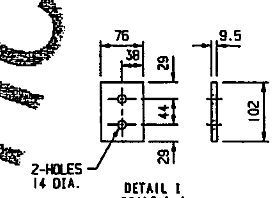
MAXIMUM ALLOWABLE PIPING LOAD COMBINATIONS FOR SERVICE LEVEL A, SERVICE LEVEL B, SERVICE LEVEL C, AND SERVICE LEVEL D SHALL NOT EXCEED THE FOLLOWING VALUES FOR EACH NOZZLE WHERE Fr(N) IS THE RESULTANT OF THREE EXTERNAL ORTHOGONAL FORCES (Fx,Fy,Fz) THAT MAY BE IMPOSED BY THE PIPE. IT SHALL BE ASSUMED THAT Fx ACTS IN A HORIZONTAL DIRECTION PARALLEL TO THE AXIS OF THE PUMP SUCTION, Fy ACTS IN THE VERTICAL DIRECTION, AND Fz ACTS IN A HORIZONTAL DIRECTION PERPENDICULAR TO Fx; AND Mr(m-N) IS THE RESULTANT OF THREE EXTERNAL ORTHOGONAL MOMENTS(Mx,My,Mz) THAT MAY BE IMPOSED BY THE PIPE. IT SHALL BE ASSUMED THAT Mx ACTS IN A HORIZONTAL DIRECTION PARALLEL TO THE AXIS OF THE PUMP SUCTION, My ACTS IN THE VERTICAL DIRECTION, AND Mz ACTS IN A HORIZONTAL DIRECTION PERPENDICULAR TO Mx. THE VALUES OF Fr AND Mr ARE GIVEN IN THE FOLLOWING TABLE.

NOZZLE	SERVICE LEVEL	FORCE-NEWTONS				MOMENT-NEWTON METERS			
		Fx	Fy	Fz	Fr	Mx	My	Mz	Mr
PUMP SUCTION	A	2962	3436	6351	7805	1408	2585	1166	3168
	B	8010	5999	11470	15220	2871	5324	1914	6347
	C	4869	4532	9422	11530	1969	4048	1573	4763
NOZZLE DIA 200 mm(8 ins)	D	11660	7461	14330	19920	3674	7040	2354	8283
PUMP DISCHARGE	A	1943	6901	2451	7577	1451	390.5	603.1	1619
	B	6808	9798	2827	12260	5049	1077	1950	5519
	C	2151	5669	1374	6217	1634	459.1	1283	2127
NOZZLE DIA 150 mm(6 ins)	D	8581	11290	3794	14680	6158	1526	2587	6851
STEAM INLET	A	1521	2435	779	2975	128	1364	1318	1901
	B	3654	6910	2893	8335	2547	1921	4544	5552
	C	1667	2506	976	3164	443.2	987.6	1676	1996
NOZZLE DIA 80 mm(3 ins)	D	4219	7934	3342	9587	2894	2119	5777	6800
TURBINE EXHAUST	A	970	5621	2154	6097	2987	750.8	417.6	3108
	B	2437	9262	4733	10680	8656	2883	1615	9265
	C	1795	7183	2561	7834	4634	1728	583.4	4980
NOZZLE DIA 200 mm(8 ins)	D	4851	12030	6002	14290	12000	5610	2286	13440

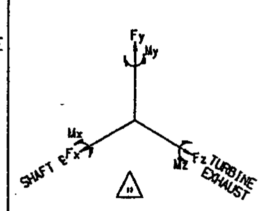


NOTES :-

1. PLUGGED HOLES ARE PROVIDED TO DRAIN PUMP & TURBINE CASING PRIOR TO MAINTENANCE.
2. ⊕ DENOTES CENTRE OF GRAVITY.
3. WEIGHT OF COMPLETE UNIT :- 4177 kg (DRY) 4227 kg (WET)
4. DIMENSIONS IN MILLIMETRES.
5. POSITIONAL TOLERANCE ON ALL TERMINAL POINTS ±.3mm



DETAIL I
SCALE 1:4
GROUNDING PAD



	THERMAL EXPANSION		
	Δx	Δy	Δz
PUMP SUCTION	+0.352 mm	0 mm	0 mm
PUMP DISCHARGE	0 mm	+0.426 mm	0 mm
STEAM INLET	-1.537 mm	+2.205 mm	+0.406 mm
TURBINE EXHAUST	-0.268 mm	-0.526 mm	+0.914 mm

FOUNDATION LOADS REFERRED TO POINT 'A'
(LOADS CORRESPOND TO THE FAULTED CONDITION)

	FORCES (N)			MOMENTS (Nm)		
	Fx	Fy	Fz	Mx	My	Mz
TOTAL	±83218	+ 80182 -163116	±81375	+104384 -107701	±43121	+108364 -117569

MAX DIRECT BOLT LOAD	90.4 kN	BOLT PRELOAD	210 kN	BOLT TORQUE	1890 Nm

INST. REF. No.	SERVICE DESCRIPTION
1	LOCAL JUNCTION BOX
2	SOLENOID VALVE
3A	LIMIT SWITCH "CLOSED"
3B	LIMIT SWITCH "TRIPPED"
3C	LIMIT SWITCH "HANDWHEEL OPEN"
4	PRESSURE GAUGE NOZZLE BOX
5	PRESSURE GAUGE EXHAUST
6	PRESSURE GAUGE STEAM INLET
7	PRESSURE GAUGE L.W. STRAINER
8	ACCELEROMETER
9	SPEED PROBE

TAIWAN POWER COMPANY
LUNGMEN NUCLEAR UNITS 1 AND 2.
CONTRACT No. B748611M001-1

UNIT 1	UNIT 2
1E51-P-0001 PUMP	2E51-P-0001 PUMP
1E51-TRB-0001 TURBINE	2E51-TRB-0001 TURBINE

WEIR PUMPS LTD.
NEWLANDS ROAD
GLASGOW, G44 4EX
SCOTLAND.
ORDER NO. 13536-001/02

ALL REVISIONS TO BE CARRIED OUT ON C.A.D.

ISSUE NO.	ZONE	DESCRIPTION OF CHANGE	DRAWN BY	CHECKER	PROJ. ENG.
3	E5	19 BOLT LOAD FIGURES REVISED	J.ADAM 16th MAY 99	R.T. 17th MAY 99	J.GRITTON 17th MAY 99
	E5	18 FORCE AND MOMENT FIGURES REVISED			
	D3	17 NEW TABLE WITH REVISED FIGURES ADDED			
	C1	16 BOLT IN TENSION/SHEAR FIGURES REVISED			
	C6	3 WAS M48 BOLT			
2	E6	15 HOLE WAS 47.6 DIA, S/FACE WAS 95 DIA	J.ADAM 16th MAY 99	R.T. 17th MAY 99	J.GRITTON 17th MAY 99
	B6	14 TURBINE NAMEPLATE ADDED			
	C8	13 DIM WAS 425			
	C6	12 117 DIM ADDED			
	E1	11 WPL PROPRIETARY NOTE DELETED			
	D8	10 WAS 4225 Kgs.			
	D8	9 WAS 4175 Kgs.			
	A5	8 WAS 197			
	A5	7 WAS 200			
	C4	6 NAMEPLATE ADDED			
	A3	5 NAMEPLATE ADDED			
	E8	4 TAG Nos. ADDED			
	C6	3 BOLT POCKETS REMOVED M48 WAS 1.3/4" UNC			
	D7	2 TERMINAL POINTS TOL.ADDED			
	C5	1 DIM WAS 2146			

ISSUE NO. 1	DRAWN BY	CHECKER	PROJ. ENG.
INITIALS	AHG	JST	JACK GRITTON
DATE	17th DEC 1998	17th DEC.98	17th DEC 98

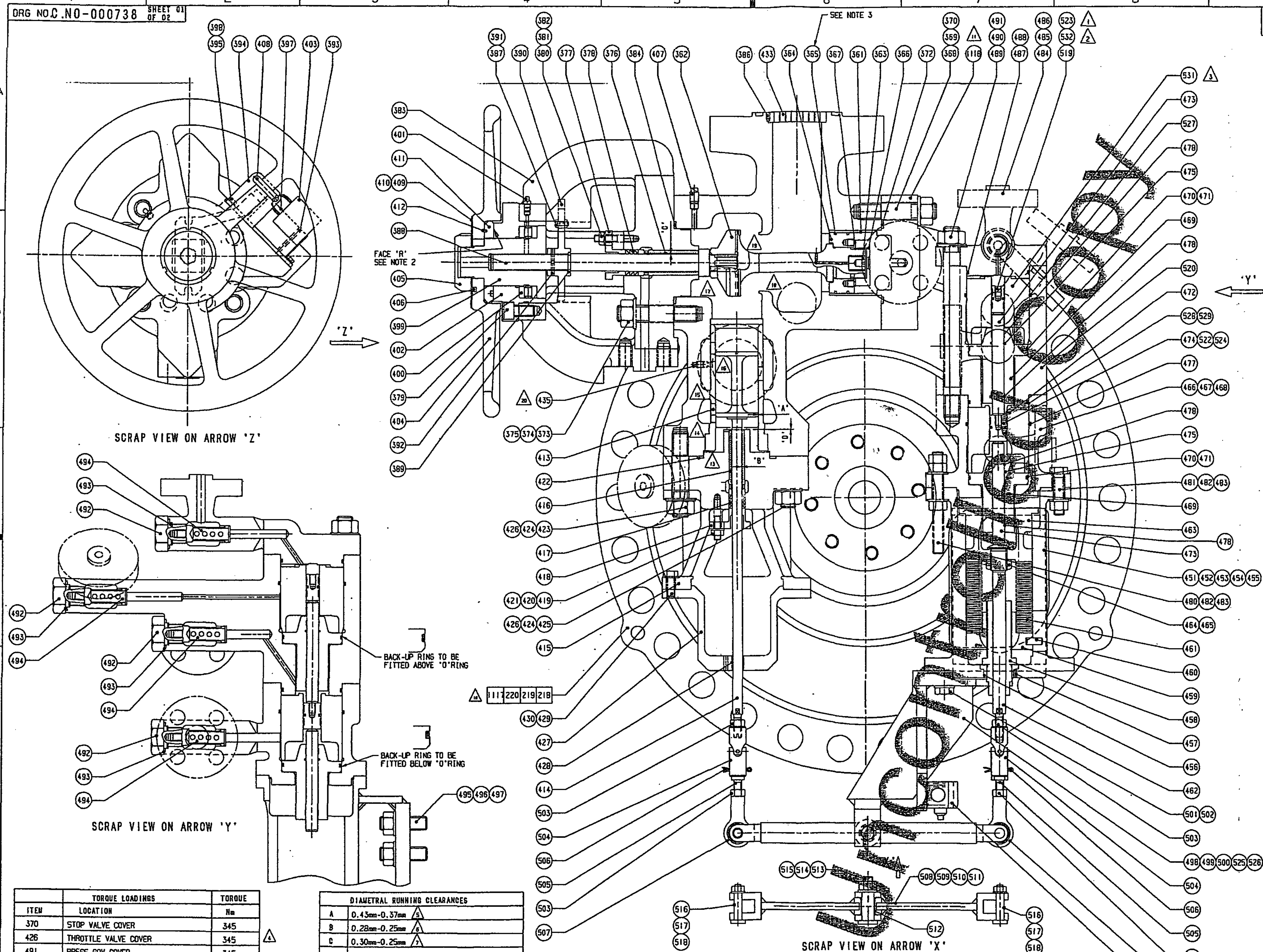
CONTROLLED PRINT
DO NOT DESTROY !!
ON DEMAND OR IF DAMAGED RETURN TO DRAWING OFFICE

JOB No.	DATE	PRINT No.	TO	INTS.

WEIR PUMPS LIMITED
SCALE:- 1:10 | PARTS LIST ITEM NO.
GENERAL ARRANGEMENT
REACTOR CORE ISOLATION COOLING PUMP
UNIT TWL45 S3-H2
DRG. No C.N0-000721
ORIGINAL DRAWING
STATE LATEST ISSUE WHEN QUOTING DRG.
COMPONENT DESCRIPTION CODE NO. 9990
PART NAME :- 57-9990-TWL45S3-N0-000721-01

DRG No C.N0-000738 SHEET 01 OF 02

DO NOT SCALE DRAWING	IF IN DOUBT ASK	FIRST ANGLE PROJECTION



TORQUE LOADINGS		TORQUE
ITEM	LOCATION	Nm
370	STOP VALVE COVER	345
426	THROTTLE VALVE COVER	345
491	PRESS.GOV.COVER	345
379	STOP VALVE, BEARING COVER	103

DIAMETRAL RUNNING CLEARANCES	
A	0.43mm-0.37mm (5)
B	0.28mm-0.25mm (6)
C	0.30mm-0.25mm (7)

SETTING DIMENSION	
D	3.0mm (NOM) (8)

1. FOR PRESSURE GOVERNOR / THROTTLE VALVE LINKAGE SETTING PROCEDURE SEE DRG. No. N0-000739
2. ITEM 411, THRUST WASHER, TO BE CUT TO PLACE LEAVING A GAP OF 0.25mm BETWEEN THRUST WASHER AND BEARING COVER, ITEM 402 WITH BUSH, ITEM 399 PULLED FULLY IN DIRECTION OF ARROW THUS ←— AGAINST ROLLER BEARING, ITEM 400. ALL MACHINING TO ACHIEVE REQUIRED GAP TO BE CARRIED OUT ON FACE 'R'. PRIOR TO FINAL FITTING ALL HOLES ON FACE 'R' OF THE THRUST WASHER TO BE PACKED WITH GREASE.
3. STOP VALVE PISTON RING (2 RINGS PER PACK) FITTED IN EACH GROOVE, WITH GAPS IN EACH RING DIAMETRICALLY OPPOSITE TO EACH OTHER.
4. FOR ITEMS INDICATED THUS ☐ SEE DRG. No. N0-000737 FOR FULL DETAILS.

ALL REVISIONS TO BE CARRIED OUT ON C.A.D.

ISSUE NO.	ZONE	DESCRIPTION OF CHANGE	DRAWN BY	CHECKER	PROJ. ENG.
5	B4	(20) ITEM 435 ADDED.	J.GROVE 15.DEC.99	J.S.T. 15.DEC.99	A.FRASER 15.DEC.99
4	B6	(19) VALVE PROFILE MODIFIED(RADIUS ADDED).	J.G. 06.DEC.1999	R.T. 06 DEC 1999	J.GRITTON 6 DEC 99
	B6	(18) CORNER RADIUS ADDED.			
	B5	(17) CORNER RADIUS ADDED.			
	B5	(16) THROTTLE VALVE O/DIA INCREASED.			
	B5	(15) THROTTLE VALVE CAGE DIAM. INCREASED.			
	C5	(14) ANTI-ROTATION PIN DELETED.			
	C5	(13) TAPPED HOLES DELETED (THROTTLE VALVE CAGE).			
3	E1	(12) WPL PROPRIETARY NOTE DELETED	JA 10th MAY 99	JST 10th MAY 99	J.GRITTON 11th MAY 99
2	A7	(11) ITEM 1118 WAS ITEM 371	J.ADAM 13th APRIL 99	J.TURTLE 13th APRIL 99	J.GRITTON 14th APRIL 99
	D4	(10) ITEM 1117 WAS 221			
	E7	(9) TAG Nos. ADDED			
	E3	(8) (0.118") DELETED			
	E3	(7) (0.012"-0.010") DELETED			
	E3	(6) (0.011"-0.010") DELETED			
	E3	(5) (0.017"-0.015") DELETED			
	E2	(4) LB F1 TORQUE FIG.5 DELETED			
	A8	(3) WAS ITEM 521			
	A8	(2) WAS ITEM 479			
	A8	(1) WAS ITEM 476			

ISSUE NO. 1	DRAWN BY	CHECKER	PROJ. ENG.
INITIALS	AHG	JST	J.GRITTON
DATE	4th NOV 1998	4th NOV 98	10th NOV '98

CONTROLLED PRINT
DO NOT DESTROY !!
ON DEMAND OR IF DAMAGED RETURN TO DRAWING OFFICE

JOB No.	DATE	PRINT No.	TO	INTS.

TAIWAN POWER COMPANY
LUNGMEN NUCLEAR UNITS 1 AND 2.
CONTRACT No. 8748611N001-1

UNIT 1	UNIT 2
1E51-P-0001	2E51-P-0001
1E51-TRB-0001	2E51-TRB-0001

WEIR PUMPS LTD.
NEWLANDS ROAD
GLASGOW, G44 4EX
SCOTLAND.
ORDER NO. 13536-001/02

ORIGINAL DRAWING N0-000595

WEIR PUMPS LIMITED
SCALE:- 1:2 | PARTS LIST ITEM NO.
STOP GEAR & PRESS.GOVERN
REACTOR CORE ISOLATION COOLING PUMP & TURBINE
UNIT TWL45 S-H2
DRG. No C. N0-000738 SHEET 01 OF 02
STATE LATEST ISSUE WHEN QUOTING DRG.
COMPONENT DESCRIPTION CODE NO. 1449

PART NAME :- 57-1449-TWL45S-N0-000738-01

DRG NO C.NO-000738 SHEET 02 OF 02

ITEM	DESCRIPTION	AMERICAN STD.	BRITISH STD.	QUALITY CLASS	QTY	CAT
454	PLATE,END	ASTM A283 GR.B	BSEN10025 S275 *	S	1	
453	PLATE,TOP	ASTM A283 GR.B	BSEN10025 S275 *	S	1	
452	CASING,PRESSURE GOVERNOR	ASTM A216 WCA	BS3100 GR.A1 *	G	1	
451	CASING,PRESSURE GOVERNOR ASSY.	ASSY ITEMS 452 TO 455 *		S	1	
435	PLUG, 1/8" NPT.	ASME SA479 304L *		S	1	1
433	STRAINER,STEAM INLET	ASTM A276 TP431	BS970 431S29T *	G	1	
431	MICROSWITCH	VARIOUS *		G	1	
430	WASHER M12	ASTM A29 GR 1020	BS970 070 M20 *	G	6	
429	SCREW HEX HEAD M12	ASTM F568 CLASS 8.8	BSEN20898-1 GR 8.8 *	G	6	
428	BUSH,SPINDLE GUIDE	GLACIER DU *		G	1	
427	PLATE,GUIDE	ASTM A283 GR B	BSEN10 025 S275 *	G	1	
426	NUT M24	ASME SA194 GR 7 *		S	8	1
425	STUD M24 x 76 LG.	ASME SA193 GR B7 *		S	6	1
424	WASHER M24	ASTM A29 GR 1020	BS970 070 M20 *	G	8	
423	STUD M24 x 90 LG.	ASME SA193 GR B7 *		S	2	1
422	GASKET,"METAFLEX"	316L STAINLESS STEEL/SUPAGRAF *		G	1	
421	WASHER M10	ASTM A29 GR 1020	BS970 070 M20 *	G	2	
420	STUD M10	ASME SA193 GR B7 *		S	2	1
419	NUT M10	ASME SA194 GR 7 *		S	2	1
418	GLAND,SOLID	ASME SA479 304L *		S	1	1
417	RING,PACKING,PRE-FORMED	CRANE 1066 MICA *		G	4	
416	RING,NECK	ASTM A436 TYP 1	BS3468 GR. F1 *	G	1	
415	COVER,THROTTLE VALVE	ASME SA217 WC1 *		S	1	1
414	SPINDLE,THROTTLE VALVE		BS970 PT1 722M24 *	S	1	
413	CAGE,THROTTLE VALVE	ASTM A276 TP431	BS970 431S29 *	S	1	
412	PIN,ANTI-ROTATION	ASTM A276 TP431	BS970 431S29 *	G	1	
411	WASHER, THRUST	ASTM B584 ALLOY C93700	BS1400 LB2 *	G	1	
410	SCREW,DRIVE No. 4 x 9.5 mm LONG	NICKEL PLATED STEEL *		G	2	
409	PLATE,INSTRUCTION	ASTM A666 TYPE 316	BS1449 316S31 *	G	1	
408	BAR,HANDWHEEL LOCKING	ASTM A29 GR. 1020	BS970 070M20 *	G	1	
407	PLUG,1/4" NPT	ASME SA479 304L *		S	1	1
406	LOCKWASHER	ASTM A666 TYPE 316	BS1449 316S31 *	G	1	
405	NUT,HANDWHEEL	ASTM A29 GR 1040	BS970 080 M40 *	G	1	
404	HANDWHEEL,STOP VALVE	ASTM A536 GR 65-45-12	BS2789 GR 420/12 *	G	1	
403	PADLOCK,HANDWHEEL LOCKING	STEEL *		G	1	
402	COVER,BEARING	ASTM A29 GR. 1040	BS970 080M40 *	G	1	
401	NIPPLE,GREASE	STEEL *		G	1	
400	BEARING,ROLLER	STEEL *		G	1	
399	BUSH,GUIDE,STOP VALVE SPINDLE	ASTM A276 TP431	BS970 431S29 *	R	1	
398	WASHER,SPRING M6	ASTM F738 A4-70	BS6104 A4-70 *	G	4	
397	MICROSWITCH	VARIOUS *		G	1	
395	SCREW,HEX HEAD M6	ASTM F568 CLASS 8.8	BSEN20898-1 GR 8.8 *	G	4	
394	BRACKET,MICRO SWITCH	ASTM A283 GR. B	BSEN10025 S275 *	R	1	
393	SCREW,ROUND HEAD 2BA	STEEL		G	2	
392	PIN,TAPER	UNS G15130	BS970 220 M07 *	G	1	
391	SCREW,HEX HEAD M5	ASTM F568 CLASS 8.8	BSEN20898-1 GR 8.8 *	G	1	
390	POSITION INDICATOR	ASTM A283 GR.B	BSEN10025 S275 *	G	1	
389	RING,ABUTMENT		IMI 130 UTS 45 TSI *	G	1	
388	SPINDLE,STOP VALVE	MONEL K500 UNS N05500	BS3076 NA18 *	S	1	
387	NUT M5	ASTM A563M CLASS 9	BSEN20898-2 GR 8 *	G	1	
386	SCREW SOCKET SET M6	ASTM F738 C3-80	BS6105 C3-80 *	G	2	
384	GASKET "METAFLEX"	316L STAINLESS STEEL/SUPAGRAF *		G	1	
383	COVER,STOP VALVE	ASME SA217 WC1 *		S	1	1
382	STUD M10	ASME SA193 GR B7 *		S	2	1
381	WASHER M10	ASTM A29 GR 1020	BS970 070 M20 *	G	2	
380	NUT M10	ASME SA194 GR 7 *		S	2	1
379	CAP SCREW M16	ASTM F568 CLASS 12.9	BSEN20898-1 GR 12.9 *	G	8	
378	RING PACKING,PRE-FORMED		CRANE 1066 MICA *	G	3	
377	GLAND,SOLID	ASME SA479 304L *		S	1	1
376	RING,NECK	ASTM A436 TYP 1	BS3468 GR F1 *	G	1	
375	WASHER M24	ASTM A29 GR 1020	BS970 070 M20	G	8	
374	STUD M24	ASME SA193 GR B7 *		S	8	1
373	NUT M24	ASME SA194 GR 7 *		S	8	1
372	GASKET "METAFLEX"	316L STAINLESS STEEL/SUPAGRAF *		G	1	
1118	COVER,STEAM CHEST	ASME SA217 WC1 *		S	1	1
370	NUT M24	ASME SA194 GR 7 *		S	8	1
369	WASHER M24	ASTM A29 GR 1020	BS970 070 M20 *	G	8	
368	STUD M24	ASME SA193 GR B7 *		S	8	1
367	LOCKWASHER,PISTON LOCKNUT	ASTM A666 TYPE 316	BS1449 316S31 *	G	1	
366	LOCKNUT,PISTON	ASTM A276 TP431	BS970 431S29 *	S	1	
365	RING,PISTON	HAYNES 25 STELLITE *		G	4	
364	PISTON,STOP VALVE	ASTM A276 TP431	BS970 431S39 *	S	1	
363	PLUG, ORIFICE	ASTM A276 TP431	BS970 431S39 *	G	1	
362	VALVE	ASME SA479 304L *		S	1	2
361	LINER,PISTON	STELLITE 6 *		S	1	
ITEM	DESCRIPTION	AMERICAN STD. / MATERIALS OF CONSTRUCTION	BRITISH STD.	QUALITY CLASS	QTY	CAT

ITEM	DESCRIPTION	AMERICAN STD.	BRITISH STD.	QUALITY CLASS	QTY	CAT
532	SLYDRING,UPPER PISTON	TURCON T10 *		G	2	
531	LINER,PRESSURE GOVERNOR,UPPER	ASTM A439 TYPE D2	BS3468 S2W *	G	1	
530	SCREW,ROUND HEAD,2BA	STEEL		G	2	
529	BACK-UP RING	PTFE *		G	1	
528	'O' RING	VITON *		G	1	
527	'O' RING	VITON *		G	1	
526	PLATE	ASTM A283 GR.B	BSEN10025 S275 *	S	2	
525	PLATE	ASTM A283 GR.B	BSEN10025 S275 *	S	1	
524	GLYD RING,LOWER PISTON	TURCON T10 *		G	1	
523	GLYD RING, UPPER PISTON	VITON / TURCON T10 *		G	1	
522	SLYDRING,LOWER PISTON	TURCON T10 *		G	1	
520	CASING,PRESSURE GOVERNOR,UPPER	ASME SA487 CA6NM CLASS A *		S	1	
519	PISTON, UPPER	ASTM A276 TP431	BS970 431 S29 *	R	1	
518	NUT M10	ASTM A563M CLASS 9	BSEN20898-2 GR 8 *	S	2	
517	WASHER M10	ASTM A29 GR 1020	BS970 070 M20 *	G	2	
516	PIN, LINKAGE (SMALL)	ASTM A276 TP431	BS970 431S29 *	S	2	
515	NUT M16	ASTM A563M CLASS 9	BSEN20898-2 GR 8 *	S	1	
514	WASHER M16	ASTM A29 GR 1020	BS970 070 M20 *	G	1	
513	PIN,LINKAGE (LARGE)	ASTM A276 TP431	BS970 431S29 *	S	1	
512	BUSH,LINKAGE LEVER	GLACIER DU *		G	1	
511	BAR,LINKAGE LEVER	ASTM A283 GR.B	BSEN10025 S275 *	S	2	
510	BAR,LINKAGE LEVER	ASTM A29 GR 1020	BS970 070 M20 *	S	1	
509	BAR,LINKAGE LEVER	ASTM A283 GR.B	BSEN10025 S275 *	S	2	
508	LINKAGE LEVER ASSEMBLY	ASSEMBLY ITEMS 509 TO 511 *		S	1	
507	BEARING,TRACK ROD END	STEEL *		G	2	
506	PIN,SPLIT 1/8"DIA	MILD STEEL *		G	2	
505	SPINDLE,ADJUSTING	ASTM A29 GR 1020	BS970 070 M20 *	G	2	
504	JOINT,UNIVERSAL	STEEL *		G	2	
503	NUT,ADJUSTING SPINDLE M12	ASTM A563M CLASS 9	BSEN20898-2 GR 8 *	G	4	
502	WASHER,PLAIN M16	ASTM A29 GR 1020	BS970 070 M20 *	G	4	
501	SCREW,HEX HEAD M16	ASTM F568 CLASS 8.8	BSEN20898-1 GR 8.8 *	G	[illegible]	
500	PLATE	ASTM A283 GR.B	BSEN10025 S275 *	S	[illegible]	
499	PLATE	ASTM A283 GR.B	BSEN10025 S275 *	S	1	
498	BRACKET,GOVERNOR LINKAGE	ASSEMBLY ITEMS 499,500,525 & 526		S	1	
497	WASHER M20	ASTM A29 GR 1020	BS970 070 M20 *	G	6	
496	NUT M20	ASTM A563M CLASS 9	BSEN20898-2 GR 8 *	S	6	
495	STUD M20	ASTM A322 GR 4140	BS970 709 M40 *	S	6	
494	ELEMENT, STRAINER	316 STAINLESS STEEL *		G	4	1
493	GASKET "METAFLEX"	316L STAINLESS STEEL/SUPAGRAF *		G	4	1
492	PLUG,STRAINER	ASME SA479 304L *		S	4	
491	NUT M24	ASME SA194 GR 7 *		S	4	1
490	WASHER M24	ASTM A29 GR 1020	BS970 070 M20	G	4	
489	STUD M24	ASME SA193 GR B7 *		S	4	
488	BACK UP RING	PTFE *		G	1	1
487	'O' RING	VITON *		G	1	1
486	PIECE,EXTENSION	ASME SA487 CA6NM CLASS A *		S	1	1
485	COVER,PRESSURE GOVERNOR	ASME SA487 CA6NM CLASS A *		S	1	
484	COVER,PRESSURE GOVERNOR	ASSY ITEMS 485 & 486		S	1	
483	NUT M16	ASTM A563M CLASS 9	BSEN20898-2 GR 8 *	S	8	
482	WASHER, M16	ASTM A29 GR 1020	BS970 070 M20 *	G	6	
481	SCREW,HEX HEAD M16	ASTM F568 CLASS 8.8	BSEN20898-1 GR 8.8 *	S	2	
480	STUD BOLT M16	ASTM A29 GR 1020	BS970 070 M20 *	S	2	
478	SLYDRING,GUIDE/PISTON ROD	TURCON T10 *		G	4	
477	'O' RING	VITON *		G	1	
475	STEP SEAL	VITON/TURCON T10 *		G	2	
474	PISTON,PRESSURE GOVERNOR, LOWER	ASTM A276 TP431	BS970 431S29 *	S	1	
473	ROD,PISTON	ASTM A182 UNS S34700	BS970 342S31 *	S	2	
472	LINER,PRESSURE GOVERNOR, LOWER	ASTM A439 TYPE D2	BS3468 S2W *	G	1	
471	BACK-UP RING	PTFE *		G	2	
470	'O' RING	VITON *		G	2	
469	GUIDE,PRESSURE GOVERNOR	ASTM A276 TP431	BS970 431S29 *	R	2	
468	EXTENSION PIECE	ASME SA487 CA6NM CLASS A *		S	1	1
467	CYLINDER,PRESSURE GOVERNOR	ASME SA487 CA6NM CLASS A *		S	1	1
466	CYLINDER,PRESSURE GOVERNOR ASSY	ASSEMBLY ITEMS 467 & 468		S	1	1
465	SCREW,SOCKET SET M6	ASTM F738 C3-80	BS6105 C3-80 *	G	1	
464	LOCKNUT,HEX	ASTM A276 TP431	BS970 431S29 *	G	1	
463	CARRIER,SPRING,TOP	ASTM B584 ALLOY 836	BS1400 LG2 *	G	1	
462	SPINDLE,PRESSURE GOVERNOR	ASTM A276 TP431	BS970 431S29 *	R	1	
461	SPRING,PRESSURE GOVERNOR	17/7 CHROME NICKEL STEEL *		S	1	
460	DOWEL, ANTI-ROTATION	ASTM A276 TP431	BS970 431S29 *	G	1	
459	CARRIER,SPRING,BOTTOM	ASTM B584 ALLOY 836	BS1400 LG2 *	G	1	
458	ADJUSTER,SPRING	ISO CuZn38Sn1	BS2874 CZ112 *	G	1	
457	SCREW,SOCKET SET M5	ASTM F738 C3-80	BS6105 C3-80 *	G	1	
456	BUSH,PRESSURE GOVERNOR CASING	ASTM A276 TP431	BS970 431S29 *	G	1	
455	RIB,CASING BRACKET	ASTM A283 GR.B	BSEN10025 S275 *	S	1	
ITEM	DESCRIPTION	AMERICAN STD. / MATERIALS OF CONSTRUCTION	BRITISH STD.	QUALITY CLASS	QTY	CAT

* DENOTES THE ACTUAL MATERIAL OF CONSTRUCTION

CAT 1 ITEMS ARE ASME CODE AFFECTED ITEMS
CAT 2 ITEMS ARE NON-ASME CODE CRITICAL PARTS

DO NOT SCALE DRAWING | IF IN DOUBT ASK | FIRST ANGLE PROJECTION

MFN 07-295
Enclosure 2
Page 3 of 4

ALL REVISIONS TO BE CARRIED OUT ON C.A.D.

ISSUE NO.	ZONE	DESCRIPTION OF CHANGE
6	A1	ITEM 435 ADDED.
5		QUALITY CLASS COLUMN REVISED
4	E7	WAS MATL. CLASS
	E4	WAS MATL. CLASS
	B8	QUALITY CLASS WAS 6
	D8	QUALITY CLASS WAS 6
	D8	QUALITY CLASS WAS 6
	D8	QUALITY CLASS WAS 6
	D8	QUALITY CLASS WAS 6
	B4	QUALITY CLASS WAS 6
3	A4	WAS TURCITE 10
	A4	WAS TURCITE
	A4	WAS VITON / TURCITE
	A4	WAS TURCITE 10
	C4	WAS TURCITE 10
	C4	WAS VITON / TURCITE
	E1	WPL PROPRIETARY NOTE DELETED
2	E8	TAG Nos. ADDED
	D1	WAS ITEM 371
	A4	WAS ITEM 476
	A4	WAS ITEM 521
	A4	WAS ITEM 479

ISSUE NO. 1	DRAWN BY	CHECKER	PROJ. ENG.
INITIALS	AHS	JST	J.BRITTON
DATE	4th NOV 1998	4th NOV 98	10th NOV '98

CONTROLLED PRINT
DO NOT DESTROY !!
ON DEMAND OR IF DAMAGED RETURN TO DRAWING OFFICE

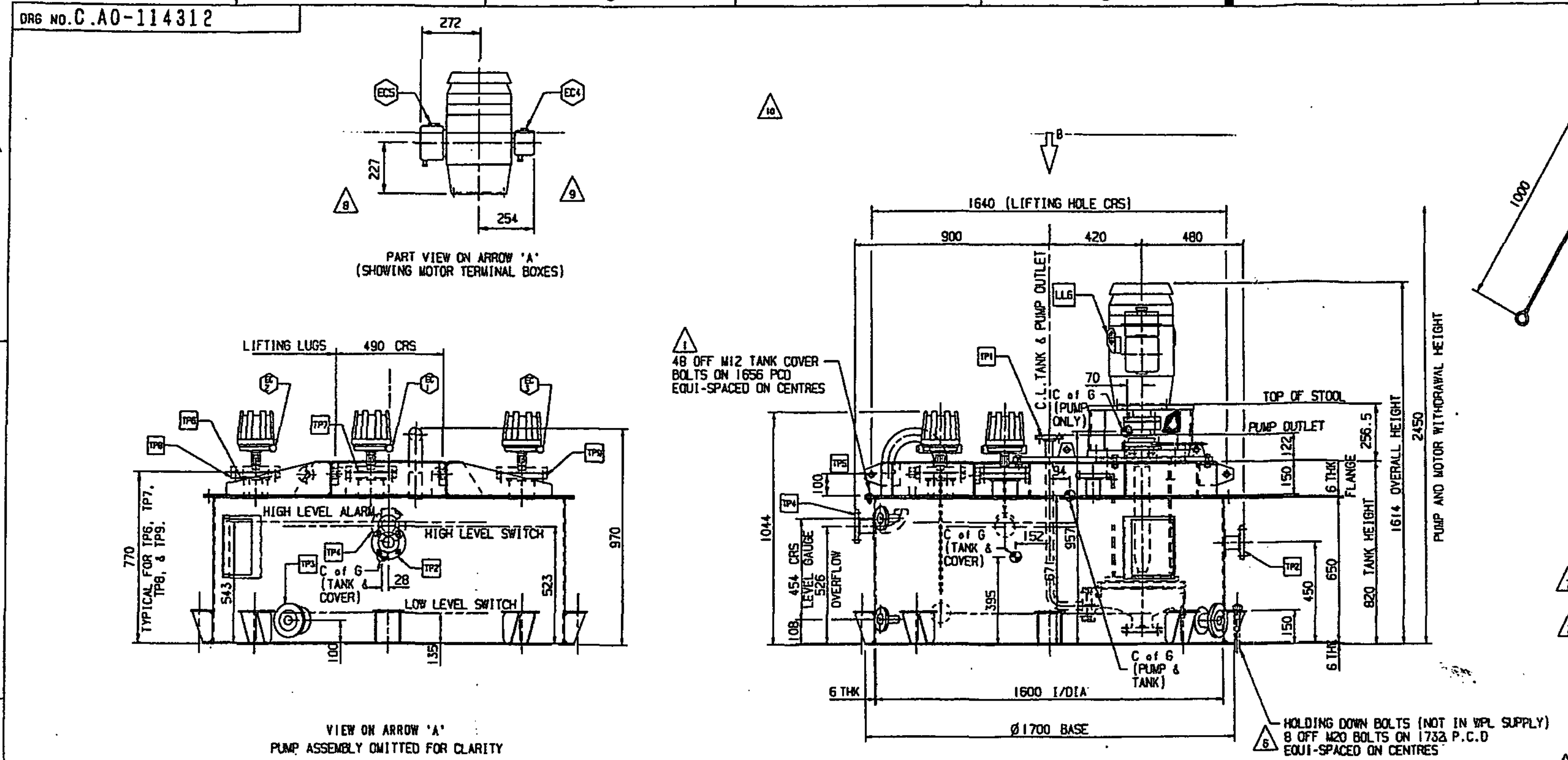
TAIWAN POWER COMPANY
LUNGMEN NUCLEAR UNITS 1 AND 2.
CONTRACT No. 87486114001-1
WEIR PUMPS LTD.
NEWLANDS ROAD
GLASGOW, G44 4EX
SCOTLAND.
ORDER NO. 13538-001/02

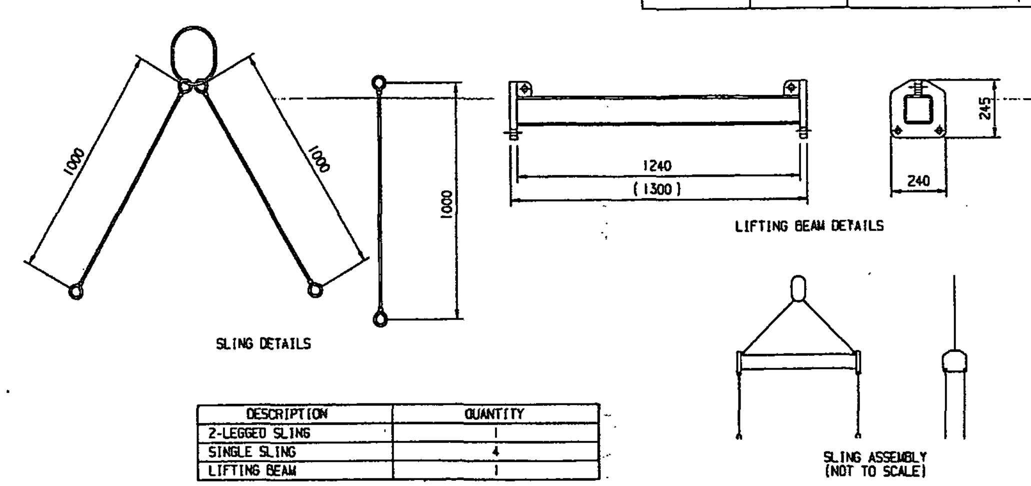
WEIR PUMPS LIMITED
SCALE:- 1:1
STOP GEAR & PRESS.GOVERN
REACTOR CORE ISOLATION COOLING PUMP & TURBINE
UNIT TWL45 S-H2
DRG. No C. NO-000738 SHEET 02 OF 02
ORIGINAL DRAWING NO-000595
STATE LATEST ISSUE WHEN QUOTING DRG.
COMPONENT DESCRIPTION CODE NO. 1449
PART NAME :- 57-1449-TWL45S-NO-000738-02

DRG NO. C.AO-114312

DO NOT SCALE DRAWING | IF IN DOUBT ASK | FIRST ANGLE PROJECTION

MFN 07-295
Enclosure 2
Page 4 of 4





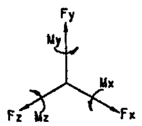
DESCRIPTION	QUANTITY
2-LEGGED SLING	1
SINGLE SLING	4
LIFTING BEAM	1

THE MAXIMUM ANCHOR BOLT LOADS DUE TO NORMAL LOADS SHALL NOT EXCEED 18046 N (4057 lbs)/BOLT IN TENSION AND 18046 N (4057 lbs)/BOLT IN SHEAR.

7 THE MAXIMUM ANCHOR BOLT LOADS DUE TO SSE & OTHER DYNAMIC LOADS SHALL NOT EXCEED 21657 N (4869 lbs)/BOLT IN TENSION AND 21657 N (4869 lbs)/BOLT IN SHEAR.

2 RECOMMENDED FOUNDATION BOLT TORQUE:- 50 N.m.(37lb.ft.)

FOUNDATION LOADS REFERRED TO BOLT GROUP CENTROID			
NORMAL	Fx = 4835 N -4835 N	Fy = -16678 N -26348 N	Fz = 4835 N -4835 N
	Mx = 6094 Nm -5823 Nm	My = 6610 Nm -6610 Nm	Mz = 6939 Nm -8813 Nm
3 SSE (FAULTED CONDITION)	Fx = 28735 N -28735 N	Fy = 10450 N -53476 N	Fz = 28735 N -28735 N
	Mx = 20837 Nm -20565 Nm	My = 15370 Nm -15370 Nm	Mz = 25991 Nm -27865 Nm
4 MAX. DIRECT BOLT LOAD (TENSILE) = 11248 N			



ESTIMATED WEIGHTS(kg)	DRY	WORKING	FLOODED
MOTOR	77	--	--
MOTOR STOOL	86	--	--
SOLEPLATE	75	--	--
PUMP	211		
TOTAL PUMP ASSEMBLY	449		
TANK	495	1705	2025
TOTAL	944	2200	2520

ELECTRICAL CONNECTION REFS DENOTED THUS (EC)

REF	LOCATION	TYPE
EC5	HIGH LEVEL SWITCH	3/4" NPT
EC4	MOTOR TERMINAL BOX	1.1/4" NPT
EC3	HIGH LEVEL ALARM	3/4" NPT-F
EC2	HIGH LEVEL SWITCH	
EC1	LOW LEVEL SWITCH	

ELECTRICAL CONNECTIONS

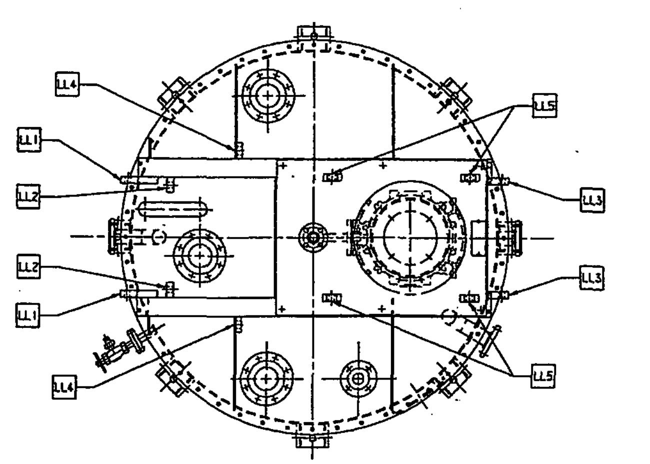
TANK CONNECTION REFS DENOTED THUS [TP]

REF	CONNECTION	TYPE
TP10	LEVEL GAUGE CONNECTION	25 NB ANSI B16.5 CLASS 150 RF
TP9	HIGH LEVEL ALARM CONNECTION	100 NB ANSI B16,5 CLASS 150 RF
TP8	HIGH LEVEL SWITCH CONNECTION	100 NB ANSI B16,5 CLASS 150 RF
TP7	LOW LEVEL SWITCH CONNECTION	100 NB ANSI B16,5 CLASS 150 RF
TP6	DRAIN PIPE AIR VENT	50 NB ANSI B16.5 CLASS 150 RF
TP5	TANK AIR VENT	50 NB (OPEN ENDED)
TP4	TANK OVERFLOW	50 NB ANSI B16.5 CLASS 150 RF
TP3	TANK DRAIN	50 NB ANSI B16.5 CLASS 150 RF
TP2	TANK INLET	50 NB ANSI B16.5 CLASS 150 RF
TP1	PUMP OUTLET	25 NB ANSI B16.5 CLASS 300 RF

TANK CONNECTIONS

FORCES AND MOMENTS				
NOZZLE	Fr [N(lbs)]		Mr[Nm(lbs.ft.)]	
	NORMAL CONDITION	SSE CONDITION	NORMAL CONDITION	SSE CONDITION
TP1 PUMP OUTLET	735(165)	955(215)	358(264)	465 (343)
TP2 TANK INLET	1910(429)	3820(859)	930(686)	1860(1372)
TP3 TANK DRAIN	1910(429)	3820(859)	930(686)	1860(1372)
TP4 TANK OVERFLOW	1910(429)	3820(859)	930(686)	1860(1372)
TP6 DRAIN PIPE VENT	1910(429)	3820(859)	930(686)	1860(1372)

SITE INSTALLATION INFORMATION



PLAN ON ARROW 'B'
(SHOWING LIFTING LUG REFERENCES)

1) LOWERING OF TANK THROUGH HATCH
LUGS REF LL1 TO BE USED IN CONJUNCTION WITH 2 LEG SLING FOR THIS PURPOSE.
NOTE: THE MOTOR AND ALL 3 LIMIT SWITCHES MUST BE REMOVED TO ALLOW THE TANK TO PASS THROUGH THE HATCH.

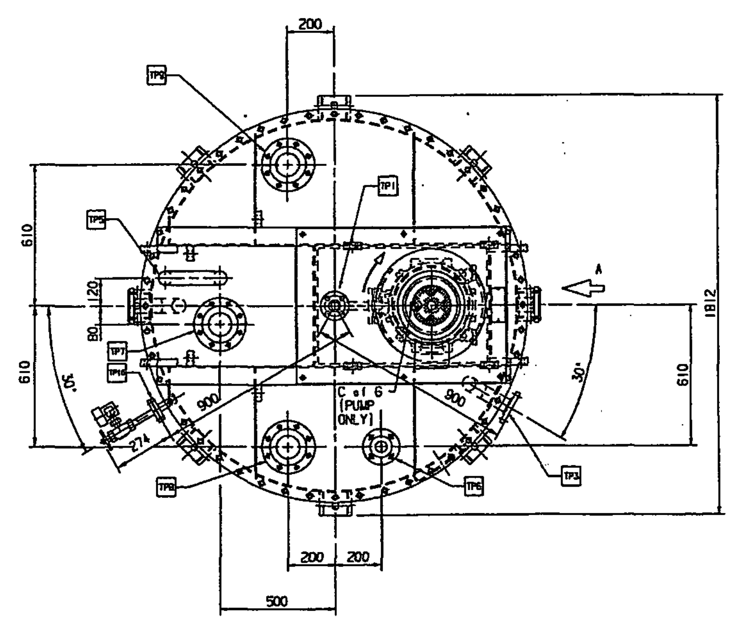
2) LIFTING OF COMPLETE TANK/PUMP ASSEMBLY
LUGS REF LL2 AND LL3 TO BE USED IN CONJUNCTION WITH 2 LEG SLING, LIFTING BEAM AND 4 OFF SINGLE SLINGS FOR THIS PURPOSE.

3) LIFTING OF TANK COVER/PUMP ASSEMBLY
LUGS REF LL3 AND LL4 TO BE USED IN CONJUNCTION WITH 2 LEG SLING, LIFTING BEAM AND 4 OFF SINGLE SLINGS FOR THIS PURPOSE.

4) LIFTING OF PUMP ASSEMBLY ONLY
LUGS REF LL5 (4 OFF) TO BE USED IN CONJUNCTION WITH 2 LEG SLING, LIFTING BEAM AND 4 OFF SINGLE SLINGS FOR THIS PURPOSE.

5) LIFTING OF MOTOR ONLY
LUGS REF LL6 (SEE ELEVATION) TO BE USED IN CONJUNCTION WITH 2 LEG SLING FOR THIS PURPOSE.

LIFTING BEAM AND ALL SLINGS (COMPLETE WITH SHACKLES) AS NOTED ABOVE, SUPPLIED BY W.P.L. FOR THIS PURPOSE.



MATERIAL LIST (TANK ONLY)	
PLATE	ASTM A240 304L
PIPING	ASTM A312 S30403
FITTINGS	ASTM A403 WP304L
FLANGES	ASTM A182 F304L
FASTENERS	BS6105 A4-70

FOR MATERIALS FOR PUMP ASSEMBLY SEE DRG AO-114458

TAIWAN POWER COMPANY
LUNGMEN PROJECT FOURTH NUCLEAR POWER PLANT UNITS 1 AND 2
CONTRACT No. 87486 | WO01-1 5

UNIT 1	UNIT 2
1E51-TNK-0001	2E51-TNK-0001

SPECIFICATION TITLE - RCIC DRAINS TANK AND PUMP
SPECIFICATION NUMBER - 31113.62.1241

WEIR PUMPS LTD.
NEWLANDS ROAD
GLASGOW, G44 4EX
SCOTLAND.

ORDER NO. AB00024-001
AB00024-002

WEIR PUMPS LIMITED

Revisions: ORIGINAL ISSUE; 1 WAS 16 OFF (Alan Greig 24.8.99, J.Turtle 24.8.99); 2 TORQUE NOTE ADDED; 3 SSE FAULTED CONDITION FIGURES AMENDED; 4 BOLT LOAD WAS 29782N (J.ADAM 13/9/99, J.TURTLE 13/9/99); 5 "0001" WAS "0002" (C.THORBURN 24/9/99, J.TURTLE 24/9/99); 6 WAS M24 BOLTS; 7 BOLT LOADS AND TORQUE AMENDED; EC5 DELETED, WARNING ELECTRICAL CHANGED; EC7 DELETED, ELECTRICAL CONNECTION IN ERROR; MOTOR LIFTING LUG DETAIL DELETED

THE FOLLOWING CONDITIONS APPLY UNLESS OTHERWISE STATED.
1. DIMENSIONS IN MILLIMETRES.
2. OVERALL DIMENSIONS MAY BE SUBJECT TO SMALL VARIATIONS DUE TO CUMULATIVE TOLERANCES ON CAST AND MACHINED COMPONENTS.

ORIGINAL SCALE:- 1:10

DRN.	C.THORBURN	DATE. 1/7/99
CHK.	R.THOMSON	DATE. 1/7/99
APP.	J.POTTER	DATE. 1/7/99

ORIGINAL DRAWING

GENERAL ARRANGEMENT
RCIC DRAINS TANK

UNIT VTZ65-40-315-V1

DRG NO. C.AO-114312

STATE LATEST ISSUE NO. WHEN QUOTING DRG.
COMPONENT DESCRIPTION CODE NO. 9990

JOB No. AB00024-001 | PART NAME :-02-9990-VTZ65-40-315-AO-114312

ENCLOSURE 4

MFN 07-295

Response to NRC Request for

Additional Information

Related to ABWR Design Certification Application

Licensing Topical Report NEDE-33329P "Advanced Boiling Water Reactor (ABWR) With Alternate RCIC Turbine-Pump Design"

NUREG-1503 Markup Requested by RAI-15

This section is not applicable to the ABWR because a main steam isolation valve leakage control system is not used. This is discussed in Section 10.3 of this report.

5.4.6 Reactor Core Isolation Cooling System

The staff evaluated the reactor core isolation cooling (RCIC) system for conformance to SRP Section 5.4.6. The staff's review criteria are based on meeting the following:

(1) GDC 4 as related to dynamic effects associated with flow instabilities and loads.

(2) GDC 5 as related to structures, systems, and components important to safety not being shared among nuclear power units unless it can be demonstrated that sharing will not impair its ability to perform its safety function.

(3) GDC 29 as related to the system being designed to have an extremely high probability of performing its safety function in the event of anticipated operational occurrences.

(4) GDC 33 as related to the system capability to provide reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary so the fuel design limits are not exceeded.

(5) GDC 34 as related to the system design being capable of removing fission product decay heat and other residual heat from the reactor core to preclude fuel damage or reactor coolant pressure boundary overpressurization.

(6) GDC 54 as related to piping systems penetrating primary containment being provided with leak detection and isolation capabilities.

Unlike most current BWR designs, the RCIC system in the ABWR is a part of the emergency core cooling system (ECCS). The initiation logic is diversified by adding a high drywell pressure input as well as by maintaining the typical system initiation on RPV Level 2. ~~In the ABWR design, system reliability is improved by including a bypass line to the turbine steam inlet valve (F045 dc powered) to provide for a smoother turbine start and reduce the possibility of an overspeed trip.~~ Since the RCIC system is a part of the ECCS, full-flow testing capability is provided using the safety-related suction source (i.e., suppression pool).

The RCIC system is designed as a high-pressure reactor coolant makeup system that will start independent of the ac power supply. All motor-operated valves will be dc operated, except the inboard steam isolation valves. Steam supply inboard isolation valve F035 and inboard bypass valve F048 will be powered from ac power sources; however, valve F035 will normally open and fail as is; therefore, loss of ac power will not prevent RCIC system operation. Inboard bypass valve F048 will be closed during the system operation; and hence, loss of ac power will not prevent RCIC system operation. The system will provide sufficient water to the reactor vessel to cool the core and to maintain the reactor in a standby condition if the vessel becomes isolated from the main condenser and experiences a loss of feedwater flow. The system also is designed to maintain reactor water inventory, in the event of a loss of normal feedwater flow, while the vessel is depressurized to the point at which the RHR system can function in the shutdown cooling mode.

In reviewing Amendment 32 to the SSAR, the staff noted that the previously described RCIC system capability, without ac power, of "8 hours" had been changed to "at least 2 hours." The staff raised a concern to GE that changing the capability from 8 hours to 2 hours would result in a measurable increase in the core damage frequency estimate as related to station blackout. To clarify the changed position, GE stated and the staff agreed that an RCIC system capability of up to 8 hours could only be adequately demonstrated during startup tests when plant steam is available after fuel loading. SSAR Section 5.4.6 stated that the RCIC system is designed to perform its function without ac power for at least 2 hours with a capability up to 8 hours. It further stated that the COL applicant will provide analyses for the as-built facility to demonstrate the 8-hour capability. This is acceptable and resolved the staff's concern.

The RCIC system consists of a steam-driven turbine-pump unit and associated valves and piping capable of delivering makeup water to the reactor vessel through the feedwater system. The steam supply to the RCIC turbine is taken from main steamline B at the upstream side of the inboard MSIV. The steam supply to the RCIC turbine will be ensured even if MSIVs are closed. Fluid removed from the reactor vessel following a shutdown from power operation will be normally made up by the feedwater system and supplemented by inleakage from the control rod drive system. If the feedwater system is inoperable, the RCIC system will start automatically when the water level in the reactor vessel reaches the Level 2 (L2) trip set point or will be started by the operator from the control room. The system is capable of delivering rated flow within 29 seconds of initiation. Primary water supply for the RCIC system comes from the condensate storage tank

ENCLOSURE 5

MFN 07-295

General Electric Company

AFFIDAVIT

AFFIDAVIT

I, Joseph A. Savage, state as follows:

(1) I am Project Manager, ABWR Licensing, General Electric Company ("GE"), have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 3 of GE's letter, MFN 07-295, Joseph A. Savage to NRC, entitled "GE Response to NRC, *Request For Additional Information Related To Advanced Boiling-Water Reactor Licensing Topical Report* (TAC NO. MD4025), *Regarding Alternate RCIC Turbine-Pump Design*", June 8, 2007. The two proprietary figures are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GE's competitors without license from GE constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GE customer-funded development plans and programs, resulting in potential products to GE;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) above is classified as proprietary because it contains detailed system design information developed during the "First of a Kind Engineering" (FOAKE) program and subsequent investment that resulted in GE's commercial product offered as the "Advanced Boiling Water Reactor." The two figures considered herein as proprietary were initially classified by GE in licensing submittals leading up to the ABWR certification, in the latest version of the "Design Control Document" (DCD), revision 4, and in NEDE-33299P. Treating these two figures as proprietary in this submittal maintains GE's prior claim of proprietary information.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 8th day of June, 2007.

Joseph A. Savage
General Electric Company