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GIRAFFE TEST SPECIFICATION

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1. INTRODUCTION

This document specifies the requirements for tests related to long-term post-accident decay heat removal from the containment of the Simplified Boiling Water Reactor (SBWR) to be performed in the GIRAFFE test facility. This facility has been designed and built by the Toshiba Nuclear Engineering Laboratory in Kawasaki City, Japan.

These tests will provide Design Basis Data for use in calculations of safety related features of the SBWR.

2. TEST PURPOSE/OBJECTIVES

The purpose of the GIRAFFE tests is to demonstrate the operation of the passive containment cooling system (PCCS) operating in post-accident containment environments with the presence of a lighter-than-steam non-condensable gas. The tests will demonstrate SBWR containment thermal-hydraulic performance, heat removal capability and systems interactions and will provide additional data for the qualification of containment response predictions in the presence of lighter-than-steam non-condensable gases by the TRACG computer program.

The tests are primarily focused on simulating the response of the SBWR containment cooling systems during the part of the post-accident transient which follows the injection of water into the reactor vessel from the Gravity Driven Cooling System (GDCS). This period starts at approximately one hour after reactor scram. At this time in the LOCA, the reactor vessel is depressurized and in approximate equilibrium with the drywell. During this period, the principal means of removing decay heat from the containment is via the PCCS.

The test objectives of the GIRAFFE Test Program are:

1. Demonstrate the operation of a passive containment cooling system with the presence of a lighter-than-steam non-condensable gas, including purging behavior of non-condensables from the PCC condenser.
2. Provide a database for computer codes used to predict SBWR containment system performance in the presence of a lighter-than-steam non-condensable gas, including potential systems interaction effects. *(Integral Systems Tests)*
3. Provide a tie-back test to repeat a previous GIRAFFE test, including appropriate Quality Assurance documentation to reinforce the validity of the previous GIRAFFE testing.

3. TEST FACILITY DESCRIPTION

3.1 General Description

The tests specified in this document will be performed in the GIRAFFE facility, a large scale, integral system test facility which models the SBWR systems which are important to the long-term containment cooling following a LOCA.

The facility has been designed to exhibit thermal-hydraulic behavior similar to SBWR under LOCA conditions beginning approximately one hour after scram. The global volume scaling of the facility is approximately 1:400 with a nominal height scaling of 1:1. The SBWR components which are modeled in the facility are: the Passive Containment Cooling System (PCCS), the Isolation Condenser (IC) System, the Gravity Driven Cooling System (GDCS), the Reactor Pressure Vessel (RPV), the Drywell (DW), the Wetwell (WW) and the connecting piping and valves. Electric heaters provide a variable power source to simulate the core decay heat and the stored energy in the reactor structures. Rigorous geometric similarity between SBWR containment volumes and test facility vessels is not necessary to capture the fundamental features of the containment response and has not been attempted.

Design specifications, design drawings, analytical backup information, verifications, and design review documentation, as appropriate shall be filed in the Test and Design Record Files identified in Section 12.

The GIRAFFE vessels are connected with scaled piping components to represent the connecting lines in the SBWR. The test facility vessels and piping connections are shown schematically in Figure 3-1.

The SBWR RPV is simulated by an approximately full height vessel. The actual SBWR height from the top of the core to the main steam line elevation is maintained in order to simulate RPV to PCC and RPV to GDCS pool vertical elevation differences. The RPV volume is scaled to 1:400, even though the upper and lower parts of the RPV are shortened. The RPV contains an electric heater used to simulate the steam generation in the core.

The upper drywell, including the annular portion of the drywell, is represented by one approximately full height vessel; the volume is scaled to 1:400. Cross sectional area variation with height is included to simulate the actual SBWR configuration. The vacuum breakers between the drywell and wetwell are represented by a ball valve connected to a pipe line between the drywell and the wetwell. The ball valve will open when the wetwell pressure is 3500 Pa higher than the drywell pressure. The ball valve will close when the pressure difference is less than 1400 Pa. The vacuum breaker line connects the upper drywell to the wetwell air space for all tests, except for the tie-back test which is described in

Section 9.2.

The wetwell is represented by one full height vessel. The wetwell air space volume and suppression pool volume are scaled to 1:400. The bottom of the wetwell vessel is filled with water to the same relative elevation above the top of active fuel as the SBWR suppression pool.

The GDCS pool is represented by one full height vessel. The GDCS air space and the drywell vessel are connected by a line in order to equalize their pressures. The SBWR GDCS vessel volume is scaled to 1:430. The GIRAFFE GDCS vessel was scaled down from the original GDCS pool volume with three interconnected GDCS pools. The interconnected pool design was later replaced with 3 separate GDCS pools with a total volume approximately 5% greater than the previous design.

The GIRAFFE facility includes one scaled IC/PCC unit . That unit is mounted above the drywell vessel at the same elevation above the Top of Active Fuel (TAF) as in SBWR. The IC/PCC condenser is connected to the drywell, wetwell and GDCS pool as shown in Figure 3-1. The condenser is installed in a pool composed of a makeup pool with a chimney and cavity arrangement in which the IC/PCC unit is set.

The IC/PCC condenser can be utilized as either an IC or PCC condenser. The condenser is a full length, three tube heat exchanger. The GIRAFFE IC/PCC condenser will be used in the PCC configuration for these tests. This single condenser represents the three condensers found in the SBWR. Figure 3-2 shows the IC/PCC condenser test unit.

3.2. Functional Capability.

The design of the facility provides the capability for establishment of initial and boundary conditions which address the test objectives stated in Section 2. The tests will be conducted at temperatures and pressures representative of SBWR postulated LOCA conditions after initiation of the GDCS. To assure these conditions can be tested in GIRAFFE, the facility has been designed to 0.60 MPa (absolute) and 159^{o} C . These conditions exceed SBWR LOCA conditions after initiation of the GDCS.

The test facility is designed to supply sufficient energy to the simulated RPV to represent the scaled decay heat and reactor stored energy release at approximately 1 hour after a scram. Water can be supplied for pools and vessels, and steam, nitrogen and helium are available to establish the initial pressure and gas concentrations in the drywell and wetwell gas space. All piping is valved to provide

maximum flexibility and ease of re-configuring the system. Instrumentation will be installed to measure the parameters of interest. A description of measurement requirements is given in Section 5.

Heat losses from the facility to the surroundings have been minimized. Vessels, piping and flanges are encased by fiberglass insulation covered with metal jackets. In order to further minimize heat losses, microheaters are installed on the dry well vertical walls, wetwell vertical walls and roof, and GDCS pool vertical walls. These microheaters are installed beneath the fiberglass insulation. Heat loss tests will be performed during facility characterization testing.

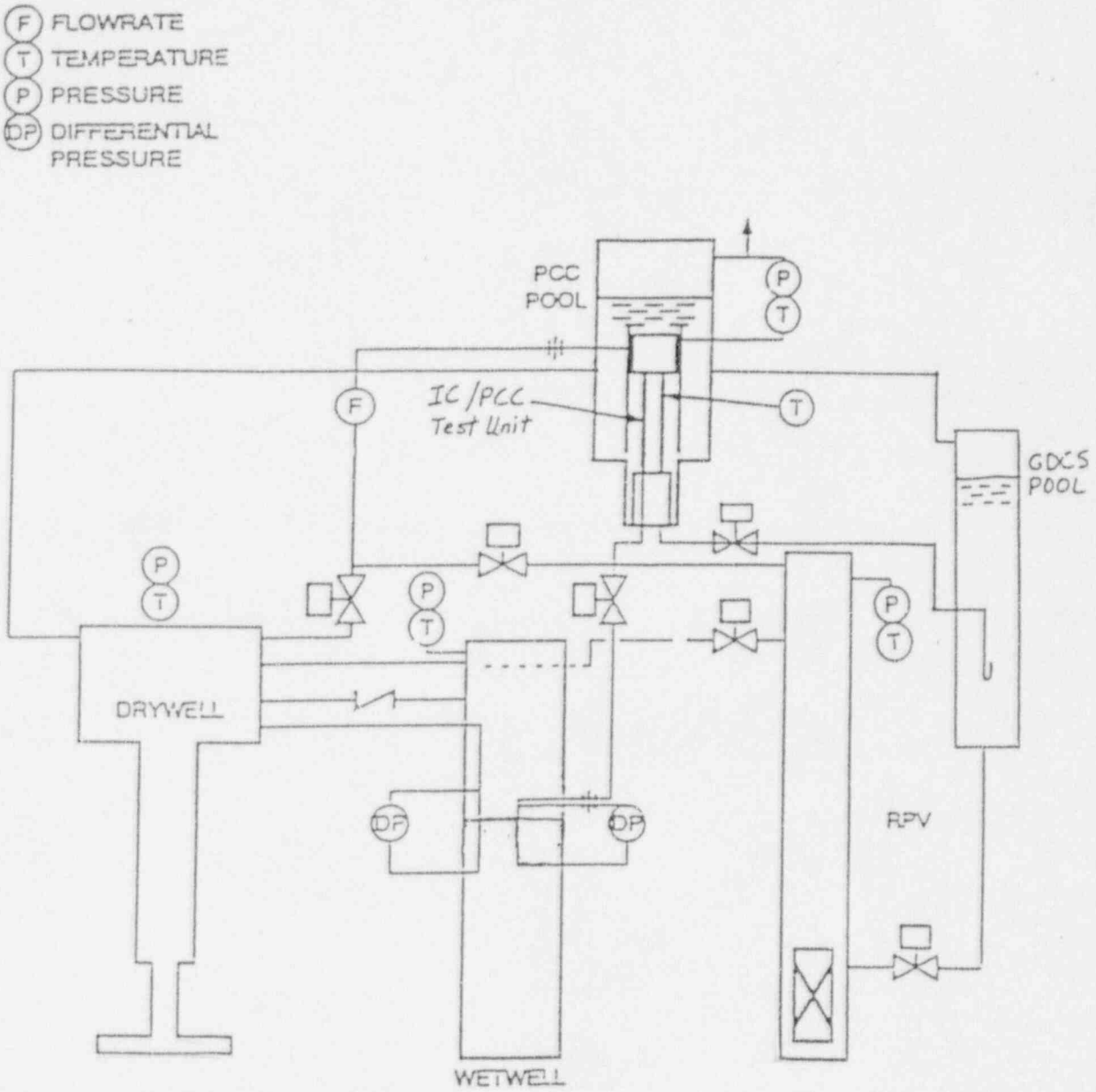

FIGURE 3-1. GIRAFFE Test Facility Schematic

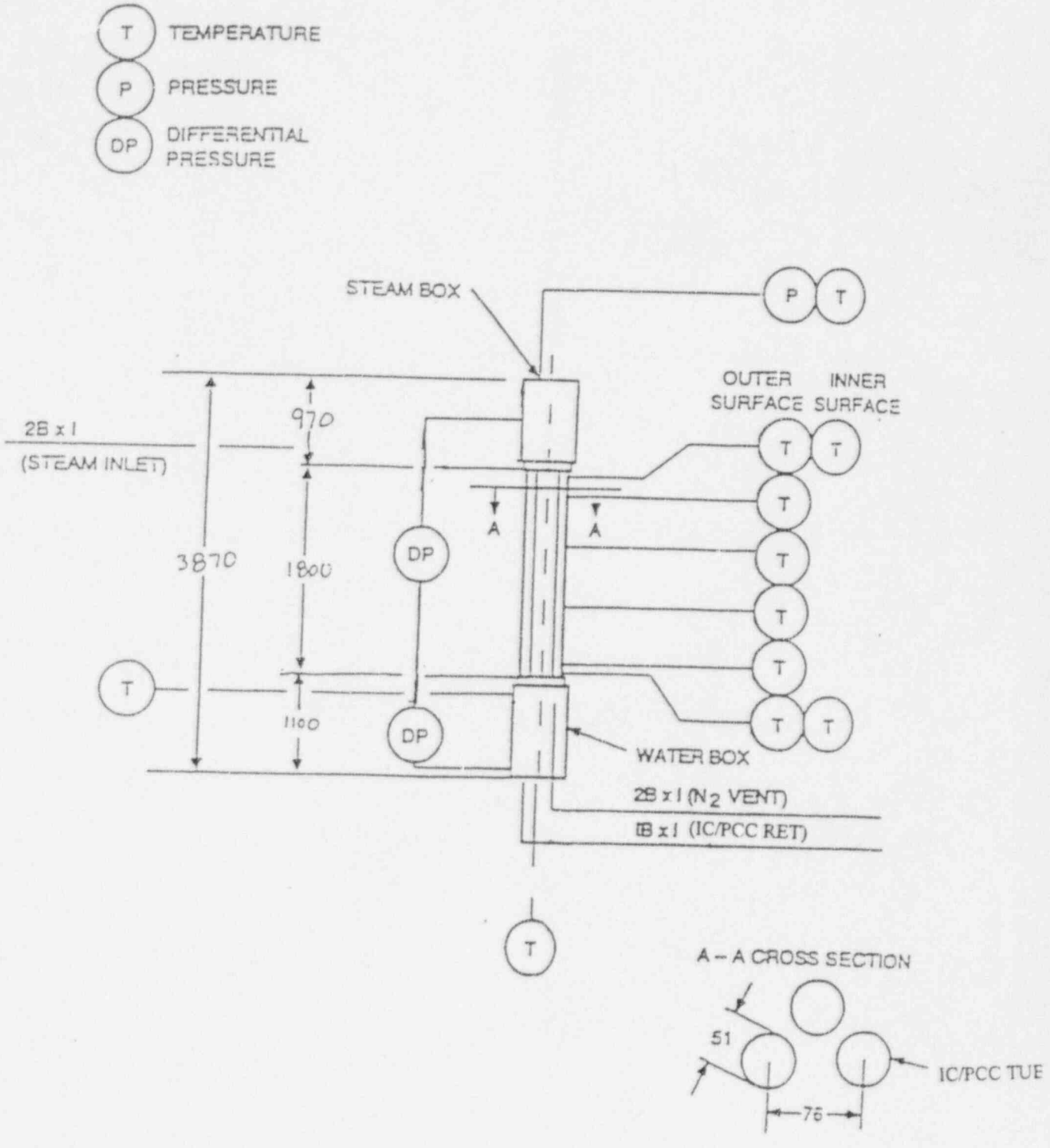

FIGURE 3-2. GIRAFFE Test Facility - IC/PCC Test Unit

4. TEST PLANT CONTROL AND SAFETY CONSIDERATIONS

Capability will be included in the facility to aid the operator in controlling the test conditions. During the tests, a control of the power to the RPV to simulate the decay heat dependence on time is required, as is a system to control the addition rate of helium. Similar control systems are required to establish the test initial pressure, temperature, level and non-condensable gas concentrations.

Special safety conditions associated with the test shall be identified in the Test Plans and Procedures. Test facility safety requirements, will be included in the Test Plans and Procedures.

5. TEST INSTRUMENTATION

5.1 General Requirements.

The test facility shall have sufficient instrumentation to measure parameters needed to achieve the test objectives defined in Section 2. Test instrumentation shall be provided by Toshiba and shall be calibrated as necessary against traceable standards , i.e. the U.S. National Institute of Standards and Technology, Japanese standards or equivalent.

5.2. Instrumentation Description.

The GIRAFFE test facility shall have the capability to measure the following physical parameters: temperatures, flow rates, pressures, differential pressures, liquid levels, and electrical power. The expected ranges for the various parameters to be measured shall be defined in the Test Plans and Procedures. The following provides an overview of the measurement capability planned for the facility.

5.2.1. Temperature

There will be capability to measure the following fluid temperatures :

- in the gas and liquid regions of vessels, i.e.
  - RPV
  - drywell
  - wetwell
  - IC/PCC pool
  - GDCS pool

- in the steam and water box of the IC/PCC unit
- inside one of the IC/PCC unit tubes.

In addition there will be capability to measure metal temperature:

- along the length of one of the IC/PCC condenser tube walls

5.2.2. Flow rate

There will be capability to measure flow rates in GIRAFFE at the following locations:

- the PCC supply lines
- the PCC drain line to GDCS pool
- the GDCS line to RPV
- the Helium continuous supply line

5.2.3. Pressure

There will be capability to measure pressure at the following locations:

- in the RPV
- in the drywell vessel
- in the wetwell vessel (gas space)
- in the PCC steam box
- in the GDCS vessel (gas space)

5.2.4. Water Level

There will be capability to measure the actual water levels using differential pressure transducers at the following locations:

- wetwell vessel
- drywell vessel
- RPV
- IC/PCC pool tank
- IC/PCC unit tube
- IC/PCC unit water box
- GDCS pool
- IC/PCC vent line to wetwell
- LOCA vent line to wetwell

5.2.5. Non-condensable Gas Concentration

The non-condensable gas distribution will be estimated within the drywell vessel from temperature and pressure measurements, assuming saturated conditions and thermodynamic equilibrium exist.

5.2.6. Miscellaneous.

Wattmeters will be used to measure the electrical power to the RPV heaters and microheaters installed on the drywell, wetwell and GDCS pool walls to minimize heat losses.

5.3. Specific Requirements

The instrumentation required for performance of particular tests, i.e. number of instruments and accuracy requirements for the measurements, shall be specified in the Test Plans and Procedures documents for each test series. Accuracy requirements are specified in Table 5.3-1.

6. DATA ACQUISITION SYSTEM AND RECORDING

A digital data acquisition system, of sufficient capacity to monitor and record specified measurements shall be used for the GIRAFFE tests. The measurements shall be recorded in digital format, on magnetic tape or disk, for subsequent reference and analysis. The required measurement frequency is one hertz.

7. DATA ANALYSIS

The processing and analysis of the recorded test data will be done in two phases in support of preparation of test reports. Equipment and software necessary for the specified data processing will be provided by Toshiba. Toshiba will prepare a plan for verification of the accuracy of the data acquisition and data reduction software. This plan and verification will be completed prior to the start of testing.

The following general data reduction software capabilities will be available:

Conversion of all recorded signals to digital values in engineering units (metric).

Print tables of digital values of recorded signals in engineering units for selected time periods.

Table 5.3-1 GIRAFFE Instrumentation Accuracy Requirements

Measurement Type	Accuracy Requirement
Temperature	± 0.5K
Pressure	± 0.2% of full range
Differential Pressure	± 0.2% of full range
Flow Rate	± 2%

Capable of performing simple arithmetic operations between test variables.

Calculate and prepare tables of mean, standard deviation, minimum and maximum value for any measurement (in engineering units) during a specified time period.

Plot graphs of any selected test variable as a function of time (time history) for any selected test time window. Be able to plot groups of test variables on a single graph.

The first data processing and analysis phase has the purposes of providing representative results from the most significant measurements to be used in the Apparent Test Results report, specified in Section 11, and to aid in defining the details of the remainder of the analysis. Time history plots of the following key parameters shall be prepared and examined to determine time periods of significant interest for more detailed analysis: IC/PCC tube bulk fluid temperature, D/W and W/W pressures, suppression pool surface temperature, D/W temperature, IC/PCC inlet flow rate, nitrogen vent line water level and LOCA vent line water level. Summary plots and digital data tables of typical results will be prepared. This first phase is expected to be completed approximately two weeks after the test.

The plots and tables for the Final Test Report, described in Section 11, will be generated during the second data processing and analysis phase to be completed three months after the test. The purpose of this phase is to organize the data in a form that provides an integrated interpretation of the test results to show the performance of the system and demonstrate that the test objectives have been achieved.

8. SHAKEDOWN AND PLANT CHARACTERIZATION

Facility shakedown and plant characterization tests will be performed. The plant characterization tests will consist of tests to quantify specific characteristics of the facility such as vessel heat loss and line pressure drop tests. These will be done by Toshiba using Toshiba procedures and the records will be included in the GIRAFFE Toshiba test file in accordance with Table 12-1.

Shakedown or debugging of the facility and its test measurement and recording system will be achieved by running tests prior to running the "matrix" tests. These shakedown tests will be run in a manner which will expose the facility components and auxiliary systems to conditions similar to those expected during the "matrix" tests. These shakedown tests will be run with test procedures prepared for the "matrix" tests in order to identify any corrections required in the test procedures.

9. TEST MATRIX

9.1 Integral Systems Tests

A series of tests is planned for the GIRAFFE facility to demonstrate the operation of the PCC system with the presence of a lighter-than-steam non-condensable gas. Table 9-1 provides the initial conditions for the RPV, drywell, wetwell, suppression pool, PCC pool and GDCS pool, which are common to all test conditions. Table 9-2 provides the test matrix which gives the drywell initial conditions and helium injection rate for each test. Each test will run for at least 8 hours, and demonstrate at least one purge/vent cycle of the PCC condenser.

The following provides the purpose and additional descriptive information on each GIRAFFE transient test:

- Test H1 will be a base case with nominal initial conditions the same as in PANDA tests M3 and M4. The nominal initial containment conditions are as calculated for the SBWR under SSAR LOCA conditions at one hour into the LOCA. The drywell will contain a mixture of steam and nitrogen at a total pressure of approximately 300 KPa.
- Test H2 is a repeat of Test H1, but with helium replacing the total volume of nitrogen in the drywell and PCCS.
- Test H3 will have the same total initial drywell pressure as Tests H1 and H2, but with the initial non-condensable fraction consisting of a helium/nitrogen mixture having the same proportions that would results from a 100% SBWR metal water reaction.
- Test H4 will start with the same initial drywell conditions as Test H1, and will have constant helium injection to the drywell. The helium addition rate will be such that the helium is injected over a period of one hour. The helium injection will be terminated when the total mass of helium added is equal to the initial drywell helium mass in Test H3.

System response from the four tests will be compared with each other to establish the effects of lighter-than-steam, or a mixture of lighter-than-steam and heavier-than-steam non-condensables, on the effectiveness of heat rejection by the IC/PCC heat exchanger.

GIRAFFE tests H1 through H4 will demonstrate the operation of the PCCS with the presence of a lighter-than-steam non-condensable gas. These tests meet the requirements of Test Objective 1.

GIRAFFE tests H1 through H4 provide data for TRACG qualification that meets Test Objective 2.

The facility configurations will be defined in the Test Plan and Procedures document. The facility configuration definition shall include the detail data needed for creating a TRACG model of GIRAFFE to be used to perform the TRACG post-test analysis.

9.2 Tie-back Test

Test T1 will be a tie-back test to repeat a previous GIRAFFE Main Steam Line Break test, including appropriate Quality Assurance documentation to reinforce the validity of the previous GIRAFFE testing. Initial conditions are specified in Table 9-3. The vacuum breaker line will be connected to the middle drywell, which is where it was located for the previous MSLB test.

This test meets the requirements of Test Objective 3.

The detailed facility configurations will be defined in the Test Plan and Procedures document.

9.3 Test T2

An additional test, identified as Test T2 is planned.

The detailed facility configurations and conditions to be tested will be agreed upon by Toshiba and GE and will be documented in the test reports, and the basis will be included in the Toshiba and GE Design Record Files.

Table 9-1. GIRAFFE Integral Systems Tests Initial Conditions

Parameter	Value	Tolerance
RPV Pressure (KPa)	295	± 4KPa
Initial Heater Power (Kw)	60+heat loss compensation	± 1Kw
RPV Collapsed Water Level (m)*	13.2	± 0.150m
Drywell Pressure (KPa)	294	± 4KPa
Wetwell Pressure (KPa)	285	± 4KPa
Wetwell Nitrogen Pressure (KPa)	240	± 4KPa
GDCS Gas Space Pressure (KPa)	294	± 4KPa
GDCS Nitrogen Pressure (KPa)	274	± 4KPa
Suppression Pool Temperature (K)	352	± 2K
PCC Pool Temperature (K)	373	± 2K
GDCS Pool Temperature (K)	333	± 2K
GDCS Pool Level* (m)	**	
Suppression Pool Level* (m)	3.8	± 0.075m
PCC Pool Collapsed Water Level* (m)	23.2	± 0.075m
PCC Vent Line Submergence (m)	0.95	± 0.075m

* Referenced to the Top of Active Fuel (TAF)

** GDCS pool level should be positioned in hydrostatic equilibrium with the RPV level (including an appropriate adjustment for temperature difference).

Table 9-2. GIRAFFE Integral Systems Test Matrix

GIRAFFE Test No.	Helium Injection Rate (Kg/sec)	Drywell Initial Partial Pressures (KPa) (±2KPa)		
		Nitrogen	Steam	Helium
H1	0	13	281	0
H2	0	0	281	13
H3	0	13	214	67
H4	0.00027	13	281	0

Table 9-3. GIRAFFE Tie-back Test Initial Conditions

Parameter	Value	Tolerance
RPV Pressure (KPa)	189	± 4KPa
RPV Collapsed Water Level (m)*	9.1	± 0.150m
Initial Heater Power (Kw)	96	± 1Kw
Drywell Total Pressure (KPa)	188	± 4KPa
Drywell Nitrogen Partial Pressure (KPa)	53	± 4KPa
Drywell Steam Partial Pressure (KPa)	135	± 4KPa
Wetwell Pressure (KPa)	174	± 4KPa
Wetwell Nitrogen Pressure (KPa)	164	± 4KPa
GDCS Pool Gas Space Total Pressure (KPa)	188	± 4KPa
GDCS Pool Gas Space Nitrogen Partial Pressure (KPa)	151	± 4KPa
Suppression Pool Temperature (K)	326	± 2K
PCC Pool Temperature (K)	373	± 2K
GDCS Pool Temperature (K)	350	± 2K
GDCS Pool Level* (m)	14.1	± 0.075m
Suppression Pool Level* (m)	3.5	± 0.075m
PCC Pool Collapsed Water Level* (m)	23.2	± 0.075m
PCC Vent Line Submergence (m)	0.90	± 0.075m

* Referenced to the TAF

** All pool temperatures are surface temperatures.

10. PRETEST PREDICTIONS/ACCEPTANCE CRITERIA

Pretest calculations will not be performed for any of the matrix tests planned for SBWR certification.

The acceptance criteria will be specified in the Test Plans and Procedures. This acceptance criteria will define the tolerance on the initial conditions and any other input test conditions (such as simulated decay heat) which can influence the test results. The acceptance criteria will also define the instrumentation performance required in order to consider the test as acceptable.

11. REPORTING

11.1. Data Transmittal.

Toshiba will provide a copy to GE of all test data on 3-1/2 inch floppy disks in a DOS readable format. This data will be provided in engineering units.

11.2. Reports.

A brief Apparent Test Results (ATR) report will be prepared by Toshiba for each test or each test series if the test series will be completed in approximately two weeks. The ATR will contain test data to be integrated into the Final Test Report. The ATR will not include any evaluation of the test data. The ATR will include a description of test anomalies and will include a list of any failed instruments and the review and disposition of these anomalies. The ATR shall be reviewed by the Toshiba responsible manager and the GE GIRAFFE responsible engineer.

Final Test Report (FTR) prepared by Toshiba and GE will contain the data, analysis and results of all tests. The FTR will include a complete description of the test facility and components tested.

12. RECORD RETENTION

All test records, analyses and verification records will be filed by Toshiba into a test file for a storage period of at least 60 years. The GE Nuclear Energy Design Record File (DRF) will be maintained for at least 60 years. The DRF number is T15-00013, and the DRF custodian is M. Herzog. The data stored electronically will be in a form suitable for long term storage, i.e. 60 years. Table 12-1 gives the table of contents for the Toshiba test file and the GE DRF.

TABLE 12-1
GIRAFFE TEST FILE AND DESIGN RECORD FILE
TABLE OF CONTENTS

		Toshiba Test File	GE DRF
1.	TEST REQUIREMENTS DOCUMENTS	X	X
1.1	Test Specification	X	X
1.2	Quality Assurance Program	X	X
1.3	Test Plans and Procedures	X	X
1.4	Test and Analysis Program Document	X	X
1.5	Meeting Minutes	X	X
2.	TEST FACILITY DESIGN	X	
2.1	Facility Design Drawings	X	
2.2	Design Review	X	
2.3	Procurement	X	
3.	TEST FACILITY CHECKOUT	X	X
3.1	As-Built Drawings	X	X*
3.2	Shakedown Test Procedure	X	
3.2.1	Hydrotests	X	
3.2.2	Heat Loss Tests	X	
3.2.3	Line Pressure Drop Tests	X	X*
4.	INSTRUMENTATION		
4.1	Instrumentation List (include serial number)	X	
4.2	Range and Accuracy Requirements	X	
4.3	Manufacturers' Specifications	X	
4.4	Uncertainty Analysis	X	
4.5	Calibration	X	
4.5.1	Plan/Procedures	X	
4.5.2	Records	X	
4 6	Exact Location on Test Facility	X	
	(drawings or sketches and tables)	X	
5.	DATA ACQUISITION SYSTEM		
5.1	DAS Hardware Requirements	X	
5.2	DAS Hardware Description	X	
5.3	Wire/Cable Lists--DAS Hookup	X	
5.4	Wire/Cable Lists Verification	X	
5.5	DAS Software	X	
5.6	DAS Software Verification	X	

* The as-built drawings in the GE-DRF will include the detail data needed for creating a TRACG model of GIRAFFE to be used to perform the TRACG post-test analysis. Test facility documents used to define orifice loss coefficients will be included in GE-DRF.

TABLE 12-1. CONTINUED

		Toshiba Test File	GE DRF
6.	TEST MATRIX	X	X
6.1	Facility Configuration	X	X
6.2	Initial Conditions/Acceptance Criteria	X	X
6.3	Test Schedule Plan	X	
7.	SHAKEDOWN TEST RESULTS	X	
7.1	Facility Configuration	X	
7.2	Initial Conditions/Acceptance Criteria	X	
7.3	Non-conformance Items	X	
8.	TEST OPERATION	X	
8.1	Pre-test Checklists/Procedures	X	
8.1.1	Preconditioning/Final Valve Alignment	X	
8.1.2	Initial Condition Acceptance	X	
8.1.3	DAS/Instrumentation Acceptance	X	
8.2	Post-test Checklists/Procedures	X	
8.2.1	Test Logs	X	
8.2.2	Non-conformance Items	X	
8.3	Data Printouts	X	
8.4	Raw Data Storage Information	X	X
9.	POST TEST DATA REDUCTION	X	X
9.1	Data Reduction Plan	X	X
9.2	Data Reduction Software and Verification	X	X
9.3	Reduced Data Records	X	X
10.	TEST REPORTS	X	X
10.1	Apparent Test Results Reports	X	X
10.2	Final Test Reports	X	X
10.2.1	Analytical Basis/Supporting Data	X	X
10.2.2	Draft Report Comment Resolution	X	X
10.2.3	Report Verification	X	X
11.	AUDIT REPORTS		
12.	PERSONNEL TRAINING PROCEDURES & DOCUMENTATION	X	
13.	REFERENCES	X	X

13. QUALITY ASSURANCE REQUIREMENTS

13.1. References.

The GIRAFFE tests will be performed in conformance with the Toshiba SBWR QA program, AS-50092, Rev. 0 (Reference 14.1a) and the GIRAFFE Quality Assurance Plan, AS-50128-E, Rev.0 (Reference 14.1b), which are based on the requirements of Japanese National Standard JEAG-4101 (Reference 14.2a) and ANSI/ASME NQA-1/1a-1983 (Reference 14.2b). The procedures to implement the QA requirements will be included in the Test Plans and Procedures document.

13.2. Review and Audit Requirements

GE Nuclear Energy may perform reviews to verify that Toshiba's quality assurance program is in place and being followed. A facility Quality Assurance Readiness Assessment will be performed prior to the start of matrix testing. Toshiba QA personnel will perform an internal audit to verify compliance with the quality assurance requirements specified in the TP&P document.

13.3. Notification.

Toshiba has the responsibility to notify GE Nuclear Energy with documentation of:

(a) any changes in the test procedure,

(b) any failure of the test device(s) or system(s) to meet performance requirements,

(c) any revisions or modifications of the test device(s) or system(s),

(d) the dates when tests are expected to be performed, and

(e) any changes to the QA requirements specified in the Toshiba SBWR QA program (Reference 14.1a), GIRAFFE Quality Assurance Plan (Reference 14.1b) and Test Plans and Procedures document.

13.4. Test Plan and Procedures.

The tests will be performed in accordance with the Test Plan and Procedures (TP&P) document to be prepared by and issued by Toshiba. The GE GIRAFFE responsible engineer and responsible manager shall review and approve the TP&P. The Toshiba GIRAFFE responsible test engineer will change the TP&P to reflect changes in how test data is obtained. The GE GIRAFFE responsible engineer and responsible manager shall review and agree with any changes to the TP&P. The TP&Ps shall be a traceable and retrievable document of test requirements consisting of the following parts:

a. Test Plan.

Document how test is to be set up and performed to meet the Test Specification and any special safety conditions associated with the test.

b. QA Plan.

Specify quality assurance requirements per the test specification and describe how they are met, including instrumentation (calibration and adequacy), confirmation of test facility configuration and the test equipment status, test record information (date, performer, results, anomalies, corrective actions, etc.), certification of test personnel, and establishment of test equipment conditions, data logging, data acquisition systems, and others needed to satisfy test requirements.

c. Test Procedures.

Document the specific procedures required to perform the test.

d. Test Records.

Include requirements for filing facility checkout and shakedown records, instrument calibration records, verified as-built drawings for test facility, Data Acquisition System wire list verifications, pre- and post-test checklists, test logs, disposition of test or instrumentation anomalies, engineering units printout of data records, and electronic media data storage information in the Toshiba Test File and GE DRF as specified in Table 12-1.

e. Instrumentation.

Document the measurements required on the test facility. Include an instrument list and its basis, measurement accuracy requirements and analyses, calibration requirements and methods and pre-test acceptability criteria (zero shift acceptability, identification of critical instruments, etc.).

f. Personnel Certification.

Document the qualification requirements for test personnel and evidence that test personnel meet these requirements.

g. Data Acquisition System Documentation.

Include the total number of measurements and scan rates, hardware and software descriptions, cabling, filtering, multiplexing, etc. Include requirement that software listings, wiring diagrams

or hook-up lists, and software or systems validation requirements and procedures shall be filed in the Toshiba Test File as specified in Table 12-1.

h. Data Reduction.

Document data reduction software, if used. Include the analytical basis for equations used in data manipulations, software coding listings, and software validation procedures and documentation, if used. Include requirement that data reduction inputs, reduced data printouts, and electronic storage media information shall be filed in the Toshiba Test File and the GE DRF as specified in Table 12-1.

i. Data Analysis and Reports.

Include the requirement that backup information, such as data analysis, to support conclusions drawn, comments and comment resolutions, and verifications as appropriate shall be filed in the Toshiba Test File and the GE DRF as specified in Table 12-1.

14. REFERENCES

14.1. Toshiba Documents:

a. Quality Assurance Program for Simplified Boiling Water Reactor Document No. AS-50092, Rev. 0, issued 16 Dec 93.

b. GIRAFFE Qualitiy Assurnace Plan (TOGE-110 Test Programs), Document No. TOGE110-TO1 AS-50128-E, Rev. 0, issued December 1994.

14.2. Other Documents:

a. Japanese National Standard JEAG-4101-1990, "Guide for Quality Assurance of Nuclear Power Plants".

b. ANSI/ASME NQA-1-1983 and Addenda NQA-1a-1983.