TABLE 3.3.7.5-1

ACCIDENT MONITORING INSTRUMENTATION

INSTRUMENT	REQUIRED NUMBER OF CHANNELS	MINIMUM CHANNELS OPERABLE	ACTION	APPLICABLE OPERATIONAL CONDITION
1. Reactor Vessel Steam Dome Pressure	2	1	80	1, 2
2. Reactor Vessel Water Level	2	1	80	1, 2
3. Suppression Chamber Water Level	2	1	80	1, 2
4. Suppression Chamber Water Temperature	8, 6 locations	6, 1/location	80	1, 2
5. Suppression Chamber Air Temperature	2	1	80	1, 2
6. Primary Containment Pressure	2/range	1/range	80	1, 2
7. Drywell Temperature	2	1	80	1, 2
8. Drywell Gaseous Analyzer				
a. Oxygen	2##	1##	~~80~~ 82	1#, 2#
b. Hydrogen	2##	1##	82	1#, 2#
9. Safety/Relief Valve Position Indicators	1/valve*	1/valve*	80	1, 2
10. Containment High Radiation	2	1	81	1, 2
11. Noble gas monitors**				
a. Reactor Bldg. Vent	1	1	81	1, 2 and ***
b. SGTS Vent	1	1	81	1, 2 and ***
c. Turbine Bldg. Vent	1	1	81	1, 2
12. Neutron Flux	2	1	80	1, 2

*Acoustic monitor.
**Mid-range and high-range channels
***When moving irradiated fuel in the secondary containment.
#See Special Test Exception 3.10.1
The preplanned alternate method of monitoring this parameter, once implemented, is considered a valid "channel" to meet this requirement.

TABLE 4.3.7.5-1

ACCIDENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION
1. Reactor Vessel Steam Dome Pressure	M	R
2. Reactor Vessel Water Level	M	R
3. Suppression Chamber Water Level	M	R
4. Suppression Chamber Water Temperature	M	R
5. Suppression Chamber Air Temperature	M	R
6. Primary Containment Pressure	M	R
7. Drywell Temperature	M	R
8. Drywell Oxygen/Hydrogen Analyzer #	M	Q*
9. Safety/Relief Valve Position Indicators	M	R
10. Containment High Radiation	M	R**
11. Noble gas monitors		
a. Reactor Bldg. Vent	M	R
b. SGTS Vent	M	R
c. Turbine Bldg. Vent	M	R
12. Neutron Flux	M	R

*For hydrogen analyzer (but not the preplanned alternate method), use sample gas containing:
a. Nominal zero volume percent hydrogen, balance nitrogen.
b. Nominal thirty volume percent hydrogen, balance nitrogen.

**CHANNEL CALIBRATION shall consist of an electronic calibration of the channel, not including the detector, for range decades above 10 R/hr and a one point calibration check of the detector below 10 R/hr with an installed or portable gamma source.

If the preplanned alternate method is being utilized, an appropriate CHANNEL CHECK and an appropriate CHANNEL CALIBRATION shall be performed at the listed frequencies.

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10. Containment High Radiation	M	R**
11. Noble gas monitors		
a. Reactor Bldg. Vent	M	R
b. SGTS Vent	M	R
c. Turbine Bldg. Vent	M	R
12. Primary Containment Isolation Valve Position	M	NA
13. Neutron Flux	M	R

*For hydrogen analyzer, (but not the preplanned alternate method) use sample gas containing:

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a. Reactor Bldg. Vent	M	R
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12. Neutron Flux	M	R

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6. Primary Containment Pressure	M	R
7. Drywell Temperature	M	R
8. Drywell Oxygen/Hydrogen Analyzer #	M	Q*
9. Safety/Relief Valve Position Indicators	M	R
10. Containment High Radiation	M	R**
11. Noble gas monitors		
a. Reactor Bldg. Vent	M	R
b. SGTS Vent	M	R
c. Turbine Bldg. Vent	M	R
12. Primary Containment Isolation Valve Position	M	NA
13. Neutron Flux	M	R

*For hydrogen analyzer (but not the preplanned alternate method), use sample gas containing:

a. Nominal zero volume percent hydrogen, balance nitrogen.

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**CHANNEL CALIBRATION shall consist of an electronic calibration of the channel, not including the detector, for range decades above 10 R/hr and a one point calibration check of the detector below 10 R/hr with an installed or portable gamma source.

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SSES FSAR 6.2.5

recombiners are located approximately midway between the pedestal and containment wall.

The suppression chamber recombiners both have structures located close to two of the recombiner ports. Both recombiners have a 42 inch diameter diaphragm slab support column approximately 1-1/2 feet from the suction, and a 24 inch beam approximately 6 inches from the 26 inch high discharge.

The hydrogen recombiner is a natural convection, flameless, thermal reactor-type hydrogen/oxygen recombiner. The initiation time for the recombiners is prior to 1.2 days, post-LOCA as shown in Figures 6.2-49, 6.2-50 and 6.2-51. The heat-up time is approximately 4 hours. Therefore, recombiner heat-up will begin approximately 4 hours prior to operation. The recombiner heats a continuous stream of containment atmosphere to a temperature sufficient for recombination of the hydrogen and oxygen to form water.

The recombination unit consists of an inlet preheater section, a heater-recombination section, and a mixing chamber. The air is drawn into the unit by natural convection via the inlet louvers and passes through the preheater section, which consists of a shroud placed around the central heaters to take advantage of heat conduction through the walls. In this area the temperature of the inlet air is raised. This accomplishes the dual function of increasing the system efficiency and of evaporating any moisture droplets which may be entrained in the air. The warmed air then passes through the flow orifice which has been specifically sized to regulate the airflow through the unit. After passing through the orifice plate, the air flows vertically upward through the heater section, where its temperature is raised to the range of 1150-1400°F, causing recombination of H_2 and O_2 to occur. The recombination temperature is approximately 1135°F. The heater section consists of five banks of electric heaters stacked vertically. Each bank contains 60 individual U-type heating elements.

Next, the air rises from the top of the heater section and flows into the mixing chamber, which is at the top of the unit. Here, the hot air is mixed with the cooler containment air to discharge it back into the containment at a lower temperature. The cooler containment air enters the mixing chamber through the lower part of the upper louvers located on three sides of the unit.

Table 6.2-18 gives the design characteristics of the hydrogen recombiner.

PC/P-4 **IF:** o H2 CONCENTRATION > 3% BY VOLUME
OR
o 24 HOURS HAS ELAPSED SINCE 1.72 PSIG SIGNAL,
THEN: o START H2 RECOMBINERS IAW OP-273-001
o RUN DW COOLERS IN SLOW IAW ES-234-001

This step becomes effective when read and remains effective until flowchart exited. Ignition of combustible gases (hydrogen and oxygen) could result in significant containment pressure transients, leading to containment failure. This will not occur if containment hydrogen concentration is maintained below 4%. Therefore, start hydrogen recombiners at 3% concentration. Run drywell coolers in slow to avoid pockets with high hydrogen concentrations. Start both systems also after 24 hours has elapsed from receipt of LOCA signal to counteract buildup of combustible gas due to radiolysis. Secure hydrogen recombiners prior to initiating containment sprays.

PC/P-5 (PC/P-1) REDUCE PC PRESSURE USING:

- SBGT IAW ON-234-001, ONLY WHEN DW AND SUPP CHAMBER TEMP < 212°F
- RPV DEPRESSURIZATION AND COOLDOWN IAW RPV CONTROL
- ES-234-001, BYPASSING DRYWELL COOLING LOGIC ISOLATIONS

Reduce containment pressure using listed procedures. These procedures account for 1.72 psig isolations. Initiate RPV depressurization and cooldown in accordance with EO-200-102, RPV Control, performed concurrently with this procedure.

Use SBGT only if primary containment temperatures are below 212°F. If temperature is above 212°F, steam may be admitted to containment. Continued use of SBGT would eventually reduce containment's non-condensible air mass and prevent using drywell sprays.

PC/P-6 BEFORE DW OR SUPP CHAMBER PRESSURE REACHES 0 PSIG, TERMINATE PRESSURE REDUCTION

This step becomes effective when read and remains effective until flowchart exited. It gives appropriate time to stop pressure reduction, whatever means employed (i.e. SBGT or sprays). Stop pressure reduction at this point to prevent containment failure on negative pressure.

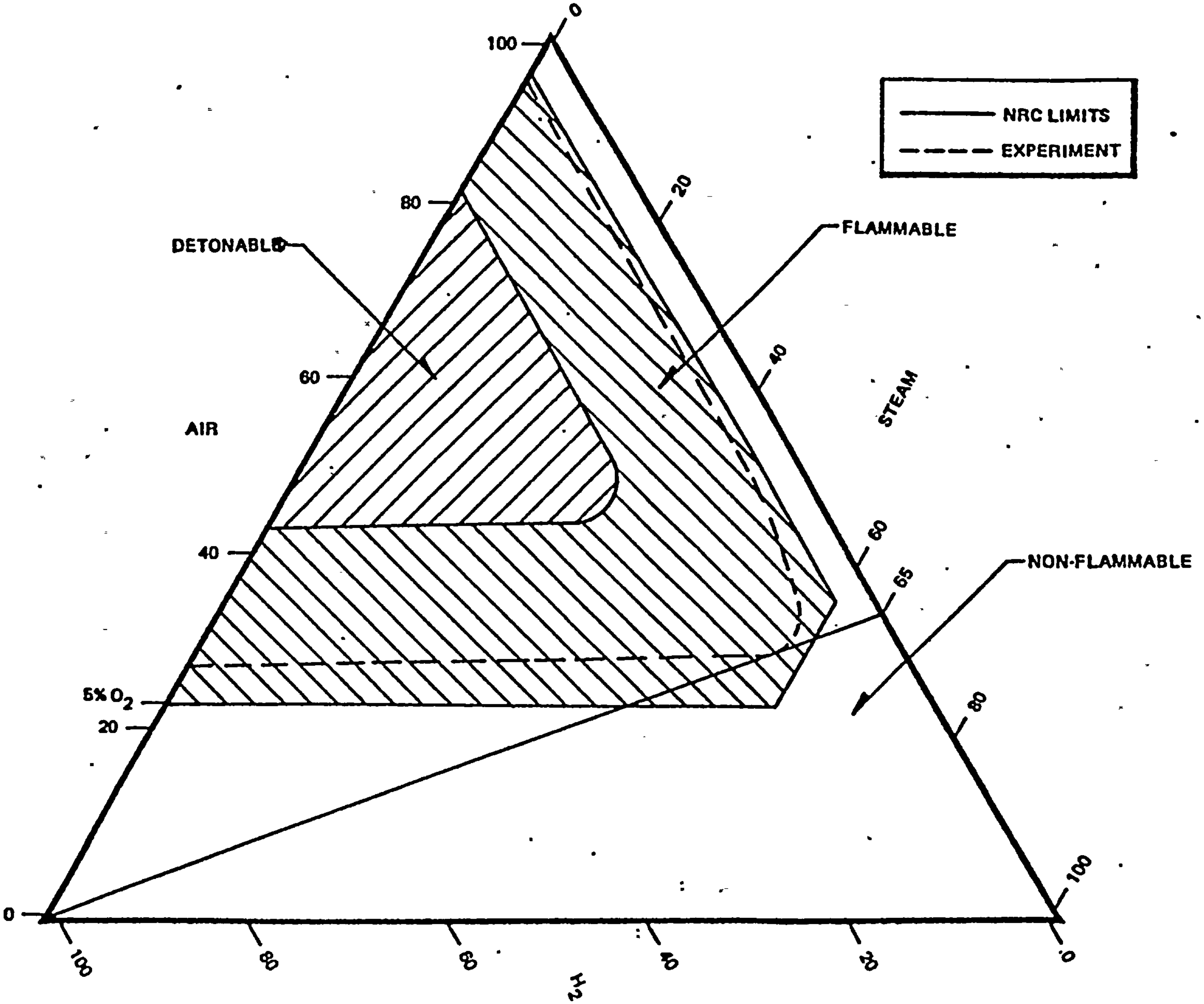


Figure 1. COMBUSTION CHARACTERISTICS OF H_2 IN AIR AND STEAM

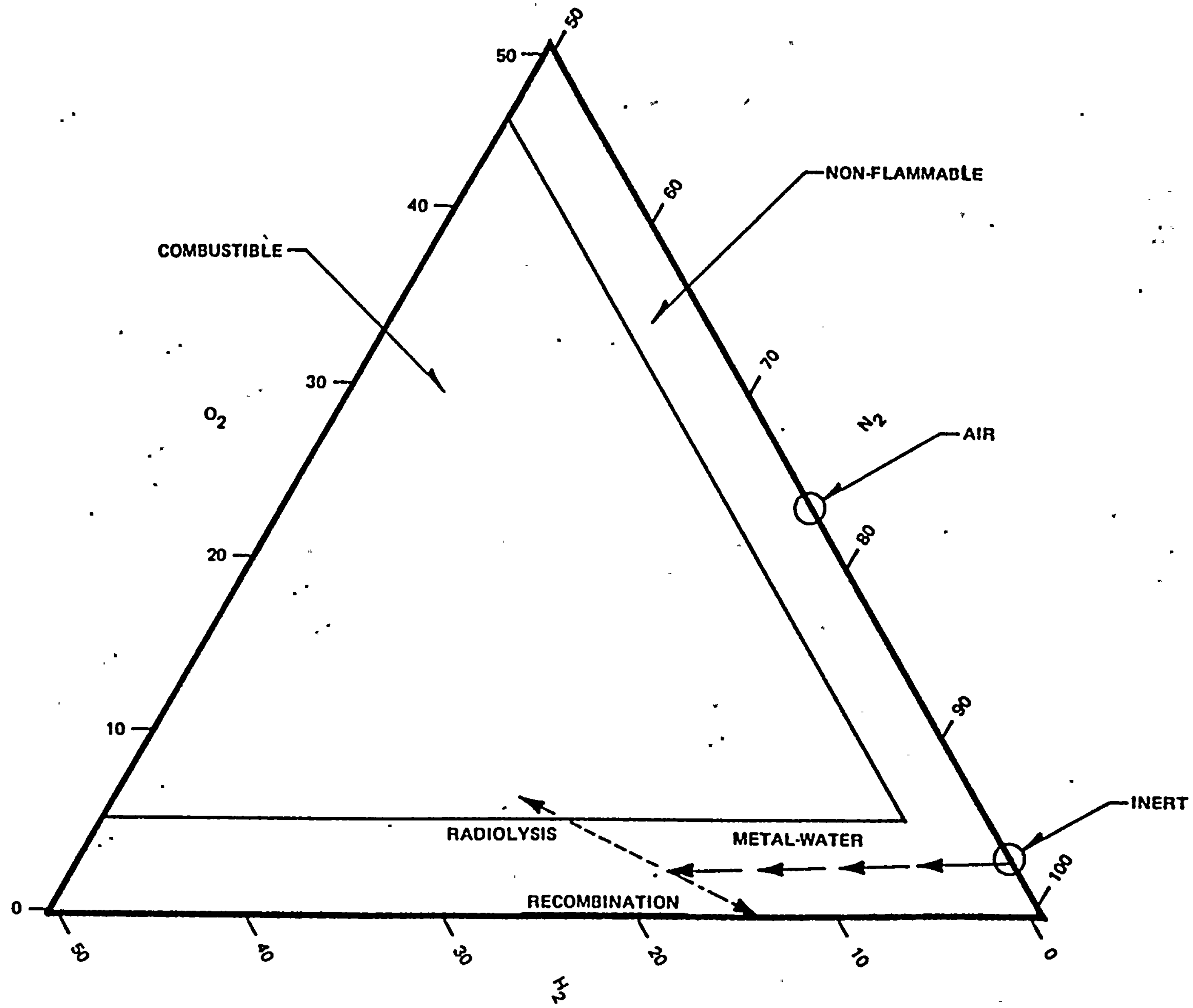
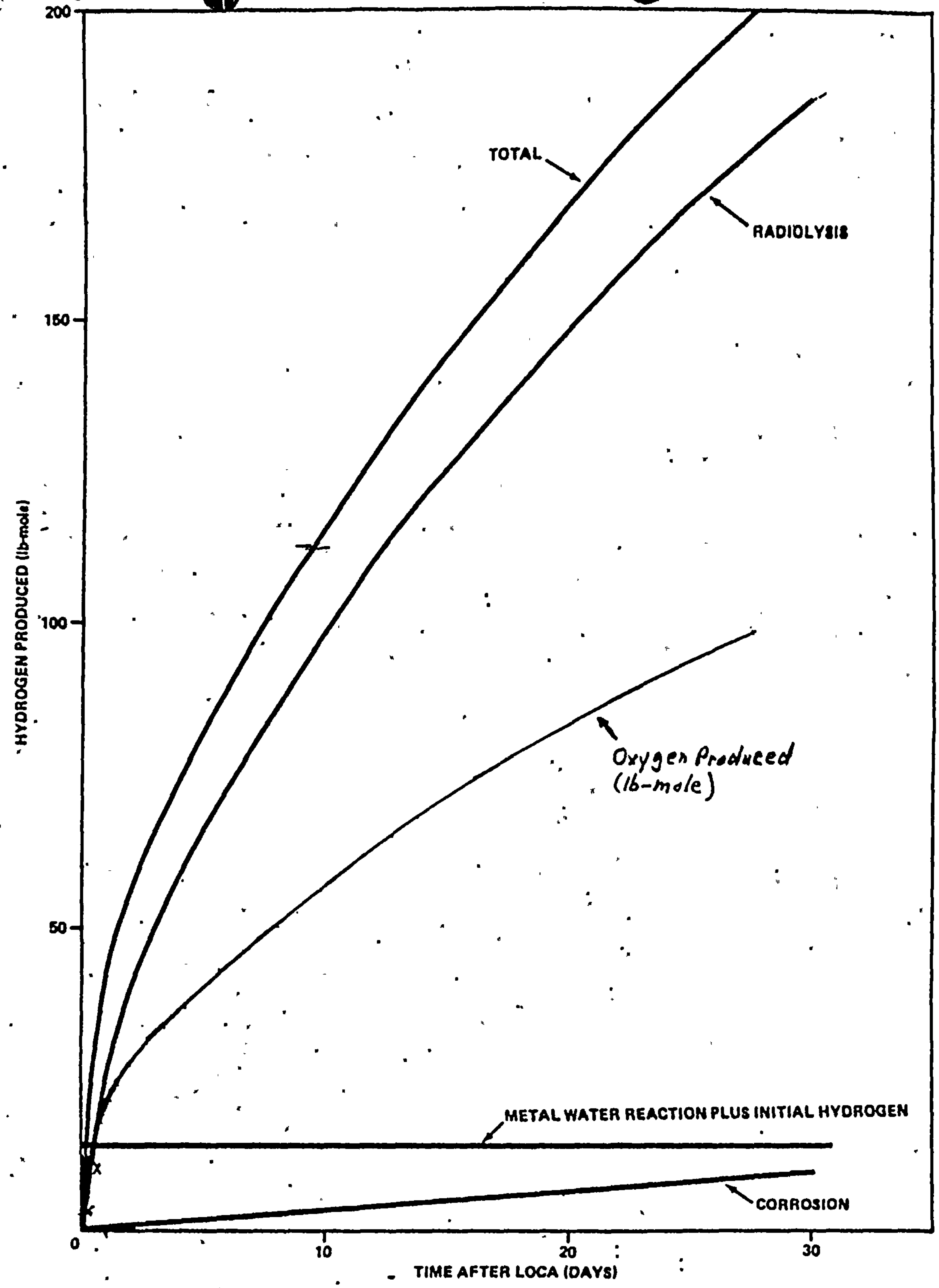


Figure 2 MITIGATION OF DEGRADED CORE ENVIRONMENT BY RECOMBINATION



$2 H_2O \rightarrow 2 H_2 + O_2$

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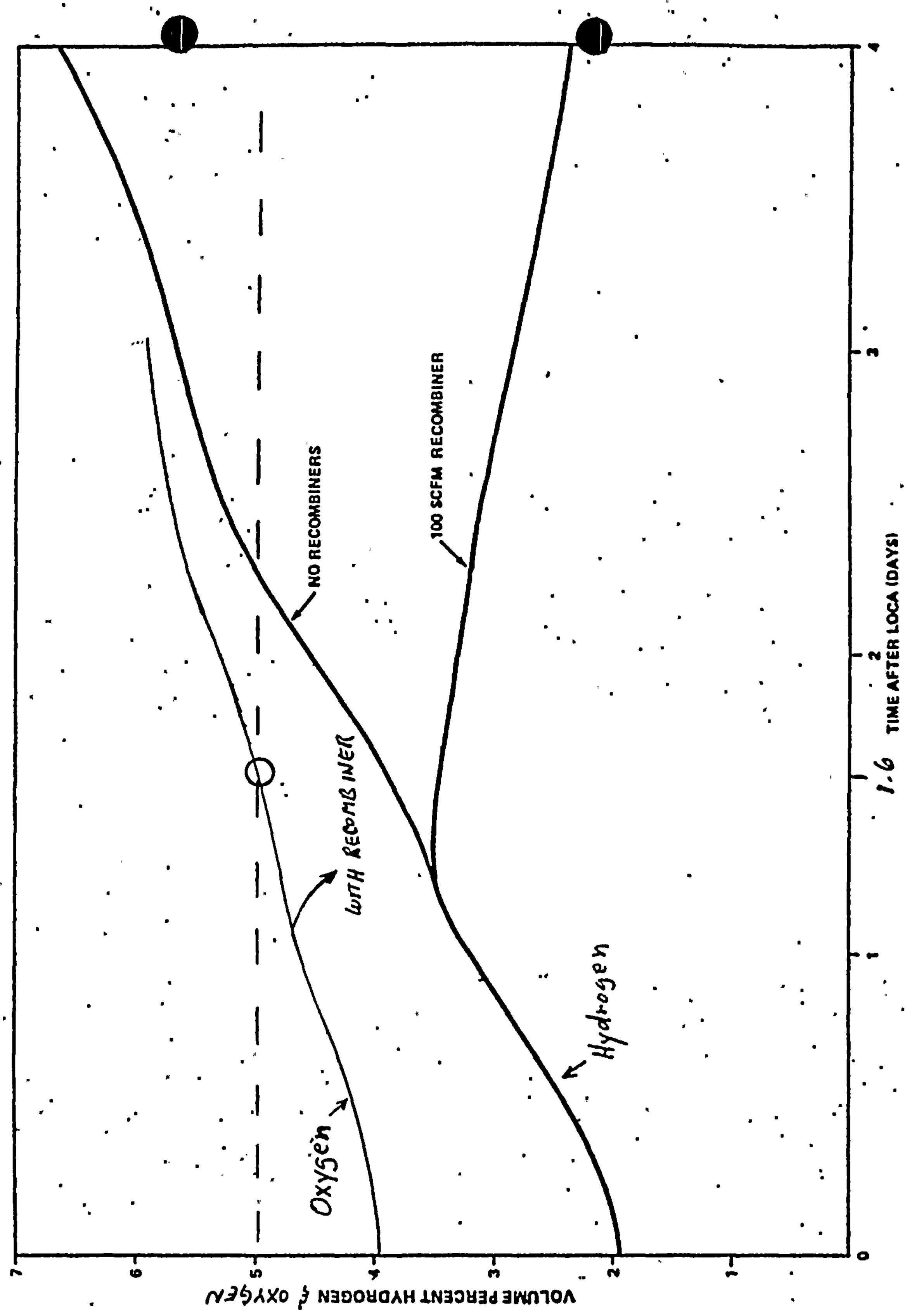
INTEGRATED PRODUCTION OF HYDROGEN VS. TIME AFTER LOCA

FIGURE 6.2-48



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HYDROGEN CONCENTRATION IN THE DRYWELL VS. TIME AFTER LOCA (SHORT TERM)

FIGURE 6.2-50

II.F.1, ATTACHMENT 6, CONTAINMENT HYDROGEN MONITOR

Position

A continuous indication of hydrogen concentration in the containment atmosphere shall be provided in the control room. Measurement capability shall be provided over the range of 0 to 10% hydrogen concentration under both positive and negative ambient pressure.

Changes to Previous Requirements and Guidance

Regulatory Guide 1.97, Rev. 2 was referenced in the October 30, 1979 letter as the guide for the design and qualification criteria for the containment hydrogen monitor. However, there have been many changes made to this proposed revision and it has not yet been made final. Therefore, the appropriate sections of the latest version of Regulatory Guide 1.97 have been added to this letter (Appendix A) and, therefore, this is to be considered a new requirement.

The implementation date has been changed due to equipment procurement problems. The new implementation schedule is intended to allow licensees enough time to complete design modifications with a minimum number of plant shutdowns.

Clarification

(1) Design and qualification criteria are outlined in Appendix A.

(2) The continuous indication of hydrogen concentration is not required during normal operation.

If an indication is not available at all times, continuous indication and recording shall be functioning within 30 minutes of the initiation of safety injection.

(3) The accuracy and placement of the hydrogen monitors shall be provided and justified to be adequate for their intended function.

Applicability

This requirement applies to all operating reactors and all applicants for operating licenses.

Implementation

For operating reactors, design modifications should be completed by January 1, 1982.

Operating license applicants with an operating license date before January 1, 1982 must have design changes completed by January 1, 1982, whereas those applicants with license dates past January 1, 1982 must have all design modifications completed before they can receive their operating license.