GPU Nuclear

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Writer's Direct Dial Number:

March 28, 1983

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Eisenhut:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
Core Spray Restart Modification

Reference: (1) Letter dated March 24, 1982
D.G. Eisenhut, Director NRC to
P.B. Fiedler GPUN

This correspondence is to advise you of a proposed modification to our Core Spray System. It has been determined that this modification requires NRC review and approval in accordance with NUREG 0737 and 10 CFR 50.59.

In addition, this modification revises our submittal of March 24, 1982 (reference 1 above) which proposed a modification that allowed only for remote manual restart of core spray.

Should you require any further information on this subject, please contact Mr. James Knubel, Manager, BWR Licensing at (201) 299-2264.

Sincerely,

Peter B. Fiedler
Vice President and Director
Oyster Creek

A046

PBF:jal

cc: Mr. Ronald C. Haynes, Administrator
Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

NRC Resident Inspector
Oyster Creek Nuclear Generating Station
Forked River, NJ 08731

CORE SPRAY RESTART MODIFICATION

1.0 DESIGN DESCRIPTION

1.1 Summary

The existing core spray system controls logic has the following two deficiencies:

- When the core spray pumps are tripped, after an ECCS actuation, the pumps cannot be restarted manually without resetting the core spray logic. The core spray logic cannot be reset, if an ECCS signal is still present.
- The core spray system pumps will not restart automatically upon loss of water level, if an ECCS signal is still present.

This modification is designed to remove these deficiencies from the core spray control logic. In addition, the modification will provide the operator the capability of throttling the parallel isolation valves manually from the control room under certain plant conditions. The operator will have the capability of overriding the automatic controls after initiation and have manual control of the core spray system. This will enhance the system performance under different modes of plant operation (e.g., ATWS).

1.2 References

1.2.1 Oyster Creek Nuclear Generating Station, Plant System Procedure No. 308 - Emergency Core Cooling System.

1.2.2 Elementary Drawings

	Drawing No.	Sheet No.	Drawing Title
1.2.2.1	NU 5060E6003	1,2 & 3	Core Spray/RBCCW Drywell Isolation System Elementary
1.2.2.2	GE 0116B8328	15 A, B C & D	Core Spray Booster Pump Power and Control Circuits
1.2.2.3	GE 0223R0173	19, 24, 26 & 26	Core Spray Pump Power and Control Circuits
1.2.2.4	BR 3020	7	460 Volt Motor Control Center Elementary Diagrams
1.2.2.5	GE 0116B8328	14 & 14A	CRD Pump Power and Control Circuits

1.2.3 The following EDS Drawings show the proposed modification.

(Attachment 1)

1.2.4 Specification for Modification to Core Spray System Controls Logic - Control Board and Control Cabinet Inserts

No. 1302-04-002

1.3 Detailed System Description

The conceptual elementary diagram and the panel layout for the modification are shown in figures 1 and 3, which are attached.

The core spray control logic mimic will be installed on the vertical portion of panel 1F/2F. The top row of the switch assemblies will be the backlighted split-lens type. There will be one such assembly for each ECCS sensor.

The switch will be the momentary contact type. The switches and lights will be wired so that the top half of the switch will light up when the ECCS sensor trips. This will provide the indication of the tripped sensors in the control room. The switch will be wired to override the respective ECCS signal. The lower half of the back light will light up when the tripped sensor is in the override state. To put the core spray controls into the override (manual) mode, all tripped ECCS sensors have to be placed in override.

The next row of key operated switches will replace the existing "INHIBIT" switches 302 AT, 302 BT, 302 CT, and 302 DT. The function of these switches shall remain unchanged.

The bottom row of the backlighted switches will replace the existing "RESET" switches S302A, S302B, S302C and S302D. The light will provide the indication of the actuated logic channels. The switches will be used to reset the actuation logic after the ECCS signals clear.

The modified system will function in the following manner under different plant conditons.

1.3.1 Normal Plant Conditions

The modification will not change the system operation with the only exception that the parallel isolation valves shall be operable manually from the control room in the throttling control mode.

The operator will be able to start and stop the core spray and the core spray booster pumps from the control panel 1F/2F by operating the existing pump control switches.

1.3.2 Emergency Plant Conditions

The modification will not change the core spray system actuation logic; i.e., both core spray systems will start automatically on the actuation of any of the Hi drywell pressure or the Lo-Lo reactor water level sensors. If the ECCS signal is present and the reactor pressure is below 285 psig, the core spray injection (parallel isolation) valves will automatically go to full open position.

To stop the core spray system, the core spray system pumps will have to be manually tripped. The following sequence of operation will be followed to trip the pumps under different status of the ECCS signals:

a. If the ECCS signals have cleared (all the sensor trip lights are off), the operator will have to depress the push buttons marked "ACTUATED" on the mimic board for all four logic channels. This will reset the controls logic and the backlights will turn off. Now the operator will be able to trip the core spray pumps from the control room. And to close the core spray injection valves, the operator will have to hold the injection valve control switches in the closed position until the valve open indication light turns off.

b. If the ECCS signals are present, the operator will be required to put the core spray system controls into the manual override mode and then trip the core spray system pumps. To put the system controls into manual override mode, the operator will have to depress the lighted-sensor trip indication push buttons. This will light up the override part of the push buttons. All the lighted sensor trip push buttons will have to be operated. Now the operator will be able to trip the core spray pumps from the control room.

Operating the unlighted push buttons will not have any detrimental effect on the system controls or the system performance.

Once the tripped ECCS sensors are put into the override mode, they will remain in override until the sensors have reset. On the recurrence of any ECCS signal, the core spray pumps will automatically restart and the core spray parallel valves will go to the full open position, if the reactor pressure is below 285 psig, the recurred signals can be overridden again.

The operator will be able to throttle the core spray parallel valves when the system controls are in the manual mode.

The existing parallel isolation valves are gate valves and are not meant for throttling service. It is anticipated that when the valves are used for throttling service, the valve seats may get damaged and valves may start leaking badly.

After analyzing the valve operator motor 'heat curves' a limitation will be put on the number of start and stop strokes within a specified time.

No analog valve position indication for the parallel isolation valves will be provided. However, the valves are provided with separate "open", "closed" indicating lights. When the valves are at an intermediate position, both the open and closed lights are on. The operator will use the valve position, core spray flow, and reactor water level instrumentation while throttling the parallel isolation valves.

1.3.3 Failed Sensor System Start

When it is established that the core spray system has initiated due to a failed sensor, the operator will be required to put the sensor in the override state and trip the pumps in both the systems.

With the existing controls logic, when the lead pumps are tripped, by the operator in the presence of the ECCS signals, the back-up pumps automatically start and have to be tripped. The modified system will eliminate the automatic start of the back-up pumps on the tripping of the lead pumps.

The operator will be able to start the core spray pumps from the control room under all plant conditions.

1.4 System Arrangement

The core spray control logic mimic board is shown in Figure 3. The mimic board along with the existing controls on panel 1F/2F will be the primary man-machine interface with the system.

1.5 Instrument and Controls

Twelve new backlighted switches will be installed on panel 1F/2F. Four existing inhibit switches will be replaced with new switches.

Four existing reset switches will be removed from panel 1F/2F and the openings blanked by putting in blanking plates.

The control switches 303A and 303B for the parallel isolation valves will be replaced with new, spring return to normal, three position switches. The new switches will be mounted in place of the existing switches.

The new interfacing control relays will be mounted inside the panels ER18A and ER18B, located in 480 volt switchgear room.

1.6 System interfaces

The Core Spray System interfaces with the following systems:

Diesel Generators
Control Rod Drive Start Circuit
Auto Depressurization System

The interfacing circuits will be modified so that the interface logic and the interface system logic remains unchanged.

OYSTER CREEK NUCLEAR GENERATING STATION

NUCLEAR SAFETY EVALUATION

1.0 TITLE

Modification to Core Spray System Controls Logic

2.0 PURPOSE

The core spray system is a low pressure standby core cooling system. This system provides an alternate supply of reactor coolant in case of a Loss of Coolant Accident (LOCA).

The present core spray system logic has the following two deficiences:

- When the core spray pumps are tripped, after an ECCS actuation, the pumps cannot be restarted manually without resetting the core spray logic. The core spray logic cannot be reset if an ECCS signal is still present.

- The core spray system logic will not restart automatically upon loss of water level if an ECCS signal is still present.

The logic deficiency identified in NUREG 0737, Item II.K.3.21 will also be corrected under this modification.

In addition, if a high drywell pressure signal stays and the reactor pressure is below 285 psig, the core spray system will continue to inject the water in the reactor vessel irrespective of the water level in the reactor. This may lead to an uncontrolled flooding of the reactor and cause water hammer in the isolation condensers and steam lines. The BWR Emergency Operating Procedure Guidelines, Rev 2, (approved for implementation by the NRC), require that the reactor level be controlled below the high level turbine trip setpoint. This step cannot be accomplished without throttle capability on the parallel injection valves. The Guidelines also require the ability to prevent injection into the reactor vessel from systems which inject inside the shroud. Thus the bypass of the core spray initiation logic to trip the pumps is necessary.

3.0 SYSTEMS AFFECTED

3.1 The following is a list of systems/devices affected by this system:

3.1.1 Core Spray System Controls
3.1.2 Diesel Generators
3.1.3 Auto Depressurization System (ADS)
3.1.4 Control Rod Drive (CRD) pumps

3.2 The following is a list of the drawings that identify these systems and/or interfaces:

3.2.1 NU 5060E6003 1,2 & 3 Core Spray/RBCCW Drywell Isolation System Elementary

3.2.2	GE 0116B8328	15 A, B, C & D	Core Spray Booster Pump Power and Control Circuits
3.2.3	GE 0223R0173	19, 24, 25 & 26	Core Spray Pump Power and Control Circuits
3.2.4	BR 3020	7	460 Volt Motor Control Center Elementary Diagrams
3.2.5	GE 0116B8328	14 & 14A	CRD Pump Power and Control Circuits

3.3 The following documents describe the systems listed in Section 3.1. These systems will be affected by the modification:

3.3.1 Facility Description and Safety Analysis Report for Oyster Creek Nuclear Power Plant - Section VI-6 Standby Core Cooling System, and Section VIII-3 Standby Generator System.

3.3.2 SDD-212A, Division I for Modification to Core Spray System Controls Logic for Oyster Creek Nuclear Generating Station.

3.3.3 Drawing G.E. 885D781 - P & ID Core Spray System.

4.0 EFFECTS ON SAFETY

4.1 Documents

4.1.1 Facility Description and Safety Analysis Report for Oyster Creek Nuclear Power Plant, Chapter VI and VIII.

4.1.2 Oyster Creek Nuclear Generating Station Operating License and Technical Specifications Section 3.4 - Limiting Conditions for Operation, Emergency Cooling, Section 3.7 - Auxiliary Electrical Power, Section 4.4 - Surveillance Requirements Emergency Cooling, and Section 4.7 - Auxiliary Electrical Power.

4.1.3 U.S. Nuclear Regulatory Commission Standard Review Plan Section 6.3 Emergency Core Cooling.

4.2 Safety Functions

4.2.1 Core Spray System

The objective of the standby core cooling system is to provide for the removal of the decay heat from the core following a postulated design basis loss of coolant accident (LOCA) over the entire range of breaks. This will insure that the fuel cladding integrity will be maintained over the entire spectrum of postulated loss of coolant accidents.

4.2.2 Diesel Generators

The diesel generators provide an alternate source of electrical power during emergency conditions. This power source is self-contained within the plant. Diesel generators provide electrical power to the systems and devices that are deemed essential on an emergency basis plus certain selected loads, with staggered time sequence, on a time sharing basis.

The diesel generators start idling on the presence of any of the following conditions:

a. Actuation of ECCS signal
b. Startup transformer lockout relay
c. Startup transformer under voltage
d. Auxiliary transformer lockout
e. Auxiliary trip lockout (differential current)
f. Main transformer lockout
g. Main generator lockout
h. Emergency 4160V bus fault lockout relay
i. Low Lube Oil Temperature

Once the start signals clear, the diesel generators continue to idle for another 11 minutes and then stop.

4.2.3 Auto Depressurization System

In case of a small break LOCA, where the break is not large enough to depressurize the reactor in time to prevent the cladding from melting due to the core spray system not spraying water in the core, the auto depressurization system is provided to depressurize the reactor.

4.2.4 Control Rod Drive (CRD) Pumps

The CRD hydraulic system can provide high pressure coolant injection capability. For break sizes up to 0.002 ft^2, a single CRD pump with flow of 110 gpm is adequate for maintaining the water level nearly five feet above the core, thus alleviating the necessity for auto-relief actuation.

4.3 Modification Impact on Safety Functions

4.3.1 System Performance

4.3.1.1 The existing core spray logic has two deficiencies that will prevent the automatic or manual restart of the core spray pumps in the presence of ECCS signals. This modification will remove these deficiencies and give the operator more flexibility in responding to emergency conditions.

The following features of the proposed modification will enhance the system performance from the safety point of view.

a. When the core spray system pumps start and the operator desires to trip the pumps, during an ECCS signal, he will first have to put the system into manual override state and then trip the pumps. This will require another deliberate operation for tripping the pumps, and minimize the chances of the operator tripping the system pumps inadvertently.

b. The exercise of tripping the system back up pumps, after tripping the main pumps, will be eliminated.

c. Whenever the system pumps are tripped in the presence of an actuation signal the antipumping logic of the pump breakers will be reset automatically. This will allow the operator to restart the pumps immediately after tripping them.

d. If the operator logic is in the manual override mode and the ECCS signal recurs, the core spray pumps will restart automatically. This will ensure the safety of the plant during the entire spectrum of the LOCA due to pipe break.

e. The operator will be able to throttle the parallel isolation valves and have better control over the reactor water level during an emergency.

   In the existing system, a delay in tripping the pumps can cause a water hammer in the emergency condenser piping and may cause damage to the piping.

f. The modification will allow the operator to be able to override both the Hi drywell pressure and the Lo-Lo reactor water level signals, therefore, tripping the pumps and throttling the parallel valves in the presence of ECCS signals. This will allow the operator to maintain the water level in the reactor just above the top of active fuel (TAF) in an Anticipated Transient Without Scram (ATWS) situation. This modification does introduce the possibility of an operator error leading to improper core cooling. However, it was concluded that the benefit of having this capability more than offsets this potential concern.

4.3.1.2 Diesel Generators

In the existing configuration the diesel generators start idling upon actuation of ECCS signals. These signals are initiated by the closure of contact relays 16K 101A, B, C, and D. The relays 16K 101A, B, C, and D will be de-energized to reset the antipumping circuit of the pump breakers as a part of modification. The proposed modification will be designed such that the idling signals for the generators are maintained during emergency conditions. This will be achieved by wiring the contacts of the override relays in parallel with the contacts of relays 16K 101A, B, C, and D.

The proposed modification will not add any additional load on the diesel generators. The additional contact devices required for the proposed modification will be powered by 125V DC panels D & F. The load increase on the 125 V DC panels is anticipated to be within 1.5 amperes. Therefore, the proposed modification will not have any adverse effect on safety nor will a change to the Technical Specification be required.

4.3.1.3 Automatic Depressurization System

The automatic depressurization system interfaces with the core spray system at the Hi drywell pressure switches (RV 46A, B, C, & D) level. Both systems share the same sensors for actuation. The proposed modification will not effect this interface and will not have any safety impact on the system.

The Oyster Creek Technical Specifications will not require any change for its ADS System due to the proposed modification.

4.3.1.4 Control Rod Drive Pumps

The core spray system logic interfaces with the CRD pump start circuit. The circuit will be modified so that the CRD start logic remains unchanged.

The proposed modification will not have any effects on the safety or require a technical specification change for CRD pumps.

4.3.2 Quality Standards

This modification is classified as Important to Safety and Nuclear Safety Related. The modification will be performed in accordance with the standards established for ITS/NSR modifications.

4.3.3 Natural Phenomenon Protection

4.3.3.1 Seismic Classification

The modification is classified Seismic S1.

4.3.3.2 Tornado, Hurricane and Flood Protection

All new equipment for the modification will be located inside the Reactor Building, Control Room or 480V switchgear rooms. Tornado, hurricane, and flood protection are not altered by this modification.

4.3.4 Environmental Qualification

The control devices and indicating lights required for the proposed modification will be qualified in accordance with the requirements of IEEE 323-1974 as endorsed by USNRC Regulatory Guide 1.89. The devices will be qualified, as a minimum, for environmental conditions to be experienced during normal and abnormal plant conditions.

The cable procured for the modification will be qualified to IEEE 383. Therefore, the proposed modification will not have any detrimental effect on safety.

4.3.5 Missile Protection

The control and indication devices for the proposed modificaton will be located in the Control Room and 480V switchgear room. These areas are missile-free areas. The interconnecting cables for the proposed modificaiton will be run in accordance with the Design Criteria Document No. 782A. This document requires cable routing through missile-free areas or with missile protection in missile zones. The proposed modificaion will be protected against missiles.

4.3.6 High Energy Pipe Breaks

The cables will be routed around jet impingement zones. If this is not possible, adequate shielding will be installed. The controls and indication will be installed in high energy line free areas. Therefore, the proposed modification will not be degraded due to high energy line pipe breaks.

4.3.7 Electrical Separation

The componets and the wiring will be arranged such that the existing separation, as a minimum, is maintained. This will ensure the safety of the proposed modificaiton.

4.3.8 Single Failure Criteria

The proposed modification and its interface with the existing system will be designed to sustain the failure of a single device.

4.3.9 10 CFR 50 Appendix K impact

Appendix K analyses assumed that the core spray system pumps started on reactor Lo-Lo or drywell high pressure and that core spray injection began at 285 psig in the reactor vessel. Since these basic automatic performance requirements will not change by this modification, the appendix K analysis results will not be affected.

5.0 CONCLUSION

The core spray system is a low pressure standby core cooling system. This system provides an alternate supply of reactor coolant in case of a Loss of Coolant Accident (LOCA).

The present core spray system logic has the following two deficiencies:

- When the core spray pumps are tripped, after an ECCS actuation, the pumps cannot be restarted manually without resetting the core spray logic. The core spray logic cannot be reset if an ECCS signal is still present.

- The core spray system logic will not restart automatically on loss of water level if an ECCS signal is still present.

The logic deficiency identitifed in NUREG 0737, Item II.K.3.21 will be corrected under this modification.

Based on the evaluation in Section 4.0 above, the impact of the proposed modification on safety are that the modification:

a. will not increase the probability of occurrence or the consequences of an accident,

b. may increase the probability of occurrence or consequence of a malfunction of equipment Important to Safety, by permitting the operator to inadvertently turn off core spray before the initiating signals have cleared. This feature however, has an overall beneficial effect of allowing operations that will help mitigate the affects of an Anticipated Transient Without Scram (ATWS).

c. will not create a possibility for an accident or malfunction of a different type than any previously identified in the FDSAR,

d. will not decrease the margin of safety as defined in the basis of any technical specification,

e. will not violate any technical specification,

f. will not violate any license requirements or regulations,

g. will not involve a radiological safety concern, and,

h. NRC approval of this change is required in accordance with NUREG 0737 and 10CFR 50.59.

Attachment 1

DRAWINGS

EDSN 0370-031-001 Rev 0

		Sheet#	Revision#
GE	0223R0173	18	184A
GE	0223R0173	24	184A
GE	0223R0173	25	184A
GE	0223R0173	26	184A
GE	0116B8328	14	184A
GE	0116B8328	14A	184A
GE	0116B8328	15A	184A
GE	0116B8328	15B	184A
GE	0116B8328	15C	184A
GE	0116B8323	15D	184A
GE	157B6350	161A	184A
GE	157B6350	162	184A
GE	157B6350	209	184A
GE	157B6350	210	184A
NUS	5060E6003	1,2,3	184A

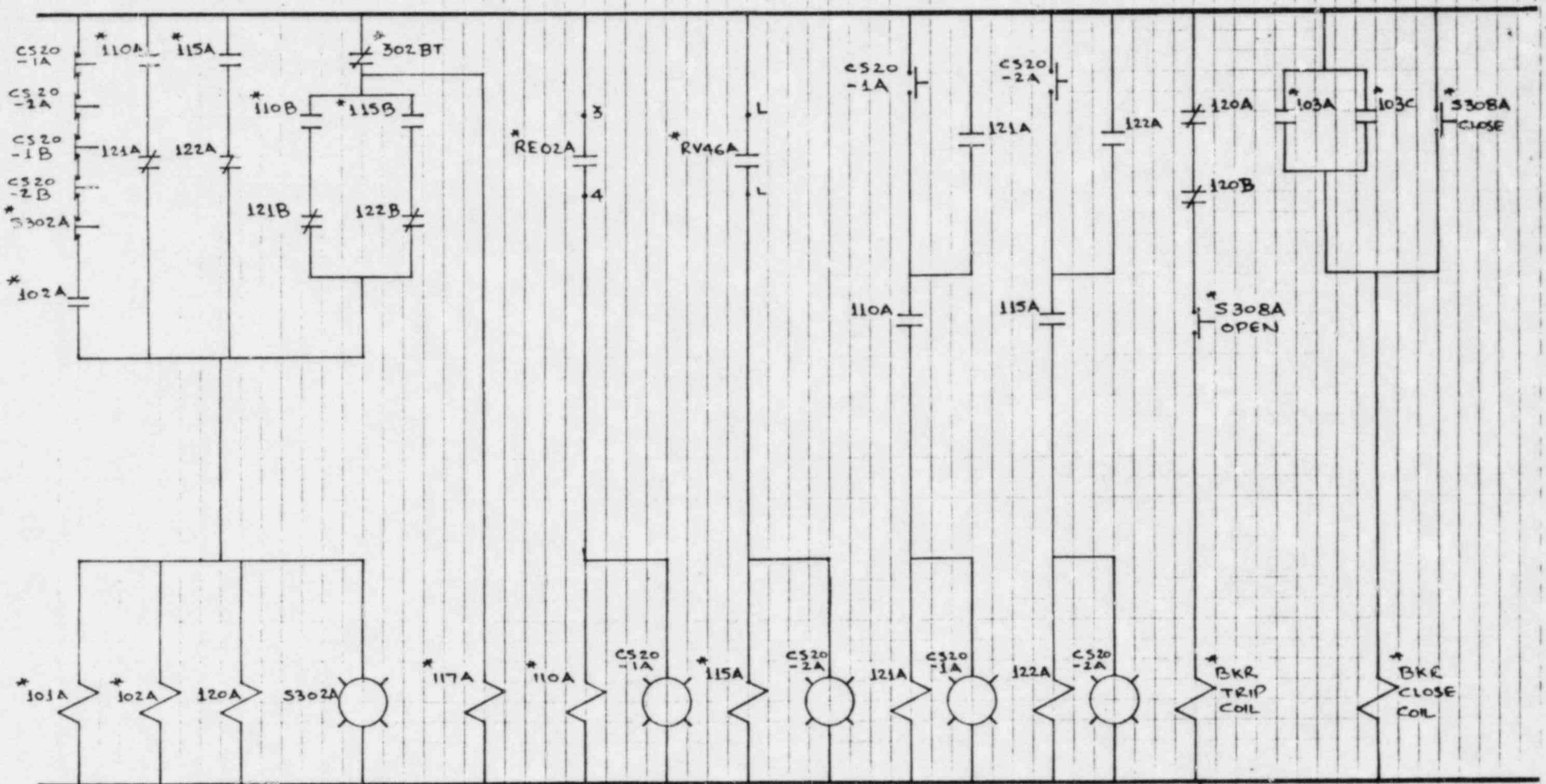

FIGURE 1 : CONCEPTUAL ELEMENTARY FOR CORE SPRAY CONTROL LOGIC MODIFICATION (Ch. A)

* Identifies an existing device/interlock.

VALVE SHOWN IN FULL OPEN POSITION

ROTOR	LIMIT SWITCH CONTACT DEVELOPMENT						
	CONTACT	VALVE POSITION: FULL OPEN				FULL CLOSED	FUNCTION
1	1	———	- - -	- - -	- - -	- - -	BY-PASS CIR.
	2	———	- - -	- - -	- - -	- - -	SPARE
	3	- - -	———	———	———	———	IND LIGHT
	4	- - -	———	———	———	———	OPEN LIMIT
2	5	- - -	- - -	- - -	- - -	———	BY-PASS CIR.
	6	- - -	- - -	- - -	- - -	———	SPARE
	7	———	———	———	———	- - -	IND. LIGHT
	8	———	———	———	———	- - -	CLOSE LIMIT

(17) CLOSING TORQUE SWITCH INTERRUPTS CONTROL CIRCUIT IF MECHANICAL OVERLOAD OCCURS DURING CLOSING CYCLE

(18) OPENING TORQUE SWITCH INTERRUPTS CONTROL CIRCUIT IF MECHANICAL OVERLOAD OCCURS DURING OPENING CYCLE

NOTES:

1. ——— CLOSED CONTACT
2. - - - - OPEN CONTACT
3. WIRES 43, 45, 53, + 55 BETWEEN TORQUE SWITCHES + LIMIT SWITCHES BY LIMITORQUE CORP ALL OTHER WIRING BY OTHERS.

Figure 2 : Valve Limit Switch Development.

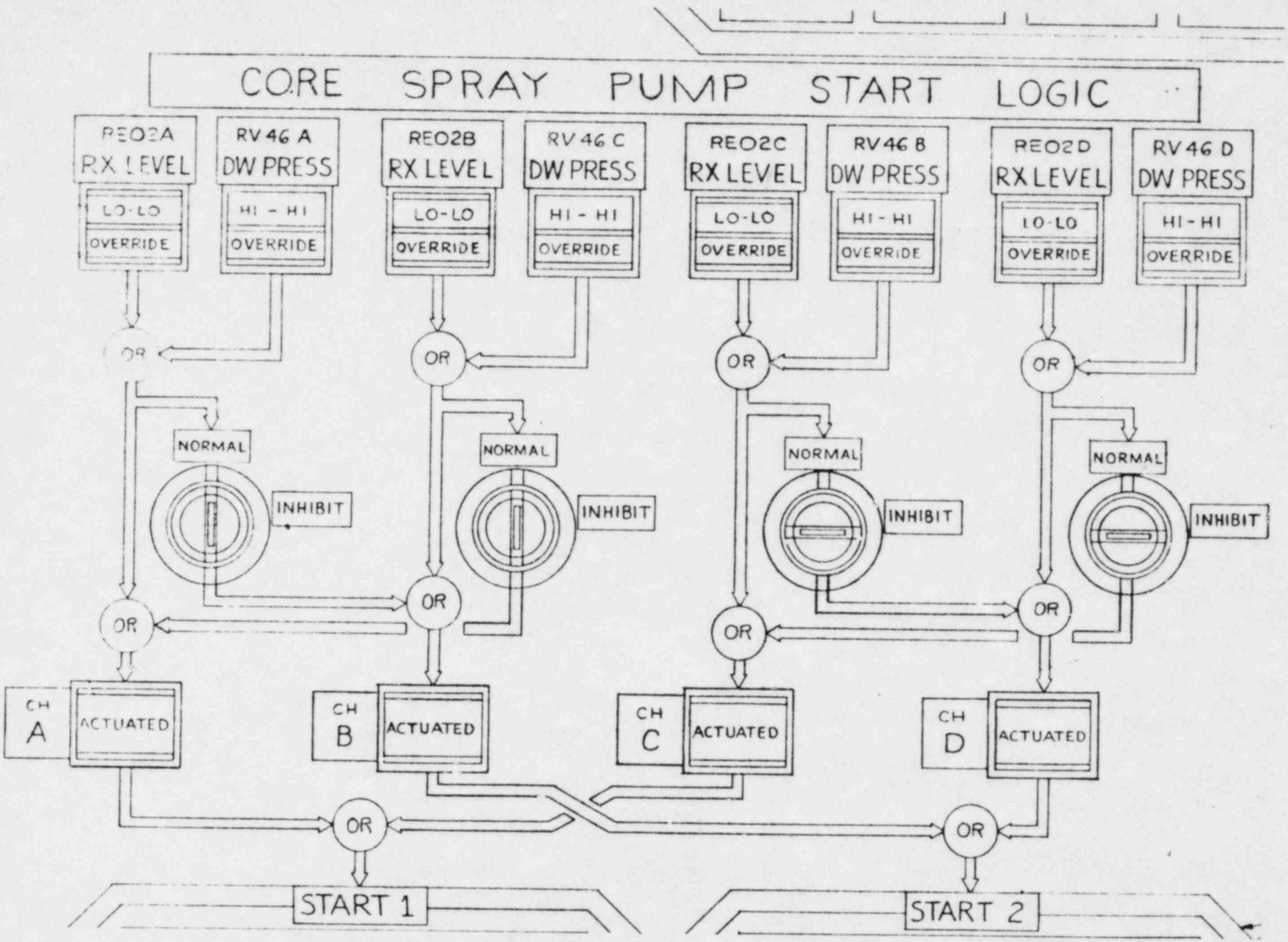

Figure 3: Panel Layout For Core Spray Control Logic Modification