ATTACHMENT 2

SUMMARY OF THE PROPOSED CHANGE TO

APPENDIX A TECHNICAL SPECIFICATION

QUAD CITIES UNIT 1 (DPR-29)

Page 1.1/2.1-4

- Delete "scram shall initiate upon actuation of the fast closure solenoid valves which trip the turbine control valves"

- Add "The scram for ... due to actuation of the fast acting solenoid valve shall be $\geq$ 460 psig EHC fluid pressure."

Page 1.1/2.1-15

- Add "The trip setpoint of $\geq$ 460 psig EHC fluid pressure was developed to ensure that the pressure switch is actuated prior to the closure of the turbine control valves (at approximately 400 psig EHC fluid pressure) yet assure that the system is not actuated unnecessarily due to EHC system pressure transients which may cause EHC system pressure to momentarily decrease."

Page 3.1/4.1-8

- Add a new paragraph:

  "The turbine control valve fast acting solenoid valve pressure switches directly measure the trip oil pressure that causes the turbine control valves to close in a rapid manner. The reactor scram setpoint was developed in accordance with NEDC 31336, "General Electric Instrument Setpoint Methodology" dated October, 1986. As part of the calculation, a calibration period is inputted to achieve a nominal trip point and an allowable setpoint (Technical Specification value). The nominal setpoint is procedurally controlled. Based on the calculation input, the calibration period is defined to be every Refueling Outage."

Page 3.1/4.1-10

- Delete: "turbine control valve fast closure,"

- Add to reference section: "3. NEDC-31336, "General Electric Instrument Setpoint Methodology" dated October, 1986.

Page 3.1/4.1-13

- Change "$\geq$ 40% turbine/generator load mismatch" to " $\geq$ 460 psig"

- Add ", Valve trip system oil pressure low" to the trip function description

Page 3.1/4-14

- Replace existing note [10] with: "Trip is indicative of turbine control valve fast closure (due to low EHC fluid pressure) as a result of fast acting solenoid actuation."

Page 3.1/4.1-17

Add to Table 4.1-2: "Turbine control valve fast closure, A, Pressure source, Refueling Outage".

ATTACHMENT 3

PROPOSED CHANGES TO APPENDIX A

TECHNICAL SPECIFICATION FOR

QUAD CITIES UNIT 1

DPR-29

Page 1.1/2.1-4

1.1/2.1-15

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3.1/4.1-10

3.1/4.1-13

3.1/4.1-14

3.1/4.1-17

rg/ZNLD:678:12

C. Power Transient

1. The neutron flux shall not exceed the scram setting established in Specification 2.1.A for longer than 1.5 seconds as indicated by the process computer.

2. When the process computer is out of service, this safety limit shall be assumed to be exceeded if the neutron flux exceeds the scram setting established by Specification 2.1.A and a control rod scram does not occur.

D. Reactor Water Level (Shutdown Condition)

Whenever the reactor is in the shutdown condition with irradiated fuel in the reactor vessel, the water level shall not be less than that corresponding to 12 inches above the top of the active fuel* when it is seated in the core.

*Top of active fuel is defined to be 360 inches above vessel zero (See Bases 3.2).

due to actuation of the fast acting solenoid valve shall be ≥ 460 psig EHC fluid pressure.

C. Reactor low water level scram setting shall be 144 inches above the top of the active fuel* at normal operating conditions.

D. Reactor low water level ECCS initiation shall be ≥ 84 inches above the top of the active fuel* at normal operating conditions.

E. Turbine stop valve scram shall be ≤ 10% valve closure from full open.

F. The scram for Turbine control valve fast closure ~~scram shall initiate upon actuation of the fast closure solenoid valves which trip the turbine control valves~~.

G. Main steamline isolation valve closure scram shall be ≤ 10% valve closure from full open.

*Top of active fuel is defined to be 360 inches above vessel zero (See Bases 3.2).

F. Turbine Control Valve Fast Closure Scram

The turbine control valve fast closure scram is provided to anticipate the rapid increase in pressure and neutron flux resulting from fast closure of the turbine control valves due to a load rejection and subsequent failure of the bypass, i.e., it prevents MCPR from becoming less than the MCPR fuel cladding integrity safety limit for this transient. For the load rejection without bypass transient from 100% power, the peak heat flux (and therefore LHGR) increases on the order of 15% which provides wide margin to the value corresponding to 1% plastic strain of the cladding.

Insert paragraph per attached

G. Reactor Coolant Low Pressure Initiates Main Steam Isolation Valve Closure

The low pressure isolation at 825 psig was provided to give protection against fast reactor depressurization and the resulting rapid cooldown of the vessel. Advantage was taken of the scram feature which occurs in the Run mode when the main steamline isolation valves are closed to provide for reactor shutdown so that operation at pressures lower than those specified in the thermal hydraulic safety limit does not occur, although operation at a pressure lower than 825 psig would not necessarily constitute an unsafe condition.

H. Main Steamline Isolation Valve Closure Scram

The low pressure isolation of the main steamlines at 825 psig was provided to give protection against rapid reactor depressurization and the resulting rapid cooldown of the vessel. Advantage was taken of the scram feature in the Run mode which occurs when the main steamline isolation valves are closed to provide for reactor shutdown so that high power operation at low reactor pressures does not occur, thus providing protection for the fuel cladding integrity safety limit. Operation of the reactor at pressures lower than 825 psig requires that the reactor mode switch be in the Startup position, where protection of the fuel cladding integrity safety limit is provided by the IRM and APRM high neutron flux scrams. Thus, the combination of main steamline low-pressure isolation and isolation valve closure scram in the Run mode assures the availability of neutron flux scram protection over the entire range of applicability of fuel cladding integrity safety limit. In addition, the isolation valve closure scram in the Run mode anticipates the pressure and flux transients which occur during normal or inadvertent isolation valve closure. With the scrams set at 10% valve closure in the Run mode, there is no increase in neutron flux.

INSERT FOR PAGE 1.1/2.1-15

The trip setpoint of $\geq$ 460 psig EHC fluid pressure was developed to ensure that the pressure switch is actuated prior to the closure of the turbine control valves (at approximately 400 psig EHC fluid pressure) yet assure that the system is not actuated unnecessarily due to EHC system pressure transients which may cause EHC system pressure to momentarily decrease.

To satisfy the long-term objective of maintaining an adequate level of safety throughout the plant lifetime, a minimum goal of 0.9999 at the 95% confidence level is proposed. With the one-out-of-two taken twice logic, this requires that each sensor have an availability of 0.993 at the 95% confidence level. This level of availability may be maintained by adjusting the test interval as a function of the observed failure history (Reference 1). To facilitate the implementation of this technique, Figure 4.1-1 is provided to indicate an appropriate trend in test interval. The procedure is as follows:

1. Like sensors are pooled into one group for the purpose of data acquisition.

2. The factor M is the exposure hours and is equal to the number of sensors in a group, n, times the elapsed time T(M=nT).

3. The accumulated number of unsafe failures is plotted as an ordinate against M as an abscissa on Figure 4.1-1.

4. After a trend is established, the appropriate monthly test interval to satisfy the goal will be the test interval to the left of the plotted points.

5. A test interval of 1 month will be used initially until a trend is established.

INSERT ATTACHED PARAGRAPH →

Group 2 devices utilize an analog sensor followed by an amplifier and a bistable trip circuit. The sensor and amplifier are active components, and a failure is almost always accompanied by an alarm and an indication of the source of trouble. In the event of failure, repair or substitution can start immediately. An as-is failure is one that "sticks" midscale and is not capable of going either up or down in response to an out-of-limits input. This type of failure for analog devices is a rare occurrence and is detectable by an operator who observes that one signal does not track the other three. For purposes of analysis, it is assumed that this rare failure will be detected within 2 hours.

The bistable trip circuit which is a part of the Group 2 devices can sustain unsafe failures which are revealed only on test. Therefore, it is necessary to test them periodically.

A study was conducted of the instrumentation channels included in the Group 2 devices to calculate their 'unsafe' failure rates. The analog devices (sensors and amplifiers) are predicted to have an unsafe failure rate of less than 20×10^{-6} failures/hour. The bistable trip circuits are predicted to have an unsafe failure rate of less than 2×10^{-6} failures/hours. Considering the 2-hour monitoring interval for the analog devices as assumed above and a weekly test interval for the bistable trip circuits, the design reliability goal of 0.99999 is attained with ample margin.

INSERT FOR PAGE 3.1/4.1-8

The turbine control valve fast acting solenoid valve pressure switches directly measure the trip oil pressure that causes the turbine control valves to close in a rapid manner. The reactor scram setpoint was developed in accordance with NEDC 31336 "General Electric Instrument Setpoint Methodology" dated October, 1986. As part of the calculation, a calibration period is inputted to achieve a nominal trip point and an allowable setpoint (Technical Specification value). The nominal setpoint is procedurally controlled. Based on the calculation input, the calibration period is defined to be every Refueling Outage.

Group 3 devices are active only during a given portion of the operation cycle. For example, the IRM is active during startup and inactive during full-power operation. Thus, the only test that is meaningful is the one performed just prior to shutdown or startup, i.e., the tests that are performed just prior to use of the instrument.

Calibration frequency of the instrument channel is divided into two groups. These are as follows:

1. Passive type indicating devices that can be compared with like units on a continuous basis, and

2. Vacuum tube or semiconductor devices and detectors that drift or lose sensitivity.

Experience with passive type instruments in Commonwealth Edison generating stations and substations indicate that the specified calibrations are adequate. For those devices which employ amplifiers, etc. drift specifications call for drift to be less than 0.4%/month i.e., in the period of a month a drift of 0.4% would occur, thus providing for adequate margin.

The sensitivity of LPRM detectors decreases with exposure to neutron flux at a slow and approximately constant rate. Changes in a power distribution and electronic drift also require compensation. This compensation is accomplished by calibrating the APRM system every 7 days using heat balance data by calibrating individual LPRM's at least every 1000 equivalent full-power hours using TIP traverse data. Calibration on this frequency assures plant operation at or below thermal limits.

A comparison of Tables 4.1-1 and 4.1-2 indicates that some instrument channels have not been included in the latter table. These are mode switch in shutdown, manual scram, high water level in scram discharge volume, main steamline isolation valve closure, ~~turbine control valve fast closure,~~ and turbine stop valve closure. All of the devices or sensors associated with these scram functions are simple on-off switches, hence calibration is not applicable, i.e., the switch is either on or off. Further, these switches are mounted solidly to the device and have a very low probability of moving; e.g., the thermal switches in the scram discharge volume tank. Based on the above, no calibration is required for these instrument channels.

B. The MFLPD shall be checked once per day to determine if the APRM scram requires adjustment. This may normally be done by checking the LPRM readings, TIP traces, or process computer calculations. Only a small number of control rods are moved daily, thus the peaking factors are not expected to change significantly and a daily check of the MFLPD is adequate.

References

1. I. M. Jacobs, "Reliability of Engineered Safety Features as a Function of Testing Frequency", Nuclear Safety, Vol. 9, No. 4, pp. 310-312, July-August 1968,

2. Licensing Topical Report NEDO-21617-A (December 1978).

3. NEDC-31336 "GENERAL ELECTRIC INSTRUMENT SETPOINT METHODOLOGY" DATED OCTOBER, 1986

TABLE 3.1-3

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENTS RUN MODE

Minimum Number of Operable or Tripped Instrument Channels per Trip System[1]	Trip Function	Trip Level Setting	Action[2]
1	Mode switch in shutdown		A
1	Manual scram		A
	APRM[3]		
2	High Flux (flow biased)	Specification 2.1.A.1	A or B
2	Inoperative		A or B
2	Downscale [11]	≥ 3/125 of full scale	A or B
2	High-reactor pressure	≤ 1060 psig	A
2	High drywell pressure	≤ 2.5 psig	A
2	Reactor low water level	≥ 8 inches[8]	A
2 (per bank)	High-water level in scram discharge volume	≤ 40 gallons per bank	A
2	Turbine condenser low vacuum	≥ 21 inches Hg vacuum	A or C
2	Main Steamline high radiation [12]	≤ 15 X normal full power background (without hydrogen addition)	A or C
4	Main steamline isolation valve closure [6]	≤ 10% valve closure	A or C
2	Turbine control valve fast closure [1 VALVE TRIP SYSTEM OIL PRESSURE LOW] [9]	~~> 40% turbine/generator load mismatch~~ [≥ 460 psig] [10]	A or C
2	Turbine stop valve closure [9]	≤ 10% valve closure	A or C
2	Turbine EHC control fluid low pressure [9]	≥ 900 psig	A or C

TABLE 3.1-4

NOTES FOR TABLES 3.1-1, 3.1-2, AND 3.1-3

[1] There shall be two operable trip systems or one operable and one tripped system for each function.

[2] If the first column cannot be met for one of the trip systems, that trip system shall be tripped. If the first column cannot be met for both trip systems, the appropriate actions listed below shall be taken:

A. Initiate insertion of operable rods and complete insertion of all operable rods within 4 hours.

B. Reduce power level to IRM range and place mode switch in the Startup/Hot Standby position within 8 hours.

C. Reduce turbine load and close main steamline isolation valves within 8 hours.

[3] An APRM will be considered inoperable if there are fewer than 2 LPRM inputs per level or there are less than 50% of the normal complement of LPRM's to an APRM.

[4] Permissible to bypass, with control rod block for reactor protection system reset in refuel and shutdown positions of the reactor mode switch.

[5] Not required to be operable when primary containment integrity is not required.

[6] The design permits closure of any one line without a scram being initiated.

[7] Automatically bypassed when reactor pressure is < 1060 psig.

[8] The +8 inch trip point is the water level as measured by the instrumentation outside the shroud. The water level inside the shroud will decrease as power is increased to 100% in comparison to the level outside the shroud to a maximum of 7 inches. This is due to the pressure drop across the steam dryer. Therefore, at 100% power, an indication of +8 inch water level will actually be +1 inch inside the shroud. 1 inch on the water level instrumentation is ≥ 504" above vessel zero. (See Bases 3.2).

[9] Permissible to bypass when first stage turbine pressure is less than that which corresponds to 45% rated steam flow. (< 400 psi)

[10] ~~Trips upon actuation of the fast-closure solenoid which trips the turbine control valves.~~ TRIP IS INDICATIVE OF TURBINE CONTROL VALVE FAST CLOSURE (due to low EHC fluid pressure) AS A RESULT OF FAST ACTING VALVE ACTUATION

[11] The APRM downscale trip function is automatically bypassed when the IRM instrumentation is operable and not high.

[12] Channel shared by the reactor protection and containment isolation system.

TABLE 4.1-2

SCRAM INSTRUMENT CALIBRATION

MINIMUM CALIBRATION FREQUENCIES FOR REACTOR PROTECTION INSTRUMENT CHANNELS

Instrument Channel	Group[1]	Calibration Standard[5]	Minimum Frequency[2]
High flux IRM	C	Comparison to APRM after heat balance	Every controlled shutdown[4]
High flux APRM			
Output signal	B	Heat balance	Once every 7 days
Flow bias	B	Standard pressure and voltage source	Refueling outage
LPRM	B[6]	Using TIP system	Every 1000 equivalent full power hours
High reactor pressure	A	Standard pressure source	Every 3 months
High drywell pressure	A	Standard pressure source	Every 3 months
Reactor low water level	B	Water level	[7]
Turbine condenser low vacuum	A	Standard vacuum source	Every 3 months
Main steamline high radiation	B	Appropriate radiation source [3]	Refueling outage
Turbine EHC control fluid low pressure	A	Pressure source	Every 3 months
Highwater level in scram discharge volume (dp only)	A	Water level	Refueling outage
TURBINE CONTROL VALVE FAST CLOSURE	A	PRESSURE SOURCE	REFUELING OUTAGE

Notes:

[1] A description of the three groups is included in the bases of this specification.

[2] Calibration tests are not required when the systems are not required to be operable or are tripped. If tests are missed, they shall be performed prior to returning the systems to an operable status.

[3] A current source provides an instrument channel alignment every 3 months.

[4] Maximum calibration frequency need not exceed once per week.

[5] Response time is not part of the routine instrument check and calibration but will be checked every refueling outage.

[6] Does not provide scram function.

[7] Trip units are calibrated monthly concurrently with functional testing. Transmitters are calibrated once per operating cycle.

ATTACHMENT 4

EVALUATION OF NO SIGNIFICANT HAZARDS

As described in the Description and Bases for the Amendment Request, the proposed change involves the requirements for the use of a pressure switch, which initiates a reactor scram, in the fast acting solenoid valves. The actuation of the fast acting solenoid valves (due to a load reject signal) causes the turbine control valves to close rapidly due to decreasing EHC fluid pressure.

Commonwealth Edision has reviewed the proposed amendment in accordance with the criteria delineated in 10 CFR 50.91 and has concluded that the proposed amendment does not present a Significant Hazards Consideration. The basis for this determination is as follows:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident.

The turbine control valve fast closure scram is provided to anticipate the rapid increase in pressure and neutron flux resulting from the fast closure of the turbine control valves due to a load reject and subsequent failure of the bypass valves (UFSAR section 14.1.2, 3.2.5.4). The turbine control valves are required to fast close as rapidly as possible to prevent overspeed of the turbine-generator rotor. The rapid closure of the control valves causes a sudden reduction of the steam flow which results in an increase to reactor pressure. The scram is provided to prevent the violation of the minimum critical power ratio (MCPR) safety limit.

The use of a pressure switch (in lieu of the limit switch) does not involve a significant increase in the probability of the transient. Upon actuation of the fast acting solenoid, the new pressure switch will sense the decreasing electro-hydraulic control (EHC) fluid (indicative of the control valve closure) and provide a reactor scram. The use of the pressure switch, therefore, provides the same function as the limit switch. In addition, the logic for the RPS trip remains the same. The pressure switches on fast acting solenoid valves for control valves #1 and #2 input to the Reactor Protection System (RPS) Channel A. Either pressure switch will cause the RPS channel to trip. Similarly, the pressure switches on the fast acting solenoid valves for control valves #3 and #4 input into Reactor Protection System Channel B. In order to achieve a full reactor scram, both RPS channels must be tripped.

The use of the pressure switch does not affect the limiting parameter (MCPR) of the transient. As such, there would be no sequence of events which would lead to the safety limit being exceeded and barrier integrity would be assured. Additionally, the proposed change would not change, degrade or prevent the responses of systems assumed in the accident(s) nor alter any assumptions previously made in evaluating the radiological consequences of an accident described (above) in the SAR.

The consequences of the turbine/generator load reject with the subsequent failure of the bypass valves are not significantly increased by this change. The pressure switch provides a scram signal to RPS when the turbine control valves close rapidly in the same time period as the position switch in place. The use of a pressure switch to input into the Reactor Protection System is widely used throughout the industry and has been shown to be reliable. The results of the accident (the lowest MCPR achieved) are, therefore, not significantly affected and are bounded by the existing analysis. The existing analysis concludes that under this transient, the site boundary doses are well within the 10 CFR 100 limits.

2. The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The significant difference between the existing valve design and the proposed design is the use of a pressure switch in lieu of a limit switch. The use of the pressure switch eliminates the failure mode associated with the limit switch and inherently introduces its own failure mode. The failure of the tubing which connects the pressure switch to the solenoid valve would initiate a scram signal. The use of the pressure switch to input into the Reactor Protection System is widely used throughout the industry and has been shown to be reliable. Based on industry experience, the new design of the fast acting solenoid valve has been more reliable in actuating the fast closure of control valves than the use of the existing design.

The logic for the RPS trip remains unchanged. In order to create a reactor scram, the logic is arranged such that actuation of the pressure switches for the fast acting solenoid valves on control valve #1 or #2 and #3 or #4 will initiate a reactor scram. Therefore, in order for the scram function to fail, two pressure switches would have to fail within the same RPS channel (which is the same RPS failure mode as the existing design).

The fast closure of the turbine control valves is considered to be an anticipatory reactor scram. The reactor pressure and neutron flux would increase significantly in the event of the turbine fast closure without a scram; however, the reactor pressure (1060 psig) or the high neutron flux scrams provide backup to the turbine fast closure scram, in the event that sensor fails to actuate RPS.

The existence of the new failure mode, therefore, does not introduce the possibility of a new or different kind of accident than previously evaluated.

3. The proposed change does not involve a significant reduction in the margin of safety.

The limiting event associated with the turbine control valve fast closure is the load reject with failure of the bypass valves. A reactor scram is initiated, when the turbine control valves fast close, to anticipate the increase in reactor pressure and neutron flux, thereby ensuring that the MCPR safety limit is not violated. The use of the pressure switch does not affect the margin of safety associated with the MCPR safety limit since the pressure switch will initiate the reactor scram within the same time period as the existing design. The trip setpoint was calculated to ensure that a reactor scram will be initiated when the turbine control valves start to close rapidly.

The proposed fast acting solenoid valves are designed such that the pressure switch will be actuated within 30 milliseconds of the time the control valves start to close. Also, current Technical Specifications require that the RPS trip actuator contacts be actuated within 50 milliseconds of the actuation of the pressure switch. These times are consistent with the design values used in the Reload Licensing calculation to analyze the load reject without bypass valve transient. The trip setpoint was calculated such that the trip signal will be generated within the 30 milliseconds after the start of the control valve fast closure. Verification of the 30 millisecond actuation will be conducted during post modification testing. This modification, therefore, does not involve a significant reduction in the margin of safety.

ATTACHMENT 5

OPERATION OF THE ELECTRO-HYDRAULIC CONTROL (EHC) SYSTEM

The following provides a brief synopsis of the operation of the EHC system as it relates to the control valves and the load reject signal to assist in the review of the proposed amendment.

I. Electro-Hydraulic Control (EHC) Pressure Control and Logic System

The purpose of the EHC pressure control and logic system is to position the turbine control valves, intercept valves and bypass valves in order to achieve the turbine speed or load which is consistent with the ability of the reactor to supply adequate steam. The system also controls and maintains reactor pressure during plant start-up, heat-up and cooldown. The logic system consists of five (5) subsystems which includes the pressure control unit, bypass control unit, load control unit, speed and acceleration control unit and the valve flow control unit.

The purpose of the load control unit is to develop a steam flow signal which represents the desired load to be placed on the turbine. The load control unit of the EHC pressure control and logic system will develop a power/load unbalance (load reject) signal in the event the first stage turbine pressure and stator winding ampere ratio exceeds 40%. The load unbalance signal actuates relays which send a signal to the turbine fast acting solenoid valves. The fast acting solenoid valves energize which causes the fast closure of the turbine control valves by decreasing the EHC fluid pressure.

II. Electro-Hydraulic Control (EHC) Hydraulic System

The pupose of the EHC hydraulic system is to supply cooled, filtered, high pressure fluid for the control of the turbine valves.

The turbine control valve hydraulic positioning unit contains two ports which are supplied by high pressure hydraulic fluid. The Fluid Jet Supply (FJS) enters one of the ports of the positioning unit (pressure rated at 1600 psig) and is directed to a servo-valve. The purpose of the servo-valve is to convert low level input signals from the EHC pressure control logic into high level hydraulic outputs which are used to position the valves. The second hydraulic fluid supply is the Fluid Actuator Supply Trip Control (FASTC) fluid which is also rated at 1600 psig. The FASTC fluid enters the positioning unit and is directed to the servo-valve and the fast acting solenoid valve. The FASTC fluid is transmitted through the fast acting solenoid valve to the disk dump valve. The purpose of the disk dump valve is to seal the end of the hydraulic positioning cyclinder so that the servo-valve (with the aid of the FJS fluid pressure) can be positioned to direct FASTC into the single acting actuator cyclinder of the turbine control valve. The turbine control valve uses the FASTC pressure to open against a closing spring and steam pressure. The disk dump valve, which normally remains closed by the FASTC pressure, will open to release actuator positioning cyclinder pressure, in the event the fast acting solenoid valves are energized.

III. Operation During The Turbine/Generator Load Mismatch

When the load control unit of the EHC logic system senses the turbine/generator load mismatch, the logic system sends a signal to the fast acting solenoid valve to reposition. When the fast acting solenoids reposition, the following occurs:

a. The FASTC fluid begins to drain as a result of the repositioned fast acting solenoid valve. The pressure, which holds the disk dump valve seated, begins to decrease.

b. The fast acting solenoid pressure switch senses decreasing fluid pressure and at a pressure equal to or greater than 460 psig initiates a scram signal to the Reactor Protection System.

   Under the existing design, a position switch on the fast acting solenoid valve senses that the fast acting solenoid valve has repositioned and initiates a scram signal to the Reactor Protection System.

c. When the EHC fluid pressure reaches approximately 400 psig, the disk dump valve is forced away from its seat and the FASTC fluid in the hydraulic cylinder is rapidly drained.

d. The control valve closes rapidly.