NUCLEAR ELECTRIC G.S. TECHNICAL TRAINING COURSE

5 - NPD Systems

6 - Instrumentation and Control

0 - General

3 - Annunciation

0.0 INTRODUCTION

The Annunciation System provides audible warning and visual identification of the occurrence or clearance of any alarm or trip condition in both the nuclear and conventional parts of the station.

1.0 INFORMATION

All annunciation points are displayed in the control room. A total of 382 points is available, of which about 15% are spares. Each point contains a Red lamp and a Green lamp for visual identification. An ALARM HORN and a CLEARANCE GONG, common to all units, provides the audible warning.

Sixty-six points are located on control console #3 and are used to annunciate reactor trip conditions. This group is therefore called the TRIP ANNUNCIATOR.

There are 21 triplicated reactor trip conditions--hence 63 of the 66 points are in use. Some of the reactor trips are conditional to be ineffective when reactor power is below 0.2% of full power. However, the annunciation is not conditioned and therefore these CONDITIONAL TRIPS are annunciated at all times.

The remaining 316 points are divided into 18 groups called ALARM ANNUNCIATORS. Each group annunciates the alarms for one or more particular systems and is mounted on the control room panels in proximity to related instruments and controls. In addition to alarms, the Alarm Annunciators also annunciate any turbine or generator TRIP conditions.

The Alarm Annunciator points are identified in the following manner:

1. The control room contains 7 PANEL SECTIONS, numbered left to right.

2. Each section contains 4 PANELS, numbered left to right.

3. Each Alarm Annunciator point is identified by 4 digits:

1st, digit-----Panel section
2nd digit -----Panel
3rd & 4th digit----annunciator point in the particular Alarm Annunciator identified by the first two digits.

e.g. Annunciator Point 2315 is the 15th point in the alarm Annunciator located on panel 3 of panel section 2.

The Trip Annunciator points are identified similarly with first two digits being 80--thus points 8001 to 8066 make up the Trip Annunciator.

The Trip Annunciator, and each Alarm Annunciator has mounted near it:

1. An ALARM ACKNOWLEDGE pushbutton

2. A CLEARANCE ACKNOWLEDGE pushbutton

Each panel section contains as ANNUNCIATOR TEST pushbutton, and an ANNUNCIATOR SHUTDOWN SWITCH. There is also an Annunciator Test pushbutton on console section #3 for the Trip Annunciator.

When the station is shutdown, certain Alarm Annunciator points normally show a fault, as a natural consequence of the station condition. The Annunciator Shutdown Switches are used to darken such points to avoid having a large number of meaningless red alarm lights illuminated. These switches effect only the lamps of the points concerned and do not affect the horn, gong, or Console Indexing Lamps. Those on panel section 1, 2, 4 and 7 are called REACTOR ANNUNCIATOR SHUTDOWN SWITCHES and must be in the "On Power" position before the reactor-boiler regulating system can be changed from its Shutdown State. Those on panel sections 5 and 6 are called THERMAL ANNUNCIATOR SHUTDOWN SWITCHES and must be in the "On Power" position before the reactor-boiler regulating system can be placed in its High Power Operating State.

The 8 alarm annunciator points on panel section 3, which are associated with the fuelling machines, are arranged so that their lamps are automatically darkened when the fuelling machines are not in operation.

A HORN SILENCE pushbutton is provided on control console #3. This is used whenever the operator cannot immediately take action to acknowledge and clear the fault. Subsequent alarms on other points are then able to sound the horn again to attract immediate attention.

A total of 18 numbered CONSOLE INDEXING LAMPS, one for each of the 18 Alarm Annunciators, are mounted on control console #3. These provide quick identification of the Alarm Annuciator involved when an alarm occurs or clears.

The following distinctive modes of operation are provided for each of the 382 points.

	RED LAMP	GREEN LAMP	ALARM HORN	CLEAR-ANCE GONG	CONSOLE INDEXING LAMP
NORMAL	OFF	ON	OFF	OFF	OFF
ALARM	FAST FLASH	FAST FLASH	ON	OFF	FAST FLASH
ALARM ACKNOWLEDGED	ON	OFF	OFF	OFF	ON
CLEARANCE	OFF	SLOW FLASH	OFF	ON	SLOW FLASH
CLEARANCE ACKNOWLEDGED i.e. Normal	OFF	ON	OFF	OFF	OFF

The clearance gong is single-stroke; the alarm horn is continuous.

The annunciation system provides general annunciation for each of the following multi-point alarm systems:

1. Flow Monitoring system
2. Temperature Monitoring system
3. Temperature Monitoring system

4. Fire Alarm system

5. D_2O Leakage Detectors

6. Multiple System (Temperature)

Details annunciation for these systems is separate, and is not covered by this manual.

2.0 GENERAL DESCRIPTION OF OPERATIONS

The following operations are to be performed on the annunciation system:

1. Identify and acknowledge the occurrence of a trip or alarm condition.

2. Identify and acknowledge the clearance of a trip or alarm condition.

3. Silence the alarm horn. This is done only when immediate action cannot be taken to rectify an alarm condition, and it is not desired to acknowledge the occurrence of the alarm.

4. Test annunciator operation, using the Annunciation Test Pushbutton.

5. Darken specific Alarm Annunciator points during station shutdown conditions, and conversely, to activate these points at an appropriate stage in the start-up sequence.

6. Periodic "TRIP and ALARM TESTS" on each trip and alarm facility.

7. Replace faulty plug-in units immediately and test.

3.0 GENERAL PRECAUTIONS AND HAZARDS

1. An alarm must not be acknowledged i.e. horn silenced and flashing stopped, unless immediate corrective action can be taken. Otherwise, the operator should silence the horn only leaving the flashing alarm condition on so that it will not be ignored indefinitely.

2. Each plug-in relay unit (one per annunciation point) has a toggle switch mounted in front. This switch allows one type of unit to be used with two types of initiating

contact, i.e. closed in the non-fault condition, or open in the non-fault condition. These switches are preset for the type of contact used and ARE NOT TO BE OPERATED. If left in the wrong position, the indicated condition is exactly opposite to the actual condition, i.e. when the annunciator indicates NORMAL, there is actually a FAULT and vice-versa. Consequently, when a plug-in unit is replaced, it is extremely important that the toggle switch be placed in the correct position.

3. Whenever a plug-in relay unit is replaced, the replacement must be tested using the Annunciator Test Pushbutton and the actual condition of the variable for which it provides annunciation must also be checked. Testing is particularly important since it is possible for a faulty replacement unit to cause malfunctioning of other parts of the Annunciation System.

4. The plug-in relay units which are supposed to be darkened when the appropriate Annunciator Shutdown Switch is in the "Standby" position, and those used for fuelling machine alarm annunciation, are wired differently from all the other units. If a unit is replaced for any reason, it is essential that the correct replacement be used. In particular, if one of the Standby types is incorrectly used in a normal position, turning the Shutdown Switch to "Standby" will darken a unit which should never be darkened.

5. TRIP tests must be performed on one trip line at a time, and no ABSOLUTE trips are to exist at the time of test. CONDITIONAL trips may exist on any or all trip lines provided the reactor power is 0.2% of full power or less, and the reactor-boiler regulating system is in it Low Log Power. Low Moderator Level or Shutdown Operating State.

6. If an annunciator nameplate window is removed for any reason, it must be replaced in the original location.

4.0 LOCATION OF EQUIPMENT

Control Console:

Contains the Trip Annunciator and its Alarm Acknowledge, Clearance Acknowledge and Annunciator Test pushbuttons. Each point contains only the Red and Green indicating lamps behind an engraved translucent window. The Relay Unit for each point is located in the Relay Room, and is of the plug-in type.

Control Room Panels:

The 18 Alarm Annunciators, each containing 8 to 21 points, are mounted on the control room panels, along with their Alarm Acknowledge, Clearance Acknowledge and Annunciator Test pushbuttons, and the Annunciator Switches. Each point consists of a plug-in module containing the Red and Green indicating lamps behind an engraved translucent window, and also containing the Relay Unit for that point.

Common Equipment:

The Alarm Horn and Clearance Gong are in the Control Room. The common relays, flasher units, horn and gong contrl unit and all fuses are in the Relay Room.

Power:

The system is supplied by 129 V. D.C. Class I power.