H. B. ROBINSON PLANT - UNIT NO. 2

SYSTEM DESIGN BASIS FOR

DEGRADED GRID VOLTAGE & EMERGENCY POWER SYSTEM MODIFICATION

INDEX

Section	Title
1.0	FUNCTION AND DESIGN REQUIREMENTS
1.1	SYSTEM DESIGN
1.1.1	Degraded Voltage
1.1.2	Load Shedding
1.2	DESIGN REQUIREMENTS
1.2.1	Performance
1.2.2	Codes, Standards, Regulatory Guides
1.2.3	Seismic Criteria
1.2.4	Layout and Arrangement Requirements
1.2.5	Operational Requirements
1.2.6	Redundancy
1.2.7	Test Requirements
2.0	DESIGN DESCRIPTION
2.1	DETAILED DESIGN DESCRIPTION
2.1.1	Degraded Voltage
2.1.2	Load Shedding
2.2	SAFETY PERFORMANCE
2.3	COMPONENT DESIGN DESCRIPTION
2.3.1	Potential Transformer
2.3.2	Timed Undervoltage Relay
2.3.3	Timed Delay Relay
2.3.4	Auxiliary Relay
3.0	EQUIPMENT SETPOINTS

1.0 FUNCTION AND DESIGN REQUIREMENTS

1.1 SYSTEM FUNCTION

1.1.1 Degraded Voltage

Provide a second level of the voltage protection to prevent failure of safety related equipment due to voltage degradation.

1.1.2 Load Shedding

Provide a means to prevent automatic load shedding of the emergency buses once the diesel generators are supplying power to all sequenced load on the emergency buses.

1.2 DESIGN REQUIREMENTS

1.2.1 Performance

Degraded voltage relays will monitor the voltage on the 480 volt emergency buses through 480-120 volt potential transformers and output a tripped signal when voltage is below the relay setpoint for a specific time limit.

1.2.2 Codes, Standards, Regulatory Guides

The modification shall satisfy the following requirements, as applicable:

A. IEEE 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations."

B. General Design Criterion 17, "Electric Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants" of 10CFR, Part 50.

C. Nuclear Regulatory Commission "Safety Evaluation and Statement of Staff Positions Relative to Emergency Power Systems for Operating Reactors" Positions 1 and 2.

D. IEEE "Proposed Standard for Seismic Testing of Relays" P501/D9 dated January, 1977.

E. Regulatory Guide 1.30 (Safety Guide 30) - Quality Assurance Requirements for Installation, Inpsection, and Testing of Instrumentation and Electric Equipment (Endorses ANSI N45.2.4 - 1972).

1.2.3 Seismic Criteria

Timed undervoltage relay shall be classified IE and shall be seismically qualified to IEEE "Proposed Standards for Seismic Testing of Relays" P501/D11 dated September, 1977. Seismic qualification and quality assurance documentation is required.

Potential transformers, test switches, fuses and blocks, auxiliary and time delay relays shall be identical to that equipment installed within existing switchgear.

1.2.4 Layout and Arrangement Requirements

Potential transformers, degraded voltage protective relays and timing relays shall be mounted on/within 480 volt emergency bus switchgear compartments 18A and 28A.

1.2.5 Operational Requirements

1.2.5.1 Degraded Voltage

The degraded voltage protective relays will be calibrated to output a trip signal to the 480 volt emergency bus incoming line breaker whenever voltage and time limits are exceeded.

1.2.5.2 Load Shedding

Operation of existing undervoltage relays which initiate load shedding shall be blocked when the diesel generator is supplying power to sequenced loads on the emergency buses.

1.2.6 REDUNDANCY

Provide 3 degraded voltage relays for each emergency bus and connect in a two out of three logic diagram.

1.2.7 Test Requirements

Provide test capability such that degraded voltagerelays can be calibrated and tested without removing system from operation or blocking ability of relays to perform their protective function.

2.0 DESIGN DESCRIPTION

2.1 DETAILED DESIGN DESCRIPTION

2.1.1 Degraded Voltage

Three phase potential transformers will be added to each 480 volt emergency bus. The potential transformers will be connected to three (3) definite time undervoltage relays. The undervoltage relays will be connected in a two out of three logic scheme and will trip the emergency bus incoming line breaker (52-18B, 52-28B) if the voltage is below the relay setpoint for a definite time delay. Provisions are included in this scheme for testing each relay and for placing each channel in a trip condition by opening the test switches

which bypass the contacts of an inoperable relay. The relay setpoint is slightly above system voltage required to maintain 84 percent voltage on the safety related motor control centers, to ensure no safety related equipment can be damaged by a degraded system. (This voltage level is required to ensure start of pick up when energized. If the starter fails to pick up due to low voltage, the 480 volt emergency bus incoming line breaker must trip). An additional time relay is included to allow approximately two seconds for the undervoltage relays to reset when the voltage is established by clearing the emergency bus incoming line breaker.

2.1.2 Load Shedding

An auxiliary relay (2 N. O. and 2 N. C. contact) will be connected into the control circuitry of each diesel generator breaker (52-17B and 52-27B). A "b" contact of the diesel generator breaker control circuit auxiliary relay will be connected in series with the emergency bus undervoltage relays pickup coils (CV-7) to prevent load shedding actuated by the undervoltage relay when the emergency bus is fed from the diesel generator.

2.2 SAFETY PERFORMANCE

2.2.1 The undervoltage relays will be set to output a trip signal when the 480 volt emergency switchgear bus voltage is below 86 percent for 10 seconds.

2.3 COMPONENT DESIGN DESCRIPTION

2.3.1 Potential Transformer

A. Westinghouse Type EMP
B. 480/120 Volts

2.3.2 Timed Undervoltage Relay

A.	ITE Type ITE-27D or equivalent	
B.	Coil rating	0-160 volts a.c.
C.	Frequency	60 hertz.
D.	Output content rating	125 volts d.c.

2.3.3 Timed Delay Relay

A.	Agastat Type 7022PB	
B.	Coil rating	125 volts d.c.
C.	Time delay	0.5-5 seconds dropout

2.3.4 Auxiliary Relay

A.	Westinghouse Type SG	
B.	Coil rating	125 volts d.c.

3.0 EQUIPMENT SETPOINTS

A. Undervoltage relay dropout voltage calibration: 103 volts ± 0.25 volts
B. Undervoltage relay time delay: 10 seconds ± 0.5 seconds
C. Time delay dropout relay calibration: 2 seconds ± 0.5 seconds