

SCOPE

- I 1.1 This practice covers the design and protection of instrument power branch circuits from the electrical power distribution panel (or transfer switch panel) of [IP 16-8-1](#) to the instrument loads (e.g., individual instrument components, the power supplies of instrument systems, and the power sub-distribution and protection within instrument panels, consoles, and systems).
- I 1.2 This practice **does not** cover electrical power distribution panels, transfer switches, and associated circuit protection included in [IP 16-8-1](#), "Instrument and Essential Services Power Supplies."
- I 1.3 **An asterisk (*)** indicates that either a decision by the Owner's Engineer or Purchaser is required, that additional information is to be furnished by the Owner's Engineer, or that information for Owner's Engineer approval is to be supplied by the vendor or Purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists practices which shall be used with this practice.
- I ↕ * 2.2 **Table 2** lists additional practices and standards which shall be used as specified by the Owner's Engineer.

TABLE 1

PRACTICES	
IP 14-3-1	Fireproofing
IP 15-6-2	Environmental Protection for Instrumentation
IP 15-10-1	Instrument Transmission Systems
IP 16-1-1	Area Classification and Related Electrical Design for Flammable Liquids, Gases or Vapors
IP 16-3-1	Wiring Methods and Material Selection
IP 16-4-1	Grounding and Overvoltage Protection
IP 16-8-1	Instrument and Essential Services Power Supplies

TABLE 2

PRACTICES	
IP 15-6-3	Programmable Logic Controllers
IP 15-7-2	Protective Systems
IP 15-7-3	Alarm Systems
IP 15-9-2	Motor Actuators for Valves
IP 15-11-1	Instrument Control Panels
STANDARDS	
National Electrical Codes	
ANSI / NFPA 70	National Electric Code (NEC)
CSA C22.1	Canadian Electrical Code (CEC) - Part I

DEFINITIONS

- I 3.1 **Control loops** are defined as the combination of one or more field sensors, one or more controllers, one or more final elements and accessories where automatic action or manipulation of the process occurs to achieve some desired result.
- I 3.2 **Controllers** are defined as instrument devices that receive one or more process variables from field sensors or other controllers (cascades) and generate an output process control signal according to a specified algorithm. A controller may serve one or more control loops.
- I 3.3 **Field Instruments** are defined as field sensors, final elements, and their accessories.
- I 3.4 **Fuse/breaker coordination** is the selective sequencing of electrical circuit protective devices (fuses and circuit breakers) which causes the correct branch circuit protective device to operate under fault conditions to safely isolate the fault before causing damage to the protected equipment and without causing other protective devices to operate.

IP 15-7-1		Electric Power Branch Circuit Design for Instrumentation (This practice is appropriate for attachment to Inquiry or Purchase Document)	EXXON INTERNATIONAL PRACTICE
Page 2 of 3			
Rev. 1	March 1998		

- I 3.5 **Instrument modules**, for the purposes of this practice, are major subcomponents of **instrument systems** that are either common to or provide functionality to more than one control or non-control loop. Examples of **instrument modules** are cards in a DCS, in a protective system, or in an alarm cabinet.
- I 3.6 **Instrument Systems** are defined as an interrelated group of modules, controllers and/or monitoring devices which are connected to the process through field instruments, housed in one or more interconnected enclosures, racks, or cabinets, and designed to perform an integrated task. Examples include Protective Systems, Alarm Systems, Digital Control Systems, Digital Variable Indicating Systems, Automatic Tank Gauging Systems, Programmable Logic Control Systems, Sequencer/Batch Control Systems, Truck/Railcar Loading Systems, Metering Systems, and Instrument Control Panels.
- I 3.7 **Monitoring Devices** are defined as instrument devices that receive one or more process variables from field sensors for operator display in the control room or in the field. A monitoring device may serve one or more Non-Control loops.
- I 3.8 **Non-Control loops** are defined as the combination of one or more field sensors, one or more monitoring devices and accessories which perform only monitoring functions; no automatic action or manipulation of the process is taken.

BASIC BRANCH CIRCUIT PROTECTION

- O,M 4.1 **Electric power distribution circuit design for instrumentation** shall be **divided into branch circuits** which are **individually protected** from overcurrent.
- R,M 4.2 **For branch circuits which supply individual instrument loop controllers/monitors**, each branch circuit shall not supply more than one control loop, not more than six non-control loops, or not more than one non-control device such as a multipoint temperature indicator or recorder.
- S,R 4.3 **Each separate instrument module** shall be provided with **fuse protection** which shall be capable of isolating a fault before causing damage to the instrument.
- M 4.4 **A branch circuit directory** identifying each circuit and all instrument modules associated with each circuit shall be provided at each branch circuit panel board or equipment cabinet containing more than one circuit breaker or fuse.
- O,R ♦ 4.5 **A branch circuit protective device** shall be a fuse or a circuit breaker having a time-current selectivity which assures the following:
 - S a. Proper fuse/breaker coordination to isolate a fault.
 - b. Ability to withstand all design normal operating and inrush loads without causing it to operate.
 - c. Ability to withstand a fault in an individual instrument circuit, which shall be protected by its own fuse, without causing the branch circuit device to operate. This usually dictates that an individual instrument shall be protected by a fast or normal blow fuse, while its upstream branch circuit protective device supplying other instruments should be a slow-blow fuse or circuit breaker of the correct higher rating to ensure proper selectivity.
- S,O 4.6 **For grounded systems**, branch circuit protective devices may be single pole in the ungrounded lead. **For ungrounded systems**, double pole devices are required.
- M ♦ * 4.7 **A branch circuit disconnect switch** is required for **each branch circuit protected by a fuse**. The switch shall be connected on the power source side of the fuses. Disconnect-type fuse holders may be used instead of a disconnect switch on low current circuits, subject to the approval of the Owner's Engineer.
 - a. **For grounded systems**, the disconnect switch may be single pole in the fused ungrounded lead.
 - b. **For ungrounded systems**, the disconnect switch shall be double pole.
- O,C 4.8 **Power distribution branch circuit panelboards** shall incorporate a minimum of **20% spare panel board branch circuit disconnect switches or breakers** at the time of installation.
- O 4.9 **Convenience outlets** shall not be provided on branch circuits supplied from Class I and II instrument power supplies per **IP 16-8-1, Figure 3b or 3c**.
- O * 4.10 Proposals to use circuit breakers for protection where **static switches or inverters** are used require the approval of the Owner's Engineer.