

SCOPE

- I ↗ 1.1 This practice covers the design, installation, and operation of process alarm/annunciation systems for control rooms, and for local panels such as compressors, furnaces, and boilers.
- I 1.2 **An asterisk (*)** indicates that a decision by the Owner's Engineer 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 Contractor.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the practices and standards which shall be used with this practice.

TABLE 1

PRACTICES	
IP 15-6-2	Environmental Protection for Instrumentation
IP 15-7-1	Electrical Power Branch Circuit Design for Instrumentation
IP 15-7-2	Protective Systems
IP 15-10-1	Transmission Systems
IP 16-1-1	Area Classification and Related Electrical Design for Flammable Liquids, Gases or Vapors
IP 16-8-1	Instrument Power Supply
IP 20-1-1	Inspection of Equipment and Materials
STANDARD	
ANSI / ISA	
S18.1	Annunciator Sequences and Specifications

DEFINITIONS

- I 3.1 Definitions shall be in accordance with **ANSI / ISA S18.1** except as modified and supplemented below.
- I 3.2 An **Alarm** is a visual and/or audible indication of an abnormal condition which requires attention and/or corrective action. An alarm shall not be used to indicate status only (i.e., information only messages, such as "MOTOR ON").
- I 3.3 A **Pre-Alarm** is an alarm indicating that a process unit or equipment system has reached the point where one or more abnormal conditions exists, and if corrective action is not taken, may lead to automatic protective action by a protective system and/or subsequent alarms.
- I 3.4 A **Local Alarm** is an alarm located within a process unit or on a local control panel rather than in a control room or other remote location. It is usually associated with facilities used to allow start-up/monitoring of an equipment system, such as a compressor, furnace, boiler.
- I 3.5 A **Common Trouble** or **Group Alarm** is a single local and/or remote alarm which is activated whenever one or more of a number of local alarms associated with the same piece of equipment is activated. For example, the vibration sensors on a specific compressor.
- I 3.6 A **Bypass Alarm** is a local and/or remote alarm which is activated whenever any protective system sensor, logic function or actuator is prevented from taking its designed protective action.
- I 3.7 A **Protective System Initiator Alarm** is a local and/or remote alarm which is activated when either a process condition or measurement exceeds a specified safe limit and requests the protective system logic to place the process in its safe state or when a **manual initiator is activated**.
- I 3.8 A **Protective System "Activated" Alarm** is a single local and/or remote alarm which occurs when the protective system logic has activated its final elements to place the process in its safe state.
- I 3.9 An **Annunciator System** is a dedicated device or group of devices that call attention to abnormal changes in process conditions. An annunciator system usually includes sequence logic circuits, labeled visual displays, audible devices, and manually operated pushbuttons. Annunciator systems are typically specified for displaying Priority 1 alarms.
- I 3.10 A **Priority 1 Alarm** is an alarm which indicates the existence of an abnormal condition which may result in unplanned unit shut down, injury to personnel, damage to process equipment, or a major environmental impact. These alarms require immediate action or attention by the console operator. Priority 1 alarms must be operable when the control system operator interface fails.

IP 15-7-3		Alarm Systems	
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

- I 3.11 A **Priority 2 Alarm** indicates the existence of an abnormal condition which may lead to a serious process upset. Prompt operator action or attention is required; however, sufficient time exists to determine the correct course of action. These typically are less critical and need not be operable when the control system interface fails.
- I 3.12 A **Priority 3 Alarm** indicates the existence of an abnormal condition which requires operator attention, but does not present an immediate threat to continued operation and/or plant safety. These may include computer control applications-generated alarms or operator messages.
- I 3.13 A **System Alarm** indicates a malfunction in auxiliary equipment, such as instrumentation hardware, electrical power distribution, instrument/UPS power supply, and environmental/fire detection facilities.
- I * 3.14 **Safety-, health-, or environmental-critical alarms** are generally those which alert the operator of a loss of containment, serious equipment damage, or serious environmental or industrial hygiene risk. **All such alarms shall be identified by the Owner's Engineer.** Alternatively, such alarms may be identified by the Contractor or the process technology licensor, and approved by the Owners Engineer.
- I 3.15 A **Video Display Unit (VDU)** is a software driven device and usually takes the form of a Cathode Ray Tube (CRT), liquid crystal display, or a plasma display.

DESIGN CONSIDERATIONS

GENERAL

- S,O * 4.1 The number of alarms, whether on an annunciator or on a video display, should be sufficient to warn the operator of an abnormal condition which may lead to an emergency situation. Excessive numbers of alarms should be avoided. The number and priority assignment of alarms should be reviewed and approved by the Owner (e.g., Operations, Process Design, Machinery, Instruments, etc.).
- I * 4.2 All alarms, including system alarms, shall be prioritized. The **time available for operator action and the consequence of failure to take corrective action** shall be key factors in determining an alarm's priority. Priority shall be distinguished by display location and/or color. **Audible tones for distinguishing alarm priority** requires Owner's Engineer approval.
- S,O * 4.3 **Priority 1 alarms** shall preferably be displayed on a **hardwired annunciator system**. Alternatively, a dedicated, independent, video display system separate from the distributed control system (DCS) and process control computer may be used with prior approval by the Owner's Engineer. In such a configuration, the alarm status information shall remain available via the control system in the event of a Priority 1 video display failure.
- O 4.4 **Priority 2 and 3 alarms** may be presented on control room video displays associated with digital control systems or process control computer systems. These alarms are typically derived from configured alarm limits on high level analog signals, auxiliary devices, or from field mounted process switches.
- S 4.5 All control center alarms shall be audible, visible, and readable from a manned control console working area.
- O 4.6 When **more than one process unit** is controlled from a given control room, or a control room is divided into different operating consoles, **each operating area or console shall have a distinct audible horn** to differentiate the location.
- O ♦ 4.7 **All Priority 1, 2, 3 and system alarms** shall be logged in the distributed control system or process control computer to allow for **historical event trending where DCS equipment is available**.
- S,O 4.8 All **safety-, health-, or environmental-critical alarm** loops shall be designed to be on-line testable.
- O 4.9 Alarm points displayed at multiple operator interfaces (e.g., local control panel, Priority 1 annunciator, DCS video display, etc.) shall have the same tag number/identifier. The DCS tag identifier is preferred.
- O * 4.10 The required resolution for timestamping alarm events to allow reliable sequence of events determination shall be specified by the Owner.

PRIORITY 1 ANNUNCIATORS

- S,O ♦ 4.11 **Priority 1 annunciator systems** and **individual Priority 1 alarm points** shall be designed to remain operable regardless of **any** failure of the process control system.
- O ♦ 4.12 **Priority 1 annunciator systems** shall be provided with features (e.g., auxiliary contacts) to meet data logging or historization requirements using the digital control system or process control computer. **Retransmitted Priority 1 alarms shall not initiate additional audible alarms.**
- M * 4.13 **Priority 1 annunciator systems** shall be of a modular construction. Alarm circuit card or lamp replacement should not require powering down the system or the use of special extraction tools or equipment. Flasher units and relays shall be of the plug-in type. Other designs require the approval of the Owner's Engineer.