Alarm Philosophy Document Template

Prepared for:

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Distribution:

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Table of Contents

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Table of Figures

List of Tables

Notes for the User: (Section to be removed from customer's final version)

The standard ANSI/ISA-18.2 -2009 "Management of Alarm Systems for the Process Industries" provides requirements and recommendations for the content that should be included in an alarm philosophy document.

ALARM PHILOSOPHY CONTENTS	REQUIRED	RECOMMENDED
Purpose of alarm system	Yes	
Definitions	Yes	
References		Yes
Roles and responsibilities for alarm management	Yes	
Alarm design principles	Yes	
Rationalization	Yes	
Alarm class definition	Yes	
Highly managed alarms (or site equivalent)		Yes
HMI design guidance	Yes	
Alarm setpoint determination		Yes
Prioritization method	Yes	
Alarm system performance monitoring	Yes	
Alarm system maintenance	Yes	
Testing of alarms	Yes	
Approved advanced alarm management techniques		Yes
Alarm documentation		Yes
Implementation guidance	Yes	
Management of change	Yes	
Training	Yes	
Alarm history preservation	Yes	
Related site procedures		Yes
Special Alarm Design Considerations		Yes

Required and Recommended Alarm Philosophy Content

This alarm philosophy template has been designed to maximize traceability to the requirements of ISA-18.2 (making it easy to demonstrate compliance) and to make it easy for organizations to adapt it to their specific operational practices and requirements.

Notes on Format of the Document:

Comments in red *describe the expectations of what could / should be documented in each section. These should be deleted before publication of the document.*

Comments in black represent example boilerplate text that can be used as is, deleted, or modified accordingly to fit the customer's requirements.

Text highlighted in yellow represents content that should be reviewed thoroughly and modified to reflect client requirements and practices (i.e. requires an explicit decision regarding applicability).

In some cases alternative wording (with varying levels of detail) have been provided. Sections containing optional details are indicated as shown below.

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Optional details

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The following documents were used in the preparation of this alarm philosophy **template**.

Standards		
[N1]	ANSI/ISA-18.2-2009 (ISA-18.2)	Management of Alarm Systems for the Process Industries
[N2]	IEC 61508	Functional Safety of Electric/Electronic/Programmable Electronic Safety-Related Systems
[N3]	ISA 84.01 / IEC 61511	Functional Safety: Safety Instrumented Systems for the Process Industry Sector
References and Industry Guidelines		
[I1]	EEMUA 191, Alarm Systems: A Guide to Design, Management, and Procurement Edition 2, The Engineering Equipment and Materials Users Association, 2007	
[I2]	ASM Consortium Guidelines: Effective Alarm Management Practices, ASM Consortium (2009)	
[I4]	Hollifield, B. and Habibi, E., "Alarm Management: A Comprehensive Guide, Second Edition," ISA, 2011	
[I5]	Rothenberg, D., "Alarm Management for Process Control", Momentum Press, 2009.	
[I8]	ISA-18.2 Technical Report 1: Alarm Philosophy [TR1], Draft 2010	
[I9]	ISA-18.2 Technical Report 2: Alarm Identification and Rationalization [TR2], Draft 2010	
[I10]	ISA-18.2 Technical Report 3: Basic Alarm Design [TR3], Draft 2010	
[I11]	ISA-18.2 Technical Report 4: Enhanced and Advanced Alarm Methods [TR4], Draft 2010	

1 Purpose and Use of an Alarm Philosophy

An alarm philosophy is a document that establishes the basic definitions, principles, and processes to design, implement, and maintain an alarm system. It is the cornerstone of an effective alarm management program. Document the purpose and use of the alarm philosophy document.

This alarm philosophy establishes the basic definitions, principles, and processes for the design, implementation, maintenance, and management of alarm system(s). It contains the alarm system performance goals and describes the key work practices, roles and responsibilities. This document provides guidance for a consistent approach to alarm management and defines how the activities of the alarm management lifecycle will be followed.

A written philosophy on alarm management is critical to creating and maintaining an effective alarm system over time. A documented alarm philosophy promotes:

a) consistency of alarm design and presentation
b) agreement with corporate risk management goals/objectives
c) agreement with good engineering practices
d) efficient alarm rationalization and design activities
e) effective operator response to alarms.

The philosophy provides a consistent and optimum basis for:

- Identification and classification of alarms
- Justification of alarms to confirm or establish that they are required
- Prioritization of alarms
- Specification of alarm conditions and settings
- Design of alarms
- Implementation and testing of alarms prior to service
- Commissioning of alarms and alarm changes
- Training in the use, maintenance, testing & modification of alarms
- Operation and use of alarms during normal and abnormal conditions
- Maintenance and testing of alarms during service
- Management of change for alarm systems
- Performance monitoring and assessment of alarm system performance

1.1 Scope

Document the scope and target audience of the alarm philosophy document, including how the requirements and recommendations should be applied to all new and existing systems.

The document pertains to all personnel involved in the design, implementation, operation, maintenance, and modification of new and existing alarm systems. It is intended for both in-house use and contractor use. The guidelines in this document apply to alarms originating from the following systems:

a) Process control systems (also called basic process control systems)

b) Protective systems (also called safety instrumented systems, process shut down systems, emergency shut down systems, shut down systems, or process safety systems)
c) Fire & gas detection systems
d) Burner management systems
e) Equipment protection systems (e.g. vibration alarms)
f) Utility and services warning systems and diagnostics (e.g. electrical system malfunction warning)
g) Packaged control systems and associated unit control panels

The following types of alarm system are considered outside the scope of this document:

a) Domestic systems (e.g. septic tank)
b) Intruder and security alarms
c) Manually operated alarms (e.g. evacuation alarms)
d) Portable alarm systems (e.g. confined space testing, personal radiation monitors)
e) Local alarms (as opposed to those annunciating in the control room)

The philosophy shall be applied retroactively as far as reasonably practical.

1.2 Assumptions

The following assumptions are made in order to successfully implement the principles of this document:

- Plants shall be designed to be inherently safe without the need for alarms whenever possible.
- No amount of alarm management will replace the surveillance of a competent operator.
- Operators will respond to all annunciated alarms, regardless of priority.
- Systems will be designed (or retroactively modified) so the operator is capable of effectively responding to all alarms in all anticipated scenarios. Operators (and all associated personnel) will be trained on the relevant parts of the alarm system for the plants they operate.
- It will be subject to periodic review and revision as part of an audit process,
- This philosophy will be kept evergreen to reflect best corporate & industry practice as well as all appropriate national & international regulations.

2 Alarm Management Principles

The advent of computer based control systems has created a situation where it is possible to configure large numbers of alarms with minimal cost or consideration as to whether they are truly necessary. Historically, alarms have also been created in an unstructured manner. This has resulted in:

- Too many alarms being configured (e.g., alarms that do not have associated operator actions).
- Alarms being ill defined (e.g., alarms given incorrect priorities).
- Poor alarm system performance (e.g., bad actors, increased potential for alarm floods).
- Increased potential for operator error (e.g., operator missing an important alarm during a flood or taking incorrect action based on a received alarm).
- Significant demand on operator and engineer resources and additional costs to rectify alarm performance problems.

2.1 Purpose and Goals of the Alarm System

The philosophy should document the purpose and the objectives of the alarm system and for alarm management in general as a means of helping to gain alignment and consistency amongst plant personnel and management. Facilities typically institute alarm systems to meet operating goals on one or more of the following:

- *Safety, health, and environmental*
- *Reliability*
- *Product quality*
- *Production rate, and*
- *Efficiency*

The purpose of the alarm system is to notify the operator of abnormal situations requiring timely operator action and to direct their attention so that they can take corrective action and prevent an undesired consequence. The alarm system must be designed for effective handling of a single alarm during normal operation and the handling of many alarms during a major plant upset.

2.2 Operator Notifications

Alarm systems are often used to notify operators of events that do not meet the criteria for being an alarm. The philosophy should clearly articulate the different types of events and specify how to treat each one.

Operator notifications can represent abnormal or expected events and may or may not require an operator action. This philosophy will define four types of notification:

Event	Operator Action Required	No Operator Action Required (Informational)
Abnormal	Alarm	Alert
Expected	Prompt	Message

Table 1 - Types of Operator Notification

Each operator notification will be managed differently, as required by the risks and potential consequences of the situation. Systems and equipment employed to inform the operator of a change in state of the facility shall be designed so that incoming notifications do not overwhelm but help lead the operator to appropriate action.

2.2.1 Definition of an Alarm

The alarm philosophy should contain the definition of an alarm as it applies to a particular organization's operation.

Alarms will meet the definition and specific criteria defined below:

1) **An alarm is an audible and/or visible means of indicating -** *There must be an indication of the alarm. An alarm limit can be configured to generate control actions or log data but if this limit is not audibly or visually indicated it should not be considered an alarm.*

2) **to the operator -** *The indication must be targeted to the operator to be an alarm, not to provide information to an engineer, maintenance technician, or manager.*

3) **an equipment malfunction, process deviation, or abnormal condition -** *The alarm must indicate a problem, not a normal process condition or normal operational event (e.g., pump stopped,valve closed). The automation system should be configured to determine if any events have occurred unexpectedly (i.e., are "abnormal"). If an unexpected or abnormal event has occurred and operator action is required, this notification should be classified as an alarm. (See Figure 1)*

4) **requiring a response.** - *There must be a defined operator response to correct the condition and bring the process back to a desired (safe and/or productive) state. If the operator does not need to respond, then the condition should not be an alarm. A notification that has no associated operator action should be defined as an alert or message. Acknowledging the alarm or logging a measurement is not considered an operator response (does not correct the abnormal situation). Typical operator responses to alarm include:*
   - *Request field operator to close a valve.*
   - *Change the setpoint or output of a controller.*
   - *Start a backup pump.*
   - *Raise a corrective action work order.*

2.2.2 Other Notification Types

Notifications that do not meet the criteria for being an alarm fall into several categories.

Alert - An audible and/or visible means of indicating to the operator an abnormal equipment or process condition that requires awareness. An alert will be indicated separately (segregated) from an alarm indication.

Prompt - A notification which requires an action to be taken by the operator as part of normal operation (e.g., start sequence when ready, take a sample, add material A).

Message - Provides information about the status of normal operations that does not require the operator to act. As an example, when a process or piece of equipment has moved from one mode of operation to another, it may

be desirable to inform the operator of this progress with a message (e.g., "Moving from Online to Regeneration Phase" or heater start-up sequence moving from purge to ready for ignition).

Events - Used for automated logging of discrete changes to the system or process (e.g., plant equipment state changes, trips, alarm activation, and acknowledge). They are used primarily for review and analysis (e.g., for post incident analysis). Equipment and process events should be elevated to an alarm if there is an associated operator action(s).

2.3 Alarm Design Principles

The alarm philosophy should establish the core alarm design principles to whatever degree is appropriate for the target audience of the document.

The following basic alarm principles should be applied to alarm design and configuration:

- **Each alarm should alert, inform and guide**.

  The information presented to the operator should not simply be the tag number of the measuring or sensing instrument but shall (where possible) offer an indication of what has gone wrong and also why it has occurred.

- **Every alarm presented to the operator should be relevant and unique.**

  Alarms should be designed so that they are worthy of operator action in all plant states and operating conditions in which they are displayed. Each configured alarm shall be unambiguous and not duplicated by other alarms. Multiple alarms should not be annunciated for a single problem / event such as those requiring the same operator action.

- **Every alarm should have a defined (required) response.**

  If there is no associated operator action then the condition should not be configured as an alarm. An alternative notification type (such as an alert) should be considered.

- **Adequate time should be allowed for the operator to analyze the situation and carry out a defined response.**

  Operator response time includes the time to diagnose the problem and perform the corrective actions. A typical response could include troubleshooting, leaving the control room, contacting other personnel, and performing a manual task (such as closing a manual shut-off valve).

- **Alarms should be explicitly designed to take into account human limitations**.

  The number (volume) and rate (flow) of alarms should be presented to the operator in a way that they can effectively respond to all alarms as well as carrying out their other duties.

Alarms shall comply with the following characteristics:

- Relevant: not spurious or of low operational value
- Unique: not duplicating another alarm
- Timely: not too long before any response is needed or too late to do anything
- Prioritized: indicating the importance for the operator to deal with the problem
- Understandable: having a message which is clear and easy to understand
- Diagnostic: identifying the problem that has occurred
- Advisory: indicative of the action to be taken
- Focusing: drawing attention to the most important issues

2.4 Alarm Management Lifecycle

Alarm management is an ongoing process that is never completed. The work process for effective alarm management is defined by an alarm management lifecycle as described in the ISA-18.2 standard. The key activities of alarm management are executed in the different stages of the lifecycle. The products of each stage are the inputs for the activities of the next stage.

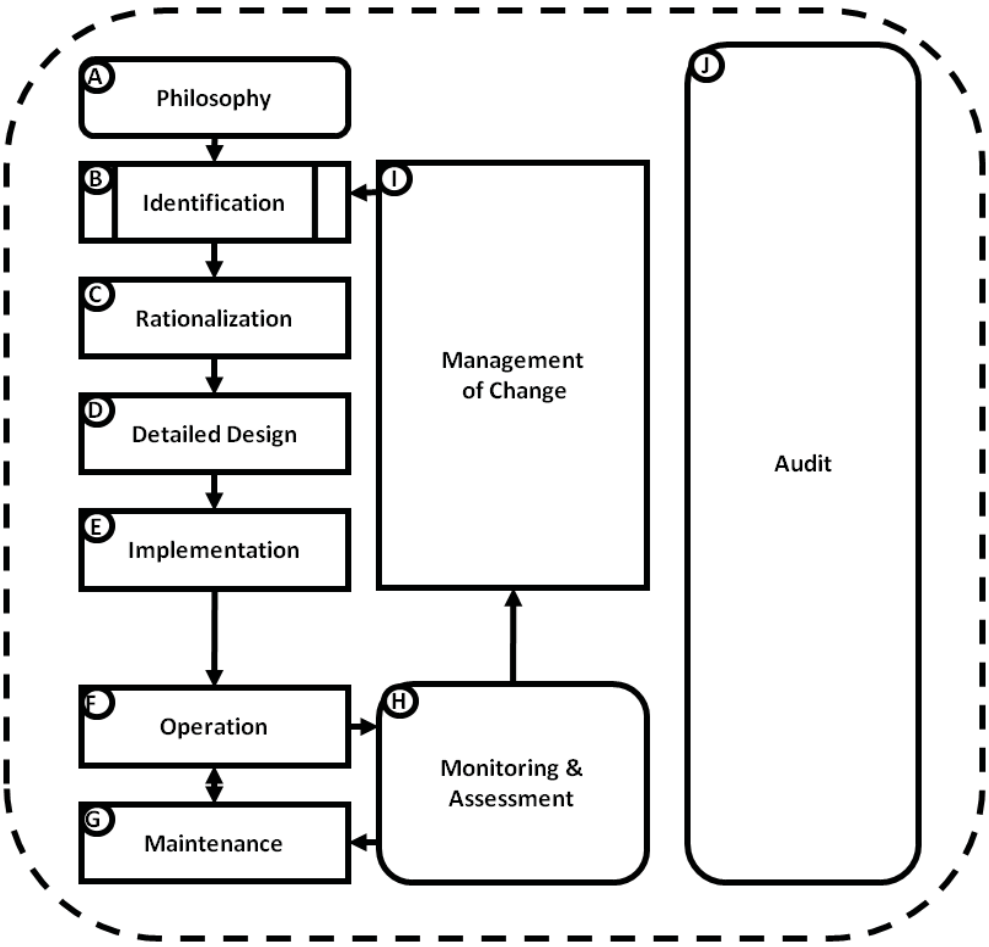

Figure 1 - Alarm Management Lifecycle per ISA-18.2

Stage	Activity	Inputs	Outputs
Philosophy	Define processes for alarm management and alarm system requirement specification (ASRS).	Corporate risk management goals/objectives, industry best practices, good engineering practices, alarm management standards.	Alarm philosophy and alarm system requirement specification.
Identification	Determine potential alarms.	Existing alarm database, critical operating limits, key process parameter limits, PHA / LOPA report, incident investigations, P&IDs, operating procedures, safety requirement specifications, etc…	List of potential alarms.
Rationalization	Rationalization, classification, prioritization, and documentation.	Alarm philosophy and list of potential alarms.	Master alarm database, alarm design requirements.
Detailed Design	Basic alarm design, HMI design, and advanced alarming design	Master alarm database, alarm design requirements.	Completed alarm design.
Implementation	Install alarms, initial testing, and initial training.	Completed alarm design and master alarm database.	Operational alarms, Alarm response procedures.
Operation	Operator responds to alarms, refresher training.	Operational alarms, alarm response procedures.	Alarm event data.
Maintenance	Inspection, repair and replacement, periodic testing.	Alarm monitoring reports, alarm philosophy, inspection and testing procedures .	Alarm reliability data.
Monitoring & Assessment	Monitor alarm data and report performance.	Alarm event and reliability data and alarm philosophy.	Alarm monitoring reports, proposed changes.
Management of Change	Process to authorize additions, modifications, and deletions of alarms.	Alarm philosophy, proposed changes.	Authorized alarm changes.
Audit	Periodic audit of alarm management processes	Standards, alarm philosophy, and audit protocol	Recommendations for improvement

Table 2 - Alarm Management Lifecycle Definitions & Description

9 Alarm System Implementation, Operation, and Maintenance

The testing and training activities of the implementation stage of the alarm lifecycle are also performed during the stages of operation and maintenance. However, the timing and personnel are usually different. The alarm philosophy should address some key elements of these activities, including:

- *Operating procedures,*
- *Training related to alarms,*
- *Testing of alarms,*
- *Alarm shelving procedure,*
- *Alarm out-of-service procedure,*
- *Incident investigation practices,*
- *Alarm system chronology.*

Many of these activities will follow site procedures which are much more broadly applicable than the limited scope of the alarm system. Where this is the case, the alarm philosophy should state that the activity is performed as part of another function.

9.1 Alarm Commissioning practices

Typically there is a site commissioning procedure in place. The alarm philosophy should not specify details of the site commissioning procedure, only additional information related to alarms, which should also be included in the commissioning procedure.

During commissioning, the system designer shall ensure that alarm settings defined in the master alarm database are implemented and that the design is consistent with the alarm philosophy document.

Prior to putting the alarm system into service it shall be installed, inspected, and tested to ensure that it operates correctly (even if it has passed the acceptance testing at the manufacturer).

During commissioning, the response time of the operator shall be confirmed for all IPL alarms and any process alarms that are deemed sufficiently significant.

9.2 Alarm System Testing

The testing requirements for alarms are typically determined by the alarm class. The alarm philosophy may document the testing requirements for each class or reference other site procedures that specify testing requirements and methods.

Routine testing of alarm detection (instruments) and presentation (annunciators and computer displays) shall be performed to assure the reliability of the alarm system. The testing requirements for alarms are dictated based on alarm classification. Test criteria shall be clearly documented to show what is considered a passed test (with suitable tolerances). All test results shall be recorded and all failures shall be explained with a documented strategy or plan for rectification and re-testing.

Alarm testing should include:

- Verification of the alarm limit or logical condition
- Verification of the alarm priority
- Verification of the audible and visual indications for the alarm
- Verification of any other functional requirement for the alarm as specified
- Requirements based on alarm classification
- Requirements based on management of change policies
- Point-to-Point check (loop or function check) as required
- Advanced alarming techniques, if implemented

During testing, alarm configuration (e.g., alarm setpoint and priority) should be verified against the master alarm database.

Alarm system testing should include:

- The audible and visual indications for each alarm priority
- The HMI features, such as alarm messages displayed in the alarm summary or equivalent
- The methods for removing an alarm from service
- The methods for alarm suppression
- Any additional functions of enhanced or advanced alarming techniques
- Method of alarm filtering, sorting, linking of alarms to process displays
- Requirements based on management of change policies
- Requirements in the Alarm System Requirements Specification if applicable

Testing should be performed by driving the alarmed process variable into the alarm state. This may be especially appropriate for flow and level alarms. Alarms shall not be tested by altering the alarm setting; this does not confirm that the instrument is capable of achieving the appropriate output. Smart devices shall also not be tested by artificially overwriting the instrument output.

Safety-critical alarms shall be tested end-to-end (from the input screw terminals to the respective process graphic and alarm summary displays) and shall include confirmation that the operator performs the correct response within the required time.

Any modifications to the alarm as a result of successful or unsuccessful testing shall be performed in accordance with the appropriate change management and updated in the master alarm database, even if the alarm system has not yet been commissioned.

All overrides (bypasses) put in place to maintain or test alarms shall be suitably controlled and removed as soon as servicing or testing is complete.

9.3 Maintenance

Regular maintenance and testing is vital to ensure the performance of the alarm system does not degrade throughout the life of the plant, building or system. The philosophy should document expected maintenance practices.

Regular maintenance is vital to ensure the performance of the alarm system does not degrade throughout the life of the plant, building or system. Routine maintenance of all alarms shall be performed to ensure that they will activate as and when required.

9.4 Alarm Shelving

Alarm Shelving is a mechanism, typically initiated manually by the operator, to temporarily suppress an alarm. It is a critical tool for helping an operator respond effectively during a plant upset by hiding less important alarms. The alarm philosophy should include guidance on how and when alarm shelving can be used. Typically the philosophy contains only broad guidance on the use of shelving and references an operating procedure that specifies the method to shelve alarms. There are typically limits on which alarms can be shelved and shelving duration, based on class or priority.

Alarm Shelving is a mechanism, typically initiated manually by the operator, to temporarily suppress an alarm. It is a critical tool for helping an operator respond effectively during a plant upset by hiding less important alarms. If shelving is used, the following shall apply:

a) The operator shall not be able to shelve safety-critical alarms or the highest priority alarms without risk assessment and approval by the shift supervisor.
b) The operator shall be able to shelve medium and low priority alarms without specific approval.
c) The reason for manually shelving an alarm should be logged.
d) Operator shall be able to shelve alarms individually or on a group basis.
e) Operator shall have quick and easy access to the total number of shelved alarms and a list of all shelved alarms.
f) Operator shall be able to easily unshelve one or more alarms simultaneously.
g) At shift changeover, operators shall be required to review the list of shelved alarms.
h) If automatic reset is not available, operating procedures should require the following to be accepted by the oncoming shift at shift changeover:
    - All shelved alarms.
    - When shelving should be removed.
i) Shelving of alarms should be automatically logged as an event by the automation system.
j) Shelved alarms should be automatically reset after a predetermined time, unless confirmed by the operator before the end of the predetermined time.
k) The predetermined time should be a maximum of one working shift.
l) Indication of any shelved alarms should be made on the appropriate automation system process displays.
m) Specific alarms that are commonly shelved shall be treated as “bad actors”, and reasons for their repeated shelving shall be addressed.
n) If operators are routinely shelving alarms during a given operating situation, a review should be conducted to investigate potential improvements (e.g., through changes to alarm settings or use of alarm suppression).

9.5 Alarm Out-of-Service Procedure

The process of placing an alarm out-of-service transitions the alarm from the operation stage to the maintenance stage. The state of out-of-service is not a function of the process equipment, but describes an administrative

process of suppressing (bypassing) an alarm using a permit system. In the maintenance stage, the alarm does not perform its function of indicating the need for the operator to take action.

The philosophy should describe the recommended elements of the procedure to remove an alarm from service and return an alarm to service. Depending on the alarm priority, classification, and time to respond, the act of taking an alarm out of service may necessitate internal administrative procedures to effectively mitigate the hazard during the period which the alarm is out of service. These procedures need to provide clear guidance on who must be notified and what other indication the operator will utilize to avert the existing abnormal situation for the specified alarm. The alarm priority and consequence may be severe enough to require management approval before the operator removes the alarm from service. Typically the philosophy contains only broad guidance on the use of removing an alarm from service and references an operating procedure that specifies the method and authorization requirements to remove an alarm from service.

The operator may take an alarm out of service, or suppress the alarm for an extended period of time, using an authorization process. Alarms are typically taken out of service for repair. Out-of-service requirements for alarms shall be determined by the classification of the alarm and the class requirements as specified in this alarm management philosophy.

Alarms that will be compromised for extended durations shall be examined to determine whether an alternative alarm is necessary. If an interim alarm is necessary, it shall adhere to the alarm class and MOC requirements.

A bypass permit is required to take an alarm out of service. The permit must document:

a) The date the alarm is taken out of service.
b) The reason the alarm is taken out of service.
c) The name of the requester.
d) The name of the authorizer.

Before returning out-of-service alarms to the operational state, operators shall be notified to ensure they are aware of the returning alarm and the removal of the interim methods.

A list of all out-of-service alarms should be readily available to the operator at all times. The operator should review the list at shift handover. Authorization must be obtained each day the alarm is out of service.

9.6 Alarm System Problem Detection and Resolution

The alarm philosophy may include guidance on the alarm system chronology, a logbook that records the problems in the process and in the alarm system identified by the monitoring system, the actions taken to resolve those problems, and the results of the actions. This document or file captures the business value of alarm management practices. There is no set format for an alarm chronology.

9.7 Operator Feedback and Resolution Work Practices

Define the workflow practices for operators to document alarm system issues, provide feedback, and to check on the status of actions.

There should be a suitable procedure or mechanism in place to capture, evaluate and address operator feedback on the operation of the alarm system, which may involve, for example, modification to alarm settings or responses. Operation and maintenance personnel shall be called on to support the review and resolution of alarm system performance issues identified by the monitoring and assessment process including determine bad actors, nuisance alarms, standing alarms and bypassed alarms.

Operator feedback should be obtained (either informally or formally) on a regular basis (at least annually) to ensure the alarm system continues to meet the needs of those who use it most. This feedback will be generally qualitative and should include input on:

- Priority – are any alarm priorities considered too high or too low ?
- Loading - are there too many alarms during normal or abnormal operation ?are there any duplicate alarms ?
- Response – are any alarm response procedures unclear, inadequate, unnecessary or inaccurate ? Is there adequate time to respond to all alarms ?
- HMI – are there any problems with the annunciation or silencing of alarms ?
- Maintenance and management - is there anything that can be improved regarding the maintenance or management of the alarms or alarm system ?

9.8 Alarm System Training

An effective alarm system requires the operator to know the correct action to take in response to each alarm. Initial training should be conducted prior to start-up during the implementation stage. Refresher training should be conducted on an appropriate frequency and is considered an activity in the operations stage. The content and attendance of training shall be documented. The rigor, formality and documentation associated with training may differ depending upon the classification of the alarm.

Typically there is a site training program in place. The alarm philosophy should not specify details of the site training program, only additional information related to alarms, which should also be included in the training program specifications.

Training on the alarm system functionality is sometimes overlooked in training programs. The alarm philosophy should address the need for this training and the topics to be covered.

An effective alarm system requires that the operator know the correct action to take in response to each alarm. Training should cover all realistic operational usage of the alarm system and address not only the system functionality and features but also the principles of the process to ensure a full understanding of 'why' as well as 'what' may happen. Initial training should be conducted prior to placing the alarm in service. Regular refresher training and re-assessment shall be conducted on an appropriate frequency (depending on the alarm's classification).

Operator training on the alarm system shall include the following at a minimum:

- the audible and visual indications for alarms,
- the distinction of alarm priorities,
- the use of the alarm HMI features (e.g., alarm summary sorting and filtering),

- the use of alarm response procedures (if available),
- the approved methods for shelving and suppression,
- the use of advanced alarming applications,
- the approved methods for removing an alarm from service,
- the approved methods for returning an alarm to service,
- the approved procedure for management of change.

For new or modified alarm the operator shall be trained on the following items as documented in the master alarm database:

- Likely causes of the alarm
- Worst Credible consequences of not responding to the alarm
- Time to respond to the alarm (e.g. time available to respond and time required to respond)
- Recommended actions to take in response to the alarm
- Information used to confirm the alarm is valid
- Alarm setpoint
- Alarm priority
- Any advanced alarm handling performed on the alarm

The use of process simulators can assist in training operators in abnormal situations.

Where the responses to alarms are unfamiliar to the operators, then these shall be practiced (wherever practical) before the alarm system is put into service.

9.9 Alarm Response Procedures

Specify what information should be included in the alarm response procedures (cause, consequence, corrective action, etc.,) and the medium and format by which it will be made available to operator (e.g. electronic through the operator interface). Recommended information includes:

- *the alarm type,*
- *alarm setpoint,*
- *potential causes,*
- *consequence of inaction (i.e. not responding or responding incorrectly),*
- *corrective action,*
- *method of confirmation / verification that the alarm is genuine,*
- *allowable response time,*
- *alarm priority,*
- *alarm classification.*

For each alarm, an alarm response procedure shall be developed. Use of alarm response procedures can reduce the time it takes the operator to diagnose the problem and determine the appropriate corrective action, as well as

promote consistency between operators. Responses shall be clear and concise and should reflect the operator's perspective of the process, and not use technical jargon. These procedures will highlight the following information:

- the alarm type,
- alarm setpoint,
- potential causes,
- consequence(s) of inaction,
- corrective action(s),
- method of confirmation / verification that the alarm is genuine,
- allowable response time,
- alarm priority.

Operators shall participate in developing responses to alarms to ensure that the responses are understandable and achievable within the physical and time constraints of the process. All operators shall review the alarm response procedures for their system or area of responsibility. These instructions shall be agreed as understood and achievable prior to putting the alarms into service. This ensures that when alarms are initiated, the operator is capable of performing the response without seeking additional guidance.