



Benchmarking the Department of Energy Integrated Safety Management System to External Safety Management Systems

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EXECUTIVE SUMMARY

The Department of Energy (DOE or Department) instituted Integrated Safety Management (ISM) more than 25 years ago. Since that time, other organizations have developed frameworks for safety management systems (SMS). This paper documents an external SMS review, benchmarking the DOE ISM system to external SMS. This paper outlines the process, key observations, and opportunities for further evaluation by the Department. This effort is the first of a multi-phase initiative focused on identifying opportunities to improve Department-wide safety performance.

The review began with the team identifying external organizations comparable to the Department such as other federal agencies, governing bodies, and consensus standard setting bodies. Next, the team performed a literature review and developed a summary for each organization, distilling information needed to understand the basic features of each SMS model studied. The review concluded with the team comparing each external SMS to the DOE ISM.

The DOE ISM Core Functions and Guiding Principles were found to be evident in all the external SMS reviewed. Many of the external SMSs reviewed also included topical areas not addressed by DOE ISM. This paper highlights the similarities and differences between DOE ISM and external SMSs and identifies aspects of the other systems that DOE can explore, adopt, and implement as the Department systematically reviews ISM. The opportunities include six considerations related to DOE ISM policy, seven ISM framework enhancements, and five opportunities to integrate ISM with other Department programs.

This benchmarking effort signals DOE's commitment to continuous improvement which is a feature of safety management.

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
Army	Department of the Army
ASSP	American Society of Safety Professionals
CFR	Code of Federal Regulations
CNSC	Canada Nuclear Safety Commission
DOE or Department	Department of Energy
FAA	Federal Aviation Administration
IAEA	International Atomic Energy Agency
ILO	United Nations International Labour Organization
ISM	Integrated Safety Management
ISO	International Organization for Standardization
Navy	Department of the Navy
NASA	National Aeronautics and Space Administration
OSHA	Occupational Safety and Health Administration
SMS	Safety Management System
USMC	United States Marine Corps

1 INTRODUCTION

On October 15, 1996, Department of Energy (DOE or Department) formalized its Integrated Safety Management System (ISM) in Policy 450.4A, *Integrated Safety Management Policy*. DOE developed this policy in response to Defense Nuclear Facilities Safety Board Recommendation 95-2. Recommendation 95-2 called for: 1) a formal process to make sure environmental, safety, and health requirements are met; 2) risk-based safety management plans for operations; 3) a list of facilities and activities in order of importance and risk; 4) direction and guidance for the integrated safety management system; and 5) steps to make sure the Department has or will get the technical expertise it needs to do its job well.

The objective of ISM is for the Department and its contractors to systematically integrate safety into management and work practices at all levels supporting mission success while protecting the public, workers, and the environment. The DOE ISM is comprised of seven Guiding Principles and five Core Functions. The ISM Guiding Principles are intended to guide Departmental and contractor actions, from developing safety directives to performing work. The Guiding Principles were developed by a group of safety and management professionals following a review of safety guiding principles in other Department documents and industry safety standards. The ISM five Core Functions are intended to provide the necessary structure for all work activity that could potentially affect the public, workers, and the environment. The DOE ISM Guiding Principles and Core Functions are defined in Policy 450.4A and provided in Appendix B of this paper.

To support continuous improvement, the Department is benchmarking ISM against external safety management systems (SMS). This effort is the first phase of a multi-phase systematic review of the DOE ISM. The purpose of the review is to identify opportunities for future consideration by the Department that would enhance the DOE ISM.

2 METHODS AND LIMITATIONS

The project team compared external SMS to DOE's ISM framework and system. The external systems are categorized into federal agencies, governing bodies, and consensus standards. The entities selected for review had readily accessible safety management systems source documents available online. The consensus standards were purchased.

FEDERAL AGENCIES

The federal agencies selected were chosen based on the agency's mission, operating model, and organizational structure being comparable to DOE's. Selected agencies perform complex technical work of national interest. They are led by their headquarters organization, with geographically dispersed operations managed by local offices. Each agency performs a broad range of activities, from routine housekeeping tasks to highly complex and hazardous operations that, if not appropriately controlled, have the potential to negatively impact workers, neighboring communities, and the environment. The following federal agencies were selected, and a summary of each agency's SMS is provided in a supplemental document to this report:

- Department of the Army (Army)
- Federal Aviation Administration (FAA)
- National Aeronautics and Space Administration (NASA)
- Department of the Navy (Navy)
- United States Marine Corps (USMC)

GOVERNING BODIES

Each governing body selected has a SMS intended for broad application. Two of the governing bodies selected provide specific guidance related to nuclear work while the other two are applicable to any workplace. The governing bodies selected prescribe SMS that are relevant to DOE's operations, e.g., occupational health and safety and nuclear safety. The following governing bodies were selected, and the summary for each SMS is provided in a supplemental document to this report:

- Occupational Safety and Health Administration (OSHA)
- International Atomic Energy Agency (IAEA)
- International Labour Organization (ILO)
- Canadian Nuclear Safety Commission (CNSC)

CONSENSUS STANDARDS

The review team selected two consensus standards that are published by reputable standard-setting organizations. The requirements identified in these standards establish national and international expectations for SMS and contain concepts and principles for SMS at the national and international levels. The following consensus standards were selected, and the summary for each SMS is provided in a supplemental document to this report:

- International Organization for Standardization (ISO) 45001, *Occupational health and safety management systems – Requirements with guidance for use*

- American National Standards Institute (ANSI) / American Society of Safety Professionals (ASSP) Z10.0, *Occupational Health and Safety, Management Systems*

LITERATURE REVIEW

The project team reviewed selected external SMS documentation to identify important elements and common features of each system. These elements and features evolved to be the outline used by the team to summarize each SMS:

- Agency Mission, Implementing Documents (Drivers), Purpose, Scope, and Applicability
- Contractor Applicability
- Safety Management System
- Risk Management, Hazard identification, and Control
- Accountability
- SMS Responsibilities
- Measuring the Performance of the Program
- Measuring the Performance of the System
- Safety Climate

The summaries for each SMS, including DOE ISM, are consolidated in *Safety Management System Review - Supplement, U.S. Department of Energy Integrated Safety Management and External Safety Management Systems*.

BENCHMARKING

The review team developed a list of topical areas and review criteria based on key features of each SMS (Appendix B). The topical areas are different for each group. The review team wrote the review criteria using either definitions supplied in source documents or based on their evaluation of the context of content in the source documents used to review each organizations' SMS. (Appendix A) The review criteria provide additional detail for topical areas that may appear alike.

The team took different approaches to compare each SMS to DOE's ISM framework which facilitated a more refined analysis to identify nuances that may have otherwise gone undiscovered. The federal agency SMS are agency-specific and robust; therefore, all documents supporting the entirety of the SMS were sourced, and all information contained within was used in the comparison. The governing bodies offered high-level as well as industry-specific SMS elements. In contrast, the consensus standards tended to offer general SMS structures on which to build an SMS. The review team relied upon the primary SMS (e.g., requirements) documents describing the SMS frameworks for each governing body and consensus standard.

The review team performed a detailed analysis based on the topical areas identified for DOE ISM and selected federal agencies, governing bodies, and consensus standards. After comparing DOE ISM to each external SMS, the review team expanded the comparison to include additional DOE directives to explore topical areas not captured in DOE ISM directives. This effort proved fruitful as reflected in Appendix C.

LIMITATIONS OF METHODS

The team's comparisons were solely based on a literature review of the publicly available online documents and purchased consensus standards. The review team strived to understand the nuanced content, details, and terminology used within the external organizations' SMS documents; however, experts from the external entities were not used to confirm the review team's interpretations. The review team, which included 3 full-time employees from the Office of Worker Safety and Health Policy, completed this effort in a five-month period.

3 RESULTS

FEDERAL AGENCIES

The DOE ISM Guiding Principles and Core Functions were compared to the SMS of other federal agencies to identify similarities and differences that could be examined more closely in future phases of the systematic review of the DOE ISM. SMS elements from federal agency SMS were similarly compared to the DOE ISM framework. Table 1 presents topical areas highlighted in other agencies' SMS that are not included in DOE's ISM Policy and Order. Table 1 includes instances where the review team identified that three or more of the agencies included a topical area in their SMS that DOE did not address in their ISM. Table 4 (Appendix C) includes a full comparison of the DOE and the five federal agencies SMS studied.

Table 1: Additional Topical Areas Included in Federal Agencies' Safety Management Systems

Topical Area	Army	FAA	NASA	Navy	USMC
Leadership participation	•	•	•	•	•
SMS includes communication process	•	•	•	•	•
SMS promotion and training	•	•	•	•	•
System analysis approach	•	•	•	•	•
Mishap Reporting	•	•	•	•	•
Investigations	•	•	•	•	•
Risk Management System	•	•	•	•	•
Risk Management policy	•	•	•	•	•
Empowerment of workers to raise safety issues (outside culture realm)	•	•	•	•	•
Multi-employer facility coordination	•	•	•	•	
Prescribed frequency for evaluations required (assessments, audits, reviews)	•		•	•	•
Plan-Do-Check-Act	•		•	•	•
SMS identifies level at which risk is accepted	•		•	•	•
SMS requirements are part of Occupational Safety and Health Program requirements document	•		•	•	•
Worker and worker representative participation required			•	•	•
Fitness for duty and mental health			•	•	•
SMS scope includes activities outside of work	•			•	•
SMS requirements document references a SMS consensus standard		• OSHA 3885	• OSHA 3885		• ANSI ASSP

(• = Included in SMS. Blank = Not included in SMS)

The review team identified nine topical areas that are relevant to all five federal agencies but are not addressed by DOE's ISM. These include leadership participation, communication, SMS promotion and training, the use of a systems analysis approach, mishap reporting, investigations, the use of risk management systems, a risk management policy, and workers empowered to raise safety issues. Five topical areas are applied by four of the five agencies: coordination of multi-employer facilities, a

prescriptive evaluation frequency, use of a plan-do-check-act cycle to improve the SMS, specification of the level at which risk is accepted, and the SMS being part of a larger safety and health program requirements document. There were four topical areas applied by three of the five agencies: worker participation required, provisions for fitness for duty and mental health, activities outside work, and the SMS references a consensus standard. Appendix B includes a description of each topical area.

GOVERNING BODIES

The review team compared the Guiding Principles and Core Functions of the DOE ISM to the SMS of governing bodies to identify similarities and differences that could be examined in later phases of the systematic review of the DOE ISM. SMS elements from governing bodies' SMS were similarly compared to the DOE ISM framework. Table 2 presents topical areas highlighted in governing bodies' SMS that are not included in DOE ISM directives. Table 5 (Appendix C) includes a full comparison of the DOE and the four governing bodies SMS studied.

Table 2: Additional Topical Areas Included in Governing Bodies' SMS Frameworks

Topical Area	IAEA	OSHA	ILO	CNSC
SMS Monitoring, Measurement and Assessment	●	●	●	●
Document Control System	●	●	●	●
SMS includes communication process	●	●	●	●
Procurement and Contracting and Contractors	●	●	●	●
Feedback and Improvement to the SMS	●	●	●	●
Emergency Preparedness		●	●	●
OS&H Monitoring, Measurement, and Assessment		●	●	
Quality Assurance	●			●
Culture for Safety	●			●
Worker Participation in SMS (all aspects)		●	●	
SMS Awareness, Training, and Competence	●	●		

(●= Included in SMS. Blank = Not included in SMS)

The review team identified five topical areas that are relevant to all four governing bodies but not covered in the DOE ISM. These include SMS monitoring, measurement, and assessment; use of a document control system; communication; procurement, contracting, and contractors; and feedback and improvement to the SMS. In addition, all four governing bodies allow for their SMS to be part of an overall management system. Emergency preparedness is included in three of the four governing bodies' SMS, and not DOE's ISM. Appendix B includes a description of each topical area.

CONSENSUS STANDARDS

The review team compared the ISM Guiding Principles and Core Functions to two consensus standards for SMS to identify similarities and differences that could be examined more closely in the next steps of the systematic review of the DOE ISM. SMS elements from the consensus standards were similarly compared to the DOE ISM framework. Table 3 presents topical areas highlighted in consensus standards' SMS that are not included in DOE ISM directives. Table 6 (Appendix C) includes a full comparison of the DOE ISM and the two consensus standards SMS studied.

Table 3: Additional Topical Areas Included in Selected Consensus Standards' SMS Frameworks

Topical Area	ANSI/ ASSP	ISO
SMS training and competence	●	●
SMS communication and promotion	●	●
Operational planning and control-- integration of SMS with existing business practices	●	●
Risk assessment	●	●
Routine management review of SMS	●	●
SMS management review of outcomes and follow-up	●	●
Worker participation in SMS (all aspects)	●	●
Organizational learning, continual improvement, and feedback specific to the SMS	●	●
Context of the organization/strategic planning	●	●
Documented information (document control system)	●	●
Emergency preparedness and response	●	●
Ongoing monitoring, measurement, analysis, and performance evaluation (in addition to management review)	●	●
Audit	●	●
Incident investigation and corrective action	●	●
Organizational learning	●	●
Design review and management of change	●	●
Procurement	●	●
Occupational Health	●	●
Contractors	●	●

(●= Included in SMS. Blank = Not included in SMS)

The review team identified nineteen topical areas in the consensus standards that are not addressed in DOE' ISM policy and order. Neither DOE's ISM policy, DOE's ISM order, nor the consensus standards address safety culture as part of their frameworks. The review team expanded their review to include DOE directives and programs outside of the ISM policy and order that address 11 of 19 topical areas. Appendix B includes a description of each topical area.

4 DISCUSSION AND OBSERVATIONS

FEDERAL AGENCIES BENCHMARK

Comparing the DOE ISM framework against other federal agencies' frameworks provided the team insight into what SMSs are expected to include. The elements of DOE's ISM framework are comparable to elements contained in the other federal agencies' systems. Table 4 illustrates that the ISM Guiding Principles and Core Functions are recognizable in other agency systems. Operations authorization, DOE ISM Guiding Principle 7, is not obvious in the other agency systems. This omission could be due to the way terms are defined in the systems, or it could be a result of DOE ISM's focus on activity level work. Table 1 demonstrates that there are differences between the DOE ISM and other SMSs. The significance of these differences cannot be known given the methods used in this study, however the differences are described in the observations below.

The review team developed the following observations for Tables 1 and 4:

- The SMS requirements documents of the other agencies provide information found only in the DOE ISM Guide. This additional detail in agency requirements documents may promote consistent implementation.
- Leadership participation in the other SMS reviewed goes well beyond leaders being responsible and accountable and requires leaders to be directly involved in specific ways.
- All other agency frameworks provided for a formal communication process or procedure to transfer SMS information. Common terminology is adopted by each agency to facilitate clear communication.
- All other agency frameworks included a mechanism for SMS-specific training and promotion.
- All other agency frameworks included a systems approach to safety for hazard identification (e.g., human performance, work environment, and processes) rather than being activity specific.
- All other agency frameworks include a formal mechanism for reporting mishaps and conducting investigations, but the DOE ISM directives do not. However, DOE does have Directives on Occurrence, Injury and Illness Reporting and Accident Investigation outside of ISM (Table 4).
- All other agencies rely on risk management systems as a part of their SMS and have risk management policies. The DOE ISM does not include a formal risk management approach. Four agencies identify the level (who) at which risk can be accepted.
- All other agency frameworks empower employees to report safety related issues. DOE's safety conscious work environment is a similar provision for ISM, but it is not discussed in DOE's ISM policy or order.
- Four agencies included requirements to address multi-employer activities and subcontractor relationships in their systems.
- Four agencies identify timeframes for conducting assessments, audits, and reviews of the SMS. DOE ISM directives do not provide a specific timeframe.
- Four agencies include their SMS as part of their overall worker safety and health program. DOE's worker safety and health programs are in a separate directive and rule.

- Three agencies mandate workers be involved in the SMS and workers are expected to participate in every aspect of the SMS. DOE ISM does not explicitly require worker participation. The formal involvement of employees in SMS is positively viewed by these agencies.
- Three agencies include mental health, fitness for duty, and activities outside of work as part of their SMS. One group within DOE does include mental health and fitness for duty, the Human Reliability Program, but these are not addressed in DOE ISM directives.

GOVERNING BODIES BENCHMARK

Governing bodies' SMS frameworks are intended to apply to many organizations. The broad nature of the governing body frameworks made comparison to DOE ISM straightforward. The DOE ISM Guiding Principles and Core Functions were part of the OSHA and ILO safety management systems, as illustrated in Table 5. However, several differences were observed between DOE ISM, IAEA and CNSC.

This study highlights a smaller number of differences between ISM's framework and the SMS of governing bodies studied. The primary differences result from including a topical element within the SMS framework that DOE has elected to manage outside of ISM. DOE could include these elements (e.g., emergency preparedness, quality, document control system) as part of its ISM framework. Ultimately this could eliminate program stovepipes between offices of principle interest and ensure that safety management is integrated in these other functional areas and programs.

The review team developed the following observations for Tables 2 and 5:

- All four governing bodies include a process(es) to check, analyze, and evaluate their SMS as part of their framework. This is an important feature to ensure their systems are effective and identify opportunities for improvement.
- All governing bodies include SMS document control which is a process to create, maintain, and control documents specified by each SMS.
- Communication is included in all four governing bodies' SMS. This topical area was addressed previously during the federal agencies review.
- All four governing bodies SMS frameworks include requirements for procurement, contracting and contractors. DOE addresses contractors and SMS via a DOE Acquisition Regulation clause and DOE has a separate office which handles procurement.
- All four governing bodies' SMS address feedback and continuous improvement. DOE ISM feedback and continuous improvement relates to the execution of work and is about improving at the activity level.
- Three governing bodies include emergency preparedness in their SMS. DOE's ISM policy and order do not address emergency preparedness. DOE established Order 151.1D, *Comprehensive Emergency Management System*, to address emergency management.

CONSENSUS STANDARDS BENCHMARK

The review team recognized that topical areas are included as part of the ANSI/ASSP and ISO SMS frameworks that are addressed in other DOE policies or orders that are separate from DOE's ISM framework and the ISM source documents. DOE Policy 450.4A did not provide sufficient detail to determine if the ISM framework fully addresses topical areas from ANSI/ASSP and ISO. Additional review

is needed for the topical areas addressed in the consensus standards that are not addressed in DOE's ISM policy and order. Where other DOE directives address these topical areas, these directives should be further evaluated to determine if it is beneficial to harmonize them with ISM.

The review team developed the following observations for Tables 3 and 6 that are not addressed in the discussions of federal agency and governing body SMS above:

- The consensus standards SMS frameworks include SMS training and competence, which is specific to SMS education, training, and competence.
- The consensus standards SMS frameworks include operational planning and control and maintenance of the processes needed to meet SMS requirements including integration of the SMS with existing business practices (e.g., finance, procurement, quality, organizational learning).
- SMS management reviews are part of the consensus standards and promote leaders participating in the outcomes and follow-up for the reviews. Senior managers independently review the SMS on a routine and recurring basis.
- The consensus standards include provisions for performance assessments in addition to management reviews of the SMS. This topical area includes ongoing monitoring, measurement, and performance evaluation (real-time feedback).
- ANSI /ASSP and ISO prescribe a process to prevent and control hazards at the design and redesign stages, and for management of change during all life-cycle phases. Title 10 of the Code of Federal Regulations (10 CFR) 851, Worker Safety and Health Program, and DOE Order 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*, and the ISM Guide address this topical area, but the DOE's ISM policy and order do not.

5 OPPORTUNITIES FOR FURTHER EXPLORATION

The following opportunities were developed from observations of the benchmarking studies. These options are for consideration and further evaluation by the ISM systematic review working group:

POLICY

- Evaluate the DOE ISM Implementation Guide to determine if additional elements should be included in the DOE ISM Order and DEAR Clause.
- Develop a DOE risk management directive to facilitate safety related decision making. Specify what level (who) can accept risk.
- Revise DOE ISM directives to require worker participation in all aspects of ISM.
- Develop specific requirements to address multi-employer worksites. Specifically addressing multi-employer activities and subcontractors in the SMS calls attention to the complex nature of these working relationships (e.g., expectations, boundaries, communication, accountability, etc.) to promote a safer workplace for all involved.
- Revise DOE ISM directives to include a specific timeframe for conducting assessments (including self-assessments), audits, and review of ISM. Alternatively, develop a directive for conducting audits, reviews, and assessments of DOE ISM. Require senior line managers to independently review ISM (conduct assessments) on a routine and recurring basis.
- Integrate DOE ISM with DOE Order 440.1B and 10 CFR 851. Another alternative is to adopt a SMS consensus standard.

ISM FRAMEWORK

- Require more active roles for leaders within the DOE ISM framework.
- Add communication as an element of the DOE ISM framework including adoption of common terminology.
- Add SMS-specific training and promotion to DOE ISM. Require SMS promotion and training that ensures leaders and workers understand the purpose and objectives of the DOE ISM and their roles within the DOE ISM framework.
- Include fitness for duty and mental health as part of the DOE ISM.
- Develop a DOE ISM document control system to include system descriptions, organizational functions, responsibilities, and authorities.
- Require DOE ISM monitoring, measurement, performance evaluation, and independent audits.
- Include organizational culture as an element of the DOE ISM framework.

INTEGRATION OF ISM WITH OTHER DEPARTMENT PROGRAMS

- Expand the DOE ISM to include a systems safety approach rather than an activity approach. This approach emphasizes system design and performance factors, human interfaces, environment, processes, and activities that may improve hazard identification and control.
- Integrate mishap reporting and investigations into the DOE ISM.

- Add a provision in DOE’s ISM policy and order to mandate workers ability to report safety issues without fear of reprisal.
- Integrate the DOE ISM into existing policies and directives to ensure their implementation appropriately reflects ISM to include topical areas such as quality assurance, emergency management, mishap reporting and accident investigation, organizational learning, system design and redesign, and occupational health.
- Integrate the DOE ISM with other business practices and ensure other functional areas (business units) integrate ISM into their work products.

6 RECOMMENDATION

The review team recommends that DOE consider the opportunities in this paper as part of the Department’s ongoing efforts to continuously improve DOE safety management programs and Directives.

7 CONCLUSION

The Office of Worker Safety and Health Policy (EHSS-11), as the Office of Primary Interest (OPI) for the Departmental Directives, Technical Standards, and Regulation on ISM, will collaborate with DOE line management to explore opportunities to enhance applicable policies to support implementation and safe performance of work across the Department.

8 AUTHORS AND CONTRIBUTORS

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Appendix A REFERENCES

FEDERAL AGENCIES

Department of the Army (Army)

- U.S. Army. (2023). The Army's Vision and Strategy. <https://www.army.mil/about/>
- Army Regulation 385-10. (2017). The Army Safety Program.
- Department of the Army Pamphlet 385-10. (2010). Army Safety Program.
- Army Techniques Publication ATP 5-19. (2014). Risk Management.
- Department of the Army Pamphlet 385-16. (2013). System Safety Management Guide.
- U.S. Army Combat Readiness Center. (2022). Annual Assessment of the Army Safety Program, Fiscal Year 2022. <https://safety.army.mil/STATISTICS>
- U.S. Army Combat Readiness Center. (2020). Annual Assessment of the Army Safety Program, Fiscal Year 2020. <https://safety.army.mil/STATISTICS>
- U.S. Army Combat Readiness Center. (2021). Annual Assessment of the Army Safety Program, Fiscal Year 2021. <https://safety.army.mil/STATISTICS>

Federal Aviation Administration (FAA)

- FAA. (2023). *About FAA*. <https://www.faa.gov/about>
- FAA Order 8000.369C. (2020). *Safety Management System*.
- FAA. (2023). *Safety Management System (SMS)*. <https://www.faa.gov/about/initiatives/sms>
- FAA Order 3900.19C. (2019). *Federal Aviation Administration (FAA) Occupational Safety and Health Policy*.
- OSHA 3885. (2016). *Recommended Practices for Safety and Health Programs*.
- FAA. (2022). *Performance and Accountability Report Fiscal Year 2022*. https://www.faa.gov/about/plans_reports/#performance.
- FAA. (2021). *Performance and Accountability Report Fiscal Year 2021*. https://www.faa.gov/about/plans_reports/#performance.
- FAA Order 8040.4B. (2017). *Safety Risk Management Policy*.

National Aeronautics and Space Administration (NASA)

- About NASA. 2023. <https://www.nasa.gov/about/index.html>
- NASA Policy Directive (NPD) 8700.1F. (2022). NASA Policy for Safety and Mission Success.
- NASA Procedural Requirements (NPR) 8715.1B. (2021). NASA Safety and Health Programs.
- NASA Procedural Requirements (NPR) 8000.4C. (2022). Agency Risk Management Procedural Requirements.
- NASA Procedural Requirements (NPR) 8715.3D. (2021). NASA General Safety Program Requirements.

- NASA Procedural Requirements (NPR) 8705.6D. (2019). Safety and Mission Assurance (SMA) Audits, Reviews, and Assessments.
- NASA Safety Center. 2023. https://www.nasa.gov/centers/hq/nsc/knowledge_sharing
- NASA Office of Safety and Mission Excellence. (2023). <https://sma.nasa.gov/>
- NASA Technical Handbook HDBK 8709.24. (2015). NASA Safety Culture Handbook.
- NASA Aerospace Safety Advisory Panel. (2022). Annual Report.

Department of the Navy

- Wikipedia. (2023). United States Department of Navy. https://en.wikipedia.org/wiki/United_States_Department_of_the_Navy
- U.S. Department of Defense. (2021). U.S. Navy 101. https://media.defense.gov/2021/Feb/10/2002580594/-1/-1/0/NAVY101_PRESENTATION_V13.PDF/NAVY101_PRESENTATION_V13.PDF
- OPNAV Manual-5100.23. (2022). Navy Safety and Occupational Health Manual.
- OPNAV Instructions 5100.23H. (2020). Safety and Occupational Health Program.
- OPNAV Manual-5100.23 CH-2. Sep. 5, 2022. Navy Safety and Occupational Health Manual
- OPNAV Instruction 3500.37D. (2018). Navy Lessons Learned Program.
- Naval Safety Center. (2021). Annual Report 2021. <https://navalsafetycommand.navy.mil/Resources/Annual-Reports/>
- Naval Safety Command. (2023). Naval Safety Command Enabling Warfighting Readiness. <https://navalsafetycommand.navy.mil/>

United States Marine Corps

- Marine Corps Purpose. 2023. <https://www.marines.com/about-the-marine-corps/who-are-the-marines/purpose.html>
- Naval Safety Command Enabling Warfighting Readiness. Feb. 7, 2022. Naval Safety Command Established. <https://navalsafetycommand.navy.mil/Media/News/Article/2925703/naval-safety-command-established/>
- Naval Safety Command Enabling Warfighting Readiness. September 14, 2022. New SMS Promotes Safety Mindset, Focus. <https://navalsafetycommand.navy.mil/Media/News/Article/3157826/new-sms-promotes-safety-mindset-focus/>
- OPNAV Manual-5100.23 CH-2. Sep. 5, 2022. Navy Safety and Occupational Health Manual.
- Marine Corps Doctrinal Publications MCDP 1-0. Aug. 9, 2011. Marine Corps Operations.
- Marine Corps Order 5100.29B. Jul. 28, 2011. Marine Corps Safety Program.
- Marine Corps Order 5100.29C, Volume 1. Aug. 5, 2021. Marine Corps Safety Management System Overview.
- Marine Corps Order 5100.29C, Volume 2. Oct. 15, 2020. Risk Management.
- Marine Corps Order 5100.29C Change Transmittal 2. Feb. 8, 2022. Marine Corps Safety Management System (MCSMS).

- Naval Safety Center. 2021. Naval Safety Center Annual Report. <https://navalsafetycommand.navy.mil/Portals/29/Documents/220510-annual-report-2021.pdf>
- Naval Safety Command Enabling Warfighting Readiness. 2023. Resources. <https://navalsafetycommand.navy.mil/>

GOVERNING BODIES

Occupational Safety and Health Administration (OSHA)

- OSHA 3885. (2016). Recommended Practices for Safety and Health Programs.
- OSHA Instruction ADM 04-00-003. (2020). Safety and Health Management System.

International Atomic Energy Agency (IAEA)

- IAEA. (2023). Atoms for Peace. <https://iaea.org>
- IAEA. (2023). List of Member States. <https://iaea.org/about/governance/list-of-member-states>
- IAEA. (2016). IAEA Safety Standards. <https://www-ns.iaea.org/downloads/standards/iaea-safety-standards-brochure.pdf>
- IAEA Safety Standards. (2006). Fundamental Safety Principles No. SF-1.
- IAEA Safety Standards. (2016). Leadership and Management for Safety No. GSR Part 2.
- IAEA Safety Standards. (2006). Application of the Management System for Facilities and Activities Safety Guide No. GS-G-3.1.
- IAEA Safety Standards. (2009). The Management System for Nuclear Installations Safety Guide No. GS-G-3.5.
- IAEA Safety Standards. (2016). Safety Assessment for Facilities and Activities General Safety Requirements No. GSR Part 4 (Rev.1).

International Labor Organization (ILO)

- ILO. (2023). About the ILO. <https://www.ilo.org/global/about-the-ilo/lang-en/index.htm#:~:text=The%20only%20tripartite%20U.N.%20agency,for%20all%20women%20and%20men>.
- ILO. (2009). Guidelines on occupational safety and health management systems ILO-OSH 2001, second edition.
- ILO. (2014). A 5 STEP GUIDE for employers, workers, and their representatives on conducting workplace risk assessments.

Canadian Nuclear Safety Commission (CNSC)

- Statutes of Canada. (1997). Nuclear Safety and Control Act 1997. Nuclear Safety and Control Act (justice.gc.ca)
- CNSC. (2023). Regulatory Framework Overview. <http://www.nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-framework/index.cfm>

- CNSC. (2017). CNSC Regulations, Class I Nuclear Facilities Regulations. SOR-2000-204.pdf (justice.gc.ca)
- CNSC. (2023). CNSC Processes and Practices: Regulatory Fundamentals REGDOC-3.5.3 Version 3. https://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/regdoc-3-5-3-regulatory-fundamentals-v3.pdf
- CNSC. (2022). Reactor Facilities License Application Guide: License to Operate a Nuclear Power Plant, REGDOC-1.1.3, Version 1.2. https://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/REGDOC-1-1-3-licence-application-guide-licence-to-operate-nuclear-power-plant-v1-2.pdf
- CNSC. (2021). Class II Nuclear Facilities License Application Guide: Class II Nuclear Facilities and Prescribed Equipment REGDOC-1.4.1. https://www.nuclearsafety.gc.ca/eng/pdfs/REGDOCS/REGDOC-1-4-1/REGDOC-1_4_1__Class_II_Nuclear_Facilities_and_Prescribed_Equipment.pdf
- CNSC. (2019). Management System REGDOC-2.1.1. http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/REGDOC_2_1_1_Management_System.pdf
- CNSC. (2018). Management System: Safety Culture REGDOC-2.1.2. http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/REGDOC2-1-2-safety-culture-final-eng.pdf
- CNSC. (2016). Glossary of CNSC Terminology REGDOC-3.6. http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/REGDOC-3-6-Glossary-of-CNSC-Terminology-eng.pdf
- CNSC. (2019). Conventional Health, and Safety REGDOC-2.8.1. https://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/REGDOC-2-8-1-Conventional-Health-and-Safety-eng.pdf
- CNSC. (2014). Deterministic Safety Analysis REGDOC-2.4.1. <https://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-4-1/index.cfm>
- CNSC. (2022). Probabilistic Safety Assessment (PSA) for Reactor Facilities, Version 2 REGDOC-2.4.2. <https://www.nuclearsafety.gc.ca/eng/pdfs/regulatory-documents/regdoc2-4-2/REGDOC-2-4-2-Probabilistic-Safety-Assessment-PSA-for-Reactor-Facilities-v2.pdf>
- CNSC. (2022). CSA N286:12 (R2022), Management system requirements for nuclear facilities. <https://www.csagroup.org/store/product/N286-12/> (note: this document is behind a paywall)

CONSENSUS STANDARDS

- International Organization for Standardization (ISO) 45001. (2018). Occupational health and safety management systems – Requirements with guidance for use.
- American National Standards Institute / American Society of Safety Professionals (ANSI/ASSP) Z10.1-2019, Occupational Health and Safety Management Systems

DEPARTMENT OF ENERGY (DOE)

- DOE. (2023). *About Us*. <https://www.energy.gov/about-us>

- 48 CFR 970.5223-1. (2000). *Integration of Environment, Safety, and Health into Work Planning and Execution*.
- DOE Policy 450.4A. (2018). *Integrated Safety Management Policy*.
- DOE-Handbook-3027-99. (1999). *DOE Handbook Integrated Safety Management Systems (ISMS) Verification Team Leader's Handbook*.
- 10 CFR 851. (2017). *Worker Safety and Health Program*.
- DOE Order 450.2. (2017). *Integrated Safety Management*.
- DOE. (2021). *Department of Energy: Safety Culture Expectations*.
<https://www.youtube.com/watch?v=pSE4fRHpo7E>

Appendix B TOPICAL AREAS AND EVALUATION CRITERIA

The following table provides topical areas and evaluations criteria for Tables 1 through 6. Where topical areas may appear similar the review criteria may differ due to the terminology and details (nuances) of the different safety management systems.

Topical Area	Evaluation Criteria
Define Scope of Work (Core Function 1)	Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.
Analyze the Hazards (Core Function 2)	Hazards associated with the work are identified, analyzed, and categorized.
Develop and Implement Hazard Controls (Core Function 3)	Applicable standards and requirements are identified and agreed-upon, controls to prevent/mitigate hazards are identified, the safety envelope is established, and controls are implemented.
Perform Work within Controls (Core Function 4)	Readiness is confirmed and work is performed safely.
Provide Feedback and Improvement (Core Function 5)	Feedback information on the adequacy of controls is gathered; opportunities for improving the definition and planning of work are identified and implemented.
Line Management Responsibility for Safety (Guiding Principle 1)	Line management is directly responsible for the protection of the workers, the public, and the environment.
Clear Roles and Responsibilities (Guiding Principle 2)	Clear and unambiguous lines of authority and responsibility for ensuring safety are established and maintained at all organizational levels within the Department and its contractors.
Competence Commensurate with Responsibilities (Guiding Principle 3)	Personnel possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.
Balanced Priorities (Guiding Principle 4)	Resources are effectively allocated to address safety, programmatic, and operational considerations. Protecting the workers, the public, and the environment is a priority whenever activities are planned and performed.
Identification of Safety Standards and Requirements (Guiding Principle 5)	Before work is performed, the associated hazards are evaluated and an agreed-upon set of safety standards and requirements is established which, if properly implemented, will provide adequate assurance that the workers, the public, and the environment are protected from adverse consequences.
Hazard Controls Tailored to Work Being Performed (Guiding Principle 6)	Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards.
Operations Authorization (Guiding Principle 7)	The conditions and requirements to be satisfied for operations to be initiated and conducted are clearly established and agreed upon.

Topical Area	Evaluation Criteria
Accountability/authority for the SMS identified	The SMS requirements document identifies the position within the organization that has ultimate accountability for the SMS.
Accountability/authority for the SMS is identified	The senior authority accountable for the SMS is identified in the SMS requirements document.
Agency Mission	The agency has a published mission statement.
Audit	SMS requires that audits be performed.
Common Language	The SMS is required to be based on a common language, e.g., common definitions and understanding of terms.
Context of the organization/strategic planning	Understanding the organization with respect to safety and health including the needs and expectations of workers/other interested parties when determining the scope of the occupational health and SMS.
Contractor Applicability	SMS includes contractors.
Contractors	Includes a process to ensure that the requirements of the SMS are met by contractors.
Culture for Safety	The term culture for safety is included in the SMS.
Design review and management of change	Includes a process to prevent or control hazards at the design and redesign stages, and for management of change (during all life-cycle phases).
Document Control System	The SMS framework includes a process to create, maintain, control documents specified by its SMS.
Emergency Preparedness	SMS includes emergency preparedness.
Emergency preparedness and response	The organization includes a process to identify, prevent, protect from, prepare for, respond to, and recover from emergencies.
Employees raise issues without fear of reprisal	The SMS includes a statement that employees can raise issues without the fear of reprisal.
Empowerment of workers to raise safety issues (outside culture realm)	SMS is built on the expectation that workers raise safety-related issues or the SMS includes a specific feature that workers are expected to raise safety issues.
Feedback and Improvement (to the SMS)	SMS includes a process whereby SMS Monitoring, Measurement and Assessment results are relayed back to support of continuous improvement of the SMS.
Feedback and Improvement to the SMS	Feedback and improvement specific to the safety management system a requirement.
Fitness for duty and mental health	SMS addresses fitness for duty and mental health.
Incident investigation and corrective action	Incident investigation and corrective action are part of the SMS.
Investigations	A formal mechanism exists within the SMS for conducting safety-related investigations.

Topical Area	Evaluation Criteria
Is the position identified at the highest level of the organization?	The accountable authority identified in the SMS requirements document is at the highest level of the organization.
Leadership Participation	Leaders are expected to actively participate in the SMS.
Measures performance of safety management system (to ensure SMS is implemented as intended)	Measurement of the SMS verifies that the SMS is implemented as intended based on established SMS policy documents.
Measuring Performance of the safety and health program (leading and lagging indicators)	The SMS includes measuring performance of the SMS (including leading and lagging indicators).
Mishap Reporting	A formal mechanism exists within the SMS for reporting mishaps.
Multi-employer facility coordination	SMS addresses multi-employer facilities.
Occupational Health	Includes a process to ensure the procurement process is aligned with and meets the requirements of the SMS
Ongoing monitoring, measurement, analysis, and performance evaluation	The SMS includes ongoing monitor, measurement, and performance evaluation of the system.
Ongoing monitoring, measurement, analysis, and performance evaluation (in addition to management review)	The SMS includes ongoing monitoring, measurement, and performance evaluation of the system. This review is in addition to the review of the SMS conducted by management.
Operational level responsible for implementation identified	The SMS requirements document identifies the position(s) responsible for SMS implementation at the operational level within the organization.
Operational planning and control - integration of SMS with existing business practices	The SMS framework includes planning and control and maintenance of the processes needed to meet SMS requirements including (wherever practical) integration of the SMS with existing business practices.
Operational planning and control- - integration of SMS with existing business practices	Integration of the SMS with existing business practices is expected.
Organizational learning	The SMS includes processes to utilize monitoring and measurement of the SMS to effect organizational learning.
Organizational learning, continual improvement, and feedback specific to the SMS	Includes a process to feedback lessons learned, findings (from audits, reviews, assessments, Occupational Safety and Health performance, etc.) in the SMS.
OS&H Monitoring, Measurement, and Assessment	The SMS includes a requirement to check, analyze, and evaluate Occupational Safety and Health
Plan-Do-Check-Act	SMS includes reference to the plan, do, check, act cycle.

Topical Area	Evaluation Criteria
Prescribed frequency for evaluations (assessments, audits, reviews)	The SMS requirements document prescribes the frequency for SMS evaluations (e.g., assessments, audits, reviews, etc.).
Procurement	Includes a process to ensure the procurement process is aligned with and meets the requirements of the SMS
Procurement and Contracting and Contractors	The SMS requirements document includes requirements for procurement, contracting, and contractors.
Purpose of SMS	SMS contains a purpose statement.
Quality Assurance	Safety Management System (SMS) includes elements of quality assurance programs (quality-related management of the supply chain, configuration management, counterfeit, fraudulent and suspect items, etc.).
Responsibilities for SMS implementation identified	The SMS requirements document identifies the responsibilities for SMS implementation.
Risk Assessment	A risk assessment process Risk must be established and implemented.
Risk management policy	The agency has a formal risk management policy document.
Risk Management System	The SMS includes a specific risk management system.
Routine management review of SMS	Senior management is required to independently review the SMS on a routine/recurring basis.
Safety climate	Monitoring of safety climate is included in the SMS.
Safety Conscious Work Environment or Just Culture (SCWE) ¹	SMS includes the concept that workers are encouraged to raise issues—broadly defined as Safety Conscious Work Environment (SCWE), e.g., environment in which employees feel free to raise safety concerns to management (or a regulator) without fear of retaliation.
SMS applies to all employees (excludes contractors)	The SMS applies to all employees except for contractors.
SMS Awareness, Training, and Competence	The SMS framework includes a segment specific to the SMS awareness, training, and competence.
SMS can be tailored to organization	The SMS can be tailored to reflect the size, infrastructure, and risks or an organization.
SMS communication and promotion	The SMS framework includes a formal communication process or procedure to communicate SMS information and promote SMS.
SMS identifies Level at which risk is accepted	The SMS requirements document identifies the organizational level at which risk is accepted.
SMS includes communication process	The SMS framework includes a formal communication process or procedure to transfer SMS information and policy (as well as flow-down of requirements when included).

¹ Adapted from Building Safety Culture into the Department’s DNA, <https://www.energy.gov/safety-culture/doe-safety-culture>.

Topical Area	Evaluation Criteria
SMS includes organizational culture	The SMS includes organizational culture as part of the SMS.
SMS includes Organizational Culture	Organizational culture is included as part of the SMS.
SMS includes Safety Culture	The SMS incorporates the term safety culture.
SMS includes safety culture	The SMS includes the term safety culture as part of the SMS.
SMS includes Safety Culture	Safety Culture is included as part of the SMS.
SMS management review of outcomes and follow-up	The SMS must include management review the SMS and follow-up actions for previous audits, reviews, etc.
SMS Monitoring, Measurement and Assessment	The SMS includes a process(es) to check, analyze, and evaluate the SMS.
SMS part of overall management system	The SMS is part of an overall management system within the organization.
SMS promotion and training	The SMS includes requirements to promote the SMS and provide training specific to the SMS.
SMS requirements are part of Occupational Safety and Health Program requirements document	The Occupational Safety and Health Program requirements document includes the requirements for the safety management system.
SMS requirements document establishes committee specific to support SMS implementation	An executive level committee is formally established in the SMS requirements document to support SMS implementation.
SMS requirements document identifies head of the organization, or an entity delegated by the head of the organization to be responsible for “administering” the SMS	The SMS requirements document identifies the head of the organization (or delegate) as responsible for “administering” the SMS.
SMS requirements document references a SMS consensus standard	A recognized SMS consensus standard is referenced in the SMS requirements document.
SMS requirements part of Worker Occupational Safety and Health Program requirements document	The program documents that establish the SMS include requirements for the worker/occupational health program.
SMS scope includes activities outside of work	The scope of the SMS includes recreational and other activities outside of assigned work duties.
SMS training and competence	The SMS framework includes a segment specific to the SMS education, training, and competence
Supports integration with other management systems	SMS is anticipated to support integration with other management systems.

Topical Area	Evaluation Criteria
System analysis approach	SMS includes system analysis, e.g., the SMS contains a feature that establishes an understanding of system design and performance factors, human interface, environment, processes, and activities to the level necessary to identify hazards.
The purpose stated within the SMS requirements documents includes public and or environment	The terms public and environment are stated within the SMS purpose.
Top Management	Senior most manager in the organization.
Worker and worker representative participation required	Workers and their representatives are required to be involved in all aspects and have input in all phases of the SMS.
Worker Participation in SMS (all aspects)	Workers are involved in all aspects and have input in all phases of the SMS

Appendix C BENCHMARKING TABLES

FEDERAL AGENCY BENCHMARK

Table 4: DOE ISM Benchmarked to Selected Federal Agencies' Safety Management Systems (SMS)

Topical Area	DOE	Army	FAA	NASA	Navy	USMC
Agency Mission	•	•	•	•	•	•
The Agency Mission includes the word workers, workforce, safety, protect or protection				•		
SMS requirements part of Worker Occupational Safety and Health Program requirements document		•		•	•	•
Purpose of SMS	•	•	•	•	•	•
The purpose stated within the SMS requirements documents includes public and or environment	•					
SMS applies to all employees (excludes contractors)	•	•	•	○	•	•
Contractor Applicability	○			○	•	
Line Management (Top Management) responsible for safety	•	•	•	•	•	•
Leadership participation		•	•	•	•	•
Worker and worker representative participation required				•	•	•
Common language			•			
Multi-employer facility coordination		•	•	•	•	
SMS includes communication process		•	•	•	•	•
Clear Roles and Responsibilities	•	•	•	•	•	•
Competence Commensurate with Responsibilities	•	•	•	•	•	•
Fitness for duty and mental health				•	•	•
Empowerment of workers to raise safety issues (outside culture realm)	○	•	•	•	•	•
SMS scope includes activities outside of work		•			•	•
SMS promotion and training		•	•	•	•	•
Balanced priorities	•	•	•	•	•	•
Identification of safety standards and requirements	•	•	•	•	•	•

Topical Area	DOE	Army	FAA	NASA	Navy	USMC
Hazard controls tailored to work being performed (graded approach)	●	●	●	●	●	●
Operations authorization	●		●	●		
Supports integration with other management systems	○		●		●	●
Define scope of work	●	●	●	●	●	●
Analyze the hazards	●	●	●	●	●	●
System analysis approach		●	●	●	●	●
Develop and implement hazard controls	●	●	●	●	●	●
Perform work within controls	●	●	●	●	●	●
Provide feedback and improvement	●	●	●	●	●	●
Measures performance of SMS (to ensure SMS is implemented as intended)	●	●	●	●	●	●
Prescribed frequency for evaluations required (assessments, audits, reviews)		●		●	●	●
Mishap reporting	○	●	●	●	●	●
Investigations	○	●	●	●	●	●
Plan-Do-Check-Act		●		●	●	●
SMS requirements document references a SMS consensus standard			●	●		●
Risk management system		●	●	●	●	●
Risk management policy		●	●	●	●	●
SMS identifies level at which risk is accepted		●		●	●	●
Accountability/authority for the SMS is identified	●	●	●	●	●	●
Accountability/authority is assigned to the highest level of the organization	●	●	●	●	●	●
SMS requirements document identifies head of the organization, or an entity delegated by the head of the organization, to be responsible for "administering" the SMS	●	●	●	●	●	●
SMS requirements document establishes committee specific to support SMS implementation	●		●		●	
Responsibilities for SMS implementation identified	●	●	●	●	●	●

Topical Area	DOE	Army	FAA	NASA	Navy	USMC
Operational level responsible for implementation identified	●	●	●	●	●	●
Measuring Performance of the safety and health program (leading and lagging indicators)	●	●	●	●	●	●
Safety Climate	●	●	●	●	●	●
SMS includes Safety Culture	○	●	●	●	●	●
SMS includes Organizational Culture		●			●	●
Quality Assurance	○	●	●		●	

(●= Included in SMS. ○ = Included in system other than SMS. Blank = Not included in SMS)

GOVERNING BODY BENCHMARK

Table 5: DOE ISM Benchmarked to Selected Governing Bodies' Safety Management Systems (SMS)

Topical Area	DOE	IAEA	OSHA	ILO	CNSC
Define Scope of Work	●	○	●	●	●
Analyze the Hazards	●	○	●	●	●
Develop and Implement Hazard Controls	●	○	●	●	●
Perform Work within Controls	●	○	●	●	●
Provide Feedback and Improvement	●	○	●	●	●
Line Management Responsibility for Safety	●	●	●	●	●
Clear Roles and Responsibilities	●	●	●	●	●
Competence Commensurate with Responsibilities	●	●	●	●	●
Balanced Priorities	●	●	●	●	●
Identification of Safety Standards and Requirements	●	○	●	●	●
Hazard Controls Tailored to Work Being Performed	●		●	●	
Operations Authorization	●		●	●	○
Quality Assurance	○	●			●
Culture for Safety	○	●			●
SMS Monitoring, Measurement and Assessment	○	●	●	●	●
Worker Participation in SMS (all aspects)			●	●	
SMS Awareness, Training, and Competence		●	●		
Document Control System	○	●	●	●	●
SMS includes communication process		●	●	●	●
Emergency Preparedness	○	○	●	●	●
Procurement and Contracting and Contractors	○	●	●	●	○
Monitoring, Measurement and Assessment	○		●	●	○
Feedback and Improvement to the SMS	○	●	●	●	●
Other Areas of Interest Outside Framework					
SMS can be tailored to organization	●	●		●	
SMS includes Organizational Culture		●			●
SMS part of overall Management System		●	●	●	●
Safety Conscious Work Environment or Just Culture	●		○		●

(● = Included in SMS. ○ = Included in system other than SMS. Blank = Not included in SMS)

CONSENSUS STANDARD BENCHMARK

Table 6: DOE ISM Benchmarked to Selected Consensus Standards' Safety Management Systems (SMS)

Topical Areas	DOE	ANSI/ASSP	ISO
Define the Scope of Work	●	●	●
Analyze the hazards	●	●	●
Develop and implement hazard controls	●	●	●
Perform work within controls	●	●	●
Provide feedback and improvement	●	●	●
Line Management Responsibility for Safety	●	●	●
Clear Roles and Responsibilities	●	●	●
Competence Commensurate with Responsibilities	●	●	●
Balanced Priorities	●	●	●
Identification of Safety Standards and Requirements	●	●	●
Hazard Controls Tailored to Work Being Performed	●	●	●
Operations Authorization	●		
SMS training and competence		●	●
SMS communication and promotion		●	●
Operational planning and control-- integration of SMS with existing business practices		●	●
Risk assessment		●	●
Routine management review of SMS		●	●
SMS management review of outcomes and follow-up		●	●
Worker participation in SMS (all aspects)		●	●
Organizational learning, continual improvement, and feedback specific to the SMS		●	●
Context of the organization/strategic planning	○	●	●
Documented information (document control process)	○	●	●
Emergency preparedness and response	○	●	●
Ongoing monitoring, measurement, analysis, and performance evaluation (in addition to management review)	○	●	●
Audit	○	●	●
Incident investigation and corrective action	○	●	●
Organizational learning	○	●	●
Design review and management of change	○	●	●
Procurement	○	●	●
Occupational Health	○	●	●
Contractors	○	●	●
Other Areas of Interest Outside Framework			
SMS includes Safety culture	○		
Employees raise issues without fear of reprisal	○	●	●
Culture of organization, organizational culture	○	●	●

(●= Included in SMS. ○ = Included in system other than SMS. Blank = Not included in SMS)