
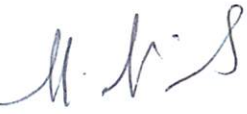
	Number: EA CRAD 32-01 Revision: 1 Effective Date: April 4, 2019
<p align="center">Explosives Safety Criteria Review and Approach Document</p>		
Authorization and Approval	 Keyil G. Kilp Director Office of Worker Safety and Health Assessments EA-32 Date: April 4, 2019	 Lead, Nim Mahimaidoss Safety Engineer Office of Worker Safety and Health Assessments EA-32 Date: April 4, 2019

1.0 PURPOSE

Within the Office of Enterprise Assessments (EA), the Office of Environment, Safety and Health Assessments (EA-30) mission is to assess the effectiveness of those safety and emergency management systems and practices used by line and contractor organizations in implementing Integrated Safety Management; and to provide clear, concise, and independent evaluations of performance in protecting our workers, the public, and the environment from the hazards associated with Department of Energy (DOE) activities and sites.

In addition to the general independent oversight requirements and responsibilities specified in DOE Order 227.1A, *Independent Oversight Program*, this criteria review and approach document (CRAD), in part, fulfills the responsibility assigned to EA in DOE Policy (P)226.2, *Policy for Federal Oversight and Contractor Assurance Systems*, dated August 09, 2016.

A key to success is the rigor and comprehensiveness of our process; and, as with any process, we continually strive to improve and provide additional value and insight to field operations. Integral to this is our commitment to enhance our program. We continue to make CRADs available for use by DOE line

and contractor assessment personnel in developing effective DOE oversight, contractor self-assessment, and corrective action processes; the current revision is available at:
<http://energy.gov/node/611001/listings/criteria-review-and-approach-documents>.

2.0 APPLICABILITY

The following CRAD is approved for use by the Office of Worker Safety and Health Assessments (EA-32).

3.0 FEEDBACK

Comments and suggestions for improvements on this CRAD can be directed to the Director, Office of Environment, Safety and Health Assessments, at (301) 903-5392.

4.0 CRITERIA REVIEW AND APPROACH

OBJECTIVE

Site contractor line management has established explosives safety management programs, including organizational structure and administration, to ensure effective implementation and control of all activities involving explosive materials (10 CFR 851 Appendix A 3.(b) *Explosives Safety*).

CRITERIA

1. The site contractor explosives safety program has been effectively implemented in support of the full scope of facilities engaged in developing, manufacturing, handling, storing, transporting, processing, or testing explosives, pyrotechnics, and propellants, or assemblies containing these materials, and to the safe management of such operations.
 - Is there a documented explosives safety program that adequately addresses the flow down of regulatory requirements including how 10 CFR 851 is implemented?
 - Are updates to the explosives safety program submitted to the appropriate head of DOE or National Nuclear Security Administration (NNSA) field element for review and approval whenever a significant change or addition to the explosives safety program is made?
 - How are specific applicable sections of DOE Technical Standard DOE-STD-1212-2012, *Explosives Safety*, identified and complied with?
 - Technical standard will serve as the successor document for the DOE Explosives Safety Manual and may be used in accordance with requirements of 10 CFR 851 Appendix A 3.(b).
2. Site contractor has established an assessment program to confirm the adequacy of the explosives safety program in support of facility activities.
 - Do qualified contractor personnel routinely conduct assessments of the explosives safety program to ensure that applicable requirements of DOE-STD-1212-2012 are adequately implemented?
 - Do the assessments evaluate the adequacy of program elements such as:
 - Standard operating procedures?
 - Employee qualifications and training?

- Maintenance and testing programs (e.g., lightning protection systems, bonding and grounding, conductive flooring and work surfaces, personal protective equipment (PPE), electrical equipment and wiring, etc.)?
 - Explosives storage?
 - Exhaust ventilation and collections systems?
 - Explosives and personnel limits and controls?
 - Quantity-distance and level of protection criteria?
 - Explosives stability testing and monitoring?
 - Explosives waste collection and disposal?
 - Transportation?
 - Emergency control?
 - Do managers and supervisors of explosives operations conduct routine self-assessments that evaluate their operations (e.g., storage, operating and laboratory facilities, transportation, explosives area controls, etc.) against the requirements of established standard operating procedures and applicable site explosives safety standards/requirements?
 - Are the results of the assessments and self-assessments evaluated and issues resolved?
3. An adequate number of explosives safety program personnel are assigned and available to support facility activities.
- Are the organizational responsibilities for explosives safety well defined and understood with staffing and resources sufficient to accomplish assigned tasks?
 - Are explosives safety requirements actively administered by site/facility management and supervision, and adhered to by personnel?
 - Do managers and supervisors observe explosives activities to ensure adherence to established policies and procedures and to identify and correct problems?
4. Maintenance of process buildings and storage facilities and equipment used to support facility explosives operations is adequate and current.
- Are lightning protection systems, grounding and bonding systems, and conductive floors and work surfaces inspected and tested at required intervals and repairs made in a timely manner?
 - Is permanent wiring, fixtures, and equipment installed in accordance with the National Electrical Code (NEC), Article 500, Hazardous (Classified) Locations?
 - When hazard Class I or II, as applicable, equipment or instrumentation is required but not available, is the substitute equipment purged or pressurized in accordance with National Fire Protection Association (NFPA) 496, or determined intrinsically safe (without regard to voltage) in accordance with NEC Article 504/American National Standards Institute (ANSI) /UL 913/ by facility management, or in hazard Class II locations, sealed to prevent explosives contamination?
 - Are procedures established to control the use and modification of electrical equipment in explosives areas and ensure that uniform standards are adhered to throughout the facility?
5. Explosives and personnel limits and control have been established and are controlled.
- Does the quantity of explosives permitted in an operating building exceed the maximum permitted by quantity-distance criteria?
 - Has the explosives quantity been subdivided and separated to prevent propagation of detonation?
 - Is the number of personnel at an operating location the minimum consistent with safe and efficient operation?
 - Is there a standardized placard posted in a conspicuous place in all rooms, bays, and buildings containing explosives stating the maximum amount of explosives and the maximum number of workers and casualties permitted in the control unit at any one time?

- Do management personnel with authority having jurisdiction (AHJ) periodically review explosives and personnel limits for each location and recommend changes as required?
 - Has a verifiable system been established to control the amount of explosives present in an explosives facility, and is a system in place to control the presence of personnel within explosive operating areas?
6. PPE and clothing is provided to protect employees.
- Are employees provided with PPE appropriate to the hazard involved?
 - Is protective equipment properly maintained and inspected and is continuity testing performed as required?
7. Site contractor has established a training and qualification program with established qualification requirements to ensure personnel have been properly trained before they are assigned to explosives operations.
- Does completion of training qualify the worker to perform a task for a specific period of time?
 - Is retraining in areas of weakness required of workers who do not demonstrate job proficiency or who subsequently violate safe practices?
 - Are personnel retrained when an operating procedure is modified (other than minor editorial changes that do not affect the process steps and/or process equipment)?
 - Are hazardous materials information and training programs required for personnel who work with explosives and hazardous materials used in conjunction with explosives operation?
 - Is there a tracking system in place for personnel training and retraining?
8. Site contractor has developed and implemented quantity-distance and level-of-protection criteria that provide specific levels of personnel and property protection from the effects of potential fires and explosions within and outside of DOE/NNSA installations.
- Has the site contractor submitted explosives safety site plans for review and approval by the AHJ for explosives safety within the operations/site office?
 - Is a process in place to ensure that preliminary site plans are submitted to DOE/NNSA for new explosives facilities and operations and explosives facilities undergoing major modifications?
 - Does the site contractor have an approved site plan for existing explosives facilities and operations that contains all information required by DOE-STD-1212-2012?
 - Does the quantity-distance criteria account for the types and severity of hazards each explosive material presents, the construction and orientation of facilities to which the criteria are applied, and the degree of protection desired for personnel and facilities adjacent to the explosives operations?
 - Has the applicable principle and tables contained in DoDM 6055.09, *Department of Defense Ammunition and Explosives Safety Standards*, been used to establish explosives quantities and distances from adjacent magazines, operating buildings, or other explosives facilities?
 - Has each bay (i.e., storage, handling, or processing building) that houses an explosives activity have a protection level based on the hazard class determined for the activity?
9. For emergency control purposes, placards and fire symbols (as specified in DoDM 6055.09 or the NFPA 704 Standard) shall be displayed consistently on buildings and work areas throughout an entire facility to warn of potential hazards from explosives and to provide information for emergency situations.
- Does each facility have a specific written plan for the control of emergencies involving explosives?
 - Have all facility personnel been trained in the plan's content applicable to their area?
 - Is the plan available to all personnel for ready reference?

10. Exemptions and waivers to DOE-STD-1212-2012 must be approved at the appropriate DOE/NNSA and contractor management level, as applicable.
 - Have exemption requests that provide equivalent safety been approved by the DOE Operations Officer or NNSA Site Manager?
 - Have exemption requests that do not provide equivalent safety been submitted to the Program Secretarial Officer?
 - Are waivers granted for the minimum time necessary, and on-going waivers updated every three years?
11. Site contractor has implemented general operations safety guidelines to protect workers from exposures to potentially toxic materials, ensure clean workplaces, and to ensure that the hazards related to explosives operations are minimized.
 - Are explosives protected from abnormal stimuli or environments (e.g., friction forces, excessive pressures and temperatures, impact, shock, and pinching, deformation, electrical sparks, abrasive or welding sparks, and open flame, contamination and contact with incompatible materials)?
 - Before being used in the explosives process, and at established intervals, is processing and test equipment used in the explosives process checked for proper design, proper function, specified clearances between parts in relative motion, abnormal metal-to-metal rubbing of moving parts potentially contacting explosive materials, cracks, voids, or screw threads where explosives may accumulate, contamination that is incompatible with the materials to be introduced?
 - Are the following general precautions used to prevent overexposure to potentially toxic materials during explosives processing and handling:
 - Health hazard and controls are known before beginning operations.
 - Operations are evaluated during startup to assure that occupational exposure limits are not exceeded.
 - Routine operations are monitored periodically.
 - Materials are handled in a well-ventilated area; local exhaust ventilation is preferred.
 - Appropriate protective clothing is used to avoid skin contact.
 - Good personal cleanliness is practiced; e.g., washing before eating, smoking, or using toilet facilities (end-of-shift showers may be required for some operators).
 - Is a Process Hazard Analysis performed before beginning any explosives synthesis, formulation, manufacturing, testing, or disposal operation?
 - Do exits for any building or structure containing explosives comply with the intent of NFPA 101, *Life Safety Code*, except as otherwise permitted by DOE-STD-1212-2012?
12. Remote explosives operations shall be conducted in facilities where the construction of the operating bay or the control room affords sufficient protection to personnel to prevent serious injuries.
 - Are interlocked access doors provided for remote operating equipment?
 - Are lights or similar warning devices provided to conspicuously identify buildings or bays in which remote operations are performed to indicate when remote operations are under way?
 - Are roads blocked at a minimum of the public traffic route distance from buildings where hazardous (remote) operations are being performed?
 - Are corridors leading to bays in which hazardous (remote) operations are being performed marked to warn of the danger, and barriers set up?
13. Exhaust ventilation should be used to control explosives dust (or other hazardous materials used in or resulting from explosives operations) that could be hazardous to operating personnel or contaminate the operating area. Exhaust ventilation used to remove explosives dust requires an approved dust collection system to prevent the release of the dust outside the building.

- Is exhaust ventilation and collection systems that control explosives dust and materials associated with explosives production designed to meet minimum requirements established in the American Conference of Governmental Industrial Hygienists Ventilation Manual (most current edition) and DOE-STD-1212-2012?
 - Are “wet collectors” used to moisten the dust close to the point of origin to keep it wet until the dust is removed for disposal?
 - Are “dry type collectors” only used when authorized by a standard operating procedure?
 - Are dry-type explosives dust collection chambers located outside operating buildings, in the open, or in buildings exclusively set aside for the purpose?
 - Are stationary and portable wet-type collectors placed in the explosives operating bays or cubicles restricted to a quantity of explosives in the collectors not to exceed 2 kg?
14. Site contractor has implemented applicable requirements for explosives storage.
- Are portable magazines sited per DoDM 6055.09-V3 as above ground magazines?
 - Are placards posted on or near each magazine door, specifying explosives and personnel limits and general safety precautions that should be observed during work in the magazine?
 - Have at least two fire extinguishers (minimum rating 2A:10BC and winterized where necessary) been provided and maintained for immediate use by personnel working around a magazine?
 - Are magazines inventoried at least annually to determine the total weight of explosives present (to assure this weight conforms to allowable quantity-distance constraints) and to remove and destroy materials that are not properly identified or labeled?
 - Has facility management established a storage review committee?
 - Are explosives stored consistent with their compatibility group?
15. Onsite and offsite transportation of explosives meet site and applicable Department of Transportation (DOT) requirements.
- Are explosives laden vehicles provided with appropriate hazard/class placards plainly visible from all directions?
 - Do motor vehicle shipments from or within a DOE/NNSA installation over public roads that meet the DOT definition of “in commerce” comply in full with applicable 49 CFR regulations?
16. Site contractor has implemented safety guidelines applicable to general laboratory operations involving explosive materials.
- Is laboratory work involving explosive materials conducted only in accordance with approved standard operating procedures?
 - Are personnel provided all the appropriate PPE if a laboratory operation involves an explosion hazard?
 - Is the quantity of explosives present in a laboratory the minimum required for the operations?
 - Are suitable guards provided for all glass or fragile equipment that must withstand reduced or elevated pressure?

APPROACH

Record Review:

- Applicable standard operating procedures
- Explosives and personnel limits and control documents
- DOE/NNSA approved site plans/preliminary site plans
- Quantity-Distance and Level-of-Protection Criteria
- Maintenance and testing records

- Employee training and qualification records
- List of required PPE and test records
- Explosives safety assessment reports
- Exemptions and waivers to DOE-STD-1212-2012
- Hot work permits
- Process hazard analyses
- Written plans for the control of emergencies involving explosives

Interviews:

- Environment, safety and health lead
- Explosives engineer/explosives safety personnel
- Explosives operating facility manager(s)
- Industrial hygienists
- Fire protection engineer
- Transportation manager and personnel
- Selected facility operational and support personnel

Observations:

- Explosives operating facilities and storage areas
- Maintenance and testing operations
- Transportation and handling of explosives
- Remote operations
- Materials storage
- Laboratory operations