



STANFORD UNIVERSITY
SLAC National Accelerator Laboratory
 Operated by Stanford University for the U.S. Department of Energy



DOE O 456.1A, The Safe Handling of Unbound Engineered Nanoparticles 07-15-2016
Site Compliance Plan (Rev 0, 01/11/2017)

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Introduction

This Site Compliance Plan (SCP):

- a) corresponds with the version of the DOE Order on Safe Handling of Unbound Engineered Nanoparticles listed in the Prime Contract,
- b) states how the Laboratory complies with applicable requirements as tailored to the risks at the Laboratory,
- c) documents DOE-approved methods of compliance for applicable requirements and that there are no recurring deliverables*.

Impact on the Contract: Under the SCP, sections of the CRD are incorporated into the Contract as-is, unless the SCP indicates that a section or portion thereof is inapplicable, or the section has been changed. Thus, for example, if “in compliance” is listed next to a CRD section, that section is incorporated into the Contract as-is. However, where an SCP indicates that a section or portion thereof is inapplicable, the section or portion thereof is excluded from the Contract. In addition, where a section or portion thereof is applicable, but changes to the section have been agreed by the Parties, the section, as modified by the Parties, shall be incorporated into the Contract. The SCP also memorializes the Parties’ agreement on how SLAC will comply with sections of the CRD (whether or not modified).

Attachment 1 - Contractor Requirements Document (CRD)

| CRD § | Requirements from CRD, Attachment 1 | Compliance Status | Method of Compliance | Deliverables* (managed through SLACTrak) | | | |
|-------------|--|-------------------|--|--|-----------|-------------|-----------------------|
| | | | | Item | Frequency | Due Date(s) | Recipient (e.g., SSO) |
| | The Contractor is responsible for flowing down the requirements of this CRD to subcontractors at any tier to the extent necessary to ensure the contractor’s compliance with the requirements. | In compliance | Requirements are flowed down to subcontractors via the terms and conditions of contracts. This stipulates that subcontractors must follow the requirements of the SLAC’s ES&H Manual, which includes SLAC’s Nanomaterials Safety Plan that is in compliance with DOE Order 456.1A. Furthermore, a kick off meeting is held before each project where safety personnel participate to answer questions. | n/a | n/a | n/a | n/a |
| 1. | CONTRACTOR PROCESS. The contractor must: | | | | | | |
| 1.a. | Review the recommendations and best practices of the | In compliance | SLAC monitors national standards and applicable guidance to ensure its Nanoscale program incorporates any elements which are applicable to | n/a | n/a | n/a | n/a |

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| | available national standards and guidance documents for applicability to their work scope. | | work scope. Also, SLAC actively participates in the Industrial Hygiene EFCOG group where best practices of nanomaterial handling are discussed. | | | | |
| 1.b. | Maintain a registry of all personnel who meet this Order's definition of UNP worker in an accessible electronic format. | In compliance | A centralized SharePoint site is setup that contains the registry for each directorate. The website address is: https://portal.slac.stanford.edu/teams/esh/nano/SitePages/Home.aspx | n/a | n/a | n/a | n/a |
| 1.c. | Registry must include as a minimum: (1) Name; (2) Job title (at the time of being designated an UNP worker), (3) A brief description of the UNP, (4) A brief description of the UNP activity, and (5) The area in which the activity is located. | In compliance | See section 1.b. | n/a | n/a | n/a | n/a |
| 1.d. | Provide the DOE occupational medicine services provider with a copy of or access to the registry. | In compliance | The SLAC Occupational Health Center has access to the SharePoint site that houses the registries. | n/a | n/a | n/a | n/a |
| 1.e. | Update the registry annually, at a minimum. | In compliance | The registries are updated by the ES&H Coordinators as part of the review and approval of SOPs for each experiment. This forces a real time update. | n/a | n/a | n/a | n/a |
| 2. | NANOTECHNOLOGY POLICIES AND PROCEDURES. The contractor must: | | | | | | |
| 2.a. | Establish safety and health policies and procedures for activities involving UNP that identify how the contractor will comply with the requirements of this Order. | In compliance; | The SLAC Worker Safety and Health Program incorporates UNP safety and health policies and procedures in the SLAC <i>Nanomaterial Safety Plan</i> (NMSP), which is part of the Chemical Safety chapter of SLAC's ESH Manual. SLAC uses this plan to comply with the contractor requirements of DOE Order 456.1A. | n/a | n/a | n/a | n/a |

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| | | | | Item | Frequency | Due Date(s) | Recipient (e.g., SSO) |
| 3. | TRAINING | | | | | | |
| 3.a. | <p>At the time of initial assignment, the contractor must provide all UNP workers and their supervisors with training specific to activities involving UNP. This training must include, as a minimum, the following topics:</p> <ul style="list-style-type: none"> (1) Uncertainties of properties and hazards of UNP; (2) Differences in reactivity and toxic potential of nanoscale and macro forms of the same materials; (3) Exposure routes and transport of UNP within the body; (4) Limitations on available information, including safety data sheets (SDS), for evaluating the significance of exposures and environmental releases; (5) The importance of minimizing exposure to UNP and their release into the environment; (6) Hazard controls including limitations on their effectiveness; | In compliance | ESH online Course 161, Nanomaterials Laboratory Safety, covers all of the required topics. This course is mandatory for UNP workers and their supervisors upon initial assignment to the Laboratory. | n/a | n/a | n/a | n/a |

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| | | | | Item | Frequency | Due Date(s) | Recipient (e.g., SSO) |
| | (7) Permissible and recommended exposure limits for UNP; (8) The location and availability of reliable reference material on the hazards, safe handling, storage and disposal of UNP, including SDSs; and (9) Site-specific policies, procedures, and hazard controls for UNP. | | | | | | |
| 3.b. | The Contractor must provide UNP workers and their supervisors with refresher training when new information and changes in requirements, policies or procedures dictate. | In compliance | Requirements and procedures for each new activity involving UNP are specified in individual SOPs approved by the appropriate ESH Coordinator. Reassignment of course 161 may be required of all UNP workers and their supervisors via the SLAC Training Assessment system, should new information or requirements dictate. | n/a | n/a | n/a | n/a |
| 4. EXPOSURE ASSESSMENT. The contractor must: | | | | | | | |
| 4.a. | Use best available hazard information when conducting exposure assessments for activities involving UNP. | In compliance | Section 3.1.2 of the NMSP gives detailed information and guidance for conducting UNP exposure assessments. | n/a | n/a | n/a | n/a |
| 4.b. | Establish an air monitoring program for UNP based on preliminary exposure assessments and guidance such as the American Industrial Hygiene Association's "A Strategy for Assessing and Managing Occupational Exposures." | In compliance | Sections 3.6 of the NMSP describe SLAC's screening and air monitoring program to characterize workplace conditions and estimate UNP exposures. | n/a | n/a | n/a | n/a |
| 5. MEDICAL SURVEILLANCE. The contractor must: | | | | | | | |

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| | | | | Item | Frequency | Due Date(s) | Recipient (e.g., SSO) |
| 5.a. | Offer a baseline medical evaluation to all of their UNP workers; | In compliance | All UNP workers are offered the required baseline medical evaluation (ESH Course 161ME) as outlined in the Section 4.1 of the NMSP. | n/a | n/a | n/a | n/a |
| 5.b. | Evaluations should include: <ul style="list-style-type: none"> • An occupational and medical history update; • A physical examination with emphasis on the respiratory system; and | In compliance | See section 5.a. | n/a | n/a | n/a | n/a |
| 5.c. | Specific medical tests (e.g., spirometry, chest X-ray) deemed appropriate by the occupational medicine provider. | In compliance | See section 5.a. | n/a | n/a | n/a | n/a |
| 5.d. | Inform any guest worker of the Medical Surveillance portion of this Order to promote awareness of medical surveillance evaluations, but need not apply such medical surveillance requirements to guest workers. | In compliance | Long term guests, collaborators and visitors who meet the definition of UNP worker are treated the same as SLAC employees for Medical Surveillance; non-resident personnel such as facility users are exempt (see Section 4.1 of the NMSP). | n/a | n/a | n/a | n/a |
| 5.e. | Control exposures to UNP using a risk-based graded approach that considers the available toxicological and environmental data. | In compliance | Section 3, Controls for Research Laboratory Operations, of the NMSP outlines SLAC's graded approach to developing administrative and engineered controls for all work with UNP based on an exposure and safety assessment for individual activities. | n/a | n/a | n/a | n/a |
| 6. | POSTING AND LABELING. The contractor must: | | | | | | |
| 6.a. | Post signs indicating hazards, personal protective equipment requirements, and administrative control requirements at entry points into areas where UNP are handled. An area may be an entire laboratory, an area of a | In compliance | NMSP Section 3.4.4, Marking, Labeling and Signage specifies on posting and labeling requirements. All UNP work areas at SLAC contain the proper signage indicating PPE requirements and administrative controls. | n/a | n/a | n/a | n/a |

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| | laboratory or a containment device such as a laboratory hood or glove box. | | | | | | |
| 6.b. | Label storage and transfer containers to plainly indicate the contents include UNP, e.g., “nanoscale zinc oxide particles” or other identifier instead of just “zinc oxide.” If affixing a label is impractical, alternative labeling schemes may be used in lieu of affixing labels, as long as the alternative method clearly identifies the containers to which it is applicable, is readily accessible, and provides information to workers regarding potential hazards. | In compliance | UNP storage and transfer container label requirements are outlined in NMSP Sections 3.4.4 and 5.1.3. | n/a | n/a | n/a | n/a |
| 6.c. | When UNP are being moved or transferred outside of the laboratory, include label text indicating that the material may be unusually reactive and vary in toxic potential, quantitatively and qualitatively, from macro size forms of the same material, when applicable. | In compliance | NMSP Section 5, Transportation of Nanomaterials, outlines labeling requirements when UNP are moved or transferred. | n/a | n/a | n/a | n/a |
| 7. | TRANSPORTATION. The contractor must: | | | | | | |
| 7.a. | Label the innermost receptacle or container with a label that communicates an appropriate level of caution and description of the contents. | In compliance | NMSP Section 5, Transportation of Nanomaterials, outlines labeling requirements when UNP are moved or transferred. | n/a | n/a | n/a | n/a |
| 8. | WASTE MANAGEMENT. | | | | | | |

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| 8.a. | The contractor must have a documented procedure for managing UNP waste that includes the proper storage and tracking of the waste as it is moved across the site and eventually dispositioned. To the extent possible, UNP waste shall be segregated from other waste during management and disposition. | In compliance | UNP waste management at SLAC is documented in the NMSP, Section 6. | n/a | n/a | n/a | n/a |
| 8.b. | The contractor must keep an inventory of all UNP waste that is shipped off site that contains a description of the waste, the quantity, and means and location of final disposition. | In compliance | All nanowastes are tracked in the SLAC Waste Management Tracking Database/System from waste generation to final disposal, "cradle to grave". | n/a | n/a | n/a | n/a |
| 8.c. | For waste containing UNP, the Site must follow all applicable Federal, State and Local disposal regulations. | In compliance | SLAC Waste Management Group complies with all local, state and federal laws and regulations. | n/a | n/a | n/a | n/a |
| 8.d. | If information on UNP hazards suggests that additional protective measures should be taken for their disposal, then those measures will be identified and put into place. | In compliance | SLAC Waste Management Group complies with all local, state and federal laws and regulations. | n/a | n/a | n/a | n/a |

(end CRD)

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Definitions (from Order)

Definitions pertaining to work with nanotechnology can be found in Standard Terminology Relating to Nanotechnology, Standard Guide for Handling Unbound Engineered Nanoscale Particles in Occupational Settings, and Nanotechnologies - Health and Safety Practices in Occupational Settings Relevant to Nanotechnologies (see References).

- a. Engineered nanoparticle means intentionally created (in contrast with natural or incidentally formed) material with one or more dimensions greater than 1 nanometer and less than 100 nanometers.
- b. Unbound Engineered Nanoscale particles (UNP), those nanoscale particles that are not contained within a matrix under normal temperature and pressure conditions that would reasonably be expected to prevent the particles from being separately mobile and a potential source of exposure. An engineered primary nanoscale particle dispersed and fixed within a polymer matrix, incapable as a practical matter of becoming airborne, would be bound," while such a particle suspended as an aerosol would be "unbound." For example, relevant nanoscale particle types include intentionally produced fullerenes, nanotubes, nanowires, nanoropes, nanoribbons, quantum dots, nanoscale metal oxides, nanoplates, nanolayers, and other engineered nanoscale particles.
- c. UNP worker is a worker who:
 - (1) Has the potential for inhalation or dermal exposure to UNP due to performing work with potential exposure to UNP;
 - (2) Routinely spends time in an area due to performance of regular duties in which engineered UNP have the potential to become dispersed in the air or onto surfaces; or
 - (3) Works on equipment that might contain or bear UNP and that could release UNP during servicing or maintenance.

Approvals

| Name | Title | Signature | Date |
|--------------|--|---|------------|
| Brian Sherin | Director, Environmental, Health and Safety, SLAC | Sherin, Brian <small>Digitally signed by Sherin, Brian Date: 2017.01.11 10:12:17 -08'00'</small> | 01/11/2017 |
| Tom Rizzi | SSO Subject Matter Expert | <i>Thomas V. Rizzi</i> | 01/11/2017 |
| Paul Golan | SLAC Site Manager | <i>Paul Golan</i> | 1/11/17 |

Please return signed document to: Contract Management, MS 75

Revision History

| Revision | Revision Date | Summary of Change(s) |
|----------|---------------|----------------------|
| R0 | 01/11/2017 | Original Release |