

**MEDICAL SCREENING PROTOCOL
FOR THE FORMER WORKER MEDICAL SCREENING PROGRAM
U.S. DEPARTMENT OF ENERGY**

General Principles:

- 1) The purpose of the medical evaluation component of the U.S. Department of Energy (DOE) Former Worker Medical Screening Program (FWP) is to provide interested former workers with targeted testing to screen for selected adverse health effects potentially related to their work in DOE operations. The program does not test for all potentially work-related conditions; for example, screening for work-related musculoskeletal conditions is not included in the medical evaluation.
- 2) The following table is intended to identify work-related health outcomes of relevance to DOE workers for which there are screening tests that are reasonably likely to be effective and beneficial to program participants. The table is not intended to represent a comprehensive list of all occupational diseases that are associated with the listed hazards or a comprehensive list of all occupational diseases for which DOE workers are at elevated risk.
- 3) The selection of specific medical evaluations is based on the collection of a detailed occupational history for each worker.
- 4) This protocol is intended to ensure consistency of approach in the medical evaluation of participants.
- 5) This protocol is not intended to dictate the clinical practice of medicine.
- 6) This protocol is not intended to substitute for periodic health maintenance/disease screening examinations by a former worker's personal physician. However, as a secondary goal the examination may include assessments that contribute to general health.
- 7) Follow-up medical evaluation and treatment are not within the scope of the FWP.
- 8) This protocol was developed by consensus of the cooperative agreement awardees and the DOE officials associated with the FWP.
- 9) The medical evaluation protocol may be changed only by or with the approval of DOE.
- 10) The protocol will be reviewed and updated at least every two years by a committee established by DOE and the FWP.

Recommended Medical Screening Protocol for Selected Occupational Health Conditions
of DOE Workers for Which Screening and/or Early Detection
is Reasonably Likely to be Effective and Beneficial

Hazard(s)	Target Organ(s)	Health Outcome(s)	Medical Evaluation	Re-screening through FWP
Asbestos	Lung	- Asbestosis - Other non-malignant respiratory disease	- Chest radiograph with B-reading - Spirometry - Physical examination	No more frequently than every 3 years
		Lung cancer	Low-dose chest CT scan for eligible participants, where offered ¹	Re-screening offered at 3 or 6 months after baseline scan for indeterminate (non-calcified) nodules as per current professional recommendations; repeat CT scan offered on an annual basis after initial baseline scan
Beryllium	Lung	- Sensitization - Chronic Beryllium Disease (CBD)	- Chest radiograph with B-reading (if symptomatic) - Physical examination - Beryllium Lymphocyte Proliferation Test (BeLPT), with repeat testing for other than normal results	- No more frequently than every 3 years if asymptomatic² - If new symptoms develop or worker is very concerned in interim, BeLPT can be performed
		Lung cancer	Low-dose chest CT scan for eligible participants, where offered ¹	Re-screening offered at 3 or 6 months after baseline scan for indeterminate (non-calcified) nodules as per current professional recommendations; repeat CT scan offered on an annual basis after initial baseline scan
Plutonium, Lung Deposition of	Lung	Pulmonary Fibrosis	Chest radiograph	No more frequently than every 3 years
		Lung cancer	Low-dose chest CT scan for eligible participants, where offered ¹	Re-screening offered at 3 or 6 months after baseline scan for indeterminate (non-calcified) nodules as per current professional recommendations; repeat CT scan offered on an annual basis after initial baseline scan

Hazard(s)	Target Organ(s)	Health Outcome(s)	Medical Evaluation	Re-screening through FWP
Silica	Lung	Silicosis	See Asbestos above	No more frequently than every 3 years
		Lung cancer	Low-dose chest CT scan for eligible participants, where offered ¹	Re-screening offered at 3 or 6 months after baseline scan for indeterminate (non-calcified) nodules as per current professional recommendations; repeat CT scan offered on an annual basis after initial baseline scan
- Epoxy resins - Methylene-dianiline - Other known bladder carcinogen	Bladder	Carcinoma	Urine cytology. Protocol should be tailored to specific exposure and approved by the DOE review process. ³	No more frequently than every 3 years
- Ionizing radiation - Chemicals (e.g., benzene, formaldehyde)	Hematopoietic	Leukemia or non-malignant conditions	Complete blood count (CBC) with differential ⁴	No more frequently than every 3 years
- Asbestos - Ionizing radiation	Gastrointestinal system	Colorectal carcinoma	Stool for occult blood ⁵	No more frequently than every 3 years ⁵
Diesel Exhaust	Lung	Chronic obstructive lung disease	- Respiratory symptoms questionnaire - Spirometry	No more frequently than every 3 years
		Lung cancer	Low-dose chest CT scan for eligible participants, where offered ¹	Re-screening offered at 3 or 6 months after baseline scan for indeterminate (non-calcified) nodules as per current professional recommendations; repeat CT scan offered on an annual basis after initial baseline
Welding	Lung	- Asthma - Chronic obstructive lung disease	- Respiratory symptoms questionnaire - Spirometry	No more frequently than every 3 years for COPD

Hazard(s)	Target Organ(s)	Health Outcome(s)	Medical Evaluation	Re-screening through FWP
Chromium	Lung	Asthma	Respiratory symptoms questionnaire, plus spirometry, as indicated	No
		Lung cancer	Low-dose chest CT scan for eligible participants, where offered ¹	Re-screening offered at 3 or 6 months after baseline scan for indeterminate (non-calcified) nodules as per current professional recommendations; repeat CT scan offered on an annual basis after initial baseline scan
Formaldehyde	Lung	Asthma	Respiratory symptoms questionnaire, plus spirometry, as indicated	No
Metal Working Fluids	Lung	Asthma	Respiratory symptoms questionnaire, plus spirometry, as indicated	No
Nickel	Lung	Asthma	Respiratory symptoms questionnaire, plus spirometry, as indicated	No
		Lung cancer	Low-dose chest CT scan for eligible participants, where offered	Re-screening offered at 3 or 6 months after baseline scan for indeterminate (non-calcified) nodules as per current professional recommendations; repeat CT scan offered on an annual basis after initial baseline scan
Respiratory irritants	Lung	Chronic obstructive lung disease	Respiratory symptoms questionnaire, plus spirometry, as indicated	No more frequently than every 3 years
- Radioactive iodine - External ionizing radiation	Thyroid	Hypothyroidism and thyroid cancer	- Physical examination (i.e., palpation of the thyroid) - Thyroid-stimulating hormone (TSH)	No more frequently than every 3 years
- Solvents - Lead - Mercury	Central Nervous System	Chronic neurologic disease	Primary care level clinical evaluation	No

Hazard(s)	Target Organ(s)	Health Outcome(s)	Medical Evaluation	Re-screening through FWP
• Toluene • Styrene • Xylene • Trichloroethylene • Methyl Ethyl Ketone • Methyl Isobutyl Ketone • Ethyl Benzene	Ears	Sensorineural hearing loss	Audiometry	No
Ionizing radiation	Female Breast	Cancer	Recommend mammography by personal physician for women 50 to 74 years of age ⁶	Recommend mammography by personal physician for women 50 to 74 years of age ⁶
Carbon tetrachloride and other chlorinated solvents	Liver	Hepatocellular injury and insufficiency	• Bilirubin • Transaminases	No
Hydrazine	Liver	Hepatocellular injury	Transaminases	No
• Cadmium • Chromium • Lead	Kidneys	Chronic renal insufficiency	Serum creatinine	No
• Nickel • Chromium • Formaldehyde	Skin	• Dermatitis • Skin cancer • Cancer of the nasal mucosa	Physical examination of the skin and nasal mucosa ⁷	No more frequently than every 3 years ⁷
Ionizing or ultraviolet radiation	Skin	Skin cancer	Physical examination of the skin ⁷	No more frequently than every 3 years ⁷
Noise	Ears	Hearing Impairment	Audiometry	No
Laser, Class 3B and 4	Eyes, Skin	Cataracts, retinal burns	• Medical history of the eye and photosensitivity • Visual acuity (far and near) for both eyes • Amsler and Ishihara visual tests⁸	No

¹ DOE FWP recommends the use of low-dose chest CT scan for early lung cancer detection for DOE workers who are at elevated lung cancer risk. This recommendation is based on the scientific demonstration of reduced lung cancer mortality and prolonged survival for individuals who have undergone low-dose CT scanning on an annual basis (National Lung Screening Trial Research Team, N Engl J Med. 2011; 365(5):395-409; International Early Lung Cancer Action Program Investigators, Henschke CI, Yankelevitz DF, et al. Survival of patients with stage I lung cancer detected on CT screening. N Engl J Med 2006;355:1763-71.) FWP acknowledges the recommendations of the USPSTF (Moyer VA, U.S. Preventive Services Task Force. Screening for lung cancer: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med 2014;160:330-8) and follows a similar set of recommendations that specifically address lung cancer risk associated with occupational exposures, i.e., the guidelines of the National Comprehensive Cancer Network (National Comprehensive Care Network Clinical Practice Guidelines. Lung Cancer Screening Version 1.2012) and the American Association of Thoracic Surgery (Jaklitsch MT, Jacobson FL, Austin JH, et al. The American Association for Thoracic Surgery guidelines for lung cancer screening using low-dose computed tomography scans for lung cancer survivors and other high-risk groups. J Thorac Cardiovasc Surg 2012;144:33-8) . at http://www.rrmginc.com/docs/NCCN_GuidelinesLungCancerScreening.pdf) FWP offers low-dose CT scanning to former DOE workers to the extent that budget permits.

²The inclusion of a BeLPT on the re-screening examination may vary among DOE sites and depends on the known prevalence of abnormal BeLPTs on initial and re-screening examinations at a particular DOE site, the use of beryllium at the DOE site, and the

medical history and occupational risk information of the individual who will undergo the re-screening examination. The determination about whether to offer the BeLPT on re-screening to individuals is made by the FWP active at the DOE site.

³Additional bladder cancer biomarker tests will be considered, if demonstrated to be effective. When screening for bladder cancer is included, the participant should also receive recommendations for periodic screening. Initial screening will be supported by the FWP.

⁴DOE FWP recognizes that the complete blood count (CBC) is not an effective screening test for the early detection of leukemia. The CBC may detect white blood depression or anemia that may be associated with pre-malignant conditions caused by occupational agents.

⁵Recommend in letter that individual discuss colonoscopy with PMD, per USPSTF and/or ACS guidelines.

⁶Communication to participant should recommend biennial screening for women 50 to 74 years of age. For women between the ages of 40 and 49, mammography is recommended following a discussion with their personal physician regarding risks and benefits (USPSTF and ACS).

⁷Communication to participant should recommend annual screening with PMD for anyone at high risk for skin cancer.

⁸In accordance with ANSI Z136.1 Standard for the Safe Use of Lasers, which states that "Laser eye examinations are performed to identify those laser users which may have a predisposition for vision related injury and to meet the medical monitoring requirements of the standard."