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DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. OSHA-2018-0003]

RIN 1218-AD20

Revising the Beryllium Standard for General Industry

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Final rule.

SUMMARY: OSHA is amending its existing general industry standard for occupational exposure to beryllium and beryllium compounds to clarify certain provisions and simplify or improve compliance. The revisions in this final rule are designed to maintain or enhance worker protections overall by ensuring that the rule is well understood and compliance is more straightforward.

DATES: This final rule becomes effective on [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: In accordance with 28 U.S.C. 2112(a)(2), OSHA designates Edmund C. Baird, Associate Solicitor of Labor for Occupational Safety and Health, to receive petitions for review of the final rule. Contact the Associate Solicitor at the Office of the Solicitor, Room S-4004, U.S. Department of Labor, 200 Constitution Avenue NW, Washington, DC 20210; telephone: (202) 693-5445.

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Citation Method

In the docket for this rulemaking found at <http://www.regulations.gov>, every submission was assigned a document identification (ID) number that consists of the docket number (OSHA-2018-0003) followed by an additional four-digit number. For example, the document ID number for the proposed rule is OSHA-2018-0003-0016. Some document ID numbers include one or more attachments (see, e.g., Document ID OSHA-2018-0003-0026).

When citing exhibits in the OSHA-2018-0003 docket in this preamble, OSHA includes the term “Document ID” followed by the last four digits of the document number; the attachment number or other attachment identifier, if necessary for clarity; and page numbers (designated “p.” or “pp.”). In a citation that contains two or more document ID numbers, the document ID numbers are separated by semi-colons. For example, a citation referring to National Jewish Health’s comments and the first attachment to Materion Brush, Inc.’s comments would be indicated as follows:
(Document ID 0022, pp. X-X; 0038-A1, p. X).

Occasionally this preamble refers to documents located in the rulemaking dockets that were used for previous beryllium rulemaking activities, including the 2017 final rule. When citing exhibits in other dockets, OSHA includes the term “Document ID” followed by the full document number. For example, this preamble cites a publication by Armstrong et al. (2014), titled “Migration of beryllium via multiple exposure pathways among work processes in four different facilities,” designated Document ID OSHA-H005C-2006-0870-0502.

The exhibits in the docket (and the other beryllium-rulemaking dockets cited in this preamble), including public comments, supporting materials, meeting transcripts, and other documents, are listed on <http://www.regulations.gov>. All exhibits are listed in the docket index on <http://www.regulations.gov>, but some exhibits (e.g., copyrighted material) are not available to read or download from that website. All materials in the docket are available for inspection at the OSHA Docket Office, Room N-3508, U.S. Department of Labor, 200 Constitution Avenue NW, Washington, DC 20210; telephone (202) 693-2350.

I. Executive Summary

On January 9, 2017, OSHA published a final rule on Occupational Exposure to Beryllium and Beryllium Compounds (82 FR 2470). This rule created health standards for beryllium exposure in the general industry (29 CFR 1910.1024), construction (29 CFR 1926.1124), and shipyards (29 CFR 1915.1024) sectors. On December 11, 2018, OSHA published a Notice of Proposed Rulemaking (NPRM) in which the agency proposed various amendments to the beryllium standard for general industry (83 FR 63746). With the proposed revisions, OSHA sought to clarify certain provisions and simplify or improve compliance with the beryllium standard for general industry. In this final rule, OSHA is finalizing the majority of the changes proposed in the NPRM, with some revisions intended to address concerns raised by stakeholders during the comment period. OSHA believes that these changes to the standard will maintain safety and health protections for workers and will further enhance worker protections by ensuring that the standard is well-understood.

The changes to the final standard for general industry are fully discussed in Section XI, Summary and Explanation of the Final Rule. Broadly, OSHA proposed to add one definition and modify five existing terms in paragraph (b), Definitions; to amend paragraph (f), Methods of compliance; paragraph (h), Personal protective clothing and equipment; paragraph (i), Hygiene areas and practices; paragraph (j), Housekeeping; paragraph (k), Medical surveillance; paragraph (m), Communication of hazards; and paragraph (n), Recordkeeping; and to replace the 2017 final standard's Appendix A with a new appendix designed to supplement the proposed definition of *beryllium work area*.

OSHA is finalizing these provisions as proposed, with the following exceptions. First, OSHA is revising the definition of *confirmed positive* to state that the findings of two abnormal, one abnormal and one borderline, or three borderline results need to occur from beryllium lymphocyte proliferation tests (BeLPTs) conducted within a three-year period. This differs from the definition proposed in the 2018 NPRM, which would have required that any combination of test results specified in the definition must be obtained within the 30-day follow-up test period required after a first abnormal or borderline BeLPT test result. Second, OSHA is modifying the proposed paragraph (j)(3), which requires employers to take certain actions when transferring materials that contain at least 0.1 percent beryllium by weight or that are contaminated with beryllium outside a plant for the purpose of disposal, recycling, or reuse, to clarify that only transfers outside of a plant, including between facilities owned by the same employer, are subject to the labeling requirements of paragraph (m)(3).

Third, in paragraphs (k)(2)(iii) and (iv), OSHA is modifying the proposed provisions pertaining to an employer's obligation to offer a medical examination after an employee is exposed to beryllium in an emergency. Fourth, OSHA is amending proposed paragraph (k)(7)(i) to require that an examination at a chronic beryllium disease (CBD) diagnostic center be scheduled within 30 days of the employer receiving certain types of documentation, listed in paragraph (k)(7)(i)(A) and (B), that trigger evaluation for CBD. OSHA is further revising proposed paragraph (k)(7) by adding a new provision, paragraph (k)(7)(ii), which clarifies that, as part of the evaluation at the CBD diagnostic center, the employer must ensure that the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center and to state that if

any tests deemed appropriate by the physician are not available at the CBD diagnostic center, they may be performed at another location that is mutually agreed upon by the employer and the employee. For a full explanation of comments received and OSHA's reasoning for these revisions, see Section XI, Summary and Explanation of the Final Rule.

OSHA's examination of the technological and economic feasibility of this final rule is presented in the Final Economic Analysis and Regulatory Flexibility Analysis (FEA), in Section IV of this preamble. As explained there, OSHA finds that none of the revisions would impose any new employer obligations or increase the overall cost of compliance, while some of the revisions in this final rule will clarify and simplify compliance in such a way that results in cost savings. OSHA also finds that none of the revisions would require any new controls or other technology. OSHA therefore concludes that the final rule is both economically and technologically feasible.

Further, this final rule is considered to be an Executive Order (EO) 13771 deregulatory action. Pursuant to the Congressional Review Act (5 U.S.C. 801 et seq.), the Office of Information and Regulatory Affairs designated this rule not a "major rule," as defined by 5 U.S.C. 804(2).

II. Events Leading to the Final Rule

On January 9, 2017, OSHA published the final rule Occupational Exposure to Beryllium and Beryllium Compounds (2017 final rule) in the *Federal Register* (82 FR 2470).¹ Therein, OSHA concluded that employees exposed to beryllium and beryllium

¹ In the 2017 final rule, OSHA issued three separate beryllium standards—general industry, shipyards, and construction. This final rule amends only the general industry

compounds at the preceding permissible exposure limits (PELs) were at significant risk of material impairment of health, specifically chronic beryllium disease (CBD) and lung cancer. The agency further determined that limiting employee exposure to an 8-hour time-weighted average (TWA) PEL of 0.2 $\mu\text{g}/\text{m}^3$ would reduce this significant risk to the maximum extent feasible. Therefore, the 2017 final rule adopted a TWA PEL of 0.2 $\mu\text{g}/\text{m}^3$. In addition to the revised PEL, the 2017 final rule established a new short-term exposure limit (STEL) of 2.0 $\mu\text{g}/\text{m}^3$ over a 15-minute sampling period and an action level of 0.1 $\mu\text{g}/\text{m}^3$ as an 8-hour TWA, along with a number of ancillary provisions intended to provide additional protections to employees. The ancillary provisions included requirements for exposure assessment, methods for controlling exposure, respiratory protection, personal protective clothing and equipment, housekeeping, medical surveillance, hazard communication, and recordkeeping that are similar to those found in other OSHA health standards.

The 2017 final rule went into effect on May 20, 2017, and OSHA began enforcing the PEL and the general industry standard's provisions for exposure assessment, respiratory protection, medical surveillance, and medical removal on May 11, 2018. See Updated Interim Enforcement Guidance for the Beryllium Standards, available at <https://www.osha.gov/laws-regs/standardinterpretations/2018-12-11>. The majority of the general industry standard's other provisions became enforceable on December 12, 2018, with compliance obligations for showers and change rooms following on March 11, 2019 (83 FR 39351). OSHA began enforcing the general industry requirements for engineering controls on March 10, 2020.

standard. Therefore, neither this Events Leading to the Final Rule section nor the remainder of the preamble will include information about the other two standards.

In response to concerns raised by stakeholders following the publication of the 2017 final rule, OSHA published a direct final rule (DFR) in the *Federal Register* on May 7, 2018 (83 FR 19936), amending the text of the beryllium standard for general industry to clarify OSHA's intent with respect to certain terms in the standard, including the definition of *beryllium work area* (BWA), the definition of *emergency*, and the meaning of the terms *dermal contact* and *beryllium contamination* (see 83 FR at 19938). The DFR also clarified OSHA's intent with respect to provisions for disposal and recycling and with respect to provisions that the agency intended to apply only where skin can be exposed to materials containing at least 0.1% beryllium by weight (83 FR at 19938). Because the agency did not receive any significant adverse comments, OSHA published a *Federal Register* notice confirming the effective date of the DFR as July 6, 2018, and withdrawing the companion NPRM (83 FR 31045 (July 3, 2018)).

On December 11, 2018, OSHA published an NPRM in the *Federal Register* (83 FR 63746) in which the agency proposed to further amend the beryllium standard for general industry.² The proposal sought to clarify certain provisions—with proposed changes designed to facilitate application of the standard consistent with the intent of the 2017 final rule—and to simplify or improve compliance, preventing costs that may flow from misinterpretation or misapplication of the standard. OSHA requested public comment on the proposed changes and provided stakeholders 60 days to submit comments. OSHA received 22 comments before the comment period closed on February 11, 2019.

² OSHA stated in the NPRM that the agency believed that the standard as modified by the proposal would provide equivalent protection to the existing standard; and OSHA would therefore accept compliance with the standard, as modified by the proposal, as compliance with the standard while the rulemaking was pending.

III. Legal Considerations

The purpose of the Occupational Safety and Health Act of 1970 (“the OSH Act” or “the Act”), 29 U.S.C. 651 et seq., is to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources. 29 U.S.C. 651(b). To achieve this goal, Congress authorized the Secretary of Labor (“the Secretary”) to promulgate occupational safety and health standards pursuant to notice and comment rulemaking. See 29 U.S.C. 655(b). An occupational safety or health standard is a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment. 29 U.S.C. 652(8).

The Act also authorizes the Secretary to “modify” or “revoke” any occupational safety or health standard, 29 U.S.C. 655(b), and under the Administrative Procedure Act, regulatory agencies generally may revise their rules if the changes are supported by a reasoned analysis, see *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 42 (1983). “While the removal of a regulation may not entail the monetary expenditures and other costs of enacting a new standard, and accordingly, it may be easier for an agency to justify a deregulatory action, the direction in which an agency chooses to move does not alter the standard of judicial review established by law.” *Id.*

The Act provides that in promulgating health standards dealing with toxic materials or harmful physical agents, such as the January 9, 2017, final rule regulating occupational exposure to beryllium, the Secretary must set the standard that most adequately assures, to the extent feasible and on the basis of the best available evidence,

that no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life. 29 U.S.C. 655(b)(5).

The Supreme Court has held that before the Secretary can promulgate any permanent health or safety standard, he must make a threshold finding that significant risk is present and that such risk can be eliminated or lessened by a change in practices. See *Indus. Union Dep't, AFL-CIO v. Am. Petroleum Inst. ("Benzene")*, 448 U.S. 607, 641–42 (1980) (plurality opinion). OSHA need not make additional findings on risk for this revised rule because OSHA previously determined that the beryllium standard addresses a significant risk that can be eliminated or lessened by a change in practices, see 82 FR 2545–52, and the changes and clarifications in this final rule do not affect that determination. See, e.g., *Pub. Citizen Health Research Grp. v. Tyson*, 796 F.2d 1479, 1502 n.16 (D.C. Cir. 1986) (rejecting the argument that OSHA must “find that each and every aspect of its standard eliminates a significant risk”).

OSHA standards must also be both technologically and economically feasible. See *United Steelworkers of Am., AFL-CIO-CLC v. Marshall ("Lead I")*, 647 F.2d 1189, 1264 (D.C. Cir. 1980). The Supreme Court has defined feasibility as “capable of being done.” *Am. Textile Mfrs. Inst. v. Donovan ("Cotton Dust")*, 452 U.S. 490, 508–09 (1981). The courts have further clarified that a standard is technologically feasible if OSHA proves a reasonable possibility, “within the limits of the best available evidence...that the typical firm will be able to develop and install engineering and work practice controls that can meet the [standard] in most of its operations.” *Lead I*, 647 F.2d at 1272. With respect to economic feasibility, the courts have held that “[a] standard is feasible if it does

not threaten massive dislocation to or imperil the existence of the industry.” Id. at 1265 (internal quotation marks and citations omitted).

OSHA exercises significant discretion in carrying out its responsibilities under the Act. Indeed, “[a] number of terms of the statute give OSHA almost unlimited discretion to devise means to achieve the congressionally mandated goal” of ensuring worker safety and health. See *Lead I*, 647 F.2d at 1230 (citation omitted). Thus, where OSHA has chosen some measures to address a significant risk over other measures, parties challenging the OSHA standard must “identify evidence that their proposals would be feasible and generate more than a de minimis benefit to worker health.” *N. Am. ’s Bldg. Trades Unions v. OSHA*, 878 F.3d 271, 282 (D.C. Cir. 2017).

Although OSHA is required to set standards “on the basis of the best available evidence,” 29 U.S.C. 655(b)(5), its determinations are “conclusive” if supported by “substantial evidence in the record considered as a whole,” 29 U.S.C. 655(f). Similarly, as the Supreme Court noted in *Benzene*, OSHA must look to “a body of reputable scientific thought” in making determinations, but a reviewing court must “give OSHA some leeway where its findings must be made on the frontiers of scientific knowledge.” *Benzene*, 448 U.S. at 656. When there is disputed scientific evidence in the record, OSHA must review the evidence on both sides and “reasonably resolve” the dispute. *Tyson*, 796 F.2d at 1500. The “possibility of drawing two inconsistent conclusions from the evidence does not prevent the agency’s finding from being supported by substantial evidence.” *N. Am. ’s Bldg. Trades Unions*, 878 F.3d at 291 (quoting *Cotton Dust*, 452 U.S. at 523) (alterations omitted). As the D.C. Circuit has noted, where “OSHA has the expertise we lack and it has exercised that expertise by carefully reviewing the scientific

data,” a dispute within the scientific community is not occasion for the reviewing court to take sides about which view is correct. *Tyson*, 796 F.2d at 1500.

Finally, because section 6(b)(5) of the Act explicitly requires OSHA to set health standards that eliminate risk “to the extent feasible,” OSHA uses feasibility analysis rather than cost-benefit analysis to make standards-setting decisions dealing with toxic materials or harmful physical agents. 29 U.S.C. 655(b)(5). An OSHA standard in this area must be technologically and economically feasible—and also cost effective, which means that the protective measures it requires are the least costly of the available alternatives that achieve the same level of protection—but OSHA cannot choose an alternative that provides a lower level of protection for workers’ health simply because it is less costly. See *Int’l Union, UAW v. OSHA*, 37 F.3d 665, 668 (D.C. Cir. 1994); see also *Cotton Dust*, 452 U.S. at 513 n.32. In *Cotton Dust*, the Court explained that Congress itself had defined the appropriate relationship between costs and benefits by prioritizing the “benefit” of worker health above all other considerations, save those that would make this “benefit” unachievable. The Court further stated that any standard based on a balancing of costs and benefits by the Secretary that strikes a different balance than that struck by Congress would be inconsistent with the command set forth in section 6(b)(5). See *Cotton Dust*, 452 U.S. at 509. Thus, while OSHA estimates the costs and benefits of its proposed and final rules, in part to ensure compliance with requirements such as those in Executive Orders 12866 and 13771, these calculations do not form the basis for the agency’s regulatory decisions.

IV. Final Economic Analysis and Regulatory Flexibility Act Certification (FEA)

A. Summary of Economic Impact

This rule amends OSHA's existing general industry standard for occupational exposure to beryllium and beryllium compounds (29 CFR 1910.1024) to clarify certain provisions and simplify or improve compliance. OSHA's final economic analysis shows that these changes will result in unquantifiable cost savings, largely due to the prevention of misinterpretation and misapplication of the standard.

In promulgating the 2017 final rule, OSHA determined that the beryllium rule was both technologically and economically feasible. See 82 FR at 2582-86, 2590-96, Summary of the Final Economic Analysis. The changes herein are intended to align the rule more clearly with the intent of the 2017 final rule. Because OSHA has determined that this final rule will decrease the costs of compliance by preventing misinterpretation and misapplication of the standard, and would require no new controls or other technology, OSHA has also determined that the rule is both technologically and economically feasible.

Because this final rule only clarifies the existing beryllium standard or makes minor revisions that will generally aid in compliance, the revised beryllium standard will maintain safety and health protections for workers. And, to the extent this final rule helps employers avoid misapplication of the beryllium standard's requirements and hence achieves greater compliance with the standard's intended meaning, there will be increased protection for workers.

B. Final Economic Analysis and Regulatory Flexibility Act Certification

Executive Orders 12866 and 13563, the Regulatory Flexibility Act (5 U.S.C. 601-612), and the Unfunded Mandates Reform Act (UMRA) (2 U.S.C. 1532(a)) require that OSHA estimate the benefits, costs, and net benefits of regulations, and analyze the

impacts of certain rules that OSHA promulgates. Executive Order 13563 emphasizes the importance of quantifying both costs and benefits, reducing costs, harmonizing rules, and promoting flexibility.

This final rule is not a “significant regulatory action” under Executive Order 12866 or the UMRA. Neither the benefits nor the costs of this final rule would exceed \$100 million in any given year. On the contrary, the possible effects of each provision on costs and benefits appear to be relatively small, and OSHA has not been able to quantify them. Nor has OSHA been able to quantify the cost savings it expects from preventing misinterpretation and misapplication of the standard. However, OSHA does expect that this final rule will increase understanding and compliance with the standard and, therefore, the agency expects the rule to result in some, unquantifiable cost savings. Moreover, and as discussed above, OSHA expects this final rule will maintain safety and health protections for workers.

1. Final Determinations Regarding Costs and Cost Savings Attributable to the Final Rule

In the Preliminary Economic Analysis and Regulatory Flexibility Act Certification (PEA) in the 2018 NPRM, OSHA considered whether each of the proposed changes could affect the costs and, if so, how those costs might be affected (83 FR at 63760-65). For the purposes of the preliminary analysis, the agency divided the proposed changes into two groups: (1) proposed clarifications and (2) proposed revisions. The “proposed clarifications” were those that were solely intended to clarify provisions and would not alter the requirements and scope of the rule (83 FR at 63760-61). The items OSHA identified as clarifications included the addition of a definition of *beryllium*

sensitization to paragraph (b); minor changes to the definitions of *CBD diagnostic center* and *chronic beryllium disease* in paragraph (b); minor changes to the written exposure control plan provisions in paragraphs (f)(1)(i)(D) and (f)(1)(ii)(B); a minor change in the PPE removal provision of paragraph (h)(2)(i); minor changes to provisions for the cleaning of PPE in paragraph (h)(3)(iii); minor changes to the cleaning of PPE upon entry to eating or drinking areas in paragraph (i)(4)(ii); and minor changes to provisions for employee information and training in paragraphs (m)(4)(ii)(A) and (m)(4)(ii)(E) (83 FR at 63760-61).

The “proposed revisions,” on the other hand, were those that would go beyond clarification and alter certain requirements of the beryllium standard (83 FR at 63761). The proposed provisions that OSHA identified as revisions included changes to the definitions of *beryllium work area*, *confirmed positive*, and *dermal contact with beryllium* in paragraph (b); a change to the requirements for washing facilities in paragraph (i)(1); a change to the requirements for provision of change rooms in paragraph (i)(2); changes to the requirements pertaining to disposal and recycling in paragraph (j)(3); a change to the requirements for medical surveillance following an employee’s exposure to beryllium in an emergency in paragraph (k)(2); revision to provisions for evaluation at a CBD diagnostic center in paragraph (k)(7)(i); a change to the requirements for warning labels in paragraph (m)(3); and changes to the requirements for recordkeeping in paragraphs (n)(1)(ii)(F), (n)(3)(ii)(A), and (n)(4)(i).

After carefully reviewing the proposed clarifications and revisions, OSHA preliminarily determined that their net total effect would result in potential cost savings, mainly from improving employer understanding and facilitating application of the rule

(83 FR at 63760-61). OSHA preliminarily identified a new potential cost, which would result from the proposed changes as a whole: a de minimis cost for the time employers would need to become familiar with the revised portions of this final rule (83 FR at 63761, 63765). Viewing all the proposed changes as a whole, OSHA explained that it preliminarily anticipated that the proposed provisions' net effect would result in some cost savings (83 FR at 63761). OSHA invited comment on all aspects of the PEA, including these preliminary determinations (83 FR at 63760-62, 63764-65).

Stakeholders either agreed with or did not comment on OSHA's analysis of potential costs and costs savings attributable to the vast majority of the proposed clarifications and revisions (e.g., Document ID 0026, pp. 1-2; 0038, pp. 21, 26, 32). The only objections the agency received related to two of the four proposed paragraphs that OSHA is revising from the proposal in the final rule: (1) the definition of the term *confirmed positive*; and (2) the requirement related to examinations at CBD diagnostic centers (Document ID 0021, p. 4; 0022, pp. 5-6). Those comments, and OSHA's final determination that each of the four paragraphs that OSHA is revising from the proposal will result in small and unquantifiable cost savings, are discussed in detail below.

OSHA has also examined the record concerning the proposed clarifications and revisions that OSHA has finalized without change. As noted above, stakeholders either agreed with or did not comment on OSHA's analysis of potential costs and costs savings attributable to these proposed changes. Therefore, after carefully considering all the comments received and the remainder of the record, OSHA affirms its preliminary determination that these clarifications and revisions are likely to result in cost savings, largely from improving employer understanding and facilitating application of the rule.

OSHA also affirms its preliminary determination that the only potential new costs are de minimis costs for the time employers would need to become familiar with the revised portions of this final rule.

In summary, OSHA finds that both the four paragraphs that OSHA is revising from the proposal and the remainder of the proposed clarifications and revisions that OSHA is finalizing without change in the final rule will result in potential cost savings mainly attributable to improving employer understanding and facilitating application of the rule, as well as preventing costs that would follow from misunderstanding the standard. OSHA expects that the cost savings attributable to these changes will offset the de minimis employer familiarization costs, resulting in a net result of cost savings. Therefore, OSHA finds that this final rule is likely to result in cost savings.

2. Analysis of Costs and Costs Savings Attributable to Provisions in the Final Rule that Differ from Those in the Proposal

In this section the agency discusses the four changes in the final rule that differ from the proposal: the definition of *confirmed positive* in paragraph (b), Definitions; a clarification to inter-plant transfers in paragraph (j), Housekeeping; and two changes to paragraph (k), Medical Surveillance: requirements related to CBD diagnostic centers and requirements for medical examination at termination of employment. In all cases, as stated above, the agency has determined these will have de minimis cost or cost savings implications.

Definition of Confirmed Positive.

The 2017 final rule did not specify a time limit within which the BeLPT tests that contribute toward a finding of “confirmed positive” must occur. In the 2018 NPRM,

OSHA proposed to modify the definition of *confirmed positive* to require that the qualifying test results be obtained within one testing cycle (including the 30-day follow-up test period required after a first abnormal or borderline BeLPT test result), rather than arguably over an unlimited time period that might have led to false positives that could needlessly concern workers and their families, could lead workers to undergo unnecessary testing, and would not enhance worker protections. In the PEA, OSHA explained that the exact effect of the proposed change was uncertain as it is unknown how many employees would have a series of BeLPT results associated with a confirmed positive finding (two abnormal results, one abnormal and one borderline result, or three borderline results) over an unlimited period of time, but would not have any such combination of results within a single testing cycle (83 FR at 63761-62). OSHA preliminarily concluded that the proposed change would not increase compliance costs and would incidentally yield some cost savings by lessening the likelihood of false positives (83 FR at 63762). The agency invited comment on its preliminary conclusion (83 FR at 63762).

As discussed in Section XI, Summary and Explanation for paragraph (b), a number of stakeholders commented that requiring results within a 30-day testing cycle could create logistical challenges, for example due to repeat testing requirements or for businesses in remote areas with limited healthcare facilities (Document ID 0022, p. 4; 0021, p. 4; 0024, p. 1; 0033, p. 5; 0027, p. 3). National Jewish Health (NJH) also commented that removing the time frame of 30 days for confirming abnormal results would allow for employee workplace protection and clinical evaluation referral at a lower cost and with less logistical burden (Document ID 0022, p. 5).

Stakeholders' logistical concerns and NJH's comment about costs reflect a misunderstanding of the proposed change. As explained in more detail in the Summary and Explanation for paragraph (b), OSHA did not intend that the initial and any follow-up tests had to be completed and interpreted within 30 days. Rather, the agency intended that the test results be obtained during one cycle of testing, that is, an initial or periodic examination followed by follow-up testing conducted within 30 days of an abnormal or borderline result. For example, if an employee received a borderline BeLPT result at his or her periodic examination, paragraph (k)(3)(ii)(E) would require the employer to offer a follow-up BeLPT within 30 days of the test results. If the follow-up BeLPT result was also borderline, paragraph (k)(3)(ii)(E) would again require the employer to offer a follow-up BeLPT within 30 days of the first follow-up test's results. If that second follow-up was borderline or abnormal, the employee would have been confirmed positive under the proposal because all of the tests that "confirmed" the results were triggered by the initial test. In other words, OSHA did not intend to suggest that the proposal would have required employers to conduct all of the tests or obtain the confirming results within a single 30-day period.

In this final rule, OSHA has revised the definition of *confirmed positive* to specify that the findings of two abnormal, one abnormal and one borderline, or three borderline results must be obtained from BeLPTs conducted within a three-year period. OSHA determined that this revision strikes the appropriate balance between the shorter time period for confirmation in the proposal and the unspecified, arguably indefinite, time period of the original definition. As explained in the Summary and Explanation section, the final three-year period will capture the identification of sensitized workers enrolled in

medical surveillance. OSHA finds that the addition of a specific time period to the text of the final rule will decrease the possibility of a misinterpretation of the provision's time frame that could lead to false positive results.

As with the proposed revisions to this definition, OSHA finds that the exact effect of this change is uncertain because it is unknown how many employees would have a series of BeLPT results associated with a confirmed positive finding (two abnormal results, one abnormal and one borderline result, or three borderline results) over an unlimited period of time, but would not have any such combination of results within a three-year testing cycle, though it is likely to be small. As discussed in Section XI, Summary and Explanation of the Final Rule, NJH reported that in a group of 194 CBD patients in their care, the length of time between abnormal results ranged from 14 days to 5.8 years, with a 95th percentile of 2.9 years. This suggests that the vast majority of individuals who will have two abnormal BeLPT tests in the course of medical surveillance are likely to be confirmed positive within the three-year window of time OSHA is establishing in the definition of *confirmed positive*. The Summary and Explanation section notes further that a three-year testing cycle is consistent with practices and recommendations of the medical community, pointing to the increasing likelihood that a confirmed positive finding over longer periods of time will be a false-positive and lead to costly further medical exams with no benefit. Thus, OSHA concludes that this change will not increase compliance costs and will incidentally yield some cost savings by lessening the likelihood of false positives.

Disposal, Recycling, and Reuse.

Paragraph (j)(3) of the previous standard (29 CFR 1910.1024(j)(3)) addresses disposal and recycling of materials that contain beryllium in concentrations of 0.1 percent by weight or more or that are contaminated with beryllium. In the 2018 NPRM, OSHA proposed to modify this paragraph in a number of ways—all of which the agency preliminarily found would not increase the costs of complying with the standard and may also result in unquantifiable savings to employers by preventing misinterpretation or misapplication of the rule (83 FR at 63762-63). Stakeholders did not offer any comments objecting to this preliminary determination. With the exception of one minor clarification to the regulatory text, discussed below, OSHA is adopting all of the proposed revisions to paragraph (j)(3) in this final rule. After reviewing the record as a whole and having received no evidence or comment to the contrary, the agency reaffirms its preliminary determination that the proposed revisions to paragraph (j)(3) that are being adopted in this final rule will result in some cost savings from increased employer understanding.

OSHA has made one change to the proposed provisions in paragraph (j)(3) in this final rule. When employers transfer certain materials to another party for disposal, recycling, or reuse, proposed paragraph (j)(3)(i) would have required employers to label the materials in accordance with paragraph (m)(3) of the standard. As explained in the Summary and Explanation for paragraph (j)(3), a comment alerted the agency to a potential ambiguity in this proposed text. Specifically, OSHA realized that the phrase “to another party” could be read to suggest that transfers between two facilities owned by the same employer are exempted from the labeling requirements in paragraph (j)(3)(i). That was not the agency’s intent in the proposal. To eliminate any ambiguity on this point, OSHA revised paragraph (j)(3)(i) in the final rule to strike the phrase “to another party”

and add the “except for intra-plant transfers” language that is found in paragraphs (j)(3)(ii) and (iii).

As with the proposed changes to paragraphs (j)(3)(ii) and (iii), which clarified that those paragraphs’ requirements did not apply to intra-plant transfers, OSHA finds that this proposed change is not a substantive change to the standard. It is simply clarifying OSHA’s original intent that all transfers outside of a plant, including between facilities owned by the same employer, are subject to the labeling requirements of paragraph (m)(3). Since this change does not alter the requirements of the standard, it will not affect the costs of compliance with the standard. Therefore, OSHA finds that none of the changes this final rule makes to paragraph (j)(3) will increase the costs of complying with the standard.

Medical Surveillance.

In the 2018 NPRM, OSHA proposed two sets of changes to paragraph (k). The first set of changes proposed is in paragraph (k)(2), which specifies when and how frequently medical examinations are to be offered to those employees covered by the medical surveillance program. Paragraph (k)(2)(i)(B) of the previous standard required the employer to provide a medical examination within 30 days after determining that the employee shows signs or symptoms of CBD or other beryllium-related health effects or that the employee has been exposed to beryllium in an emergency.

Based on stakeholder feedback and other evidence indicating that the 30-day period in the previous standard may be insufficient to detect beryllium sensitization in individuals exposed one time in an emergency, OSHA proposed removing the requirement for a medical examination within 30 days of exposure to beryllium during an

emergency, under paragraph (k)(2)(i)(B), and adding paragraph (k)(2)(iv), which would require the employer to offer a medical examination at least one year after but no more than two years after the employee is exposed to beryllium during an emergency (83 FR at 63757).

In the PEA, OSHA preliminarily determined that the net cost impact of these proposed changes would be slight, with some possible cost savings. Specifically, OSHA explained that, in the FEA for the 2017 final rule, the agency estimated that emergencies would affect a very small number of employees in a given year, likely less than 0.1 percent of the affected population, representing a small addition to the costs of medical surveillance for the standard (Document ID OSHA-H005C-2006-0870-2042, p. V-196). Under the 2017 final rule, some employees might have required two examinations to be confirmed positive: a first test cycle within the initial 30-day period and a second BeLPT at least two years later. Under the 2018 NPRM, OSHA expected that more of the employees who became sensitized from exposure in an emergency would be confirmed positive through a single testing cycle because that test would have been administered one to two years following the emergency. The agency anticipated that the proposed change would result in the elimination of one premature testing, which would ensure better detection for more employees and incidentally trigger some cost savings (83 FR at 63764).³

To the extent that lengthening the time period in which the test must be offered from within 30 days to between one and two years leads to earlier confirmed positive

³ Assuming that this initial analysis does not result in a confirmed positive diagnosis, that employee would not be confirmed positive until a second test two years later under the current rule.

results (within two years, as opposed to within two years plus 30 days), OSHA preliminarily found that the proposed change could slightly accelerate costs to the employer for earlier CBD diagnostic center referral and medical removal protection. OSHA estimated that the proposed change would affect a very small percentage of an already very small population. The agency preliminarily determined that the proposed revision would only potentially change the timing of the already-required BeLPT, CBD diagnostic center referral, and medical removal protection (83 FR at 63764, 63764 n.5).

In summary, OSHA preliminarily found that the end result of the proposed changes to paragraph (k)(2) from a cost perspective would be that the cost savings from the potential avoidance of a premature BeLPT within 30 days following an emergency would likely be largely canceled out by the acceleration of the cost of the CBD diagnostic center evaluation and medical removal protection. Therefore, OSHA preliminarily determined that the net cost impact of the proposed changes would be slight, with some possible cost savings (83 FR at 63764). Stakeholders did not submit any comments related to OSHA's preliminary determinations regarding potential costs of the proposed revisions to paragraph (k)(2).

In sum, after considering the record as a whole, OSHA finds that its preliminary estimates were correct: a small change in costs, with possible cost savings. Nevertheless, as discussed in more detail in the Summary and Explanation for paragraph (k), Medical Surveillance, some stakeholders expressed concerns about possible delays in medical consultations and examinations and lack of employee knowledge of potential health effects, and one stakeholder argued that employees who terminate employment before

receiving the post-emergency examination might not receive an examination at all after being exposed in an emergency (Document ID 0023, pp. 2-3; 0024, p. 2; 0027, p. 4).

OSHA is revising paragraphs (k)(2) in the final rule in two ways to address these concerns. First, OSHA has added two sub-provisions under paragraph (k)(2)(iv) to provide for post-emergency examination timing for two separate groups of employees. Final paragraph (k)(2)(iv)(A) focuses on the very small group of employees who are exposed in an emergency but have not received a medical examination under paragraph (k)(1)(i) within the previous two years. The requirement for these employees is similar to the requirement contained in the previous standard; i.e., under the final standard, the employer must provide these employees with a medical examination within 30 days of the date of the emergency. Because the final standard treats these employees similarly to the manner in which the previous standard treated all employees exposed in an emergency, OSHA does not expect that there will be any change in cost attributable to this change. In other words, for those employees who have not had a medical examination within the past two years there is no change in protocol and, thus, no change in costs.

Final paragraph (k)(2)(iv)(B) focuses on employees who are exposed during an emergency, but have recently received an examination. Under this new provision, if an employee has received a medical examination under paragraph (k)(1)(i) within the previous two years, then the employer would be required to offer that employee a medical examination that meets the requirements of the standard at least one year but no more than two years after the employee was exposed to beryllium in an emergency. Because this provision treats employees who have recently received an examination

similarly to the manner in which the proposal would have treated all employees exposed in an emergency, OSHA expects that this change will result in a fraction of the small cost savings preliminarily estimated in the proposal.

Second, to address concerns that delaying the medical examination to at least one year and no more than two years following the emergency may result in employees not receiving a post-emergency examination if their employment ends soon after exposure during an emergency, OSHA is revising paragraph (k)(2)(iii) to require that each employee who is exposed in an emergency and has not received an examination since the emergency exposure is provided an examination at the time employment is terminated. Because paragraph (k)(2)(iii) already requires an examination at termination if there has not been one within the last six months due to any of the standard medical exam triggers, including emergency exposure, OSHA expects that this change will affect an extremely small group of employees. This revision, however, will ensure that all employees with emergency exposure are offered a medical exam, even under this very narrow set of circumstances. The baseline of costs and cost savings of this analysis is the previous rule, which already required a medical exam within 30 days of emergency exposure. Thus, OSHA does not expect that this change will have any cost implications.

In summary, OSHA finds that this final rule's revisions to paragraph (k)(2) will result in slight cost savings. No costs or costs savings are attributable to new paragraph (k)(2)(iv)(A), which treats employees exposed in an emergency who have not received a medical examination within the previous two years pursuant to paragraph (k)(1)(i) similarly to how all employees exposed in an emergency were treated under the previous standard. The end result of final paragraph (k)(2)(iv)(B), however, will be cost savings

from the potential avoidance of a premature BeLPT that are largely offset by the acceleration of the cost of the CBD diagnostic center evaluation and medical removal protection. OSHA does not attribute any costs or cost savings to result from the revisions to paragraph (k)(2)(iii). Therefore, the agency expects the new result of final paragraph (k)(2) to be a slight cost savings.

The second set of changes proposed to the standard's medical surveillance requirements is in paragraph (k)(7), which contains the requirements for evaluation at a CBD diagnostic center. Paragraph (k)(7)(i) of the previous rule required employers to provide an evaluation at no cost to the employee at a CBD diagnostic center that is mutually agreed upon by the employee and employer within 30 days of the employer receiving a written medical opinion that recommends referral to a CBD diagnostic center, or a written medical report indicating that the employee has been confirmed positive or diagnosed with CBD. To address stakeholder concerns that scheduling the appropriate tests with an examining physician at the CBD diagnostic center may take longer than 30 days, OSHA proposed that the employer provide an initial consultation with the CBD diagnostic center, rather than the full evaluation, within 30 days of the employer receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B). The agency noted that the consultation could occur via telephone or virtual conferencing methods and would demonstrate that the employer made an effort to begin the process for a medical examination (83 FR at 63758). Evaluation and any testing would then occur within a reasonable time after the consultation.

In the PEA, OSHA noted that while the addition of the consultation would not result in any additional costs or cost savings (since the 2017 FEA had already accounted

for a 15-minute discussion between the employee and a physician (Document ID OSHA-H005C-2006-0870-2042, p. V-206)), allowing more flexibility in scheduling the tests at the CBD diagnostic center would enable employers to find more economical travel and accommodation options. To the extent that it takes longer than 30 days to schedule the tests at the CBD diagnostic center, the agency preliminarily found that employers may realize a cost savings due to retaining funds during the delay. OSHA could not quantify the effect of this flexibility, however, concluding only that it expected that the changes would produce minor, if any, cost savings. The agency invited comment on its preliminary assessment of these potential effects (83 FR at 63764).

Stakeholders did not offer any comments on the agency's preliminary estimates regarding the cost savings attributable to these proposed changes. Several commenters objected to adding the consultation requirement, however, arguing that it was an unnecessary step that would add logistical complications and costs (see, e.g., Document ID 0021, p. 3; 022, p. 6). This is discussed in more detail in the Summary and Explanation for paragraph (k), Medical Surveillance. After considering these comments and the record as a whole, OSHA decided to modify paragraph (k)(7)(i) to require that the employer within 30 days of receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B) schedule an evaluation at a CBD diagnostic center. In addition, OSHA is adding a requirement that the evaluation itself must occur within a reasonable time.

OSHA finds that these changes may slightly delay the incidence of costs of an evaluation under paragraph (k)(7)(i), in that it may occur at a later date in some cases than under the existing provision. This would slightly decrease the costs of compliance

with the standard. The agency also finds that allowing the evaluation to occur within a reasonable time, rather than within 30 days, may allow for more cost-effective travel and accommodation options. Thus, as with the proposal, OSHA concludes that these changes may produce minor cost savings.

To account for a proposed change to the definition of *CBD diagnostic center*, the proposed rule would also have amended paragraph (k)(7)(i) to clarify that the employer must provide, at no cost to the employee and within a reasonable time after consultation with the CBD diagnostic center, any of the following tests that a CBD diagnostic center must be capable of performing, if deemed appropriate by the examining physician at the CBD diagnostic center: a pulmonary function test as outlined by American Thoracic Society criteria testing, bronchoalveolar lavage (BAL), and transbronchial biopsy. In the PEA, OSHA explained that this proposed change would not alter the requirements of the standard and therefore would not change the costs of compliance with the standard (83 FR at 63764).

Stakeholders did not offer any comments on OSHA's determination that these proposed changes would not affect costs. Some stakeholders argued, however, that the proposed provision could be misinterpreted to mean that the employer does not have to make available other tests that the examining physician deems appropriate for reasons such as diagnosing or determining the severity of CBD (Document ID 0021, p. 3; 0022, p. 3; 0028, p. 2). This is discussed in more detail in the Summary and Explanation for paragraph (k), Medical Surveillance. To address these concerns, OSHA is adding a new provision, paragraph (k)(7)(ii), which clarifies that, as part of the evaluation at the CBD diagnostic center, the employer must ensure that the employee is offered any tests

deemed appropriate by the examining physician at the CBD diagnostic center, such as pulmonary function testing as outlined by American Thoracic Society criteria testing, bronchoalveolar lavage (BAL), and transbronchial biopsy.⁴ If any of these tests deemed appropriate by the examining physician are not available at the CBD diagnostic center, the final rule allows them to be performed at another location that is mutually agreed upon by the employer and the employee.

OSHA does not believe that requiring employers to provide any tests deemed appropriate by the examining physician would change the costs of compliance with the standard because the agency accounted for such costs in the 2017 final rule.⁵ Specifically, when calculating the unit cost for going to a CBD diagnostic center in the 2017 FEA, the agency used a typical suite of tests that would be performed (Document ID OSHA-H005C-2006-0870-2042, p. V-205). Consequently, OSHA's unit cost in the 2017 final rule for an evaluation at a CBD diagnostic center was an average for standard tests that are required. The agency finds that this average set of tests by definition is constructed to give the average cost for the tests deemed appropriate by the examining physician and, thus, concludes that there are no costs or cost savings attributable to this change.

Paragraph (k)(7)(ii) requires that if any test deemed appropriate by the examining physician is not available at the CBD diagnostic center, the test must be performed at

⁴As discussed in Section XI, Summary and Explanation of the Final Rule, OSHA also redesignated previous paragraphs (k)(7)(ii), (iii), (iv), and (v) as paragraphs (k)(7)(iii), (iv), (v), and (vi), respectively. This redesignation in paragraph (k) also affects a reference in paragraph (l)(1)(ii). These changes are merely administrative and do not have any substantive or monetary effect.

⁵As discussed in the Summary and Explanation for paragraph (k), Medical Surveillance, OSHA never intended to limit the required tests to the three tests listed in the previous definition of the term *CBD diagnostic center*.

another location that is mutually agreed to by the employer and employee. OSHA believes that such circumstances would be very rare. CBD diagnostic centers with the ability to perform pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy are most likely to also provide other medical tests related to CBD.⁶ As a result, the CBD diagnostic center in the vast majority of cases will be able to offer the additional testing deemed necessary by the examining physician. Moreover, because the three tests noted above are the tests that are commonly needed to diagnose CBD, OSHA expects that these are the tests that would most commonly be performed (see Section XI, Summary and Explanation of the Final Rule). Given that this standard requires CBD diagnostic centers to be able to perform the three tests that are most commonly performed to diagnose CBD and CBD diagnostic centers typically would be able to offer any additional tests deemed necessary, OSHA expects that employees would rarely, if ever, need to travel to a second location.⁷ In those rare cases, the added flexibility of having the tests performed outside of a CBD diagnostic center gives more options for the employer and employee and

⁶ Document ID OSHA-H005C-2006-0870-0637 provides some information from the NJH website, which provides an overview of the types of tests performed.

⁷ OSHA also notes that it has always intended for employers to make available any additional tests deemed appropriate by the examining physician (see the discussion of paragraph (k), Medical Surveillance, in Section XI, Summary and Explanation of the Final Rule, of this preamble). The economic analysis of the 2017 final rule did not explicitly account for these rare cases where a test recommended by the examining physician of the CBD diagnostic center was not available at the same center. Hence, there would be a de minimis cost adjustment increase of the total cost of the 2017 final rule due to this consideration. This is not a change in people's behavior, simply a methodological change. The current final rule could affect people's behavior and be a true change (decrease) in costs. This change merely provides employers with a more flexible, potentially less expensive, manner to provide those tests in the rare situation where they are not available at the original CBD diagnostic center.

should lead to cost savings. Because this situation should be quite uncommon, OSHA expects that the cost savings of allowing employees to have additional tests outside of a CBD diagnostic center are likely to be de minimis.

This change to paragraph (k)(7) clarifies OSHA's intent that the employer provide any tests deemed appropriate by the examining physician at the CBD diagnostic center, or at another location if not available at the CBD diagnostic center, but does not substantively change the requirements of the beryllium standard. OSHA expects that the changes described here would maintain safety and health protections for workers.

3. Economic and Technological Feasibility

In the FEA in support of OSHA's 2017 Beryllium Final Rule, OSHA concluded that the general industry beryllium standard was economically and technologically feasible (see 82 FR at 2471). In the 2018 NPRM, OSHA explained that it anticipated that none of the proposed changes would impose any new employer obligations or increase the overall cost of compliance, while some of the changes would clarify and simplify compliance in such a way that results in cost savings. In addition, OSHA preliminarily anticipated that the de minimis cost of any time spent reviewing the proposed changes would be more than offset by the cost savings described in the PEA. OSHA further found that none of the proposed revisions would require any new controls or other technology. OSHA therefore preliminarily determined that the proposed rule was both economically and technologically feasible. OSHA did not receive any comments objecting to or otherwise questioning this preliminary determination.⁸ Therefore, after considering the

⁸ Although the agency did not receive any comments questioning the economic or technological feasibility of the proposed changes, at least one stakeholder argued that the previous standard was not economically or technologically feasible and that the proposed

record as a whole, OSHA finds that the proposed provisions that are being adopted in this final rule are economically and technologically feasible.

OSHA also finds that the few new changes between the proposal and the final rule would not require any new controls or other technology and will result in cost savings. Therefore, OSHA finds that these final provisions, and the final rule as a whole, are economically and technologically feasible.

4. *Effects on Benefits*

In the 2017 FEA, OSHA attributed approximately 67 percent of the beryllium sensitization cases and the CBD cases avoided, and none of the lung cancer cases avoided, solely to the ancillary provisions of the standard (Document ID OSHA-H005C-2006-0870-2042, pp. VII-4 to VII-5, VII-24). This estimate was based on the ancillary provisions as a whole, rather than each provision separately.

In the PEA, OSHA considered the potential effect of each proposed change to ancillary provisions on employee protections. Because the proposed revisions to the standard would not remove or change the general nature of any ancillary provisions, and because the agency expected the proposed revisions to maintain safety and health protections for workers and facilitate employer understanding and compliance, OSHA preliminarily determined that the proposed changes would increase the standard's benefits as a whole by enhancing worker protections overall and by preventing costs that follow from misunderstanding the standard.

provisions remedied some of that stakeholder's concerns with feasibility (Document ID 0038, pp. 13, 21-22, 43). Because the feasibility of the January 2017 final rule as a whole is not at issue in this rulemaking, OSHA considers these comments indicating that these changes provide both economic and technological feasibility relief as support for the economic and technological feasibility of the proposed revisions.

OSHA did not receive any comments related to its preliminary assessment of the proposed provisions' effects on benefits. Having considered the record as a whole, including all the comments received, OSHA finds that the changes in this final rule will maintain safety and health protections for workers while aligning the standard with the intent behind the 2017 final rule and otherwise preventing costs that could follow from misinterpretation or misapplication of the standard. And the agency reaffirms its determination that facilitating employer understanding and compliance has the benefit of enhancing worker protections overall. Therefore, OSHA finds that the changes in this final rule will increase the benefits of the standard as a whole.

5. Regulatory Flexibility Act Certification

In accordance with the Regulatory Flexibility Act, 5 U.S.C. 601 et seq. (as amended), OSHA has examined the regulatory requirements of this final rule to revise the general industry beryllium standard to determine whether they would have a significant economic impact on a substantial number of small entities. The final rule modifies the general industry standard to clarify certain provisions and simplify or improve compliance. It does not impose any new duties or increase the overall cost of compliance, and OSHA expects it will provide some cost savings. OSHA therefore expects that this final rule will not have a significant economic impact on any small entities. Accordingly, OSHA certifies that this final rule will not have a significant economic impact on a substantial number of small entities.

V. Office of Management and Budget (OMB) Review Under the Paperwork Reduction Act of 1995

A. Overview

This final rule revises information collection (paperwork) requirements in the occupational exposure to beryllium in general industry (29 CFR 1910.1024) standard that are subject to Office of Management and Budget (OMB) approval under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501 et seq.) and its implementing regulations (5 CFR part 1320). OSHA is revising the previously approved paperwork package under OMB control number 1218-0267, as it pertains to general industry only. The collection of information items contained in the Information Collection Request (ICR) pertaining to occupational exposure to beryllium in the construction and shipyard sectors remain in the ICR without change.

The PRA generally requires that agencies consider the impact of paperwork and other information collection burdens imposed on the public, obtain public input, and obtain approval from OMB before conducting any collection of information (44 U.S.C. 3507). The PRA defines a *collection of information* as “the obtaining, causing to be obtained, soliciting, or requiring the disclosure to third parties or the public, of facts or opinions by or for an agency, regardless of form or format” (44 U.S.C. 3502(3)(A)). Federal agencies generally cannot conduct or sponsor a collection of information, and the public is generally not required to respond to an information collection, unless it is approved by OMB under the PRA and displays a valid OMB control number (44 U.S.C. 3507). Also, notwithstanding any other provision of law, no person shall be subject to penalty for failing to comply with a collection of information if the collection of information does not display a valid OMB control number (44 U.S.C. 3512).

B. Solicitation of Comments

On January 9, 2017, OSHA published a final rule establishing new permissible exposure limits and other provisions to protect employees from beryllium exposure, such as requirements for exposure assessment, respiratory protection, personal protective clothing and equipment, housekeeping, medical surveillance, hazard communication, and recordkeeping for the general industry, construction, and shipyard sectors. OMB approved the collections of information contained in the final rule under OMB Control Number 1218-0267.

On December 11, 2018, OSHA published a Notice of Proposed Rulemaking (NPRM) to modify the general industry beryllium standard by clarifying certain provisions to improve and simplify compliance (83 FR 63746). The 2018 NPRM proposed to revise the collections of information contained in the general industry standard by modifying provisions for the written exposure control plan; the cleaning and replacement of personal protection equipment; the disposal, recycling, and reuse of contaminated materials; certain aspects of medical surveillance; and the collection of social security numbers in recordkeeping. OSHA prepared and submitted to OMB an ICR for the 2018 proposed rule for review in accordance with 44 U.S.C. 3507(d). A copy of the proposed ICR is available to the public at

<http://www.reginfo.gov/public/do/PRAOMBHistory?ombControlNumber=1218-0267>.

In accordance with the PRA (44 U.S.C. 3506(c)(2)), OSHA solicited public comments on the collection of information contained in the 2018 proposed rule. OSHA encouraged commenters to submit their comments on the information collection requirements contained in the proposed rule under docket number OSHA-2018-0003, along with their comments on other parts of the proposed rule. In addition to generally

soliciting comments on the collection of information requirements, the proposed rule indicated that OSHA and OMB were particularly interested in the following items:

- Whether the proposed collection of information is necessary for the proper performance of the agency's functions, including whether the information is useful;
- The accuracy of the agency's estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;
- The quality, utility, and clarity of the information to be collected; and
- Ways to minimize the compliance burden on employers, for example, through the use of automated or other technological techniques for collecting and transmitting information (83 FR 63766).

On March 29, 2019, OMB issued a Notice of Action (NOA) stating, "Terms of the previous clearance remain in effect. OMB is withholding approval at this time. Prior to publication of the final rule, the agency should provide a summary of any comments related to the information collection and their response, including any changes made to the ICR as a result of comments. In addition, the agency must enter the correct burden estimates" (see OMB Conclusion Action on ICR Reference No. 201812-1218-001, dated March 29, 2019, available at:

<https://www.reginfo.gov/public/do/PRAOMBHistory?ombControlNumber=1218-0267>).

The agency did not receive any public comments in response to the proposed ICR submitted to OMB for review. Public comments submitted in response to the NPRM, however, substantively addressed provisions containing collection of information. OSHA considered these comments when it developed the revised ICR for this final rule.

Summaries of comments received on the NPRM and OSHA's responses are found in Sections XI, Summary and Explanation of the Final Rule, and IV, Final Economic Analysis and Regulatory Flexibility Act Certification.

The Department of Labor submitted the final ICR concurrent with the publication of this final rule, containing the full analysis and description of the burden hours and costs associated with the final rule, to OMB for approval. A copy of this ICR will be available to the public at http://www.reginfo.gov/public/do/PRAViewICR?ref_nbr=202006-1218-006 (this link will become active on the day following publication of this notice). At the conclusion of OMB's review, OSHA will publish a separate notice in the *Federal Register* to announce the results.

C. Summary of Information Collection Requirements

As required by 5 CFR 1320.5(a)(1)(iv) and 1320.8(d)(2), the following paragraphs provide information about the ICR.

1. *Title:* Beryllium Standard for General Industry (29 CFR 1910.1024), Construction (29 CFR 1926.1124), and Maritime (29 CFR 1915.1024)
2. *Type of Review:* Revision
3. *OMB Control Number:* 1218-0267
4. *Affected Public:* *Business or Other For-Profit.* This final rule applies to employers in general industry who have employees that may have occupational exposures to any form of beryllium, including compounds and mixtures, except those articles and materials exempted by paragraphs (a)(2) and (a)(3).
5. Occupational Exposure to Beryllium in General Industry only:
 - a. *Number of Respondents:* 4,538

- b. *Frequency of Responses*: On occasion, quarterly, semi-annually, annually, biannually.
- c. *Number of Responses*: 134,570
- d. *Estimated Total Burden Hours*: 82,822
- e. *Estimated Cost*: \$18,741,540

6. Occupational Exposure to Beryllium in Construction and Shipyard Sectors

(previously-approved costs not affected by this rulemaking):

- a. *Number of Respondents*: 2,796
- b. *Frequency of responses*: On occasion, quarterly, semi-annually, annually, biannually.
- c. *Number of responses*: 39,420
- d. *Estimated Total Burden Hours*: 25,269
- e. *Estimated Cost*: \$8,774,874

7. Total Estimated Burden Hours and Cost for All Three Industries:

- a. *Estimated Total Number of responses*: 173,990
- b. *Estimated Total Burden Hours*: 108,091
- c. *Estimated Cost*: \$27,516,414

D. Summary of Changes in the Collection of Information Requirements

This final standard for occupational exposure to beryllium and beryllium compounds in general industry revises the collection of information requirements contained in the existing ICR for general industry, approved under OMB control number 1218-0267. OSHA is updating the new ICR to reflect those changes, which include changes to the written exposure control plan; the cleaning and replacement of personal protection equipment; the disposal, recycling, and reuse of contaminated materials; certain aspects of medical surveillance; and the collection of social security numbers in

recordkeeping (see Table V.1 below). The majority of these changes were adopted by the agency as proposed. However, in response to comments on the proposed rule, OSHA has revised a few of the provisions of the final rule that affect the collection of information. Those changes are also noted in Table V.1 below.

Table V.1 – Changes to Collection of Information Requirements in the Final Rule for General Industry

Information Collection Requirements in this Final Rule	Explanation of this Final Rule’s Changes to the Information Collection Requirements
<p>§ 1910.1024(f)(1)(i), (ii), & (iii) -- Methods of Compliance -- Written Exposure Control Plan.</p> <p>(i) The employer must establish, implement, and maintain a written exposure control plan, which must contain:</p> <ul style="list-style-type: none"> (A) A list of operations and job titles reasonably expected to involve airborne exposure to or dermal contact with beryllium; (B) A list of operations and job titles reasonably expected to involve airborne exposure at or above the action level; (C) A list of operations and job titles reasonably expected to involve airborne exposure above the TWA PEL or STEL; (D) Procedures for minimizing cross-contamination, including the transfer of beryllium between surfaces, equipment, clothing, materials, and articles within beryllium work areas; (E) Procedures for keeping surfaces as free as practicable of beryllium; (F) Procedures for minimizing the migration of beryllium from beryllium work areas to other locations within or outside the workplace; (G) A list of engineering controls, work practices, and respiratory protection required by paragraph (f)(2) of this standard; (H) A list of personal protective clothing and equipment required by paragraph (h) of this standard; and (I) Procedures for removing, laundering, storing, cleaning, repairing, and disposing of beryllium-contaminated personal protective clothing and equipment, including 	<p>This final rule removed the word “preventing” from (f)(i)(D), which previously contained the phrase “including preventing the transfer of beryllium.” In addition, the final rule revised (f)(1)(ii)(B) by replacing the phrase “airborne exposure to or dermal contact with beryllium” with “exposure to beryllium.” Both of these changes were adopted as proposed.</p>

<p>respirators.</p> <p>(ii) The employer must review and evaluate the effectiveness of each written exposure control plan at least annually and update it, as necessary, when:</p> <ul style="list-style-type: none"> (A) Any change in production processes, materials, equipment, personnel, work practices, or control methods results, or can reasonably be expected to result, in new or additional airborne exposure to beryllium; (B) The employer is notified that an employee is eligible for medical removal in accordance with paragraph (l)(1) of this standard for evaluation at a CBD diagnostic center, or shows signs or symptoms associated with exposure to beryllium; or (C) The employer has any reason to believe that new or additional airborne exposure is occurring or will occur. <p>(iii) The employer must make a copy of the written exposure control plan accessible to each employee who is, or can reasonably be expected to be, exposed to airborne beryllium in accordance with OSHA’s Access to Employee Exposure and Medical Records (Records Access) standard (29 CFR 1910.1020(e)).</p>	
<p>§ 1910.1024(h)(3)(iii) -- Personal Protective Clothing and Equipment -- Cleaning and Replacement.</p> <p>(3)(iii) The employer must inform in writing the persons or the business entities who launder, clean, or repair the personal protective clothing or equipment required by this standard of the potentially harmful effects of exposure to beryllium and that the personal protective clothing and equipment must be handled in accordance with this standard.</p>	<p>This final rule revised (h)(3)(iii) by replacing the phrase “airborne exposure to and dermal contact with beryllium” with “exposure to beryllium.” This change was adopted as proposed.</p>

<p>§ 1910.1024(j)(3)(i), (ii), & (iii) – Housekeeping- Disposal, recycling, and reuse.</p> <p>(3)(i) Except for intra-plant transfers, when the employer transfers materials that contain at least 0.1% beryllium by weight or are contaminated with beryllium for disposal, recycling, or reuse, the employer must label the materials in accordance with paragraph (m)(3) of this standard;</p> <p>(ii) Except for intra-plant transfers, materials designated for disposal that contain at least 0.1% beryllium by weight or are contaminated with beryllium must be cleaned to be as free as practicable of beryllium or placed in enclosures that prevent the release of beryllium-containing particulate or solutions under normal conditions of use, storage, or transport, such as bags or containers; and</p> <p>(iii) Except for intra-plant transfers, materials designated for recycling or reuse that contain at least 0.1% beryllium by weight or are contaminated with beryllium must be cleaned to be as free as practicable of beryllium or placed in enclosures that prevent the release of beryllium-containing particulate or solutions under normal conditions of use, storage, or transport, such as bags or containers.</p>	<p>This final rule revised (j)(3) by explicitly addressing transferring materials for reuse; reorganizing the previous two provisions into three to allow the agency to incorporate the new reuse requirements, while also setting out each distinct obligation clearly; replacing the phrase materials “that contain beryllium in concentrations of 0.1 percent by weight or more” with a shorter, easier to understand phrase: materials “that contain at least 0.1 percent beryllium by weight;” clarifying that the rule’s requirements for disposal, recycling, and reuse do not apply to intra-plant transfers; clarifying the enclosure requirements by providing more detail on what constitutes an appropriate enclosure; allowing for the cleaning of materials bound for disposal; and removing the undefined phrase “surface beryllium contamination.”</p> <p>In addition to the above actions, which were all adopted as proposed, in this final rule, OSHA revised paragraph (j)(3)(i) to explicitly incorporate the clarification that the rule’s requirements for disposal, recycling, and reuse do not apply to intra-plant transfers.</p>
<p>§ 1910.1024(k)(2) -- Medical Surveillance.</p> <p>(2) Frequency.</p> <p>The employer must provide a medical examination:</p> <p>(i) Within 30 days after determining that:</p> <ul style="list-style-type: none"> (A) An employee meets the criteria of paragraph (k)(1)(i)(A), unless the employee has received a medical examination, provided in accordance with this standard, within the last two years; or (B) An employee meets the criteria of paragraph (k)(1)(i)(B) of this standard. 	<p>Paragraph (k)(2)(i)(B) of the 2017 standard previously required the employer to provide a medical examination within 30 days after determining that the employee shows signs or symptoms of CBD or other beryllium-related health effects or that the employee has been exposed to beryllium in an emergency. The 2018 NPRM would have added paragraph (k)(2)(iv) to require employers to offer an examination to employees exposed to beryllium in an emergency at least one year after but no more than two years after the employee is exposed to beryllium in an emergency. It also would have amended paragraph (k)(2)(i)(B) to focus only on the</p>

<p>(ii) At least every two years thereafter for each employee who continues to meet the criteria of paragraph (k)(1)(i)(A), (B), or (D) of this standard.</p> <p>(iii) At the termination of employment for each employee who meets any of the criteria of paragraph (k)(1)(i) of this standard at the time the employee's employment terminates, unless an examination has been provided in accordance with this standard during the six months prior to the date of termination. Each employee who meets the criteria of paragraph (k)(1)(i)(C) of this standard and who has not received an examination since exposure to beryllium during the emergency must be provided an examination at the time the employee's employment terminates.</p> <p>(iv) For an employee who meets the criteria of paragraph (k)(1)(i)(C) of this standard:</p> <p style="padding-left: 40px;">(A) If that employee has not received a medical examination within the previous two years pursuant to paragraph (k)(1)(i) of this standard, then within 30 days after the employee meets the criteria of paragraph (k)(1)(i)(C) of this standard; or</p> <p style="padding-left: 40px;">(B) If that employee has received a medical examination within the previous two years pursuant to paragraph (k)(1)(i) of this standard, then at least one year but no more than two years after the employee meets the criteria of paragraph (k)(1)(i)(C) of this standard.</p>	<p>frequency of examinations for employees who show signs or symptoms of CBD or other beryllium-related health effects.</p> <p>This final rule's provisions differ from those in the proposal. Specifically, in this final rule, OSHA removed the requirement for a medical examination within 30 days of exposure in an emergency and added paragraph (k)(2)(iv). Final paragraph (k)(2)(iv)(A) requires the employer to offer a medical examination to an employee within 30 days after the employee was exposed to beryllium in an emergency, if the employee has not had an examination under paragraph (k)(1)(i) within the last two years, while final paragraph (k)(2)(iv)(B) requires the employer to offer a medical examination to an employee within one to two years after the employee was exposed to beryllium in an emergency, if the employee had an examination under paragraph (k)(1)(i) of the beryllium standard within the last two years. In addition, this final rule revised paragraph (k)(2)(iii) to require that each employee who is exposed in an emergency and has not received an examination since the emergency exposure must be provided an examination at the time employment is terminated.</p> <p>As proposed in the 2018 NPRM, this final rule also amended paragraph (k)(2)(i)(B) to focus only on the frequency of examinations for employees who show signs or symptoms of CBD or other beryllium-related health effects.</p>
<p>§ 1910.1024(k)(7) -- Medical Surveillance -- Referral to the CBD Diagnostic Center.</p> <p>(7) <i>CBD diagnostic center.</i> (i) The employer must provide an evaluation at no cost to the employee at a CBD diagnostic center that is mutually agreed upon by the employer and</p>	<p>The 2018 NPRM would have amended paragraph (k)(7) of the 2017 standard to require employers to provide, at no cost to the employee and within a reasonable time after the initial consultation with the CBD diagnostic center, any of the following tests if</p>

the employee. The evaluation at the CBD diagnostic center must be scheduled within 30 days, and must occur within a reasonable time, of:

- (A) The employer's receipt of a physician's written medical opinion to the employer that recommends referral to a CBD diagnostic center; or
- (B) The employee presenting to the employer a physician's written medical report indicating that the employee has been confirmed positive or diagnosed with CBD, or recommending referral to a CBD diagnostic center.

(ii) The employer must ensure that, as part of the evaluation, the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center, such as pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. If any of the tests deemed appropriate by the examining physician are not available at the CBD diagnostic center, they may be performed at another location that is mutually agreed upon by the employer and the employee.

(iii) The employer must ensure that the employee receives a written medical report from the CBD diagnostic center that contains all the information required in paragraph (k)(5)(i), (ii), (iv), and (v) of this standard and that the PLHCP explains the results of the examination to the employee within 30 days of the examination.

(iv) The employer must obtain a written medical opinion from the CBD diagnostic center within 30 days of the medical examination. The written medical opinion must contain only the information in paragraph (k)(6)(i), as applicable, unless the

deemed appropriate by the examining physician at the CBD diagnostic center: Pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. The proposal also specified the timing of the initial consultation.

This final rule's provisions differ from those in the proposal. Specifically, OSHA revised paragraph (k)(7)(i) to require that the evaluation must be *scheduled* within 30 days, and must occur within a reasonable time, of the employer receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B). Previously, the general industry standard required employers to *provide* the examination within 30 days of the employer receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B).

This final rule also added a provision, in paragraph (k)(7)(ii), which specifies that the employer must ensure that, as part of the evaluation, the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center, such as pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. The new provision also states that if any of the tests deemed appropriate by the examining physician are not available at the CBD diagnostic center, they may be performed at another location that is mutually agreed upon by the employer and the employee.

<p>employee provides written authorization to release additional information. If the employee provides written authorization, the written opinion must also contain the information from paragraphs (k)(6)(ii), (iv), and (v), if applicable.</p> <p>(v) The employer must ensure that each employee receives a copy of the written medical opinion from the CBD diagnostic center described in paragraph (k)(7) of this standard within 30 days of any medical examination performed for that employee.</p> <p>(vi) After an employee has received the initial clinical evaluation at a CBD diagnostic center described in paragraphs (k)(7)(i) and (ii) of this standard, the employee may choose to have any subsequent medical examinations for which the employee is eligible under paragraph (k) of this standard performed at a CBD diagnostic center mutually agreed upon by the employer and the employee, and the employer must provide such examinations at no cost to the employee.</p>	
<p>§ 1910.1024(n)(1)(i), (ii), & (iii) -- Recordkeeping -- Air Monitoring Data.</p> <p>(i) The employer must make and maintain a record of all exposure measurements taken to assess airborne exposure as prescribed in paragraph (d) of this standard.</p> <p>(ii) This record must include at least the following information:</p> <ul style="list-style-type: none"> (A) The date of measurement for each sample taken; (B) The task that is being monitored; (C) The sampling and analytical methods used and evidence of their accuracy; 	<p>This final rule removed the requirement for collection and recording of social security numbers from this provision. This change was adopted as proposed.</p>

<p>(D) The number, duration, and results of samples taken;</p> <p>(E) The type of personal protective clothing and equipment, including respirators, worn by monitored employees at the time of monitoring; and</p> <p>(F) The name and job classification of each employee represented by the monitoring, indicating which employees were actually monitored.</p> <p>(iii) The employer must ensure that exposure records are maintained and made available in accordance with the Records Access standard (29 CFR 1910.1020).</p>	
<p>§ 1910.1024(n)(3)(i), (ii), & (iii) – Recordkeeping -- Medical Surveillance.</p> <p>(i) The employer must make and maintain a record for each employee covered by medical surveillance under paragraph (k) of this standard.</p> <p>(ii) The record must include the following information about the employee:</p> <ul style="list-style-type: none"> (A) Name and job classification; (B) A copy of all licensed physicians' written medical opinions for each employee; and (C) A copy of the information provided to the PLHCP as required by paragraph (k)(4) of this standard. <p>(iii) The employer must ensure that medical records are maintained and made available in accordance with the Records Access standard (29 CFR 1910.1020).</p>	<p>This final rule removed the requirement for collection and recording of social security numbers from this provision. This change was adopted as proposed.</p>
<p>§ 1910.1024(n)(4)(i) & (ii) -- Recordkeeping -- Training.</p> <p>(4) <i>Training.</i> (i) At the completion of any training required by this standard, the</p>	<p>This final rule removed the requirement for collection and recording of social security numbers from this provision. This change was adopted as proposed.</p>

employer must prepare a record that indicates the name and job classification of each employee trained, the date the training was completed, and the topic of the training.	
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(ii) This record must be maintained for three years after the completion of training.	
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VI. Federalism

OSHA reviewed this rule in accordance with the Executive Order on Federalism (Executive Order 13132, 64 FR 43255, August 10, 1999), which requires that federal agencies, to the extent possible, refrain from limiting state policy options, consult with states prior to taking any actions that would restrict state policy options, and take such actions only when clear constitutional and statutory authority exists and the problem is national in scope. Executive Order 13132 provides for preemption of state law only with the expressed consent of Congress. Any such preemption is to be limited to the extent possible.

Under Section 18 of the OSH Act, Congress expressly provides that states and U.S. territories may adopt, with federal approval, a plan for the development and enforcement of occupational safety and health standards. OSHA refers to such states and territories as “State Plans” (29 U.S.C. 667). Occupational safety and health standards developed by State Plans must be at least as effective in providing safe and healthful employment and places of employment as the federal standards. Subject to these requirements, State Plans are free to develop and enforce under state law their own requirements for safety and health standards.

OSHA previously concluded from its analysis for the 2017 final rule that promulgation of the beryllium standard complies with EO 13132 (82 FR at 2633). The

amendments in this final rule do not change that conclusion. In states without OSHA-approved State Plans, Congress expressly provides for OSHA standards to preempt state occupational safety and health standards in areas addressed by the federal standards. In these states, this rule limits state policy options in the same manner as every standard promulgated by OSHA. In states with OSHA-approved State Plans, this rulemaking does not significantly limit state policy options.

VII. State Plans

When federal OSHA promulgates a new standard or more stringent amendment to an existing standard, the states and U.S. Territories with their own OSHA-approved occupational safety and health plans (State Plans) must promulgate a state standard adopting such new federal standard, or more stringent amendment to an existing federal standard, or an at least as effective equivalent thereof, within six months of promulgation of the new federal standard or more stringent amendment. The state may demonstrate that a standard change is not necessary because the state standard is already the same or at least as effective as the federal standard change. Because a state may include standards and standard provisions that are equally or more stringent than federal standards, it would generally be unnecessary for a state to revoke a standard when the comparable federal standard is revoked or made less stringent. To avoid delays in worker protection, the effective date of the state standard and any of its delayed provisions must be the date of state promulgation or the federal effective date, whichever is later. The Assistant Secretary may permit a longer time period if the state makes a timely demonstration that good cause exists for extending the time limitation (29 CFR 1953.5(a)).

Of the 28 states and territories with OSHA-approved State Plans, 22 cover public and private-sector employees: Alaska, Arizona, California, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Washington, and Wyoming. The remaining six states and territories cover only state and local government employees: Connecticut, Illinois, Maine, New Jersey, New York, and the Virgin Islands.

As discussed in detail below in Section XI, Summary and Explanation of the Final Rule, the majority of the changes made by this final rule will clarify certain provisions and simplify or improve employer compliance. After considering all of the changes made by this final rule and the record as a whole, OSHA believes that this final rule enhances employee safety, in part by revising provisions that may be misinterpreted. Therefore, OSHA has determined that, within six months of the rule's promulgation date, State Plans must review their state standards and adopt amendments to those standards that are at least as effective as the amendments to the beryllium general industry standard finalized herein, as required by 29 CFR 1953.5(a), unless the State Plans demonstrate that such amendments are not necessary because their existing standards are already at least as effective at protecting workers as this final rule. This decision is also informed by a comment from Materion Brush, Inc. (Materion), in which Materion argued that OSHA should require states to adopt the proposed changes (Document ID 0038-A5, p. 2).⁹ No other stakeholders opined on this issue.

⁹ OSHA notes that Materion also argued that the State Plans that have already adopted the original OSHA standard should be required to adopt the changes OSHA previously adopted in the 2018 direct final rule, as well as the changes that result from the current rulemaking (Document ID 0038-A5, p. 1). Whether OSHA should require State Plans to

VIII. Unfunded Mandates Reform Act

OSHA reviewed this final rule according to the Unfunded Mandates Reform Act of 1995 (UMRA) (2 U.S.C. 1501 et seq.) and Executive Order 13132 (64 FR 43255). As discussed above in Section IV, Final Economic Analysis and Regulatory Flexibility Act Certification (FEA), of this preamble, the agency determined that this final rule will not impose significant additional costs on any private- or public-sector entity. Further, OSHA previously concluded that the rule will not impose a federal mandate on the private sector in excess of \$100 million (adjusted annually for inflation) in expenditures in any one year (82 FR at 2634). Accordingly, this final rule will not require significant additional expenditures by either public or private employers.

As noted above under Section VII, State Plans, the agency's standards do not apply to state and local governments except in states that have elected voluntarily to adopt a State Plan approved by the agency. Consequently, this final rule does not meet the definition of a "federal intergovernmental mandate" (see Section 421(5) of the UMRA (2 U.S.C. 658(5))). Therefore, for the purposes of the UMRA, the agency certifies that this final rule will not mandate that state, local, or tribal governments adopt new, unfunded regulatory obligations of, or increase expenditures by the private sector by, more than \$100 million in any year.

IX. Consultation and Coordination with Indian Tribal Governments

OSHA has reviewed this final rule in accordance with Executive Order 13175 (65 FR 67249) and determined that it does not have "tribal implications" as defined in that order. This final rule does not have substantial direct effects on one or more Indian tribes,

adopt the changes made in the 2018 direct final rule is out of the scope of this rulemaking and, thus, will not be considered here.

on the relationship between the federal government and Indian tribes, or on the distribution of power and responsibilities between the federal government and Indian tribes.

X. Environmental Impacts

OSHA has reviewed this final rule in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 et seq.), the Council on Environmental Quality NEPA regulations (40 CFR part 1500-1508), and the Department of Labor's NEPA procedures (29 CFR part 11). As a result of this review, OSHA has determined that this final rule will not have a significant impact on air, water, or soil quality; plant or animal life; the use of land; or aspects of the external environment.

XI. Summary and Explanation of the Final Rule

On December 11, 2018, OSHA published a Notice of Proposed Rulemaking (83 FR 63746) (2018 NPRM) proposing changes to a number of provisions in the general industry beryllium standard. Following publication of the 2018 NPRM, a variety of stakeholders, including representatives of industry, labor, medical groups, public health organizations, federal and state government agencies, academia, trade associations, and private citizens, submitted comments on OSHA's proposed changes. After reviewing and carefully considering these comments and the remainder of the record, OSHA has decided to adopt the majority of the changes proposed, as well as additional changes that were prompted by the comments received. These changes clarify certain provisions and simplify or improve compliance for the other provisions of the standard. OSHA believes that these changes will maintain safety and health protections for workers and will further

enhance worker protections by ensuring that the standard is well understood and implemented according to the agency's intent.

The following discussion summarizes the comments received on the proposed changes to the general industry standard, lays out OSHA's responses to and final determinations regarding the issues in the comments, and explains each new or revised provision in this final rule including details on any modification made from the proposal. As discussed in detail below, the changes include the addition of one definition and modifications to five existing definitions in paragraph (b) and revisions to seven of the standard's other paragraphs, including paragraph (f), Methods of compliance; paragraph (h), Personal protective clothing and equipment; paragraph (i), Hygiene areas and practices; paragraph (j), Housekeeping; paragraph (k), Medical surveillance; paragraph (m), Communication of hazards; and paragraph (n), Recordkeeping. The final rule also replaces the 2017 standard's Appendix A with a new appendix designed to supplement the final standard's definition of *beryllium work area*.

Definitions.

Paragraph (b) of the beryllium standard for general industry provides definitions of key terms used in the standard. In this final rule, OSHA is changing or adding six terms in the definitions paragraph of the standard. The terms that OSHA is changing or adding are *beryllium sensitization*, *beryllium work area*, *CBD diagnostic center*, *chronic beryllium disease*, *confirmed positive*, and *dermal contact with beryllium*.

Beryllium sensitization.

OSHA is adding the following definition for *beryllium sensitization*: "a response in the immune system of a specific individual who has been exposed to beryllium. There

are no associated physical or clinical symptoms and no illness or disability with beryllium sensitization alone, but the response that occurs through beryllium sensitization can enable the immune system to recognize and react to beryllium. While not every beryllium-sensitized person will develop chronic beryllium disease (CBD), beryllium sensitization is essential for development of CBD.” The agency is adding this definition to clarify other provisions in the standard, such as the definitions of *chronic beryllium disease (CBD)* and *confirmed positive*, as well as the provisions for medical surveillance in paragraph (k) and hazard communication in paragraph (m).

This definition of *beryllium sensitization* is identical to the definition proposed in the 2018 NPRM and is consistent with information provided in the 2017 final beryllium rule (82 FR 2470). In the preamble to the 2017 final rule, OSHA found that individuals sensitized through either the dermal or inhalation exposure pathways respond to beryllium through the formation of a beryllium-protein complex, which then binds to T-cells stimulating a beryllium-specific immune response (82 FR at 2494). The formation of the T-cell-beryllium-protein complex that results in beryllium sensitization rarely manifests in any outward symptoms (such as coughing or wheezing); most who are sensitized show no symptoms at all (see 82 FR at 2492, 2527). Once an individual has been sensitized, any subsequent beryllium exposures via inhalation can progress to serious lung disease through the formation of granulomas and fibrosis (see 82 FR at 2491-98). Since the pathogenesis of CBD involves a beryllium-specific, cell-mediated immune response, CBD cannot occur in the absence of sensitization (82 FR at 2492; see also NAS, 2008 (Document ID OSHA-H005C-2006-0870-1355)). Therefore, this

definition's explanation that beryllium sensitization is essential for development of CBD is consistent with the agency's findings in the 2017 final rule.

Several commenters expressed support for OSHA's inclusion of a definition of *beryllium sensitization* in the beryllium general industry standard, including NJH (Document ID 0022, p. 2), the United Steelworkers (USW) (Document ID 0033, p. 1), Materion (Document ID 0038, p. 8), the U.S. Department of Defense (DOD) (Document ID 0029, p. 1), and Edison Electric Institute (EEI) (Document ID 0031, p. 2). According to the USW, the proposed definition is clear and accurate, and is necessary because the beryllium standard includes many provisions related to the recognition of and appropriate response to beryllium sensitization among beryllium-exposed workers (Document ID 0033, p. 1). Materion similarly commented that inclusion of the proposed definition in the standard would improve workers' and employers' understanding of this term (Document ID 0038, p. 4).

While OSHA received no objections to including a definition of *beryllium sensitization* in the beryllium standard, several commenters suggested changes to the proposed definition. The National Supplemental Screening Program (NSSP) and NJH recommended that the definition of *beryllium sensitization* should include the following text, based on the ATS Statement on Beryllium: "Beryllium sensitization is a response in the immune system of an individual who has been exposed to beryllium. A diagnosis of [beryllium sensitization] can be based on two abnormal blood BeLPTs, one abnormal and one borderline blood BeLPT, three borderline BeLPTs, or one abnormal bronchoalveolar lavage (BAL) BeLPT. Beryllium sensitization is essential for development of CBD" (Document ID 0027 p. 1; 0022, p. 2; see also Document ID OSHA-H005C-2006-0870-

0364, pp. 1, 44). Neither organization, however, explained why this definition of *beryllium sensitization* should be used instead of the definition OSHA proposed.

OSHA disagrees with this recommendation. The agency is providing a definition of *beryllium sensitization* to give stakeholders a general understanding of what beryllium sensitization is and its relationship to CBD. Information pertinent to medical identification of sensitization is provided in the definition of confirmed positive, which appears later in this section. OSHA has determined that the agency's definitions of *beryllium sensitization* and *confirmed positive* together provide the information suggested by NJH and the NSSP. The definition of *confirmed positive* explains how the results of BeLPT testing should be interpreted in the context of the standard's provisions that refer to that term, such as evaluation at a CBD diagnostic center and medical removal protection. The *confirmed positive* definition establishes that these benefits should be extended to workers who have a pattern of BeLPT results, obtained in a three-year period, consistent with the NJH and the NSSP's recommended definition of beryllium sensitization. The remainder of the information suggested by NJH and the NSSP, which pertains to the relationship of beryllium sensitization to beryllium exposure, the immune system, and the development of CBD, is included in the definition of *beryllium sensitization* that OSHA proposed and is including in this final standard. For these reasons, OSHA has decided not to adopt the language suggested by NJH and the NSSP.

The NSSP objected to the statement that no physical or clinical symptoms, illness, or disability are associated with beryllium sensitization alone, but did not explain the reason for their concern with this statement (Document ID 0027, p. 1). Materion supported the agency's inclusion of this information in the definition, stating that

“employees deserve to understand that beryllium sensitization does not involve symptoms . . .” (Document ID 0038, p. 5). The USW also specifically supported the accuracy of this section of OSHA’s proposed definition of *beryllium sensitization* (Document ID 0033, p. 1).

The agency has decided to retain this statement in the definition of *beryllium sensitization* because it is important that employers and employees understand the asymptomatic nature of beryllium sensitization and the need for specialized testing such as the BeLPT. The statement is consistent with OSHA’s discussion of beryllium sensitization in the 2017 final rule (82 FR at 2492-99). As OSHA discussed in the 2017 final rule, sensitization through dermal contact has sometimes been associated with skin granulomas, contact dermatitis, and skin irritation, but these reactions are rare and those sensitized through dermal exposure to beryllium typically do not exhibit any outward signs or symptoms (see 82 FR at 2488, 2491-92, 2527). OSHA determined that while beryllium sensitization rarely leads to any outward signs or symptoms, beryllium sensitization is an adverse health effect because it is a change to the immune system that leads to risk of developing CBD (82 FR at 2498-99). The agency believes that the asymptomatic nature of beryllium sensitization, especially in the lung, should be conveyed to employers and employees to emphasize why specialized testing such as the BeLPT should be provided to workers who may have no symptoms of illness associated with beryllium exposure. For these reasons, OSHA is retaining the statement “[t]here are no associated physical or clinical symptoms and no illness or disability with beryllium sensitization alone” in the definition of *beryllium sensitization*.

The State of Washington Department of Labor and Industries, Division of Occupational Safety and Health (DOSH), commented that OSHA’s proposed definition of *beryllium sensitization* places unnecessary emphasis on the role that beryllium sensitization plays in the development of CBD. According to DOSH, “[t]his language may cause confusion with proper diagnosis of CBD and application of the rule requirements for workers who have developed CBD without a confirmed beryllium sensitization” (Document ID 0023, p. 1). Other commenters, however, including NJH, the NSSP, and the USW, supported including the statement that beryllium sensitization is necessary for the development of CBD in OSHA’s definition of beryllium sensitization (Document ID 0022, p. 2; 0027, p. 1; 0033, p. 1).

Following consideration of DOSH’s comment, OSHA has determined that this information should remain in the definition of *beryllium sensitization* (as well as the definition of *chronic beryllium disease*, discussed later). OSHA believes that an understanding of the relationship between beryllium sensitization and CBD is key to workers’ and employers’ understanding of the beryllium standard. By including the role that sensitization plays in the development of CBD in the definition of *beryllium sensitization*, OSHA intends to make a number of things clear to workers and employers: that beryllium sensitization, although not itself a disease, is nevertheless an adverse health effect that presents a risk for developing CBD and thus should be prevented; the need to identify beryllium sensitization through regular medical screening; and why workers who are confirmed positive should be offered specialized medical evaluation and medical removal protection. OSHA notes that DOSH does not dispute the factual accuracy of OSHA’s statement regarding the role beryllium sensitization plays in the

development of CBD, which the agency established in the Health Effects section of the 2017 final rule (82 FR at 2495-96).

Nevertheless, OSHA agrees with DOSH that it is not always necessary to identify a worker as beryllium sensitized by the BeLPT as part of a diagnosis of CBD, and the agency acknowledges that some sensitized individuals may not be confirmed positive for beryllium sensitization by BeLPT testing. OSHA established in the Health Effects section of the preamble to the 2017 final rule that while BeLPT testing is helpful to identify workers at risk for CBD and to differentiate CBD from respiratory diseases with similar clinical presentation, CBD can be diagnosed in the absence of a confirmed positive BeLPT (see 82 FR at 2499-5002) (discussing a number of studies conducted prior to the development of the BeLPT). At least one study in the rulemaking record found that some beryllium workers who would not have been confirmed positive by their BeLPT results were found to be sensitized via the BAL BeLPT and went on to develop CBD (Newman et al., 2001, Document ID OSHA-H005C-2006-0870-1354, p. 234). Other studies indicate that the BeLPT has a false-negative rate of approximately 25-28 percent (that is, approximately 25-28 percent of individuals who have a single normal BeLPT result are in fact sensitized) (Middleton et al., 2011, Document ID OSHA-H005C-2006-0870-0399, p. 2 (25 percent); Stange et al., 2004, Document ID OSHA-H005C-2006-0870-1402, p. 457 (27.7 percent)). Because the BeLPT itself may have a false-negative result and because other means exist to diagnose CBD apart from the BeLPT, examining physicians should have the latitude to diagnose CBD in the absence of a “confirmed positive” pattern of BeLPT results. Moreover, as discussed below, the determination that an employee is “confirmed positive” under the beryllium standard acts only as a trigger for medical

monitoring and surveillance and OSHA does not intend the phrase “confirmed positive” to be interchangeable with “beryllium sensitized.”

The standard provides a mechanism for an employee to be referred to a CBD diagnostic center and diagnosed with CBD, even in the absence of a confirmed positive blood BeLPT result. Under paragraph (k)(5)(iii), the licensed physician can recommend referral to a CBD diagnostic center if he or she deems it appropriate. As OSHA explained in the preamble to the 2017 final rule, the licensed physician could recommend an evaluation at a CBD diagnostic center based on questionable BeLPT findings (82 FR at 2714). For example, in a scenario where an employee has repeating borderline or abnormal results but does not meet the definition for confirmed positive, referral to a CBD diagnostic center may be appropriate.

Furthermore, the standard does not specify how CBD is diagnosed and gives the licensed physician at the CBD diagnostic center discretion for making that diagnosis, including by means other than blood BeLPT results. The diagnostic criteria for CBD include (1) history of beryllium exposure; (2) histopathological evidence of non-caseating granulomas or mononuclear cell infiltrates in the absence of infection; and (3) positive blood or BAL BeLPT (82 FR at 2500; see also Newman et al., 1989 (Document ID OSHA-H005C-2006-0870-0196, p. 1480)). The availability of transbronchial lung biopsy facilitates the evaluation of the second criterion, by making histopathological confirmation possible in almost all cases (82 FR at 2500). The ATS has noted that the BAL BeLPT can be useful in diagnosing CBD in individuals who have normal blood BeLPT results and considers one positive BAL BeLPT sufficient for the diagnosis of beryllium sensitization (Document ID OSHA-H005C-2006-0870-0364, pp. 44-45).

OSHA expects that the licensed physician might apply such criteria in the diagnosis of CBD, without relying on a confirmed positive finding based on blood BeLPT results.

In summary, OSHA believes that emphasizing the role that beryllium sensitization plays in the development of CBD provides employers and employees with important context for understanding the beryllium standard. At the same time, the agency acknowledges that employees may be diagnosed with CBD in the absence of a confirmed positive BeLPT, and the beryllium standard allows for such a diagnosis. Thus, following consideration of the record of comments on OSHA's proposed definition of *beryllium sensitization*, the agency is finalizing the definition as proposed in the 2018 NPRM. The addition of this definition for *beryllium sensitization* does not change employer obligations under paragraphs (k) and (m) and, therefore, OSHA expects that the new definition will maintain safety and health protections for workers.

Beryllium work area.

Paragraph (b) of the final rule defines *beryllium work area* as any work area where materials that contain at least 0.1 percent beryllium by weight are processed either: (1) during any of the operations listed in Appendix A of the standard; or (2) where employees are, or can reasonably be expected to be, exposed to airborne beryllium at or above the action level. The presence of a beryllium work area triggers a number of requirements in the standard. These include the requirements under paragraphs (e)(1)(i) and (2)(i) to establish, maintain, and demarcate the boundaries of each beryllium work area, as well as requirements under paragraphs (f)(1)(i)(D) and (F), written exposure control plan requirements; paragraph (f)(2)(ii), required exposure controls; paragraphs (i)(1) and (2), general hygiene practices and change rooms requirements; paragraphs

(j)(1)(i) and (2), housekeeping requirements; and paragraph (m)(4)(ii)(B), employee training. The establishment of beryllium work areas serves to ensure that employees and other persons are aware of the potential presence of airborne beryllium; to control access to these areas; and in conjunction with other provisions such as the written control plan, hygiene, and housekeeping requirements, to minimize the transfer of beryllium to other areas of the facility and reduce the potential for exposure to other employees.

The term *beryllium work area* (as revised in the 2018 direct final rule) was defined as any work area (1) containing a process or operation that can release beryllium and that involves material that contains at least 0.1 percent beryllium by weight; and, (2) where employees are, or can reasonably be expected to be, exposed to airborne beryllium at any level or where there is the potential for dermal contact with beryllium. That definition was developed in response to stakeholder comments on the 2015 NPRM, which had proposed to define a *beryllium work area* as any work area where there is potential for exposure to airborne beryllium at any level, and which did not include dermal contact as a trigger for establishment of a beryllium work area. Some stakeholders argued that the definition proposed in the 2015 NPRM was overly broad and could be interpreted as applying to most or all areas of a worksite, regardless of the work processes or operations occurring in those areas. Commenters also expressed concern that the definition was vague and should be triggered on a measurable threshold of exposure. NIOSH commented that the proposed definition's focus on airborne beryllium did not account for the potential contribution of dermal exposures to total exposure (82 FR at 2659).

In response to these comments, OSHA modified the definition in the 2017 final rule to require the presence of a beryllium-releasing process. The agency explained in the preamble that triggering the requirement of creating a beryllium work area on a specific threshold level of exposure would be insufficiently protective of workers, but also explained that the agency did not intend for a beryllium work area to be established in areas where work processes or operations that release beryllium do not occur, such as where employees handle articles containing beryllium (82 FR at 2659-60). Rather, the purpose of establishing beryllium work areas is to identify and demarcate areas within a facility where processes or operations release beryllium so that necessary control measures can be implemented, such as those designed to prevent the migration of beryllium to other areas where beryllium is not processed or released. OSHA clarified this intent by defining a *beryllium work area* as an area that contains processes or operations that release beryllium to which workers could be exposed. Additionally, OSHA accounted for NIOSH's concern by including the potential for dermal contact with beryllium in the definition (see 82 FR at 2658-60).

In the preamble to the 2017 final rule, however, OSHA disagreed with commenters who claimed that the proposed definition of *beryllium work area* was impermissibly vague. The agency explained that, by limiting the trigger for beryllium work areas to exposures generated from a beryllium-releasing process or operation within the area, the definition made clear that the requirements were not triggered solely on the fact that an employee may be handling solid material containing beryllium. Additionally, any employer who had doubts about whether a process was releasing beryllium or created the potential for dermal contact with beryllium could use air sampling or wipe sampling

to determine where the boundary of a beryllium work area should be established. OSHA reasoned that, rather than rendering the provision vague, defining a beryllium work area in a performance-based manner left employers flexibility in complying with the standard (82 FR at 2659).

Nevertheless, following publication of the 2017 standard, OSHA continued to hear from stakeholders that the definition of *beryllium work area* remained a source of substantial uncertainty and confusion. Some stakeholders expressed concern that defining a *beryllium work area* to include any area where unspecified processes can reasonably be expected to generate any level of airborne beryllium, or where there is a process or operation that can release beryllium or the potential for dermal contact with beryllium, could lead to the designation of entire facilities as beryllium work areas because minute quantities of beryllium can sometimes be detected in areas of a facility far distant from the work processes that create beryllium exposures. Stakeholders requested that OSHA provide a list of operations that are known to release airborne beryllium, which would allow employers to more accurately identify where beryllium work areas must be established and demarcated at their workplaces. As described in more detail below, stakeholders also requested that “dermal contact” be removed from the definition of *beryllium work area*.

In response to this feedback, OSHA proposed in this rulemaking to modify the definition of *beryllium work area* to provide clarity for employers on where and when to establish a beryllium work area. First, OSHA proposed a new appendix to the standard (Appendix A), containing Table A.1, which includes a list of operations that are commonly performed when processing beryllium materials and are known to generate

airborne beryllium. OSHA proposed to revise the definition of *beryllium work area* so that any work area where an operation that is listed in proposed Appendix A occurs, and involves materials containing at least 0.1 percent beryllium by weight, is a beryllium work area. For work areas where no operations listed in proposed Appendix A occur, the proposed definition would require a beryllium work area wherever materials containing at least 0.1 percent beryllium by weight are processed and where employees are, or can be reasonably expected to be, exposed to airborne beryllium at or above the action level. The list of operations in Table A.1 was compiled based on the experience of Materion, the primary beryllium manufacturer in the United States, and the USW, the primary union representing employees with beryllium exposure.¹⁰ As noted in the preamble to the 2018 NPRM, OSHA intends the list to cover all operations and processes that have the potential for exposure to airborne beryllium (83 FR at 63761).

Second, OSHA proposed to remove the reference to dermal contact from the definition of the term beryllium work area. OSHA preliminarily determined that this change would make it less likely that the definition could be misinterpreted as extending to areas of a facility where work processes or operations that release beryllium do not occur or even to entire facilities (83 FR at 63749). Further, the agency explained that it was unaware of beryllium-releasing processes or operations that have a potential for dermal contact that are not included in the proposed Appendix A or do not generate airborne exposures at or above the action level (83 FR at 63749). Therefore, OSHA

¹⁰ Table A.1 is divided into three categories: (1) Beryllium Metal Alloy Operations (generally < 10% beryllium by weight); (2) Beryllium Composite Operations (generally ≥ 10% beryllium by weight) and Beryllium Metal Operations; and (3) Beryllium Oxide Operations.

preliminarily determined that the proposed change would be as protective as the previous definition, while more clearly avoiding the erroneous perception that the standard would require employers to treat entire facilities as beryllium work areas.

Comments submitted in response to the NPRM showed general support from employers, unions, and public health experts for OSHA's proposed approach and for providing better clarity with respect to beryllium work areas (Document ID 0017; 0022, pp. 6-7; 0029, p. 1; 0033, pp. 1-4; 0038, pp. 8-9). For example, the USW agreed with OSHA that the revisions proposed in the NPRM would make the definition more precise and help to ensure that employers can appropriately comply with the standard. The USW stated that the proposed definition "provides employers with a clearer means of understanding when and where demarcation is required" for beryllium work areas (Document ID 0033, p. 2). Materion likewise indicated that this new approach "greatly improves and simplifies an understanding of where beryllium work areas should be in a facility, allowing employers and employees to know and understand how to comply with the requirement to establish these protective work areas" (Document ID 0038, p. 9). While there was general support for this proposed approach to beryllium work areas, several commenters expressed concerns about various aspects of the new definition and new Appendix A. For example, DOSH agreed that the addition of a new Appendix A would provide clarity to the beryllium work area requirements but expressed concern that removal of the dermal contact trigger would reduce worker protections. DOSH suggested the use of a defined lower limit for beryllium contamination on surfaces that would address this concern while maintaining the protection for workers (Document ID 0023, pp. 1-2).

OSHA does not agree that removing the reference to dermal contact from the definition of the term *beryllium work area* reduces protections. As noted above and explained in both the preambles to the 2017 final rule and the 2018 NPRM, OSHA's intent was to capture those areas of a facility where beryllium-generating processes or operations are located; OSHA never intended for dermal contact alone to trigger the standard's beryllium work area requirements (82 FR at 2659; 83 FR at 63748). Contrary to DOSH's assertion, the requirement to establish a beryllium work area was dependent on the presence of a process or operation that can release beryllium and that involves material that contains at least 0.1 percent beryllium by weight in the area in question; exposure alone, whether airborne or dermal, was never a trigger for the beryllium work area requirements.

Moreover, again as noted above, OSHA explained in the 2018 NPRM that it did not know of any beryllium-releasing processes or operations with the potential for dermal contact that are not included in the proposed Appendix A or that do not generate airborne exposures at or above the action level. Put more simply, OSHA was unaware of any situation where an employer would be required to establish a beryllium work area under the previous definition but would not be required to do so under the proposed definition. However, in the interest of caution, OSHA asked stakeholders specifically whether there are any operations or processes that trigger beryllium work areas under the previous definition that would not be covered under the proposed definition (83 FR at 63749). Commenters did not point to any such processes. On the contrary, the only stakeholder to squarely address this issue, Materion, noted that it too was "unaware of work areas containing beryllium-releasing processes or operations that have a potential for dermal

contact that are not included in the proposed Appendix A or generate airborne exposures at or above the action level” (Document ID 0038 p. 13).

Furthermore, another stakeholder, the USW commented that it supported OSHA’s proposed removal of the reference to dermal contact from the definition of the term *beryllium work area* (Document ID 0033, p. 3). The USW stated that it does not have reservations about the proposed change and explained its belief “that dermal exposure is properly addressed elsewhere in the standard” (Document ID 0033, pp. 1-3). According to the USW, “[a]lthough dermal exposure to beryllium is important and must be properly addressed, removal of dermal exposure from this definition will reduce the confounding factors that might result in unnecessarily extending beryllium work areas beyond needed portions of a workplace” (Document ID 0033, p. 3).

In addition, DOSH did not explain why it believes the change would reduce worker protections. Given that DOSH did not point to any particular loss of worker protection and the lack of evidence of any differences between the coverage of the two definitions, OSHA has decided to adopt the proposed definition, which commenters have indicated reduces the confusion caused by the previous definition. OSHA expects the revised definition to provide clarity on the proper boundaries of a beryllium work area. Employers are required by paragraph (j)(1), in conjunction with paragraph (f)(1), to minimize the migration of beryllium from beryllium work areas, and clearly defining the beryllium work area ensures employees working outside of these areas receive the protective benefits of these requirements. If a beryllium work area is defined overly broadly, then more employees may inadvertently be exposed to beryllium within the beryllium work area and would not receive some of these benefits. Moreover, as stated in

the 2018 NPRM, PPE requirements to protect against dermal exposure to beryllium do not depend on the existence of a beryllium work area. The standard requires employers to provide and ensure the use of appropriate PPE whenever there is a reasonable expectation of dermal contact with beryllium, regardless of whether or not the area is a beryllium work area (see 83 FR at 63749).

OSHA also does not agree with DOSH that a lower limit for beryllium contamination on surfaces is necessary as a trigger for establishing a beryllium work area. In the 2017 final rule, OSHA chose not to set quantitative limits for surface contamination because the best available scientific evidence on adverse health effects from dermal contact with beryllium made it difficult to identify an appropriate limit for surface contamination (82 FR at 2688). This remains the case today. OSHA discusses the limitations of this data more fully below in the Summary and Explanation of the definition of dermal contact with beryllium.

Two commenters objected to the exemption for materials that contain less than 0.1 percent beryllium from the definition of beryllium work area (Document ID 0022, p. 7; 0027, p. 2). However, OSHA incorporated this change in the 2018 direct final rule. At the time, OSHA explained that it was never the agency's intent that the requirements related to beryllium work areas apply to these materials (83 FR 19936, 19938 (May 7, 2018)). OSHA did not receive any adverse comments on the direct final rule and therefore finalized the change. The 2018 NPRM did not propose to amend this portion of the definition and therefore comments related to the 0.1 percent limitation are not within the scope of this rulemaking.

OSHA also received comments on the new Appendix A. NJH expressed concerns that the proposed list of operations in Appendix A was geared toward manufacturing and that it “may restrict employers’ interpretations of a beryllium work area and prevent employees from the protections afforded by the beryllium standard. Employers may only consider these featured tasks as those that dictate a beryllium work area, when other tasks may be considered as such” (Document ID 0022, pp. 6-7). OSHA believes NJH’s concern is misplaced. First, OSHA requested comment on whether there were additional operations that should be included on the list of operations in Appendix A, and no suggestions for additional operations were put forth by commenters. More importantly, the final standard requires that a beryllium work area be established if exposures can reasonably be expected to exceed the action level where materials that contain at least 0.1 percent beryllium by weight are processed, regardless of whether the operation is listed in Appendix A. As the USW noted, this requirement “provides a backstop for any unforeseen operation which can expose employees above the action level” (Document ID 0033, p. 2). Thus, employees who may be exposed above the action level during a process not listed in Appendix A will still receive the protections afforded by the beryllium work area requirements.

DOD, while generally supportive of the proposed definition of *beryllium work area*, expressed some concerns about Appendix A (Document ID 0029, p. 1). First, DOD suggested, without explanation, that OSHA remove the word “generally” from the description of the table in Appendix A, which describes beryllium metal alloy operations as being “generally < 10% beryllium by weight” and beryllium composite operations as being “generally \geq 10% beryllium by weight.” OSHA disagrees with this suggestion. The

table in Appendix A reflects materials that are on the market today. However, the inclusion of the word “generally” accounts for the possibility of beryllium metal alloy operations and beryllium composite operations involving different materials. Thus, if alloys are developed with greater than 10 percent beryllium or composites less than 10 percent beryllium, these materials will be covered under Table A.1. Because OSHA does not intend to limit Table A.1 to processes involving only those materials on the market today, the agency is retaining the word “generally” in the description of the tables in Appendix A.¹¹

DOD, along with DOSH, also questioned the deletion of the Appendix A published with the 2017 final beryllium rule. That old appendix provided non-mandatory general control strategies for common operations. These commenters thought that the old appendix was useful and should be retained in the standard (Document ID 0029, p. 1; 0023, p. 3). OSHA agrees that the old appendix contained useful information, but expects that in time it would have become either obsolete or incomplete. Instead, OSHA plans to provide this information about general control strategies in guidance materials tailored to reach the targeted audience. This will make it easier to update as new technologies or beryllium processes become available.

In addition, under paragraph (f)(2), Engineering and work practices, employers are obligated to use engineering controls in beryllium work areas. OSHA requires

¹¹ The agency notes that DOD’s comment suggests there might be some confusion as to whether beryllium alloys and beryllium composites are analogous. In fact, these materials have different structures and should be treated differently from a control strategy point of view. A metal alloy is a metal which is a homogeneous mixture of two or more metals or of a metal and another element to provide unique characteristics or properties (see <https://www.thefreedictionary.com/Metal+alloy>). A “beryllium composite,” on the other hand, is a metal matrix composite or (MMC) which typically contain at least two distinct constituent parts (see <https://www.azom.com/article.aspx?ArticleID=9843>).

employers to use at least one type of control that is listed in paragraph (f)(2)(ii) (substitution, isolation, local exhaust ventilation, or process controls) unless controls are infeasible or exposures are demonstrated to be below the action level. These general controls are the same types of controls that were listed in Appendix A and are required regardless of whether that appendix is retained. For these reasons, this final standard does not retain the old Appendix A.

Materion fully supported the proposed changes to the *beryllium work area* definition and the proposed Appendix A. However, it noted a typographical error in Appendix A for “High Speed Machining (\leq 10,000 rpm),” which should be ($>$ 10,000 rpm) (Document ID 0038, p. 10). OSHA agrees that the entry in the NPRM’s Appendix A is incorrect and made the appropriate correction in this final rule.

After careful consideration of the record, OSHA has determined that the revised definition of *beryllium work area* will improve compliance with the standard by providing greater clarity to employers regarding when and where beryllium work areas should be established in the workplace. The agency further finds that properly identifying beryllium work areas will reduce potential exposure for workers outside of these areas through the various provisions triggered by beryllium work areas. In sum, OSHA has determined that the revision to the definition of *beryllium work area* will ensure that the standard’s requirements related to beryllium work areas are workable and properly understood. Therefore, OSHA has decided to finalize the definition of *beryllium work area* and the corresponding update to Appendix A as proposed, with the exception of correcting the typographical error in Appendix A noted by Materion.

CBD diagnostic center.

OSHA is amending the 2017 final rule’s definition of *CBD diagnostic center* to clarify certain requirements used to qualify an existing medical facility as a CBD diagnostic center. The clarification does not change the requirement for the employer to offer a follow-up examination at a CBD diagnostic center to employees meeting the criteria set forth in paragraph (k). OSHA is defining *CBD diagnostic center* to mean a medical diagnostic center that has a pulmonologist or pulmonary specialist on staff and on-site facilities to perform a clinical evaluation for the presence of CBD. The revised definition also states that a CBD diagnostic center must have the capacity to perform pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. In the revised definition, the CBD diagnostic center must also have the capacity to transfer BAL samples to a laboratory for appropriate diagnostic testing within 24 hours and the pulmonologist or pulmonary specialist must be able to interpret the biopsy pathology and the BAL diagnostic test results. This definition is identical to the definition of *CBD diagnostic center* that OSHA proposed in the 2018 NPRM.

The revised definition of *CBD diagnostic center* differs from the former definition in a number of ways. First, whereas the 2017 final rule’s definition specified only that a CBD diagnostic center must have a pulmonary specialist, OSHA is adding the term “pulmonologist” to clarify that either type of specialist is qualified to perform a clinical evaluation for the presence of CBD. Additionally, the 2017 definition required that a CBD diagnostic center have an on-site pulmonary specialist. The revised definition states that the CBD diagnostic center must simply have a pulmonologist or pulmonary specialist

on staff. This clarifies OSHA’s intent that a specialist must be available to the CBD diagnostic center but need not necessarily be on site at all times.

In their comments on the 2018 NPRM, two commenters, NJH and the ATS, recommended that a pulmonologist, occupational medicine specialist, or physician with expertise in beryllium disease should conduct the clinical evaluation for CBD and that a pulmonologist should be on staff or available to perform the bronchoscopy (Document ID 0022, p. 2; 0021, p. 2). According to NJH, clinics that regularly evaluate patients for CBD have physicians with experience in occupational health conduct the clinical evaluation for CBD, in conjunction with a pulmonologist who performs a bronchoscopy (Document ID 0022, pp. 2-3).

OSHA notes that, although the agency is requiring facilities to have a pulmonologist or pulmonary specialist on staff who is able to interpret the biopsy pathology and the BAL diagnostic test results, OSHA does not intend that all aspects of clinical evaluation for CBD must be performed by a pulmonologist or pulmonary specialist. In the preamble to the 2017 final rule, OSHA explained that the agency was defining a *CBD diagnostic center* as a facility with a pulmonary specialist “on-site” specifically to indicate that the specialist need not personally perform the BeLPT testing (82 FR at 2645). Moreover, paragraph (k)(7), which sets out the substantive requirements for the evaluation at the CBD diagnostic center, refers to recommendations of the “examining physician,” not necessarily the pulmonologist or pulmonary specialist.

Paragraph (b), in turn, defines *physician or other licensed health care professional (PLHCP)* as an individual licensed to provide some or all of the services required by paragraph (k). As such, some parts of the evaluation, such as lung function

tests, might be performed by a certified medical professional other than a pulmonologist or pulmonary specialist. The arrangement that NJH describes as typical for clinics treating CBD patients, in which physicians with experience in occupational health conduct the clinical evaluation for CBD in conjunction with a pulmonologist who performs a bronchoscopy, is consistent with OSHA's intent for the definition of *CBD diagnostic center* and other provisions of the standard related to CBD diagnosis. Therefore, OSHA has determined that it is not necessary to revise the definition of *CBD diagnostic center* to require that the clinical evaluation for CBD be conducted by a pulmonologist, occupational medicine specialist, or physician with expertise in beryllium disease.

An additional change to the definition of *CBD diagnostic center* clarifies that the diagnostic center must have the capacity to perform pulmonary function testing (according to American Thoracic Society criteria), bronchoalveolar lavage (BAL), and tranbronchial biopsy. OSHA determined that the former definition—which stated that the evaluation at the diagnostic center “must include” these tests—could have been misinterpreted to mean that the examining physician was required to perform each of these tests during every clinical evaluation at a CBD diagnostic center. The agency's intent is not to dictate which tests an evaluation at a CBD diagnostic center should include, but to ensure that any CBD diagnostic center has the capacity to perform any of these tests, which are commonly needed to diagnose CBD. OSHA expects that these are the tests that would most commonly be requested for a CBD evaluation. Therefore, the agency is revising the definition to clarify that the CBD diagnostic center must simply have the ability to perform each of these tests when deemed appropriate. These changes

clarify the definition of *CBD diagnostic center*, and OSHA expects they will maintain safety and health protections for workers.

Materion submitted comments supporting OSHA's intent to specify the required capacities of a CBD diagnostic center, rather than the contents of a CBD evaluation, in the definition of *CBD diagnostic center* (Document ID 0038, pp. 16-17). NJH expressed concern that this change to the definition may indicate that the clinical evaluation for CBD need not include certain aspects of a CBD evaluation, which NJH, the Association of Occupational and Environmental Clinics (AOEC), and the ATS recommend should typically include full pulmonary function testing (lung volumes, spirometry, and diffusion capacity for carbon monoxide), chest imaging, and cardiopulmonary exercise testing, and may also include bronchoscopy in some cases (Document ID 0022, p. 3; 0028, p. 2; 0021, pp. 1-2). Similarly, the ATS commented that not requiring certain diagnostic tests "could reduce the potential to diagnose CBD and determine disease severity" (Document ID 0021, p. 3). NJH recommended that OSHA require the ATS recommendations for diagnostic evaluation, which the NJH stated include the BeLPT; pulmonary function testing and chest imaging; and in some cases bronchoscopy (Document ID 0022, p. 3).

As explained below in the Summary and Explanation of paragraph (k)(7), that provision—which establishes the substantive requirements for the evaluation at the CBD diagnostic center—makes clear that the employer must offer any tests that the examining physician at the CBD diagnostic center deems appropriate. The definition of *CBD diagnostic center* in paragraph (b) does not alter this requirement. In light of paragraph (k), the revised definition of *CBD diagnostic center* cannot reasonably be read to limit the

types of tests available to the employee (see the Summary and Explanation for paragraph (k)(7) for a full discussion of this topic). Thus, after considering these comments, OSHA has decided to retain the proposed change to the definition of *CBD diagnostic center*. *Chronic beryllium disease (CBD)*.

OSHA is also amending the definition of *chronic beryllium disease*. For the purposes of this standard, the agency is using the term *chronic beryllium disease* to mean a chronic granulomatous lung disease caused by inhalation of airborne beryllium by an individual who is beryllium sensitized. OSHA is finalizing the definition as proposed. It includes several changes to the 2017 final rule's definition of *chronic beryllium disease*, which was "a chronic lung disease associated with exposure to airborne beryllium" (82 FR at 2645-46). The revisions serve to differentiate CBD from other respiratory diseases associated with beryllium exposure (e.g., lung cancer) and to make clear that beryllium sensitization and the presence of beryllium in the lung are essential in the development of CBD (see 82 FR at 2492).

First, OSHA is adding the term "granulomatous" to the definition. A granulomatous lung formation is a focal collection of inflammatory cells (e.g., T-cells) creating a nodule in the lung (see Ohshimo et al., 2017, Document ID OSHA-H005C-2006-0870-2171, p. 2). The formation of the type of lung granuloma specific to a beryllium immune response can occur only in those with CBD (82 FR at 2492-2502). Next, OSHA is removing the phrase "associated with airborne exposure to beryllium" and replacing it with "caused by inhalation of airborne beryllium." This change is more consistent with the findings in the 2017 final rule that beryllium is the causative agent for CBD and that CBD occurs only after inhalation of beryllium (82 FR at 2513). Finally,

OSHA is clarifying that CBD is caused by inhalation of airborne beryllium “by an individual who is beryllium sensitized.” Along with the revised definition of *beryllium sensitization* discussed above, this revision emphasizes to employers and employees the role that beryllium sensitization plays in the development of CBD.

NJH, the USW, and Materion agreed with OSHA that the 2017 final standard’s definition of *chronic beryllium disease* should be clarified. Materion supported the changes OSHA proposed, which it characterized as a necessary clarification to ensure the definition provided is specific to chronic beryllium disease (Document ID 0038, p. 17). The USW similarly supported the proposed definition, stating that it clarifies the previous definition which “could be read to apply to any chronic lung disease caused by beryllium, including lung cancer” (Document ID 0033, p. 5). These comments reinforce OSHA’s determination that adding the term “granulomatous” to the definition will better distinguish CBD from other occupationally associated chronic pulmonary diseases. As OSHA explained in the preamble to the 2017 final rule, the formation of the type of lung granuloma specific to a beryllium immune response can occur only in those with CBD (82 FR at 2492-2502).

Several commenters expressed concern that the proposed definition of *chronic beryllium disease* does not provide sufficient information to guide diagnosis of CBD, and specifically that OSHA’s emphasis on the role of sensitization in the development of CBD may confuse diagnostic efforts. The ATS noted that demonstrating beryllium sensitization may be challenging in certain settings and recommended that OSHA’s definition of *chronic beryllium disease* use the diagnostic criteria for CBD outlined in a 2014 ATS document on diagnosis and management of beryllium sensitivity and CBD

(“the ATS Statement”). These diagnostic criteria include confirmation of an immune response to beryllium and granulomatous lung inflammation using lung biopsy and emphasize the various approaches which may be used “[d]epending on the clinical setting, feasibility of certain diagnostic tests, and degree of diagnostic certainty needed” (Document ID 0021, p. 5). DOSH similarly emphasized that individuals may be diagnosed with CBD without a confirmed positive BeLPT result and advocated that the definition of *chronic beryllium disease* “ensure employers and medical providers are given a clear expectation of how beryllium conditions are properly identified” (Document ID 0023, p. 2).

OSHA notes that the standard’s definition of *chronic beryllium disease* is not intended to provide criteria for the diagnosis of CBD. The agency’s intent is to provide readers who may have little or no familiarity with CBD with a general understanding of the term, rather than to provide diagnostic criteria for healthcare professionals in addressing CBD.

Due to differences in individual cases and circumstances, medical specialists may need to apply somewhat different testing regimens and/or diagnostic criteria to different individuals they evaluate for CBD. Furthermore, the diagnostic tools and criteria available to medical specialists may change over time. As discussed in the Summary and Explanation for paragraph (k)(7), OSHA believes that the physician at the CBD diagnostic center should have the latitude to use any tests he or she deems appropriate for the purpose of diagnosing or otherwise evaluating CBD in a patient, and has revised paragraph (k)(7) to make this clear. Therefore, OSHA has determined that it is neither necessary nor appropriate to specify diagnostic criteria in the beryllium standard’s

definition of *chronic beryllium disease*. Instead, OSHA has decided to retain a definition that provides the reader with a general understanding of the term.

NJH suggested that the agency define *chronic beryllium disease* as a disease “characterized by evidence of granulomatous lung inflammation in an individual who is sensitized to beryllium.” According to NJH, this definition would allow for diagnosis based on different combinations of clinical evaluation results as detailed the ATS Statement (Document ID 0022, p. 3). OSHA believes that the definition the agency proposed—a chronic granulomatous lung disease caused by inhalation of airborne beryllium by an individual who is beryllium sensitized—conveys the substance of NJH’s recommended definition while also emphasizing that CBD results from the inhalation of airborne beryllium. OSHA has therefore decided not to adopt the definition NJH suggested.

The ATS expressed concern that OSHA’s proposed changes to the definition of *chronic beryllium disease* could create confusion in the diagnosis of CBD because it may be challenging in certain settings to identify sensitization and granulomatous lung disease based on lung pathology (Document ID 0021, p. 5). DOSH similarly commented that the proposed definition may be misleading because, although those with CBD have sensitization to beryllium, the current testing for sensitization has a high false-negative rate and individuals may be diagnosed with CBD without first being confirmed positive for beryllium sensitization (Document ID 0023, p. 2).

Although OSHA agrees that employees may be diagnosed with CBD without confirmed positive BeLPT results, the agency does not agree with these commenters that references to sensitization should be excluded from the definition of *chronic beryllium*

disease. OSHA first notes that neither DOSH nor the ATS contend that OSHA's definition is inaccurate. Furthermore, as OSHA explained previously in its discussion of the *beryllium sensitization* definition, the agency believes that a correct understanding of the relationship between beryllium sensitization and CBD is key to workers' and employers' understanding of many provisions of the beryllium standard. By stating the role that sensitization plays in the development of CBD in the standard's definition of *chronic beryllium disease*, OSHA intends to convey clearly to the regulated community why protecting workers from becoming beryllium sensitized is key to the prevention of CBD and why workers who are confirmed positive for beryllium sensitization should be offered both a clinical evaluation for CBD and medical removal protection.

OSHA acknowledges that it is not always necessary to identify a worker as confirmed positive for beryllium sensitization using the BeLPT as part of a diagnosis of CBD and that the BeLPT can yield false-negative results in some individuals. For this reason, an examining physician should have the latitude to diagnose CBD even in the absence of a "confirmed positive" pattern of BeLPT results. As explained in the Summary and Explanation of paragraph (k)(7) of the 2017 final rule, that provision gives the examining physician this latitude (82 FR 2704, 2709). Because the substantive provisions of the standard leave the examining physician discretion in diagnosing CBD, OSHA does not agree that acknowledging the role of beryllium sensitization in the development of CBD will result in diagnostic confusion.

The NSSP recommended the following addition to OSHA's proposed definition of *chronic beryllium disease*: "The presence of interstitial mononuclear cell (T cell) infiltrates (lymphocytosis) is characteristic of chronic beryllium disease" (Document ID

0027, pp. 3-4). The NSSP argued that the presence of these infiltrates on lung biopsy indicates the presence of chronic beryllium disease, and should therefore be included in the standard's definition (Document ID 0027, p. 4). OSHA disagrees. The agency believes that the term "granulomatous" sufficiently addresses the presence of T-cell infiltrates, which occur at an early stage in the development of granulomas (82 FR at 2492-2502). As discussed previously, OSHA's intent in defining *chronic beryllium disease* is to provide the reader a general understanding of what CBD is, rather than provide a technical definition for diagnostic use. The suggested addition is not necessary to describe the nature of CBD in general terms. With the addition of the term "granulomatous," the definition is sufficiently specific for OSHA's purposes in the context of paragraph (b).

In summary, for the purposes of this standard OSHA is defining *chronic beryllium disease* as a chronic granulomatous lung disease caused by inhalation of airborne beryllium by an individual who is beryllium sensitized. This definition is identical to the definition of *chronic beryllium disease* OSHA proposed in 2018 and includes only minor changes from the definition included in the 2017 final standard. OSHA is providing this definition to enhance stakeholders' general understanding of the beryllium standard; it is neither intended nor suitable to provide guidance to medical professionals on the diagnosis of CBD. OSHA expects these changes to the 2017 definition of *chronic beryllium disease* will clarify the standard, and will therefore maintain safety and health protections for workers.

Confirmed positive.

OSHA is amending the definition of *confirmed positive* to mean (1) the person tested has had two abnormal BeLPT test results, an abnormal and a borderline test result, or three borderline test results, obtained from tests conducted within a three-year period; or (2) the result of a more reliable and accurate test indicating a person has been identified as having beryllium sensitization. The revised definition includes several changes to the 2017 definition of *confirmed positive* and one change from the definition of *confirmed positive* that OSHA proposed in the 2018 NPRM.

First, the agency is removing the phrase “beryllium sensitization” from the first sentence of the definition, which previously stated that a person is confirmed positive if that person has beryllium sensitization, as indicated by two abnormal BeLPT test results, an abnormal and a borderline test result, or three borderline test results. OSHA intends that *confirmed positive* act only as a trigger for requirements such as continued medical monitoring and surveillance for the purposes of this standard, and not as a general-purpose definition of beryllium sensitization. By removing the phrase “beryllium sensitization” from the first sentence of the definition, the agency hopes to avoid confusion resulting from scientific disagreements over whether certain test results, such as three borderlines, necessarily prove that sensitization has occurred. For purposes of the beryllium standard, any worker with the BeLPT test results specified in the definition of *confirmed positive* should be offered an evaluation for CBD with continued medical surveillance as well as the option of medical removal protection, even though some small percentage of workers who are confirmed positive by this definition may not in fact be

sensitized to beryllium, as is the case for any diagnostic test (Middleton et al., 2008 (Document ID OSHA-H005C-2006-0870-0480, p. 4)).¹²

Both the USW and Materion supported this proposed revision. The USW stated that the former definition of *confirmed positive* had acted “as a de facto definition of sensitization” and that removing the phrase from this portion of the definition ensures that a finding of confirmed positive will trigger medical surveillance and medical removal protection “without an intermediate stop at a finding of sensitization” (Document ID 0033, p. 5). Similarly, Materion commented that the revised definition allows individuals with three borderline BeLPT results to obtain the protections of the standard, including evaluation for CBD and medical removal protection, without necessarily being “declared sensitized” (Document ID 0038, p. 18). Materion further asserted that the change enhances employee protection by increasing the number of persons eligible for further testing (Document ID 0038, p. 19).

NJH opposed the revised definition, asserting that the removal of the phrase “beryllium sensitization” could prevent individuals who meet the definition of being confirmed positive from being identified as sensitized. NJH further expressed concern that this could make it difficult for some workers to access the medical testing and workplace protections required by the rule (Document ID 0022, p. 4).

¹² In the preamble to the 2017 final rule, OSHA found that three borderline BeLPT results recognize a change in a person’s immune system with respect to beryllium exposure based on Middleton et al.’s 2011 finding that three borderline BeLPT results have a positive predictive value (PPV) of over 90 percent (82 FR at 2501), and therefore the agency included three borderline results in the criteria for confirmed positive (82 FR at 2646).

The ATS and the AOEC also disagreed with the removal of the phrase “beryllium sensitization” from the definition of *confirmed positive*, stating the medically accepted interpretation of BeLPT testing results is that they indicate beryllium sensitization, and that removing this phrase may cause confusion about what condition the term *confirmed positive* refers to (Document ID 0021, p. 3; 0028, p. 2). The ATS further stated without explanation that removing the term “beryllium sensitization” from the definition of *confirmed positive* would reduce worker protections.¹³ The Nssp also expressed disagreement with OSHA’s proposal to remove “beryllium sensitization” from the first part of the *confirmed positive* definition, but did not state the reasons for their concern (Document ID 0027, p. 3).

Following consideration of the concerns raised by these organizations, OSHA disagrees that removing the phrase “beryllium sensitization” from the first sentence of the definition of *confirmed positive* will create confusion or reduce worker protections. The provisions of the standard intended to benefit workers who may be sensitized (evaluation at a CBD diagnostic center and medical removal protection) are available to all workers who meet the definition of *confirmed positive*. Therefore, removing the term “beryllium sensitization” from the first sentence of the definition will not change the access to these benefits for any workers. By removing the term “beryllium sensitization” from the first

¹³ The ATS also asserted that the removal of the phrase “beryllium sensitization” would reduce workers’ right to file for worker’s compensation (Document ID 0021, p. 3). The ATS did not explain how the definition of *confirmed positive* in the beryllium standard could affect worker’s compensation claims and at least one other commenter questioned the ATS’s assertion (see Document ID 0038, p. 19). Regardless, OSHA intends the definition of *confirmed positive* to serve only as a trigger for certain provisions of the beryllium standard. How OSHA defines this phrase for purposes of the beryllium standard in no way limits healthcare professionals’ ability or incentive to diagnose beryllium sensitization.

sentence of the definition, OSHA seeks to ensure that workers with three borderline BeLPT results (or other patterns of test results that some physician or other licensed health care professionals (PLHCPs) may consider ambiguous) will receive the benefits of the standard regardless of whether their PLHCP views their results as firm evidence of sensitization. Furthermore, OSHA disagrees that removing the reference to “beryllium sensitization” will lead to confusion about what the BeLPT results are supposed to indicate because the second sentence of the definition of *confirmed positive* makes clear that a worker who has been diagnosed with beryllium sensitization would also meet the definition of *confirmed positive*: “It [confirmed positive] also means the result of a more reliable and accurate test indicating a person has been identified as having beryllium sensitization.”

An additional change to the definition of *confirmed positive* provides that the findings of two abnormal, one abnormal and one borderline, or three borderline results need to occur from BeLPTs conducted within a three-year period. This change in the definition of *confirmed positive* differs from the proposal and is based on comments submitted to the record following publication of the 2018 NPRM.

The 2017 final rule did not specify a time limit within which the BeLPT tests that contribute toward a finding of “confirmed positive” must occur. After publication of the 2017 final rule, stakeholders suggested to OSHA that the definition of *confirmed positive* could be interpreted as meaning that findings of two abnormal, one abnormal and one borderline, or three borderline results over any time period, even as long as 10 years, would result in the employee being confirmed positive and automatically referred to a CBD diagnostic center for evaluation. As discussed in the preamble to the 2017 standard,

clinical evaluation for CBD involves bronchoalveolar lavage and biopsy (82 FR at 2497) which, like all invasive medical procedures, carry risks of infection and other complications.¹⁴ Given such risks, and the possibility that some repeat abnormal or borderline results obtained over a long period of time could be false positives, it was not the agency's intent that workers with rarely recurring abnormal or borderline BeLPT results should necessarily proceed to evaluation at a CBD diagnostic center unless recommended to do so by their examining physician. At the same time, OSHA notes that under paragraph (k)(5)(iii), the licensed physician performing the BeLPT testing retains the discretion to refer an employee to a CBD diagnostic center if the licensed physician deems it appropriate, regardless of the BeLPT result.

In the 2018 NPRM OSHA proposed that any combination of test results specified in the definition of *confirmed positive* must result from the tests conducted in one cycle of testing, including the initial BeLPT and the follow-up retesting offered within 30 days of an abnormal or borderline result (paragraph (k)(3)(ii)(E)). As outlined in proposed paragraph (k)(3)(ii)(E), an employee would be offered a follow-up BeLPT within 30 days if the initial test result is anything other than normal, unless the employee had been confirmed positive (e.g., if the initial BeLPT was performed on a split sample and showed two abnormal results). Thus, for example, if an employee's initial test result was abnormal, and the result of the follow-up testing offered to confirm the initial test result was abnormal or borderline, the employee would be confirmed positive. Alternatively, if the result of the follow-up testing offered to confirm the initial abnormal test result was

¹⁴ Bronchoalveolar lavage is a method of "washing" the lungs with fluid inserted via a flexible fiberoptic instrument known as a bronchoscope, removing the fluid and analyzing the content for the inclusion of immune cells reactive to beryllium exposure (82 FR at 2497).

normal, the employee would not be confirmed positive. Any additional abnormal or borderline results obtained from the next required BeLPT for that employee (typically, two years later) would not identify that employee as confirmed positive under the proposed modification to *confirmed positive*. OSHA requested comments on the appropriateness of this proposed time period.

Several stakeholders, including Materion, NJH, the ATS, DOSH, the NSSP, the AOEC, the USW, and The American College of Occupational and Environmental Medicine (ACOEM), submitted comments regarding OSHA's proposal to require that the test results specified in the agency's definition of *confirmed positive* must occur within a single testing cycle. Commenters focused on several aspects of the proposed timing. First, many of the comments focused on the logistics of OSHA's proposed change. Materion supported the proposed definition of *confirmed positive*, stating that a 30-day allowance for follow-up testing after a first abnormal or borderline BeLPT result is appropriate to ensure that testing is completed in a timely manner (Document ID 0038, p. 17). However, NJH, the ATS, ACOEM, the USW, and the NSSP all indicated that requiring results with a 30-day testing cycle could create logistical challenges, for example due to repeat testing requirements or for businesses in remote areas with limited healthcare facilities (Document ID 0022, p. 4; 0021, p. 4; 0024, p. 1; 0033, p. 5; 0027, p. 3). In this final rule and preamble, OSHA clarifies that it did not intend that the initial and follow-up tests had to be completed and interpreted within 30 days. It intended that the test results used to determine if a worker is confirmed positive be obtained during one cycle of testing (i.e., an initial or periodic examination), including follow-up testing conducted within 30 days of an abnormal or borderline result.

Secondly, stakeholders commented on the appropriateness of limiting the use of the BeLPT from one test cycle in determining if a worker is confirmed positive. Materion agreed with the proposed timing and commented that the change “increases employee protections by establishing an employee as confirmed positive in a shorter time frame, thus, making the medical removal benefit option available to the worker in a more timely manner” (Document ID 0038, p. 19). Stakeholders from the medical community disagreed and raised concerns that limiting test results to one test cycle would affect the ability to identify workers who should be referred for a CBD evaluation and receive other protections under the standard.

The NSSP cited data from healthcare providers to demonstrate that a 30-day testing cycle is insufficient to properly identify sensitized workers. According to the NSSP, in over 20 years of conducting BeLPTs in worker populations, Oak Ridge Associated Universities observed approximate median times of 45 days (range of 3 days to 16 years) between first and second abnormal tests, 1.5 years (range of 30 days to 11 years) for the abnormal/borderline test combination, and 1 year (range of 30 days to 11 years) for three borderlines (Document ID 0027, p. 3). Under the proposed 30-day requirement, the NSSP stated that the majority of workers who have been identified as sensitized in the past would not meet the proposed definition of confirmed positive (Document ID 0027, p. 3).

NJH reported similar findings in new evidence submitted to the record (Document ID 0022, pp. 4-5). The evidence indicates that many workers who develop CBD have abnormal or borderline results that do not immediately repeat upon retesting. To the contrary, many CBD patients have a series of tests which alternate between normal and

abnormal. Data based on NJH's extensive experience show that the BeLPT does not yield consistently abnormal results among CBD patients. Of 194 patients diagnosed with CBD at NJH, the length of time between abnormal results ranged from 14 days to 5.8 years, with a 95th percentile of 2.9 years. In this group, 150 patients (or 77 percent) would not have been evaluated for CBD if two abnormal BeLPT results were required to occur within a 30-day testing cycle (Document ID 0022, p. 5).

Although the information the NSSP and NJH submitted to the record is unpublished, their findings are consistent with published studies. Kreiss et al. (1997) reported that nine individuals had initial abnormal BeLPT results followed by two normal tests; six of those individuals were re-tested approximately one year later and four were confirmed positive for beryllium sensitization based on abnormal BeLPT results (Document ID OSHA H005C-2006-0870-1360, pp. 610-12). These findings suggest a high rate of false-negative results and are consistent with results reported in a study by Stange et al. (2004). That study found an average false-positive rate of 1.09 percent, and a false-negative rate of 27.7 percent for the BeLPT (Document ID OSHA-H005C-2006-0870-1402, p. 459).

Other public health organizations, including DOSH, the ATS, the NSSP, and the AOEC, agreed with NJH that workers who are sensitized to beryllium may show varying test results over time; and restricting the time period for determining "confirmed positive" status to 30 days would cause sensitized individuals to go undetected (Document ID 0023, p. 2; 0021, p. 2; 0027, p. 3; 0028, p. 2). The ATS and the AOEC recommended that results from tests performed up to at least three years after the initial abnormal or borderline test result should be used to determine whether the person tested

is confirmed positive for beryllium sensitization (Document ID 0021, p. 2; 0028, p. 2). The ATS stated that a timeframe of at least three years, which encompasses two rounds of regularly scheduled testing required biennially by the beryllium standard, would adequately address its concerns regarding logistical feasibility, would improve diagnostic accuracy, and help ensure that sensitized workers are identified (Document ID 0021, p. 4). The AOEC agreed that consideration of BeLPT test results obtained during a time period of at least three years “will increase the potential that workers are accurately diagnosed with beryllium sensitization [and] will receive the necessary care” (Document ID 0028, p. 2).

The approaches recommended by the ATS and the AOEC are similar to the approach NJH used in providing medical surveillance consultation to workforces that use beryllium. NJH stated that, if an individual’s BeLPT results are abnormal and normal on their initial round of BeLPT testing, they will usually request another BeLPT within a month. If the result of that test is normal, they do not request further testing until the next regularly scheduled BeLPT. If the result of the next regularly scheduled BeLPT comes back abnormal, they refer the worker for clinical evaluation even though the tests are separated by the two-year testing cycle (Document ID 0022, p. 5).

Following consideration of the comments and of the new evidence submitted to the record following the proposal, OSHA is convinced that some workers who are ultimately found to be sensitized to beryllium or diagnosed with CBD may have alternating abnormal and normal BeLPT results, and that the time period for abnormal or borderline results to repeat can be months or years. OSHA is also convinced that requiring two abnormal, an abnormal and borderline, or three borderline results to occur

in one cycle of an initial or periodic exam before an employee can be confirmed positive could result in beryllium sensitization or CBD going undetected in many employees. This is demonstrated by the unpublished data submitted by NJH showing that a substantial percentage of individuals with CBD (77 percent) may not have been referred for further testing based on results obtained within a 30-day cycle of testing and is confirmed by the experience of the NSSP. Therefore, OSHA finds that its proposed change would have the unintended and unacceptable consequence of reducing employee protections because some employees who are sensitized or have CBD would be deprived of the benefits available through the standard, such as a timely evaluation at a CBD diagnostic center. In addition, requiring that results be obtained in one test cycle is not consistent with the approaches currently applied or supported by the medical community.

For these reasons, OSHA is revising the definition of *confirmed positive* to specify that the findings of two abnormal, one abnormal and one borderline, or three borderline results must be obtained from BeLPTs conducted within a three-year period. OSHA agrees with the ATS and the AOEC that a three-year period will facilitate the identification of sensitized workers enrolled in medical surveillance (see Document ID 0022, p. 5; 0028, p. 2). In addition, this approach is consistent with the practices and recommendations from the medical community, including NJH, which provides beryllium-related medical surveillance consultation. OSHA believes that allowing a worker to be confirmed positive based on BeLPT results obtained over a three-year time period strikes a reasonable balance that would allow a timely evaluation for CBD, while at the same time, maintaining OSHA's original intent that a confirmed positive finding not be based on results obtained over an indefinite time period.

OSHA emphasizes that this revision does not modify the requirements of paragraph (k)(3)(ii)(E). Under that paragraph, if the results of the BeLPT are other than normal, a follow-up BeLPT must be offered within 30 days of receiving the results, unless the employee has been confirmed positive. Only other than normal BeLPT results must be followed up within 30 days of the same test cycle (i.e., an initial or periodic medical examination).

As an example, an employee who receives a borderline result during one periodic examination conducted in 2020 would be retested within 30 days, and if the follow-up test is normal, testing would stop. That employee would be offered another BeLPT at the next periodic examination conducted in 2022. However, if the result of the 2022 test is borderline, the employee would be retested within 30 days of that test result receipt, and if the follow-up test is borderline, the employee would be confirmed positive because of receiving three borderline tests within three years. A three-year period for the employee to be confirmed positive would ensure sufficient time for such follow-up tests that may need to be conducted over two cycles of medical examinations.

DOD recommended changing the term “confirmed positive” to another term such as “confirmed non-negative,” “confirmed finding of concern,” or “pattern of concern.” According to the DOD, the term “confirmed positive” typically “implies an initial positive test that was repeated with another test or another, more sensitive test, which confirms the initial positive test result” (Document ID 0029, p. 2). The CBD literature, however, commonly treats individuals as confirmed positive for sensitization through sequentially conducted BeLPTs (see, for example, the ATS Statement on Diagnosis and Management of Beryllium Sensitivity and Chronic Beryllium Disease, ATS 2014,

Document ID OSHA-H005C-2006-0870-0364, p. e41; see also Document ID OSHA-H005C-2006-0870-1543, 0603, 0398, 1403, 1449). Additionally, OSHA again emphasizes that terms defined in the beryllium standard are defined only for purposes of the standard and are not intended as diagnostic, scientific, or all-purpose definitions. OSHA believes that its definition of *confirmed positive* clearly indicates what that term means for purposes of the beryllium standard and therefore disagrees with DOD's concern that the term may cause confusion. Accordingly, OSHA is retaining the term "confirmed positive" in this final standard.

Dermal contact with beryllium.

Paragraph (b) of this final rule defines *dermal contact with beryllium* as skin exposure to (1) soluble beryllium compounds containing beryllium in concentrations greater than or equal to 0.1 percent by weight; (2) solutions containing beryllium in concentrations greater than or equal to 0.1 percent by weight; or (3) visible dust, fumes, or mists containing beryllium in concentrations greater than or equal to 0.1 percent by weight. The definition also states that handling of beryllium materials in non-particulate solid form that are free from visible dust containing beryllium in concentrations greater than or equal to 0.1 percent by weight is not considered dermal contact under the standard. Several of the standard's provisions are triggered where an employee has, or can be reasonably expected to have, dermal contact with beryllium. These include provisions in paragraph (f), Written exposure control plan; paragraph (h), Personal protective clothing and equipment (PPE); paragraph (i), Hygiene areas and practices; paragraph (k), Medical surveillance; and paragraph (m), Communication of hazards.

This final rule makes two changes to the previous definition, which was added to the standard through the 2018 direct final rule (83 FR at 19940) following OSHA’s promulgation of the final rule in January 2017. That direct final rule defined *dermal contact with beryllium* as skin exposure to soluble beryllium compounds, beryllium solutions, or dust, fumes, or mists containing beryllium, where these materials contain beryllium in concentrations greater than or equal to 0.1 percent by weight (83 FR at 19940). First, this final rule modifies the definition to refer to “visible” dust, fumes, or mists containing beryllium in concentrations greater than or equal to 0.1 percent by weight. Second, OSHA is adding a sentence to the definition specifying that handling beryllium materials in non-particulate solid form that are free from visible dust containing beryllium in concentrations greater than or equal to 0.1 percent by weight is not considered dermal contact with beryllium under the standard. This final rule’s definition of *dermal contact with beryllium* is identical to the definition that OSHA proposed in the 2018 NPRM.

The revisions incorporated in this definition are intended to help employers more accurately identify areas where the provisions triggered by dermal contact apply. Based on feedback OSHA received from stakeholders following publication of the 2017 final standard, OSHA became concerned that employers might have difficulty accurately identifying when and where the provisions triggered by dermal contact are required. Beryllium-generating processes can release beryllium in varying particle sizes and amounts, some of which are visible to the naked eye and some of which are not. OSHA was concerned that employers could reasonably interpret the provisions triggered by dermal contact with beryllium (e.g., the use of PPE) as extending to every employee who

could potentially encounter a minute and non-visible amount of beryllium particulate at its facility, irrespective of the employee's job duties and tasks, or who might handle an object containing beryllium. Such an interpretation would be contrary to OSHA's intent and could prompt employers to attempt infeasible compliance measures. Therefore, as explained in the 2018 NPRM, OSHA proposed adding the term "visible" to clarify when skin exposure to beryllium-containing dust, fumes, or mist should be considered dermal contact with beryllium for the purpose of triggering the standard's requirements. OSHA also proposed adding a sentence to state that handling of beryllium materials in non-particulate solid form that are free from visible dust containing beryllium in concentrations greater than or equal to 0.1 percent by weight is *not* considered "dermal contact with beryllium" under the standard.

Several commenters supported revising the definition of *dermal contact with beryllium* to apply to visible particulate, agreeing that the revised definition would facilitate compliance with the standard. In its submission, Materion stated that the proposed change to the definition "clears up the ambiguity and eliminates the vagueness of the [previous]... standard," and that

Revising the standard to provide employees as well as employers clear lines will likely immeasurably help not only with compliance but with enforcement of the standard. Without the visible cue, employees will have no idea whether and when they should be protected by PPE.... OSHA has fixed this problem with a sensible and clear demarcation threshold for dermal contact, and has done so in a manner that does not sacrifice protection against the risk of CBD.

(Document ID 0038, p. 21). Similarly, the USW stated that dermal exposure to beryllium needed to be "properly addressed," but that triggering provisions by dermal contact with materials containing beryllium at any level "could extend the application of the standard

far beyond what OSHA intended or what is necessary to protect workers” (Document ID 0033, p. 4). The USW referred to non-sparking tools made from beryllium-copper alloy and beryllium foil used for x-ray windows as examples of materials where dermal contact should not trigger provisions of the standard (Document ID 0033, p. 4).

Century Aluminum Company (Century Aluminum) (Document ID 0026, p. 2) and DOD (Document ID 0029, p. 1) also agreed with the proposal to add the term “visible” to the definition. However, DOD recommended that OSHA revise the definition to explicitly identify skin exposure to “visible dust that has accumulated on surfaces” in addition to visible dust, fumes, or mists containing beryllium in concentrations greater than or equal to 0.1 percent by weight. OSHA does not believe this added phrase is necessary. The definition of *dermal contact with beryllium* does not distinguish the exposure routes that cause the skin exposure and, as proposed, the phrase “visible dust” encompasses exposures via both air and surface contamination.

The ATS commented that adding “visible” to the definition to trigger provisions related to dermal contact “could be helpful,” but cautioned that inhalation of beryllium particulate that is not visible is “the major concern” for developing CBD (Document ID 0021, p. 5). It urged OSHA to ensure that the revised definition neither undermines the requirements of the beryllium standard which limit exposure to respirable beryllium, nor limits education on the health effects of beryllium to only those workers with exposure to visible dust (Document ID 0021, p. 5).

NJH objected to OSHA’s proposal to restrict the definition to visible dust, fumes, and mists, believing that doing so could reduce employee protections from beryllium-induced sensitization and disease (Document ID 0022 p. 7). NJH commented that the

smallest respirable particles are not visible and are inhaled into the deepest part of the lung. It further commented that a “monitoring program that routinely samples all departments with air and wipe samples can accomplish identifying ‘nonvisible’ dust contamination and should be part of any industry that needs to comply with an exposure limit” (Document ID 0022, p. 7). Other commenters voiced similar concerns about the risk posed by exposure to ultrafine particles containing beryllium, including the NSSP (Document ID 0027, p. 3), the AOEC (Document ID 0028, p. 2), and DOSH (Document ID 0023, p. 2).

OSHA agrees that exposure to airborne beryllium, even when not visible to the naked eye, is an important risk factor for developing CBD and that it would be inappropriate to rely on the presence of visible airborne particulate to assess workers’ exposure to airborne beryllium and the need to implement engineering and work practice controls or respiratory protection. The standard’s permissible exposure limits and requirements for quantitative exposure assessments and use of respiratory protection are of paramount importance for ensuring that workers are protected from CBD, and these requirements are unaffected by the changes to the *dermal contact with beryllium* definition. In addition, the standard’s requirements to train workers on the health hazards of exposure to beryllium and on the employer’s exposure control plan (paragraph (m)(4)) apply to all employees within the scope of the general industry standard who have, or can reasonably be expected to have, airborne exposure (regardless of the size fraction) to or

dermal contact with beryllium, thus including all workers that would be considered to be potentially at risk of beryllium-related disease.¹⁵

DOSH advocated for surface sampling as being a “practical method” for assessing exposure and asserted that adopting a “specific numerical surface contamination criterion” to assess dermal contact hazard was a more protective strategy. DOSH further suggested that, in establishing this numerical criterion, OSHA “consider levels that could result in uptake of beryllium by workers at rates similar to action level airborne exposures” (Document ID 0023, p. 2).

With respect to inhalation hazards associated with beryllium, OSHA agrees that relying on the visibility of particulate does not adequately protect workers from CBD or lung cancer, and that both conducting routine air sampling and ensuring no employees are exposed to airborne beryllium in excess of the PELs are essential to minimizing workers’ exposures to airborne particulate. The TWA PEL for beryllium is based on robust evidence from studies of beryllium workers that permitted the agency to determine that there is significant risk of sensitization, CBD, and lung cancer associated with the previous TWA PEL, and that this risk would be substantially reduced by the new PEL (82 FR at 2545-52).

¹⁵ NJH also asserted that “[a]ll workers in a beryllium using industry should receive beryllium education with programs tailored to specific jobs and processes” (Document ID 0022, p. 7). Mount Sinai Selikoff Centers for Occupational Health similarly advocated for “intensive training and protective gear for all workers who may be at risk of beryllium exposure” (Document ID 0032, p. 3). OSHA notes that the beryllium standard has never required all workers in a beryllium-using industry to receive training. Rather, the standard has always required training for those workers who have or are reasonably expected to have airborne exposure to beryllium regardless of the size fraction. The standard continues to require training for all such workers.

Unlike the case for inhalation, the available data on the effects of dermal contact with beryllium make it difficult to establish a reasonably precise, objective limit on surface contamination above which protective measures should be triggered. The most recent effort to derive a health-based measure of surface cleanliness for beryllium was that of Shay et al. (Document ID H005C-2006-0870-0417), who used models that accounted for particulate dissipation, resuspension into air, transfer efficiency from surface to skin, dermal absorption of particulate through intact or damaged skin, and other factors. The authors used these models along with both oral and inhalation toxicity values derived by the Environmental Protection Agency to relate the level of surface contamination to target risk values for cancer and noncancer effects that would generally be considered to be de minimis (i.e., an exposure associated with either a lifetime cancer risk of one death per million persons exposed, or no excess risk of adverse noncancer effects). After accounting for these factors, the resulting surface dust cleanup criteria for each health endpoint ranged over several orders of magnitude, reflecting a high degree of uncertainty (for the noncancer endpoint, the criteria ranged from 5 to 370 $\mu\text{g}/\text{cm}^2$ for damaged skin, and from 17 to 3,337 $\mu\text{g}/\text{cm}^2$ for intact skin; for cancer, the criteria ranged from 51 to 485 $\mu\text{g}/\text{cm}^2$).

This study illustrates the difficulty in establishing a reliable and objective risk-based limit on surface contamination that could be used to trigger measures that would prevent dermal contact with beryllium particulate when such contact is sufficient to contribute to a significant risk of disease. Absent an objective measure, OSHA finds that it is preferable to base the definition of *dermal contact with beryllium* on a clear, qualitative indicator of when dermal contact is occurring or is reasonably anticipated to

occur so that employers can have assurance that they are in compliance with the provisions that are triggered by dermal contact. Accordingly, the final rule's definition of *dermal contact with beryllium* refers to skin exposure to visible dusts, fumes, or mists, as well as to soluble compounds and solutions of beryllium, as was proposed. As stated above, OSHA expects that revisions in this final rule will maintain worker protections.

NJH also objected to defining *dermal contact with beryllium* when handling finished beryllium products only by the presence of visible dust, asserting that gloves are warranted because beryllium could oxidize on the surface (Document ID 0022, p. 7). However, for the reasons explained below, OSHA considers these comments to be beyond the scope of the proposal. The agency also notes that the revision NJH's comment refers to merely clarifies the meaning of the 2017 standard, rather than modifying it substantively.

OSHA's revision to the definition of *dermal contact with beryllium* clarifies OSHA's intent that the provisions in the standard related to dermal contact with beryllium do not apply to the handling of solid beryllium-containing objects that the employer does not process, unless visible beryllium particulate has contaminated the surface of the object. OSHA explained in the 2017 final rule that beryllium-containing solid objects, or "articles," with uncompromised physical integrity are unlikely to release beryllium that would pose a health hazard for workers (82 FR at 2640). An article, by definition, "under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical . . . , and does not pose a physical hazard or health risk to employees" (29 CFR 1910.1200(c)). The agency therefore excluded articles that contain beryllium, and that the employer does not process,

from the scope of the 2017 beryllium standard (see paragraph (a)(3)). OSHA did not intend for the 2018 NPRM to open the agency's underlying findings on the handling of beryllium-containing articles, nor their exclusion from the scope of the standard, for notice and comment. To the extent NJH's comment challenges the articles exemption, these comments are beyond the scope of the proposal.

Nevertheless, even for those solid beryllium-containing objects that do not fall under the definition of an article, such as ingots that might be processed further, OSHA notes that PPE would be required if there is a reasonable expectation that oxidation may result in visible surface contamination. In its comments on the 2015 NPRM, Materion explained that beryllium oxides are created through particular manufacturing processes, typically those involving heating of the beryllium-containing materials (e.g., hot forming operations, melting, or heat treating) (see Document ID OSHA-H005C-2006-0870-1662, p. 16). These operations may give rise to a reasonable expectation of dermal contact due to the expected oxidization that will occur as a result of the process. Where there is a reasonable expectation that oxidization may result in visible surface contamination, an employer must not wait for the surface to be contaminated to require PPE for potentially exposed employees. For example, if the surface of a solid object must be heat treated, and the employer has reason to believe this will result in surface oxidation absent cleaning the surface, PPE would be required under this final rule.

After carefully considering the record of public comments on this topic, OSHA finds that the revised definition of *dermal contact with beryllium* will provide a clearer and more workable definition, without reducing worker protections. The specification of “*visible* dust, fumes, or mists containing beryllium in concentrations greater than or equal

to 0.1 percent by weight” and clarification regarding beryllium-containing articles will allow employers to accurately identify the employees, particularly those working outside of beryllium work areas or regulated areas, to whom the provisions triggered by dermal contact with beryllium apply, including the requirement in paragraph (h) to provide employees with PPE to protect against reasonably expected dermal contact with beryllium. The revised definition will also render more workable the additional provisions in the standard that are triggered by dermal contact with beryllium, which include provisions in paragraph (f), Written exposure control plan; paragraph (i), Hygiene areas and practices; paragraph (k), Medical surveillance; and paragraph (m), Communication of hazards.

This final rule better addresses the practical aspects of a “reasonable expectation” trigger for PPE than did the previous rule, which could have been read as effectively requiring employees to wear PPE facility-wide, even when not in proximity to beryllium generating processes, such as in administrative offices. OSHA believes that use of PPE in that circumstance is unwarranted and would not meaningfully enhance worker protections against beryllium exposure. Where an employer has a reasonable expectation that even very small amounts of beryllium dust, fume, or mist might spread outside of beryllium work areas, they might have interpreted the language of the previous rule to require all employees in the facility to wear PPE all of the time. OSHA did not intend and did not cost the previous rule as requiring PPE to protect against dermal contact with non-visible beryllium dust, fumes, or mists outside of beryllium work areas. The addition of a visual cue will enable employers to accurately identify the employees outside of

beryllium work areas who need to wear PPE due to their reasonably-expected dermal contact with beryllium.

As OSHA explained in the 2018 NPRM (83 FR at 63752), the agency expects that the use of PPE will always be required in beryllium work areas because both the operations listed in Appendix A and those that can be reasonably expected to generate exposure at or above the action level would create a reasonable expectation of dermal contact with beryllium. This expectation is based, in part, on a study conducted by NIOSH and Materion and published in the Journal of Occupational and Environmental Hygiene (Document ID OSHA-H005C-2006-0870-0502, p. 791). In the 2018 NPRM, OSHA explained that this study identified a strong correlation between airborne beryllium concentrations and the amount measured on gloves worn by workers at multiple beryllium facilities and jobs, indicating the potential for skin exposure where airborne beryllium is present. The study further concluded that this correlation implies that one type of measurement can be indicative of other exposure pathways (Document ID OSHA-H005C-2006-0870-0502, p. 791). OSHA further explained that the expectation of dermal contact within beryllium work areas is also based on OSHA's review of data collected during site visits conducted by the agency that cover a wide range of processes (e.g., furnace and melting operations, casting, grinding/deburring, machining and stamping) and a wide range of materials including beryllium composite, beryllium alloy, and beryllium oxide. The data show that those operations that would create a reasonable expectation of dermal contact, either through beryllium surface contamination or skin contamination, are covered either by proposed Appendix A or have exposures above the action level (see Document ID OSHA-H005C-2006-0870-0341).

In its comment, Materion questioned OSHA's reliance on the 2007 Day et al. study (82 FR at 2488-89) and suggested that, contrary to OSHA's statement, Day did not identify a "strong correlation" between airborne concentrations and skin exposure (Document ID 0038, pp. 13-14). Materion cited Day's finding of a potential for greater transfer of beryllium from surfaces to cotton gloves that could lead to an overestimation of the amount of beryllium transferred. OSHA disagrees with Materion's assessment of the Day study. Day indicates that the underlying assumption that glove-sampling techniques actually remove the majority of the contamination may be overstated and that the surface and skin wipe samples may underestimate the mass of beryllium that is present. The Day study demonstrates that there is a correlation between airborne and potential for skin exposures (Document ID OSHA-H005C-2006-0870-1548, p. 79).

As OSHA discussed in the NPRM, this finding is supported by a follow-up study by Armstrong et al. (2014) conducted at four different Materion manufacturing locations over a wide variety of jobs. This study also showed strong positive correlations between air, dermal, and surface exposures among the four different facilities that process beryllium (Document ID OSHA-H005C-2006-0870-0502, p. 791). The study further concludes that this correlation implies that one type of measurement can be indicative of other exposure pathways. OSHA finds that these studies demonstrate a correlation between airborne exposure and the reasonable expectation of dermal contact.¹⁶

¹⁶ Materion also asserted that the evidence in the record is insufficient to conclude that "dermal contact alone is sufficient to create a significant risk of CBD or even beryllium sensitization" (Document ID 0038, pp. 14-15). However, in the 2017 final rule, OSHA specifically found that that dermal exposure can result in sensitization (see 82 FR at 2489). The 2018 NPRM did not propose revisiting this finding.

In the 2018 NPRM, OSHA specifically requested comments on whether processes exist that could trigger the creation of a beryllium work area, but could be reasonably expected to release only non-visible beryllium-containing dusts, fumes, or mists. No commenter provided evidence of such processes. Materion asserted that OSHA should not “automatically classify” beryllium work areas as having a reasonable expectation of dermal contact because this would serve as “a serious disincentive for employers to eliminate exposure meeting the definition of dermal contact” (Document ID 0038, p. 15). However, Materion did not explain how such a presumption would serve as a disincentive and, more importantly, did not identify any process that could trigger the creation of a beryllium work area while not also, in fact, creating a reasonable expectation of dermal contact.

Accordingly, OSHA reaffirms its expectation that both the provisions associated with beryllium work areas (listed above) and the provisions associated with dermal contact with beryllium would apply to employees in a beryllium work area. OSHA expects that employers will, for each beryllium work area, assess the PPE needs as required by paragraph (f)(1) and OSHA’s Personal Protective Equipment standards (subpart I of 29 CFR 1910) and provide their employees with appropriate PPE.

Because it will help employers identify which employees have, or can be reasonably expected to have, dermal contact with beryllium, the revised definition will allow employers to more accurately comply with the requirement in paragraph (f)(1)(i)(A) to establish, implement, and maintain a written exposure control plan that includes a list of operations and job titles reasonably expected to involve airborne exposure to or dermal contact with beryllium. OSHA expects that the list would likely

include all operations and job titles in beryllium work areas, along with any additional operations or job titles for employees whose skin could be exposed to visible beryllium dust, fumes, or mists in concentrations of 0.1 percent by weight or more. Under the previous definition, employers could have reasonably interpreted the standard as requiring them to list the job title for every employee at the facility who could come into contact with a minute and non-visible amount of beryllium particulate, including employees who do not work in proximity to beryllium-releasing processes.

Similarly, the revised definition will facilitate employer compliance with the requirement to provide information and training (in accordance with the Hazard Communication standard (29 CFR 1910.1200(h)) to each employee who has, or can reasonably be expected to have, airborne exposure to or dermal contact with beryllium by the time of the employee's initial assignment and annually thereafter (paragraphs (m)(4)(i)(A)-(C)). Under this requirement, employees entitled to training include all employees who work in beryllium work areas and any other employees who may not be working directly with a beryllium-generating process, but who may nonetheless reasonably be expected to have airborne exposure to and/or skin contact with soluble beryllium, beryllium solutions, or visible beryllium dust, fumes, or mists in concentrations of 0.1 percent by weight or more. As discussed previously, OSHA intends the revised definition of dermal contact with beryllium to provide employers with a workable indicator for determining which employees outside of beryllium work areas should receive this information and training.

Because the change would allow employers to more accurately identify areas where provisions related to dermal contact should apply, the revised definition would

also facilitate proper compliance with paragraph (i)(1)(ii), which requires employers to ensure employees who have dermal contact with beryllium wash any exposed skin at the end of the activity, process, or work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet. OSHA's revisions to the definition of *dermal contact with beryllium* would prevent employers from speculating that all employees in a facility, including those employees who do not work near beryllium-releasing processes, must wash their exposed skin because they might have come into contact with non-visible beryllium particulate or handled articles that contain beryllium. Such an interpretation would be contrary to OSHA's intent.

The revised definition is designed to further improve employer compliance with the requirements in paragraph (k) to offer employees a medical examination including a medical and work history that emphasizes past and present airborne exposure to or dermal contact with beryllium (paragraph (k)(3)(ii)(A)), and to provide the examining physician or other licensed health care professional (PLHCP) (and the agreed-upon CBD diagnostic center, if such an evaluation is required) with a description of the employee's former and current duties that relate to the employee's airborne exposure to and dermal contact with beryllium (paragraph (k)(4)(i)). Because it would improve employers' ability to identify when dermal contact with beryllium has occurred or could occur, this change would permit employers to accurately complete employee medical and work histories and the reports that they must provide to examining PLHCPs or CBD diagnostic centers. As with the provisions discussed above, OSHA's revisions to the definition of *dermal contact with beryllium* will prevent employers from including superfluous information in these medical and work histories and reports because they are concerned

that an employee might have conceivably had skin contact with minute, non-visible beryllium particulate or handled beryllium-containing articles outside of a beryllium work area. Such an expansive interpretation is again contrary to OSHA's intent.

OSHA is adding two references to dermal contact with beryllium in paragraph (i), Hygiene areas and practices, to account for the final rule's changes to the definition of *beryllium work area* in paragraph (b). Paragraph (i) in the previous rule included requirements for employers to provide each employee working in a beryllium work area with readily accessible washing facilities (paragraph (i)(1)(i)) and a designated change room where employees are required to remove their personal clothing (paragraph (i)(2)). But, as explained earlier in this section, OSHA is revising the definition of *beryllium work area* so that the requirement to establish these areas is no longer triggered on the potential for dermal contact with beryllium.

OSHA intends for the washing facilities and change rooms requirements to apply where employees are reasonably expected to have dermal contact with beryllium, regardless of whether they work in a beryllium work area, as now defined in this final rule. As discussed above, there may be employees outside of the beryllium work area that may have a reasonable expectation of dermal contact with beryllium. Therefore, as was proposed, OSHA is adding two additional references to dermal contact with beryllium to paragraph (i). First, OSHA is revising paragraph (i)(1) so that the requirements would apply to each employee who works in a beryllium work area or who can reasonably be expected to have dermal contact with beryllium. Paragraph (i)(1)(i) would then require employers to provide washing facilities to all employees who can be reasonably expected to have dermal contact with beryllium. Second, OSHA is revising paragraph (i)(2) so that

employers are required to provide change rooms to employees who are required to use personal protective clothing or equipment under paragraph (h)(1)(ii), if those employees are required by the employer to remove their personal clothing. Because paragraph (h)(1)(ii) requires the use of PPE where there is a reasonable expectation of dermal contact with beryllium, the change to paragraph (i)(2) ensures that the requirement for change rooms would continue to protect those employees who can reasonably be expected to have dermal contact with beryllium.

Methods of Compliance.

Paragraph (f) of the beryllium standard for general industry contains provisions covering methods for reducing employee exposure to beryllium through the use of a written exposure control plan and engineering and work practice controls. Paragraph (f)(1) sets forth the requirements for written exposure control plans. Paragraph (f)(1)(i) requires employers to establish, implement, and maintain such a plan, and paragraphs (f)(1)(i)(A)-(H) specifies the information and procedures that must be included in the plan. Paragraph (f)(1)(ii) directs employers to review and evaluate each plan at least annually and update it under specified circumstances.

In the 2018 NPRM, OSHA proposed two wording changes to paragraph (f)(1) (83 FR at 63754). The first proposed change relates to the contents of the written exposure control plan. Under paragraph (f)(1)(i)(D), employers were previously required to include procedures in their plans for minimizing cross-contamination, “including preventing the transfer of beryllium” between surfaces, equipment, clothing, materials, and articles within beryllium work areas. OSHA proposed removing the word “preventing” from the regulatory text to clarify that these procedures may not totally eliminate the transfer of

beryllium, but should minimize cross-contamination of beryllium, including between surfaces, equipment, clothing, materials, and articles.

The second proposed change involves one of the circumstance when employers must update their written exposure control plans. Paragraph (f)(1)(ii)(B) of the standard directed employers to update the written exposure control plan, as necessary, when they are notified that an employee is eligible for medical removal in accordance with paragraph (l)(1), referred for evaluation at a CBD diagnostic center, or shows signs or symptoms associated with “airborne exposure to or dermal contact with beryllium.” In the 2018 NPRM, OSHA proposed to replace the phrase “airborne exposure to and dermal contact with beryllium” with “exposure to beryllium.” The agency explained that the change would simplify the language of the provision while still capturing all potential exposure scenarios currently covered. Because these proposed changes are merely clarifying, OSHA explained that it expected that they would maintain safety and health protections for workers.

All of the stakeholders that submitted comments related to OSHA’s proposed changes to the written exposure control plan provisions supported the changes (see, e.g., Document ID 0031, p. 2; 0038, p. 31). For example, EEI observed that OSHA’s discussion of the proposed changes were appropriate modifications to the beryllium standard (Document ID 0031, p. 2). Materion also supported the proposed changes and agreed with OSHA that these proposed changes are merely clarifying, and that they will maintain safety and health protections for employees. In addition, Materion noted that it “identifie[d] no reduction in protection to employees associated with these clarifying language revisions” (Document ID 0038, p. 31).

After reviewing these comments and considering the record as a whole, OSHA has determined that the proposed changes will clarify for employers the requirements of the written exposure control plan without sacrificing safety and health protections for workers. Therefore, OSHA is finalizing the proposed changes to paragraph (f) in this final rule.

Personal Protective Clothing and Equipment.

Paragraph (h) of the beryllium standard for general industry requires employers to provide employees with personal protective clothing and equipment (PPE) where employee exposure exceeds, or can reasonably be expected to exceed, the TWA PEL or STEL, or where there is a reasonable expectation of dermal contact with beryllium. Paragraph (h) also contains provisions for the safe removal, storage, cleaning, and replacement of the PPE required by this standard. As explained in the 2017 final rule preamble, these PPE requirements are intended to protect employees by preventing dermal exposure to beryllium and the accumulation of airborne beryllium on PPE, and to protect employees and other individuals both inside and outside the workplace from exposures that could occur if contaminated clothing were to transfer beryllium (82 FR at 2678).

In the 2018 NPRM, OSHA proposed two changes to paragraph (h). The first revision relates to paragraph (h)(2)(i), which addresses removal and storage of PPE. Paragraph (h)(2)(i) previously required employers to ensure that each employee removes all beryllium-contaminated PPE at the end of the work shift, “at the completion of tasks involving beryllium,” or when PPE becomes visibly contaminated with beryllium, whichever comes first. OSHA proposed modifying the phrase “at the completion of tasks

involving beryllium” by changing “tasks” to “all tasks,” so that it reads “at the completion of all tasks involving beryllium” (83 FR at 63754).

OSHA explained in the 2018 NPRM that this revision to paragraph (h)(2)(i) merely clarifies the trigger for when employees must remove beryllium-contaminated PPE, consistent with the agency’s original intent (83 FR at 63754). As expressed in the preamble to the 2017 final rule, OSHA intended that PPE contaminated with beryllium should not be worn after tasks involving beryllium exposure have been completed for the day (82 FR at 2682). Thus, when employees perform multiple tasks involving beryllium successively or intermittently throughout the day, the employer must ensure that each employee removes all beryllium-contaminated PPE at the completion of the set of tasks involving beryllium, not necessarily after each separate task. If, however, employees perform tasks involving beryllium exposure for only a portion of a work shift, and then perform tasks that do not involve exposure to beryllium, the employer must ensure that employees remove their PPE after the beryllium exposure period. Unless the PPE becomes visibly contaminated with beryllium, OSHA did not intend this provision to require multiple PPE changes throughout the work shift. Thus, the proposed revision to paragraph (h)(2)(i) clarifies OSHA’s original intent.

OSHA received multiple comments in support of the proposed change to paragraph (h)(2)(i). The USW commented that it believes the change is reasonable and clarifies the intent of the standard (Document ID 0033, p. 6). Similarly, Century Aluminum expressed its support for this “sensibl[e]” revision, commenting that it is an example of a logical and workable requirement that will produce better work practices and habits and, in turn, improve employee health and safety outcomes (Document ID

0026, p. 2). In addition, Century Aluminum commented that requiring PPE to be changed after every task would “significantly increase costs without increasing employee health and safety” and could actually increase the amount of time employees are exposed to beryllium, thus increasing their risk of sensitization and disease (Document ID 0026, p. 2). Materion also expressed its general support for the “clarifying language revisions” to paragraph (h) (Document ID 0038, p. 32).

OSHA also received two comments opposing the proposed change to paragraph (h)(2)(i). A private citizen commented that, although OSHA did not intend to require continuous PPE changes throughout a work shift, doing so seemed necessary to limit transmission of contaminant between workers and work areas (Document ID 0017). And another private citizen commented that if a worker’s suit is contaminated, the worker should be required to change even if the suit is not visibly contaminated (Document ID 0019).

OSHA does not believe it is necessary for workers to change PPE after each work task, or after each instance of PPE contamination, in order to limit the spread of beryllium particulate between work areas because, absent visible contamination of PPE, any contamination present will likely be minute and will not contaminate other work areas to such a degree as to materially increase worker exposures. Furthermore, as explained in the preamble to the 2017 final rule (82 FR at 2682), because the purpose of PPE is to serve as a barrier between an employee’s body and ambient or surface beryllium, PPE becomes contaminated with beryllium immediately as part of its protective function. Requiring PPE to be changed upon contamination with any amount of beryllium is unreasonable and unnecessary to protect employees. This is because

contamination of PPE with beryllium during work processes does not reduce the effectiveness of PPE or create hazards to employees unless sufficient beryllium accumulates on the PPE to impair its function or create additional exposures, such as by dispersing accumulated beryllium into the air. Moreover, the process of changing contaminated PPE can create opportunities for both inhalation exposure and dermal contact with beryllium. Accordingly, the use of “visibly contaminated” protects employees from potential exposures while changing PPE by limiting the requirement to change PPE during work tasks involving beryllium exposure to those circumstances when changing it is necessary to maintain its protective function and prevent deposits of beryllium from accumulating and dispersing.

Notably, the USW commented that it believes including the term “visibly contaminated” in the provision provides for employee safety (Document ID 0033, pp. 6-7), and Materion similarly stated that “visibility [of beryllium-contaminated PPE and equipment] is a conservative, stringent” trigger that “also has the benefit of compliance clarity” (Document ID 0038, p. 32). After reviewing these comments and considering the record as a whole, OSHA finds that the proposed change in paragraph (h)(2)(i) is reasonably necessary and appropriate and has retained the revised language in the final rule.

The second proposed revision relates to paragraph (h)(3)(iii), which addresses cleaning and replacement of PPE. This paragraph required employers to inform in writing the persons or the business entities who launder, clean, or repair the PPE required by this standard of the potentially harmful effects of “airborne exposure to and dermal contact with beryllium.” The 2018 NPRM proposed replacing the phrase “airborne exposure to

and dermal contact with beryllium” with “exposure to beryllium” (83 FR at 63755). OSHA explained that this change simplifies the language of the provision while still capturing all potential exposure scenarios currently covered; and, as such, the agency concluded that the revised language will maintain safety and health protections for workers. OSHA received no comments on this proposed change beyond Materion’s general support for the clarifying revisions to paragraph (h) as a whole (Document ID 0038, p. 32). OSHA is therefore retaining the proposed revision to paragraph (h)(3)(iii) in the final rule.

Hygiene Areas and Practices.

Paragraph (i) of the beryllium general industry standard requires that the employer provide employees with readily accessible washing facilities, change rooms, and showers when certain conditions are met; requires the employer to take certain steps to minimize exposure in eating and drinking areas; and prohibits certain practices that may contribute to beryllium exposure. As explained in the 2017 final rule, OSHA believes that strict compliance with these provisions will reduce the amount and duration of employees’ airborne exposure and dermal contact with beryllium (82 FR at 2683-88). In the 2018 NPRM, OSHA proposed three changes to paragraph (i) of the general industry standard. The agency proposed the first two changes (83 FR at 63755), which apply to paragraphs (i)(1) and (i)(2), to maintain the protections included in these paragraphs for employees who have dermal contact with beryllium notwithstanding the proposed change to the definition of beryllium work area, discussed previously in this Summary and Explanation. OSHA proposed the third change, which applies to paragraph

(i)(4), to clarify the requirements for cleaning beryllium-contaminated PPE prior to entering an eating or drinking area (83 FR at 63755-56).

As explained in the previous discussion of changes to the definition of *beryllium work area*, OSHA proposed and has finalized these changes to the definition of *beryllium work area* to clarify where a beryllium work area must be established. One of these changes removes dermal contact with beryllium as one of the triggers that requires an employer to establish a beryllium work area. As explained in the 2018 NPRM, OSHA intended for the hygiene provisions related to washing facilities and change rooms to continue to apply to all employees who can reasonably be expected to have dermal contact with beryllium, regardless of whether they work in beryllium work areas as defined in the revised definition (83 FR at 63755). OSHA accordingly proposed two changes.

First, OSHA proposed a change in the wording of paragraph (i)(1), which required that “[f]or each employee working in a beryllium work area,” the employer must provide readily accessible washing facilities to remove beryllium from the hands, face, and neck; and ensure that employees who have dermal contact with beryllium wash any exposed skin at specific designated times. The 2018 NPRM proposed amending the language to apply to “each employee . . . who can reasonably be expected to have dermal contact with beryllium,” in addition to each employee working in a beryllium work area (83 FR at 63768).

Second, OSHA proposed a change in the wording of paragraph (i)(2), which required employers to provide “employees who work in a beryllium work area,” with a designated change room where employees are required to remove their personal clothing.

OSHA proposed revising paragraph (i)(2) to require employers to provide a designated change room to employees who are required to use personal protective clothing or equipment under paragraph (h)(1)(ii) of the beryllium standard, instead of to employees who work in a beryllium work area (83 FR at 63768). Paragraph (h)(1)(ii) of the beryllium standard requires the provision and use of appropriate PPE where there is a reasonable expectation of dermal contact with beryllium. The requirement to provide change rooms would continue to apply only where employees are required to remove their personal clothing. As noted above and explained in the 2018 NPRM, the proposed changes to paragraphs (i)(1) and (i)(2) were merely intended to ensure that the hygiene provisions related to washing facilities and change rooms would continue to protect employees who are reasonably expected to have dermal contact with beryllium, if the agency adopted the proposed revised definition of the term *beryllium work area*.

OSHA also proposed a third change, which applies to paragraph (i)(4), in order to clarify the requirements for cleaning beryllium-contaminated PPE prior to entering an eating or drinking area. Paragraph (i)(4)(ii) required the employer to ensure that no employees enter any eating or drinking area with beryllium-contaminated personal protective clothing or equipment unless, prior to entry, surface beryllium has been removed from the clothing or equipment by methods that do not disperse beryllium into the air or onto an employee's body. In the 2018 NPRM, OSHA proposed to modify this paragraph to require the employer to ensure that, before employees enter an eating or drinking area, beryllium-contaminated PPE is cleaned, as necessary, to be as free as practicable of beryllium by methods that do not disperse beryllium into the air or onto an employee's body (83 FR at 63768). The agency explained that this proposed change

would clarify that OSHA does not expect the methods used to clean PPE prior to entering an eating or drinking area to completely eliminate residual beryllium from the surface of the PPE if complete elimination is not practicable (83 FR at 63755-56). OSHA also explained that this is consistent with its determination, expressed in the preamble to the 2017 final rule, that “as free as practicable” is “the most appropriate terminology for requirements pertaining to surface cleanliness” (82 FR at 2687). This proposed clarification also aligns the language of paragraph (i)(4)(ii) with the language of paragraph (i)(4)(i), which requires employers to ensure that beryllium-contaminated surfaces in eating and drinking areas are as free as practicable of beryllium. Finally, OSHA explained that requiring cleaning only “as necessary” would clarify that cleaning would not be required if the PPE is already as free as practicable of beryllium. OSHA stated that it expected these proposed changes to paragraph (i) would maintain safety and health protections for workers.

Commenters expressed broad support for OSHA’s proposed changes to paragraph (i) (see, e.g., Document ID 0029, p. 1; 0031, p. 2; 0033, p. 6; 0038, p. 32). For example, EEI observed that the proposed changes to this paragraph as a whole were appropriate modifications to the beryllium standard (Document ID 0031, p. 2) and DOD generally agreed with the proposed changes, commenting that they are evidence based and provide greater employee protections (Document ID 0029, p. 1). Materion also supported the proposed changes to paragraph (i) as a whole, and agreed with OSHA that these proposed changes are merely clarifying, and that they will maintain safety and health protections for employees (Document ID 0038, p. 32; see also Document ID 0034 and 0035, p. 1 (supporting and endorsing the comments submitted by Materion)).

OSHA did not receive any comments that specifically addressed the two proposed changes to paragraphs (i)(1) and (i)(2). The agency is therefore adopting the changes to those paragraphs as proposed.

Stakeholders also did not submit any comments on the majority of the agency's proposed changes to paragraph (i)(4). A DOD comment specifically addressed the term "as free as practicable," suggesting that because the term is not defined, OSHA should require employers to establish procedures for cleaning PPE, document accomplishment of procedures, and periodically review compliance with cleaning procedures (Document ID 0029, p. 2). The USW supported the proposed change for cleaning PPE "as necessary," agreeing with OSHA's explanation in the 2018 NPRM that requiring cleaning only as necessary would clarify that cleaning would not be required if the PPE is already as free as practicable of beryllium (Document ID 0033, p. 6).

The requirement to maintain surfaces as free as practicable of a regulated substance is included in other OSHA health standards, such as those for lead (29 CFR 1910.1025, 29 CFR 1926.62), chromium (VI) (29 CFR 1910.1026), and asbestos (29 CFR 1910.1001), and is used elsewhere in the beryllium general industry standard (29 CFR 1910.1024(f)(1)(i)(E), (i)(4)(i), (j)(1)(i), (j)(3)(ii)). Employers therefore have the benefit of previous experience interpreting and developing methods for compliance with requirements to maintain surfaces "as free as practicable" of toxic substances, including beryllium, as well as guidance from OSHA on compliance with such requirements. OSHA discussed the meaning of this phrase in the Summary and Explanation of paragraph (j) in the 2017 final rule (82 FR at 2690), as well as in a 2014 letter of interpretation explaining the phrase in the context of the agency's standard for chromium

(VI) (OSHA, Nov. 5, 2014, Letter of Interpretation, available at <https://www.osha.gov/laws-regs/standardinterpretations/2014-11-05>). As OSHA explained in the 2014 letter of interpretation, OSHA evaluates whether a surface is “as free as practicable” of a contaminant by the efficacy of the employer’s program to keep surfaces clean. OSHA intends for this term to be broad and performance-oriented, so as to allow employers in a variety of industries flexibility to decide what type of control methods and procedures are best suited to their beryllium operations, and OSHA intends to evaluate compliance based on employer efforts under the circumstances present at each facility. Notably, in its comment, Materion expressed general support for use of the phrase “as free as practicable” in other parts of the standard, acknowledging that this is the workable legal standard OSHA relies on in occupational health standards (Document ID 0038, pp. 25-26, 33).

Moreover, as to DOD’s recommendation that OSHA require employers to establish procedures for cleaning PPE, document accomplishment of procedures, and periodically review compliance with cleaning procedures (Document ID 0029, p. 2), OSHA agrees that requiring employers to establish PPE cleaning procedures is important. To meet this objective, the written exposure control plan provision in paragraph (f)(1)(i) requires employers to establish, implement, and maintain a written exposure control plan, which must contain, among other things, procedures for removing, laundering, storing, cleaning, repairing, and disposing of beryllium-contaminated personal protective clothing and equipment, including respirators. Paragraph (f)(1)(ii) requires employers to review and evaluate the effectiveness of each written exposure control plan at least annually and update it, as necessary, if certain specified events occur. OSHA believes that these

requirements satisfy DOD's concerns while still allowing employers the flexibility to establish, implement, and maintain a plan that works best for their individual workplaces.

After reviewing these comments and considering the record as a whole, OSHA believes that the term "as free as practicable" is understood by employers through its use in other standards and as explained in letters of interpretation and other guidance, and does not believe that defining the term in this standard or establishing specific PPE cleaning and documentation procedures is necessary. OSHA also believes the proposed change is necessary to align the language of paragraphs (i)(4)(i) and (i)(4)(ii). OSHA did not receive any comments objecting to the revised requirement that PPE be "cleaned, as necessary," which makes clear that cleaning would not be required if PPE is already as free as practicable of beryllium. OSHA believes these changes clarify the agency's intent without sacrificing safety and health protection for workers. The agency is therefore adopting the changes as proposed to paragraph (i)(4)(ii) in this final rule.

Disposal, Recycling, and Reuse.

Paragraph (j) of the beryllium general industry standard requires employers to adhere to certain housekeeping practices. Paragraphs (j)(1) and (j)(2) require employers to maintain all surfaces in beryllium work areas as free as practicable of beryllium, promptly clean spills and emergency releases of beryllium, and use appropriate cleaning methods, while paragraph (j)(3) requires employers to take certain actions when transferring materials that contain at least 0.1 percent beryllium by weight or that are contaminated with beryllium outside a plant for the purpose of disposal, recycling, or reuse. Specifically, paragraph (j)(3)(i) requires that, except for intra-plant transfers, when transferring these materials for any of these purposes the employer must label the

materials in accordance with paragraph (m)(3). Paragraph (j)(3)(ii) further requires that those materials designated for disposal must be either cleaned to be as free as practicable of beryllium or placed in enclosures that prevent the release of beryllium-containing particulate or solutions under normal conditions of use, storage, or transport, such as bags or containers. Paragraph (j)(3)(iii) requires the same for materials designated for recycling or reuse.

The final rule makes a number of changes to the previous requirements of paragraph (j)(3). As originally promulgated in the 2017 final rule, paragraph (j)(3)(i) required that materials designated for disposal be disposed of in sealed, impermeable enclosures, such as bags or containers, that are labeled according to paragraph (m)(3) of the beryllium standard, but did not allow employers the alternative option of cleaning such material to be as free as practicable of beryllium. Further, both paragraphs (j)(3)(i) and (j)(3)(ii) required that materials be transferred in sealed, impermeable bags, but did not further define this requirement. Finally, the original paragraph (j)(3) did not explicitly address transfers of materials for the purpose of reuse.¹⁷

After the promulgation of the final rule in 2017, OSHA learned that some stakeholders were confused about these requirements. For example, stakeholders were uncertain about what types of enclosures would be acceptable under the standard. To help alleviate stakeholder confusion, OSHA proposed a number of changes in the 2018 NPRM that make explicit what had been intended in the 2017 final rulemaking. Specifically, OSHA proposed adding provisions explicitly addressing transferring materials for reuse;

¹⁷ Subsequent to the 2017 final rule, the 2018 direct final rule clarified that the requirements of paragraph (j)(3) do not apply to materials containing only trace amounts of beryllium (less than 0.1 percent by weight).

clarifying that the rule's requirements for disposal, recycling, and reuse do not apply to intra-plant transfers; and allowing for the cleaning of materials bound for disposal. The agency also proposed reorganizing the paragraph's two paragraphs into three that focused on specific topics and making minor changes in terminology to improve the clarity and internal consistency of the standard. Only one of the changes is substantive, which is the inclusion of the option for cleaning instead of enclosure; the remaining edits merely clarify OSHA's original intent. As discussed in more detail below, OSHA is retaining the changes proposed in the 2018 NPRM in the final rule with only one clarifying revision. With these changes, final paragraph (j)(3) provides comprehensive, easy to understand requirements for employers that are transferring materials outside of their plants for disposal, recycling, or reuse that contain at least 0.1 percent beryllium by weight or are contaminated with beryllium.

In response to the 2018 NPRM, a number of commenters, including the DOD, Materion, the USW, and EEI, expressed support for the proposed revisions generally (see, e.g., Document ID 0029, p. 1; 0038, pp. 32-33; 0033, p. 5; 0031, p. 2). For example, DOD stated that the revisions "are evidence based and provide greater employee protection" (Document ID 0029, p. 1). Similarly, Materion commented that the revisions "will provide improved understanding and more practical meaning to manufacturers by improving the clarity and internal consistency of the standard" (Document ID 0038, p. 32).

Stakeholders also offered specific comments on the individual changes OSHA proposed to paragraph (j)(3). OSHA outlines each of those changes below, along with

any specific comments received on those changes and the agency's final determination as to whether to retain the proposed change in the final rule.

OSHA proposed seven changes to the 2017 version of paragraph (j)(3). First, the agency proposed that the provisions address reuse (in addition to disposal and recycling). As noted above, paragraph (j)(3) of the 2017 final rule contained requirements for the labeling and enclosure of certain materials designated for disposal and the labeling and either enclosure or cleaning of materials designated for recycling. The preamble to the 2017 final rule made clear that paragraph (j)(3)'s requirements related to recycling also applied to reuse (see 82 FR at 2695-96), but the standard did not explicitly advise employers of this requirement. To make the agency's original intent clear, OSHA proposed in the 2018 NPRM to include provisions addressing reuse. This proposed change was intended to ensure that workers who may be exposed to materials containing or contaminated with beryllium that are directly reused without first being processed into a different form are appropriately protected. For example, a manufacturer may sell a by-product from a process to a downstream manufacturer that would reuse the by-product as a component of a new product. Recycling, on the other hand, typically involves the further processing of waste materials to separate and recover various components of value. OSHA did not receive any specific comments on the addition addressing reuse of materials in paragraph (j)(3). Therefore, OSHA has finalized the inclusion of requirements related to the reuse of materials in paragraph (j)(3).

Second, OSHA proposed reorganizing paragraph (j)(3)'s original two paragraphs (one on disposal, one on recycling—with the labeling requirements specified in each) into three new paragraphs with each paragraph focusing on a different topic. Proposed

paragraph (j)(3)(i) spelled out the labeling requirements, proposed paragraph (j)(3)(ii) included the requirements for cleaning or enclosing materials bound for disposal, and proposed paragraph (j)(3)(iii) laid out the obligations as to materials designated for recycling or reuse. The proposed reorganization allowed the agency to incorporate the new reuse requirements, while also setting out each distinct obligation clearly. OSHA further explained in the proposal that this is not a substantive change to the standard, but rather only a reorganization of the existing provisions (see 83 FR at 63763). One commenter, Materion, addressed the reorganization of paragraph (j)(3), noting that the change would improve the clarity and employers' understanding of the provisions (Document ID 0038, p. 32). Having received no comments to the contrary, OSHA is adopting the new structure to paragraph (j)(3) in the final rule.

Third, OSHA proposed a simplifying change relating to the description of which materials must be labeled and cleaned or enclosed prior to transfer for disposal, recycling, or reuse. The 2018 direct final rule required employers to label and clean or enclose two groups of materials: (1) materials that contain beryllium in concentrations of 0.1 percent by weight or more, and (2) materials that are contaminated with beryllium. In the 2018 NPRM, OSHA proposed a simplifying edit to the first group of materials. Specifically, the agency proposed replacing the phrase materials "that contain beryllium in concentrations of 0.1 percent by weight or more" with a shorter phrase: materials "that contain at least 0.1 percent beryllium by weight." As the agency explained in the 2018 NPRM, this change is meant to simplify the language and does not change the meaning. OSHA did not receive any comments on the proposed simplification of this language.

Therefore, OSHA is adopting the new phrase “that contain at least 0.1 percent beryllium by weight” in paragraph (j)(3) in the final rule.

Fourth, OSHA proposed adding an explicit exemption for materials transferred within a plant from the cleaning and enclosure requirements in new paragraphs (j)(3)(ii) and (iii). While this exemption was not explicitly included in the regulatory text of the 2017 final rule, its inclusion in this final rule is not a substantive change. As OSHA noted in the 2018 NPRM, the agency never intended the provisions of paragraph (j)(3) to require employers to clean or enclose materials to be used in another location within the same facility (83 FR at 63756 (citing 82 FR at 2696)).¹⁸ Thus, the inclusion of the exemption in the proposed regulatory text simply makes the agency’s intent plain.

The USW supported the proposed inclusion of the “intra-plant transfer” exemption in the regulatory text (Document ID 0033, p. 5). Specifically, the USW pointed to its comments on OSHA’s 2015 NPRM, which stated that the agency should not require all materials to be decontaminated or sealed in an enclosure (Document ID 0033, p. 5). Rather, the USW explained, the initial intent of the corresponding provision of the model standard it drafted jointly with Materion was “to ensure that materials *leaving a facility* and designated for recycling be containerized or visibly clean” (Document ID 0033, p. 5) (emphasis added).

¹⁸ As OSHA noted in the 2018 NPRM, employees who may be exposed to these materials during intra-plant transfers will not go unprotected. On the contrary, other provisions of the beryllium standard require employers to communicate possible hazards to these employees and protect them during such transfers (see, e.g., paragraph (f), Methods of compliance; paragraph (g), Respiratory protection; paragraph (h), Personal protective clothing and equipment; paragraph (m), Communication of hazards).

DOD did not submit a comment on the proposed intra-plant transfer exception, but its comment on another part of paragraph (j)(3) suggested that it understood the paragraph to apply to intra-plant transfers (see Document ID 0029, p. 1 (“To support the proposed revisions that require surface cleaning of equipment and materials to remove beryllium before recycling, re-use, or intra-plant transfers, we recommend the use of the Department of Energy’s (DOE’s) cleanliness standards as specified in Title 10 Code of Federal Regulations Part 850.”)).¹⁹ As discussed below, OSHA does not agree with DOD’s suggested use of DOE’s surface limits and, as already stated, OSHA never intended to require employers to clean or enclose materials transferred within a single plant. Rather, the provisions in paragraph (j)(3) have always been intended to protect employees after the materials leave the facility.

Materion commented that beryllium-containing scrap metal or wastes are, in most cases, recycled internally “either within or between facilities,” but companies “also recycle scrap or purchase scrap on the open market” (Document ID 0038, p. 32). Materion further asserted that OSHA’s regulation “should not be construed as potentially limiting the environmentally beneficial recycling of metals” (Document ID 0038, p. 32). OSHA agrees that paragraph (j)(3)’s requirements should not be read to discourage the reuse or recycling of metals and reads Materion’s statements regarding the manner in which companies recycle scrap metal or wastes (i.e., within or between facilities or on the open market) as purely informational. However, the agency notes that this comment could be read to suggest that the exception for items transferred within a facility also

¹⁹ DOD’s suggestion regarding DOE’s cleanliness standards is addressed below in this section of this final rule as part of the discussion of the seventh and final proposed change to paragraph (j)(3) relating to the cleaning of materials designated for disposal, recycling, or reuse.

applies to items transferred between two facilities owned by the same employer. Such an interpretation would be incorrect—the *intra*-plant transfer exception only exempts transfers within a single plant; material transfers between plants are not excluded, regardless of plant ownership.

This comment also alerted the agency to a potential ambiguity in the text of proposed paragraph (j)(3)(i). Specifically, OSHA realized that the phrase “to another party” could be read to suggest that transfers between two facilities owned by the same employer are exempted from the labeling requirements in paragraph (j)(3)(i). Again, this was not the agency’s intent. As noted above, the proposed addition of the explicit *intra*-plant transfer exception in paragraphs (j)(3)(ii) and (iii) was not a substantive change—the agency never intended to require employers to clean or enclose materials transferred within a single plant. The reorganization of paragraph (j)(3) was also not a substantive change; it merely allowed the agency to make clear that the labeling requirements apply regardless of whether the employer transfers materials for the purpose of disposal, recycling, or reuse (83 FR at 63763, 63756). Because the labeling requirements were part of paragraphs (j)(3)(i) and (ii) in the 2017 final rule, to which the *intra*-plant exemption applied, and were simply moved to a new stand-alone paragraph without substantive change, the scope of those activities requiring labeling has not changed. Put another way, the *intra*-plant exemption continues to apply to the labeling provision to the same extent it did prior to the proposal. And, more to the point, the labeling requirement continues to apply to all other transfers for purposes of disposal, recycling, or reuse, regardless of whether they involve transfers between two locations operated by the same employer.

If proposed paragraph (j)(3)(i) was interpreted to only require the labeling of materials transferred to another *employer* (rather than another facility), then an employer could place materials that were designated for reuse in an enclosure and transfer them to another facility *without* a label, so long as the employer owned the second facility. This scheme could potentially put both the transferring *and* receiving employees at risk by failing to appropriately apprise them of the presence of beryllium-containing materials and the hazardous nature of beryllium exposure.

Moreover, such an interpretation could lead to inconsistencies or conflicts with the Hazard Communication standard (HCS) (29 CFR 1910.1200), which requires labeling for all hazardous chemicals leaving a worksite regardless of destination. This is clearly laid out in OSHA’s Hazard Communication directive (CPL 02-02-079): “Manufacturers, importers, and distributors are required to ensure that each container of hazardous chemicals is appropriately labeled. Labeling requirements apply for shipped containers leaving the workplace regardless of whether the intended destination is interstate or intrastate.”

Although the agency’s intent was always to exempt only *intra*-plant transfers from the labeling requirement, OSHA sees value in eliminating any ambiguity and ensuring that labeling is consistent with the requirements of the HCS. Therefore, the agency is revising the text of paragraph (j)(3)(i) to more explicitly match the intent expressed in both the 2017 rule and the 2018 proposal. Specifically, OSHA is revising paragraph (j)(3)(i) in the final rule to strike the phrase “to another party” and add the “except for intra-plant transfers” language that is found in paragraphs (j)(3)(ii) and (iii). Final paragraph (j)(3)(i), therefore, provides that except for intra-plant transfers, when the

employer transfers materials that contain at least 0.1 percent beryllium by weight or are contaminated with beryllium for disposal, recycling, or reuse, the employer must label the materials in accordance with paragraph (m)(3) of this standard.

In summary, OSHA is adopting the proposed addition of the explicit intra-plant exception in final paragraphs (j)(3)(ii) and (iii). No commenters opposed these revisions and, therefore, OSHA has decided to retain them, unchanged from the proposal (see Document ID 0038, p. 32; 0033, p. 5). The agency is also revising proposed paragraph (j)(3)(i) to explicitly incorporate the exception. As explained in detail above, none of these changes are substantive, but OSHA expects the clarified language will aid employers in understanding and, thus, carrying out their responsibilities under these provisions.

OSHA's fifth proposed change to paragraph (j)(3) focused on the requirement to place items in "sealed, impermeable enclosures." Specifically, paragraph (j)(3)(i) in the 2017 final rule required employers to place certain materials bound for disposal in "sealed, impermeable enclosures, such as bags or containers." Paragraph (j)(3)(ii) in the 2017 final rule also required enclosure of certain materials that had not been appropriately cleaned. In the preamble to the 2017 final rule, OSHA explained that it intended these requirements to be broad and performance-oriented and clarified that the term "impermeable" was not intended to mean absolutely impervious to rupture but, rather, that the enclosures would not allow materials to escape under normal conditions of use (82 FR at 2695). Nevertheless, the agency learned that confusion around the enclosure requirement remained.

To alleviate the confusion regarding the enclosure requirements, OSHA proposed in the 2018 NPRM to clarify the “sealed, impermeable bag” requirement to make explicit what had been intended in the 2017 final rulemaking: that employers must utilize enclosures that prevent the release of beryllium-containing particulate or solutions under normal conditions of use, storage, or transport. The agency further explained that the proposed change would reinforce the requirement that employers select the appropriate type of container to prevent release based on the form of beryllium and how it is normally handled. For example, a container that prevents the release of a beryllium particulate may not be effective in preventing the release of a beryllium solution.

One commenter, Materion, submitted comments specific to this proposed change (Document ID 0038, p. 32). Materion was supportive of the revision, noting that it will significantly improve understanding of the requirements for containerization and transport of recycled materials and asserting its belief that without the proposed changes the disposal and recycling provision are technologically and economically infeasible (Document ID 0038, p. 32). According to Materion, the change appropriately accommodates the various physical properties of beryllium materials being recycled, the “many different applications resulting in many types of container configurations,” and the “many types of transfer mechanisms and end use processing applications” (Document ID 0038, p. 32). No commenters opposed these revisions and, therefore, OSHA has decided to retain them unchanged from the proposal.

Unlike the previous five proposed changes, the sixth proposed change was more than a clarifying change from the 2017 final rule. Under the 2017 final rule, employers could either clean *or* enclose materials designated for recycling. Materials designated for

disposal, however, could only be enclosed; the option to clean the materials was not available. The difference in the two provisions stemmed from the concern that municipal and commercial disposal workers should be protected from exposure to beryllium from contact with materials discarded from beryllium work areas in general industry by placing those materials in enclosed containers. However, as OSHA explained in the 2018 NPRM, the agency had not considered situations where it would be impractical to require enclosure because the materials in question were large items, such as machines or structures, that may contain at least 0.1 percent beryllium by weight or be contaminated with beryllium, rather than more common items, such as beryllium scrap metal or shavings.

With that situation in mind, OSHA reconsidered its earlier determination and preliminarily determined that workers handling items designated for disposal, like workers handling items designated for recycling or reuse, would be just as protected from exposure to beryllium if the items are cleaned to be as free as practicable of beryllium as if the items were placed in containers. In accordance with this preliminary determination, OSHA in the 2018 NPRM proposed adding the cleaning option to paragraph (j)(3)(ii). The agency explained that, regardless of whether an employer chooses to clean or enclose materials designated for disposal, the labeling requirements under proposed paragraph (j)(3)(i) would apply and would require that the materials designated for disposal be labeled in accordance with paragraph (m)(3) of this standard. It further noted its expectation that these proposed changes would maintain safety and health protections for workers.

OSHA received no comments on this proposed revision and has therefore finalized it as proposed.

The seventh and final proposed change also relates to the cleaning of materials designated for disposal, recycling, or reuse. Paragraph (j)(3)(ii) in the 2017 final rule required the specified materials to be cleaned to be as free as practicable of surface beryllium contamination. However, the 2017 final rule did not define the term “surface beryllium contamination” and other parts of the 2017 final rule used the term “as free as practicable” without the “surface beryllium contamination” modifier. To alleviate any potential confusion stemming from the agency’s use of this new, undefined term, OSHA proposed to eliminate any potential confusion by removing the phrase “surface beryllium contamination.”

OSHA did not receive any comments that directly addressed the removal of this phrase but one stakeholder, DOD, offered a suggestion. Specifically, DOD recommended the use of the Department of Energy’s (DOE’s) cleanliness standards as specified in Title 10 Code of Federal Regulations Part 850 (Document ID 0029, p. 1). According to DOD, these standards are “generally-acceptable criteria for surface contamination and were adopted based on DOE’s assessment of practical cleanliness levels and proven feasibility” (Document ID 0029, p. 1).

OSHA agrees that DOE’s standards might be a useful reference for employers seeking advice on how to clean materials prior to transfer for disposal, reuse, or recycling or how to determine the effectiveness of existing cleaning efforts and that wipe sampling in general can be a useful tool for employers to provide feedback on their cleaning procedures. To the extent that DOD’s recommendation was intended to suggest an

amendment to the proposed provisions, however, OSHA does not believe such an amendment is appropriate. As discussed in the 2018 NPRM, the “as free as practicable” standard is well-understood by the regulated community. OSHA has used the phrase in existing substance-specific standards, including those for lead (29 CFR 1910.1025, 29 CFR 1926.62), chromium (VI) (29 CFR 1910.1026), and asbestos (29 CFR 1910.1001), and has previously discussed its meaning in a 2014 letter of interpretation explaining the phrase in the context of the chromium standard (OSHA, Nov. 5, 2014, Letter of Interpretation, available at <https://www.osha.gov/laws-regs/standardinterpretations/2014-11-05>).

Additionally, as discussed in the Summary and Explanation of the definition of the term *dermal contact with beryllium*, the best available scientific evidence on adverse health effects from dermal contact with beryllium does not provide sufficient information to link risk of adverse health effects with specific levels of surface contamination. Therefore, the agency has chosen not to require a specific target level of surface contamination for any of the surface cleanliness requirements of the beryllium standards. Instead, the agency has determined that the more performance-oriented “as free as practicable” standard for cleaning—rather than a more prescriptive requirement—is appropriate. The agency finds that the use of the broader standard will better serve employees by allowing employers in a variety of industries flexibility to decide what type of control methods and procedures are best suited to their beryllium operations.

Having received no other comments on this proposed provision, OSHA strikes the phrase “surface beryllium contamination” from the regulatory text, as proposed.

In summary, OSHA is finalizing (j)(3) as proposed in 2018, except for the clarifying revision in paragraph (j)(3)(i), which explicitly incorporates the intra-plant exception found in paragraphs (j)(3)(ii) and (j)(3)(iii). OSHA has based this decision on the record and has determined this will maintain or enhance worker protections.

Medical Surveillance.

Paragraph (k) of the beryllium standard for general industry (29 CFR 1910.1024) addresses medical surveillance requirements. The paragraph specifies which employees must be offered medical surveillance, as well as the frequency and content of medical examinations. It also sets forth the information that must be provided to the employee and employer. The purposes of medical surveillance for beryllium are (1) to identify beryllium-related adverse health effects so that appropriate intervention measures can be taken; (2) to determine if an employee has any condition that might make him or her more sensitive to beryllium exposure; and (3) to determine the employee's fitness to use personal protective equipment such as respirators. The inclusion of medical surveillance in the beryllium standard for general industry is consistent with Section 6(b)(7) of the OSH Act (29 U.S.C. 655(b)(7)), which requires that, where appropriate, medical surveillance programs be included in OSHA health standards to aid in determining whether the health of employees is adversely affected by exposure to the hazards addressed by the standard.

In the 2018 NPRM, OSHA proposed two sets of changes to paragraph (k). The first set of changes proposed is in paragraph (k)(2), which specifies when and how frequently medical examinations were to be offered to those employees covered by the medical surveillance program. Paragraph (k)(2)(i)(B) of the standard requires the

employer to provide a medical examination within 30 days after determining that the employee shows signs or symptoms of CBD or other beryllium-related health effects or that the employee has been exposed to beryllium in an emergency. After publication of the 2017 final rule, stakeholders suggested to OSHA that, for individuals exposed one-time during an emergency, 30 days may be insufficient to detect beryllium sensitization, so a longer timeframe for medical examinations may be more appropriate (83 FR at 63757).

In the 2018 NPRM, OSHA acknowledged uncertainty regarding the time period in which sensitization may occur following a one-time exposure to a significant concentration of beryllium in an emergency (83 FR at 63757). In fact, beryllium sensitization can occur several months or more after initial exposure to beryllium among workers with regular occupational exposure to beryllium (see 83 FR at 63757 (citing 82 FR at 2530, 2533)). Based on this evidence and stakeholder feedback, OSHA proposed removing the requirement for a medical examination within 30 days of exposure in an emergency, under paragraph (k)(2)(i)(B), and adding paragraph (k)(2)(iv), which would require the employer to offer a medical examination at least one year after but no more than two years after the employee is exposed to beryllium in an emergency. OSHA requested comments on the appropriateness of this change (83 FR at 63757).

Several stakeholders commented on this issue. NJH supported extending the time to offer medical surveillance to one year after an emergency because 30 days following a high exposure may not be enough time to detect beryllium sensitization (Document ID 0022, p. 8). Materion also agreed with the proposed one-to-two-year timeframe for examinations following exposure during an emergency because 30 days may be too soon

to detect an immunological change using the BeLPT (Document ID 0038, p. 33). DOSH similarly commented that delaying the medical examination to one year might improve the detection of sensitization because it may take several months to detect it (Document ID 0023, p. 2). DOSH also expressed concern, however, that workers would not get counseling about signs and symptoms of beryllium-related conditions, an occupational history review, and other medical advice which may allow for the worker to identify a developing condition within the first year after exposure (Document ID 0023, p. 2). DOSH added that if the medical examination will be delayed, it would be appropriate to have a requirement for additional training or a brief medical consultation for workers who are not knowledgeable about beryllium and the potential medical conditions that may be triggered by exposure (Document ID 0023, pp. 2-3).

The ACOEM and NSSP shared DOSH's concerns regarding potential delays in consultations and counseling (Document ID 0024, p. 2; 0027, p. 4). The NSSP recommended an earlier discussion with employees exposed in an emergency to address their individual concerns, the medical path forward, options available, and to answer any questions the employees might have (Document ID 0027, p. 4). It suggested that the medical examination could then be scheduled in keeping with the individual employee's medical needs (Document ID 0027, p. 4). ACOEM opposed the change, arguing that workers who are exposed to beryllium in an emergency deserve prompt medical evaluation to understand the potential health risks, receive baseline testing, if desired, and to receive medical counseling (Document ID 0024, p. 2). ACOEM maintained that it would be "an extremely insensitive and harsh change in policy" to require exposed workers to wait more than a year to receive professional medical advice (Document ID

0024, p. 2). On the other hand, Materion argued that the standard protects workers who may have been exposed in an emergency, regardless of when the emergency occurred, by requiring employers to make medical surveillance available to any employees showing signs and symptoms of CBD or other beryllium-related health effects (Document ID 0038, p. 33). Specifically, paragraph (k)(2)(i)(B) requires employers to provide an examination to these employees within 30 days of determining that the employee shows signs or symptoms of CBD.

After considering these comments and the record as a whole on this issue, OSHA reaffirms its preliminary belief that testing conducted during the proposed time period of one to two years is more likely to detect sensitization than testing conducted 30 days following emergency exposure (82 FR at 63757). Nevertheless, DOSH, the NSSP, and ACOEM's concerns about possible delays in medical consultations and examinations and lack of employee knowledge of potential health effects prompted the agency to reevaluate the standard's medical surveillance and training triggers to determine if any employees could potentially be exposed in an emergency but may not be knowledgeable about symptoms, health effects, and medical surveillance because they have not been trained, or if any employees might be exposed but have not recently received a medical examination during which they had the opportunity to talk with a PLHCP about exposure to beryllium.

First, OSHA considered the population of employees affected by emergencies. As noted in the 2018 NPRM, OSHA estimates that a very small number of employees, likely less than 0.1 percent of the affected population, would be affected by emergencies in a given year (83 FR at 63764). Second, OSHA considered if any of the small number of employees exposed in an emergency in a given year would not be knowledgeable about

symptoms, health effects, and medical surveillance through the training provided under paragraph (m)(4) at the time of emergency and, thus, might need such training after exposure during an emergency. Paragraph (m)(4)(i) requires the employer to provide information and training in accordance with the Hazard Communication Standard (HCS), 29 CFR 1910.1200(h), for each employee who has, or can reasonably be expected to have, airborne exposure to or dermal contact with beryllium. Final paragraph (m)(4)(ii) requires employers to ensure that each employee who is, or can reasonably be expected to be, exposed to airborne beryllium can demonstrate knowledge and understanding of a number of specified topics, including (1) the health hazards associated with airborne exposure to and dermal contact with beryllium, including signs and symptoms of CBD; (2) the purpose and a description of the medical surveillance program under paragraph (k) of the standard, including risks and benefits of each test to be offered; (3) the purpose and a description of the medical removal protection provided under paragraph (l) of the standard; and (4) the contents of the standard.

OSHA expects that the vast majority of employees who could be exposed to beryllium in an emergency are those who are regularly exposed to beryllium as part of their normal work duties performed near processes involving beryllium. Therefore, most of those employees are already likely to be trained in accordance with the HCS under paragraph (m)(4)(i) because the training requirements under paragraph (m)(4)(i) are triggered by actual, or reasonably anticipated, airborne exposure at any level or dermal contact with beryllium. In addition, OSHA anticipates that most of these employees would also be knowledgeable about beryllium-related health effects, medical surveillance, medical removal, and the remainder of the standard, as required by

paragraph (m)(4)(ii). Nevertheless, if an employee who had not been trained in accordance with paragraph (m)(4) or was not knowledgeable of the subjects covered in paragraph (m)(4)(ii) was exposed in an emergency, the standard would require that the employee be trained after the emergency because the exposure during the emergency would cause them to meet the standard's training triggers. In other words, the standard already provides for training of the very small number of untrained or unknowledgeable employees who might be exposed during an emergency.²⁰

Third, OSHA considered if any employees exposed during an emergency would likely not have received a recent examination under the standard. Under paragraph (k)(1)(i), the employer must make medical surveillance available to four groups of employees: (A) employees who are or are reasonably expected to be exposed at or above the action level for more than 30 days per year, (B) employees who show signs or symptoms of CBD or other beryllium-related health effects, (C) employees who are exposed to beryllium during an emergency, and (D) employees whose most recent written medical surveillance opinion required by paragraph (k)(6) or (k)(7) of the standard recommends periodic medical surveillance. Under paragraph (k)(2)(ii), employees who continue to meet above-triggers (A), (B), or (D) of the standard receive examinations at least every two years after their most recent examination. Employees previously exposed in an emergency (and all other employees who have received an

²⁰ OSHA notes that the standard would require additional training for workers who were exposed during an emergency who had already been trained if the employer realized that those workers were not knowledgeable about topics such as the potential medical conditions which may result from exposure to beryllium or symptoms that may trigger a medical examination (see paragraph (m)(4)(ii)(A); see also additional training requirements under paragraph (m)(4)(iii)).

examination, but no longer meet the criteria for periodic examinations) continue to be offered a standardized BeLPT or equivalent test at least every two years, unless they are confirmed positive (paragraph (k)(3)(i)(E); 82 FR at 2705).

As noted above, OSHA expects that the vast majority of employees who could be exposed to beryllium in an emergency are those who are regularly exposed to beryllium as part of their normal work duties that are performed near processes involving beryllium. As a result, OSHA expects that the majority of employees who could be exposed to beryllium in an emergency are likely to be those who meet the trigger for periodic medical surveillance under paragraph (k)(1)(i)(A) (i.e., they are or are reasonably expected to be exposed at or above the action level for more than 30 days per year). Thus, they have likely had an opportunity to consult with a PLHCP at a minimum of every two years (paragraph (k)(2)(ii)). Other employees exposed during an emergency may have also had a recent examination because they have recently met one of the other triggers, such as experiencing signs or symptoms of CBD or other beryllium-related health effects. OSHA recognizes, however, that a much smaller number of employees, such as office and warehouse workers, who do not have regular exposures to beryllium at or above the action level and have also not met one of the other medical surveillance triggers, could potentially be exposed to beryllium in an emergency. These employees may have never received a medical examination or a BeLPT or equivalent test.

OSHA agrees with ACOEM that it is unacceptable to have employees who have not recently been offered a medical examination under the beryllium standard wait for a year or more for a medical consultation and examination after exposure during an emergency. These employees may not have baseline information on their health status,

and they may not have had the opportunity to speak to a PLHCP to ask questions related to their concerns, such as possible health risks, symptoms, and medical interventions. In contrast, employees who had a medical examination within the previous two years would have a baseline and have had the opportunity to speak with a health professional. Therefore, to adequately meet the needs of all employees who may be exposed in an emergency, OSHA is deleting final paragraph (k)(2)(iv) and replacing it with paragraphs (k)(2)(iv)(A) and (k)(2)(iv)(B).

New paragraph (k)(2)(iv)(A) addresses the needs of the very small group of employees who are exposed in an emergency but have not received a medical examination under paragraph (k)(1)(i) within the previous two years. Specifically, paragraph (k)(2)(iv)(A) requires that if an employee is exposed to beryllium during an emergency and has not received a medical examination under paragraph (k)(1)(i) within the previous two years, then the employer must provide that employee with a medical examination within 30 days of the date of the emergency. New paragraph (k)(2)(iv)(B), on the other hand, focuses on employees who are exposed during an emergency, but have recently received an examination. Under paragraph (k)(2)(iv)(B), if an employee has received a medical examination under paragraph (k)(1)(i) within the previous two years, then the employer would be required to offer that employee a medical examination that meets the requirements of the standard at least one year but no more than two years after the employee was exposed to beryllium in an emergency.

OSHA concludes that it is appropriate to provide a medical examination within 30 days after the employee was exposed in an emergency, if the employee has not had an examination under the beryllium standard within the last two years. It addresses the

concerns of DOSH, ACOEM, and the NSSP that employees receive timely medical consultations and evaluations. If an employee has not had a previous examination under the standard, the examination at 30 days after the emergency allows for collection of baseline values on health status, as recommended by ACOEM. Baseline information about the employee's current health status, such as lung function, will allow for a comparison with changes that might occur in the future. Moreover, if the employee is confirmed positive by the baseline BeLPT and there is a possibility that the employee could be exposed to beryllium again in the future, knowledge about the confirmed positive finding would allow the employee to consider risks and options related to employment (82 FR at 2702).

OSHA recognizes, as NJH, DOSH, and Materion noted, that 30 days following the emergency is not the best timeframe for detecting sensitization. However, paragraph (k)(3)(ii)(E) of the beryllium standard for general industry already requires that employees who received a medical examination because of an emergency exposure continue to receive a BeLPT, or an equivalent test, every two years following that examination, unless the employee is confirmed positive. Therefore, the standard already requires the employers to offer these employees a BeLPT for the remainder of their tenure in the workplace where they were exposed in an emergency, rather than limiting the opportunity to detect sensitization to 30 days following the emergency.

OSHA also concludes that it is appropriate to require employers to offer medical surveillance within one to two years after exposure to beryllium in an emergency, if that employee had an examination that meets the requirements of the beryllium standard within the last two years. These employees could include those who undergo periodic

medical surveillance at least every two years under paragraph (k)(2)(A) or (D), or who may have received a medical examination within the last two years because they were experiencing symptoms or were exposed in a previous emergency (paragraphs (k)(2)(B) and (C)). These employees would have received a recent medical consultation and examination which would have allowed them to ask questions. In addition, these employees would have received a baseline examination. Like the employees examined within 30 days after exposure to beryllium in an emergency, all these employees examined within one to two years of the emergency will continue to be offered BeLPT testing every two years under paragraph (k)(3)(ii)(E) if they have not been confirmed positive and do not or no longer meet the criteria for full periodic medical examinations under paragraph (k)(2)(ii).

The requirement for continuing BeLPTs for any employee who has received an examination under the beryllium standard, including for an emergency exposure, addresses another concern voiced by NJH, which is that anyone exposed in an emergency should be provided periodic medical surveillance (Document ID 0022, p. 8). If the employee is confirmed positive, or if the licensed physician otherwise deems it appropriate, the licensed physician is to provide in the written medical opinion to the employee a referral to a CBD diagnostic center and a recommendation for continued periodic medical surveillance under paragraph (k)(5)(iii) and (iv). If the employee authorizes the recommendation for referral to be included in the written opinion, the employer must provide an examination at a CBD diagnostic center (discussed in more detail below) (paragraph (k)(6)(iii)). Once an employee is evaluated at a CBD diagnostic center, as described under paragraph (k)(7)(i), the employee may choose to have any

subsequent medical examinations for which the employee is eligible, performed at the CBD diagnostic center at no cost to the employee (see final paragraph (k)(7)(vi)).

Therefore, the standard already allows for periodic BeLPT testing for all employees exposed in an emergency, and periodic medical surveillance for any of those employees who are confirmed positive.

Another concern that was raised by DOSH is that delaying the medical examination to at least one year following the emergency may result in employees not receiving the examination if their employment ends within that one-year period (Document ID 0023, p. 3). This concern continues to be relevant to employees who are receiving the examination for an emergency exposure at one to two years after the exposure in the emergency (paragraph (k)(2)(iv)(B)). If employment does end before one year after the emergency, paragraphs (k)(2)(iii) and (1)(i)(C) require the employer to offer a medical examination at termination of employment to any employee exposed to beryllium in an emergency, unless the employee received an examination in accordance with the standard within the last 6 months. OSHA is concerned that this provision would not require employers to offer a medical examination to some employees who would receive the emergency examination at one to two years after the emergency exposure. For example, if such an employee, already under medical surveillance, received a medical examination one month before the emergency and then terminated employment two months after the emergency, the employer would not be required to offer a medical examination to that employee exposed during the emergency under the proposed changes, and the employee would not have an opportunity to have a medical exam that could detect any adverse effects that might have occurred because of the emergency. OSHA

agrees with DOSH that further revision is necessary to ensure that every employee who is exposed in an emergency receives an examination following the emergency.

Accordingly, OSHA is revising paragraph (k)(2)(iii) to require that each employee who is exposed in an emergency and has not received an examination since the emergency exposure is provided an examination at the time employment is terminated. OSHA finds that this change better protects employees because it allows health effects that could have resulted from the emergency exposure to be more readily detected.

In making these decisions on the appropriate timing for medical examinations for employees exposed to beryllium during an emergency, OSHA considered Materion's point that employees experiencing signs or symptoms or other beryllium-related health effects after an emergency can ask for an examination under paragraph (k)(1)(i)(B) (Document ID 0038, p. 33). As explained above, all employees who are exposed in an emergency will either have previously received training under paragraph (m)(4) or will need to be trained within a reasonable time after exposure. And these employees should already be knowledgeable or will soon become knowledgeable about the health hazards associated with airborne exposure to and dermal contact with beryllium, including signs and symptoms of CBD, as required by paragraph (m)(4)(ii). Therefore, all employees exposed during an emergency should be able to identify and report signs or symptoms of CBD or other beryllium-related health effects either at the time of the emergency or within a reasonable time after it. Materion is, thus, correct in pointing out that if these employees did experience such signs or symptoms, they could ask for a medical examination. Other employees exposed during an emergency that have not had an examination and do not experience these health effects, however, would still not have had

the opportunity for a timely consultation and medical examination with a PLHCP. Consequently, OSHA does not find that the signs-or-symptoms trigger is sufficient to resolve the concerns raised by the other stakeholders.

OSHA also proposed one additional change to the paragraph involving emergency exposure. As promulgated in the 2017 final rule, paragraph (k)(2)(i)(B) required the employer to provide a medical examination within 30 days after the employer determines that an employee shows signs or symptoms of CBD or other beryllium-related health effects or has been exposed to beryllium in an emergency. Because OSHA believes that employers typically will learn of any emergency resulting in exposure immediately or soon after it occurs, OSHA preliminarily determined that it is appropriate to measure the time period from the date of exposure. Therefore, under proposed paragraph (k)(2)(iv), the time period for providing a medical examination begins to run from the date the employee is exposed during an emergency, regardless of when the employer discovers that the exposure occurred. OSHA requested comments on the appropriateness of calculating the time period for a medical examination from the occurrence of the emergency rather than from the employer's determination of eligibility.

Materion agreed with OSHA that most employers will learn about the emergency resulting in exposure immediately or soon after the occurrence, and it supported measuring the time period from the date of the exposure, provided that the employer determined that the incident can be defined as an emergency under the standard (Document ID 0038, pp. 33-34). OSHA did not receive any comments objecting to OSHA's proposal to measure the time period from the date of exposure in an emergency;

therefore, OSHA is retaining the proposed language to measure the time period from the date of the exposure in the emergency in final paragraphs (k)(2)(iv)(A) and (B).

Paragraph (k)(2)(iv)(B) does not preclude employers from voluntarily providing a medical examination within the first year after an emergency. Providing a medical examination sooner would not, however, relieve an employer of the duty to provide an exam in the one-to-two-year window. For those employees who are already eligible for periodic medical surveillance, the examination for the emergency exposure could be scheduled to coincide with the next periodic examination that is within two years of the last periodic medical examination and at least one but no more than two years after the emergency exposure, satisfying the requirements of both paragraphs (k)(2)(ii) and (iv)(B).

In summary, OSHA is modifying proposed paragraph (k)(2)(iv) to customize protections for two general groups of employees who could be exposed to beryllium in an emergency. Paragraph (k)(2)(iv)(A) will require the employer to offer a medical examination to an employee within 30 days after the employee was exposed to beryllium in an emergency, if the employee has not had an examination under paragraph (k)(1)(i) within the last two years. This requirement improves protections for what is likely to be a very small group of employees who have not had a medical examination under the beryllium standard within the last two years because it allows those employees to have a timely consultation and examination. Paragraph (k)(2)(iv)(B) will require the employer to offer a medical examination to an employee within one to two years after the employee was exposed to beryllium in an emergency, if the employee had an examination under paragraph (k)(1)(i) of the beryllium standard within the last two years. This provision

eliminates the requirement to offer an examination within 30 days to the majority of employees who are likely to be exposed in an emergency and have already received a recent medical examination. Thus, these employees would have received a baseline examination and a recent consultation regarding beryllium. And either group will continue to be offered the BeLPT, or an equivalent test, every two years under paragraph (k)(3)(ii)(E), even if they do not or no longer meet the criteria for full periodic medical examinations under paragraph (k)(ii). OSHA is also revising paragraph (k)(2)(iii) to require that employers offer a medical examination to any employee who has not received an examination since the emergency exposure at the time the employee's employment is terminated. Again, OSHA expects this to be a very small group of employees that would have had an exam within six months of termination but not have had an exam since exposure during an emergency. This change ensures that all employees exposed in an emergency receive a medical examination for the emergency exposure before their employment is terminated.

In addition, other provisions in the standard ensure that either group of employees (i.e., those who receive a medical examination within 30 days or one to two years after an emergency) are knowledgeable about the signs and symptoms of CBD and that if employees are experiencing signs and symptoms, they will be provided a medical examination within 30 days of the employer determining that they are experiencing such signs or symptoms.

The second (and final) set of changes that OSHA proposed to the standard's medical surveillance requirements is in paragraph (k)(7), which contains the requirements for evaluation at a CBD diagnostic center. In this final rule, OSHA is amending

paragraph (k)(7) in three ways. First, OSHA is revising paragraph (k)(7)(i) to require that the evaluation must be scheduled within 30 days, and must occur within a reasonable time, of the employer receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B). Second, OSHA is adding a provision, in paragraph (k)(7)(ii), which clarifies that, as part of the evaluation at the CBD diagnostic center, the employer must ensure that the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center, such as pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. The new provision also states that if any of the tests deemed appropriate by the examining physician are not available at the CBD diagnostic center, they may be performed at another location that is mutually agreed upon by the employer and the employee. Third, OSHA is making a handful of minor, non-substantive numbering and reference edits to other provisions in paragraph (k)(7) to account for the addition of new paragraph (k)(7)(ii). Specifically, OSHA is renumbering current paragraphs (k)(7)(ii), (iii), (iv), and (v) as (k)(7)(iii), (iv), (v), and (vi), respectively, and is adding a reference to new paragraph (k)(7)(ii) to the newly renumbered paragraph (k)(7)(vi).

Each of these final revisions differ in some way from the proposed amendments based on stakeholder feedback. With regard to the first change concerning the timing of the exam, the current standard requires employers to provide the examination within 30 days of the employer receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B). The purpose of the 30-day requirement was to ensure that employees receive the examination in a timely manner. As OSHA explained in the proposal,

however, since the publication of the 2017 final rule stakeholders have raised concerns that the examination and any required tests could not be scheduled and completed within 30 days (83 FR at 63758).

To address this concern, OSHA proposed that the employer provide an initial consultation with the CBD diagnostic center, which could occur via telephone or virtual conferencing methods, rather than the full evaluation, within 30 days of the employer receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B).

OSHA explained that providing a consultation before the full examination at the CBD diagnostic center would demonstrate that the employer made an effort to begin the process for a medical examination. OSHA also noted that the proposed change would also allow (1) the employee to consult with a physician to discuss concerns and ask questions while waiting for a medical examination, and (2) the physician to explain the types of tests that are recommended based on medical findings about the employee and the risks and benefits of undergoing such testing. OSHA requested comments on the appropriateness of providing the consultation within 30 days and on the sufficiency of a consultation via telephone or virtual conference (83 FR at 63758).

Several stakeholders offered comments on this issue (Document ID 0021, p. 3; 0022, p. 6; 0029, p. 2; 0038, p. 34). The ATS, NJH, and Materion agreed that an examination at the CBD diagnostic center should not be required to occur within 30 days of the referral because it may take weeks or months before the CBD diagnostic center has an opening for an evaluation. In addition, many of the stakeholders noted that work responsibilities, personal and family obligations, or the need to arrange travel may make it difficult for employees to have an evaluation done within that time period.

Materion also supported the proposed requirement for a telephone or virtual consultation within 30 days, claiming that it is a more workable solution that does not reduce protections, while allowing employees to consider medical options available under the standard and offering the employee more flexibility in determining when they can undergo testing based on their availability and preference (Document ID 0038, p. 34). In contrast to Materion, the ATS and NJH opposed the proposed requirement for a consultation that can be performed via telephone or virtual conferencing within 30 days of the employer receiving documentation recommending a referral. NJH commented that a video or phone consultation would add cost and logistical difficulty to scheduling, and that it is not necessary because the PLHCP who sees the employee for screening provides information on the clinical evaluation. Furthermore, they commented, there are HIPAA privacy issues of a phone or video conference to consider (Document ID 0022, p. 6).

The ATS agreed with many of the concerns expressed by NJH, including concerns regarding logistical challenges, the need for an in-person clinical evaluation and review of medical tests to provide effective care, and redundancy with the PLHCP consultation (Document ID 0021, p. 3). The ATS and NJH recommended that the standard be revised to require that the employer make an appointment for the employee to be evaluated at the CBD diagnostic center within 30 days of receiving documentation for the referral (Document ID 0021, p. 3; 0022, p. 6). DOD also opposed requiring an evaluation by telephone or virtual conferencing and stated that an ill worker should be examined immediately; it recommended that the employer make the appointment for evaluation at a CBD diagnostic center within seven days of receiving documentation for a referral (Document ID 0029, p. 2).

After considering these comments, OSHA is convinced that scheduling a phone or virtual consultation with the CBD diagnostic center is an unnecessary step that adds logistical complications and costs. Although the agency understands Materion's point that the additional consultation could provide employees with more time and information to make medical decisions, as well as accommodate other scheduling logistics, OSHA finds that the scheduling approach suggested by the ATS and NJH addresses both the logistical difficulties cited by stakeholders with respect to the requirements in the current standard and the timing concerns Materion raised. Moreover, OSHA finds that employees will have enough information (through trainings under paragraph (m) and discussions with the PLHCP) to allow them to decide whether to be evaluated at the CBD diagnostic center.²¹ OSHA is therefore amending paragraph (k)(7)(i) to require that the employer schedule an examination at a CBD diagnostic center within 30 days of receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B). And to maintain the intent of the 2017 final rule and the 2018 NPRM that evaluation at a CBD diagnostic center occurs in a timely manner, OSHA is adding that the evaluation must occur within a reasonable time. Requiring that the evaluation occur within a reasonable time ensures that the evaluation is done as soon as practicable based upon availability of openings at the CBD diagnostic center and the employee's preferences. This revision better addresses OSHA's original intent that the employee be examined within a timely period, while providing employees and employers with maximum flexibility and convenience.

²¹ Under paragraph (k)(6)(i)(D), the employer is to ensure that the PLHCP explains the results of the medical examination to the employee, including results of tests conducted and medical conditions related to airborne beryllium exposure that require further evaluation or treatment.

Although OSHA understands DOD’s concerns about making a timely appointment, requiring that an appointment be made within a seven-day period might not give the employee enough time to consider his or her future obligations and possibly have discussions with family members to determine the best time period for the examination. OSHA believes that a 30-day period to schedule an appointment for an examination is a reasonable time that allows the employee to consider his or her preferences for an examination date. In addition, a 30-day period offers more administrative convenience for employers because it is consistent with other triggers in the beryllium standard.

The second change that OSHA proposed to paragraph (k)(7)(i) relates to the contents of the examination at the CBD diagnostic center. As discussed in more detail above, the former definition of *CBD diagnostic center*—which stated that the evaluation at the diagnostic center “must include” a pulmonary function test as outlined by American Thoracic Society criteria, bronchoalveolar lavage (BAL), and transbronchial biopsy —could have been misinterpreted to mean that the examining physician was required to perform each of these tests during every clinical evaluation at a CBD diagnostic center. That was not OSHA’s intent. Rather, the agency merely intended to ensure that any CBD diagnostic center has the capacity to perform any of these tests, which are commonly needed to diagnose CBD. Therefore, OSHA proposed revising the definition to clarify that the CBD diagnostic center must simply have the ability to perform each of these tests when deemed appropriate.

To account for that proposed change to the definition of *CBD diagnostic center* and to ensure that the employer provides those tests if deemed appropriate by the examining physician at the CBD diagnostic center, OSHA proposed expanding paragraph

(k)(7)(i) to require that the employer provide, at no cost to the employee and within a reasonable time after consultation with the CBD diagnostic center, any of the three tests mentioned above, if deemed appropriate by the examining physician at the CBD diagnostic center (83 FR at 63764). OSHA explained that the revision would also clarify the agency's original intent that, instead of requiring all three tests to be conducted after referral to a CBD diagnostic center, the standard would allow the examining physician at the CBD diagnostic center the discretion to select one or more of those tests as appropriate (83 FR at 63764).

Several stakeholders offered opinions on these proposed changes. For example, Materion agreed with the proposed changes to align paragraph (k)(7)(i) with the definition for *CBD diagnostic center* (Document ID 0038, p. 34). However, as discussed above in the Summary and Explanation of paragraph (b), Definitions, the ATS argued that "not requiring certain diagnostic tests (or an equivalent) could reduce the potential to diagnose CBD and determine disease severity" (Document ID 0021, p. 3). The ATS further asserted that "confirmed positive workers should have an assessment of lung function and gas exchange (such as a full set of pulmonary function tests with spirometry, lung volumes and diffusion capacity for carbon monoxide or other similar tests) and also chest imaging" (Document ID 0021, p. 3). NJH and the AOEC expressed similar concerns, commenting that lung function and imaging tests should be included as part of an evaluation at the CBD diagnostic center (Document ID 0022, p. 3; 0028, p. 2).

After reviewing these comments and the remainder of the record on this issue, OSHA agrees that pulmonary function testing, BAL, and transbronchial biopsies are important diagnostic tools, but finds that the examining physician at the CBD diagnostic

center is in the best position to determine which diagnostic tests are appropriate for particular workers. The agency believes that the modified definition of the term *CBD diagnostic center*, which requires the centers to have the capacity to perform these three tests, will serve to ensure that healthcare providers at the centers are aware of the importance of and are able to perform pulmonary function testing, BAL, and transbronchial biopsies.

Nevertheless, OSHA understands that the proposed provision could be misinterpreted to mean that the employer does not have to make available additional tests that the examining physician deems appropriate for diagnosing or determining severity of CBD. That was never the agency's intent. In fact, OSHA noted the potential for other tests, as deemed necessary by the CBD diagnostic center physician, several times in the preamble to the 2017 final rule (see, e.g., 82 FR at 2709, 2714). Similar to paragraph (k)(3)(ii)(G), which requires the employer to ensure that the employee is offered as part of the initial or periodic medical examination any test deemed appropriate by the PLHCP, OSHA intends for the employer to ensure the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center, including tests for diagnosing CBD, for determining its severity, and for monitoring progression of CBD following diagnosis. Allowing the physician at the CBD diagnostic center to order additional tests that are deemed appropriate is also consistent with most OSHA substance-specific standards, such as respirable crystalline silica (29 CFR 1910.1053) and chromium (VI) (29 CFR 1910.1026).

To clarify the agency's intent that the physician at the CBD diagnostic center has discretion to order appropriate tests, and to further respond to stakeholder concerns

regarding the necessity of pulmonary function testing, BAL, and transbronchial biopsies, OSHA is adding a new sub-paragraph (k)(7)(ii), which focuses on the content of the examination. This new provision requires the employer to ensure that, as part of the evaluation, the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center, such as pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. OSHA intends for the new provision to make clear that the employer must provide additional tests, such as those noted by the ATS, NJH, and the AOEC, at no cost to the employee, if those tests are deemed necessary by the examining physician. The agency also believes that explicitly naming the three examples of tests that may be appropriate will further emphasize their importance to examining physicians at the CBD diagnostic centers.

Consistent with OSHA's original intent, those tests are required to be offered only if deemed appropriate by the physician at the CBD diagnostic center. For example, if lung volume and diffusion tests were performed according to the ATS criteria as part of the periodic medical examination under paragraph (k)(3) and the physician at the CBD diagnostic center found them to be of acceptable quality, those tests would not have to be repeated as part of a CBD evaluation. The addition of paragraph (k)(7)(ii) clarifies that the employer must, however, offer any test that the PLHCP deems appropriate.

Consistent with previous health standards and the meaning of the identical phrase in paragraph (k)(3)(ii)(G), OSHA intends the phrase "deemed appropriate" to mean that additional tests requested by the physician must be both related to beryllium exposure

and medically necessary, based on the findings of the medical examination (see 82 FR at 2709; 81 FR 16286, 16826 (March 25, 2016)).

New paragraph (k)(7)(ii) also addresses the possibility that a test that is deemed appropriate by the examining physician at the CBD diagnostic center might not be available at that center. Although OSHA's intention has been to require any testing to be provided by the same CBD diagnostic center unless the employer and employee agree to a different CBD diagnostic center (see 83 FR at 63758), there may be cases where the CBD diagnostic center does not perform a type of test deemed appropriate by the examining physician. In such a case, OSHA wants to ensure that the employee can receive the appropriate test. Therefore, OSHA is also including in paragraph (k)(7)(ii) a requirement that if any of those tests deemed appropriate by the physician are not available at the CBD diagnostic center, they may be performed at another location that is mutually agreed upon by the employer and the employee. This other location does not need to be a CBD diagnostic center as long as it is able to perform tests according to requirements under paragraph (k). OSHA believes that such circumstances would be very rare because CBD diagnostic centers with the ability to perform pulmonary function testing (as outlined by the ATS criteria), BAL, and transbronchial biopsy are likely to also provide other medical tests related to CBD.²² As a result, the CBD diagnostic center in the vast majority of cases will be able to offer the additional testing deemed necessary by the examining physician. Given that this standard requires CBD diagnostic centers to be able to perform the three most common tests for diagnosing CBD, and CBD

²² Document ID OSHA-H005C-2006-0870-0637 provides information from the NJH website, which provides an overview of the types of tests performed.

diagnostic centers typically would be able to offer any additional tests deemed necessary, OSHA expects that employees would rarely, if ever, need to travel to a second location.

In summary, final paragraph (k)(7)(i) requires that the employer provide an evaluation at no cost to the employee at a CBD diagnostic center that is mutually agreed to by the employer and the employee. The evaluation must be scheduled within 30 days and must occur within a reasonable time of the employer receiving one of the types of documentation listed in paragraph (k)(7)(i)(A) or (B). Final paragraph (k)(7)(ii) requires the employer to ensure that, as part of the evaluation, the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center, such as pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. Paragraph (k)(7)(ii) further provides that any test deemed appropriate by the examining physician that is not available at the CBD diagnostic center may be performed at another location that is agreed upon by the employer and employee. Such tests must be provided at no cost to the employee, whether performed at the CBD diagnostic center or at another location.

As noted above, OSHA is also making a handful of minor, non-substantive numbering and reference edits to other provisions in paragraph (k)(7) to account for the addition of new paragraph (k)(7)(ii). Specifically, OSHA is renumbering current paragraphs (k)(7)(ii)-(v) as (k)(7)(iii), (iv), (v), and (vi), accordingly, and is adding a reference to new paragraph (k)(7)(ii) to the newly renumbered paragraph (k)(7)(vi). Paragraph (k)(7)(vi) provided that after an employee received the initial clinical evaluation at the CBD diagnostic center described in paragraph (k)(7)(i), the employee could choose to have any subsequent medical evaluations for which the employee is

eligible under paragraph (k) performed at a CBD diagnostic center mutually agreed upon by the employer and employee and that the employer must provide such examinations to the employee at no cost. OSHA is revising the paragraph to add the reference to new paragraph (k)(7)(ii) because the description of the initial clinical evaluation is now split between paragraph (k)(7)(i) and (ii), rather than appearing solely in paragraph (k)(7)(i). OSHA does not expect that this clarifying change will have any substantive effect. Newly renumbered paragraph (k)(7)(vi) (previous paragraph (k)(7)(v)), therefore, continues to require that, after an employee has received the initial clinical evaluation at a CBD diagnostic center, the employee may choose to have any subsequent medical examinations for which the employee is eligible under paragraph (k) of this standard performed at a CBD diagnostic center mutually agreed upon by the employer and the employee, and the employer must provide such examinations at no cost to the employee.

The addition of paragraph (k)(7)(ii) and consequential renumbering of current paragraphs (k)(7)(ii)-(v) as (k)(7)(iii), (iv), (v), and (vi) also affects two other cross-references in the standard. Paragraph (l)(1) of the standard details the eligibility requirements for medical removal. Two of the criteria, those in (l)(1)(i)(B) and (l)(1)(ii) reference paragraphs (k)(7)(ii) and (k)(7)(iii), respectively. In this final rule, OSHA is updating those references to reflect the renumbering in paragraph (k)(7). Therefore, final paragraph (l)(1)(i)(B) references paragraph (k)(7)(iii) and paragraph (l)(1)(ii) references paragraph (k)(7)(iv). These edits, like those noted above in paragraph (k)(7)(vi), do not change the substantive meaning of the provisions.

Communication of Hazards.

Paragraph (m) of the beryllium standard for general industry (29 CFR 1910.1024(m)) sets forth the employer's obligation to comply with the Hazard Communication standard (HCS) (29 CFR 1910.1200) relative to beryllium and to take additional steps to warn and train employees about the hazards of beryllium. Under the HCS, beryllium manufacturers and importers are required to evaluate the hazards of beryllium and prepare labels and safety data sheets (SDSs) and provide both documents to downstream users. Employers whose employees are exposed to beryllium in their workplace must develop a hazard communication program and ensure that employees are trained on the hazards of beryllium. These employers must also ensure that all containers of beryllium are labeled and that employees are provided access to the SDSs. In addition to the requirements under the HCS, paragraph (m)(1)(ii) of the beryllium standard for general industry specifies certain criteria that must be addressed in classifying the hazards of beryllium. Paragraph (m)(2) requires employers to provide and display warning signs with specified wording at each approach to a regulated area. Paragraph (m)(3) requires employers to label each container of clothing, equipment, and materials contaminated with beryllium using specified language. Finally, paragraph (m)(4) details employers' duties to provide information and training to employees.

In the 2018 NPRM, OSHA proposed three revisions to paragraph (m) of the beryllium standard for general industry (83 FR at 63759-60, 63769). The first change is related to paragraph (m)(3), which previously required employers to label "each bag and container" of clothing, equipment, and materials contaminated with beryllium. In the 2018 NPRM, OSHA proposed to replace the phrase "each bag and container" with the phrase "each immediate container," to clarify that the employer need only label the

immediate bag or container of beryllium-contaminated items and not larger containers holding the labeled bag or container. OSHA proposed this change to be consistent with the HCS, which requires only the primary or immediate container to be labeled (see 29 CFR 1910.1200(c)) (definition of “Label”). OSHA explained that this proposed change would effectuate OSHA’s intent, expressed in the 2017 final rule, that the hazard communication requirements of the beryllium standard “be substantively as consistent as possible” with the HCS (82 FR at 2694, 2724). As such, OSHA preliminarily determined that the change would maintain safety and health protections for workers.

Next, OSHA proposed two revisions to paragraph (m)(4), which addresses employee information and training. Paragraph (m)(4)(ii) requires the employer to ensure that each employee who is, or can reasonably be expected to be, exposed to airborne beryllium can demonstrate knowledge and understanding of certain specified topics. One of the topics specified in the previous standard was the health hazards associated with “airborne exposure to and contact with beryllium,” including the signs and symptoms of CBD (83 FR at 63759). OSHA proposed to modify this language by adding the word “dermal” immediately prior to “contact with beryllium.” OSHA explained that the change would clarify OSHA’s intent that employers must ensure that exposed employees can demonstrate knowledge and understanding of the health hazards caused by dermal contact with beryllium.

OSHA also proposed to modify the language in paragraph (m)(4)(ii)(E), which required the employer to ensure that each employee who is, or can reasonably be expected to be, exposed to airborne beryllium can demonstrate knowledge and understanding of measures employees can take to protect themselves from “airborne

exposure to and contact with beryllium,” including personal hygiene practices (83 FR at 63759). As with the previous revision, OSHA proposed adding the word “dermal” to “contact with beryllium” to clarify OSHA’s intent that employers must ensure exposed employees can demonstrate knowledge and understanding of measures employees can take to protect themselves from dermal contact with beryllium.

Commenters did not object to any of the changes that OSHA proposed to paragraph (m). In fact, the only stakeholder that offered any comments on these revisions, Materion, generally supported the proposed changes, commenting that the changes will maintain safety and health protections for employees (Document ID 0038, p. 34). OSHA agrees with this assessment and finds that the proposed changes will clarify employers’ requirements for the communication of hazards of beryllium. Therefore, OSHA is finalizing the proposed changes to paragraph (m) in this final rule.

Recordkeeping.

Paragraph (n) of the beryllium standard for general industry requires employers to make and maintain air monitoring data, objective data, and medical surveillance records, and prepare and maintain training records. The 2017 final rule required employers’ air monitoring data ((n)(1)(ii)(F)), medical surveillance ((n)(3)(ii)(A)), and training ((n)(4)(i)) records to include employee Social Security Numbers (SSNs). In the 2018 NPRM, OSHA proposed to modify paragraph (n) to remove that requirement. This final rule adopts the proposed revisions, eliminating the requirement to include employee SSNs in these records.

The issue of whether to include employee SSNs in records under OSHA’s standards for beryllium dates back to the 2015 beryllium NPRM. In that NPRM, OSHA

proposed to require inclusion of employee SSNs in records related to air monitoring, medical surveillance, and training, similar to provisions in previous substance-specific health standards. Some stakeholders objected to the proposed requirement based on employee privacy and identity theft concerns (82 FR at 2730). OSHA recognized the validity of these concerns, but preliminarily concluded that due to the agency's past consistent practice of requiring an employee's SSN on records, any change to this requirement should be comprehensive and apply to all OSHA standards, not just the standards for beryllium (82 FR at 2730).

In 2016, in its Standards Improvement Project-Phase IV (SIP-IV) proposed rule (81 FR 68504, 68526-28 (October 4, 2016)), OSHA proposed to delete the requirement that employers include employee SSNs in records required by the agency's substance-specific standards. The 2017 final rule for beryllium included the SSN requirements, but, in the preamble, OSHA recognized that the SIP-IV rulemaking was ongoing and stated that it would revisit its decision to require employers to include SSNs in beryllium records in light of the SIP-IV rulemaking, if appropriate (82 FR at 2730).

The SIP-IV rulemaking was still ongoing when OSHA published the 2018 NPRM. Consistent with the SIP-IV proposal, OSHA proposed to modify the beryllium standard for general industry by removing the requirement to include SSNs in the recordkeeping provisions in paragraphs (n)(1)(ii)(F) (air monitoring data), (n)(3)(ii)(A) (medical surveillance), and (n)(4)(i) (training). OSHA noted that these proposed revisions would address the privacy concerns raised in response to the 2015 NPRM, while maintaining safety and health protection for workers.

Three commenters, Phylmar Regulatory Roundtable, DOD, and Materion, expressed general support for the proposed changes to the recordkeeping provisions (Document ID 0020, p. 1; 0029, p. 1; 0038, p. 34), and no commenters expressed opposition to OSHA's proposal to remove the requirement to include each employee's SSN in these three sets of records. After reviewing these comments, OSHA is finalizing the proposed deletion of the SSN requirements in this final rule. This change is also consistent with the agency's decision in the SIP-IV rulemaking, which was finalized in the months since the publication of the 2018 NPRM (84 FR 21416 (May 14, 2019)). The SIP-IV final rule deletes the requirement to include employee SSNs in records employers must maintain under the substance-specific standards that existed at the time of OSHA's 2016 SIP-IV proposal (see 84 FR at 21439-40).²³ The deletion of the SSN requirements in the beryllium general industry standard will, thus, bring this standard into line with the majority of OSHA's other substance-specific standards.

OSHA received one other comment related to SSNs in this rulemaking. A private citizen agreed that the proposed changes were "necessary and appropriate," but expressed concerns that there is no additional requirement to remove SSNs from existing records and that allowing employers the option to continue using SSNs will not effectively protect employee privacy (Document ID 0017). OSHA understands the private citizen's concerns. The SIP-IV NPRM did not propose to require employers to remove employee SSNs from existing records or to prohibit employers from using employee SSNs in their records. The agency did, however, request comment on whether employers should be

²³ The beryllium standard for general industry, which was not published until 2017, was not listed in the SIP-IV NPRM and, therefore, the SIP-IV final rule did not affect the 2017 final rule's requirement to include employee SSNs in records.

required to use an alternative identification system rather than SSNs, or to remove SSNs from existing records (81 FR at 68528).

As discussed in the preamble to the SIP-IV final rule, the comments that OSHA received in response to the SIP-IV NPRM advocated against requiring employers to use an alternative type of employee identifier or to remove SSNs from existing records (84 FR at 21440). For example, the Construction Industry Safety Coalition (CISC) supported OSHA's statements in the SIP-IV NPRM that employers would not be required to delete employee SSNs from existing records, would not be required to use an alternative employee identifier on existing records, and would still be permitted to use SSNs if they wish to do so. CISC stated that limiting employers' flexibility to come up with an identification system that works best for their situations would create an undue compliance burden (84 FR at 21440). After considering the comments, OSHA decided in the SIP-IV final rule to proceed with removing the SSN collection requirements from previously published standards, but not to require employers to delete employee SSNs from existing records or to use an alternative employee identifier.

In order to maintain consistency among OSHA recordkeeping requirements for substance-specific standards, the agency has decided not to require employers to delete employee SSNs from existing records relating to beryllium or to use an alternative employee identifier. The final rule allows employers the option to still use SSNs or to use some other alternative employee identifier system, as explained in the SIP-IV final rule. This will give employers the flexibility to choose the best option for their particular circumstance and will avoid unnecessarily increasing employers' compliance burdens.

Additional Comments.

The scope of the 2018 proposal was limited to the specific revisions and clarifications to the beryllium standard identified in the NPRM. The NPRM did not invite comment on all of the agency's underlying determinations from the 2017 beryllium final rule. As such, OSHA determined that some comments the agency received in response to the 2018 NPRM pertained to subjects outside the scope of the proposal. OSHA briefly addresses these comments below.

Two commenters addressed issues related to OSHA's significant risk finding from the 2017 final rule. One commenter focused on the risk of health effects related to beryllium exposure in the aluminum smelting industry and the methodologies underlying OSHA's risk assessment of occupational exposure to beryllium (Document ID 0026, Attachment 2, pp. 9-16). Another took issue with OSHA's risk determination pertaining to dermal contact with beryllium and argued that the current standard did not distinguish between the chemical forms of beryllium and its varying risk of injury from dermal contact (Document ID 0038, pp. 13-15). OSHA addressed these concerns about risk in the 2017 final rule and determined that the beryllium standard addresses a significant risk (see 82 FR at 2545-52). The changes and clarifications proposed by the 2018 NPRM do not affect that determination.

Another commenter took issue with the revised PEL for beryllium set in the 2017 final rule, suggesting that a lower PEL was needed to protect workers from CBD and lung cancer (Document ID 0028, p. 1). Although OSHA determined in the 2017 final rule that there remains a significant risk of material impairment of health at the 0.2 $\mu\text{g}/\text{m}^3$ PEL and the 2.0 ug/m^3 STEL, the agency further determined that it could not demonstrate

that a lower PEL would be technologically feasible (82 FR at 2552). Again, OSHA did not propose to revisit this finding in this rulemaking.

List of Subjects for 29 CFR Part 1910

Beryllium, General industry, Health, Occupational safety and health.

Authority

Loren Sweatt, Principal Deputy Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, directed the preparation of this document. The agency issues the sections under the following authorities: 29 U.S.C. 653, 655, 657; Secretary of Labor's Order 1-2012 (77 FR 3912); 29 CFR part 1911; and 5 U.S.C. 553, as applicable.

Signed at Washington, DC, on May 13, 2020.

Loren Sweatt,

Principal Deputy Assistant Secretary of Labor for Occupational Safety and Health.

Amendments to Standards

For the reasons set forth in the preamble, chapter XVII of title 29, part 1910 is amended to read as follows:

PART 1910--OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority section for part 1910, subpart Z, continues to read as follows:

Authority: 29 U.S.C. 653, 655, 657; Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 6-96 (62 FR 111), 3-2000 (65 FR 50017), 5-2002 (67 FR 65008), 5-2007 (72 FR 31160), 4-2010 (75 FR 55355), or 1-2012 (77 FR 3912); and 29 CFR part 1911.

All of subpart Z issued under [29 U.S.C. 655\(b\)](#), except those substances that have exposure limits listed in Tables Z-1, Z-2, and Z-3 of § 1910.1000. The latter were issued under [29 U.S.C. 655\(a\)](#).

Section 1910.1000, Tables Z-1, Z-2 and Z-3 also issued under [5 U.S.C. 553](#), but not under 29 CFR part 1911 except for the arsenic (organic compounds), benzene, cotton dust, and chromium (VI) listings.

Section 1910.1001 also issued under [40 U.S.C. 3704](#) and [5 U.S.C. 553](#).

Section 1910.1002 also issued under [5 U.S.C. 553](#), but not under [29 U.S.C. 655](#) or 29 CFR part 1911.

Sections 1910.1018, 1910.1029, and 1910.1200 also issued under [29 U.S.C. 653](#).

Section 1910.1030 also issued under [Public Law 106-430, 114 Stat. 1901](#).

Section 1910.1201 also issued under 49 U.S.C. 1801-1819 and [5 U.S.C. 553](#).

2. Amend § 1910.1024 by:

A. Revising the definitions for “Beryllium sensitization,” “Beryllium work area,” “CBD diagnostic center,” “Chronic beryllium disease (CBD),” and “Dermal contact with beryllium”.

B. Revise paragraphs (f)(1)(i)(D), (f)(ii)(B), (h)(2)(i), (h)(3)(iii), (i)(1) introductory text, (i)(2), (i)(4)(ii), (j)(3), (k)(2)(i)(B), (k)(2)(iii) and (iv), (k)(7)(i) introductory text, (k)(7)(ii) through (vi), (l)(1)(i)(B), (l)(1)(ii), (m)(3), (m)(4)(ii)(A), (m)(4)(ii)(E), (n)(1)(ii)(F), (n)(3)(ii)(A), (n)(4)(i), and Appendix A.

The revisions read as follows:

§ 1910.1024 Beryllium.

* * * * *

(b) * * *

Beryllium sensitization means a response in the immune system of a specific individual who has been exposed to beryllium. There are no associated physical or clinical symptoms and no illness or disability with beryllium sensitization alone, but the response that occurs through beryllium sensitization can enable the immune system to recognize and react to beryllium. While not every beryllium-sensitized person will develop chronic beryllium disease (CBD), beryllium sensitization is essential for development of CBD.

Beryllium work area means any work area where materials that contain at least 0.1 percent beryllium by weight are processed either:

- (1) During any of the operations listed in Appendix A of this standard; or
- (2) Where employees are, or can reasonably be expected to be, exposed to airborne beryllium at or above the action level.

CBD diagnostic center means a medical diagnostic center that has a pulmonologist or pulmonary specialist on staff and on-site facilities to perform a clinical evaluation for the presence of chronic beryllium disease (CBD). The CBD diagnostic center must have the capacity to perform pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. The CBD diagnostic center must also have the capacity to transfer BAL samples to a laboratory for appropriate diagnostic testing within 24 hours. The pulmonologist or pulmonary specialist must be able to interpret the biopsy pathology and the BAL diagnostic test results.

Chronic beryllium disease (CBD) means a chronic granulomatous lung disease caused by inhalation of airborne beryllium by an individual who is beryllium sensitized.

Confirmed positive means the person tested has had two abnormal BeLPT test results, an abnormal and a borderline test result, or three borderline test results, obtained from tests conducted within a three-year period. It also means the result of a more reliable and accurate test indicating a person has been identified as having beryllium sensitization.

* * * * *

Dermal contact with beryllium means skin exposure to:

- (1) Soluble beryllium compounds containing beryllium in concentrations greater than or equal to 0.1 percent by weight;
- (2) Solutions containing beryllium in concentrations greater than or equal to 0.1 percent by weight; or
- (3) Visible dust, fumes, or mists containing beryllium in concentrations greater than or equal to 0.1 percent by weight. The handling of beryllium materials in non-particulate solid form that are free from visible dust containing beryllium in concentrations greater than or equal to 0.1 percent by weight is not considered dermal contact under the standard.

* * * * *

(f) * * *

(1) * * *

(i) * * *

(D) Procedures for minimizing cross-contamination, including the transfer of beryllium between surfaces, equipment, clothing, materials, and articles within beryllium work areas;

* * * * *

(ii) * * *

(B) The employer is notified that an employee is eligible for medical removal in accordance with paragraph (l)(1) of this standard, referred for evaluation at a CBD diagnostic center, or shows signs or symptoms associated with exposure to beryllium; or

* * * * *

(h) * * *

(2) * * *

(i) The employer must ensure that each employee removes all beryllium-contaminated personal protective clothing and equipment at the end of the work shift, at the completion of all tasks involving beryllium, or when personal protective clothing or equipment becomes visibly contaminated with beryllium, whichever comes first.

* * * * *

(3) * * *

(iii) The employer must inform in writing the persons or the business entities who launder, clean, or repair the personal protective clothing or equipment required by this standard of the potentially harmful effects of exposure to beryllium and that the personal protective clothing and equipment must be handled in accordance with this standard.

* * * * *

(i) * * *

(1) *General*. For each employee working in a beryllium work area or who can reasonably be expected to have dermal contact with beryllium, the employer must:

* * * * *

(2) *Change rooms*. In addition to the requirements of paragraph (i)(1)(i) of this standard, the employer must provide employees who are required to use personal protective clothing or equipment under paragraph (h)(1)(ii) of this standard with a designated change room in accordance with this standard and the Sanitation standard (§ 1910.141) where employees are required to remove their personal clothing.

* * * * *

(4) * * *

(ii) No employees enter any eating or drinking area with beryllium-contaminated personal protective clothing or equipment unless, prior to entry, it is cleaned, as necessary, to be as free as practicable of beryllium by methods that do not disperse beryllium into the air or onto an employee's body; and

* * * * *

(j) * * *

(3) *Disposal, recycling, and reuse*. (i) Except for intra-plant transfers, when the employer transfers materials that contain at least 0.1 percent beryllium by weight or are contaminated with beryllium for disposal, recycling, or reuse, the employer must label the materials in accordance with paragraph (m)(3) of this standard;

(ii) Except for intra-plant transfers, materials designated for disposal that contain at least 0.1 percent beryllium by weight or are contaminated with beryllium must be cleaned to

be as free as practicable of beryllium or placed in enclosures that prevent the release of beryllium-containing particulate or solutions under normal conditions of use, storage, or transport, such as bags or containers; and

(iii) Except for intra-plant transfers, materials designated for recycling or reuse that contain at least 0.1 percent beryllium by weight or are contaminated with beryllium must be cleaned to be as free as practicable of beryllium or placed in enclosures that prevent the release of beryllium-containing particulate or solutions under normal conditions of use, storage, or transport, such as bags or containers.

* * * * *

(k) * * *

(2) * * *

(i) * * *

(B) An employee meets the criteria of paragraph (k)(1)(i)(B) of this standard.

* * * * *

(iii) At the termination of employment for each employee who meets any of the criteria of paragraph (k)(1)(i) of this standard at the time the employee's employment terminates, unless an examination has been provided in accordance with this standard during the six months prior to the date of termination. Each employee who meets the criteria of paragraph (k)(1)(i)(C) of this standard and who has not received an examination since exposure to beryllium during the emergency must be provided an examination at the time the employee's employment terminates.

(iv) For an employee who meets the criteria of paragraph (k)(1)(i)(C) of this standard:

(A) If that employee has not received a medical examination within the previous two years pursuant to paragraph (k)(1)(i) of this standard, then within 30 days after the employee meets the criteria of paragraph (k)(1)(i)(C) of this standard; or

(B) If that employee has received a medical examination within the previous two years pursuant to paragraph (k)(1)(i) of this standard, then at least one year but no more than two years after the employee meets the criteria of paragraph (k)(1)(i)(C) of this standard.

* * * * *

(7) * * *

(i) The employer must provide an evaluation at no cost to the employee at a CBD diagnostic center that is mutually agreed upon by the employer and the employee. The evaluation at the CBD diagnostic center must be scheduled within 30 days, and must occur within a reasonable time, of:

* * * * *

(ii) The employer must ensure that, as part of the evaluation, the employee is offered any tests deemed appropriate by the examining physician at the CBD diagnostic center, such as pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. If any of the tests deemed appropriate by the examining physician are not available at the CBD diagnostic center, they may be performed at another location that is mutually agreed upon by the employer and the employee.

(iii) The employer must ensure that the employee receives a written medical report from the CBD diagnostic center that contains all the information required in paragraph

(k)(5)(i), (ii), (iv), and (v) of this standard and that the PLHCP explains the results of the examination to the employee within 30 days of the examination.

(iv) The employer must obtain a written medical opinion from the CBD diagnostic center within 30 days of the medical examination. The written medical opinion must contain only the information in paragraph (k)(6)(i), as applicable, unless the employee provides written authorization to release additional information. If the employee provides written authorization, the written opinion must also contain the information from paragraphs (k)(6)(ii), (iv), and (v), if applicable.

(v) The employer must ensure that each employee receives a copy of the written medical opinion from the CBD diagnostic center described in paragraph (k)(7) of this standard within 30 days of any medical examination performed for that employee.

(vi) After an employee has received the initial clinical evaluation at a CBD diagnostic center described in paragraphs (k)(7)(i) and (ii) of this standard, the employee may choose to have any subsequent medical examinations for which the employee is eligible under paragraph (k) of this standard performed at a CBD diagnostic center mutually agreed upon by the employer and the employee, and the employer must provide such examinations at no cost to the employee.

* * * * *

(l) * * *

(1)***

(i) * * *

(B) A written medical report recommending removal from airborne exposure to beryllium in accordance with paragraph (k)(5)(v) or (k)(7)(iii) of this standard; or

(ii) The employer receives a written medical opinion recommending removal from airborne exposure to beryllium in accordance with paragraph (k)(6)(v) or (k)(7)(iv) of this standard.

* * * * *

(m) * * *

(3) *Warning labels.* Consistent with the HCS (§ 1910.1200), the employer must label each immediate container of clothing, equipment, and materials contaminated with beryllium, and must, at a minimum, include the following on the label:

DANGER

CONTAINS BERYLLIUM

MAY CAUSE CANCER

CAUSES DAMAGE TO LUNGS

AVOID CREATING DUST

DO NOT GET ON SKIN

(4) * * *

(ii) * * *

(A) The health hazards associated with airborne exposure to and dermal contact with beryllium, including the signs and symptoms of CBD;

* * * * *

(E) Measures employees can take to protect themselves from airborne exposure to and dermal contact with beryllium, including personal hygiene practices;

* * * * *

(n) * * *

(1) * * *

(ii) * * *

(F) The name and job classification of each employee represented by the monitoring, indicating which employees were actually monitored.

* * * * *

(3) * * *

(ii) * * *

(A) Name and job classification;

* * * * *

(4) * * *

(i) At the completion of any training required by this standard, the employer must prepare a record that indicates the name and job classification of each employee trained, the date the training was completed, and the topic of the training.

* * * * *

(p) *Appendix*. Table A.1 in this appendix sets forth the operations that, where performed under the circumstances described in the column heading above the particular operations, trigger the requirement for a beryllium work area.

Appendix A to § 1910.1024 - Operations for Establishing Beryllium Work Areas

Paragraph (b) of this standard defines a *beryllium work area* as any work area where materials that contain at least 0.1 percent beryllium by weight are processed (1) during any of the operations listed in Appendix A of this standard, or (2) where employees are, or can reasonably be expected to be, exposed to airborne beryllium at or

above the action level. Table A.1 in this appendix sets forth the operations that, where performed under the circumstances described in the column heading above the particular operations, trigger the requirement for a beryllium work area.

Table A.1: Operations for Establishing Beryllium Work Areas Where Processing Materials Containing at Least 0.1 Percent Beryllium by Weight

Beryllium Metal Alloy Operations (generally < 10 % beryllium by weight)	Beryllium Composite Operations (generally ≥ 10% beryllium by weight) and Beryllium Metal Operations	Beryllium Oxide Operations
Abrasive Blasting	Abrasive Blasting	Abrasive Blasting
Abrasive Processing	Abrasive Processing	Abrasive Processing
Abrasive Sawing	Abrasive Sawing	Abrasive Sawing
Annealing	Annealing	Boring
Bright Cleaning	Atomizing	Brazing (> 1,100° C)
Brushing	Attritioning	Broaching with green ceramic
Buffing	Blanking	Brushing
Burnishing	Bonding	Buffing
Casting	Boring	Centerless Grinding
Centerless Grinding	Breaking	Chemical Cleaning
Chemical Cleaning	Bright Cleaning	Chemical Etching
Chemical Etching	Broaching	CNC Machining
Chemical Milling	Brushing	Cold Isostatic Pressing (CIP)
Dross Handling	Buffing	Crushing
Deburring (grinding)	Burnishing	
Electrical Chemical	Casting	

Machining (ECM)	Centerless Grinding	Cutting
Electrical Discharge	Chemical Cleaning	Deburring (grinding)
Machining (EDM)	Chemical Etching	Deburring (non-grinding)
Extrusion	Chemical Milling	Destructive Testing
Forging	CNC Machining	Dicing
Grinding	Cold Isostatic Pressing	Drilling
Heat Treating (in air)	Cold Pilger	Dry/Wet Tumbling
High Speed Machining (>10,000 rpm)	Crushing	Extrusion
Hot Rolling	Cutting	Filing by Hand
Lapping	Deburring	Firing of Green Ceramic
Laser Cutting	Dicing	Firing of Refractory
Laser Machining	Drawing	Metallization (> 1,100° C)
Laser Scribing	Drilling	Grinding
Laser Marking	Dross Handling	Honing
Melting	Electrical Chemical	Hot Isostatic Pressing
Photo-Etching	Machining (ECM)	(HIP)
Pickling	Electrical Discharge	Lapping
Point and Chamfer	Machining (EDM)	Laser Cutting
Polishing	Extrusion	Laser Machining
Torch Cutting (i.e., oxy- acetylene)	Filing by Hand	Laser Scribing
Tumbling	Forging	Laser Marking
	Grinding	Machining
	Heading	Milling

Water-jet Cutting	Heat Treating	Piercing
Welding	Honing	Mixing
Sanding	Hot Isostatic Pressing	Plasma Spray
Slab Milling	(HIP)	Polishing
	Lapping	Powder Handling
	Laser Cutting	Powder Pressing
	Laser Machining	Reaming
	Laser Scribing	Sanding
	Laser Marking	Sectioning
	Machining	Shearing
	Melting	Sintering of Green Ceramic
	Milling	Sintering of Refractory
	Mixing	Metallization (>1,100° C)
	Photo-Etching	Snapping
	Pickling	Spray Drying
	Piercing	Tape Casting
	Pilger	Turning
	Plasma Spray	Water Jet Cutting
	Point and Chamfer	
	Polishing	
	Powder Handling	
	Powder Pressing	
	Pressing	

	Reaming	
	Roll Bonding	
	Rolling	
	Sanding	
	Sawing (tooth blade)	
	Shearing	
	Sizing	
	Skiving	
	Slitting	
	Snapping	
	Sputtering	
	Stamping	
	Spray Drying	
	Tapping	
	Tensile Testing	
	Torch Cutting (i.e., oxy acetylene)	
	Trepanning	
	Tumbling	
	Turning	
	Vapor Deposition	
	Water-Jet Cutting	
	Welding	

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