Laboratories and Production Facilities. (f) Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up, and (g)(1) Labels and Signs of this section, shall take effect July 6, 1992.

APPENDIX A TO SECTION 1910.1030—HEPATITIS B VACCINE DECLINATION (MANDATORY)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

§ 1910.1043 Cotton dust.

(a) Scope and application. (1) This section, in its entirety, applies to the control of employee exposure to cotton dust in all workplaces where employees engage in yarn manufacturing, engage in slashing and weaving operations, or work in waste houses for textile operations.

(2) This section does not apply to the handling or processing of woven or knitted materials; to maritime operations covered by 29 CFR Parts 1915 and 1918; to harvesting or ginning of cotton; or to the construction industry.

(3) Only paragraphs (h) Medical surveillance, (k)(2) through (4) Recordkeeping—Medical Records, and Appendices B, C and D of this section apply in all work places where employees exposed to cotton dust engage in cottonseed processing or waste processing operations.

(4) This section applies to yarn manufacturing and slashing and weaving operations exclusively using washed cotton (as defined by paragraph (n) of this section) only to the extent specified by paragraph (n) of this section.

(5) This section, in its entirety, applies to the control of all employees exposure to the cotton dust generated in the preparation of washed cotton from opening until the cotton is thoroughly wetted.

(6) This section does not apply to knitting, classing or warehousing operations except that employers with these operations, if requested by NIOSH, shall grant NIOSH access to their employees and workplaces for exposure monitoring and medical examinations for purposes of a health study to be performed by NIOSH on a sampling basis.

(b) Definitions. For the purpose of this section:

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee;

Blow down means the general cleaning of a room or a part of a room by the use of compressed air.

Blow off means the use of compressed air for cleaning of short duration and usually for a specific machine or any portion of a machine.

Cotton dust means dust present in the air during the handling or processing of cotton, which may contain a mixture of many substances including ground up plant matter, fiber, bacteria, fungi, soil, pesticides, non-cotton plant matter and other contaminants which may have accumulated with the cotton during the growing, harvesting and subsequent processing or storage periods. Any dust present during the handling and processing of cotton through the weaving or knitting of fabrics, and dust present in other operations or manufacturing processes using raw or waste cotton fibers or cotton fiber byproducts from textile mills are considered cotton dust within this definition. Lubricating oil mist associated with weaving operations is not considered cotton dust.

Director means the Director of the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee;

Equivalent Instrument means a cotton dust sampling device that meets the
vertical elutriator equivalency requirements as described in paragraph (d)(1)(iii) of this section.

*Lint-free respirable cotton dust* means particles of cotton dust of approximately 15 micrometers or less aerodynamic equivalent diameter;

*Vertical elutriator cotton dust sampler* or *vertical elutriator* means a dust sampler which has a particle size cut-off at approximately 15 micrometers aerodynamic equivalent diameter when operating at the flow rate of 7.4 ± 0.2 liters of air per minute;

*Waste processing* means waste recycling (sorting, blending, cleaning and willowing) and garnetting.

*Yarn manufacturing* means all textile mill operations from opening to, but not including, slashing and weaving.

(c) Permissible exposure limits and action levels—(1) Permissible exposure limits (PEL).

(i) The employer shall assure that no employee who is exposed to cotton dust in yarn manufacturing and cotton washing operations is exposed to airborne concentrations of lint-free respirable cotton dust greater than 200 μg/m³ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(ii) The employer shall assure that no employee who is exposed to dust from “lower grade washed cotton” as defined in paragraph (n)(5) of this section is exposed in yarn manufacturing to airborne concentrations of lint-free respirable cotton dust greater than 500 μg/m³ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(iii) The employer shall assure that no employee who is exposed to cotton dust in the textile processes known as slashing and weaving is exposed to airborne concentrations of lint-free respirable cotton dust greater than 750 μg/m³ mean concentration, averaged over an eight hour period, as measured by a vertical elutriator or an equivalent instrument.

(2) Action levels.

(i) The action level for yarn manufacturing and cotton washing operations is an airborne concentration of lint-free respirable cotton dust of 100 μg/m³ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(ii) The action level for waste houses for textile operations is an airborne concentration of lint-free respirable cotton dust of 250 μg/m³ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(iii) The action level for the textile processes known as slashing and weaving is an airborne concentration of lint-free respirable cotton dust of 375 μg/m³ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(d) Exposure monitoring and measurement—(1) General.

(i) For the purposes of this section, employee exposure is that exposure which would occur if the employee were not using a respirator.

(ii) The sampling device to be used shall be either the vertical elutriator cotton dust sampler or an equivalent instrument.

(iii) If an alternative to the vertical elutriator cotton dust sampler is used, the employer shall establish equivalency by reference to an OSHA opinion or by documenting, based on data developed by the employer or supplied by the manufacturer, that the alternative sampling devices meets the following criteria:

(A) It collects respirable particulates in the same range as the vertical elutriator (approximately 15 microns);

(B) Replicate exposure data used to establish equivalency are collected in side-by-side field and laboratory comparisons; and

(C) A minimum of 100 samples over the range of 0.5 to 2 times the permissible exposure limit are collected, and 90% of these samples have an accuracy range of plus or minus 25 per cent of the vertical elutriator reading with a 95% confidence level as demonstrated by a statistically valid protocol. (An acceptable protocol for demonstrating equivalency is described in appendix E of this section.)

(iv) OSHA will issue a written opinion stating that an instrument is equivalent to a vertical elutriator cotton dust sampler if
(A) A manufacturer or employer requests an opinion in writing and supplies the following information:

(1) Sufficient test data to demonstrate that the instrument meets the requirements specified in this paragraph and the protocol specified in appendix E of this section;

(2) Any other relevant information about the instrument and its testing requested by OSHA; and

(3) A certification by the manufacturer or employer that the information supplied is accurate, and

(B) if OSHA finds, based on information submitted about the instrument, that the instrument meets the requirements for equivalency specified by paragraph (d) of this section.

(2) Initial monitoring. Each employer who has a place of employment within the scope of paragraph (a)(1), (a)(4), or (a)(5) of this section shall conduct monitoring by obtaining measurements which are representative of the exposure of all employees to airborne concentrations of lint-free respirable cotton dust over an eight-hour period. The sampling program shall include at least one determination during each shift for each work area.

(3) Periodic monitoring. (i) If the initial monitoring required by paragraph (d)(2) of this section or any subsequent monitoring reveals employee exposure to be at or below the permissible exposure limit, the employer shall repeat the monitoring for those employees at least annually.

(ii) If the initial monitoring required by paragraph (d)(2) of this section or any subsequent monitoring reveals employee exposure to be above the PEL, the employer shall repeat the monitoring for those employees at least every six months.

(iii) Whenever there has been a production, process, or control change which may result in new or additional exposure to cotton dust, or whenever the employer has any other reason to suspect an increase in employee exposure, the employer shall repeat the monitoring and measurements for those employees affected by the change or increase.

(4) Employee notification. (i) The employer must, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to employees.

(ii) Whenever the results indicate that the employee’s exposure exceeds the applicable permissible exposure limit specified in paragraph (c) of this section, the employer shall include in the written notice a statement that the permissible exposure limit was exceeded and a description of the corrective action taken to reduce exposure below the permissible exposure limit.

(e) Methods of compliance—(1) Engineering and work practice controls. The employer shall institute engineering and work practice controls to reduce and maintain employee exposure to cotton dust at or below the permissible exposure limit specified in paragraph (c) of this section, except to the extent that the employer can establish that such controls are not feasible.

(2) Whenever feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the permissible exposure limit, the employer shall nonetheless institute these controls to reduce exposure to the lowest feasible level, and shall supplement these controls with the use of respirators which shall comply with the provisions of paragraph (f) of this section.

(3) Compliance program. (i) Where the most recent exposure monitoring data indicates that any employee is exposed to cotton dust levels greater than the permissible exposure limit, the employer shall establish and implement a written program sufficient to reduce exposures to or below the permissible exposure limit solely by means of engineering controls and work practices as required by paragraph (e)(1) of this section.

(ii) The written program shall include at least the following:

(A) A description of each operation or process resulting in employee exposure to cotton dust at levels greater than the PEL;

(B) Engineering plans and other studies used to determine the controls for each process;
(C) A report of the technology considered in meeting the permissible exposure limit;
(D) Monitoring data obtained in accordance with paragraph (d) of this section;
(E) A detailed schedule for development and implementation of engineering and work practice controls, including exposure levels projected to be achieved by such controls;
(F) Work practice program; and
(G) Other relevant information.

(iii) The employer’s schedule as set forth in the compliance program, shall project completion of the implementation of the compliance program no later than March 27, 1984 or as soon as possible if monitoring after March 27, 1984 reveals exposures over the PEL, except as provided in paragraph (m)(2)(ii)(B) of this section.

(iv) The employer shall complete the steps set forth in his program by the dates in the schedule.

(v) Written programs shall be submitted, upon request, to the Assistant Secretary and the Director, and shall be available at the worksite for examination and copying by the Assistant Secretary, the Director, and any affected employee or their designated representatives.

(vi) The written program required under paragraph (e)(3) of this section shall be revised and updated when necessary to reflect the current status of the program and current exposure levels.

4. Mechanical ventilation. When mechanical ventilation is used to control exposure, measurements which demonstrate the effectiveness of the system to control exposure, such as capture velocity, duct velocity, or static pressure shall be made at reasonable intervals.

5. Respiratory protection—(1) General. For employees who are required to use respirators by this section, the employer must provide each employee an appropriate respirator that complies with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls.
(ii) Maintenance and repair activities for which engineering and work-practice controls are not feasible.
(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limits.

(iv) Work operations specified under paragraph (g)(1) of this section.
(v) Periods for which an employee requests a respirator.

(2) Respirator program. (i) The employer must implement a respiratory protection program in accordance with §1910.134(b) through (d) (except (d)(1)(iii)), and (f) through (m), which covers each employee required by this section to use a respirator.

(ii) Whenever a physician determines that an employee who works in an area in which the cotton-dust concentration exceeds the PEL is unable to use a respirator, including a powered air-purifying respirator, the employee must be given the opportunity to transfer to an available position, or to a position that becomes available later, that has a cotton-dust concentration at or below the PEL. The employer must ensure that such employees retain their current wage rate or other benefits as a result of the transfer.

(3) Respirator selection. (i) Employers must:

(A) Select, and provide to employees, the appropriate respirators specified in paragraph (d)(3)(i)(A) of 29 CFR 1910.134; however, employers must not select or use filtering facepieces for protection against cotton dust concentrations greater than five times (5 x) the PEL.

(B) Provide HEPA filters for powered and non-powered air-purifying respirators used at cotton dust concentrations greater than ten times (10 x) the PEL.

(ii) Employers must provide an employee with a powered air-purifying respirator (PAPR) instead of a non-powered air-purifying respirator selected according to paragraph (f)(3)(i) of this standard when the employee chooses to use a PAPR and it provides adequate protection to the employee as specified by paragraph (f)(3)(i) of this standard.
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(g) **Work practices.** Each employer shall, regardless of the level of employee exposure, immediately establish and implement a written program of work practices which shall minimize cotton dust exposure. The following shall be included where applicable:

1. Compressed air “blow down” cleaning shall be prohibited where alternative means are feasible. Where compressed air is used for cleaning, the employees performing the “blow down” or “blow off” shall wear suitable respirators. Employees whose presence is not required to perform “blow down” or “blow off” shall be required to leave the area affected by the “blow down” or “blow off” during this cleaning operation.

2. Cleaning of clothing or floors with compressed air shall be prohibited.

3. Floor sweeping shall be performed with a vacuum or with methods designed to minimize dispersal of dust.

4. In areas where employees are exposed to concentrations of cotton dust greater than the permissible exposure limit, cotton and cotton waste shall be stacked, sorted, baled, dumped, removed or otherwise handled by mechanical means, except where the employer can show that it is infeasible to do so. Where infeasible, the method used for handling cotton and cotton waste shall be the method which reduces exposure to the lowest level feasible.

(h) **Medical surveillance—**

1. **General.** (i) Each employer covered by the standard shall institute a program of medical surveillance for all employees exposed to cotton dust.

(ii) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided without cost to the employee.

(iii) Persons other than licensed physicians, who administer the pulmonary function testing required by this section shall have completed a NIOSH-approved training course in spirometry.

2. **Initial examinations.** The employer shall provide medical surveillance to each employee who is or may be exposed to cotton dust. For new employees, this examination shall be provided prior to initial assignment. The medical surveillance shall include at least the following:

   (i) A medical history;

   (ii) The standardized questionnaire contained in appendix B; and

   (iii) A pulmonary function measurement, including a determination of forced vital capacity (FVC) and forced expiratory volume in one second ($FEV_1$), the $FEV_1$/FVC ratio, and the percentage that the measured values of $FEV_1$ and FVC differ from the predicted values, using the standard tables in appendix C. These determinations shall be made for each employee before the employee enters the workplace on the first day of the work week, preceded by at least 35 hours of no exposure to cotton dust. The tests shall be repeated during the shift, no less than 4 and no more than 10 hours after the beginning of the work shift; and, in any event, no more than one hour after cessation of exposure. Such exposure shall be typical of the employee’s usual workplace exposure. The predicted $FEV_1$ and FVC for blacks shall be multiplied by 0.85 to adjust for ethnic differences.

   (iv) Based upon the questionnaire results, each employee shall be graded according to Schilling’s byssinosis classification system.

3. **Periodic examinations.** (i) The employer shall provide at least annual medical surveillance for all employees exposed to cotton dust above the action level in yarn manufacturing, slashing and weaving, cotton washing and waste house operations. The employer shall provide medical surveillance at least every two years for all employees exposed to cotton dust at or below the action level, for all employees exposed to cotton dust from washed cotton (except from washed cotton defined in paragraph (n)(3) of this section), and for all employees exposed to cotton dust in cottonseed processing and waste processing operations. Periodic medical surveillance shall include at least an update of the medical history, standardized questionnaire (App. B–111), Schilling byssinosis grade, and the pulmonary function measurements in paragraph (h)(2)(iii) of this section.

(ii) Medical surveillance as required in paragraph (h)(3)(i) of this section shall be provided every six months for
all employees in the following categories:
(A) An FEV\textsubscript{1} of greater than 80 percent of the predicted value, but with an FEV\textsubscript{1} decrement of 5 percent or 200 ml. on a first working day;
(B) An FEV\textsubscript{1} of less than 80 percent of the predicted value; or
(C) Where, in the opinion of the physician, any significant change in questionnaire findings, pulmonary function results, or other diagnostic tests have occurred.
(iii) An employee whose FEV\textsubscript{1} is less than 60 percent of the predicted value shall be referred to a physician for a detailed pulmonary examination.
(iv) A comparison shall be made between the current examination results and those of previous examinations and a determination made by the physician as to whether there has been a significant change.
(iii) Information provided to the physician. The employer shall provide the following information to the examination physician:
(i) A copy of this regulation and its Appendices:
(ii) A description of the affected employee’s duties as they relate to the employee’s exposure;
(iii) The employee’s exposure level or anticipated exposure level;
(iv) A description of any personal protective equipment used or to be used; and
(v) Information from previous medical examinations of the affected employee which is not readily available to the examining physician.
(5) Physician’s written opinion. (i) The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:
(A) The results of the medical examination and tests including the FEV\textsubscript{1}, FVC, AND FEV\textsubscript{1}/FVC ratio;
(B) The physician’s opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee’s health from exposure to cotton dust;
(C) The physician’s recommended limitations upon the employee’s exposure to cotton dust or upon the employee’s use of respirators including a determination of whether an employee can wear a negative pressure respirator, and where the employee cannot, a determination of the employee’s ability to wear a powered air purifying respirator; and,
(D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.
(ii) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure.
(i) Employee education and training—
(1) Training program. (i) The employer shall train each employee exposed to cotton dust in accordance with the requirements of this section. The employer shall institute a training program and ensure employee participation in the program.
(A) The acute and long term health hazards associated with exposure to cotton dust;
(B) The names and descriptions of jobs and processes which could result in exposure to cotton dust at or above the PEL.
(C) The measures, including work practices required by paragraph (g) of this section, necessary to protect the employee from exposures in excess of the permissible exposure limit;
(D) The purpose, proper use and limitations of respirators required by paragraph (f) of this section;
(E) The purpose for and a description of the medical surveillance program required by paragraph (h) of this section and other information which will aid exposed employees in understanding the hazards of cotton dust exposure; and
(F) The contents of this standard and its appendices.
(ii) The training program shall be provided prior to initial assignment and shall be repeated annually for each employee exposed to cotton dust, when job assignments or work processes change and when employee performance indicates a need for retraining.
(2) Access to training materials. (i) Each employer shall post a copy of this section with its appendices in a public location at the workplace, and shall,
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upon request, make copies available to employees.

(ii) The employer shall provide all materials relating to the employee training and information program to the Assistant Secretary and the Director upon request.

(j) Signs. (1) The employer shall post the following warning sign in each work area where the permissible exposure limit for cotton dust is exceeded:

DANGER
COTTON DUST
CAUSES DAMAGE TO LUNGS
(BYSSINOSIS)
WEAR RESPIRATORY PROTECTION IN
THIS AREA

(2) Prior to June 1, 2016, employers may use the following legend in lieu of that specified in paragraph (j)(1) of this section:

WARNING
COTTON DUST WORK AREA
MAY CAUSE ACUTE OR DELAYED
LUNG INJURY
(BYSSINOSIS)
RESPIRATORS
REQUIRED IN THIS AREA

(k) Recordkeeping—(1) Exposure measurements. (i) The employer shall establish and maintain an accurate record of all measurements required by paragraph (d) of this section.

(ii) The record shall include:

(A) A log containing the items listed in paragraph IV (a) of appendix A, and the dates, number, duration, and results of each of the samples taken, including a description of the procedure used to determine representative employee exposure;

(B) The type of protective devices worn, if any, and length of time worn; and

(C) The names, social security numbers, job classifications, and exposure levels of employees whose exposure the measurement is intended to represent.

(iii) The employer shall maintain this record for at least 20 years.

(2) Medical surveillance. (i) The employer shall establish and maintain an accurate medical record for each employee subject to medical surveillance required by paragraph (h) of this section.

(ii) The record shall include:

(A) The name and social security number and description of the duties of the employee;

(B) A copy of the medical examination results including the medical history, questionnaire response, results of all tests, and the physician’s recommendation;

(C) A copy of the physician’s written opinion;

(D) Any employee medical complaints related to exposure to cotton dust;

(E) A copy of this standard and its appendices, except that the employer may keep one copy of the standard and the appendices for all employees, provided that he references the standard and appendices in the medical surveillance record of each employee; and

(F) A copy of the information provided to the physician as required by paragraph (h)(4) of this section.

(iii) The employer shall maintain this record for at least 20 years.

(3) Availability. (i) The employer shall make all records required to be maintained by paragraph (k) of this section available to the Assistant Secretary and the Director for examination and copying.

(ii) Employee exposure measurement records and employee medical records required by this paragraph shall be provided upon request to employees, designated representatives, and the Assistant Secretary in accordance with 29 CFR 1910.1020 (a) through (e) and (g) through (i).

(4) Transfer of records. (i) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by paragraph (k) of this section.

(ii) The employer shall also comply with any additional requirements involving transfer of records set forth in 29 CFR 1910.1020(h).

(l) Observation of monitoring. (1) The employer shall provide affected employees or their designated representatives an opportunity to observe any measuring or monitoring of employee exposure to cotton dust conducted pursuant to paragraph (d) of this section.

(2) Whenever observation of the measuring or monitoring of employee exposure to cotton dust requires entry into an area where the use of personal
(3) Without interfering with the measurement, observers shall be entitled to:
   (i) An explanation of the measurement procedures;
   (ii) An opportunity to observe all steps related to the measurement of airborne concentrations of cotton dust performed at the place of exposure; and
   (iii) An opportunity to record the results obtained.

(m) Washed Cotton—(1) Exemptions. Cotton, after it has been washed by the processes described in this paragraph, is exempt from all or parts of this section as specified if the requirements of this paragraph are met.

(2) Initial requirements. (i) In order for an employer to qualify as exempt or partially exempt from this standard for operations using washed cotton, the employer must demonstrate that the cotton was washed in a facility which is open to inspection by the Assistant Secretary and the employer must provide sufficient accurate documentary evidence to demonstrate that the washing methods utilized meet the requirements of this paragraph.

   (ii) An employer who handles or processes cotton which has been washed in a facility not under the employer’s control and claims an exemption or partial exemption under this paragraph, must obtain from the cotton washer and make available at the worksite, to the Assistant Secretary, to any affected employee, or to their designated representative the following:

      (A) A certification by the washer of the cotton of the grade of cotton, the type of washing process, and that the batch meets the requirements of this paragraph;
      (B) Sufficient accurate documentation by the washer of the cotton grades and washing process; and
      (C) An authorization by the washer that the Assistant Secretary or the Director may inspect the washer’s washing facilities and documentation of the process.

   (3) Medical and dyed cotton. Medical grade (USP) cotton, cotton that has been scoured, bleached and dyed, and mercerized yarn shall be exempt from all provisions of this standard.

   (4) Higher grade washed cotton. The handling or processing of cotton classified as “low middling light spotted or better” (color grade 52 or better and leaf grade code 5 or better according to the 1993 USDA classification system) shall be exempt from all provisions of the standard except the requirements of paragraphs (h) medical surveillance, (k)(2) through (4) recordkeeping—medical records, and Appendices B, C, and D of this section, if they have been washed on one of the following systems:

      (i) On a continuous batt system or a rayon rinse system including the following conditions:

          (A) With water;
          (B) At a temperature of no less than 60 °C; and
          (C) With a water-to-fiber ratio of no less than 40:1; and
          (D) With bacterial levels in the wash water controlled to limit bacterial contamination of the cotton.

      (ii) On a batch kier washing system including the following conditions:

          (A) With water;
          (B) With cotton fiber mechanically opened and thoroughly prewetted before forming the cake;
          (C) For low-temperature processing, at a temperature of no less than 60 °C with a water-to-fiber ratio of no less than 40:1; or, for high-temperature processing, at a temperature of no less than 93 °C with a water-to-fiber ratio of no less than 15:1;
          (D) With a minimum of one wash cycle followed by two rinse cycles for each batch, using fresh water in each cycle, and
          (E) With bacterial levels in the wash water controlled to limit bacterial contamination of the cotton.

   (5) Lower grade washed cotton. The handling and processing of cotton of grades lower than “low middling light spotted,” that has been washed as specified in paragraph (n)(4) of this section and has also been bleached, shall be exempt from all provisions of the standard except the requirements of paragraphs (c)(1)(ii) Permissible Exposure


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II. SAMPLING EQUIPMENT

(a) Sampler. The instrument selected for monitoring is the Lumsden-Lynch vertical elutriator. It should operate at a flow rate of 7.4±0.2 liters/minute.

The samplers should be cleaned prior to sampling. The pumps should be monitored during sampling.

(b) Filter Holder. A three-piece cassette constructed of polystyrene designed to hold a 37-mm diameter filter should be used. Care must be exercised to insure that an adequate seal exists between elements of the cassette.

(c) Filters and Support Pads. The membrane filters used should be polyvinyl chloride with a 5-μm pore size and 37-mm diameter. A support pad, commonly called a backup pad, should be used under the filter membrane in the field monitor cassette.

(d) Balance. A balance sensitive to 10 micrograms should be used.

(e) Monitoring equipment for use in Class III hazardous locations must be approved for use in such locations, in accordance with the requirements of the OSHA electrical standards in subpart S of part 1910.

III. INSTRUMENT CALIBRATION PROCEDURE

Samplers shall be calibrated when first received from the factory, after repair, and after receiving any abuse. The samplers should be calibrated in the laboratory both before they are used in the field and after they have been used to collect a large number of field samples. The primary standard, such as a spirometer or other standard calibrating instruments such as a wet test meter or a large bubble meter or dry gas meter, should be used. Instructions for calibration with the wet test meter follow. If another calibration device is selected, equivalent procedures should be used:

(a) Level wet test meter. Check the water level which should just touch the calibration point at the left side of the meter. If water level is low, add water 1–2 °F warmer than room temperature of till point. Run the meter for 30 minutes before calibration;

(b) Place the polyvinyl chloride membrane filter in the filter cassette;

(c) Assemble the calibration sampling train;

(d) Connect the wet test meter to the train.

The pointer on the meter should run clockwise and a pressure drop of not more than 1.0 inch of water indicated. If the pressure drop is greater than 1.0, disconnect and check the system;

(e) Operate the system for ten minutes before starting the calibration;

(f) Check the vacuum gauge on the pump to insure that the pressure drop across the orifice exceeds 17 inches of mercury;

(g) Record the following on calibration data sheets:

APPENDIX A TO §1910.1043—AIR SAMPLING AND ANALYTICAL PROCEDURES FOR DETERMINING CONCENTRATIONS OF COTTON DUST

I. SAMPLING LOCATIONS

The sampling procedures must be designed so that samples of the actual dust concentrations are collected accurately and consistently and reflect the concentrations of dust at the place and time of sampling. Sufficient number of 6-hour area samples in each distinct work area of the plant should be collected at locations which provide representative samples of air to which the worker is exposed. In order to avoid filter overloading, sampling time may be shortened when sampling in dusty areas. Samples in each work area should be gathered simultaneously or sequentially during a normal operating period. The daily time-weighted average (TWA) exposure of each worker can then be determined by using the following formula:

\[
\text{Total hours exposed} 
\times \text{Summation of hours spent in each location and the dust concentration in that location.} 
\]

A time-weighted average concentration should be computed for each worker and properly logged and maintained on file for review.

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APPENDIX C TO §1910.1043

APPENDIX D TO §1910.1043

APPENDIX E TO §1910.1043

APPENDIX F TO §1910.1043
(1) Wet test meter reading, start and finish;
(2) Elapsed time, start and finish (at least two minutes);
(3) Pressure drop at manometer;
(4) Air temperature;
(5) Barometric pressure; and
(6) Limiting orifice number;
(h) Calculate the flow rate and compare against the flow of 7.4±0.2 liters/minute. If flow is between these limits, perform calibration; average results, and record orifice number and flow rate. If flow is not within these limits, discard or modify orifice and repeat procedure;
(i) Record the name of the person performing the calibration, the date, serial number of the wet test meter, and the number of the critical orifices being calibrated.

IV. SAMPLING PROCEDURE
(a) Sampling data sheets should include a log of:
(1) The date of the sample collection;
(2) The time of sampling;
(3) The location of the sampler;
(4) The sampler serial number;
(5) The cassette number;
(6) The time of starting and stopping the sampling and the duration of sampling;
(7) The weight of the filter before and after sampling;
(8) The weight of dust collected (corrected for controls);
(b) Assembly of filter cassette should be as follows:
(1) Loosely assemble 3-piece cassette;
(2) Number cassette;
(3) Place absorbant pad in cassette;
(4) Weigh filter to an accuracy of 10 μg;
(5) Place filter in cassette;
(6) Record weight of filter in log, using cassette number for identification;
(7) Fully assemble cassette, using pressure to force parts tightly together;
(8) Install plugs top and bottom;
(9) Put shrink band on cassette, covering joint between center and bottom parts of cassette; and
(10) Set cassette aside until shrink band dries thoroughly.
(c) Sampling collection should be performed as follows:
(1) Clean lint out of the motor and elutriator;
(2) Install vertical elutriator in sampling locations specified above with inlet 4½ to 5½ feet from floor (breathing zone height);
(3) Remove top section of cassette;
(4) Install cassette in ferrule of elutriator;
(5) Tape cassette to ferrule with masking tape or similar material for air-tight seal;
(6) Remove bottom plug of cassette and attach hose containing critical orifice;
(7) Start elutriator pump and check to see if gauge reads above 17 in. of Hg vacuum;
(8) Record starting time, cassette number, and sampler number;
(9) At end of sampling period stop pump and record time; and
(10) Controls with each batch of samples collected, two additional filter cassettes should be subjected to exactly the same handling as the samples, except that they are not opened. These control filters should be weighed in the same manner as the sample filters.
Any difference in weight in the control filters would indicate that the procedure for handling sample filters may not be adequate and should be evaluated to ascertain the cause of the difference, whether and what necessary corrections must be made, and whether additional samples must be collected.
(d) Shipping. The cassette with samples should be collected, along with the appropriate number of blanks, and shipped to the analytical laboratory in a suitable container to prevent damage in transit.
(e) Weighing of the sample should be achieved as follows:
(1) Remove shrink band;
(2) Remove top and middle sections of cassette and bottom plug;
(3) Remove filter from cassette and weigh to an accuracy of 10 μg; and
(4) Record weight in log against original weight.
(f) Calculation of volume of air sampled should be determined as follows:
(1) From starting and stopping times of sampling period, determine length of time in minutes of sampling period; and
(2) Multiply sampling time in minutes by flow rate of critical orifice in liters per minute and divide by 1000 to find air quantity in cubic meters.
(g) Calculation of Dust Concentrations should be made as follows:
(1) Substract weight of clean filter from dirty filter and apply control correction to find actual weight of sample. Record this weight (in μg) in log; and
(2) Divide mass of sample in μg by air volume in cubic meters to find dust concentration in μg/m. Record in log.
APPENDIX B-1
RESPIRATORY QUESTIONNAIRE

A. IDENTIFICATION DATA

PLANT ________________________________ SOCIAL SECURITY NO ________________

DAY __________ MONTH ______ YEAR ______
(figures: last 2 digits)

NAME ________________________________ DATE OF INTERVIEW __________________

(First Names) ________________________ DATE OF BIRTH __________ M __ F ______

ADDRESS ______________________________ AGE _______ (8,9) SEX ________ (10)

(occupation in race) ______________ RACE W ______ N ______ IND. ______ OTHER ________ (11)

INTERVIEWER: 1 2 3 4 5 6 7 8 ______ (12)

WORK SHIFT: 1st ________ 2nd ________ 3rd ________ (13) STANDING HEIGHT ________ (14,15)

PRESENT WORK AREA WEIGHT _____________ (16,18)

If working in more than one specified work area, X area where most of the work shift is spent. If "other," but spending 25% of the work shift in one of the specified work areas, classify in that work area. If carding department employee, check area within that department where most of the work shift is spent (if in doubt, check "throughout"). For work areas such as spinning and weaving where many work rooms may be involved, be sure to check the specific work room to which the employee is assigned -- if he works in more than one work room within a department classify as 7 (all) for that department.

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290
Use the actual wording of each question. Put X in appropriate space after each question. When in doubt record "No." When no square, circle appropriate answer.

B. COUGH

(on getting up?)
Do you usually cough first thing in the morning? Yes No (31)
(Count a cough with first smoke or on "first going out of doors." Exclude clearing throat or a single cough.)
Do you usually cough during the day or at night? Yes No (32)
(Ignore an occasional cough.)

If 'Yes' to either question (31-32):

Do you cough like this on most days for as much as three months a year? Yes No (33)
Do you cough on any particular day of the week? Yes No (34)


C. PHLEGM or alternative word to suit local custom.

(on getting up?)
Do you usually bring up any phlegm from your chest first thing in the morning? Yes No (36)
(Count phlegm with the first smoke or on "first going out of doors." Exclude phlegm from the nose. Count swallowed phlegm.)
Do you usually bring up any phlegm from your chest during the day or at night? Yes No (37)
(Accept twice or more.)

If 'Yes' to either question (36) or (37):

Do you bring up phlegm like this on most days for as much as three months each year? Yes No (38)

If 'Yes' to question (33) or (38):

How long have you had this phlegm? Write in number of years

(1) 2 years or less (39)
(2) More than 2 years-9 years
(3) 10-19 years
(4) 20+ years

These words are for subjects who work at night

D. CHEST ILLNESSES

In the past three years, have you had a period of (increased) cough and phlegm lasting for 3 weeks or more? Yes No (40)
(2) Yes, only one period
(3) Yes, two or more periods

For subjects who have phlegm

During the past 3 years have you had any chest illness which has kept you off work, indoors at home or in bed? Yes No (41)

If 'Yes' to (41): Did you bring up (more) phlegm than usual in any of these illnesses? Yes No (42)

If 'Yes' to (42): During the past three years have you had:

(1) Only one such illness with increased phlegm? (43)
(2) More than one such illness? (44)

Br. Grade________
§ 1910.1043 29 CFR Ch. XVII (7-1-13 Edition)

E. TIGHTNESS

Does your chest ever feel tight or your breathing become difficult? ______ Yes ______ No ______ 15

Is your chest tight or your breathing difficult on any particular day of the week? (after a week or 10 days away from the mill) ______ Yes ______ No ______ 16


If 'Yes' Monday: At what time on Monday does your chest feel tight or your breathing difficult? 1 □ Before entering the mill 18

2 □ After entering the mill

(Ask only if NO to Question 45)

In the past, has your chest ever been tight or your breathing difficult on any particular day of the week? ______ Yes ______ No ______ 19


F. BREATHLESSNESS

If disabled from walking by any condition other than heart or lung disease put "X" here and leave questions (52-60) unasked 21

Are you ever troubled by shortness of breath when hurrying on the level or walking up a slight hill? ______ Yes ______ No ______ 22

If 'No', grade is 1. If 'Yes', proceed to next question

Do you get short of breath walking with other people at an ordinary pace on the level? ______ Yes ______ No ______ 23

If 'No', grade is 2. If 'Yes', proceed to next question

Do you have to stop for breath when walking at your own pace on the level? ______ Yes ______ No ______ 24

If 'No', grade is 3. If 'Yes', proceed to next question

Are you short of breath on washing or dressing? ______ Yes ______ No ______ 25

If 'No', grade is 4. If 'Yes', grade is 5

Dyspnia Grd: __________ 26

ON MONDAYS

Are you ever troubled by shortness of breath when hurrying on the level or walking up a slight hill? ______ Yes ______ No ______ 27

If 'No', grade is 1. If 'Yes', proceed to next question

Do you get short of breath walking with other people at an ordinary pace on the level? ______ Yes ______ No ______ 28

If 'No', grade is 2. If 'Yes', proceed to next question

Do you have to stop for breath when walking at your own pace on the level? ______ Yes ______ No ______ 29

If 'No', grade is 3. If 'Yes', proceed to next question

Are you short of breath on washing or dressing? ______ Yes ______ No ______ 30

If 'No', grade is 4. If 'Yes', grade is 5

B. Grd: __________ 31
G. OTHER ILLNESSES AND ALLERGY HISTORY

Do you have a heart condition for which you are under a doctor's care? _______ Yes ______ No (62)

Have you ever had asthma? _______ Yes ______ No (63)

If 'Yes', did it begin (1) [ ] Before age 30
(2) [ ] After age 30

If 'Yes' before 30, did you have asthma before you ever went to work in a textile mill? _______ Yes ______ No (64)

Have you ever had hay fever or other allergies (other than above)? _______ Yes ______ No (65)

H. TOBACCO SMOKING*

Do you smoke? [ ]

Do you smoke? (Cigarettes, cigar, or pipe) _______ Yes ______ No (66)

If 'No', to (63) [ ]

Have you ever smoked? (Cigarettes, cigar, pipe) _______ Yes ______ No (67)

Has smoking been as much as one cigarette a day, or 1 or more packs of tobacco a month, for as long as one year? [ ]

If 'Yes', to (63) or (64), how many years?

[Write in specific number of years in the appropriate square]

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If cigarettes, how many packs per day?

[Write in number of cigarettes]

(1) [ ] ≤ 1 pack per day
(2) [ ] 1 to 3 packs per day
(3) [ ] 4 to 5 packs per day
(4) [ ] 6 or more packs per day

Number of pack years

[Write in number of years]

(1) [ ] 0 years
(2) [ ] 1 to 4 years
(3) [ ] 5 to 9 years
(4) [ ] 10 or more years

*Have you changed your smoking habits since last interview? [ ] If yes, specify what change.

I. OCCUPATIONAL HISTORY**

Have you ever worked in:

- A foundry? (As long as one year) _______ Yes ______ No (75)
- Stone or mineral mining, quarrying or processing? (As long as one year) _______ Yes ______ No (76)
- Asbestos milling or processing? (Ever) _______ Yes ______ No (77)

Other dusts, fumes or smoke? [ ]

Type of exposure

Length of exposure

**Ask only on first interview.

At what age did you first go to work in a textile mill? (Write in specific age in appropriate square)

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<td>25-29</td>
<td>30-34</td>
<td>35-39</td>
<td>40+</td>
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</table>

When you first worked in a textile mill, did you work with (1) [ ] Cotton or cotton blend (79)
(2) [ ] Synthetic or wool (80)
APPENDIX B-II

Respiratory Questionnaire for Non-Textile Workers for the Cotton Industry

<table>
<thead>
<tr>
<th>Identification No.</th>
<th>Interviewer Code</th>
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<tr>
<td>Location</td>
<td>Date of Interview</td>
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</table>

A. IDENTIFICATION

1. NAME (Last) (First) (Middle Initial)
2. CURRENT ADDRESS (Number, Street, or Rural Route, City or Town, County, State, Zip Code)
3. PHONE NUMBER AREA CODE ( )
4. SOCIAL SECURITY NO. (optional see below)
5. BIRTHDATE (Mo., Day, Yr.)
6. AGE LAST BIRTHDAY
7. SEX
   1. Male  2. Female
8. ETHNIC GROUP OR ANCESTRY
   1. White, not of Hispanic Origin
   2. Black, not of Hispanic Origin
   3. Hispanic
   4. American Indian or Alaskan Native
   5. Asian or Pacific Islander
   6. Other:

9. STANDING HEIGHT (cm)
10. WEIGHT
11. WORK SHIFT
    1st  2nd  3rd

12. PRESENT WORK AREA
    Please indicate primary assigned work area and percent of time spent at that site. If at other locations, please indicate and note percent of time for each.

   PRIMARY WORK AREA
   SPECIFIC JOB

13. APPROPRIATE INDUSTRY
    1. Garnetting
    2. Cottonseed Oil Mill
    3. Cotton Warehouse
    4. Utilization
    5. Cotton Classification
    6. Cotton Ginning

(Your Social Security number is voluntary. Your refusal to provide this number will not affect any right, benefit, or privilege to which you would be entitled if you did provide your Social Security number. Your Social Security number is being requested since it will permit use in future determinations in statistical research studies.)
B. OCCUPATIONAL HISTORY TABLE

Complete the following table showing the entire work history of the individual from present to initial employment. Sporadic, part-time periods of employment, each of no significant duration, should be grouped if possible.

<table>
<thead>
<tr>
<th>INDUSTRY AND LOCATION</th>
<th>TENURE OF EMPLOYMENT FROM 19__ TO 19__</th>
<th>SPECIFIC OCCUPATION</th>
<th>AVERAGE NO. DAYS WORKED PER WEEK</th>
<th>HAZARDOUS HEALTH EXPOSURE ASSOCIATED WITH WORK</th>
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<td>YES   NO IF YES, DESCRIBE</td>
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## §1910.1043

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### C. SYMPTOMS

Use actual wording of each question. Put X in appropriate square after each question. When in doubt record "No".

#### COUGH

1. Do you usually cough first thing in the morning? 
   (on getting up)*
   (Count a cough with first smoke or on "first going out of doors." Exclude clearing throat or a single cough.)

   - Yes
   - No

2. Do you usually cough during the day or at night?
   (Ignore an occasional cough.)

   - Yes
   - No

*If YES to either question 1 or 2:

3. Do you cough like this on most days for as much as three months a year?

   - Yes
   - No
   - NA

4. Do you cough on any particular day of the week?

   - Yes
   - No

*If YES:


#### PHLEGM

6. Do you usually bring up any phlegm from your chest first thing in the morning? (on getting up)*
   (Count phlegm with the first smoke or on "first going out of doors." Exclude phlegm from the nose. Count swallowed phlegm.)

   - Yes
   - No

7. Do you usually bring up any phlegm from your chest during the day or at night?
   (Accept twice or more.)

   - Yes
   - No

*If YES to either question 6 or 7:

8. Do you bring up phlegm like this on most days for as much as three months each year?

   - Yes
   - No

*If YES to question 3 or 8:

9. How long have you had this phlegm? (cough)
   (Write in number of years)

   - 2 years or less
   - More than 2 years - 9 years
   - 10-19 years
   - 20+ years

*These words are for subjects who work at night
CHEST ILLNESS

10. In the past three years, have you had a period of (increased) cough and phlegm lasting for 3 weeks or more?
   (1) [ ] No
   (2) [ ] Yes, only one period
   (3) [ ] Yes, two or more periods

For subjects who usually have phlegm:

11. During the past 3 years have you had any chest illness which has kept you off work, indoors at home or in bed? (for as long as one week, flu?)
   1 [ ] Yes 2 [ ] No

If YES to 11:

12. Did you bring up (more) phlegm than usual in any of these illnesses?
   1 [ ] Yes 2 [ ] No

If YES to 12: During the past three years have you had:

13. Only one such illness with increased phlegm?
   1 [ ] Yes 2 [ ] No

14. More than one such illness:
   1 [ ] Yes 2 [ ] No

Br. Grade ______

TIGHTNESS

15. Does your chest ever feel tight or your breathing become difficult?
   1 [ ] Yes 2 [ ] No

16. Is your chest tight or your breathing difficult on any particular day of the week? (after a week or 10 days away from the mill)
   1 [ ] Yes 2 [ ] No

   (1) Sometimes
   (2) Always

18. If YES Monday: At what time on Monday does your chest feel tight or your breathing difficult? [ ] Before entering mill [ ] After entering mill

(ASSK ONLY IF NO TO QUESTION 15)

19. In the past, has your chest ever been tight or your breathing difficult on any particular day of the week?
   1 [ ] Yes 2 [ ] No

   (1) Sometimes
   (2) Always
§ 1910.1043

BREATHLESSNESS

21. If disabled from walking by any condition other than heart or lung disease put "X" in the space and leave questions (22-30) unasked.

22. Are you ever troubled by shortness of breath, when hurrying on the level or walking up a slight hill?  

   1 □ Yes  2 □ No

   If NO, grade is 1. If YES, proceed to next question

23. Do you get short of breath walking with other people at an ordinary pace on the level?  

   1 □ Yes  2 □ No

   If NO, grade is 2. If YES, proceed to next question

24. Do you have to stop for breath when walking at your own pace on the level?  

   1 □ Yes  2 □ No

   If NO, grade is 3. If YES, proceed to next question

25. Are you short of breath on washing or dressing?  

   1 □ Yes  2 □ No

   If NO, grade is 4. If YES, grade is 5.

26. Dyspnea Grd. __________________

ON MONDAYS:

27. Are you ever troubled by shortness of breath, when hurrying on the level or walking up a slight hill?  

   1 □ Yes  2 □ No

   If NO, grade is 1. If YES, proceed to next question

28. Do you get short of breath walking with other people at an ordinary pace on the level?  

   1 □ Yes  2 □ No

   If NO, grade is 2. If YES, proceed to next question

29. Do you have to stop for breath when walking at your own pace on the level?  

   1 □ Yes  2 □ No

   If NO, grade is 3. If YES, proceed to next question

30. Are you short of breath on washing or dressing?  

   1 □ Yes  2 □ No

   If NO, grade is 4. If YES, grade is 5

31. B. Grd. __________________

OTHER ILLNESSES AND ALLERGY HISTORY

32. Do you have a heart condition for which you are under a doctor's care?  

   1 □ Yes  2 □ No
OTHER ILLNESSES AND ALLERGY HISTORY CONTINUED:

33. Have you ever had asthma?  
   1 ☐ Yes  2 ☐ No  
   If yes, did it begin:  
   (1) Before age 30 ☐  
   (2) After age 30 ☐

34. If yes before 30: did you have asthma before ever going to work in a textile mill?  
   1 ☐ Yes  2 ☐ No

35. Have you ever had hay fever or other allergies (other than above)?  
   1 ☐ Yes  2 ☐ No

TOBACCO SMOKING

36. Do you smoke?  
   Record Yes if regular smoker up to one month ago. (Cigarettes, cigar or pipe)  
   1 ☐ Yes  2 ☐ No  
   If NO to (33).

37. Have you ever smoked? (Cigarettes, cigars, pipe. Record NO if subject has never smoked as much as one cigarette a day, or 1 oz. of tobacco a month, for as long as one year.)  
   1 ☐ Yes  2 ☐ No  
   If Yes to (33) or (34); what have you smoked for how many years? (Write in specific number of years in the appropriate square)

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<td>40. Cigars</td>
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41. If cigarettes, how many packs per day?  
   Write in number of cigarettes

☐ Less than 1/2 pack  
☐ 1/2 pack, but less than 1 pack  
☐ 1 pack, but less than 1 1/2 packs  
☐ 1-1/2 packs or more

42. Number of pack years: _____________

43. If an ex-smoker (cigarettes, cigar or pipe), how long since you stopped? (Write in number of years.)  
   ☐ 0-1 year  
   ☐ 1-4 years  
   ☐ 5-9 years  
   ☐ 10+ years
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OCCUPATIONAL HISTORY

Have you ever worked in:

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<tbody>
<tr>
<td>44. A foundry? (As long as one year)</td>
<td>1 □ Yes 2 □ No</td>
</tr>
<tr>
<td>45. Stone or mineral mining, quarrying or processing? (As long as one year)</td>
<td>1 □ Yes 2 □ No</td>
</tr>
<tr>
<td>46. Asbestos milling or processing? (Ever)</td>
<td>1 □ Yes 2 □ No</td>
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<tr>
<td>47. Cotton or cotton blend mill? (For controls only)</td>
<td>1 □ Yes 2 □ No</td>
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<tr>
<td>48. Other dusts, fumes or smoke? If yes, specify.</td>
<td>1 □ Yes 2 □ No</td>
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</table>

Type of exposure ______________________________

Length of exposure ______________________________
## APPENDIX B-III
### ABBREVIATED RESPIRATORY QUESTIONNAIRE

### A. IDENTIFICATION DATA

- **PLANT**: 
- **SOCIAL SECURITY NO.**: 
- **DAY MONTH YEAR** 
  (figured last 2 digits)
- **NAME**
  
  (Surname)
  (First Name)
- **DATE OF INTERVIEW**: 
- **DATE OF BIRTH**: 
  M F
- **ADDRESS**: 
- **AGE**: (8,9) 
- **SEX**: (10)
- **RACE**: W N IND. OTHER (11)
- **INTERVIEWER**: 1 2 3 4 5 6 7 8 (12)
- **WORK SHIFT**: 1st 2nd 3rd (13) 
- **STANDING HEIGHT**: (14,15)
- **PRESENT WORK AREA**: WEIGHT (16,18)

If working in more than one specified work area, X area where most of the work shift is spent. If "other," but spending 25% of the work shift in one of the specified work areas, classify in that work area. If carding department employee, check area within that department where most of the work shift is spent (if in doubt, check "thoroughly"). For work areas such as spinning and weaving where many work rooms may be involved, be sure to check the specific work room to which the employee is assigned — if he works in more than one room within a department classify as 7 (all) for ... department.

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<thead>
<tr>
<th>Workroom Number</th>
<th>Open</th>
<th>Pick</th>
<th>Area</th>
<th>Card</th>
<th>Spin</th>
<th>Wind</th>
<th>Twist</th>
<th>SPOOL</th>
<th>Warp</th>
<th>Shear</th>
<th>Waste</th>
<th>Other</th>
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<tbody>
<tr>
<td><strong>AT RISK (cotton &amp; cotton blend)</strong></td>
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<tr>
<td>1</td>
<td>Cards</td>
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<td>Draw</td>
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<td>4</td>
<td>Rove</td>
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<td>Thru Out</td>
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<td><strong>Control (synthetic &amp; wool)</strong></td>
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<td><strong>Ex-Worker (cotton)</strong></td>
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Use actual wording of each question. Put X in appropriate square after each question. When in doubt record "No." When no square, circle appropriate answer.

B. COUGH
(on getting up?)

Do you usually cough first thing in the morning? ____________________________ Yes  No  (31)
(Count a cough with first smoke or on "first going out of doors.")

Do you usually cough during the day or at night? ____________________________ Yes  No  (32)
(Ignore an occasional cough.)

If "Yes" to either question (31–32):

Do you cough like this on most days for as much as three months a year? ____________ Yes  No  (33)

Do you cough on any particular day of the week? ____________ Yes  No  (34)

(1)  (2)  (3)  (4)  (5)  (6)  (7)


C. PHLEGM or alternative word to suit local custom
(on getting up?)

Do you usually bring up any phlegm from your chest first thing in the morning? (Count phlegm with the first smoke or on "first going out of doors.")

Do you usually bring up any phlegm from your chest during the day or at night? (Accept twice or more) ____________________________ Yes  No  (36)

If "Yes" to either question (36) or (37):

Do you bring up phlegm like this on most days for as much as three months each year? ____________ Yes  No  (38)

If "Yes" to question (33) or (36):

How long have you had this phlegm? ____________________________
(Write in number of years)

1 2 years or less
2 2 years to 9 years
3 10 years
4 20+ years

†These words are for subjects who work at night

D. TIGHTNESS

Does your chest ever feel tight or your breathing become difficult? ____________ Yes  No  (39)

Is your chest tight or your breathing difficult on any particular day of the week? (after a week or 10 days away from the mill) ____________ Yes  No  (40)


(1)  (2)  (3)  (4)  (5)  (6)  (7)  (8)

If "Yes": Monday: At what time on Monday does your chest feel tight or your breathing difficult? 1  (1) After entering the mill
2  (2) After entering the mill

(Ask only if NO to Question 45)

If in the past, has your chest ever been tight or your breathing difficult on any particular day of the week? ____________ Yes  No  (43)


(1)  (2)  (3)  (4)  (5)  (6)  (7)  (8)

E. TOBACCO SMOKING

*Have you changed your smoking habits since last interview? If yes, specify what changes.
APPENDIX D TO §1910.1043—PULMONARY FUNCTION STANDARDS FOR COTTON DUST STANDARDS

The spirometric measurements of pulmonary function shall conform to the following minimum standards, and these standards are not intended to preclude additional testing or alternate methods which can be determined to be superior.

I. APPARATUS

a. The instrument shall be accurate to within ±50 milliliters or within ±3 percent of reading, whichever is greater.
b. The instrument should be capable of measuring vital capacity from 0 to 7 liters BTPS.
c. The instrument shall have a low inertia and offer low resistance to airflow such that the resistance to airflow at 12 liters per second must be less than 1.5 cm H₂O/(liter/sec).
d. The zero time point for the purpose of timing the FEV₁ shall be determined by extrapolating the steepest portion of the volume time curve back to the maximal inspiration volume (1, 2, 3, 4) or by an equivalent method.
e. Instruments incorporating measurements of airflow to determine volume shall conform to the same volume accuracy stated in (a) of this section when presented with flow rates from at least 0 to 12 liters per second.
f. The instrument or user of the instrument must have a means of correcting volumes to body temperature saturated with water vapor (BTPS) under conditions of varying ambient spirometer temperatures and barometric pressures.
g. The instrument used shall provide a tracing or display of either flow versus volume or volume versus time during the entire forced expiration. A tracing or display is required for reproducibility from flow-volume or volume-time tracings or displays. The following efforts shall be judged unacceptable when the patient:
1. Has not reached full inspiration preceding the forced expiration.
2. Has not used maximal effort during the entire forced expiration.
3. Has not continued the expiration for at least 5 seconds or until an obvious plateau in the volume time curve has occurred.
4. Has coughed or closed his glottis.
5. Has an obstructed mouthpiece or a leak around the mouthpiece (obstruction due to false teeth falling in front of mouthpiece, etc.)
6. Has an unsatisfactory start of expiration, one characterized by excessive hesitation (or false starts), and therefore not allowing back extrapolation of time 0 (extrapolated volume on the volume time tracing must be less than 10 percent of the FVC).
7. Has an excessive variability between the three acceptable curves. The variation between the two largest FVC’s and FEV₁’s of the three satisfactory tracings should not exceed 10 percent or ±100 milliliters, whichever is greater.
b. Periodic and routine recalibration of the instrument or method for recording FVC and FEV₁ should be performed using a syringe or other volume source of at least 2 liters.

c. The instrument shall have a low inertia and offer low resistance to airflow such that the resistance to airflow at 12 liters per second must be less than 1.5 cm H₂O/(liter/sec).
d. The zero time point for the purpose of timing the FEV₁ shall be determined by extrapolating the steepest portion of the volume time curve back to the maximal inspiration volume (1, 2, 3, 4) or by an equivalent method.
e. Instruments incorporating measurements of airflow to determine volume shall conform to the same volume accuracy stated in (a) of this section when presented with flow rates from at least 0 to 12 liters per second.
f. The instrument or user of the instrument must have a means of correcting volumes to body temperature saturated with water vapor (BTPS) under conditions of varying ambient spirometer temperatures and barometric pressures.
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b. Periodic and routine recalibration of the instrument or method for recording FVC and FEV₁ should be performed using a syringe or other volume source of at least 2 liters.
III. INTERPRETATION OF SPIROGRAM

a. The first step in evaluating a spirogram should be to determine whether or not the patient has performed the test properly or as described in II above. From the three satisfactory tracings, the forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV\textsubscript{1}) shall be measured and recorded. The largest observed FVC and largest observed FEV\textsubscript{1} shall be used in the analysis regardless of the curve(s) on which they occur.

b. The following guidelines are recommended by NIOSH for the evaluation and management of workers exposed to cotton dust. It is important to note that employees regardless of the curve(s) on which they occur.

c. Differences—For each of the 100 sets of measurements (VE and AD) the difference is obtained as the average VE reading minus the AD reading. Call these differences D. Thus, we have:

\[ D = \text{VE} - \text{AD}, 1.2, \ldots, 100 \]  

Next we compute the arithmetic mean and standard deviations of the differences, using equations (2) and (3), respectively.

\[ X_{D} = \frac{1}{N} \sum_{i=1}^{N} D_{i} \] (2)

\[ S_{D} = \sqrt{\frac{\sum_{i=1}^{N} D_{i}^{2} - (\sum_{i=1}^{N} D_{i})^{2}}{N-1}} \] (3)

where N equals the number of differences (100 in this case), \( X_{D} \) is the arithmetic mean and \( S_{D} \) is the standard deviation.

We next calculate the critical value as

\[ T = K S_{D} + X_{D} \] where K=1.87, based on 100 samples.

d. Equivalency test. The next step is to obtain the average of the 100 VE readings. This is obtained by equation (4)

\[ X_{VE} = \frac{1}{n} \sum_{i=1}^{n} \text{VE}_{i} \] (4)

We next multiply 0.25 by \( X_{VE} \). If \( T \leq 0.25 X_{VE} \), we can say that the alternate device has passed the equivalency test.

"EC28OC91.038</MATH> EC28OC91.039</MATH>"