North Carolina Department of Labor
Division of Occupational Safety and Health
Raleigh, North Carolina

Field Information System

Operational Procedures Notice 112
SN/OPN

Subject: Division Respiratory Protection Program

A. **Purpose**.

This directive transmits the attached respiratory protection program which has been developed for use by OSH personnel located in all district offices.

B. **Scope**.

This respiratory protection program applies to any employee of the Division of Occupational Safety and Health who is required or may be required as a result of worksite conditions or employer policy to don and use a respirator during the conduct of compliance or consultant field activities.

C. **Background**.

Compliance officers, consultants, and other personnel in the Division of Occupational Safety and Health are potentially exposed to a variety of respiratory hazards while conducting compliance inspections, consultation audits, and monitoring visits.

Because respiratory effects from exposure to air contaminants depend on the nature of the substance, it is important that OSH personnel be provided with respirators that are appropriate for the substances (dust, fiber, mist, fume, gas or vapor) to which they may be exposed or on the basis of conditions which are immediately dangerous to life and health (IDLH).

D. **Cancellation**.

This directive cancels and replaces CPL 2-2.54 as the respirator policy applicable to OSHNC personnel.

E. **Statement of Policy**.

See attached Division Respiratory Protection Program.

F. **Term of Action**.

This policy becomes effective as of the approval date below and shall remain in effect until canceled by a new or revised policy.

August 21, 1996
Date

(Signed on Original)
Charles N. Jeffress
Director

NC Department of Labor

Division of Occupational

Safety & Health

Respiratory Protection Program

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Appendix A Respiratory Protection Program Coordinators

Chapter I

RESPONSIBILITIES

A. North Carolina Department of Labor - Central Safety & Health Committee shall.

1. Assist the Division Directors in complying with the program(s).

2. Audit and review the effectiveness of the program.

B. OSH Division/Division Director.

1. Establish a Division respirator program that is consistently implemented throughout the Division.

2. Examine and evaluate the effectiveness of the respirator program.

3. Appoint a Division coordinator to administer and evaluate the overall program. The Division coordinator monitors field office adherence to the procedures established in this directive. A written report detailing program effectiveness measures shall be prepared by the Division coordinator for submission by the Director to the Safety Committee Chairman annually. This individual will be designated the Respiratory Protection Program Coordinator (RPPC). The designated RPPC for the Division is J. Edgar Geddie, Health Standards Officer.

4. In addition, appoint a RPPC in each district office who is trained in the use and care of specific types of equipment. (See Appendix A for list of District RPPC.)

C. Division Respiratory Protection Program Coordinator (RPPC) shall:

1. Assume responsibility for administering the program for the Division.

2. Develop standard operating procedures (SOPs).

3. Recommend systems for complying with the program and assist in technical requirements.

4. Maintain models and sizes of air-purifying respirators for selection and fitting. These models and sizes will be representative of respirators from major manufacturers.

5. Ensure the purchase of the proper type of equipment in adequate quantities.

6. Ensure that each District RPPC implements and maintains the respirator program in the field.

7. Supervise the repair of respirators.

8. Ensure proper training of district RPPCs to conduct fit testing of respirators.

9. Provide an annual evaluation to the Division Director regarding the status of the Respiratory Protection Program. The report shall include the following information:

ANNUAL REPORT FORMAT. The following information shall be included in the annual report:

a. Listing by field office of names of those quantitatively fit tested including:

(1) Current test date, quantitative fit testing (QNFT) method (Portacount or Photometric), respirator models evaluated and fit factors (FF) derived. (See attached form)

(2) Most recent previous quantitative fit test date, model selected and fit factors (FF) obtained.

b. Resources used to administer the program including:

(1) Staff-years to perform quantitative fit testing including subject time.

(2) Staff-years to administer program which includes training, evaluation and report writing.

c. Comments and suggestions concerning program administration, effectiveness, technical problems relating to equipment and other relevant issues.

D. District RPPC shall:

1. Assume responsibility for administering the program in the District office.

2. Attend the OSHA Training Institute respiratory protection course (222/222A) or an equivalent course.

3. Ensure that the respirator program is adhered to by OSH Division inspectors and consultants.

4. Be responsible for cleaning, maintenance and storage of all respirators not routinely used, or not individually assigned.

5. Maintain respirator supplies, including spare parts; obtain new equipment and maintain non-individually assigned equipment for reissue.

6. Ensure that sufficient quantities of filters and chemical cartridges and canisters for specific contaminants shall be available in each District Office.

7. Aid Compliance officers and Consultants in respirator fit testing. Each individual designated to use a respirator shall receive respirator fitting instructions and undergo at least annual quantitative fit testing to select the best fitting facepiece. Fit testing shall be performed more frequently to

meet the requirements prescribed in specific standards, such as asbestos or acrylonitrile.

8. Ensure that each District office properly maintains long service life and emergency escape self-contained breathing apparatus (SCBAs). A fully charged spare cylinder shall be available for routine use SCBA. These cylinders will be properly inspected and maintained.

9. Provide additional training and information for Compliance officers and Consultants in the correct use, maintenance, cleaning and care of respirators.

10. Provide an evaluation of the respiratory protection program to the Division RPPC annually. The following elements should be considered when evaluating the program's effectiveness:

a. The proper types of respirators are selected.

b. The wearers are properly trained.

c. The correct respirators are issued.

d. The respirators are properly worn.

e. The respirators are properly maintained and cleaned.

f. The respirators are properly stored.

g. Fit testing is conducted properly.

h. All pertinent records are kept.

I. Submit a report to the Division Coordinator after each evaluation of the program. The report shall include the results of inspection, the respirator program administration. investigating wearer acceptance, any inadequacy of the program and any action taken to correct the deficiency, and target dates for planning implementation. The Division

Program Coordinator shall prepare a summary of each field office's program to the Division Director and, where appropriate, to the Bureau Chief.

E. Safety and Health Compliance Officers.

1. Individuals assigned tasks which require respiratory protective equipment will use the appropriate equipment in accordance with this instruction.

2. Each individual, as designated in section E.1., shall clean, disinfect and properly store as necessary, the respirator assigned for personal use. Cleaning agents shall be available in each field office.

3. Each designated respirator user shall inspect the respirator before each use and after cleaning and disinfecting. The inspection shall include a check for defects, missing parts and a facepiece leak check. If a respirator is found defective, it shall be returned to the DISTRICT PROGRAM COORDINATOR for repair.

4. Each individual designated shall comply with fit test requirements and all other provisions of this directive.

5. Each designated respirator user shall attend the OSHA Training Institute respirator course or an equivalent course.

F. Division Office Personnel.

1. Other OSH Division employees, including consultants and representatives from the Bureau of Education, Training & Technical Assistance, will comply with this policy when visiting a site where respiratory protective equipment is or may be required to be worn. Such individuals shall use the appropriate equipment in accordance with this instruction.

2. Each respirator wearer shall clean, disinfect and properly store as necessary, the respirator assigned for personal use.

3. Each respirator wearer shall inspect the respirator before each use and after cleaning and disinfecting. The inspection

shall include a check for defects, missing parts and a facepiece leak check. If a respirator is found defective, it shall be returned to the District RPPC for repair.

4. Each respirator wearer shall comply with fit test requirements and all other provisions of this directive.

5. Each respirator wearer shall receive appropriate instruction from the District RPPC.

Chapter II

RESPIRATORY PROTECTION PROGRAM ADMINISTRATION

A. Respirators and accessories shall be available for Compliance officers and Consultants to carry to job sites. Respirators shall be worn whenever requested by the employer, as well as during the time an Compliance officer or Consultant is in a contaminated area performing air sampling, since the possibility of overexposure exists. Even in the event that air sampling is not being performed, and a Compliance Officer or Consultant is in a contaminated area which is likely to exceed the PEL (e.g., a previous citation for overexposure was issued to the company for that area), respirators shall also be worn. Exceptions to this policy may include air samples taken for screening purposes or other situations as individually approved by the supervisor. Compliance officers are encouraged to wear respirators at any time they feel it is appropriate for their self-protection.

B. Written standard operating procedures (SOP) shall be prepared including all information and guidance necessary for proper respirator selection, use, care, and maintenance. The written SOP shall be provided by the Division and shall be modified to suit the needs of each District Office.

C. Respirators shall be selected on the basis of hazards to which the person is exposed with consideration given to both safety and health factors as well as probable risk. Individuals issuing respirators shall be adequately instructed to ensure that the correct respirator is issued and that each respirator is complete. To the extent possible, half-mask

respirators should be assigned to individual workers for their exclusive use.

D. Before initial use, all new respirators shall be washed, cleaned, sanitized and inspected per respirator manufacturer's instruction. The oxygen content of the SCBA cylinder shall be verified. Each respirator shall be properly fitted and a leakage test performed. Before each use, both positive and negative pressure fit checks shall be conducted. The user shall be instructed and trained in the proper use of respirators and informed about their limitations.

E. Respirators shall be cleaned and disinfected by the wearer after use. Those used by more than one Compliance officer shall be thoroughly cleaned and disinfected after each use. Respirators shall be stored in a convenient, clean, and sanitary location free of contaminants which may damage the components of a respirator.

F. Respirators used on a regular basis shall be inspected during cleaning. Trained personnel shall replace worn or deteriorated parts with parts designed for the respirator. No attempt shall be made to replace components or to make adjustments or repairs beyond the manufacturer's recommendations.

G. Supervisors and workers shall be instructed and trained in the selection, use, care, and maintenance of respiratory protective devices. Training shall provide each user an opportunity to handle the respirator, to have it fitted properly, to test its facepiece-to-face seal, to wear it in normal air for a familiarization period, and to wear it in a test atmosphere. Retraining will be performed as needed or at least annually to ensure an effective program.

H. There shall be regular inspections and evaluations to determine the continued effectiveness of the program.

I. Clean shaven skin must be in contact with all respirator sealing surfaces. Even a mild growth of whiskers may interfere with this seal. In addition, respirators shall not be worn when conditions such as sideburns, a skull cap that projects under the facepiece, temple pieces on corrective spectacles or goggles, or the absence of one or both dentures prevent a good facepiece-to-face seal. Therefore, while on duty, all Compliance officers and Consultants designated to wear respirators must be clean shaven, or prepared to shave if needed, in the areas of the face

which form a seal with the respirator face sealing surface. If hair growth, other than in the clean shaven area of facepiece-to-face seal, interferes with the proper function of the respirator such as the exhalation valve, then it shall be altered or removed so as to eliminate interference. The Division's position is to provide negative pressure, half-mask or full-face piece respirators that can be tested with available fit testing equipment. The Department will also provide tight fitting powered air-purifying respirators (PAPRs) to Compliance officers and Consultants when necessary.

J. Corrective lenses which interfere with the facepiece-to-face sealing area shall not be used with a full facepiece.

K. Single use, disposable or maintenance free respirators will not generally be used by NC DOL Consultants or Compliance officers except when necessary and such respirators are permitted by a specific standard (e.g., cotton dust standard). Otherwise, since consultants and compliance officers may encounter different air contaminants during an inspection, air-purifying respirators with replaceable cartridges shall be used because these devices provide more flexibility and reduce the number of single respirators which need to be carried by Compliance officers and Consultants. Furthermore, disposable, maintenance free or single use respirators provide a poorer facepiece seal than multi-sized elastomeric facepieces and often it is difficult to perform an effective negative and/or positive pressure facepiece leakage test. Only "mechanical type" high-efficiency particulate air (HEPA) filters enclosed in cartridges or canisters are acceptable for protection against any particulate exposure because efficiency of these filters does not change with dust loading and ambient conditions.

L. Any respirator may produce undesirable effects on the wearer. Respirators are uncomfortable, and may reduce field of vision, require the individual to carry extra weight, place an additional burden on the respiratory system, cause a feeling of claustrophobia, and may result in a general feeling of anxiety. The two areas of greatest interest as far as physiological effects are concerned are the respiratory system and the cardiovascular system.

M. Individuals shall be examined medically before being assigned to use respirators. The examining physician shall be given information about the equipment to be used. He or she should know whether it produces additional inspiratory and expiratory stress, whether it represents an

additional weight, such as self-contained breathers, and whether it may cause an increase in the metabolic heat load, such as chemical protective clothing.

1. Compliance officers and Consultants shall not be assigned to tasks requiring use of respirators unless it has been determined by medical authorities that they are physically able to perform their duties while wearing the prescribed respirators and chemical protective clothing. The examining physician shall provide a written opinion which describes the ability of the individual to wear the prescribed respirator and recommends limitations on the use of respirators if any. The report and opinion shall be forwarded to the Bureau Chief.

2. The medical status of the respirator user shall be reviewed as part of the examinations required under the Division's physical program for Compliance officers and Consultants. This review shall be performed with the assistance of the contracted occupational medicine provider. The occupational medicine contracted for the Occupational Safety & Health Division is Duke Occupational Medicine.

Chapter III

RESPIRATOR SELECTION

A. GENERAL.

1. The guidelines outlined in this section provide assistance in the selection of appropriate respiratory protection by North Carolina Department of Labor (NC DOL) personnel. The department shall provide appropriate approved respiratory protective devices and the employees shall use these devices whenever necessary to protect their health due to the nature of the work environment. It is important

that NC DOL personnel assess the potential hazards and degree of controls which can be exercised over each situation. The respiratory protective devices selected in each situation will depend upon the information from a qualitative and/or quantitative determination of the hazard. Professional judgment is essential to insure appropriate selections of respirators.

2. The nature of respiratory hazard, as it refers to the selection and classification of respirators, depends upon the atmospheric oxygen concentration; a contaminant's physical state, toxicity, and concentration; the presence of other contaminants or stress factors in the working environment; and worker exposure time and susceptibility. Respiratory hazards may be classified as gas and vapor contaminants (immediately or not immediately dangerous to life or health), particulate contaminants (immediately or not immediately dangerous to life or health), and oxygen deficiencies. Each classification requires a different type of respiratory protection.

3. In the selection and use of respiratory protective devices, health and safety factors must be considered, such as nature of the hazard, intended uses and limitations of respiratory protective devices, movement and work rate limitations, emergency escape time and distance requirements, and training requirements.

4. Among additional general considerations in determining the appropriate respirator are sorbet efficiencies, odor warning properties, eye irritation potential, protection factors (PF), lower flammability limit (LFL), and conditions which are immediately dangerous to life or health (IDLH -- as defined in ' 1910.120). Reference materials are also available in the Appendices to assist in determining the general conditions or situations which would indicate the most prudent use of respirator protection

5. It is the policy of this Division that employees will not expose themselves to conditions that are immediately dangerous to life and health (IDLH). In fact, in most situations, the presence of IDLH conditions would be

considered an "Imminent Danger" and the Division representative would be required to take appropriate action. Exposure to air contaminants in excess of exposure limits may occur during the course of visits to various work environments. Under these circumstances, the employee will need to select respiratory protection in accordance with the policies and procedures of this respiratory protection program.

B. AIR-PURIFYING RESPIRATORS.

1. In general, air-purifying cartridge or canister respirators will be allowed if the contaminant(s) is(are) known, the concentration(s) is(are) known, the air-purifying element provides adequate protection for the air contaminant(s), and the contaminant(s) has(have) good warning properties. Certain specific health standards permit the use of air-purifying respirators even though the chemical has poor or no warning properties. This type of respirator may either be equipped with chemical cartridges or a canister for protection against gases and vapors.

2. With regard to particulate respirators, an increase in breathing resistance (comfortable breathing impaired) occurs as a result of the challenge particulate lodging on the respirator filter. Since this is a subjective indicator, the HEPA filter cartridges should be replaced at least once a week in moderate to dusty workplaces or every three weeks in low dust environments, when contamination of the cartridge surface is noticed, or when the filter has been dropped or subjected to other trauma.

3. A much more insidious problem occurs with regard to end of service life indication for gas and vapor cartridge/canister equipped respirators. End of service life indication is generally based on an individual's ability to detect (e.g., taste, smell) the contaminant within the respirator wearer's facepiece. This guideline is totally subjective and may expose the respirator user to considerable risk.

The basis of the subject detection principle is the assumption that gases/vapors in question have good warning properties. Often the necessary information relative to this limiting factor is difficult to obtain or may not exist, i.e., the odor threshold of a particular material. Studies have also shown that certain people have only a moderately developed sense of smell. Olfactory fatigue may occur to individuals acclimatized to the odor.

Some gaseous contaminants will migrate across the adsorbent or absorbent bed while the respirator is not in use, such as overnight. This migration subjects the user to an initial dose of the contaminant when the respirator is again placed in service. Therefore, as a minimum, gas/vapor cartridges shall be disposed of after each day's activities no matter how short those activities were. A day's activities would begin when the plastic seal or bag is removed from the cartridges allowing those cartridges to be exposed to moisture. These cartridges, even if they are not exposed to a contaminated atmosphere, must be discarded. A label must be attached to the cartridge indicating the installation date.

4. Since odor threshold and olfactory fatigue vary among different individuals, the use of chemical cartridge respirators against substances with poor warning properties shall not be permitted unless its use is permitted in specific health standards. In this case, reliable information concerning service life must be available. Since some reactive chemicals cannot be effectively adsorbed by the sorbet, its use should also be restricted. A partial (not all-inclusive) list of air contaminants with poor odor warning properties or short breakthrough time follows:

> Acrolein, aniline, arsine, boron hydrides, bromine, carbon dioxide, carbon monoxide, carbonyls, carbon disulfide, cyanogen dimethylaniline, dimethyl sulfate, fluorine, hydrogen cyanide, hydrogen fluoride, hydrogen selenide, hydrogen sulfide, isocyanates: HDI, MDI, MIC and TDI, methanol methyl bromide, methyl chloride, methyl iodine, nickel carbonyl, nitro compounds: nitrobenzene,

nitrogen oxides, nitroglycerine, nitromethane, ozone, phosgene, phosphine, phosphorous trichloride, stibine, sulfur chloride, and vinyl chloride.

5. With regard to air-purifying respirators, the fit factor obtained during fit testing has little predictive ability for determining the specific level of protection that will be achieved all of the time in the workplace. Because of this, the respirator assigned protection factors listed in Table III-1 should not be exceeded no matter how high the fit factor during fit testing:

Table III-1

RESPIRATOR SELECTION

TYPE	FACEPIECE PRESSURE	MAXIMUM USE CONCENTRATION (MUC) IN MULTIPLES OF PEL
Half-mask	-	10 X
Full facepiece	-	50 X
Powered air-purifying:		
Half-mask	+	250 X
Full facepiece	+	500 X
Pressure Demand Supplied Air Respirator (PDSAR):		
Half-mask	+	250 X
Full facepiece	+	500 X
Full facepiece w/ escape prov.	+	1000 X
SCBA:		

Entry and escape: Full facepiece pressure Demand	+	IDLH and unknown Concentrations
Escape only:		
Continuous flow	+	IDLH
Mouthpiece	-	IDLH

NOTES:

1. Only a half-mask with interchangeable cartridges is acceptable.

2. Respirator assigned for higher concentrations may be used at lower concentrations.

3. Full facepiece is required if eye irritation is experienced.

4. A minimum service life of 60 minutes is required for sorbet cartridges and canisters to provide adequate protection against air contaminants having poor odor warning properties. The maximum use concentration (MUC) of a respirator for protection against gases or vapors is limited by the service life of the sorbet. For example, if the cartridges used for protection against compound X have only a service life of 60 minutes at a concentration of 50 times the PEL, then the MUC for a full facepiece PAPR equipped with these cartridges is only 50 times rather than 500 times the PEL listed in the respirator selection table.

CHAPTER IV

TRAINING

A. Selecting the respirator appropriate to a given hazard is important, but equally important is using the selected device properly. Proper use can be ensured by carefully training both supervisors and affected employees in selection, use, fit testing, and maintenance of respirators. Unless the reasons for the use of respiratory protective devices and instructions on proper use and maintenance are thoroughly understood and ongoing

training provided, the devices will not be used or may not work properly. Minimum training activities shall include:

1. Instruction in the nature of the hazard and a discussion of what the results may be if the respirator is not used.

2. A discussion of why a certain type of respirator is used in a particular environment. The purpose of using respirators must be presented as well as a description of respirator capabilities and limitations.

3. Periodic instruction and training in actual respirator use including fit testing.

4. Recognition of emergency situations and methods to deal with such situations must be covered. Cleaning and maintenance of respirators will also be covered.

5. All OSH Division personnel who will have access to respirators will attend the OSHA Training Institute course on Respiratory Protection or an equivalent. Other division employees will arrange to receive training from the departmental safety director or from an individual designated by the safety officer.

CHAPTER V

FIT TESTING

GENERAL

Employees of the North Carolina Department of Labor, Occupational Safety and Health Division (OSH) who have occasion to wear respirators shall be required to have annual qualitative and/or quantitative respirator fit testing performed. Qualitative fit testing (QLFT) shall only be allowed for half face air purifying respirators. Full face and powered air purifying respirators (PAPR) shall have quantitative fit testing (QNFT) done to receive the proper fit factor.

A. QUANTITATIVE FIT TESTING

1. PURPOSE:

The purpose of quantitative fit testing is to provide the best fitting respirators to employees. This is the method which provides the highest fit factor.

2. DEFINITIONS:

a. Quantitative Fit Test - the use of instrumentation and appropriate procedures to measure respirator effectiveness. Effectiveness refers to the respirator's ability to conform to the wearers' face minimizing face to seal leakage. This is determined by comparing measured concentrations of a challenge agent inside and outside of the respirator face piece.

b. Challenge Agent - the test agent introduced into a test chamber for photometric based systems. Ambient air is the challenge agent when employing condensation nuclei counter (CNC) devices.

3. APPARATUS:

Two systems available for use:

a. Photometric - Employs the generation of a known concentration of corn oil, sodium chloride or other aerosol in a test chamber.

b. Condensation Nuclei Counter (CNC) - Ambient air serves as the challenge agent, no test chamber is necessary.

4. GENERAL REQUIREMENTS:

a. Test chamber - shall be large enough to permit all test subjects to freely perform all required exercises without distributing the challenge agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the challenge agent is effectively isolated from the ambient air yet uniform in concentration

throughout the chamber. When ambient air is used as the challenge agent, quantitative fit testing shall be conducted in an area relatively free of air contaminants (including tobacco products). The minimum ambient air particle count shall be 10,000 per cubic centimeter (cc) before testing begins.

b. When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high-efficiency particulate air filter supplied by the same manufacturer.

c. When applicable, the sampling instrument shall be selected so that a strip chart record may be made of the test showing the rise and fall of challenge agent concentration with each inspiration and expiration at fit factors of at least 5,000. When utilizing systems that perform automatic programmed calculations, the strip chart must record the calculated average fit factor for each exercise period.

d. The combination of substitute air-purifying elements (if any), challenge agent, and challenge agent concentration in the test chamber shall be such that the test subject is not exposed in excess of the permissible exposure limit to the challenge agent at any time during the testing process.

e. The sampling port on the probed specimen respirator shall be placed and constructed so that there is no detectable leak around the port. A free airflow is allowed into the sampling line at all times so there is no interference with the fit or performance of the respirator.

f. Where a test chamber is used, the test chamber and test set-up shall permit the person administering the test to observe one test subject inside the chamber during the test.

g. The equipment generating the challenge atmosphere shall maintain the concentration of

challenge agent constant within a 10 percent variation for the duration of the test.

h. The time lag (interval between an event and its being recorded on the strip chart) of the instrumentation may not exceed 2 seconds.

I. The tubing for the test chamber atmosphere and for the respirator sampling port shall be the same diameter, length and material. It shall be kept as short as possible. the smallest diameter tubing recommended by the manufacturer shall be used.

j. The exhaust flow from the test chamber shall pass through a high-efficiency filter before release to the room.

k. When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

5. PROCEDURAL REQUIREMENTS:

a. The fitting of the half-mask respirators should be started with those having multiple sizes and a variety of interchangeable cartridges and canisters such as the MSA Comfo elite-M, North-M, Survivair-M. Use either of the tests outlined below to assure that the facepiece is promptly adjusted.

1) Positive pressure test - With the exhaust port(s) blocked, the positive pressure upon slight exhalation should remain constant for several seconds.

2) Negative pressure test - With the intake port(s) blocked, the negative pressure upon slight inhalation should remain constant for several seconds.

3) After a facepiece is adjusted, the test subject shall wear the facepiece for at least 5

minutes before conducting an abbreviated qualitative fit test by using either of the methods described below and using either of the exercises a, b, c, and d. described in c.5. or safety glasses when performing his/her duties, the fit test must be performed when these glasses are worn.

a) Isoamyl acetate test - when using organic vapor cartridges, the test subject who is capable of smelling the odor should be unable to detect the odor of isoamyl acetate in the air near the most vulnerable portion of the facepiece seal such as the nose bridge. A combination cartridge or canister with organic vapor and high-efficiency filters shall be sued when available for the particular mask being tested. The test subject shall be given an opportunity to smell the odor of isoamyl acetate before the test is conducted in a location which is separated from the test area.

b) Irritant fume test - When using high-efficiency filters, the test subject should be unable to detect the irritant fume (stannic chloride ventilation smoke tubes) squirted into the air near the most vulnerable portions of the facepiece seal. The test subject shall be instructed to close her/his eyes during the test period. Unless the test subject cannot smell the odor of isoamyl acetate, the irritant fume test

should not be performed due to the irritant nature to the fume.

c) A QNFT may be conducted only when the test subject has obtained a satisfactory fit on either of the tests above.

The following three paragraphs apply only to QNFT utilizing photometric technology.

d) Before the subject enters the test chamber, a reasonably stable challenge agent concentration shall be obtained in the test chamber.

e) Immediately after the subject enters the test chamber, the challenge agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half-mask and 1 percent for a full facepiece.

f) A stable challenge agent concentration shall be established prior to the actual start of testing.

6. EXERCISE REGIMEN:

Prior to entering the test chamber, the test subject shall be given complete instructions as to her/his part in the test procedures. The test subject shall perform the following exercises, in the order given, for each independent test.

a) Normal Breathing (NB) - In the normal standing position, without talking, the subject shall breathe normally for at least one minute.

b) Deep Breathing (DB) - In the normal standing position the subject shall do deep breathing for at least one minute pausing so as not to hyperventilate.

c) Turning head side to side (SS) - Standing in place the subject shall slowly turn his/her head from side to side between the extreme positions to each side. The head shall be held at each extreme position for at least five seconds. Perform for at least one minute.

d) Moving head up and down (UD) - Standing in place, the subject shall slowly move his/her head up and down between the extreme position straight down. The head shall be held at each extreme position for at least five seconds. Perform for at least one minute.

e) Reading (R) - The subject shall read out slowly and loud so as to be heard clearly by the test conductor or monitor. The test subject shall read the "rainbow passage".

RAINBOW PASSAGE

When sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is according to legend, a boiling pot of gold at one end. People look but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

f) Grimace (G) - The test subject shall grimace, smile, frown, and generally contort the face using the

facial muscles. Continue for at least 15 seconds. The test is used to check the reseal of the respirator after seal is broken.

g) Bend over and touch toes (B) - The test subject shall bend at the waist and touch toes and return to upright position. Repeat for at least one minute.

h) Jogging in place (J) - The test subject shall perform jog in place for at least one minute.

I) Normal Breathing (NB) - Same as exercise (a) above.

j) The test shall be terminated whenever any single peak penetration exceeds five percent for half masks and one percent for full facepieces. The test subject may be refitted and retested. If two of the three required tests are terminated, the fit shall be deemed inadequate.

7. CALCULATION OF FIT FACTORS

a) The fit factor determined by the quantitative fit test is expressed as the ratio of challenge concentration outside the respirator to the concentration inside the respirator.

b) The average test chamber concentration is the arithmetic average of the test chamber concentration at the beginning and of the end of the test.

c) The average peak concentration of the challenge agent inside the respirator shall be the arithmetic average peak concentrations for each of eight exercises of the test which are computed as the arithmetic average of the peak concentrations found for each breath during the exercise.

d) The average peak concentration for any exercise may be determined graphically if there is not a great

variation in the peak concentrations during a single exercise.

e) When fit factors are calculated by a computer the average concentration, instead of average peak concentration, may be used.

B. QUALITATIVE RESPIRATOR FIT TEST (QLFT)

1. PURPOSE:

The Qualitative Respirator Fit Test procedures in this section shall be performed to supplement quantitative fit testing to meet the fit testing requirement for a specific standard such as asbestos or acrylonitrile.

2. DEFINITION(S):

a) Qualitative fit test - an assessment of the adequacy of respirator fit by determining whether or not an individual wearing the respirator can detect the odor, taste, or irritation of a contaminant introduced into the vicinity of the respirator wearer’s head.

3. RESPIRATOR SELECTION:

a. The test will be performed using the respirator which was determined to be the most effective during the last quantitative fit test. Isoamyl acetate will be the agent used. Individuals must be tested to ensure that they can detect, isoamyl acetate. It may be necessary to use the irritant smoke test, when an individual cannot detect isoamyl acetate.

b. The fitting process should be conducted in a room separate from the fit-test room to prevent odor fatigue. Both rooms should be well ventilated and separated by a distance for enough to avoid cross contamination. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to assess a "comfortable"

respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This will not constitute his/her formal training on respirator use, only a review.

c. Assessment of comfort shall include reviewing the following points with the test subject:

-Chin properly placed

-Positioning of mask on nose

-Strap tension

-Fit across nose bridge

-Room for safety glasses

-Distance from nose to chin

-Room to talk

-Tendency to slip

-Cheeks filled out

-Self-observation in mirror

-Adequate time for assessment

d. The test subject shall conduct the conventional negative and positive-pressure fit checks (e.g., see American National Standards Practices for Respiratory Protection, ANSI Z88.2-1980). Before conducting the negative or positive-pressure checks, the subject shall be told to "seat" the mask by rapidly moving the head side-to-side and up and down, taking a few deep breaths.

e. The test subject is now ready for fit testing.

f. After passing the fit test, the test subject shall be questioned again regarding the comfort of the

respirator. If it has become uncomfortable, another model of respirator shall be tried.

4. FIT TEST PROCEDURE:

a. Each respirator used for fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges shall be changed at least once weekly.

b. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room.

c. Each test subject shall wear her/his respirator for at least five minutes before starting the fit test.

d. Exercise Regimen:

NOTE: See 6a) through j) under the Quantitative fit test section.

e. If at anytime during the test, the subject detects the odor of the testing agent, she/he shall quickly exit from the test chamber and leave the test area.

f. If the entire test is completed without the test subject detecting the odor of the testing agent, the test is passed and the respirator selected is judged adequate.

C. OTHER REQUIREMENTS:

1. Based upon an analysis of the fit test records of Federal OSHA CSHOs in the past, the test subject shall not be permitted to wear a half-mask or full facepiece respirator if the minimum fit factor of 500 or 3,000, respectively, cannot be obtained. If hair growth or apparel interferes with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as a powered air-

purifying respirator, supplied air respirator or self-contained breathing apparatus.

2. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

3. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator disease or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

4. The test subject shall be given the opportunity to wear the assigned respirator for one month. If the respirator does not provide a satisfactory fit during actual use, the test subject may request another quantitative fit test which shall be performed as soon as possible.

5. A respirator fit factor card shall be issued to the test subject with the following information:

a) Name.

b) Date of fit test.

c) Make and model of QNFT equipment.

d) Fit factors obtained through each manufacturer, model and approval number (such as TC-21C-XXX) of the respirator tested.

e) Name and signature of the person who conducted the test.

f) Filters used for qualitative or quantitative fit testing shall be replaced whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media. Organic vapor cartridges/canisters shall be replaced whenever there is any indication of breakthrough by the test agent. Each fresh filter or sorbet cartridge shall be dated when it is installed.

7. In addition, because the face-to-facepiece seal of the respirator may be affected, qualitative fit testing shall be repeated immediately and quantitative fit testing as soon as possible when the test subject has:

a) Weight change of 20 pounds or more,

b) Significant facial scarring in the area of the facepiece seal,

c) Significant dental changes, i.e., multiple extractions without prothesis, or acquiring endures,

d) Reconstructive or cosmetic surgery, or

e) Any other condition that may interfere with facepiece sealing.

D. RECORDKEEPING.

A summary of all test results shall be maintained with the Division RPPC for seven years (see OSHA Instruction ADM 12-7.2A). These records shall be considered as EMPLOYEE EXPOSURE RECORDS. A copy of the summary shall include:

1. Name of test subject.

2. Date of testing.

3. Name of the test conductor.

4. Fit factors obtained from every respirator tested (indicate manufacturer, model, size and approval number).

5. Name and type of facepiece(s) which has failed during the qualitative test or has yielded a fit factor less than those prescribed in paragraph F.7.c.(1).

6. When applicable, the strip chart for fit testing shall also be maintained for seven years (see OSHA Instruction ADM 12-7.2A), and should contain the following information:

a. Date and time

b. Name of test subject

c. Name of test conductor

d. Manufacturer name and model of QNFT equipment

e. Respirator (type, brand, style, size and TC number)

f. Chart scale (e.g. 1 percent-full scale)

g. Chart speed1

h. Initial ambient

I. Initial base line estimate

j. Individual exercise (mark beginning and end)

k. Final base line

l. Calculation of penetration for each exercise

m. Overall fit factor (average of all exercises)

n. Notes (eyeglasses, dentures, scars, etc.)

E. MAINTENANCE

1. A program for respirator cleaning and care shall be established as a part of the standard operating procedures (SOP) by all division personnel who use respirators. The purpose of this element of a respirator program is to assure that all respirators are properly maintained. If they are modified in any way, their protection may be reduced. The Program Coordinators shall be trained to inspect, clean, repair, and store respirators. The program should be based on the number and types of respirators, working conditions, and hazards involved. In general, the program should include: inspection, cleaning, repair and storage.

a. All respirators shall be inspected before and after each use. The cleaning of respirators is the responsibility of the employee who is using the respirator, not the Program Coordinator.

b. Air-purifying respirators:

1) Thoroughly check all connections, gaskets and valves for proper fit and tightness. Check the condition of the facepiece and all its parts, and all connecting air tubes and head bands. Inspect parts, and all connecting air tubes and head bands. Inspect rubber or elastomer parts for pliability and signs or deterioration.

2) Clean and disinfect respirators as follows:

(A) Remove all cartridges, canisters, and filters, plus gaskets or seals not affixed to their seats. Cartridges will be discarded.

(B) Remove elastic head bands.

(C) Remove exhalation cover.

(D) Remove speaking diaphragm or speaking diaphragm-exhalation valve assembly.

(E) Remove inhalation valves.

(F) Wash facepiece and breathing tube in cleaner/sanitizer recommended by the manufacturer with warm water, use manufacturers' recommended temperature. Wash components separately from the facepiece, as necessary.

Remove heavy soil from surfaces with a hand brush.

3) After respirators have been inspected, cleaned, sanitized, and repaired, store them so as to protect against dust, excessive moisture, damaging chemicals, extreme temperatures and direct sunlight.

4) Each unit shall be sealed in a plastic bag, placed in a separate box, and tagged for immediate use.

5) Cartridges and canisters shall always be stored in their sealed plastic bags until ready for use. Canisters will be stored with original seals intact in the upright position.

(6) Wash facepiece and breathing tube in cleaner/sanitizer recommended by the manufacturer with warm water, use manufacturers' recommended temperature. Wash components separately from the facepiece, as necessary. Remove heavy soil from surfaces with a hand brush.

Appendix A

Respiratory Protection Program Coordinators

Division RPPC: J. Edgar Geddie, Ph.D., Health Standards Officer

Charlotte RPPC:

Raleigh RPPC:

Wilmington RPPC:

Winston-Salem RPPC:

OSHNC Respiratory Protection Program

Standard Operating Procedures

NC Division of Occupational Safety and Health (OSHNC) compliance officers and consultants are potentially exposed to a variety of air contaminants during the performance of their duties. Such exposures can occur during the conduct of compliance inspections (fatality/accident, complaint, referral and general schedule) or consultative audits involving high hazard processes.

The nature of these contaminants include: dusts, mists and fumes; organic vapors; gases; biohazards; and IDLH atmospheres. The concentration of these airborne contaminants can range from at or below recognized exposure limits (PELs, TLVs, RELs) to several times above these exposure limits to IDLH concentrations. Levels of air contaminants are influenced by the nature of the contaminant and the process by which this substance is rendered airborne.

In general, Compliance Officers and consultants may be required to wear respirators in the following circumstances:

1. In areas where airborne contaminant levels are known or potentially known to exceed mandatory or recognized exposure limits.

2. When required by an employer to access areas where specific processes are present.

3. When conducting inspections in areas of facilities where potential exposure to airborne biohazards may exist (e.g., Mycobacterium tuberculosis).

4. During inspections of emergency response.

However, the CSHO shall consult with his or her Compliance Supervisor prior to entering areas where respirators may be required.

Selection of Approved Respirators

In order to ensure adequate protection, each respirator user will be trained, fitted and provided with a NIOSH-approved half-mask, air purifying respirator for which an adequate supply of replaceable cartridges will be maintained. This supply will, at a minimum, consist of organic vapor (OV), acid gas (AG), acid gas/organic vapor (AG/OV), ammonia/methylamine, and high-efficiency

particulate air (HEPA) cartridges. In addition, prefilters and adapters will be maintained for paint spray mists and dusts, mists, and fumes (DMF) to be used in conjunction with other cartridges.

Since proper selection of respirator cartridges is based on the nature of the air contaminant(s), the appropriate chemical cartridges will be selected in accordance with substance-specific standards and any other guidance regarding respirator selection (e.g., NIOSH Pocket Guide to Chemical Hazards). Table I lists the maximum air concentrations for some of the specifically regulated air contaminants for which half-mask respirators may be used, except as otherwise noted:

Table I -- Maximum Allowable Concentrations of Some Specifically Regulated Chemical Substances for Half Mask Respirators

Chemical/Substance	Respirator Cartridge	Maximum Allowable Concentration for Half Mask Facepiece
Arsenic (As)	HEPAH	100 mg/m3 (10 x PEL)
Asbestos	HEPAH	1 fiber/cc (10 x PEL)
Benzene	OV	10 ppm (10 x PEL)
Cadmium	HEPAH	5 mg/m3
Ethylene Oxide (EtO)	EtO	50 ppm (Note: Full facepiece respirator with EtO canister is minimum required respirator)
Formaldehyde (HCHO)	HCHO	7.5 ppm (10 x PEL) (Note: Full facepiece required)
Lead (Pb)	HEPAH	500 mg/m3 (10 x PEL)
Methylene chloride (CH2Cl2)	n/a	n/a

Methylenedianiline (MDA)	HEPAH	100 ppb (10 x PEL)
	HEPA/OVH (when MDA in liquid form or in process requiring heat)	
Mycobacterium tuberculosis	HEPAI	None specified

H HEPA filters certified under 30 CFR Part 11 cannot be sold or shipped after July 10, 1998. Thereafter, N-100, R-100, and P-100 particulate respirators will be the only high-efficiency respirators sold. OSHA and MSHA will determine the period for continued use of HEPA and other particulate respirators which were certified under 30 CFR Part 11.

I N-95 respirator is the minimal acceptable level of respiratory protection against M. tuberculosis.

Warning Signs of Respirator Failure

˜ Particulate Air-Purifying

As with any air filter, overloading of particulate respirator filters leads to air flow resistance. Whenever breathing difficulty is encountered while wearing a half-mask, full-face, or PAPR, the CSHO or consultant must exit the area and replace the filters.

˜ Gas or Vapor Air-Purifying (Chemical Cartridge or Canister)

Failure of gas or vapor air-purifying respirators may be indicated by warning properties. These include any of the following: odor; taste; eye irritation; respiratory irritation. If any of these occur while wearing the respirator, leave the area and check the respirator for the following:

- Proper face seal
- Damaged or missing respirator parts
- Saturated or inappropriate cartridge or canister

If none of these conditions are present, replace the cartridge or canister. If any of the warning properties persist, this may indicate that the design of the cartridge or canister specifications may be exceeded.

Fit-Testing

Employees are required to be quantitatively fit-tested for each of the different masks he/she may be required to wear before he/she is able to enter an area that requires respirator use. Fit-testing shall be performed for both negative and positive pressure face pieces.

- Fit-testing will be performed by Office Respiratory Protection Program Coordinators (RPPC)
- Division Respiratory Protection Program Coordinator (Ed Geddie)

Employees are required to have certificates that are issued after the completion of initial or annual fit-testing. Certificate information is required to be filled out by RPPCs or Supervisors and will contain the following information:

- Manufacturer's Name
- Model
- Size
- Fit-tester's Initials
- Date of Fit-Test
- Date of Medical Evaluation
- Name of Employee
- Social Security Number
- Supervisor's Signature

Employees must have certificates in their possession and signed by their supervisor, before a respirator will be issued to them.

Any physical changes which have occurred that may interfere with the respirator face to facepiece seal, must be reported to the RPPC by the employee (i.e., facial or dental surgery, weight change, etc.). The respirator user must undergo another fit test prior to further respirator usage if before the next scheduled (annual) fit test.

Facial hair that inhibits the sealing surface of the respirator is not authorized for anyone who may need to wear a respirator.

Fit-test records shall be maintained by RPPCs and/or Supervisors.

****Employees must be medically certified for respirator use and free of interfering facial hair before fit-test begins.

Qualitative fit-testing

Qualitative fit-testing is acceptable only under the following conditions:

- Quantitative equipment is unavailable
- Compliance officer needs the use of a respirator and has not been previously fit-tested.
- Supervisor has approved a qualitative fit-test as a temporary measure.

Medical Evaluations

Individuals shall be examined medically before being assigned to use a respirator in accordance with the division respiratory protection program and on an annual basis. It is the responsibility of each supervisor to verify that respirator users have received medical approval to wear a respirator from the contracted occupational medicine provider. It is also the responsibility of each supervisor to track employees that have received restricted respirator use and the applicable restrictions.

Special Emphasis Programs Which May Require Expedited Respirator Training and Fit Testing

- PQV Team Members
- Asbestos Inspection Team
- Pesticide Inspection Team
- Lead Inspection Team

Cleaning and Disinfecting respirators

Respirators are to be cleaned and disinfected after each use or as frequently as necessary to ensure cleanliness. Respirators used for emergency purposes are to be cleaned after each use. They should also be cleaned if dirty when being inspected.

Respirator cleaning follows OSHA instruction, described below:

1- Remove all canisters, filters, valves, straps, and speaking diaphragms from the face piece.

2- Wash all pieces including face piece in warm soapy water. Use only approved soap/disinfectant. Scrub gently with brush or cloth, to remove excess dirt.

3- Make sure to rinse in clean water before reassembling.

4- Air dry

5- Reassemble pieces

As soon as cleaning is complete, place respirator in an airtight bag and store in a clean dry space.

Respirator Storage

Respirators are to be stored in a clean dry place. They should not be exposed to dust, sunlight, extreme heat or cold, chemicals or moisture.

Respirators should be stored so that they will not be disfigured or get contaminated. They should be stored in an airtight bag.

***RESPIRATORS SHOULD NOT BE STORED DIRTY.

***ALWAYS CLEAN YOUR RESPIRATOR AFTER USE.

Qualitative fit-testing

Qualitative fit-testing is acceptable only under the following conditions:

- Quantitative equipment is unavailable
- Compliance officer needs the use of a respirator and has not been previously fit-tested.
- Supervisor has approved a qualitative fit-test as a temporary measure.