



Technical Data Bulletin
技术数据通报

#176 Pandemic Influenza Preparedness Planning: Practical Considerations for
Respirator Use in a Health Care Setting
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#176大流行性流感准备计划：在医疗机构使用呼吸器应实际考虑的因素
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Background 背景

On October 17, 2006, the Centers for Disease Control and Prevention (CDC) issued a guidance document titled “Interim Guidance on Planning for the Use of Surgical Masks and Respirators in Health Care Settings during an Influenza Pandemic.”¹ The intent of the guidance is to provide health care operations a framework to assist in the planning process for use of surgical masks and respirators during an influenza pandemic. The CDC recommendations apply to settings where pandemic influenza patients may receive health care services such as hospitals, emergency departments, out-patient facilities, residential care facilities, emergency medical services, and home health care delivery.

2006年10月17日，疾病预防控制中心（CDC）发表了题为“对医疗机构在大流行性流感爆发期间使用外科口罩和呼吸器计划的临时性指南”¹，旨在给医疗系统提供一个框架，在其制订大流行性流感爆发期间的外科口罩和呼吸器使用计划的工作中提供帮助。CDC的这个指南适用于接收流感病人的医疗服务设施，如医院、急救服务、诊所、疗养、应急医疗服务和提供家庭护理的机构。

According to the CDC, lack of immunity to a pandemic influenza strain and potential for a high case-fatality rate makes it advisable to take additional precautions beyond those typically recommended during a seasonal influenza outbreak. Use of respiratory protection during an influenza pandemic is one of those additional precautions. The primary consideration for use of respiratory protection in a health care setting during an influenza pandemic is the reduction in exposure needed or desired for the situation. For most types of patient care a “N95” respirator may be used. However, the CDC has described certain activities as “high risk” due to the likelihood of generating infectious respiratory aerosols and indicates a higher

level of respiratory protection may be considered.¹ Examples of high risk activities as defined by the CDC include aerosol generating procedures such as endotracheal intubation, nebulizer treatment, and bronchoscopy performed on patients with confirmed or suspected pandemic influenza; emergency intubation or cardiac pulmonary resuscitation of a confirmed or suspect pandemic influenza patient; and providing direct care of a patient with confirmed or suspected pandemic influenza-associated pneumonia due to the potential for the individual to produce an increased amount of respirable infectious particles when they cough. The CDC also indicates that it would be prudent for health care workers to wear respiratory protection for other direct care activities involving patients with confirmed or suspected pandemic influenza. An example cited includes housekeeping staff that may enter rooms of influenza patients to mop floors or clean patient equipment. In the guidance document, several types of respiratory protection are referenced as potentially utilized by health care workers during a pandemic situation. The purpose of this technical data bulletin is to describe the types of respirators available and considerations for use in a health care setting during an influenza pandemic. It is important to remember that use of respirators is only one of many strategies to help reduce exposure to biological hazards. Since no respirator will completely prevent the inhalation of all particles, use of respirators may help reduce, but not eliminate, the risk of exposure, infection, illness or death. Reading and understanding the CDC guidance document prior to selecting and using respiratory protective equipment is recommended.

按照CDC的建议，鉴于人们普遍缺乏对大流行性流感的免疫力，而且流感可能导致很高的病死率，所采取的预防措施应高于季节性流感的常规预防，其中包括使用呼吸器。在大流行性流感爆发期间使用呼吸器，主要的目的是需要和期望降低医疗机构工作人员的暴露，绝大多数的病人护理工作都可以使用“N95”级别的呼吸器，然而，CDC也定义了某些“高风险”作业，指出，对那些可能产生传染性的呼吸性气溶胶的作业，应考虑使用更高防护级别的呼吸器。CDC定义并列举的高风险作业包括产生气溶胶的一些过程，如：对确诊或疑似病人实施气管插管、喷雾治疗和支气管镜检查等作业；对确诊或疑似病人实施的紧急插管或心肺复苏的作业；对确诊或疑似流感所导致的肺炎病人所进行的直接护理作业，其间病人咳嗽会产生大量的呼吸性传染性气溶胶。CDC还指出，在确诊或疑似流感病人的其它直接护理中，使用呼吸器也是谨慎的考虑，CDC所列举的有进入流感病人房间，擦地板或清洁病人使用设备的房间保洁员。在指南中，CDC列举了在流感爆发期间医护人员可以使用的几种类型的呼吸器，发表本技术通报的目的就在于，对流感爆发期间医护人员可以使用的这几类呼吸器进行介绍，对选择使用中应考虑的因素进行探讨。需要牢记的是，使用呼吸器不是帮助降低生物危害暴露的唯一措施，而且呼吸器也并不能完全防止颗

粒物的吸入，其使用只能降低吸入量，但不能消除暴露、感染、生病或死亡的风险。我们建议在选择和使用呼吸器之前，大家应先阅读并理解CDC的指南。

Types of Respiratory Protection

呼吸器的种类

A respirator is a protective device designed to provide the wearer with respiratory protection against inhalation of a hazardous atmosphere.² In a pandemic influenza scenario, the hazards are airborne infectious biological particles, or bioaerosols. Bioaerosols can be filtered by respirators with particulate filters.³⁻⁷ For use in the United States, respiratory protective equipment must be certified by the National Institute for Occupational Safety and Health (NIOSH), the federal agency tasked with testing and certification of respirators. NIOSH has nine approval categories for respirators designed to reduce exposure to particles.

呼吸器是一类防护装置，设计提供使用者针对有害空气的呼吸防护²。在大流行性流感爆发的情况下，危险因素是空气中的传染性微生物颗粒，或生物气溶胶。使用颗粒物过滤元件的呼吸器可以过滤生物气溶胶³⁻⁷，在美国，呼吸防护用品必须经过美国职业安全健康研究所（NIOSH）的认证，该机构负责测试和认证呼吸器，共有九类防颗粒物呼吸器。

The NIOSH approval categories for particulate filters include N95, N99, N100, R95, R99, R100, P95, P99 and P100 and, for powered air purifying respirators (PAPRs), a high efficiency (HE) filter designation similar in filter efficiency to the 100 level category. The 95, 99 and 100 (99.97) refer to the percentage of particle filtration efficiency when tested according to the NIOSH laboratory test methods.² An N-certified respirator can only be used in environments that do not contain oil aerosols. R and P-certified respirators can be used in both oil and non-oil containing environments. Healthcare settings normally do not contain oil aerosols and in most healthcare applications respirators from any of the approval categories and filtration efficiencies could be selected to help reduce exposure to bioaerosols.

NIOSH认证的防颗粒物呼吸器的过滤元件包括N95、N99、N100、R95、R99、R100、P95、P99和P100九类，动力送风过滤式呼吸器（PAPR）使用一类高过滤效率（HE）的过滤元件，相当于100的效率级别。其中95、99和100（99.97）指的是NIOSH的实验室测试条件下²的颗粒物过滤效率水平，N类的呼吸器只能用在不含油性气溶胶的环境中，R和P类呼吸器在含油性气溶胶和非油性气溶胶的环境中都能使用。医疗机构内通常不存在油性气溶胶，绝大多数医疗机构可以选用经过认证的任何类别及任何效率级别的防颗粒物呼吸器，这些都可以帮

助减少生物气溶胶的暴露。

It should be noted that penetration of particles through the filter is only one of the possible sources of respiratory exposure. Other potential sources such as face seal leakage, improper maintenance, or not wearing the respirator when necessary may contribute more to exposure than filter penetration. Each of these must be addressed and controlled. Wearers must be trained how to properly maintain their respirators and the importance of wearing them during all times of exposure.

应当指出的是，颗粒物穿过滤元件仅仅是呼吸暴露的一种可能，其它可能因素来自面部与呼吸器密合部分的泄漏，因维护不当而导致的失效，或在需要佩戴呼吸器的时候没有佩戴等，这些都比过滤元件穿透所产生的暴露要多，因此对这些情况都必须加以重视和控制。佩戴者必须经过培训，了解妥善保养呼吸器的方法，和在暴露期间一直佩戴的重要性。

It is also important to emphasize that respirators only reduce exposure. Types or classes of respirators are given an “assigned protection factor” or APF. APF is the expected ability of the respirator to reduce exposure when used according to an effective respiratory protection program. For example, an APF of 10 means that a respirator is expected to reduce exposure by a factor of 10 (or 90%) when properly selected, maintained, fitted and worn. Therefore, even if a filter is 100% efficient, the expected amount of exposure reduction would be limited by the APF. Because no respirator will prevent the inhalation of all particles, they cannot eliminate the risk of exposure, infection and illness.

还需要重点强调的是，呼吸器只能降低暴露。每类/级别的呼吸器都被给定了一个“指定防护因数”或APF，当按照有效的呼吸保护计划使用时，APF是呼吸器预计能够降低暴露的能力，例如，APF等于10表明，当正确选择和维护，脸型能够适配并正确佩戴的条件下，该呼吸器可以将暴露降低10倍（或降低90%）。因此，即便过滤元件有100%的过滤效率，暴露的预期降低水平将受APF的限制，因为呼吸器不可能阻止所有颗粒物的吸入，不能消除暴露、感染和患病的风险。

Use of respirators in the workplace, including health care facilities, is regulated by the Occupational Safety and Health Administration (OSHA) and requires a complete respiratory protection program including fit testing, training and medical evaluation.⁸

在工作场所，包括在医疗机构中使用呼吸器，必须符合美国职业安全与健康管理局（OSHA）的规定，规定要求制订一个完整的呼吸保护计划，计划中必须

包括适合性检验（译者注：即检测密合型呼吸器面罩与具体使用者面部的密合水平）和医学评价（译者注：即评价呼吸器使用者身体状况是否适合使用呼吸器）⁸。

Filtering Facepiece Respirator 过滤式呼吸防护口罩

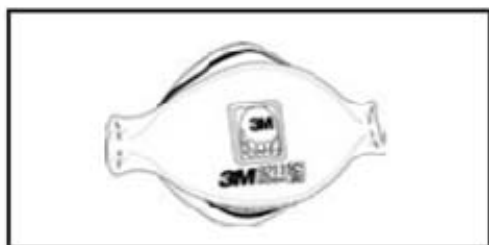
A particulate filtering facepiece respirator has an integral part, if not all, of the respirator comprised of the filter material. This type of respirator fits from the nose to just beneath the chin and is called a half facepiece respirator. OSHA has given half facepiece respirators an APF of 10.9. Filtering facepiece respirators are available with or without exhalation valves. Some filtering facepiece respirators have also been cleared by the FDA and these respiratory protective devices are classified as N95 surgical respirators.

过滤式防颗粒物口罩的主要部件（如果不是所有部件），是由过滤材料构成的面罩本体，这类呼吸器盖在从鼻子到下巴以下的位置，也称为半面罩呼吸器。OSHA规定，呼吸器半面罩的指定防护因数APF为10⁹。过滤式呼吸防护口罩有些有呼气阀，有些没有。有些过滤式呼吸防护口罩获得了FDA的批准，这类产品称为N95级别的医用防护口罩。



**3M™ Filtering Facepiece Respirator
Without Exhalation Valve**

3M™过滤式呼吸防护口罩，无呼气阀



**3M™ Filtering Facepiece Respirator
With Exhalation Valve**

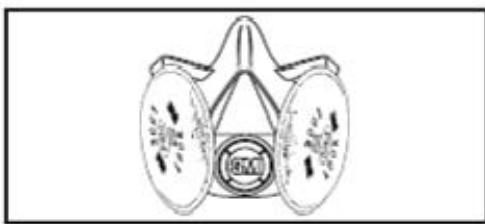
3M™过滤式呼吸防护口罩，带呼气阀

Elastomeric Respirator

橡胶面罩呼吸器

An elastomeric respirator's facepiece is normally made of an elastomer or "rubber-like" material. The appropriate filter is then attached to the facepiece and in most styles can be removed and replaced. Elastomeric respirators are available as half facepiece and full facepiece respirators. A half facepiece respirator fits from the nose to just beneath the chin and has an OSHA APF of 10. A full facepiece respirator fits from the upper portion of the forehead to just beneath the chin. Full facepiece respirators have an APF of 10 when qualitatively fit tested and an APF of 50 when quantitatively fit tested. A full facepiece respirator provides additional area for the face to facepiece seal compared to a half facepiece respirator and hence can offer a higher level of protection, or greater reduction in exposure. The particulate filters for elastomeric respirators are also tested and certified per the NIOSH approval categories described above.

橡胶面罩呼吸器通常是用人造橡胶或“橡胶类”的材料制成的呼吸器面罩，面罩上装配适当选择的过滤元件，多数设计都允许拆卸和更换过滤元件。橡胶面罩呼吸器有半面罩和全面罩之分。半面罩盖在从鼻子到下巴以下的位置，OSHA规定其APF为10⁹。全面罩盖在从前额的上部到下巴以下的位置，通过定性适合性检测的全面罩APF为10，通过定量适合性检验的全面罩APF为50⁹。与半面罩相比，全面罩在面部的密合区域更大，因此可以提供更高水平的防护，或更大程度地降低暴露的风险。与橡胶面罩一起使用的防颗粒物过滤元件，同样通过NIOSH的测试和认证，认证类型和级别同上所述。



Half Facepiece Elastomeric Respirator

橡胶半面罩呼吸器



Full Facepiece Elastomeric Respirator

橡胶全面罩呼吸器

Powered Air Purifying Respirator (PAPR) 动力送风过滤式呼吸器 (PAPR)

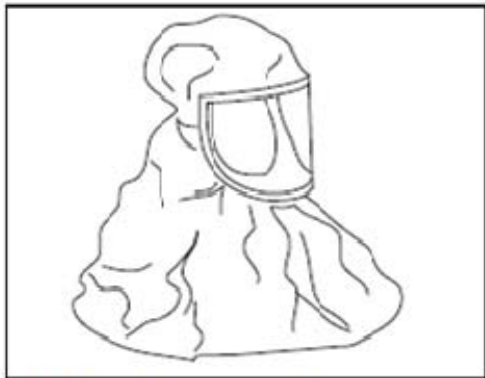
A powered air purifying respirator relies on a battery operated motor blower, rather than the person's lungs, to draw air through the filter material. The motor blower and filter are often attached to a belt and worn at the waist. The filtered air is then delivered through a "breathing tube" to a loose-fitting facepiece or hood worn by the individual. A loose-fitting facepiece is designed to seal loosely and forms a partial seal with the face. A PAPR used with a loose fitting facepiece has an OSHA APF of 25.9 A hood, on the other hand, completely covers the head and neck and may also cover a portion of the shoulders. A PAPR used with a hood can achieve an OSHA APF of up to 1000.9 PAPRs, where the air is flowing out from the respirator, make it more difficult for particles to enter the breathing zone and offer a higher level of protection than a half facepiece respirator. PAPRs suitable for particles such as bioaerosols carry a NIOSH high efficiency (HE) approval, similar in filter efficiency to the 100 level categories described above.

动力送风过滤式呼吸器靠电池供电，依靠电动风机而不肺，使空气通过过滤元件来呼吸。常见的设计是靠腰带把电动风机和过滤元件固定在腰间，经过滤的空气通过一根呼吸管送到松配合的面罩或头罩内供使用者呼吸。所谓松配合面罩的设计，是只与面部松松地密合，形成部分的密封。OSHA规定，配松配合面罩的PAPR的APF为25⁹。另外还有一类头罩，设计可以完全覆盖在头部和颈部，并可以部分覆盖肩，OSHA规定，使用这种类型头罩的PAPR的APF最高可以达到1000⁹。使用PAPR呼吸器，空气是从呼吸器向外吹，颗粒物难以进入呼吸区域，比半面罩型呼吸器的防护级别要高。获得NIOSH高效过滤（HE）认证的PAPR可以防护颗粒物，如生物气溶胶，其过滤效率与上述100级的过滤效率相当。



3M™ Loose-fitting Facepiece for Powered Air Purifying Respirator

3M™动力送风过滤式呼吸器使用的松配合面罩



3M™ Hood for Powered Air Purifying Respirator

3M™动力送风过滤式呼吸器使用的头罩



3M™ Motor Blower with Enclosed Filter

3M™动力送风过滤式呼吸器使用的电动风机

Additional Considerations for Use

关于使用呼吸器的考虑因素

Fit Testing

适合性检验

Respirators which rely on a face to facepiece seal require fit testing per OSHA regulations. This requirement includes the filtering facepiece respirators as well as the half and full facepiece elastomeric respirators. Respirators which do not rely on a

seal to the face, such as PAPRs with loose-fitting facepieces and hoods do not require fit testing.

凡是依靠面罩与人脸密合的呼吸器，按照OSHA的规定，都必须做适合性检验，这包括过滤式呼吸防护口罩、橡胶半面罩和全面罩呼吸器。不靠与人面部密合的呼吸器，如使用松配合面罩和头罩的PAPR，就不需要做适合性检验。

Fit test methods that are acceptable to OSHA are listed in Appendix A of 1910.134. These include qualitative fit test methods such as the saccharin or bitter aerosol methods or quantitative fit test methods where a device gives a numerical measurement of the fit.

OSHA所接受的适合性检验方法在29CFR1910.134《呼吸防护标准》的附录A中有提供，这包括定性适合性检验，如使用糖精的甜味道的气溶胶方法，或使用苦味道的气溶胶的方法，另外还有定量适合性检验，依靠仪器测量适合性的数值。

Employees with facial hair cannot wear respirators which rely on a face to facepiece seal such as the filtering facepiece respirators and the half and full facepiece elastomeric respirators. This needs to be considered during respirator selection. A PAPR with a hood can be used by most employees with facial hair, such as a full beard. A PAPR with a loose-fitting facepiece can be used with limited facial hair, as long as the facial hair does not come between the face and the respirator face seal. 面部留有毛发的雇员不能够使用依靠脸部与面罩密合的呼吸器，如过滤式呼吸防护口罩、橡胶半面罩和全面罩呼吸器，在呼吸器选择过程中要考虑到这种情况。带有头罩的PAPR可用于多数面部留有毛发的雇员，面部有少量毛发的员工，只要毛发不在密合区，就可以选用松配合面罩的PAPR。

The need to fit test individuals also involves logistical considerations. During a pandemic event, it may be necessary to utilize staff that may not have been previously fit tested on filtering facepiece or elastomeric respirators. From a preparedness perspective, the preferred scenario is that all potentially affected employees will have been properly fit tested and trained in preparation for such an event well in advance of a potential occurrence. If this has not transpired, logistical considerations could include a plan to fit test these employees at the time of an event (prior to use of the respirator) as well as potential use of PAPRs with loose fitting facepieces or hoods. Training, medical evaluation and all other requirements of the respirator standard are, however, required for use of PAPRs.

对每个人进行适合性检验还需要有后勤方面的考虑。在流感爆发期间，使用呼

吸器的员工可能事前并没有做过过滤式呼吸防护口罩或橡胶面罩的适合性检验。从防患未然的角度看，应在流感爆发之前，事先对所有相关的员工进行适合性检验和培训。如果没能做到这种事前的准备，则在后勤方面应考虑，如何在突发事件发生之际，（在使用呼吸器之前）进行适合性检验的计划，以及使用松配合面罩或头罩的PAPR。然而，使用PAPR同样要满足《呼吸防护标准》对培训、医学评估等所有其它相关要求。

It is also important to note that the CDC encourages measures to minimize the number of personnel who come into contact with suspected or confirmed pandemic influenza patients in order to minimize the number of workers exposed as well the demand for respirators.

此外，还必须注意到，CDC鼓励采取措施，尽量减少接触疑似或确诊流感病人的人数，以减少接触暴露的工人，减少对呼吸器的需求。

Reuse of Respiratory Protection

关于重复使用呼吸器

Filtering Facepiece Respirators:

过滤式防护口罩

Any reuse of a filtering facepiece respirator during a pandemic event is restricted to use by a single person, not to be shared between employees and only done if absolutely necessary. In its guidance document the CDC indicates that a disposable N95 respirator(i.e. a filtering facepiece respirator) should be discarded once worn in the presence of a patient with pandemic influenza. They also site an Institute of Medicine (IOM) suggestion that if it is necessary to reuse a disposable N95 respirator, precautions should be taken to cover the respirator with a medical mask or protective faceshield, to store the respirator carefully between uses and to wash hands before and after handling the respirator and the mask or faceshield used to cover the respirator.¹⁰ Filtering facepiece respirators are not designed to be washed. Storage of filtering facepiece respirators in re-sealable plastic bags may not be appropriate due to moisture after use and the potential for microorganism survival on filters. Paper bags have been utilized in some healthcare facilities as a storage container.

在大流行性流感爆发期间，过滤式呼吸防护口罩的重复使用仅限于使用者本人，而不是在员工之间共享，而且只有在非常必要的时候才考虑重复使用。CDC在指南中指出，随弃式N95呼吸防护口罩（即过滤式防护口罩）一旦在有流感病人的环境中使用过，使用后就必须废弃。CDC还引用医学协会（IOM）的建

议，即如果有必要重复使用随弃式N95防护口罩，应当采取预防措施，使用医用外科口罩或防护面屏盖住呼吸防护口罩，每次使用后小心保存防护口罩，每次接触防护口罩，或接触盖在防护口罩外面的外科口罩或防护面屏前后应洗手¹⁰。把过滤式防护口罩储存在可重复封口的塑料袋中并不是一个好的方法，因为使用后口罩可能会比较潮，在塑料袋中保存会利于病原微生物的存活。在一些医疗机构，已经使用纸口袋作为存放的工具。

Elastomeric Facepiece Respirators and PAPRs: 橡胶面罩呼吸器和PAPR:

In Appendix B of the guidance document, the CDC explains that elastomeric respirator facepieces and PAPRs can be “cleaned, disinfected, and fitted with new filters for reuse.” They do caution that care must be taken to prevent exposure of the wearer to any infectious material that may be on the outside surface of the respirator. The CDC directs facilities to follow the manufacturer’s instructions for cleaning PAPRs and the assumption is that would be true for elastomeric respirator facepieces as well. Used filters should be discarded. Filters and cartridges cannot be washed and reused.

在指南的附录B中，CDC解释，对橡胶面罩和PAPR可以“清洗和消毒，可以更换新的过滤元件后重复使用”。CDC确实提醒，必须注意防止佩戴者因接触受到污染的呼吸器外表面材料而受到传染，CDC要求应遵循制造商的使用说明清洗PAPR。可以认为，清洗橡胶面罩同样也应遵守制造商的说明。用过的过滤元件应该废弃，不能水洗和重复使用。

Cleaning of 3M elastomeric respirators is often accomplished by removing the filters and then immersing the facepiece, loose-fitting facepiece, or hood in warm water with a neutral detergent and scrubbing with a soft brush if needed. Solvents and strong detergents may damage 3M respirators and respirator components and should not be used for cleaning. 3M half and full facepieces can be sanitized by soaking in a quaternary ammonia disinfectant, sodium hypochlorite, or other disinfecting agent. Hoods and loose-fitting facepieces can be wiped with similar disinfecting agents. The sodium hypochlorite solution used to sanitize respirators, 1 ounce (30ml) of household bleach in 2 gallons (7.5L) of water, may be less concentrated than the sodium hypochlorite solution used in a health care setting. The directions that accompany the quaternary ammonia solutions or other disinfecting agents should be followed, including mixing instructions and the appropriate contact time. Contact times of disinfecting agents may be several minutes in duration and should be included in the logistics of cleaning and maintenance.

清洗3M橡胶面罩呼吸器需先拆除过滤元件，然后将面罩、松配合面罩或头罩浸泡在温水中，使用中性洗涤剂清洗，如果需要，可以使用软毛刷。溶剂和强的除垢剂会损坏3M呼吸器和呼吸器部件，不能用于呼吸器的清洗。3M半面罩和全面罩可以浸泡在季铵盐消毒剂、次氯酸钠消毒器或其它消毒剂中进行消毒，对松配合面罩和头罩，可以用同样的消毒剂进行外表面的擦拭。制备呼吸器消毒的次氯酸钠溶液，可以用1盎司（30毫升）家用漂水加入2加仑（7.5升）水，这会比医疗机构使用的次氯酸钠消毒液浓度低一些。对季铵盐类或其它类型的消毒剂，应遵照使用说明进行配制，包括混合方法和适当的接触时间。使用消毒液消毒所需的接触时间要有几分钟，这一点也应在清洗和保养的后勤准备上予以考虑。

Although elastomeric facepieces and components can be submerged, this is not true for many PAPR components such as motor blowers, batteries and breathing tubes that have a “muffler” inside for sound dampening. Submersion of these components in any liquid will likely result in damage and instead should be wiped with a disinfecting solution. One exception is the motor blower of the 3M GVP PAPR, which is designed to be sealed or capped and then submerged for cleaning. Filters and cartridges should not be submerged or washed.

尽管橡胶面罩和部件可以在液体中浸泡，但对PAPR的多数部件，如电机、电池和带消声器的呼吸管，却不能浸在液体中，否则会损坏设备，因此只能使用消毒液做外表面擦拭。3M GVP PAPR的电机是一个例外，其设计有密封和保护盖，可以浸泡清洗，但滤棉或滤盒都不能浸泡或清洗。

In an industrial setting, once an elastomeric respirator or a PAPR with a loose-fitting facepiece or hood has been cleaned and sanitized per the user instructions, it is returned to inventory and can be used by another person. Although sharing disinfected respirators between employees is not specifically addressed by the CDC, it is an additional factor for consideration in the event of an influenza pandemic.

在工业企业中，一旦按照使用说明进行过消毒后，橡胶面罩、PAPR用的松配合面罩或头罩就可以返回仓库，供别人下次使用。尽管CDC没有专门就雇员之间共享消毒后的呼吸器进行说明，但一旦流感大爆发，这也是一个需要考虑的额外因素。

Inspection

检查

All respirators, including brand new respirators, and components must be inspected prior to each use and any damaged or deteriorated components replaced. Refer to the

User Instructions provided with each respirator system for specific cleaning, sanitizing, inspection and maintenance procedures.

所有呼吸器，包括新的呼吸器和部件，在每次使用前都必须检查，更换损坏或老化的部件。应参阅说明书，了解每个呼吸器产品清洗、消毒、检查和维修的程序。

Storage

储存

The CDC did not provide guidance regarding storage; however, OSHA requires that respirators be stored in an area free from potential contamination and in a method that will not cause any damage. Elastomeric respirators and PAPRs dedicated to specific individuals should be identifiable to the person (e.g. write name on headband of respirator, store in a specified location, etc).

CDC没有提供关于储存的指导性意见；然而，OSHA要求呼吸器必须储存在无潜在污染的环境中，且储存方式不应导致产品损坏。专人使用的橡胶面罩和PAPR应该标识使用者，便于识别（例如：在呼吸器头带上签名，存放在特定地点，等等）。

Maintenance

保养

Filtering facepieces respirators have no replaceable parts and are considered disposable. Elastomeric facepiece respirators and PAPRs, however, do have parts and filters that need to be available when a replacement is needed. Planning for a pandemic event should include not only the respirator system but any replacement parts and filters that may be required. In addition, PAPR systems operate on a battery which requires a battery charging and maintenance program be in place or detailed in preparedness plans. For guidance on battery charging and maintenance of 3M PAPRs refer to 3M OH&ESD Technical Data Bulletin 151 titled “PAPR Management and Planning for First Responders.”

过滤式呼吸防护口罩没有可以更换的零部件，可以认为是随弃式的。橡胶面罩呼吸器和PAPR的确需要备好零部件和滤棉，在需要的时候更换。制订流感应对计划不仅要考虑呼吸器，还应包含所需要的呼吸器配件和滤棉。另外，PAPR系统靠电池运行，需要使用充电器，需要相关的保养计划，或在准备计划中作详细的要求。关于3M PAPR电池的充电以及保养的指南，请参考3M OH&ESD技术通报#151，题为“应急响应中PAPR的管理与计划”。

Infection Control

传染控制

CDC's guidance indicates if a respirator that provides protection from splashes of blood or body fluids is needed, an FDA-cleared surgical respirator should be selected. Currently, only filtering facepiece respirators have been cleared by the FDA as surgical respirators.

CDC在指南中指出，如果呼吸器需要具备对飞溅的血液或体液的防护功能，应选择FDA批准的医用防护口罩。目前，FDA批准的医用防护口罩只有过滤式呼吸防护口罩这一类产品。

An additional infection control consideration is that PAPRs and respirators with exhalation valves allow the air, including the person's exhaled breath, to be released into the environment. If worn by an infected person, these respirators would not prevent transmission of a virus from the wearer. PAPRs and respirators with exhalation valves should not be used in healthcare environments requiring a sterile environment such as the operating room.

其它有关感染控制的考虑是，PAPR和带有呼气阀的呼吸器允许使用者呼出的气体被排入到环境中，如果是一个感染者使用，有呼气阀的呼吸器和PAPR都无法阻止使用者传播病毒。PAPR和带有呼气阀的呼吸器不能用在有无菌要求的医疗环境中，如手术室。

Ability to Perform Job Duties

关于佩戴呼吸器后的工作的能力

Selection criteria may also include which style respirator will be least likely to affect the person's ability to perform job duties. The ability to communicate to co-workers and patients is perhaps least affected by filtering facepiece respirators. Speaking while wearing elastomeric facepiece respirators may sound slightly more muffled. PAPRs also have some noise associated with the motor blower which may interfere with the ability to hear while using a stethoscope. It is not recommended to use a stethoscope with a hood as the stethoscope tubing may interfere with the sealing area.

呼吸器的选择准则还包括，选择的呼吸器类型应最小限度地影响使用者的工作能力。过滤式呼吸防护口罩对使用者与同事和病人的沟通影响最小；戴橡胶面罩呼吸器讲话时，声音听起来会有些闷的感觉；PAPR的电机会产生一些噪声，

噪声的有可能会干扰听诊器的使用；不建议戴头罩使用听诊器，因为听诊器的管子会妨碍头罩的密封。

Summary 总结

Many aspects of respirator use and selection must be considered while planning for the possibility of a pandemic influenza event. Table 1 is a summary of the considerations described in this document. Preparedness planning may require a combination of approaches and perhaps even selection of a variety of respiratory protection products. Respirator use in a health care setting, as in any occupational setting, must be in compliance with a complete respiratory protection program in accordance with OSHA regulations (29 CFR 1910.134).

为可能爆发的大流行性流感制订应对的计划中，在选用呼吸器的时候应考虑多个方面，表1对本通告所讨论的各种考虑因素进行了汇总。计划准备和采取措施都应多管齐下，同时选择多种呼吸器产品也是可能的。和在任何工作场所一样，在医疗机构中使用呼吸器必须符合OSHA法规（29 CFR 1910.134）的规定，执行完整的呼吸保护计划。

Table 1: Summary of Consideration

Consideration	Filtering Facepiece Respirator	Elastomeric Half Facepiece Respirator	Elastomeric Full Facepiece Respirator	PAPR with Loose-fitting Facepiece	PAPR with Hood
Reduction in Exposure Desired	APF of 10	APF of 10	APF of 50 (if quantitatively fit tested)	APF of 25	APF of 1000 (consult manufacturer)
Requires Fit Testing	Yes	Yes	Yes	No	No
Can be Used with Facial Hair	No	No	No	Limited facial hair	Yes
Reusable	No	Yes, with cleaning and disinfection. Dispose of used filters	Yes, with cleaning and disinfection. Dispose of used filters	Yes, with cleaning and disinfection. Dispose of used filters	Yes, with cleaning and disinfection. Dispose of used filters
Maintenance Required	No	Yes	Yes	Yes	Yes
Batteries to Charge	No	No	No	Yes	Yes
Exhaled Breath Released into Environment	No (without valve), Yes (with valve)	Yes	Yes	Yes	Yes
Compatibility with stethoscope	Yes	Yes	Yes	Yes, but noise from motor blower may interfere	No

表 1：各种考虑因素汇总

考虑因素	过滤式呼吸防护口罩	橡胶半面罩呼吸器	橡胶全面罩呼吸器	配松配合面罩的PAPR	配头罩的PAPR
希望降低暴露水平	APF10	APF 10	APF 50 (如果通过定量适合性检验)	APF 25	APF 1000 (参考制造商说明)
是否需要适合性检验	是	是	是	否	否
面部有毛发是否可以使用	否	否	否	少量面部毛发可以使用	是
是否可重复使用	否	是, 需清洗和消毒, 废弃用过的滤棉	是, 需清洗和消毒, 废弃用过的滤棉	是, 需清洗和消毒, 废弃用过的滤棉	是, 需清洗和消毒, 废弃用过的滤棉
是否需要保养	否	是	是	是	是
电池是否需要充电	否	否	否	是	是
呼出气体是否会释放到环境中	否 (无呼气阀) 是 (有呼气阀)	是	是	是	是
是否能和听诊器配合使用	是	是	是	是, 电机可能产生噪声干扰	否

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Additional Resources:

其它资源:

CDC Website: www.cdc.gov

OSHA Website: www.osha.gov

3M OH&ESD Technical Data

- Bulletin #174, March 2007, Respiratory Protection Against Biohazards
- Bulletin #151, March 2002, PAPR Management and Planning for First Responders