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**Standard Guide for标准指南**

Storage of Radiographs and Unexposed Industrial Radiographic Films1储存射线照片和未曝光工业射线胶片的标准指南1

This standard is issued under the fixed designation E1254; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (s) indicates an editorial change since the last revision or reapproval.本标准以固定编号 E1254 发布；编号后的数字表示最初采用的年份，如为修订本，则表示最近一次修订的年份。 括号中的数字表示最近一次重新批准的年份。 上标ε（s）表示上次修订或重新批准后的编辑改动。

## Scope适用范围

* 1. This guide may be used for the control and maintenance of industrial radiographs and unexposed films used for indus- trial radiography.本指南可用于控制和维护工业射线照片和用于工业射线照片的未曝光胶片。
  2. The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.以英寸磅为单位的数值应视为标准值。 括号中的数值是与国际单位制单位的数学换算，仅供参考，不视为标准值。

NOTE 1—For information purposes, refer to Terminology E1316. The terms stated therein, however, are not specifically referenced in the text of this document.注 1-为提供信息，请参阅术语 E1316。 但本文件正文中并未具体引用其中的术语。

* 1. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro- priate safety and health practices and determine the applica- bility of regulatory limitations prior to use.本标准无意解决与使用本标准相关的所有安全问题（如有）。 本标准的使用者有责任在使用前制定适当的安全和健康措施，并确定法规限制的适用性。*

## Referenced Documents参考文件

* 1. *ASTM Standards:2ASTM 标准：2*

E94 Guide for Radiographic ExaminationE94 射线检查指南

E746 Practice for Determining Relative Image Quality Re- sponse of Industrial Radiographic Imaging SystemsE746 确定工业射线成像系统相对图像质量反应的方法

E1316 Terminology for Nondestructive ExaminationsE1316 无损检测术语表

* 1. *ISO Standards:3ISO 标准：3*

ISO 18901 Imaging Materials—Processed silver-gelatin type black-and-white films - Specifications for stability ISO 18902 Imaging Materials—Processed photographicISO 18901 影像材料--冲洗过的银明胶型黑白胶片--稳定性规格 ISO 18902 影像材料--冲洗过的摄影胶片、印版和相纸--归档外壳和储存容器

films, plates, and papers - Filing enclosures and storage containers文件柜和储存容器

ISO 18916 ProcessedPhotographicMaterials—ISO 18916 已冲洗照片材料--稳定性规格

1 This guide is under the jurisdiction of ASTM Committee E07 on Nondestruc- tive Testing and is the direct responsibility of Subcommittee E07.01 on Radiology (X and Gamma) Method.1 本指南由 ASTM 非破坏性测试 E07 委员会管辖，并由放射学（X 和伽马）方法 E07.01 小组委员会直接负责。

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2 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard’s Document Summary page on the ASTM website.2 有关参考的 ASTM 标准，请访问 ASTM 网站 www.astm.org，或联系 ASTM 客户服务部门 service@astm.org。 有关《ASTM 标准年鉴》卷册信息，请参阅 ASTM 网站上的标准文件摘要页面。

3 Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.3 美国国家标准学会 (ANSI) 地址：25 W. 43rd St.

Photographic activity test for enclosure materials外壳材料照度测试

ISO 18917 Photography—Determination of residual thiosul- fate and other related chemicals in processed photographic materials - Methods using iodine-amylose, methylene blue and silver sulfideISO 18917 摄影--确定已处理感光材料中残留的硫化物及其他相关化学物质--使用碘-淀粉、亚甲基蓝和硫化银的方法

## Significance and Use意义和用途

* 1. The provisions of this guide are intended to control the quality of industrial radiographs and unexposed films only and are not intended for controlling the acceptability of the materials or products radiographed. It is further intended that this guide be used as an adjunct to Guide E94.本指南的规定仅用于控制工业射线照相和未曝光胶片的质量，并不用于控制所照材料或产品的可接受性。 此外，本指南还可作为 E94 指南的辅助工具。
  2. The necessity for applying specific control procedures such as those described in this guide is dependent to a certain extent, on the degree to which a user adheres to good processing and storage practices as a matter of routine proce- dure.是否有必要采用本指南中描述的特定控制程序，在一定程度上取决于用户在日常工作中坚持良好的冲洗和储存方法的程度。

## Unexposed Film Storage未曝光胶片的储存

* 1. *Unopened Containers:未开封的容器：*
     1. Storage Recommendations—Any films in containers sealed by the manufacturer and not opened should be stored with the films on edge, or as recommended by the specific manufacturer, to avoid container damage and possible film damage. Storage temperature should be between 40 °F (4.4 °C) and 75 °F (24 °C) at a relative humidity range of 30 to 60 %.储存建议-任何在制造商密封容器中的胶片，在未打开的情况下，应将胶片放在边缘上储存， 或按照特定制造商的建议储存，以避免容器损坏和可能的胶片损坏。 储存温度应在 40 °F (4.4 °C) 到 75 °F (24 °C) 之间，相对湿度范围为 30% 到 60%。
     2. Higher Storage Temperatures—When temperatures exceed 90 °F (32 °C) for 30 days, some unexposed films may be processed under normal existing conditions to test for fogging. The outside sheets in a pack of cut films or the ends of rolled films are most affected by heat. If excessive fogging is found on these samples, subsequent sampling may be done on inner sheets or further in on the rolls to avoid unnecessary scrap. A limit of 0.30 density units total for the base density and fog is acceptable (see 4.3) for industrial radiographic films.较高的储存温度--当温度超过 90 °F (32 °C)持续 30 天时，一些未曝光的胶片可在正常条件下进行雾化测试。 一包剪切好的胶片的外片或卷筒胶片的两端受热影响最大。 如果在这些样品上发现过多的雾化，随后的取样可在内层或卷筒的更深处进行，以避免不必要的报废。 对于工业射线胶片来说，基本密度和雾的总密度单位限制为 0.30 是可以接受的（见 4.3）。
     3. Lower Storage Temperatures—The temperature can be lower than 40 °F (4.4 °C) as lower temperatures reduce the rate of heat and age fogging. However, lower temperatures will have no effect on background radiation fogging. Films stored at these lower temperatures in unopened containers should be allowed to stabilize at room temperature before opening the containers. The stabilization time varies with the bulk of the较低的储存温度--温度可低于 40 °F（4.4 °C），因为较低的温度会降低热量和老化起雾的速度。 但是，较低的温度对本底辐射雾化没有影响。 在这些较低温度下储存在未开封容器中的胶片应在室温下稳定后再开封。 稳定时间因胶片的体积而异。

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stored films and the temperature stored at. The lower the temperature and greater the bulk the longer the time required to reach room temperature. If the containers are opened too soon, condensation could cause the films to stick to whatever is touching their surfaces.储存薄膜的体积和储存温度。 温度越低，体积越大，达到室温所需的时间就越长。 如果过早打开容器，冷凝水会导致胶片粘在接触其表面的物体上。

* + 1. Lower or Higher Storage Humidities— If the relative humidity is below 30 % and the moisture in the films is reduced sufficiently, film emulsion cracking or damage can occur during handling after opening the sealed containers, and the films may be subjected to static electrical discharges. Storage humidities over 60 % can also cause the films to stick to whatever is touching their surfaces.较低或较高的储存湿度 - 如果相对湿度低于 30%，并且薄膜中的水分减少得足够多，那么在打开密封容器后的操作过程中，薄膜乳剂可能会开裂或损坏，并且薄膜可能会受到静电放电的影响。 储存湿度超过 60 % 也会导致薄膜粘在任何接触其表面的物体上。
  1. Opened Containers—The same considerations de- scribed in 4.1 for unopened containers apply. Opened contain- ers are those on which the manufacturer’s inner bag around the film itself has been opened. This can cause the unexposed film to stick and fog more rapidly when exposed to high humidity and temperature.开封容器 - 4.1 中针对未开封容器的规定同样适用。 已开封的容器是指胶片本身的内袋已被制造商打开的容器。 这可能会导致未曝光的胶片在高湿度和高温度下更快地粘连和起雾。

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* 1. Time-of-Use Usability—Tests used to evaluate image quality in accordance with Test Method E746 showed that equivalent penetrameter sensitivity (EPS) of 1.4 % can be maintained for films with base plus-fog (B + Fog) up to 0.30.根据测试方法 E746 进行的用于评估影像质量的使用时间可用性测试表明，对于片基加雾 (B + 雾) 高达 0.30 的胶片，等效透射灵敏度 (EPS) 可保持在 1.4%。
     1. If unexposed sheets or rolls are processed normally through the available processing system, and base plus-fog density exceeds 0.30, the film may still be suitable for use. However, specific agreement should be obtained between the purchaser and supplier if out-dated film or film stored under non-recommended conditions is to be used.如果未曝光的片材或卷材通过现有的冲洗系统正常冲洗，且基底加雾密度超过 0.30，则该胶片仍适合使用。 但是，如果要使用过期胶片或在非推荐条件下储存的胶片，应在购买者和供应商之间达成具体协议。
  2. Radiation Protection—Storage facilities for unexposed films should provide adequate protection from penetrating radiation.辐射防护-储存未曝光胶片的设施应提供足够的防护，防止穿透性辐射。

## Radiograph Storage射线照片的储存

* 1. Introduction—Radiographs are normally stored in some form of enclosures to exclude dirt and protect them against physical deterioration and damage. Storage conditions can be designed for archival preservation, normally considered to be for more than 100 years or for moderate time periods by using the guidelines in this standard; however, the radiographs must have been sufficiently fixed and washed and stored in suitable enclosures to ensure preservation.导言-射线照片通常储存在某种形式的外壳中，以防止灰尘进入，并防止其物理退化和损坏。 储存条件可设计为档案保存，通常被认为可保存 100 年以上，或通过使用本标准中的指 导原则，可保存中等时间段；但是，射线照片必须经过充分的固定和清洗，并储存在合适 的外壳中，以确保保存。
  2. Residual Thiosulfate—If radiographs are not fully fixed and washed, they can retain some fixer, or thiosulfate, and some residual silver in the lower density areas. During storage, these residual chemicals can generate permanent, brownish stains super-imposed on the radiographic image. Since the rate at which a stain is generated depends on both the amount of residual thiosulfate and radiograph storage conditions, factors such as the temperature, humidity, and air flow in the storage facility must be considered as they affect this rate (see ISO 18901). If radiographs are stored at or below the upper limits of the temperature and relative humidity ranges de- scribed in 4.1.1, stain generation will be minimized and lowered as these two parameters are lowered. Again, be aware of possible film emulsion cracking at very low humidities.残留硫代硫酸钠-如果射线照片没有完全固定和清洗，就会在低密度区域残留一些定影剂或硫代硫酸钠，以及一些残留银。 在储存过程中，这些残留的化学物质会在射线图像上产生永久性的褐色斑点。 由于污渍产生的速度取决于残留硫代硫酸钠的量和射线照片的存储条件，因此必须考虑存储设施中的温度、湿度和气流等因素，因为它们会影响这一速度（参见 ISO 18901）。 如果射线照片在 4.1.1 所述的温度和相对湿度范围的上限或更低的温度和相对湿度下储存，污点的产生将减至最低，并随着这两个参数的降低而降低。 同样要注意的是，在湿度很低的情况下可能会出现薄膜乳化开裂。
     1. Testing for Residual Thiosulfate— The procedure described in ISO 18917 as the silver densitometric method for残留硫代硫酸钠的测试 ISO 18917 中描述的银密度测定方法用于测试残留硫代硫酸钠。

measuring residual thiosulfate details a silver nitrate-acetic acid reagent. A solution that can be used as a spot test for residual thiosulfate is as follows: Dissolve 10 g silver nitrate in a solution of 30 mL glacial acetic acid in 750 mL water. Dilute to 1 L and store in brown, glass-stoppered bottle. Discard if darkened. Two minutes after a drop of this solution has been placed on the lowest density area of a radiograph, a stain will appear if any residual thiosulfate is present. The intensity of the stain will approximate the maximum amount of discoloration that one side of the radiograph will ever reach during any kind of storage conditions of temperature and humidity. For a visual reference to the approximate maximum discoloration of both sides of a radiograph, both sides must be tested with superim- posed drops. This spot test is not usually considered adequate where critical work or work to a strict code or specification is involved. Consequently, the methylene blue method or the complete silver densitometric method described in ISO 18917 would be preferred.测量残留硫代硫酸盐的详细方法是硝酸银-醋酸试剂。 残留硫代硫酸盐的定点检测溶液如下： 将 10 克硝酸银溶解在 750 毫升水兑 30 毫升冰醋酸的溶液中。 稀释至 1 升，保存在棕色玻璃瓶中。 如果颜色变深，请丢弃。 将该溶液滴在射线照片的最低密度区域两分钟后，如果有残留的硫代硫酸盐，就会出现污点。 染色的强度将近似于射线照片单面在任何温度和湿度储存条件下所能达到的最大褪色量。 为了直观地参考射线照片两面的大致最大褪色量，必须用超量的液滴对两面进行测试。 在涉及关键工作或严格规范或规格的工作时，通常认为这种点测试是不够的。 因此，最好采用亚甲基蓝法或 ISO 18917 中描述的完全银密度测定法。

* + 1. Natural Aging Stain—Practical long-time storage tests indicate that under normal “office” conditions of controlled, moderate temperature and humidity, approximately one third of the maximum stain indicated by such a spot test was actually generated over a 10-year period.自然老化染色--实际的长期储存测试表明，在温度和湿度受控的正常 "办公 "条件下，10 年间实际产生的染色量约为这种斑点测试所显示的最大染色量的三分之一。
    2. Rewashing Radiographs—If the spot test does gener- ate a stain, the radiograph can be rewashed to lower the residual level and then retested to confirm the lower level. Immersion in a fixer neutralizer such as 2 to 6 % solution of sodium sulfite can drastically reduce rewashing times.重新冲洗射线照片--如果斑点测试确实产生了污点，可以重新冲洗射线照片以降低残留水平，然后重新测试以确认较低的水平。 浸泡在定影剂中和剂（如 2% 至 6% 的亚硫酸钠溶液）中可大大缩短重洗时间。
  1. *Enclosure Materials for Radiographs:射线照片的外壳材料：*
     1. General—Packaging enclosure materials, including corrugated boxes and interleaving paper, shall be chemically stable and have a slightly rough or matted surface. Guidelines for enclosure materials are described in ISO 18902. A photo activity test for suitability is described in ISO 18916.一般--包装外壳材料，包括瓦楞纸箱和夹层纸，应化学性质稳定，表面略微粗糙或无光泽。 ISO 18902 中描述了外壳材料的准则。 ISO 18916 中描述了适用性的光活性测试。
  2. *Storage Area Conditions:储存区条件：*
     1. Air Impurities—Inert or inactive solid particles can be deposited on radiographs and interfere with readability and produce scratches. Reactive types of solids may cause fading or staining and gaseous impurities may cause base or image deterioration. Impurities such as peroxides, ammonia, paint fumes, sulfur dioxides, or compounds of sulfur, such as hydrogen sulfide, can be particularly harmful.空气杂质-惰性或非活性固体颗粒会沉积在射线照片上，影响可读性并产生划痕。 反应型固体可能会导致褪色或染色，气体杂质可能会导致底片或图像质量下降。 过氧化物、氨、油漆烟雾、二氧化硫或硫化合物（如硫化氢）等杂质尤其有害。
        1. In addition to the impurities mentioned in 5.4.1, the presence of acetic acid fumes (commonly known as the vinegar syndrome) produced by the decay of cellulose acetate film base, can additionally cause degradation of films stored in close proximity to the decaying film. Monitoring of the level of acetic acid in film storage areas can be accomplished using several different commercially available test methods. Separa- tion of remaining films from the acetic acid environment and storage at colder temperatures is recommended to prevent continued deterioration.除了 5.4.1 中提到的杂质外，醋酸纤维素胶片片基腐烂产生的醋酸烟雾（俗称醋综合症）也会导致存放在腐烂胶片附近的胶片降解。 监测胶片储存区的醋酸水平可以通过几种不同的商用检测方法来实现。 建议将剩余的胶片从醋酸环境中分离出来，存放在温度较低的地方，以防止继续恶化。
     2. Temperature—Continuous temperatures above 100 °F (38 °C) will accelerate staining caused by residual thiosulfate and temperatures below the dew point of the air may produce condensed moisture on the radiographs and cause sticking. In general, a moderate temperature range, as described in 4.1, is recommended.温度-持续温度高于 100 °F（38 °C）会加速残留硫代硫酸引起的染色，温度低于空气露点会在射线照片上产生冷凝湿气并导致粘连。 一般来说，建议使用 4.1 中所述的适中温度范围。
     3. Humidity—The extremes must be avoided as pro- longed exposures to relative humidities over 60 % will tend to damage the emulsion because of fungus growth and could cause sticking. Under conditions of low or changing humidity, emulsion adhesion defects such as edge peeling, flaking, or emulsion cracking can develop. Low humidities will also increase the potential of static charges on the radiographs attracting solids that could harm them. In general, a relative humidity range of 30 to 60 % is recommended.湿度--必须避免极端湿度，因为长期暴露在相对湿度超过 60% 的环境中会因真菌生长而损坏乳剂，并可能导致粘片。 在湿度较低或不断变化的条件下，可能会出现边缘剥落、剥落或乳液开裂等乳液附着缺陷。 低湿度还会增加射线照片上的静电电荷吸附固体的可能性，从而损害射线照片。 一般来说，建议相对湿度在 30% 到 60% 之间。
  3. Fire Resistance—Radiographs can withstand tempera- tures as high as 302 °F (150 °C) without significant loss of image quality, provided they are free of residual thiosulfate;耐火性-只要没有残留硫代硫酸钠，射线照相机可以承受高达 302 °F（150 °C）的温度而不会明显降低图像质量；

however, they may become distorted or stick to each other or to the enclosure material.但是，它们可能会变形或相互粘连或粘在外壳材料上。

## Precision and Bias精度和偏差

* 1. No statement is made about either the precision or bias of this guide for measuring residual thiosulfate and the activity test for enclosure materials since the results merely state whether there is conformance to the criteria for success specified in the procedure.本指南用于测量残余硫代硫酸盐和外壳材料的活性测试，由于结果仅说明是否符合程序中规定的成功标准，因此不对其精度或偏差进行说明。

## Keywords关键词

* 1. industrial radiographic films; radiograph storage; unex- posed film工业用射线照相胶片；射线照片储存；未装胶片

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