



भारत सरकार/Government of India

श्रम एवं रोजगार मंत्रालय/Ministry of Labour & Employment

खान सुरक्षा महानिदेशालय/Directorate General of Mines Safety

धनबाद -826001 / Dhanbad-826001



No. DGMS/OH/ (Tech) Circular No. 04

Dhanbad, Dated 21/08/ 2024

To  
The Owners, Agents and Managers of all Mines

**Subject: Acceptance of Digital Radiography in Statutory Medical Examination of Mine employees conducted under Mines Rule 29 F of 1955**

### 1. Introduction

Chest radiographs are invariably essential for the detection of Dust induced Lung diseases including pneumoconiosis amongst Miners involved in dusty trades. As on date, conventional film screen radiograph (FSR) technology is being allowed for all statutory medical examinations like PME/IME, for ILO classification of the Chest Radiographs as per DGMS Circular No. DGMS (Tech.) No.04 of 2007, dated 11/05/2007. Accordingly all PME Centers of the Mines were to ensure the availability of a set of standard ILO International Radiograph 2000, for screening and classification of chest radiographs, for diagnosis of Pneumoconiosis.

In clinical practice and public health surveillance, digital chest radiographs (DR) presented on medical-grade monitors have largely replaced the conventional film-screen radiograph (FSR) technology. Though, conventional radiography is still used more widely than digital radiography but this dominance is fast dwindling.

The reasons behind the declining popularity of conventional radiography are—fixed dose latitude, fixed non-linear grey scale response, and limited potential for reducing dose to the patient. All these parameters limit the information that can be captured on film. The images cannot be changed in contrast once they have been processed. Apart from this, film is expensive, uses hazardous materials for processing, is labour intensive, and long term storage and retrieval of film is difficult. Further conventional radiography is not compatible with the picture archiving and communication systems (PACS).

The *International Labour Office (ILO) Guidelines for the Classification of the Pneumoconiosis* has been an invaluable tool for standardization of interpretations of chest radiographs for epidemiologic studies of the Pneumoconiosis. To enhance accuracy and precision in applying the ILO classification scoring system, readers are required to perform a side-by-side comparison of each individual worker's radiograph to one or more prototypical chest images, which illustrate a variety of types and severity of radiographic abnormalities induced by dust inhalation. The ILO classification system includes a standard set of chest images for comparison purposes.

Until recently, the ILO classification system only provided a set of standard images in the film-screen radiograph (FSR) format. However, in 2011, the ILO revised its guidelines to "extend the applicability of the Classification to digital radiographic images of the chest". In the 2011 revision of the classification, the ILO included a set of electronic image files (ILO Standard Digital Images [2011-D]) that was digitized from the film-based standards included in the 2000 revision of the classification. Subsequently in 2022 the revised edition of the Guidelines for the use of the ILO International Classification of Radiographs of Pneumoconiosis, which is accompanied by one set of digitally acquired radiographic images, was introduced by ILO after collaboration with NIOSH. This set consists of 23 radiographic images, which are called The ILO 2022 standard digital images:

In view of the current scenario, it has been decided to allow Digital Radiography, for all statutory medical examinations like Pre-employment Medical Examination/Periodical Medical Examination after fulfilling protocols specified below, based on the reference standards issued by ILO, in addition to the Conventional film screen radiographs (FSR), being used currently.

## **2. Viewing Principles of Digital Radiographs:**

When viewing and classifying a subject's digital image (also known as "soft copy"), a high resolution, medical-grade flat-panel monitors designed for diagnostic radiology, is essential.

The intensity of illumination should be uniform all over the total surface of the high resolution radiology monitors used to view the chest images to be classified.

While classifying digital images, the ILO 2022 digitally acquired standard images should be displayed as provided, without alteration.

ILO digital images must be close enough for the observer to see opacities only 1 mm in diameter, that is, a distance of about 250 mm. It is also essential to view the entire chest image.

The observer should be seated comfortably. The viewing surfaces must be clean. The general illumination in the room should be low, without direct daylight. The room should be quiet, comfortable and free from distractions.

The diagonal display should be at least 21" (54 cm) per image, with a ratio of maximum to minimum luminance at least 50; a maximum luminance of at least 250 candelas per m<sup>2</sup>; pixel pitch no greater than 210 µm; and with resolution at least 2.5 line-pairs per mm.

The subject and ILO 2022 digital images should be displayed simultaneously, similarly sized, side-by-side.

Further, for display, storage and classification of digital chest images/ Radiographs, recent version of the Digital Imaging and Communications in Medicine (DICOM) standards are required.

### **Examples of approaches required to be avoided for viewing digital images include:**

- Displaying the images on a personal computer screen rather than on a medical-grade flat-panel monitor designed for diagnostic radiology.
- Comparing the subject digital image to ILO standard analog radiographs displayed on a view box.

*Tom*

- Viewing the subject digital image, or the ILO 2022 digital images, or both in formats reduced to less than two-thirds of their full size.
- Using digital images printed on film or paper for classification. As with all radiographic viewing activities, procedures should be followed to ensure an appropriate environment, including restriction of ambient light sources and other distracting factors.

### **3. Image processing**

Digital radiographic systems vary in the approaches taken to address the display quality of digital chest images. Image processing software continues to evolve. Imaging systems should comply with the standards set by their countries respective radiologic societies and professional organizations. The NIOSH Guideline "Application of Digital Radiography for the Detection and Classification of Pneumoconiosis" is a useful resource and recommends that image enhancement functions be discouraged as chest images should appear similar to traditional film screen radiographs when displayed. No specific recommendations are made by the ILO regarding the selection of digital systems. Performance testing and monitoring should be used to evaluate the ability to produce quality images for any combination of hardware, exposure parameters and software. Facilities providing images for classification should employ a program for continual quality assurance consistent with national practices and standards. Staff at facilities that perform digital chest radiography for pneumoconiosis classification should review each image to ensure optimal quality.

### **4. Image display**

Good image quality is essential for accurate classification of digital chest radiographs. Maintenance, assessment, and optimization of the image display monitors and all other components of the digital radiographic systems should be undertaken periodically, as recommended or specified by manufacturers, professional organizations, or governmental agencies.

### **5. Data recording, storage and security**

Digital images should be securely archived and transferred in a manner that permits retrieval of their original appearance, in compliance with national practices and standards. Standard measures to prevent unauthorized access to data should be employed, for instance by password-protected access and rigorous security precautions for transfers through data networks.

All the Owners, Agents and managers are here by informed that henceforth, Digital Radiography shall be permissible as part of statutory medical examination for mine employees, once it is conducted following the standards and guidelines mentioned above.



Director General of Mines Safety &  
Chief Inspector of Mines