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GUIDELINES FOR THE USE OF THE ILO INTERNATIONAL CLASSIFICATION OF RADIOGRAPHS OF PNEUMOCONIOSES

Revised edition 2000

INTERNATIONAL LABOUR OFFICE · GENEVA

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ILO
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Foreword

Over the last seven decades the International Labour Office (ILO) has promoted discussion and published a series of guidelines on how to classify chest radiographs of persons with pneumoconioses. The goals have been to standardize classification methods and facilitate international comparisons of data on pneumoconioses, epidemiological investigations and research reports. This revised edition of the ILO's International Classification of Radiographs of Pneumoconioses is a further effort towards these objectives. Based on the principles that governed the development of earlier editions of the Classification (those of 1950, 1958, 1968, 1971 and 1980), it refers to radiological appearances seen in all types of pneumoconioses. The description of the scheme in this revision of the *Guidelines* is more concise than previously. Some ambiguities in earlier editions have been clarified further, and the conventions for classifying pleural abnormalities have been revised. The changes are based on a comprehensive review of experience in using the preceding (1980) edition of the Classification.

The ILO initiated the review process in November 1989 at a meeting of 11 experts from seven countries. Participants were asked to advise on the kind of changes to the scheme that might be desirable, and to reconsider the suitability of the standard radiographs that accompanied the 1980 edition. Some parts of the *Guidelines* were identified as requiring revision, but the importance of continuity in the Classification was re-emphasized. With this in mind, it was agreed that the set of standard radiographs that were distributed with the 1980 edition should be retained, although it was recognized that the technical quality of many of them was inferior to that available with modern equipment and techniques. Participants in the meeting also suggested that the number of radiographs included in the complete set of standards (22) might be usefully reduced by reproducing critical parts from some of them onto quadrant sections of full-size radiographs. It was agreed, however, that it was necessary to verify that such a reform would not, in itself, result in a change in the way that radiographs of persons exposed to dust were classified. A controlled trial was therefore arranged by the ILO and the Division of Respiratory Disease Studies of the United States National Institute for Occupational Safety and Health (NIOSH). This involved 40 physicians, working at specialized clinical and research centres in ten countries (see Appendix F).

Results from the trial showed that the proposed modification to the ILO standard radiographs, involving reproduction of sections from 15 of the ILO (1980) standards onto five new "quadrant" radiographs, would not increase variability between readers, and might improve the reproducibility of small-opacity profusion classification in some respects, but could also reduce slightly the frequency with which some readers identify large opacities. Use of the standards containing the quadrant radiographs was associated with an increase in the frequency with which some readers described the shapes of the small opacities that they saw as predominantly irregular, rather than rounded. It was

concluded, however, that the effects found were unlikely to be distinguishable from inter- and intra-reader variability in most occupational health survey situations.[1]

In October 1997 more than 200 participants in the Ninth International Conference on Occupational Respiratory Diseases in Kyoto, Japan, attended an ILO-convened Working Group on the Classification. That meeting recommended further work on the development of quadrant or sectional composite radiographs and improved techniques for standard radiograph reproduction prior to the introduction of revised standard radiographs. A smaller group of experts attending the same conference then considered in detail a draft revised text of the *Guidelines* to the Classification. Discussion of this draft continued at a further meeting in March 1998 at the offices of the American College of Radiology (ACR) in Reston, Virginia, and was concluded on 26 October 2000 at the ILO Branch Office in Washington, DC. Participants in the latter meeting also compared two types of new copies of several sets of ILO (1980) standard radiographs, of sectional quadrant radiographs that had been used in the international trial, and of a newly prepared composite radiograph illustrating pleural abnormalities. The new copies that were under review were produced from earlier copies, both by standard film copying methods and by improved techniques from digitized versions of the earlier copies. The experts preferred the copies made from the digitized versions, and they recommended the use of this technology and the associated reproduction process for producing future copies of ILO standard radiographs. The individuals who attended the various ILO-convened meetings concerned with the revision of the Classification are listed in Appendix F.

The ILO (2000) International Classification of Radiographs of Pneumoconioses is accompanied by two sets of standard radiographs, as described in Appendix C. Both sets are available from the ILO. The first ("Complete") Set consists of 22 radiographs. Twenty of them are new copies from digitized full-size standard radiographs distributed previously with the 1980 edition of the ILO Classification. A further radiograph illustrates u/u-sized irregular opacities. Three quadrants of this radiograph reproduce the sections of the composite radiograph that was used in 1980 to depict increasing profusion of u/u-sized irregular opacities; the fourth quadrant illustrates subcategory 0/0. A new composite radiograph is provided to illustrate pleural abnormalities.

The "Quad" Set consists of 14 radiographs. Nine of them are the most commonly used standards from the Complete Set. The other five reproduce (quadrant) sections of the remaining radiographs in the Complete Set.

The development of this revised (2000) edition of the *Guidelines for the Use of the ILO International Classification of Radiographs of Pneumoconioses* has been made possible by virtue of intensive and sustained activity on the part of many individuals and organizations. Some of them are named in Appendix F. Others, too numerous to list, provided valuable comments and suggestions in writing and by contributing to discussions at various scientific meetings, including four ILO international conferences on pneumoconioses and occupational lung diseases (Bochum, Germany, 1983; Pittsburgh, Pennsylvania, 1987; Prague, 1992; and Kyoto, 1997). The ILO wishes to express its sincere thanks to all concerned, and to acknowledge gratefully the active assistance from the Committee on Pneumoconiosis (previously the Task Force on Pneumoconiosis) of the American College of Radiology (ACR), the United States National Institute for Occupational Safety and Health (NIOSH), the Rosai Hospital for Silicosis in Japan, the WHO Collaborating

[1] *A trial of additional composite standard radiographs for use with the ILO International Classification of Radiographs of Pneumoconioses*, NIOSH Report No. HETA 93-0340, July 1997, available from National Technical Information Service (NTIS), 5825 Port Royal Road, Springfield, Virginia 2216, United States. A shorter report has been published: "New composite ("Quadrant") standard films for classifying radiographs of pneumoconioses", in *Industrial Health*, Vol. 36, No. 4, Oct. 1998, pp. 380-383.

Centre for Radiological Education in Sweden, the Finnish Institute of Occupational Health, the German Committee for Diagnostic Radiology of Occupational and Environmental Diseases, and the Institute for Occupational and Social Medicine of the University of Cologne. Continuing use of the ILO International Classification of Radiographs of Pneumoconioses will contribute further to the protection of the health of workers in dusty occupations.

1

Introduction

Scope of the Classification

The Classification provides a means for describing and recording systematically the radiographic abnormalities in the chest provoked by the inhalation of dusts. It is used to describe radiographic abnormalities that occur in any type of pneumoconiosis and is designed for classifying only the appearances seen on postero-anterior chest radiographs. Other views and imaging techniques may be required for clinical assessment of individuals, but the ILO International Classification has not been designed to code such findings.

Object of the Classification

The object of the Classification is to codify the radiographic abnormalities of the pneumoconioses in a simple, reproducible manner. The Classification neither defines pathological entities nor takes into account working capacity. It does not imply legal definitions of pneumoconioses for compensation purposes and does not set or imply a level at which compensation is payable.

Uses of the Classification

The Classification is used internationally for epidemiological research, for screening and surveillance of those in dusty occupations, and for clinical purposes. Use of the scheme may lead to better international comparability of data concerning the pneumoconioses.

Standard radiographs and written definitions

The Classification consists of a set of standard radiographs and this text, with the accompanying footnotes. These footnotes are intended to reduce ambiguity and are based on experience with earlier editions of the ILO Classification. In some parts of the scheme, the standard radiographs take precedence over the written definitions. The text makes it clear when this is so.

2

General instructions

No radiographic features are pathognomonic of dust exposure. Some radiographic features that are unrelated to inhaled dust may mimic those caused by dust. Readers may differ about the interpretation of such appearances.

In epidemiological studies, therefore, the study protocol will usually require that all appearances described in these *Guidelines* and seen on the standard radiographs are to be classified. Symbols must always be used and appropriate Comments must be reported.[1]

When the Classification is used for some clinical purposes, the protocol may require that medical readers classify only those appearances which the reader believes or suspects to be pneumoconiotic in origin. Symbols must always be used and appropriate Comments must be reported.[1]

[1] See sections 3.4 and 3.5.

3

Specific instructions for use of the Complete Classification

3.1. Technical quality[2, 3]

Four grades of technical quality are used:

1. Good.
2. Acceptable, with no technical defect likely to impair classification of the radiograph for pneumoconiosis.
3. Acceptable, with some technical defect but still adequate for classification purposes.
4. Unacceptable for classification purposes.

If technical quality is not grade 1, a Comment must be made about the technical defects.

3.2. Parenchymal abnormalities

Parenchymal abnormalities include both small opacities and large opacities.

Small opacities

Small opacities are described by *profusion, affected zones of the lung, shape (rounded or irregular)* and *size*. The order of identifying and recording the presence or absence of these findings while classifying a radiograph is left to the reader's preference.

Profusion

The *profusion* of small opacities refers to the concentration of small opacities in affected zones of the lung. The category of profusion is based on comparisons with the standard radiographs. For profusion the written descriptions are a guide, but the standard

[2] Appendix A emphasizes the importance of good radiographic quality for the interpretation of chest radiographs. It is essential to produce radiographs that show clearly both the parenchyma and the pleural characteristics. For clinical purposes, special views or techniques may also be required. When it is not possible to replace a grade 3 radiograph by a better one, more details about technical defects should be recorded.

[3] The standard radiographs are not to be considered in determining technical quality of the subject radiographs. The standard radiographs were chosen to demonstrate the radiographic features of the pneumoconioses, rather than to demonstrate technical quality.

radiographs take precedence. Four categories are defined by the standard radiographs. Profusion is classified into one of 12 ordered subcategories, which are represented symbolically as follows.[4]

Increasing profusion of small opacities ⟶

Categories	**0**			**1**			**2**			**3**		
Subcategories	**0/–**	**0/0**	**0/1**	**1/0**	**1/1**	**1/2**	**2/1**	**2/2**	**2/3**	**3/2**	**3/3**	**3/+**

Category **0** refers to the absence of small opacities or the presence of small opacities that are less profuse than category **1**.

Classification of a radiograph using the 12-subcategory scale is performed as follows. The appropriate category is chosen by comparing a subject radiograph with standard radiographs that define the levels of profusion characteristic of the centrally placed subcategories (**0/0**, **1/1**, **2/2**, **3/3**) within these categories. The category is recorded by writing the corresponding symbol followed by an oblique stroke, i.e. **0/** , **1/** , **2/** , **3/**. If no alternative category was seriously considered, the radiograph is classified into the central subcategory, i.e. **0/0**, **1/1**, **2/2**, **3/3**. For example, a radiograph that shows profusion which is considered to be similar to that shown on a subcategory **2/2** standard radiograph, i.e. neither category **1** nor **3** was seriously considered as an alternative, would be classified as **2/2**. However, subcategory **2/1** refers to a radiograph with profusion of small opacities judged to be similar in appearance to that depicted on a subcategory **2/2** standard radiograph, but category **1** was seriously considered as an alternative before deciding to classify it as category **2**.

The standard radiographs provide examples of appearances classifiable as subcategory **0/0**. Subcategory **0/0** refers to radiographs where there are no small opacities, or if a few are thought to be present, they are not sufficiently definite or numerous for category **1** to have been seriously considered as an alternative. Subcategory **0/1** is used for radiographs classified as category **0** after having seriously considered category **1** as an alternative. Subcategory **1/0** is used for radiographs classified as category **1** after having seriously considered category **0** as an alternative. If the absence of small opacities is particularly obvious, then the radiograph is classified as subcategory **0/–**.

A radiograph showing profusion much greater than that depicted on a subcategory **3/3** standard radiograph is classified as subcategory **3/+**.

[4] The 12 subcategories refer only to the profusion of small opacities. Profusion, including references to subcategories **0/–** or **0/0** when appropriate, must always be recorded, irrespective of any other abnormalities that may be present. Conversely, when other abnormalities are seen, their presence must also be recorded, irrespective of whether any small opacities are present. The subcategories are arbitrary divisions of an underlying continuum of increasing profusion of small opacities. Those divisions are defined by the standard radiographs, together with the instructions for their use. The validity of the classification procedure to represent this continuum has been demonstrated in studies of relationships between results obtained by using the ILO Classification and (a) indices of cumulative exposures to various dusts; (b) the dust content of coalminers' lungs post mortem; (c) mortality of asbestos workers and coalminers; and (d) pathological appearances of coalminers' lungs post mortem.

Affected zones

The zones in which the opacities are seen are recorded. Each lung field is divided into three zones (upper, middle, lower) by horizontal lines drawn at approximately one-third and two-thirds of the vertical distance between the lung apices and the domes of the diaphragm.

The overall profusion of small opacities is determined by considering the profusion as a whole over *affected zones* of the lungs. When there is a marked (three subcategories or more) difference in profusion in different zones of the lungs, then the zone or zones showing the marked lesser degree of profusion is/are ignored for the purpose of classifying the overall profusion.[5]

Shape and size

For shape and size, the written definitions are a guide, and the standard radiographs take precedence. The shape and size of small opacities are recorded. Two kinds of shape are recognized: rounded and irregular. In each case, three sizes are differentiated.

For small rounded opacities, the three size ranges are denoted by the letters **p, q** and **r**, and are defined by the appearances of the small opacities on the corresponding standard radiographs. These illustrate:

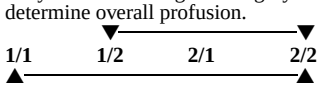
p-opacities with diameters up to about 1.5 mm;
q-opacities with diameters exceeding about 1.5 mm and up to about 3 mm;
r-opacities with diameters exceeding about 3 mm and up to about 10 mm.

The three size ranges of small irregular opacities are denoted by the letters **s**, **t** and **u**, and are defined by the appearances of the small opacities on the corresponding standard radiographs. These illustrate:

s-opacities with widths up to about 1.5 mm;
t-opacities with widths exceeding about 1.5 mm and up to about 3 mm;
u-opacities with widths exceeding about 3 mm and up to about 10 mm.

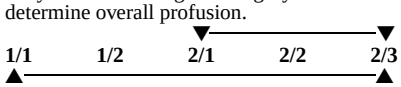
[5] A "marked (three subcategories or more) difference" in profusion in different zones of the lung is present when there are two or more subcategories of profusion *between* the zone (or zones) of the lowest profusion *and* the zone (or zones) of the highest profusion. For example, if a subject radiograph displays zones with profusion levels **1/1**, **1/2**, **2/1** and **2/2**, the overall profusion is determined by ignoring the zone with profusion level **1/1**, since two or more subcategories (**1/2**, **2/1**) are between that zone and the zone of the highest profusion (**2/2**). The overall profusion, therefore, is determined by considering only the affected zones showing profusion levels **1/2**, **2/1** and **2/2**, since there is only one subcategory of profusion (**2/1**) between profusion levels **1/2** and **2/2**.

Example 1
Only one intervening subcategory between the zones of lowest (**1/2**) and highest (**2/2**) profusion; use all three to determine overall profusion.



There are two intervening subcategories between the zones of lowest (**1/1**) and highest (**2/2**) profusion; ignore **1/1** to determine overall profusion.

Example 2
Only one intervening subcategory between the zones of lowest (**2/1**) and highest (**2/3**) profusion; use all three to determine overall profusion.



There are three intervening subcategories between the zones of lowest (**1/1**) and highest (**2/3**) profusion; ignore **1/1** and **1/2**; use **2/1**, **2/2**, **2/3** to determine overall profusion since there is only one subcategory between **2/1** and **2/3**.

All zones in which opacities are seen *are recorded,* irrespective of whether some are later ignored in determining overall profusion.

Two letters must be used to record shape and size. Thus, if the reader considers that all, or virtually all, opacities seen are of one shape and size, then this is noted by recording the letter twice, separated by an oblique stroke (for example **q/q**). If, however, significant numbers of another shape or size are seen, then this is recorded by writing a different letter after the oblique stroke (for example **q/t**); **q/t** would mean that the predominant small opacities are rounded and of size **q**, but that there are significant numbers of small irregular opacities present of size **t**. In this way, any combination of small opacities may be recorded.[6] When small opacities of different shapes and/or size are seen, the letter for the predominant shape and size (primary) is recorded before the oblique stroke, while the letter for the less frequently occurring shape and size (secondary) is recorded after the oblique stroke.

Large opacities

A large opacity is defined as an opacity having the longest dimension exceeding 10 mm. Categories of large opacities are defined below. These definitions take precedence over the examples of large opacities illustrated on standard radiographs.

Category **A** One large opacity having the longest dimension up to about 50 mm, or several large opacities with the sum of their longest dimensions not exceeding about 50 mm.

Category **B** One large opacity having the longest dimension exceeding 50 mm but not exceeding the equivalent area of the right upper zone, or several large opacities with the sum of their longest dimensions exceeding 50 mm but not exceeding the equivalent area of the right upper zone.

Category **C** One large opacity which exceeds the equivalent area of the right upper zone, or several large opacities which, when combined, exceed the equivalent area of the right upper zone.

3.3. Pleural abnormalities

Pleural abnormalities are divided into pleural plaques (localized pleural thickening), costophrenic angle obliteration and diffuse pleural thickening.

Pleural plaques (localized pleural thickening)

Pleural plaques represent localized pleural thickening, generally of the parietal pleura. Pleural plaques may be seen on the diaphragm, on the chest wall (in-profile or face-on), and at other sites. At times, they are recognized only by their calcification. Pleural plaques are recorded as absent or present. If present on the chest wall, they are recorded as in-profile or face-on, and separately for the right and left sides. A minimum width of about 3 mm is required for an in-profile plaque to be recorded as present.[7, 8]

[6] See Appendix E for possible combinations.

[7] The measurement of width is made from the innermost margin of the rib to the innermost sharp margin of the plaque at the pleural-parenchymal boundary.

[8] If more detailed measurement of width is required for a particular study, three categories may be used:
a – about 3 mm up to about 5 mm;
b – about 5 mm up to about 10 mm;
c – over about 10 mm.

Site, calcification and extent of pleural plaques are recorded separately for the right and for the left side of the chest. The written guidelines describing these features take precedence over the examples provided on the standard radiograph.

Site

The sites (locations) of pleural plaques include chest wall, diaphragm and other sites. Other sites include the mediastinal pleura in the para-spinal or para-cardiac locations. The presence or absence of pleural plaques is recorded for all sites, and separately for the right and for the left sides.

Calcification

Radiographic images of pleural plaques may include recognizable areas of calcification. The presence or absence of calcification is recorded for all plaques, and separately for the right and for the left sides. When calcification is seen, a plaque is also recorded as present at that site.

Extent

Extent is not recorded for plaques on the diaphragm or at other sites. It is recorded only for plaques along the chest wall, and is combined for both in-profile and face-on varieties. Extent is defined in terms of the total length of involvement with respect to the projection of the lateral chest wall (from the apex to the costophrenic angle) on the postero–anterior chest radiograph:

1 = total length up to one-quarter of the projection of the lateral chest wall;

2 = total length exceeding one-quarter and up to one-half of the projection of the lateral chest wall;

3 = total length exceeding one-half of the projection of the lateral chest wall.

Costophrenic angle obliteration

Costophrenic angle obliteration is recorded as either present or absent, separately for the right and for the left side. The lower limit for recording costophrenic angle obliteration is defined by the standard radiograph showing profusion subcategory **1/1 t/t**. If the pleural thickening extends up the lateral chest wall from the obliterated costophrenic angle, the thickening should be classified as diffuse pleural thickening. Costophrenic angle obliteration may occur without diffuse pleural thickening.

Diffuse pleural thickening

Diffuse pleural thickening historically has referred to thickening of the visceral pleura. The radiological distinction between parietal and visceral pleural thickening is not always possible on a postero–anterior radiograph.

For the purpose of the ILO (2000) Classification, diffuse pleural thickening extending up the lateral chest wall is recorded *only* in the presence of, and in continuity with, an obliterated costophrenic angle. Diffuse pleural thickening is recorded as absent or present along the chest wall. If present, it is recorded as in-profile or face-on, and separately for the right and the left side. Its extent is recorded in the same manner as for pleural plaques. A minimum width of about 3 mm is required for in-profile diffuse pleural

thickening to be recorded as present. If detailed measurement of its width is required for a particular study, see the comment provided in footnote 8.

Calcification and extent of diffuse pleural thickening on the chest wall are recorded separately for the right and for the left side (see guidelines for pleural plaques). The pleura may often be seen at the apex of the lung and should not be recorded as part of diffuse pleural thickening of the chest wall.

3.4. Symbols

Symbols to record radiographic features of importance are listed below. Their use is relevant because they describe additional features related to dust exposure and other aetiologies. Use of these symbols is obligatory.[9]

Some of the symbols imply interpretations, rather than just descriptions, of what is seen on the radiograph. A postero–anterior chest radiograph on its own may not be sufficient to justify definitive interpretation; therefore, each of the following definitions of symbols assumes an introductory qualifying word or phrase such as "changes indicative of", or "opacities suggestive of", or "suspect".

The symbols are:

aa atherosclerotic aorta
at significant apical pleural thickening (see Appendix D)
ax coalescence of small opacities[10]
bu bulla(e)
ca cancer: thoracic malignancies excluding mesothelioma
cg calcified non-pneumoconiotic nodules (e.g. granuloma) or nodes
cn calcification in small pneumoconiotic opacities
co abnormality of cardiac size or shape
cp cor pulmonale
cv cavity
di marked distortion of an intrathoracic structure
ef pleural effusion
em emphysema
es eggshell calcification of hilar or mediastinal lymph nodes
fr fractured rib(s) (acute or healed)
hi enlargement of non-calcified hilar or mediastinal lymph nodes
ho honeycomb lung
id ill-defined diaphragm border[11]
ih ill-defined heart border[12]
kl septal (Kerley) lines
me mesothelioma

[9] Inclusion of this information in statistical analyses of results may help to explain otherwise inexplicable variation between readers in their classifications of the same radiographs.

[10] The symbol **ax** represents coalescence of small opacities with margins of the small opacities remaining visible, whereas a large opacity demonstrates a homogeneous opaque appearance.The symbol **ax** (coalescence of small opacities) may be recorded either in the presence or in the absence of large opacities.

[11] The symbol **id** (ill-defined diaphragm border) should be recorded only if more than one-third of one hemidiaphragm is affected.

[12] The symbol **ih** (ill-defined heart border) should be recorded only if the length of the heart border affected, whether on the right or on the left side, is more than one-third of the length of the left heart border.

pa plate atelectasis
pb parenchymal bands[13]
pi pleural thickening of an interlobar fissure[14]
px pneumothorax
ra rounded atelectasis
rp rheumatoid pneumoconiosis[15]
tb tuberculosis[16]
od other disease or significant abnormality[17]

3.5. Comments

If the technical quality of the radiograph is not recorded as **1** (good), then a Comment on why this is so should be made at that time, before proceeding with the classification.

Comments are also required if the symbol **od** (other disease) is recorded, and to identify any part of the reading of a chest radiograph which is believed by a reader to be probably or certainly not dust related.

Comments should also be recorded to provide other relevant information.

[13] Significant parenchymal fibrotic strands in continuity with the pleura.

[14] Illustrated on the **3/3 s/s** standard radiograph.

[15] Illustrated on the **1/1 p/p** standard radiograph.

[16] The symbol **tb** should be used for either suspect active or suspect inactive tuberculosis. The symbol **tb** should not be used for the calcified granuloma of tuberculosis or other granulomatous processes, e.g. histoplasmosis. Such appearances should be recorded as **cg**.

[17] If the symbol **od** is used, then an explanatory Comment must be made.

4

Specific instructions for the use of the Abbreviated Classification

The Abbreviated Classification, described below, is a simplified version of the Complete Classification and includes its major components.

Technical quality

The recording of the technical quality of the radiograph is the same as for the Complete Classification (see section 3.1).

Small opacities

Profusion is determined by comparison with standard radiographs and recorded as one of the categories: **0**, **1**, **2** or **3** (see section 3.2).

Shape and size are determined by comparison with standard radiographs. The predominant shape and size are recorded using only one of the following letters: **p**, **q**, **r**, **s**, **t** or **u** (see section 3.2).

Large opacities

Large opacities are recorded as size **A**, **B** or **C**, in the same way as for the Complete Classification (see section 3.2).

Pleural abnormalities

All types of pleural thickening are recorded by the letters **PT**.
All types of pleural calcifications are recorded by the letters **PC**.

Symbols

Symbols are recorded as for the Complete Classification (see section 3.4).

Comments

Comments are recorded as for the Complete Classification (see section 3.5).

5

Using the ILO Classification

Efficient use of the ILO Classification requires good viewing and recording conditions. The following recommendations are particularly important for epidemiological studies.

Viewing

The illuminated boxes for viewing the radiographs to be classified and the standard radiographs 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 radiograph. The observer should be seated comfortably.

The minimum number of viewing spaces is two, allowing comparisons between the subject radiograph and the standard radiographs. However, it is recommended that three viewing spaces be used, so that the subject radiograph can be placed between the appropriate standard radiographs to assess profusion. It is important to make it easy to select and put up the standard radiographs for comparison, which is mandatory.

The viewing surfaces must be clean and the intensity of illumination should be uniform over all surfaces. The general illumination in the room should be low, without direct daylight. The room should be quiet, comfortable and free from distractions.

Epidemiological reading protocols

When classifying radiographs for epidemiological purposes, it is essential that the reader does not consider any other information about the individuals being studied. Awareness of supplementary details specific to individuals can introduce bias into results. If the epidemiological objective is to make comparisons between two or more groups, then the radiographs from all groups should be mixed and presented to the reader in random order. Failure to observe these principles may invalidate conclusions from the study.

Recording

Recording of results should be standardized and systematic. It is important to make provision for recording explicitly the presence or absence of all features to be evaluated for a particular study. Clerical help for recording results is valuable when

classifying large numbers of radiographs. The clerical assistant should be asked to remind the reader of failure to report the presence or absence of any features to be analysed in the study.

Reading rates

The number of radiographs classifiable per unit of time can vary greatly. Factors influencing reading rates include the technical quality of the radiographs, the prevalence of abnormalities on the radiographs, the experience of the reader, the purpose of the reading exercise and the length of the reading session.

Number of readers

It is recognized that there is considerable variation in multiple readings of some radiographs, not only from reader to reader (inter-observer variation), but also between readings by the same reader (intra-observer variation). It is recommended that, in epidemiological studies, at least two, but preferably more, readers each classify all radiographs independently.

When many radiographs are being read, intra-observer variation, i.e. variation in repeated readings by the same reader, should be assessed.

6

Appendices

The appendices have been prepared by individual experts to assist understanding of the principles and development of the ILO International Classification. They are not part of the text of the ILO (2000) International Classification of Radiographs of Pneumoconioses. The ILO wishes to express its gratitude to Dr. Kurt G. Hering, Dr. Yutaka Hosoda, Dr. Michael Jacobsen, Dr. Yukinori Kusaka, Mr. Otha W. Linton, Dr. John E. Parker, Dr. Anthony V. Proto, Dr. Hisao Shida, Dr. Gregory R.Wagner, Dr. Jerome F. Wiot and Dr. Anders Zitting for the preparation of the appendices.

Appendix A – A note on technical quality for chest radiographs of dust-exposed workers

It has long been recognized that the technique and equipment used for chest radiographic imaging of dust-exposed workers affect the radiographic appearance of pneumoconiotic lesions, and that this can influence the classification of a radiograph for pneumoconiosis. Both clinical interpretations of chest radiographs, and the use of the ILO Classification for medical screening, public health surveillance and epidemiological research, require good-quality radiographs. Consequently, readers may find it difficult to use the ILO Classification if the quality of chest radiographs is suboptimal. In some cases, it may be impossible to classify such a radiograph. Provision has been made for this contingency in section 3.1 of these *Guidelines* by the definition of technical quality grade **4** ("unacceptable for classification purposes").

Common quality faults include *underexposure* (often associated with a tendency to read more profusion than would be recognized on an optimally produced radiograph) and *overexposure* (associated with the converse tendency). Experienced readers may sometimes adjust their assessments of such radiographs to compensate, to some extent, for these perceived technical faults. Nevertheless, physicians and radiographers should strive always to obtain good-quality radiographs.

An optimal radiographic technique for the assessment of pneumoconiosis should reveal the fine detail of parenchymal markings, demonstrate clearly the costal–pleural junctions and show vascular markings through the cardiac shadow. It should be noted, however, that good contrast, required to evaluate the pulmonary parenchyma, may be suboptimal for assessment of mediastinal structures.

Methods for imaging the chest for dust-related lung diseases continue to evolve as new technologies are introduced. In view of these ongoing developments, it would be inappropriate here to attempt to provide detailed technical advice on radiographic technique and equipment. Authoritative information on these topics may be found in a number of specialist publications. A select bibliography is provided at the end of this appendix.

These *Guidelines* require that a decision on whether a radiograph is of good, or at least of acceptable, technical quality rests ultimately with the physician who classifies the radiograph. Therefore, a key general principle must be the establishment and maintenance of good communication between the physician and the radiographer, so that high-quality images, providing an adequate view of the pulmonary parenchyma and pleura, are obtained. The radiographer must be well trained and supervised, and must work in a climate that invites dialogue with the physician/reader. The physician must provide feedback to the radiographer to ensure improvement of any suboptimal images, and should be prepared to advise on quality control for the production of chest radiographs of dust-exposed workers. Physicians and radiographers should take cognizance of local regulations.

Select bibliography

American College of Radiology. *ACR Standard for the Performance of Pediatric and Adult Chest Radiography*. Reston, Va., American College of Radiology, 1997.

Commission of the European Community. *European Guidelines on Quality Criteria for Diagnostic Radiographic Images*, edited by J.H.E. Carmichael et al. Report OP-EUR 16260, Luxembourg, 1996.

Guibelalde, E., et al. "Image quality and patient dose for different screen-film combinations", in *British Journal of Radiology*, Vol. 67, No. 794, Feb. 1994, pp.166-173.

Holm, T.; Palmer, P.E.S.; Lehtinen, E. *Manual of radiographic technique: WHO Basic Radiological System*. Geneva, World Health Organization, 1986.

International Labour Office. "Appendix A. Equipment and technology: Guidance notes", prepared by H. Bohlig et al., in *Guidelines for the Use of ILO International Classification of Radiographs of Pneumoconioses*. Geneva, revised edition 1980, pp. 21-25.

Ravin, C.E.; Chotas, H.G. "Chest radiography", in *Radiology*, Vol. 204, No. 3 (Sep.), 1997, pp. 593-600.

Appendix B – Reading sheets

The reading sheets on the following pages are examples of what may be used with the ILO (2000) International Classification of Radiographs of Pneumoconioses. In some situations, clinical or epidemiological, other designs may be preferred for specific uses. The sheets illustrated here make provision for recording all features described in the Complete Classification and the Abbreviated Classification. However, they are not a formal part of the ILO International Classification.

READING SHEET FOR
COMPLETE ILO (2000) INTERNATIONAL CLASSIFICATION OF RADIOGRAPHS OF PNEUMOCONIOSES

READER CODE ☐☐☐ RADIOGRAPH IDENTIFIER ☐☐☐☐☐☐☐☐☐

DATE OF READING ☐☐—☐☐—☐☐☐☐ DATE OF RADIOGRAPH ☐☐—☐☐—☐☐☐☐

TECHNICAL QUALITY

Grade 1, 2, 3 or 4 (Mark appropriate box) 1 2 3 4

If grade not 1, **Comment** *required here*

Comment on technical quality:

PARENCHYMAL ABNORMALITIES

Small opacities

Profusion (12-point scale)

0/– 0/0 0/1 1/0 1/1 1/2 2/1 2/2 2/3 3/2 3/3 3/+

(Consult standard radiographs — mark profusion subcategory.)

0/–	0/0	0/1
1/0	1/1	1/2
2/1	2/2	2/3
3/2	3/3	3/+

Affected zones

(Mark ALL affected zones)

	R	L
Upper	☐	☐
Middle	☐	☐
Lower	☐	☐

Shape and size: p, q, r, s, t or u
(Consult standard radiographs. Two symbols required;

mark one primary and one secondary.)

Primary	Secondary
p s	p s
q t	q t
r u	r u

Large opacities Mark 0 for none or mark A, B, or C [0] [A] [B] [C]

PLEURAL ABNORMALITIES

Yes ☐ No ☐
If "No" go to ***SYMBOLS**

(0=None R=Right L=Left)

PLEURAL PLAQUES

Site (Mark appropriate boxes)		*Calcification (Mark)*	*Extent (chest wall; combined for in-profile and face-on)* up to ¼ of lateral chest wall = 1; ¼ to ½ of lateral chest wall = 2; > ½ of lateral chest wall = 3		*Width (optional)* (3 mm minimum width required) 3 to 5 mm = a; 5 to 10 mm = b; > 10 mm = c	
Chest wall in profile	0 R L	0 R L	0 R	0 L	R	L
			1 2 3	1 2 3	a b c	a b c
face-on	0 R L	0 R L				
Diaphragm	0 R L	0 R L				
Other site(s)	0 R L	0 R L				

COSTOPHRENIC ANGLE OBLITERATION 0 R L

DIFFUSE PLEURAL THICKENING
(Mark appropriate boxes)

Calcification (Mark)

Extent (chest wall; combined for in-profile and face-on)
up to ¼ of lateral chest wall = 1
¼ to ½ of lateral chest wall = 2
> ½ of lateral chest wall = 3

Width (optional)
(3 mm minimum width required)
3 to 5 mm = a
5 to 10 mm = b
> 10 mm = c

Chest wall in profile	0 R L	0 R L	0 R: 1 2 3	0 L: 1 2 3	R: a b c	L: a b c
face-on	0 R L	0 R L				

***SYMBOLS**
aa at ax bu ca cg cn co cp cv di ef em es
fr hi ho id ih kl me pa pb pi px ra rp tb od

Yes ☐ No ☐
(Circle as appropriate; if **od** *circled,* **COMMENT** *must be made below)*

COMMENTS

Yes ☐ No ☐

READING SHEET FOR
ABBREVIATED ILO (2000) INTERNATIONAL CLASSIFICATION OF RADIOGRAPHS OF PNEUMOCONIOSES

READER CODE ☐☐☐ RADIOGRAPH IDENTIFIER ☐☐☐☐☐☐☐☐☐

DATE OF READING ☐☐—☐☐—☐☐☐☐ DATE OF RADIOGRAPH ☐☐—☐☐—☐☐☐☐

TECHNICAL QUALITY
Grade 1, 2, 3 or 4

(Mark appropriate box) 1 2 3 4
If grade not 1, **Comment** *required here*

Comment on technical quality:

PARENCHYMAL ABNORMALITIES

Small opacities

Profusion (4-point scale)
(Consult standard radiographs — mark profusion category) 0 1 2 3

Predominant shape and size p, q, r, s, t or u
(Consult standard radiographs) (Mark only one box)

p s
q t
r u

Large opacities Mark 0 for none
or mark A, B or C 0 A B C

PLEURAL ABNORMALITIES

Yes ☐ No ☐

If "No" go to ***SYMBOLS**

(0 = None R = Right L = Left)

Pleural thickening — PT 0 R L

Pleural calcification — PC 0 R L

***SYMBOLS**

Yes ☐ No ☐

aa at ax bu ca cg cn co cp cv di ef em es

fr hi ho id ih kl me pa pb pi px ra rp tb od

(Circle as appropriate; if **od** *circled,* **COMMENT** *must be made below)*

COMMENTS

Yes ☐ No ☐

Appendix C – Description of standard radiographs

The Complete Set (22 radiographs)

The ILO (2000) International Classification of Radiographs of Pneumoconioses is accompanied by 22 standard radiographs. Two of them illustrate category **0/0** profusion of small opacities. Fifteen others define small-opacity profusion categories (**1/1**, **2/2** and **3/3**), and some of the shapes and sizes of these opacities (**p**, **q**, **r**, **s**, and **t**). Large opacities (categories **A**, **B** and **C**) are shown on three additional radiographs. These 20 radiographs are described in the following table using the conventions defined in the preceding text and including Comments. The site of small opacities is shown by a tick in the boxes symbolizing the zones of the lungs, as follows:

	Right	Left
Upper	☐	☐
Middle	☐	☐
Lower	☐	☐

The two remaining standard radiographs are composite reproductions of sections from full-size chest radiographs. One depicts increasing profusion of irregular small **u**-sized opacities. The other illustrates various pleural abnormalities.

The radiographs that define the small-opacity profusion categories are copies of the same standards that were published in 1980, thus preserving continuity and consistency in the Classification. As noted in footnote 3 on page 3, the standard radiographs were chosen to demonstrate the radiographic features of the pneumoconioses, rather than to demonstrate technical quality.

The descriptions of the radiographs in the following table are the consensus views of a group of experts who reassessed the standards in the year 2000. These descriptions differ in some respects from those published in the earlier (1980) edition of the Classification. Judgements about the technical quality of the radiographs reflect familiarity with current optimal techniques and thus may appear more severe, with only six graded **1** (good). Descriptions of pleural abnormalities now follow the modified conventions that are defined in these *Guidelines* (section 3.3). The Comments in the right-hand column of the table include some additional observations by the reviewers.

The Quad Set (14 radiographs)

Also available from the ILO is a set of 14 standard radiographs that are wholly compatible with the Complete Set referred to above.[1] The Quad Set may be preferred by some users of the Classification. It includes nine of the most commonly used standard radiographs from the Complete Set (both category **0/0** examples, six showing categories **1/1**, **2/2** and **3/3** for **q/q** and **t/t** small opacities, and the composite radiograph that illustrates pleural abnormalities). The remaining five radiographs in the Quad Set are composite reproductions of quadrant sections from the other radiographs in the Complete Set. Four of them show different profusion categories for small opacities classifiable as **p/p**, **r/r**, **s/s** and **u/u**, respectively, and one shows large opacities (categories **A**, **B** and **C**).

Scientific reports that mention these *Guidelines* and the associated standard radiographs should refer to them explicitly as the ILO (2000) International Classification of Radiographs of Pneumoconioses, to avoid confusion with earlier editions of the Classification and copies of standard radiographs. The international trial, which demonstrated the general compatibility of the Quad Set with the Complete Set, showed that, when using the Quad Set, some readers identified large opacities less frequently than when they used the Complete Set. Use of the Quad Set was also associated with an increase in the frequency with which some readers described the shapes of the small opacities that they saw as predominantly irregular, rather than rounded. It is recommended, therefore, that authors of research reports should indicate which set of standard radiographs (the Complete Set or the Quad Set) was used in their studies.

[1] See footnote 1 in the foreword.

Description of standard radiographs

Standard radiograph (ILO, 2000)	Technical Quality	Parenchymal abnormalities				Pleural abnormalities					Symbols	Comments
		Profusion	Shape and size	Zones	Large opacities	Chest wall		Costophrenic angle obliteration	Diaphragm	Calcification		
						Plaques (localized pleural thickening)	Diffuse pleural thickening					
0/0 (example 1)	2	0/0	—	—	No	No	No	No	No	No	None	Quality: unsharp upper ribs. Vascular pattern well illustrated.
0/0 (example 2)	2	0/0	—	—	No	No	No	No	No	No	None	Quality: unsharp upper ribs. Vascular pattern well illustrated, but not as clearly as in example 1.
1/1 p/p	2	1/1	p/p	R L ☑ ☑ ☑ ☑ ☑ ☑	A	No	No	No	No	No	 ca rp od	Quality: scapular overlap. rp in left lower zone. od in left upper and left lower zones; evaluate.
2/2 p/p	1	2/2	p/p	R L ☑ ☑ ☑ ☑ ☑ ☑	No	No	No	No	No	No	cg pi	
3/3 p/p	2	3/3	p/p	R L ☑ ☑ ☑ ☑ ☑ ☑	No	No	No	No	No	No	 ca	Quality: scapular overlap. ca in right upper zone.

Description of standard radiographs

Standard radiograph (ILO, 2000)	Technical Quality	Parenchymal abnormalities				Pleural abnormalities					Symbols	Comments
		Profusion	Shape and size	Zones	Large opacities	Chest wall: Plaques (localized pleural thickening)	Chest wall: Diffuse pleural thickening	Costophrenic angle obliteration	Diaphragm	Calcification		
1/1 q/q	2	1/1	q/q	R L ☑☑ ☑☑ ☐☐	No	No	No	No	No	No	None	Quality: overexposed; costophrenic angles excluded.
2/2 q/q	1	2/2	q/q	R L ☑☑ ☑☑ ☑☑	No	No	No	Yes R L ☐☑	No	No	None	Right costophrenic angle appearance due to muscle slip.
3/3 q/q	2	3/3	q/q	R L ☑☑ ☑☑ ☑☑	No	No	No	No	No	No	pi	Quality: underexposed; costophrenic angle excluded.
1/1 r/r	2	1/1	r/r	R L ☑☑ ☑☑ ☐☐	No	No	No	Yes R L ☐☑	No	No	None	Quality: scapular overlap; unsharp lower zones. Profusion of small opacities is more marked in right lung.
2/2 r/r	2	2/2	r/r	R L ☑☑ ☑☑ ☑☑	No	No	No	No	No	No	hi	Quality: contrast too high. hi in right paratracheal area; evaluate.

Description of standard radiographs

Standard radiograph (ILO, 2000)	Technical Quality	Parenchymal abnormalities				Pleural abnormalities					Symbols	Comments
		Profusion	Shape and size	Zones	Large opacities	Chest wall: Plaques (localized pleural thickening)	Chest wall: Diffuse pleural thickening	Costophrenic angle obliteration	Diaphragm	Calcification		
3/3 r/r	2	3/3	r/r	R L ☑ ☑ ☑ ☑ ☑ ☑	No	No	No	No	No	No	 ax ih	Quality: contrast too high. ax in right upper zone.
1/1 s/t	2	1/1	s/t	R L ☑ ☐ ☑ ☑ ☑ ☑	No	No	No	No	No	No	None	Quality: unsharp areas; costophrenic angles excluded.
2/2 s/s	2	2/2	s/s	R L ☐ ☐ ☑ ☑ ☑ ☑	No	No	No	No	No	No	 em pb	Quality: slightly underexposed; costophrenic angles excluded. em in upper zones. pb in left lower zone.
3/3 s/s	2	3/3	s/s	R L ☑ ☑ ☑ ☑ ☑ ☑	No	No	No	No	No	No	 ho ih pi	Quality: slightly underexposed; scapular overlap. ho at right costrophenic angle See footnote 14 on page 9.

Description of standard radiographs

Standard radiograph (ILO, 2000)	Technical Quality	Parenchymal abnormalities				Pleural abnormalities					Symbols	Comments
		Profusion	Shape and size	Zones	Large opacities	Chest wall: Plaques (localized pleural thickening)	Chest wall: Diffuse pleural thickening	Costophrenic angle obliteration	Diaphragm	Calcification		
1/1 t/t Costophrenic angle obliteration	2	1/1	t/t	R L ☐☐ ☑☑ ☑☑	No	Yes R L ☐☑ face-on	No	Yes R L ☑☐	No	Yes R L ☐☑	None	Quality: scapular overlap on right, but visualization of lung and pleura not compromised. This radiograph defines the lower limit of costophrenic angle obliteration. Calcified face-on plaques at lower and mid-left chest wall.
2/2 t/t	1	2/2	t/t	R L ☑☑ ☑☑ ☑☑	No	No	No	No	No	No	None	
3/3 t/t	1	3/3	t/t	R L ☑☑ ☑☑ ☑☑	No	No	No	No	No	No	ca cp ho id ih od	ca: superior to left hilum. ho: best seen at left lower zone. od: nodule lateral to left hilum.
0/0	—	—	—	—	—	—	—	—	—	—	—	This composite radiograph illustrates central subcategories of profusion of small opacities classifiable for shape and size as u/u.
1/1 u/u	—	—	—	—	—	—	—	—	—	—	—	
2/2 u/u	—	—	—	—	—	—	—	—	—	—	—	
3/3 u/u	—	—	—	—	—	—	—	—	—	—	—	

Description of standard radiographs

Standard radiograph (ILO, 2000)	Technical Quality	Parenchymal abnormalities				Pleural abnormalities					Symbols	Comments
		Profusion	Shape and size	Zones	Large opacities	Chest wall		Costophrenic angle obliteration	Diaphragm	Calcification		
						Plaques (localized pleural thickening)	Diffuse pleural thickening					
A	2	2/2	p/q	R L ☑☑ ☑☑ ☑☑	A	No	No	No	No	No	None	Quality: high contrast; right scapular overlap obscures visualization. If concerned that right upper zone opacity could be cancer, add symbol ca.
B	1	1/2	q/p	R L ☑☑ ☑☑ ☑☑	B	No	No	No	No	No	ax ca	ca: right lateral mid-zone nodule.
C	1	2/1	q/t	R L ☑☑ ☑☑ ☑☑	C	No	No	No	No	No	ax bu em es ih	bu at right upper zone. em best seen at left lower zone; es at hilar and azygos node. Small opacities difficult to classify in the presence of large opacities.

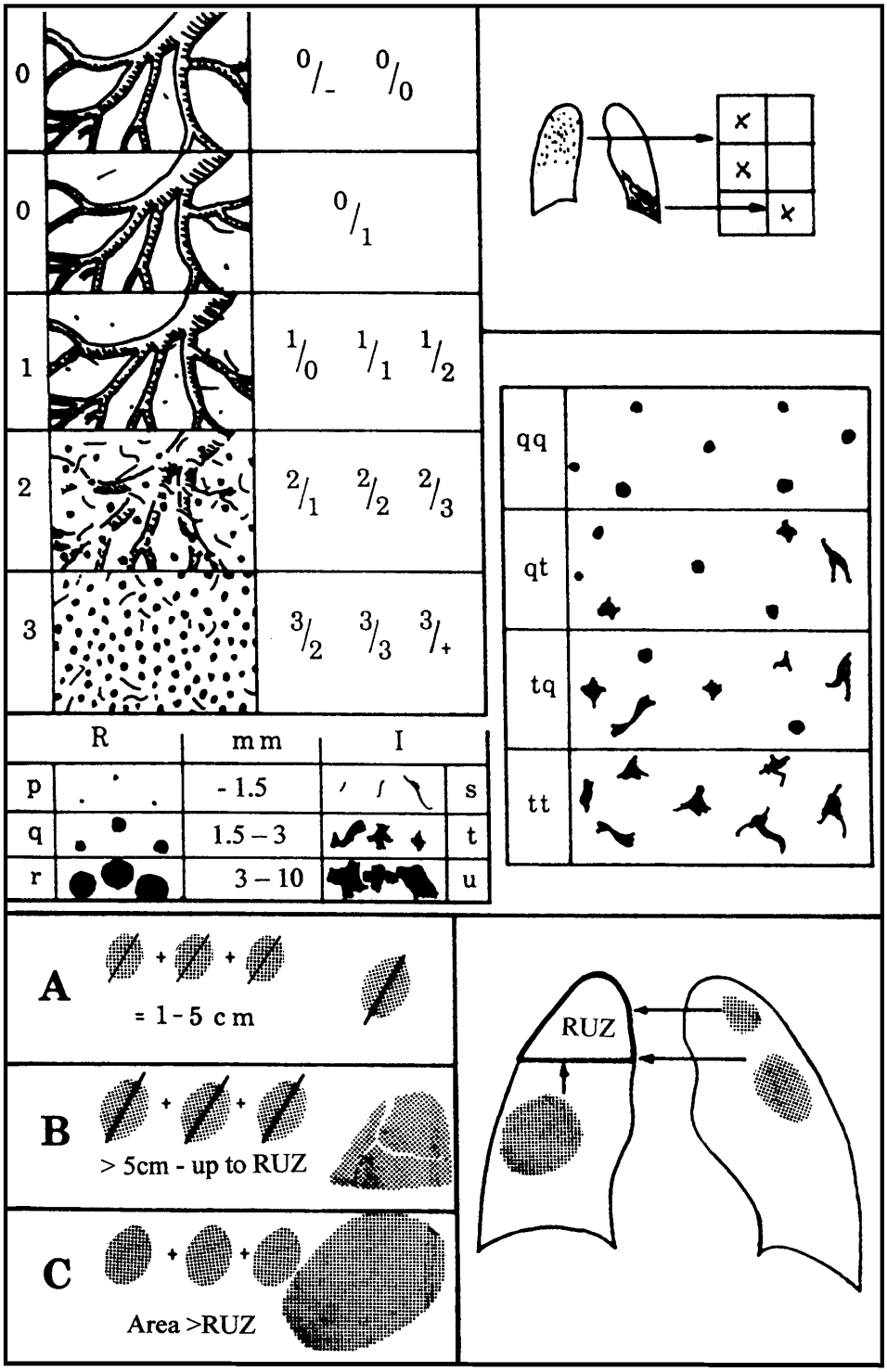
ILO (2000) Composite standard radiograph showing examples of pleural abnormalities

Upper-left section: calcified plaques at diaphragm	**Upper-right section:** calcified in-profile and face-on plaques
Lower-left section: diffuse in-profile pleural thickening with the required costophrenic angle obliteration; also diffuse face-on pleural thickening	**Lower-right section:** calcified and uncalcified face-on plaques

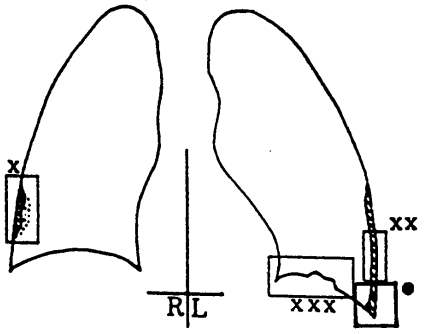
Appendix D – Diagrams

The diagrams on the following pages represent illustrations of radiographic features that are included in the Complete Classification. Those features are defined in the text of these *Guidelines* and by the appearances on the standard radiographs. The diagrams are intended to serve as pictorial reminders, but they are not a substitute for the standard radiographs or the written text.

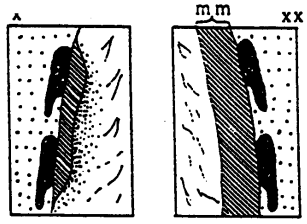
Diagrams that represent symbols do not illustrate all the manifestations of the conditions defined by these symbols, for example **ca** (carcinoma), **cg** (calcified granuloma), **od** (other disease). The two drawings of appearances classifiable as **od** in this appendix represent lobar pneumonia and aspergilloma, goiter and hiatal hernia.

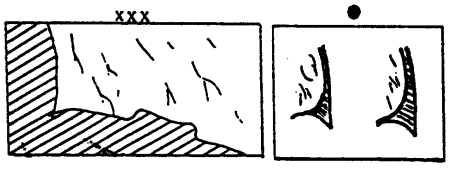

0
0
1
2
3
0/- 0/0
0/1
1/0 1/1 1/2
2/1 2/2 2/3
3/2 3/3 3/+
R
mm
I
p
- 1.5
s
q
1.5 – 3
t
r
3 – 10
u
qq
qt
tq
tt
A
= 1 - 5 cm
B
> 5cm - up to RUZ
C
Area >RUZ
RUZ

Pleural abnormalities -
(localized and diffuse pleural thickening):

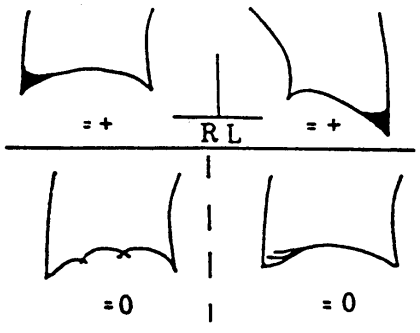


Extent:	Width:	
0 = 0	a = 3-5 mm	See Text!
1 = up to ¼	b = 5-10 mm	
2 = ¼ - ½	c = > 10 mm	
3 > ½		



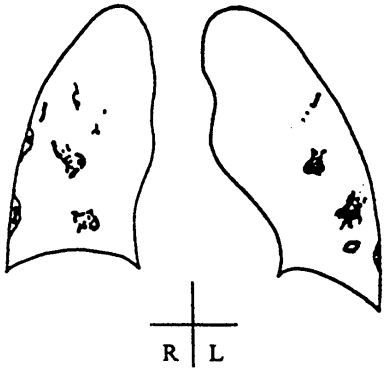


Costophrenic angle:

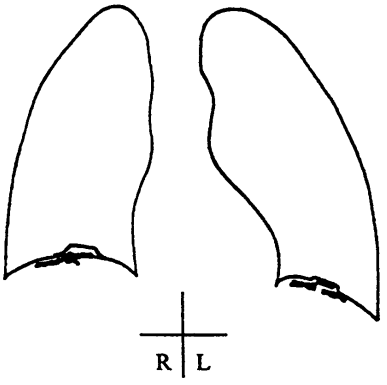


Pleural calcification:

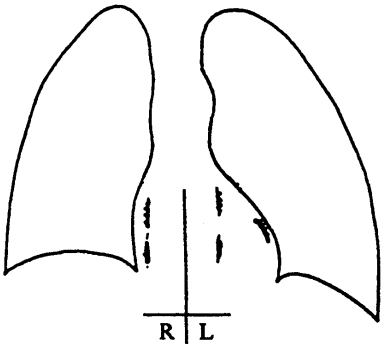
Chest wall



Diaphragm



Other sites



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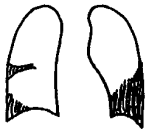
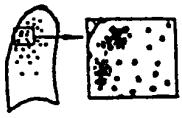
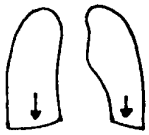
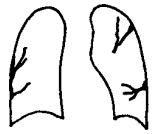
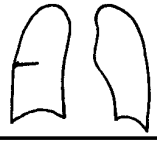
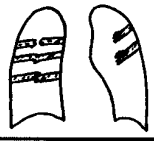
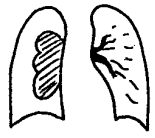
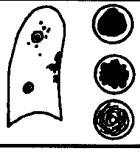
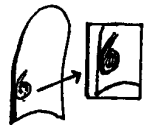
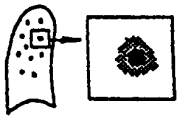
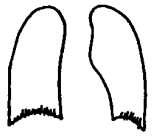
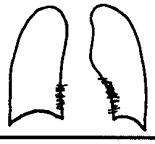
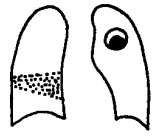
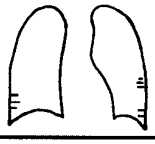
at 	ef 	pa 
ax 	em 	pb 
bu 	es 	pi 
ca 	fr 	px 
cg 	hi 	ra 
cn 	ho 	rp 
co 	id 	tb 
cp 	ih 	od 
cv 	kl 	od 

Appendix E – Summary of details of the ILO (2000) International Classification of Radiographs of Pneumoconioses

Features	Codes	Definitions
TECHNICAL QUALITY		
	1	Good.
	2	Acceptable, with no technical defect likely to impair classification of the radiograph for pneumoconiosis.
	3	Acceptable, with some technical defect but still adequate for classification purposes.
	4	Unacceptable for classification purposes.
		If technical quality is not grade 1, a comment must be made about the technical defect.
PARENCHYMAL ABNORMALITIES		
Small opacities		
Profusion		The category of profusion is based on assessment of the concentration of opacities by comparison with the standard radiographs.
	0/– 0/0 0/1 1/0 1/1 1/2 2/1 2/2 2/3 3/2 3/3 3/+	Category 0: small opacities absent or less profuse than category 1. Categories 1, 2 and 3 represent increasing profusion of small opacities, as defined by the corresponding standard radiographs.
Zones	RU LU RM LM RL LL	The zones in which the opacities are seen are recorded. The right (R) and left (L) thorax are both divided into three zones: upper (U), middle (M) and lower (L). The category of profusion is determined by considering the profusion as a whole over the affected zones of the lung and by comparing this with the standard radiographs – see footnote 5 on page 5 of these *Guidelines*.
Shape and size		
— rounded	p/p q/q r/r	The letters p, q and r denote the presence of small rounded opacities, with three sizes defined by the appearances on the standard radiographs: p = diameter up to about 1.5 mm; q = diameter exceeding about 1.5 mm and up to about 3 mm; r = diameter exceeding about 3 mm and up to about 10 mm.
— irregular	s/s t/t u/u	The letters s, t and u denote the presence of small irregular opacities, with three sizes defined by the appearances on the standard radiographs: s = width up to about 1.5 mm; t = width exceeding about 1.5 mm and up to about 3 mm; u = width exceeding 3 mm and up to about 10 mm.

Features	Codes	Definitions
— mixed	p/s p/t p/u p/q p/r q/s q/t q/u q/p q/r r/s r/t r/u r/p r/q s/p s/q s/r s/t s/u t/p t/q t/r t/s t/u u/p u/q u/r u/s u/t	For mixed shapes (or sizes) of small opacities, the predominant (primary) shape and size is recorded first. The presence of a significant number of another shape and size (secondary) is recorded after the oblique stroke.
Large opacities	0 A B C (0 = no large opacities)	One large opacity is defined as an opacity having the longest dimension exceeding 10 mm. Categories of large opacities are defined below. These definitions take precedence over the examples of large opacities illustrated on standard radiographs. Category A: one large opacity having the longest dimension up to about 50 mm, or several large opacities with the sum of their longest dimensions not exceeding about 50 mm. Category B: one large opacity having the longest dimension exceeding 50 mm but not exceeding the equivalent area of the right upper zone, or several large opacities with the sum of their longest dimensions exceeding 50 mm but not exceeding the equivalent area of the right upper zone. Category C: one large opacity which exceeds the equivalent area of the right upper zone, or several large opacities which when combined exceed the equivalent area of the right upper zone.
PLEURAL ABNORMALITIES		Three types of pleural abnormalities are recognized: pleural plaques (localized pleural thickening), costophrenic angle obliteration and diffuse pleural thickening. These abnormalities are recorded as absent (0) or present. If present they are recorded separately for the right (R) and left (L) sides.
Pleural plaques (localized pleural thickening)		
Chest wall		Pleural plaques on the chest wall are recorded separately as "in-profile" or "face-on". A minimum width of about 3 mm is required for an in-profile plaque to be recorded as present. The presence or absence of calcification is also noted separately for in-profile and face-on plaques. When calcification is seen, a plaque is also recorded as present at that site. For optional recording of width of an in-profile plaque, see footnote 8 on page 6.
in-profile	0 R L	
— calcification	0 R L	
— width (optional)	R(a, b, c) L(a, b, c)	
face-on	0 R L	
— calcification	0 R L	
extent	R(1, 2, 3) L(1, 2, 3)	Extent refers to the total length of involvement with respect to the projection of the lateral chest wall for in-profile and face-on plaques combined: 1 = total length up to ¼ of the projection of the lateral chest wall; 2 = total length exceeding ¼ and up to ½ of the projection of the lateral chest wall; and 3 = total length exceeding ½ of the projection of the lateral chest wall.
Diaphragm	0 R L	
— calcification	0 R L	When calcification is seen, a plaque is also recorded at that site.
Other sites	0 R L	Other sites include the mediastinal pleura in the para-spinal or para-cardiac locations.
— calcification	0 R L	When calcification is seen, a plaque is also recorded at that site.

Features		Codes	Definitions
Costophrenic angle obliteration		0 R L	The lower limit for costophrenic angle obliteration is defined by the standard radiograph showing profusion category **1/1 t/t**.
Diffuse pleural thickening	Chest wall in-profile	0 R L	Diffuse pleural thickening extending up the lateral chest wall is recorded only in the presence of an obliterated costophrenic angle. If present, diffuse pleural thickening is recorded separately for the right and left sides when seen in-profile and when seen face-on. The presence or absence of calcification is noted in both cases.
	— calcification	0 R L	
	— width (optional)	R(a, b, c) L(a, b, c)	For optional recording of width of in-profile diffuse pleural thickening, see footnote 8 on page 6.
	face-on	0 R L	
	— calcification	0 R L	
	extent	R(1, 2, 3) L(1, 2, 3)	Extent refers to the total length of involvement with respect to the projection of the lateral chest wall for in-profile and face-on varieties combined: 1 = total length up to ¼ of the projection of the lateral chest wall; 2 = total length exceeding ¼ and up to ½ of the projection of the lateral chest wall; and 3 = total length exceeding ½ of the projection of the lateral chest wall.
SYMBOLS			The definition of each symbol should be understood as being preceded by an introductory qualifying word or phrase such as "changes indicative of", "opacities suggestive of", or "suspect".
		aa	atherosclerotic aorta
		at	significant apical pleural thickening
		ax	coalescence of small opacities
		bu	bulla(e)
		ca	cancer: thoracic malignancies excluding mesothelioma
		cg	calcified non-pneumoconiotic nodules (e.g. granuloma) or nodes
		cn	calcification in small pneumoconiotic opacities
		co	abnormality of cardiac size or shape
		cp	cor pulmonale
		cv	cavity
		di	marked distortion of an intrathoracic structure
		ef	pleural effusion
		em	emphysema
		es	eggshell calcification of hilar or mediastinal lymph nodes
		fr	fractured rib(s) (acute or healed)
		hi	enlargement of non-calcified hilar or mediastinal lymph nodes
		ho	honeycomb lung
		id	ill-defined diaphragm border
		ih	ill-defined heart border
		kl	septal (Kerley) lines
		me	mesothelioma
		pa	plate atelectasis
		pb	parenchymal bands
		pi	pleural thickening of an interlobar fissure
		px	pneumothorax

Features	Codes	Definitions
	ra	rounded atelectasis
	rp	rheumatoid pneumoconiosis
	tb	tuberculosis
	od	other disease or significant abnormality
COMMENTS	Y {= Yes} N {= No}	In addition to comments about the technical quality of the radiograph (see above), comments are also required if the symbol od (other disease) is recorded, and to identify any part of the reading of a chest radiograph which is believed by a reader to be probably or certainly not dust related. Comments should also be recorded to provide other relevant information.

Appendix F – Participants in ILO-convened meetings leading to the revised (2000) edition of the Classification

Meeting of Discussion Group at ILO Headquarters, Geneva, 6-7 November 1989

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Dr. Georges H. Coppée
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Meeting of Discussion Group in Kyoto, Japan, 15-16 October 1997

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Meeting of Discussion Group at the Office of the American College of Radiology, Reston, Virginia, United States, 20-21 March 1998

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Meeting of Discussion Group at the ILO Branch Office, Washington, DC, United States, 26 October 2000

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[1] As of 1 January 1993. Prior to that date, Czechoslovakia.

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[1] As of 1 January 1993. Prior to that date, Czechoslovakia.