

Australian Standard™

Guide to the sampling of particulate materials

Part 6: Inspection of mechanical sampling systems



Standards Australia



Documents

Document Sharing Hub

This Australian Standard was prepared by Committee MN-010, Sampling of Minerals. It was approved on behalf of the Council of Standards Australia on 15 September 2000 and published on 27 December 2000.

The following interests are represented on Committee MN-010:

Australasian Institute of Mining and Metallurgy
Australian Coal Association
Chamber of Minerals and Energy of Western Australia
CSIRO Mathematical and Information Sciences
CSIRO Minerals

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about Standards can be found by visiting the Standards Australia web site at www.standards.com.au and looking up the relevant Standard in the on-line catalogue.

Alternatively, the printed Catalogue provides information current at 1 January each year, and the monthly magazine, *The Australian Standard*, has a full listing of revisions and amendments published each month.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.com.au, or write to the Chief Executive, Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001.

This Standard was issued in draft form for comment as DR 99484.

Australian Standard™

Guide to the sampling of particulate materials

Part 6: Inspection of mechanical sampling systems

First published as AS 4433.6—2000.

COPYRIGHT

© Standards Australia International

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia International Ltd
GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 3608 4

PREFACE

This Standard was prepared by the Standards Australia Committee MN-010, Sampling of Minerals.

This Standard was prepared with reference to ASTM D 4702-91, *Standard guide for inspecting crosscut, sweep-arm, and auger mechanical coal sampling systems for conformance with current ASTM Standards*.

The term ‘informative’ has been used in this Standard to define the application of the appendices to which it applies. An ‘informative’ appendix is for information and guidance only.

The objective of this Standard is to provide users of new and existing mechanical sampling systems for minerals with guidance on their operation and inspection.

CONTENTS

	Page
1 SCOPE	3
2 REFERENCED DOCUMENTS	3
3 DEFINITIONS	3
4 SAFETY	3
5 GENERAL CONSIDERATIONS.....	4
6 ESTABLISHMENT OF INSPECTION SYSTEM.....	5
7 PROCEDURES	6
APPENDICES	
A EXAMPLE OF SAMPLING CHECKLIST	12
B EXAMPLE OF SAMPLING PLANT OPERATORS INSPECTION REPORT.....	15
C EXAMPLE OF SAMPLING PLANT OPERATIONS INSPECTION SUMMARY ...	20

STANDARDS AUSTRALIA

Australian Standard

Guide to the sampling of particulate materials

Part 6: Inspection of mechanical sampling systems

1 SCOPE

This Guide sets out recommended practices for the inspection of mechanical sampling systems. This Guide serves as a reference for conformance with applicable Australian Standards.

This Guide covers general considerations including precision, mineral variability and bias; establishment of inspection systems and inspection procedure.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 4433 Guide to the sampling of particulate materials
- 4433.1 Part 1: Sampling procedures
- 4433.3 Part 3: Estimating sampling precision

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 4433.1 and those below apply.

3.1 Audit

A critical review of a mechanical sampling system, undertaken by a person not directly involved in the operation of that system, which measures its compliance with stipulated operating specifications.

3.2 Mechanical inspection

A comparative record of observations and measurements of physical parameters against design criteria undertaken by a suitably qualified inspector.

3.3 Operational inspection

A record of observations and inspections undertaken by the operator during sampling of a consignment. The operator is the person taking the sample.

4 SAFETY

This Standard does not purport to address safety issues that may be associated with its use. It is the responsibility of the user of this Standard to establish appropriate safety and health practices in line with site safety regulations and Occupational Health and Safety Acts in the relevant States of Australia. It is highly recommended that clear safety and maintenance instructions be provided to operators in the event of a breakdown. If parts of a system are used as a manual back-up, the parts not in use are to be clearly isolated according to site requirements.

5 GENERAL CONSIDERATIONS

5.1 Precision

Precision checks are recommended for each mineral used in the system. If there is a significant change in mineral type or a new mineral type is introduced, a precision check should be carried out. The test should outline the precision of sampling, preparation and analysis of each type of mineral used in the system. These tests are to be in accordance with AS 4433.3.

5.2 Mineral variability

The entire mineral-handling system up to the mechanical sampling system should be examined to determine whether any unloading, storage, or reclaiming procedures produce a cyclical pattern which could cause the increment collection to get in phase with the sequence of mineral variability. Variations in the physical characteristics, such as particle-size distribution, surface moisture, extraneous matter, and oversized material, could become cyclical and even could be in phase with time-based increment collection. Where such cyclical variations occur in the mineral stream, the source of the variations should be investigated to determine the practicability of eliminating the variations. If there is no practical way to eliminate the variations, the time interval between primary cuts should be adjusted so that the collection of increments is not in phase with the cyclic variation. Alternatively, stratified random sampling may be used.

5.3 Bias

It is recommended that, after commissioning and auditing of a new system or any major engineering modifications of an existing system, a bias test be carried out to confirm the system. In multi-mineral facilities, a size-analysis parameter index for each mineral is undertaken. It is recommended that the mineral having the highest index be chosen to be used in the subsequent bias test.

It is recommended that on a regular basis further bias sample pairs be taken to confirm that the initial bias result is still relevant. If a significant change is made to the sampling system, or a new mineral having more difficult sampling characteristics is introduced, the need for a new bias test should be considered.

NOTE: Provided that the mechanical sampling system satisfies the criteria outlined in AS 4433.1, bias tests are not mandatory. However, quality assurance principles at individual plants may require bias tests.

5.4 Operation of sampling system

The mechanical plant system should be started at some time in advance of the start of conveying mineral so that any foreign substances (including water) are purged. Where hydraulic drives are used, sufficient time should be allowed for the hydraulic oil and the associated system to attain temperature equilibrium. It is recommended, particularly in multi-mineral sampling systems, that one primary cut be allowed to pass through the mechanical system as a conditioner before sampling commences.

It is recommended that the operator review any sampling plant records maintained by the previous operator. These records should include such things as quantities of mineral handled and sampled, and notations as to system malfunctions, stoppages, blockages, or other deficiencies. The operator should use a suitable checklist, such as the example in Appendix A. It is recommended that the operator complete all items on a suitable checklist designed for the particular system. For large multi-user systems, an operators' inspection report, such as the example in Appendix B, should be developed.

Sufficient suitably designed inspection points should be available to observe that the falling-stream and cross-belt cutters cut the full stream of mineral, and cutter apertures can be inspected for blockages and blinding.

6 ESTABLISHMENT OF INSPECTION SYSTEM

6.1 General

To ensure reliable operation, it is recommended that a sampling checklist (Appendix A) and operators' sampling record (Appendix B) be developed with input from the following sources:

- (a) Original design criteria.
- (b) Sampling equipment operating and maintenance manuals.
- (c) Management responsible for the system.
- (d) Personnel operating or maintaining the system.
- (e) For a new system, the designers and commissioning personnel.
- (f) Relevant Australian Standards where applicable.

The general method for establishing these procedures is as follows:

- (i) Reference should be made to AS 4433.1 to ascertain the correct sampling scheme.
- (ii) Reference should be made to the equipment supplier's operating and maintenance manual to ascertain correct procedures for operation and intervals for routine maintenance. The manuals can provide useful information on the basis of the system design. Such information as conveyor rates, conveyor speeds, material parameters (particularly sizing and variability) are significant data and should always be kept in mind when changes are contemplated.
- (iii) Existing sampling and maintenance records for an extended period should be examined. This information will provide guidance for operators to ensure that the required level of inspection and maintenance is carried out to ensure reliable operation and will possibly alert operators to any inappropriate maintenance or modifications that may have been made to the equipment.
- (iv) Personal experience of maintenance, operational and sampling personnel should be sought with respect to the sampling system. This information together with that obtained from the above will enable appropriate operators' manual, operators' sampling record and system checklist to be prepared.

6.2 Audits

A scheme for regular audits of the sampling system should be established. Reference should be made to the original operating parameters and equipment supplier's design data in order to establish conformance with current applicable Standards.

NOTE: Appendix A provides a typical reference list. It is recommended that correct operation of all new systems be confirmed by an audit following the commissioning stage before being accepted as operational. Also, the design and operation of the system should be confirmed by an audit prior to any bias test.

6.3 Mechanical inspections

A scheme for routine inspections of the sampling system by operators should be established. The frequency and detail of inspections will be determined by such factors as, but not limited to, reliability of the system, handling characteristics of the sampled material, frequency of use of the system and purpose of sampling (e.g. process control compared to large multi-user port facilities).

6.4 Operational inspections

Operational procedures and inspections should be established and carried out immediately before, during and immediately after operation of the sampling system for a given lot or sampling unit. These procedures and inspections will be less extensive than those undertaken as audits or mechanical inspections as given in Clauses 6.2 and 6.3. They should be designed to be simple inspections of the integrity of the sampling process. For large multi-user facilities, it is recommended that a system of operational reports, as per the example in Appendix B, be developed.

7 PROCEDURES

7.1 Audits

When assessing the conformance of a mechanical sampling system, an auditor should refer to Appendix A, the relevant parts of AS 4433.1, and the design flow chart of the particular system being evaluated. It is recommended that an audit be carried out at least once per year by a person who is not directly involved in the operation and management of that particular sampling system.

It is essential that reference be made to the original operational parameters upon which the sampling system is designed. Operational conditions such as conveyor capacity, belt speed or material top size could have been altered without due regard to the impact on the operation and conformity of the sampling system.

Common examples of such alterations and their potential consequences are as follows:

- (a) An increase in the capacity of a conveyor could result in excessive primary increment mass that will no longer be entirely contained by the primary sample cutter.
- (b) A change in conveyor speed could affect the trajectory of material at a transfer point which could result in a part of the material stream being missed by the sample cutter.
- (c) A change in nominal top size of the mineral could result in the original cutter aperture no longer being large enough (i.e. three times nominal top size of the mineral) to conform to the relevant parts of AS 4433.

Items that should be covered as a minimum are as follows:

- (i) Safety requirements of site.
- (ii) Original and current operating parameters.
- (iii) Selection of appropriate sampling procedure.
- (iv) General condition of the equipment including buildup of material or blockages in chutes, cutters and sample loss or sample contamination.
- (v) Comparison of design and actual increment masses for all cutters at several flow rates on the product belt, up to the maximum.
- (vi) Condition of cutters, cutter apertures and cutter lips. Check for foreign material such as wood, rags, stones and material that may be blinding the cutter apertures.
- (vii) Conformance to AS 4433.1. In particular, the following information should be referenced:
 - (A) Minimizing bias.
 - (B) Correct design and operation of sample cutters.
 - (C) The number of primary increments and sampling units required.
 - (D) The methods of taking primary increments and division of gross samples, partial samples and increments.