FIVE-DAY ONLINE COURSE

Practical Metallurgical Accounting

AMIRA P754 Code of Practice | Metallurgical auditing | Reporting systems

Duration: 30 learning hours over five days. Four hours of facilitated online learning and two hours of independent practical work daily. Breaks are additional.

Course purpose

Equip participants to prepare, evaluate and improve metallurgical accounts that support reliable operational decisions and transparent reporting. One plant case study progresses from measurement and sampling through balancing, reporting and audit.

Learning outcomes

- Apply AMIRA principles when reviewing an accounting system.
- Define accounting boundaries, material streams and custody transfer points.
- Evaluate mass measurement, sampling and analytical data.
- Calculate metal balances, recoveries and inventory movements.
- Investigate discrepancies and perform basic data reconciliation.
- Design reporting workflows with traceable data and controlled approvals.
- Plan a metallurgical accounting audit and report evidence-based findings.
- Develop a practical improvement plan for an operation.

Reference framework

AMIRA P754 provides the course reference framework. Its emphasis on custody transfers, measurement quality, reporting and audit connects technical performance with commercial accountability. The instructor should confirm the edition used before delivery.

Reference: Morrison, R. D. and Gaylard, P. G. (2008), *Applying the AMIRA P754 Code of Practice for Metal Accounting*, MetPlant 2008, pp. 3-22, AusIMM. View publication.

Prospective Participants

For personnel who generate, review, use or assure metal accounting information across mineral processing operations.

Participant group	Expected benefit
Metallurgists and metallurgical accountants	Prepare balances, investigate discrepancies and improve monthly accounts.
Process engineers and plant technical personnel	Relate measurement quality and inventory movements to reported performance.
Production managers, supervisors and superintendents	Interpret production, recovery and loss reports; oversee corrective actions.
Laboratory managers, chemists and sampling personnel	Improve sample traceability, assay quality and measurement confidence.
Instrumentation, measurement and weighing personnel	Understand calibration, verification and measurement uncertainty.
Internal auditors, risk and assurance personnel	Plan audits, test controls and evaluate supporting evidence.
Finance staff, cost accountants and financial controllers	Understand metal quantities, inventory adjustments and handover to valuation.
Technical services managers and consultants	Assess system design, governance and improvement priorities.

Entry requirements

- Basic knowledge of mineral processing and production terminology.
- Working knowledge of spreadsheet calculations.
- No prior metallurgical auditing experience is required.

Online requirements

- Computer, spreadsheet software, PDF reader and reliable internet access.
- Access to the selected video-conferencing and learning platforms.
- Headset or microphone for group exercises and presentations.

Commodity relevance

Examples may be adapted for gold, platinum group metals or base metals. Participants may bring a non-confidential site flow diagram to relate exercises to their operations.

DAY 1

Fundamentals and the AMIRA Code of Practice

Learning objective: Establish boundaries, responsibilities and controls for credible accounts.

Session 1: Introduction to metallurgical accounting

- Purpose and business value; links with production, process control and financial accounting.
- Accounting boundaries: feed, intermediate products, final products and waste streams.
- Custody transfers and the Check In-Check Out approach.
- Roles of operations, laboratories, instrumentation, finance and management.

Session 2: AMIRA P754 framework

- Structure and purpose of the Code and supporting guidelines.
- Review of all ten principles using the course reference copy.
- Translating principles into site procedures and evidence.
- Accountability, competent oversight, authorization and documented review of departures from prescribed practice.

Session 3: Accounting system design

- Process flow diagrams and accounting stream registers.
- Primary accounting measurements and supporting process measurements.
- Reporting periods, cut-off times, units and wet/dry bases.
- Risk assessment and prioritization of critical streams.

Online practical

Map a sample plant, identify accounting boundaries and custody transfer points, and complete an initial AMIRA gap assessment.

Daily submission

Accounting flow diagram, responsibility matrix and priority risk register.

DAY 2

Measurement, Sampling and Laboratory Quality

Learning objective: Evaluate the reliability of measurements used to calculate metal quantities.

Session 1: Mass and volume measurement

- Weighbridges, belt scales, tanks and flowmeters.
- Calibration, verification and maintenance records.
- Moisture determination and dry mass conversion.
- Slurry density, solids concentration and flow calculations.
- Measurement timing and matching samples to production quantities.

Session 2: Sampling and sample preparation

- Representative sampling and common sources of bias.
- Sampling frequency, increment collection and composite samples.
- Crushing, splitting, pulverizing and contamination control.
- Sample identification, custody and traceability; safe access to sampling locations.

Session 3: Laboratory assurance and uncertainty

- Accuracy, precision, bias and measurement uncertainty.
- Certified reference materials, blanks, duplicates and check assays.
- Control charts and investigation of failed quality checks.
- Random errors, systematic errors and gross mistakes.
- Introduction to uncertainty propagation.

Online practical

Review calibration and laboratory quality-control records; calculate dry mass and contained metal; assess how moisture or assay bias changes reported recovery.

Daily submission

Measurement quality assessment and corrective action recommendations.

DAY 3

Metal Balancing, Inventory and Reconciliation

Learning objective: Prepare a defensible metal balance and investigate unexplained differences.

Session 1: Mass and metal balances

- Conservation of mass and metal; two-product and introductory multiple-stream balances.
- Recovery, yield, grade and concentration ratio.
- Treatment of recycles, bypasses, spillages and unmeasured streams.
- Clear recovery definitions when inventories change.

Session 2: Inventory accounting

- Opening and closing stocks; stockpiles, tanks, bins and material within the process.
- Physical stocktakes and estimation methods.
- Inventory movement, residence time and period cut-off.
- Approval and documentation of inventory adjustments.

Session 3: Reconciliation and investigation

- Comparing measured inputs, outputs and stock movements.
- Distinguishing balance discrepancies from demonstrated physical losses.
- Data validation, outlier investigation and introductory weighted least-squares reconciliation.
- Preserving measured values alongside reconciled results.
- Investigation thresholds informed by uncertainty and business significance.

Online practical

Build a monthly balance containing a moisture error, missing assay and inventory discrepancy. Define consistent boundaries and units before applying: balance discrepancy = opening metal inventory + metal received - metal dispatched - measured metal losses - closing metal inventory.

Daily submission

Measured and reconciled balance, recovery calculations and discrepancy investigation note.

DAY 4

Reporting Systems and Data Governance

Learning objective: Design timely, reproducible and reviewable metallurgical accounts.

Session 1: Reporting system architecture

- Data flow from instruments, laboratory systems and manual records.
- Interfaces with plant historians, accounting databases and business systems.
- Stream identifiers, units, timestamps and calculation definitions.
- Spreadsheet controls and criteria for selecting dedicated software.
- Access permissions, backups and retention of evidence.

Session 2: Data validation and month-end close

- Completeness, range and consistency checks.
- Handling missing, provisional, corrected and late data.
- Version control, change logs and separation of entry, review and approval.
- Month-end timetable, account locking and controlled reopening.

Session 3: Operational and management reporting

- Daily, weekly and monthly reporting needs.
- Feed, product, residue and inventory summaries.
- Recovery, balance discrepancy and measurement quality indicators.
- Actual versus budget and forecast comparisons.
- Commentary on uncertainty, adjustments and unresolved exceptions.
- Handover of approved metal quantities to finance for valuation.

Online practical

Design a monthly reporting pack and workflow showing data sources, validation rules, reviewers and approval points.

Daily submission

Reporting template, data flow diagram and month-end close checklist.

DAY 5

Metallurgical Auditing and Integrated Case Study

Learning objective: Assess a system, communicate findings and recommend practical improvements.

Session 1: Planning the audit

- Distinguishing process performance reviews from accounting system audits.
- Audit scope, criteria, independence and evidence requirements.
- Risk-based planning; desk review, interviews and remote inspection limitations.
- Selecting transactions and reporting periods for examination.

Session 2: Conducting and reporting the audit

- Tracing a reported metal quantity to source records.
- Reviewing measurement, sampling and laboratory controls.
- Reperforming calculations and testing cut-off.
- Examining stocktakes, adjustments and approvals.
- Writing findings that distinguish evidence, risk and recommendation.
- Assigning actions, owners, deadlines and follow-up verification.

Session 3: Integrated case study and presentations

- Evaluate accounts and identify material weaknesses.
- Produce a corrected reporting summary with explicit assumptions.
- Present findings and proposed corrective actions.
- Develop a prioritized 90-day improvement plan.

Online practical

Teams review a fictional operation with incomplete calibration records, inconsistent inventory estimates and unsupported reporting adjustments. Teams present conclusions and respond to peer questions.

Daily submission

Audit report, management presentation and implementation plan.

Delivery, Assessment and Resources

Daily online learning structure

Activity	Time
Recap, questions and knowledge check	30 minutes
Interactive teaching and worked examples	90 minutes
Facilitated spreadsheet workshop	90 minutes
Group discussion and feedback	30 minutes
Independent assignment and reading	120 minutes
Total learning time per day	6 hours

Breaks are additional. Use live demonstrations, breakout groups, polls and a shared discussion forum. Provide recordings, downloadable datasets and worked solutions through the learning platform. A single plant case study runs through all five days.

Assessment and completion

Assessment	Weight
Daily knowledge checks	20%
Practical assignments from Days 1-4	40%
Final case study and audit presentation	40%

Suggested completion criteria: At least 80% attendance, all required work submitted and an overall score of 70%. A certificate should identify completion of the training provider's course. AMIRA endorsement or professional accreditation should only be stated where formally obtained.

Participant resource pack

- Course notes and access to an appropriately obtained AMIRA reference copy.
- AMIRA principle-to-control worksheet, plant flow diagram and stream register templates.
- Mass, moisture, assay and metal balance calculation workbook.
- Sampling and laboratory checklist; inventory and stocktake worksheet.
- Monthly reporting pack and close checklist.
- Audit plan, evidence register, findings template and corrective action tracker.
- 90-day improvement plan template.

Instructor preparation

Confirm the AMIRA edition, select the commodity case study, and align terminology with participants' processing routes. Prepare datasets, worked solutions and assessment criteria before delivery.