1. INTRODUCTION

One of the services provided by NBE is to assess and accredit the proficiency of Reference Material Producers. This Guidance states the rules and standards applicable to the accreditation of Reference Material Producers. This document has been issued to provide guidance and information for the relevant parties considering the experience from NBE's assessment processes and knowledge derived from international studies.

The purpose of accreditation assessments is to check whether Reference Material Producers comply with the requirements of ISO 17034 standard, relevant EA, ILAC and NBE documents. Accreditation assessments of Reference Material Producers are conducted by an assessment team including Assessors/Technical Experts with subject-matter expertise.

The confidentiality of all information obtained by the Assessment Team and Case Officer during the assessment process is guaranteed by the contracts and forms prepared by NBE. This Guidance introduces additional requirements to the assessment processes conducted according to Procedure for the Accreditation of Conformity Assessment Bodies (PR-7-01).

This document primarily includes the requirements on the application and accreditation process for Reference Material Producers, metrological traceability, measurement uncertainty, subcontracting, accreditation scope etc. according to ISO 17034 standard.

2. DEFINITIONS

Terms and definitions used in the accreditation of Reference Material Producers are provided in ISO Guide 30 and Clause 3 of ISO 17034.

2.1 Reference Material (RM): Material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process.

2.2 Certified Reference Material (CRM): Reference Material characterized by a metrologically valid procedure for one or more specified properties, accompanied by a Reference Material certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability.

2.3 Candidate Reference Material: Material intended to be produced as Reference Material. To use a candidate Reference Material as a Reference Material, investigation should be made of

being sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process.

2.4 Reference Material Producer (RMP): Body (organization or company, public or private) that is fully responsible for project planning and management; assignment of, and decision on property values and relevant uncertainties; authorization of property values; and issuance of a reference material certificate or other statements for the Reference Materials it produces.

2.5 Reference Material Certificate: Document containing the essential information for the use of a CRM, confirming that the necessary procedures have been carried out to ensure the validity and metrological traceability of the stated property values. Information on the content of a Reference Material Certificate is given in ISO Guide 31.

2.6 Product Information Sheet: Document containing all the information that is essential for using an RM other than a CRM.

2.7 Homogeneity: Uniformity of a specified property value throughout a defined portion of a Reference Material (RM)

2.8 Stability: Characteristic of a reference material, when stored under specified conditions, to maintain a specified property value within specified limits for a specified period of time.

2.9 Characterisation: Determination of the property values or attributes of a reference material, as part of the production process.

2.10 Subcontractor: Collaborating firm. Body (organization or company, public or private) that undertakes aspects of the processing, handling, homogeneity and stability assessment, characterization, storage or distribution of the reference material under its own management system on behalf of the reference material producer.

3. RELATED DOCUMENTS

3.1 ISO 17034 General requirements for the competence of Reference Material Producers
3.2 ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
3.3 ISO 15189 Medical laboratories – Requirements for quality and competence
3.4 ISO Guide 30 Reference materials - Selected terms and definitions
3.5 ISO Guide 31 Reference materials - Contents of certificates, labels and accompanying

documentation
3.6 ISO Guide 33 Reference materials - Good practice in using reference materials
3.7 ISO Guide 35 Reference materials - Guidance for characterization and assessment of homogeneity and stability
3.8 ISO/TR 10989 Reference materials - Guidance on, and keywords used for, RM categorization
3.10 ILAC P10 ILAC Policy on Traceability of Measurement Results
3.11 PR-7-01 Procedure for the Accreditation of Conformity Assessment Bodies
3.12 PR-7-04 The Procedure for Proficiency Tests and Interlaboratory Comparison Programs
3.13 G-1-06 Requirements for Using NBE Accreditation Symbol by the Accredited Bodies
3.14 G-2-43 Guideline on Accreditation of Laboratories
3.15 G-1-12 Guideline on Traceability of Measurement Results

4. APPLICATION

A Reference Material Producer that seeks accreditation according to ISO 17034 may file its application for accreditation by "FR-7-1-80 Application Form for Accreditation for Reference Material Producers". The producer shall submit, to NBE through the form, information on the purpose of application (initial assessment, scope extension, etc.), current accreditation if applicable, entity's legal status, organizational structure, subcontractor, accreditation status of subcontractors and the scope for which it seeks accreditation; and mark the choice whether or not it wishes to have a pre-assessment.

A Reference Material Producer, which has filed an application by submitting the Application Form for Accreditation for Reference Material Producers and annexes to NBE and whose application has been accepted, should send the documents indicated in The Requested Documents For Reference Material Producers at Application According to ISO 17034 (FR-7-1-79) to the relevant field in NBE's e-mail.

In the initial accreditation application, the reference material production should be completed within the scope of application in order to carry out the assessment after the application is registered. When an accredited reference material producer makes an application for scope extension for RMs with a matrix similar to the ones in which they are accredited, if the production process of the applied RMs has not been completed, NBE may decide to make reviews and to include them in the accreditation scope of RMP. However, in order to expand the scope from a new area by the RMP, the RM production process should be completed. The accreditation assessment of a Reference Material Producer is conducted through methods such as documentation review, on-site assessment by visiting the head office and branch offices if any,

and supervising the assessment of subcontractors by reference material producer in the context of the activity if any.

5. ISO 17034 REQUIREMENTS AND OTHER PROVISIONS

Management requirements of ISO 17034 are generally similar to ISO/IEC 17025; however there are some significant differences in the technical requirements. Reference Material Producer has a couple of alternatives it can follow for producing the Reference Material and determining the assigned value. In addition, except for some activities, it may also be possible to use subcontractors in this process. Whichever way or method is chosen, Reference Material Producer is directly responsible for the adequate performance of the actions within the process. Therefore, NBE assesses the competence of a Reference Material Producer according to ISO 17034, and in case of laboratory activity, according to ISO/IEC 17025. It can be used ISO 15189 instead of ISO/IEC 17025 in the medical field.

5.1 Traceability of Measurements

In the process of producing Reference Materials, all devices used for performing measurements and/or tests and have significant impact on the results must be calibrated in a manner to have metrological traceability. For ensuring metrological traceability, NBE's "G-1-12 Guideline on Traceability of Measurement Results" must be taken into account.

5.2 Measurement Uncertainty

Measurement uncertainty in Reference Material Producer accreditation can be complicated due to many measurement uncertainty components of different nature. ISO 17034 requires that relevant clauses of ISO/IEC 17025 are met. ISO Guide 35 may be taken into account as an informative document. Where alternative methods are used, justification should be provided.

All contributions to uncertainty should be stated for the certified values of a Reference Material. ISO Guide 35 and ISO/IEC 98-3 provide detailed information on estimating uncertainties. In addition, ISO GUM provides information on assessing measurement uncertainty.

5.3 Proficiency Testing

As well as meeting the relevant requirements of the ISO/IEC 17025 standard, Reference Material Producers which use the resources of their own laboratories shall also participate in the proficiency testing in accordance with their accreditation scopes. Guidance on this matter can be found in NBE's The Procedure for Proficiency Tests and Interlaboratory Comparison Programs

(PR-7-04).

If a Reference Material Producer does not perform all testing and measurement activities with its own resources and uses a subcontractor, it shall also demonstrate that its subcontractor also meets the criteria laid down in the first paragraph.

5.4 Subcontracting

A Reference Material Producer can use subcontractors for the activities except for production planning, selection of subcontractors, assignment of property values and uncertainties, validation of property values and uncertainties, and authorization of Reference Material documents as activities to be performed during the production process as expressed in ISO 17034 Clause 6.2.3. When a Reference Material Producer uses subcontractors, it must have all policies and procedures in order to demonstrate that it meets all the requirements of the standard for the relevant activity including the selection and assessment of subcontractors. It might be a significant record for demonstrating the technical competence of the subcontractor that it has accreditation according to ISO/IEC 17025; however it may not be sufficient for a Reference Material Producer's accreditation process. Reference Material Producer must keep records for all activities carried out by subcontractors showing that the Standard and the specifications stated by the producer are met adequately. A Reference Material Producer may consider the participation statues and results of the subcontractor to proficiency testing in order to show competence.

5.5 Quality System Documentation

A Reference Material Producer should establish its management systems by choosing any of Option A or Option B being more suitable for its structure. The primary purpose of both options is to establish a management system that enables the management of the requirements of the standard in a repeatable manner. Option B is expected to guarantee the minimum requirements indicated in Option A. There is no difference between the options in terms of accreditation assessments. For both options, the assessment team will assess whether a management system that at minimum complies with the requirements of Option A. In respect of Option B, it makes no difference for accreditation assessments whether the applicant entity is certified by a certification body or itself operating ISO 9001.

Reference Material Producers may submit, along with the Quality manual, the documentation to demonstrate the integrity of the quality management system and compliance with ISO 17034 standard. Reference Material Producers should establish their management systems in accordance with ISO 17034 and accreditation rules, and document their procedures to the extent

necessary to consistently implement their quality management systems pursuant to the standard. When determining the limits for documenting, entities should consider that the aforesaid compliance could be demonstrated to the assessors of the accreditation body and the assessment of the system is assured. Internal audits should be scheduled and conducted at periods of maximum 12 months. Management reviews should also be scheduled and conducted at periods of maximum 12 months.

5.6 Assessment of Risks and Opportunities

Reference Material Producers should address, assess and document the risks and opportunities relating to its activities. The actions identified as a result of such assessment should be proportionate to the impact of the risks and opportunities on the Reference Material production and service quality. While the assessment of risks and opportunities is not restricted to any methodological requirement in the standard, the assessment should be conducted in accordance with the objectives of a Reference Material Producer, complexity of its management system, and the legislation and other mandatory documents to which it is subject. The assessment of risks and opportunities involves the identification, analysis and evaluation of risks and opportunities. The purpose of risk evaluation is to assist in making a decision whether, based on the results of the risk analysis, there is need to reduce risks and/or make improvement in priority. This is the most fundamental management approach expected of the assessment of risks and opportunities.

Reference Material Producers may operate an advanced risk assessment processes. At what depth the risks and opportunities are to be assessed or what situations are to be identified as risks relate to the organizational structure, the structure and competence of the personnel, infrastructure, Reference Material production processes of a Reference Material Producer, and thus may vary by entity. A Reference Material Producer may assess the risks and opportunities on the basis of accredited scope considering the quality management system as a whole. A Reference Material Producer may, when assessing the risks and opportunities, follow the clauses of the standard focusing on production activities.

There is no restriction on a Reference Material Producer to specify similar/same risk monitoring / prevention method for the common risks for the process approach or multiple production activities. Risk assessment process is required updating according changing circumstances, continuous monitoring of improvement actions and conducting re-evaluations. Risk management is a not a one-off activity. A Reference Material Producer should use the outputs from the risk management as inputs to production control activities.

5.7. RM Documents and Labels

A Reference Material Producer should prepare a product information sheet for every Reference Material produced, and a certificate for every Certified Reference Material.

A Reference Material's document or certificate may only provide information on the materials under the accreditation scope. Non-certified values of the Reference Materials may be included in the Reference Material certificates provided that it is clearly marked by an asterisk (*) and stated that these data must not be used for dissemination of metrological traceability. For Reference Material documents, it is necessary to comply with the accreditation body's rules on use of mark. Reference Material Producers accredited by NBE should comply with the requirements of Requirements for Using NBE Accreditation Symbol by the Accredited Bodies (G-1-06) for the use of accreditation mark on their Reference Material documents or certificates.

ISO 17034 Clause 7.14.2 provides information on the content of Reference Material certificates or product information sheets. In addition, Clause 7.14.3 specifies the additional information that should be included in Reference Material certificates.

The Reference Material label shall be firmly affixed onto the product container of each Reference Material unit and be so designed as to remain legible and intact under the defined storage and handling conditions for the lifetime of the Reference Material, or in other words, it should remain intact for the period starting from the supply of the Reference Material from the Reference Material Producer until the end of the expiry date of its certificate. The label shall denote the RMP, batch and other necessary information that helps identify the material uniquely, and where appropriate referring to the product information sheet or RM certificate (e.g. individual sample number etc.).

Where applicable, labels should comply with the requirements of health, safety and environmental regulations. If the material is classified as hazardous for transport and use, the label should include mandatory information as specified by the applicable regulation.

Where a Reference Material Producer is to make an amendment on the document, certificate or label of a Reference Material, the new document should include a correction in reference to the former. Once the correction is made, the updated certificates for non-expired Reference Materials should be transmitted to the customers.
ISO Guide 31 describes in detail the contents of the product information sheet for a Reference Material, or the certificate for a Certified Reference Material, and how the labelling should be effected.

6. ASSESSMENT PROCESS

NBE verifies the information on various branches where a Reference Material is being produced and at which ones key activities are executed. Key activities generally cover policy making, process and/or procedure development including Reference Material production planning, reviewing the contract as applicable, planning conformity assessment activities, reviewing, approving and deciding the results of conformity assessment activities, monitoring the competence of technical personnel and subcontractors, data analysis, evaluating the assigned values and reporting which are processes that affect the competence of a CAB.

Before the assessment, a Reference Material Producer should inform NBE who among its personnel are competent for which activities. If the assessed entity undertakes work on homogeneity and stability of samples, Reference Material production, testing or calibration activities; the assessment team may also assess the assessed entity's competence in testing or calibration and participation in proficiency testing. NBE may observe the critical activities undertaken by a subcontractor through an on-site visit. Where the assessment team concludes that the subcontractor of a Reference Material Producer fails to meet the requirements, it may propose a suspension of the accreditation. All activities relating to each Reference Material in the scope will be subject to assessment.

In such cases, in order to see the compliance of the reference material producer using subcontractor, NBE may supervise assessments performed by the reference material producer receiving the service from the subcontractor in relation to assuring the compliance of the subcontractor.
The assessment team may, in line with Assessment Team Working Instructions (I-7-01-13), utilise the following forms to record the following matters of the assessment:

- Participants List of Assessment (FR-7-01-36) to record the persons interviewed during the assessment,
- List of Reviewed Documents and Records During the Assessment (FR-7-01-45) to record the documents and records reviewed during the assessment, and
- Checklist for Reference Material Producers (FR-7-01-81) to record the findings of the assessment.

6.1 Surveillance and Re-Assessment

According to Procedure for the Accreditation of Conformity Assessment Bodies (PR-7-01) an accreditation cycle program is prepared for each CAB that will enable assessment in related

locations in a way to represent all activities in the scope of accreditation (scope in the annex to the accreditation certificate) together with the management system throughout the cycle. When the cycle program is prepared, information on CAB's management system, activities and performance is taken into account.

When preparing assessment of reference material producer within accreditation cycle program, risk factors to be considered may include, but are not limited to:

- The changes in personnel
- The changes in equipment used in production of reference material
- The changes in locations
- The non-conformities found in previous assessment, observation and / or focus of the subsequent assessment
- Subcontractor information (accreditation status, changes etc.)
- Unsatisfactory PT/ ILC results
- Revised standards related to RMP accreditation
- Changes in requirements of regulation, legislation etc. (if applicable)
- Corrective actions made by RMP for nonconforming work and preventive actions.
- Frequency of conformity assessment activities and number of RM / CRMs produced within the scope of accreditation
- Feedback or complaints from interested parties

The re-assessment will be conducted in content and format similar to the initial assessment to allow a comprehensive review of the activities and quality system of a Reference Material Producers.

6.2 Scope Extension

Where possible, scope extension assessment conducts with surveillance assessment or re-assessment. A Reference Material Producer is required to be presently executing activities in the scopes for which it has requested scope extension and has already produced Reference Materials for such scopes. Scope extension on Reference Material may be taken up as new RM, new property value, new characterization technique or new site.

7. ACCREDITATION SCOPE

During the application, Reference Material Producers specify in detail the information about the material subject to the accreditation request, characterized values and parameters and characterization procedures and techniques. When the abundance of the materials and properties to be characterized is considered, a very broad definition can be made. In order to avoid the confusion this situation will cause, Materials column in the "Requested Scope" section

of the Application Form for Accreditation for Reference Material Producers (FR-7-1-80) must be specified by taking into account the categories and sub-categories provided in Annex 1. Further, ISO/TR 10989 Reference materials - Guidance on, and keywords used for, RM categorization is a document that provides information on the categories of Reference Materials and can be used. Scope requested during the application shall be discussed and finalized with NBE. The relevant sections of the application form should indicate the information on the type (RM, CRM or both), matrix, characterized property values and information on characterization procedure of the Reference Materials produced in the area for which the application for accreditation is made. ISO 17034 is taken into account in evaluating the procedures/techniques. In addition, ISO Guide 35 provides detailed information on this issue.

ANNEX 1
REFERENCE MATERIAL CATEGORIES

CATEGORY A: CHEMICAL COMPOSITION

A1: Metals

A1.1 Ferrous

Steels
carbon steels
low alloy steels
high alloy steels
cast steels
speciality steels

Irons
white cast irons
ductile irons

Gases in metals

A1.2 Nonferrous

Aluminium alloys
Copper base alloys
Lead base alloys
Tin base alloys
Brasses
Bearing alloys
Titanium base alloys
Zirconium base alloys
Gases in metals

A1.3 Special alloys

A1.4 Refractory metals and alloys

A1.5 Rare earth metals

A1.6 High purity metals

Solid forms
Spectrochemical
materials
Spectrochemical solutions

A2: Inorganic Reference Materials

A2.1 Ores and minerals

A2.2 Cements, clays and related products

A2.3 Ceramics, glasses and refractory oxides
CarbidesGlasses

A2.4 Agricultural chemicals and fertilisers

A2.5 Solid fuels
Coal and coke
mineral
content major
elements trace
elements
A2.6 Pure chemicals
Stoichiometry
standards primary
standards working
standards secondary
standards
Chromatography
standards Pharmaceutical
materials Cosmetic
materials

A2.7 Stable isotope materials

A3: Organic Reference Materials

A3.1 Pure organic compounds
Compounds for elemental
analysis Compounds for
molecular weight
Chromatography standards
Illicit drugs and their metabolites - (See also A8 Forensic Reference Materials)
Illicit drugs
- delta-9-THC and other cannabinoids
- amphetamine
- methylamphetamine
- 3,4-methylenedioxyamphetamine
- 3,4-methylenedioxy-
- methylamphetamine 3,4-
- methylenedioxyethylamphetamine
- diacetylmorphine
- morphin
- e cocaine
- lysergic acid diethylamide and isomers

Therapeutic drugs
Veterinary drugs
Steroids
Pesticides, herbicides, acaricides,
etc Metabolites of any of the above
Priority pollutants
PCBs, PAHs, etc
Fine chemicals
Pharmaceutical
materials Cosmetic
materials
Isotopically labelled compounds

A3.2 Agricultural materials, fertilisers

A3.3 Foodstuffs
Proximate analysis
Nutritional
properties Vitamins
Other food additives
antioxidants emulsifiers
Toxins
animal origin
plant origin
other biological origin
Trace elements
Trace organics
pesticide residues
other organic contaminants

A3.4 Plastics and rubbers
Hardness
Natural rubber
content Identity
copolymers
plasticisers
vulcanising agents
blowing agents
antioxidants fillers

A3.5 Petroleum products
Fuels and lubricants
lead
vanadium
nickel
Transformer oils
moistur
e PCBs

Heat exchange fluids
moistur
e PCBs

A3.6 Vegetable oils and fats
Fatty acid profile Triglyceride composition

A4: Environmental Reference materials

A4.1 Soils and sludges
Trace elements
Mineral content
Trace organics
TCLP leachate

A4.2 Ashes
Fly ash from coal and coke
Incinerator ash

A4.3 Waters
Potable water
routine analytes
trace elements
organic pollutants other analytes
Fresh water
major elements trace elements
other analytes
Sea water
major elements trace elements
other analytes
Industrial waste water
routine analytes
trace elements
organic pollutants other analytes
Treated sewage
routine analytes

A4.4 Plant material
Trace elements

Mineral content

A4.5 Marine
Fish) trace elements
Molluscs) mineral content
Plankton) organics

A4.6 BOD reference compounds
A4.7 Miscellaneous biological materials

A5: Health and Industrial Hygiene

A5.1 Clinical laboratory materials

A5.2 Ethanol solutions

A5.3 Toxic substances in urine
Toxic metals
Fluoride
Mercury

A5.4 Drugs of abuse in urine
A5.5 Drugs of abuse in hair
A5.6 Materials on filter media
A5.7 Trace elements in blank filters
A5.8 Lead in paint (powder and sheet forms)
A5.9 Respirable silica

A6: Engine Wear Materials
A6.1 Metallo-organic compounds
A6.2 Wear metals in oil

A7: Analysed Gases
A7.1 Gas mixtures
A7.2 Trace volatile organic compounds

A8: Forensic Reference Materials

A8.1 Ethanol reference standards
Ethanol
Ethanol, aqueous solutions containing 0.050, 0.150, 0.250 g/100mL

A8.2 Drugs (individually named) and metabolites*
In whole human blood and urine (*metabolites to include glucuronides). See also A3.1 Pure Organic Compounds.

A8.3 Glasses
bottle

window
automotive
spectacle

A8.4 Paints
Automotive
Architectural

A8.5 Accelerants
Flammable liquids and residues thereof

A8.6 Explosives and primers

A8.7 Gunshot residues
A8.8 Noxious substances
Crowd control agents
capsaicin
o-chlorobenzalmalononitrile (CS)
chloroacetophenone (CN)
A8.9 Document examination

A9: Ion Activity
A9.1 pH standards
A9.2 Ion selective electrode calibrants
A9.3 Conductivity standards
A9.4 Buffer systems

A10: Textile Reference Materials for Chemical Parameters
A10.1 Fibers
A10.2 Yarns
A10.3 Woven fabrics
A10.4 Knitted fabrics
A10.5 Nonwovens A10.6
Coated fabrics A10.7
Metal accessories
A10.8 Other polymeric textile reference materials

CATEGORY B : BIOLOGICAL AND CLINICAL PROPERTIES

B1 General Medicine
B1.1 Human serum materials (powder and solution forms)

B2 Clinical Chemistry
B2.1 Proteins
B2.2 Apolipoproteins
B2.3 Enzymes
B2.4 Hormones
B2.5 Trace elements
lead and cadmium

B3 Tissue Pathology

B4 Haematology and Cytology
B4.1 Blood serum

B5 Immunohaematology

B6 Immunology

B7 Parasitology

B8 Bacteriology and Mycology
B8.1 Reference cultures
B8.2 Antibiotics

B9 Virology

B10 Other biological and clinical reference materials

B11 Forensic Reference Materials
Purified DNA of known and continuing genetic composition
Human, primate and animal blood
Animal hairs
Fibres (see also C7.1 to C7.3)

CATEGORY C: PHYSICAL PROPERTIES

C1 Reference Materials with Optical Properties
C1.1 Optical rotation
C1.2 Refractive index
C1.3 Spectral absorbance
visible
ultraviolet
infrared
C1.4 Specular reflectance
C1.5 Colour
white reference material (opal
glass) ceramic tiles

C2 Reference Materials with Electrical and Magnetic Properties
C2.1 Dielectric strength
C2.2 Resistivity
C2.3 Magnetic susceptibility

C3 Reference Materials for Frequency Measurements

C4 Reference Materials for Radioactivity

C4.1 Radiation dosimetry
C4.2 Radiopharmaceuticals
C4.3 Labelled compounds
C4.4 Matural matrix materials
C4.5 Carbon-14 dating

C5 Reference Materials for Thermodynamic Properties

C5.1 Calorimetry
C5.2 Thermal conductivity
metals
pyrex glass
resin-bonded fibre
board C5.3 Vapour
pressure C5.4 Thermal
expansion C5.5 Thermal
resistance
C5.6 ITS-90 temperature fixed point
C5.7 Curie point
C5.8 Boiling point
C5.9 Melting point
C5.10 Thermal analysis standards

C6 Reference Materials for Physicochemical Properties

C6.1 Density
C6.2 Viscosity
C6.3 Surface tension
C6.4 Molecular weight

C7 Textile Reference Materials for Physical Parameters

C7.1 Reference Materials for Fiber Identification
Natural Fibers
-Animal fibers
-Plant fibers
Synthetic fibers
-Organic polymers
-Inorganic polymers
Asbestos fibers
-Raw fibers
-Samples for fiber counting
C7.2 Yarns
C7.3 Woven fabrics
C7.4 Knitted fabrics
C7.5 Nonwovens
C7.6 Coated fabrics
C7.7 Metal accessories
C7.8 Other polymeric textile reference materials

C8 Reference Materials for other properties

C8.1 Shear testing of powders
C8.2 Minerals for x-ray diffraction

CATEGORY D: ENGINEERING PROPERTIES

D1 Surface Finish

D1.1 Surface rougness
D1.2 Corrosion
D1.3 Microhardness
D1.4 Abrasive wear
D1.5 Properties of films and surfaces
Nominal thickness
- x-ray fluorescence
- B particle backscattering
- ion beam sputtering

D2 Sizing

D2.1 Particle size
Particulate materials
Latex sphere
suspensions D2.2
Surface area

D3 Nondestructive Testing

D3.1 Dye penetrant test blocks
D3.2 Artificial flaw for eddy current
D3.3 Magnetic particle inspection

D4 Hardness

D4.1 Rockwell hardness
D4.2 Izod hardness

D5 Impact Toughness

D5.1 Charpy V-notch test blocks

D6 Tensile Strength

D7 Elasticity

D8 Creep

D9 Fire Research

D9.1 Surface flammability
D9.2 Smoke density

CATEGORY E : MISCELLANEOUS PROPERTIES
(Sub-categories to be developed as required).