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Standard

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# Terminology management — Concept arrangement in concept systems — System membership, relationship establishment and qualification, and mutual exclusivity of subdivision

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# Foreword

ES is the publishing imprint of the Enosema Foundation. ES documents are prepared by the technical committees of the Enosema Foundation under the ES Directives (EFD 101 to EFD 105) and are published under a Creative Commons Attribution 4.0 International licence (CC BY 4.0).

This document was prepared by Technical Committee Terminology.

This first edition of EFS 2525 establishes the requirements for arranging concepts into concept systems: how a concept becomes a member of one or more concept systems, how the relations that position a concept in a system are established, how those relations are qualified with the metadata that reviewers and consumers need, and how the mutual exclusivity and collective exhaustiveness of every subdivision is established and maintained.

This document is one of the Terminology series of ES. It builds on the relation vocabulary of EFS 2510, the concept management system requirements of EFS 2513, the interchange record of EFS 2516, and the entry quality requirements of EFS 2522. Where this document states a requirement about relation types, relation records, or entry records, the vocabulary and the record structure of those documents apply.

The requirements of this document are grouped into five groups with stable identifiers: Group A (system membership), Group E (relationship establishment), Group Q (relationship qualification), Group M (mutual exclusivity and exhaustiveness), and Group V (arrangement validation). Requirement identifiers are stable: they do not change between editions, and cross-references in conformity assessments, checklists, and tooling cite the identifiers rather than clause numbers.

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# Introduction

## 0.1 The problem this document solves

A concept system is only as good as its arrangement. Two termbases can hold the same concepts with the same definitions and still present fundamentally different knowledge: in one, every concept sits in a single defensible position, every subdivision separates its coordinates cleanly, and every relation carries the evidence that justifies it; in the other, concepts float in several systems without recorded reasons, subdivisions overlap so that consumers cannot tell where a boundary runs, and relations assert positions that no reviewer has qualified. The difference is not the vocabulary of terms. The difference is arrangement.

The international framework answers parts of the problem. ISO 704 gives the theory: concepts are bounded by intensions, systems are built by subdividing along a criterion, and the regrouping test checks whether a subdivision is sound. ISO 1087-1 defines the relation categories. EFS 2510 supplies the machine-readable vocabulary of relation types. None of them states, as operational requirements that a register can check, how membership is decided and recorded, which metadata a relationship is required to carry, or which tests a subdivision is required to pass before it ships.

This document does that. It treats arrangement as a governed process with four operations, each with its own requirement group:

— **membership** (Group A): the decision that a concept belongs to a concept system, at a stated position, in one system or in several;

— **relationship establishment** (Group E): the selection, direction and recording of the relations that connect a concept to its superordinates, subordinates and associates;

— **relationship qualification** (Group Q): the metadata — source, criterion, delimitation, count constraints, normative force, status — that turns an asserted relation into a defensible one; and

— **mutual exclusivity and collective exhaustiveness** (Group M): the discipline that every subdivision of a superordinate concept separates its coordinates without overlap and accounts for its full extension.

Group V (arrangement validation) binds the four operations to the checks and reviews that keep them true over time.

## 0.2 Why mutual exclusivity is a requirement, not an aspiration

Mutual exclusivity is often described as a property to hope for. This document treats it as a property to test for. A subdivision that overlaps — where one concept satisfies the delimiting characteristics of two coordinates at once — produces entries whose definitions contradict each other, produces consumers who cannot decide which designation to use, and produces relations that assert a position for a concept that a second relation contradicts. Group M states the tests that detect these failures while the arrangement is being built, and the remediation paths that apply when a test fails. The tests are stated so that most of them can run mechanically over a machine- readable register (EFS 2516, EFS 2513, clause 7), and so that the remainder are review tasks with written procedures.

## 0.3 Concepts in several systems at once

Real terminology does not stay inside one hierarchy. A concept such as “data quality” belongs in a management concept system, in a statistics concept system, and in a domain-specific system, and it occupies a different position in each. Multidimensional subdivision — one system per criterion of subdivision, combined by composition — is the correct instrument when the dimensions are known in advance. Cross- system membership with mapped positions is the correct instrument when separate communities maintain separate systems. This document states requirements for both instruments and the rule for choosing between them, so that a register records one truth per position instead of pretending that one hierarchy can serve all viewpoints.

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### 0.4 How to use this document

A register operator who is building or auditing a concept system reads Clause 4 for the arrangement principles, Clause 5 for membership, Clause 6 for establishing relations, Clause 7 for qualifying them, and Clause 8 for the exclusivity discipline; the annexes carry the working instruments — the placement decision procedure (Annex A), the MECE test suite (Annex B), the qualification vocabulary (Annex C), the worked examples (Annex D), and the cross-reference map to the other ES terminology documents (Annex E). Requirement identifiers (A, E, Q, M, V) are cited in the checklists of EFG 2519 and in the scoring model of EFS 2522 where arrangement quality feeds an entry grade.

### 0.5 Relationship to the evidence base

The requirements of this document are calibrated against the same evidence base as the rest of the ES Terminology series. The corpus study of international standard vocabulary — the ISO Online Browsing Platform terminology and the IEC International Electrotechnical Vocabulary, analysed in the ES quality review of international standard vocabulary — shows what large production systems actually maintain: hierarchies dominated by single criteria, positions asserted without recorded criteria, and the MECE discipline upheld in places and merely intended in others. The requirement groups of this document name those practices where they succeed and close them where they fail:

— the single-criterion test (M-3) and the criterion record (Q-2) respond to the unrecorded and unnamed criteria that the corpora exhibit wherever subdividers left their decisions implicit;

— the boundary convention rule (M-7) responds to the ranged subdivisions — sizes, ranges, durations — whose corpora-wide boundaries are conventionally applied in practice but stated almost nowhere;

— the residual category rule (M-6) responds to the “other” and “miscellaneous” nodes that the corpora carry at every depth, and states the discipline that keeps them from accreting; and

— the cross-system requirements (A-9 to A-13) respond to the reality that international vocabularies overlap across communities, and that correspondence between positions is a fact to record, not a coincidence to ignore.

The quality review report of the ES Terminology series carries the full statistics and the traceability from each finding to the requirements it informs. The registers that conform to EFS 2513 and arrange under this document are, among other things, the next corpus: the validation records of Group V are the evidence by which arrangement quality becomes observable and improvable over time.

### 0.6 How the requirement groups hold together

The five groups divide the work of arrangement along its real seams, and the seams matter to conformity. A register can hold strong records (Group E, Group Q) and still ship an overlapping rake (Group M failure); another can test exclusivity diligently and still lose the property because membership moves without review (Group A and Group V failure). Conformance to this document is conformance to all five groups, and the groups cite each other where the dependency runs:

— Group A produces the assertions that Group E forms and Group Q qualifies; a placement decided outside Group A has no Group Q metadata, because nothing determined its criterion or its source;

— Group M tests what Group A and Group E build, and its remediation paths route back through Group A procedures and Group Q records; and

— Group V observes the whole: its mechanical checks run the structural rules of Groups A, E and Q, its reviews run the judgement tests of Group M, and its records are the evidence that the first four groups hold.

The identifiers are stable across editions, and the dependencies are part of the contract: a checklist or a tool that cites M-3 is citing a test whose inputs are produced by Q-2 records, and a conforming register supplies both.

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# Terminology management — Concept arrangement in concept systems — System membership, relationship establishment and qualification, and mutual exclusivity of subdivision

## 1 Scope

This document specifies requirements for the arrangement of concepts in concept systems. It covers:

— the principles of concept arrangement by subdivision, including criteria of subdivision, dimensions, and the construction of hierarchies from generic and partitive relations;

— system membership: the decision procedure by which a concept becomes a member of a concept system, the record that the decision produces, membership in one system, and membership in several systems at once, whether by multidimensional composition or by cross-system placement;

— the establishment of the relationships that position a concept in a system: the selection of relation types from the ES relation vocabulary (EFS 2510), the direction and locus of each assertion, and the record of each assertion;

— the qualification of established relationships: the source, criterion, delimitation, presence and count constraints, normative force, and lifecycle status that a relationship carries; and

— mutual exclusivity of subdivision and collective exhaustiveness: the tests that verify that every subdivision separates its coordinate concepts and accounts for the full extension of the superordinate concept, together with the remediation paths that apply when a test fails.

This document applies to concept systems maintained in registers that conform to EFS 2513 and that record concepts, localizations and relations in machine-readable form per EFS 2516.

This document does not specify:

— the theory of concepts and of concept formation, which ISO 704 covers;

— the structure of the concept entry itself, which EFS 2522 covers;

— the semantics of individual relation types, which EFS 2510 covers; or

— the operating practice of a register — proposal forms, decision records, review cadence — which EFG 2519 covers.

In this document, the verb **shall** expresses a requirement on a conforming register or on the operator of such a register, the verb **should** expresses recommended practice from which deviation is permitted when the deviation and its reason are recorded, and the verb **may** expresses permission.

## 2 Normative references

There are no normative references in this document.

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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# 3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org

## 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1.1**
**concept**
unit of knowledge created by a unique combination of characteristics

**3.1.2**
**characteristic**
abstraction of a property of an object or of a set of objects

**3.1.3**
**essential characteristic**
characteristic of a concept that is required by the concept's intension

**3.1.4**
**delimiting characteristic**
essential characteristic that distinguishes a concept from its coordinate concepts

**3.1.5**
**intension**
set of characteristics that makes up the concept

**3.1.6**
**extension**
set of objects to which the concept applies

**3.1.7**
**concept system**
set of concepts structured according to the relations among them

**3.1.8**
**concept arrangement**
assignment of a set of concepts to positions in a concept system, together with the relations that hold the positions together

**3.1.9**
**criterion of subdivision**
criterion of categorization

single essential characteristic applied to subdivide the extension of a superordinate concept into its coordinate subordinate concepts

[SOURCE: ISO 704, modified — the established term "criterion of subdivision" is retained for this document]

**3.1.10**
**dimension**
criterion of subdivision that is declared, named and applied consistently across the coordinate concepts of a subdivision

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**3.1.11**
**multidimensional concept system**
concept system in which the coordinate subordinate concepts of a superordinate concept are produced by subdividing along several declared dimensions simultaneously and are composed into the positions of the system

[SOURCE: ISO 704, modified — expressed as a requirement-bearing system shape]

**3.1.12**
**concept position**
location of a concept in a concept system, determined by the concept's superordinate concept and by the criterion of subdivision that separates it from its coordinate concepts

**3.1.13**
**system membership**
recorded assertion that a concept occupies a concept position in a stated concept system

**3.1.14**
**mutual exclusivity**
property of a subdivision under which no concept satisfies the intension of more than one coordinate subordinate concept of the subdivision

**3.1.15**
**collective exhaustiveness**
property of a subdivision under which the extension of the superordinate concept is covered by the union of the extensions of its coordinate subordinate concepts

**3.1.16**
**residual category**
coordinate subordinate concept whose extension is defined as the part of the superordinate extension not covered by the other coordinate concepts

**3.1.17**
**relationship establishment**
selection of a relation type from a relation vocabulary, direction of the relation between its stated ends, and recording of the assertion in the register

**3.1.18**
**relationship qualification**
association of a recorded relationship with the metadata that states its evidence and scope: source, criterion, delimitation, presence and count constraints, normative force, and status

**3.1.19**
**normative force**
weight of a relationship assertion in the arrangement, expressed as essential, characteristic or contextual

**3.1.20**
**cross-system membership**
system membership of one concept in two or more concept systems that are maintained independently, with the relation set of each system recorded separately

**3.1.21**
**rake**
complete set of coordinate subordinate concepts produced by one subdivision of a superordinate concept

**3.1.22**
**generic relation**
relation between two concepts where the intension of one concept forms part of the intension of the other, and where the extension of the former includes the extension of the latter

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**3.1.23**
**partitive relation**
relation between two concepts where one concept forms the whole and the other concept forms a part of that whole

**3.1.24**
**associative relation**
pragmatic relation

relation between two concepts having a non-hierarchical thematic connection by virtue of experience

**3.1.25**
**mapping relation**
relation between concepts or concept positions of different concept systems that states the degree of their correspondence

**3.1.26**
**superordinate concept**
concept whose intension is presupposed by the intension of another concept and whose extension includes the extension of that other concept

**3.1.27**
**subordinate concept**
concept whose intension presupposes the intension of another concept and whose extension is included in the extension of that other concept

**3.1.28**
**coordinate concept**
concept that shares the superordinate concept of another concept and differs from it by the delimiting characteristics of one criterion of subdivision

[SOURCE: ISO 1087-1, modified — bound to the single criterion of this document]

**3.1.29**
**generic concept system**
concept system structured predominantly by generic relations

**3.1.30**
**partitive concept system**
concept system structured predominantly by partitive relations

**3.1.31**
**placeholder superordinate**
superordinate concept introduced to hold a rake for which no natural superordinate concept exists, declared as such in the system description

**3.1.32**
**orphan**
concept whose membership relations in a system are all deprecated without replacement

## 3.2 Abbreviated terms

MECE mutual exclusivity, collective exhaustiveness — the paired property that a subdivision is required to satisfy under this document

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# 4 Concept arrangement

## 4.1 Principles of arrangement

Concept arrangement gives a body of concepts its shape. The shape is not decoration: the position of a concept carries information that the definition alone does not carry, because the position states which superordinate concept the concept refines, which criterion of subdivision separates it from its coordinates, and which concepts stand beside it as coordinates. A consumer who reads a definition learns the intension of one concept; a consumer who reads a position learns how the domain is organized.

Arrangement rests on four principles, which the requirements of clauses Clause 5 to Clause 9 apply.

— **Intension governs position.** A concept belongs where its intension fits: under the superordinate concept whose intension it presupposes, and beside the coordinates from which its delimiting characteristics distinguish it (ISO 704). Position is decided by characteristics, not by designations, document history, or convenience.

— **One criterion per subdivision.** Each subdivision of a superordinate concept applies a single criterion of subdivision to produce its rake of coordinate concepts (ISO 704). Subdividing along two criteria at once produces coordinates that overlap in extension and that cannot be separated by definition.

— **Dimensions are declared.** Where several criteria genuinely apply, each criterion is a dimension: it is named, it is stated as the criterion of subdivision for its own subdivision, and the coordinate concepts of the different dimensions are composed into positions of a multidimensional concept system rather than flattened into one rake.

— **Systems are many.** One concept can occupy one position in each of several systems. The systems are distinct artifacts with distinct scopes, and the membership of a concept in each is recorded separately (Clause 5).

## 4.2 The shape of an arrangement

The requirements of this document are neutral about representation: they apply to hierarchies of generic and partitive relations, to multidimensional systems, and to thesaurus-like arrangements in which broader and narrower relations are complemented by associative ones (ISO 25964-1). Three shapes recur, and the register states which shape each system has:

— **a generic hierarchy**, in which every non-root position is reached from its superordinate concept by a generic relation and every rake subdivides along one declared criterion;

— **a partitive hierarchy**, in which every non-root position is reached from its superordinate concept by a partitive relation and the presence and count constraints of the partitive relations are recorded (clause Clause 7); and

— **a mixed system**, in which generic and partitive subdivisions alternate and associative relations connect positions across the system without carrying arrangement weight.

Associative relations do not place concepts. A position is reached only through hierarchical relations; associative relations annotate the arrangement (EFS 2510).

## 4.3 Depth and breadth

Depth and breadth of an arrangement are quality trade-offs, not targets. A deep system with many single-child subdivisions hides its structure; a wide rake with dozens of coordinates buries its criterion. The register should observe the following practice, and records any deviation with its reason:

— a subdivision with a single coordinate concept is collapsed: the coordinate and the superordinate are merged, or a second criterion produces further coordinates;

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— a rake with more than about twelve coordinate concepts is examined for a second dimension: where the rake is really the composition of two criteria, the system is restructured as a multidimensional subdivision; and

— the depth of a generic hierarchy follows the depth of the intension hierarchy: each level adds at least one delimiting characteristic, and a level that adds none is removed.

These are recommended practices. Group M tests, not depth or breadth limits, decide whether an arrangement is correct.

## 4.4 Arrangement mechanics

The principles become concrete through three mechanics that reviewers apply to every arrangement decision.

**The intension-to-position derivation.** The intension of a concept determines its position: the concept sits under the concept whose intension it presupposes, and beside the concepts from which its delimiting characteristics distinguish it. The derivation is repeatable — two reviewers applying the derivation to the same intension reach the same position, or the difference between them is itself a finding (a defective definition, a mixed rake, a missing intermediate concept). The validation requirements of clause Clause 9 make the repeatable derivation the instrument of review: positions are audited by re-deriving them.

**The regrouping test.** The test of ISO 704 for a subdivision is applied at construction: the characteristics used to differentiate the coordinate concepts are regrouped under the criterion of subdivision; a rake passes when every coordinate can be stated as "superordinate + criterion-value" and nothing else. A coordinate whose intension needs a second characteristic family to separate it from its neighbour is the symptom of a mixed rake (E-6), and the regrouping attempt exposes it before publication.

**The extension walk.** For each rake, the reviewer walks the extension of the superordinate concept with one question: for an arbitrary object of that extension, which coordinate takes it? The walk exercises exclusivity (the object has exactly one answer) and coverage (an answer exists). Where the answer is "it depends" — a boundary case, a hybrid, a context-dependent case — the rake is incomplete without a convention (M-7) or a residual (M-6), and the walk names the case precisely. The extension walk is a review technique (Annex B, T4); it is also the fastest way to explain an arrangement defect to its author, because it states the failure in terms of objects instead of terms of logic.

## 4.5 Systems and their scopes

A concept system exists for a scope: the set of concepts the system undertakes to arrange. The scope is declared in the system description (EFS 2513, clause 5) and does three pieces of work in arrangement:

— **it bounds membership**: a concept outside the scope is not placed in the system even where a position can be constructed for it (A-8 holds a concept unplaced rather than placing it badly; the scope settles whether the system is the right home at all);

— **it anchors coverage**: the coverage statement of a rake (M-5) runs over the scope — a rake covers the extension of its superordinate concept as far as the system scope extends; and

— **it disciplines cross-system choice**: where two systems can both host a concept, the scope statement, not convenience, decides which membership is primary, and the other system relates through mapping (A-11) rather than duplication.

A system without a declared scope cannot pass the coverage tests, because there is no boundary over which coverage can be claimed. The register validates scope presence at publication (V-1).

## 4.6 The arrangement as evidence

A published arrangement is evidence about the domain: it states, in machine-readable form, which concepts the community distinguishes and how the distinctions relate. The evidentiary character raises the stakes of the requirements in this document. A registry that publishes a rake with an overlap is not merely untidy; it asserts

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to every consumer that two incompatibles are both true of some objects. The validation requirements of clause Clause 9 exist because the arrangement publishes assertions, and assertions need the same gate as definitions.

### 4.7 The criterion of subdivision in practice

The criterion of subdivision is the unit of honesty in an arrangement. Every requirement that names a criterion — A-2, E-6, M-3, Q-2 — is a requirement that the arrangement state its reason: why these coordinates and not others. In practice the criterion does three jobs at once, and a criterion statement is adequate only when it serves all three:

— **it explains the rake**: a reader of the criterion sees why the coordinates differ from one another — "currency" explains current, historical and forecast; and

— **it bounds the rake**: a reader can tell what does not belong — a concept whose distinguishing characteristic is not a form of the criterion is evidence of a misplaced concept, not of a missing coordinate; and

— **it survives subdivision**: a child rake states how it refines the parent criterion — size subdivides by range, colour by hue — and the chain of criteria is the system's account of itself.

A criterion that does only the first job is a label. The registers that the corpora exhibit most often stop at the label; the requirements of this document are calibrated to move practice from the label to the instrument.

### 4.8 What arrangement is not

Arrangement is not classification for retrieval. A register may tag concepts with facets, subject codes or collection markers for search and navigation; those tags are not system membership, do not carry relation semantics, and are not governed by this document. The register keeps the two mechanisms distinguishable in its records: membership is a relation assertion with full Group A and Group Q metadata, and a retrieval tag is a data category outside the relation set. A system that treats retrieval tags as membership silently loses the tests of Group M, because nothing forces the tags to satisfy exclusivity.

## 5 System membership (Group A)

### 5.1 General

A concept position exists only as a recorded assertion. The position states that a concept is subordinate to a stated superordinate concept under a stated criterion of subdivision; the assertion lives in the register as a relation record (EFS 2516, EFS 2510). Group A governs the making of that assertion: who decides it, on what evidence, in which system, and in how many systems.

### 5.2 Membership decision

A-1 System membership shall be asserted only by a hierarchical relation of the relation vocabulary (EFS 2510): a generic relation or a partitive relation. An associative relation, a mapping relation, or a lifecycle relation shall not carry system membership.

A-2 A membership assertion shall state the concept, the superordinate concept, the relation type, and the criterion of subdivision under which the concept is coordinate with the superordinate's other subordinate concepts.

A-3 A membership assertion shall be decided against the intensions of the concepts: the subordinate concept shall presuppose the intension of the superordinate concept, and shall add at least one delimiting characteristic that distinguishes it from each of its coordinate concepts (ISO 704).

A-4 The membership decision shall be reviewed and accepted by the control body or its delegate under the change management requirements of EFS 2513, clause 7, before the position becomes public.

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A-5 Where a membership decision is contested — two proposed positions both plausibly fit — the register shall record the contested positions and the decision, with reasons, in the proposal record (EFG 2519, Annex B); the position that ships is the accepted one, and the alternative remains discoverable in the record.

## 5.3 Membership in one system

A-6 Within one concept system, a concept shall occupy exactly one position: exactly one hierarchical relation shall place the concept under a superordinate concept of that system, except for the root concepts of the system, which carry none.

A-7 Where two positions in one system appear equally correct, the system shall not carry both; the operator applies the placement decision procedure (Annex A) to select one, and records the rejected candidate position in the membership record.

A-8 A concept with no adequate superordinate concept in a system shall not be forced into an inadequate one; the register holds the concept as unplaced in that system, with a recorded placement need under the requirements management of EFS 2513, clause 6, until either a superordinate concept is added or a subdivision is restructured.

## 5.4 Membership in several systems

A-9 A concept may hold membership in several concept systems. Each membership is a separate assertion, complete in itself: it states its own superordinate concept, its own relation type, and its own criterion of subdivision in the system that receives it.

A-10 Where the several systems are facets of one arrangement — the dimensions are known and maintained together — the register shall represent the arrangement as a multidimensional concept system: each dimension subdivides by its own criterion, and the positions of the system are the compositions of the dimensional coordinates.

A-11 Where the several systems are maintained independently — different scopes, different control bodies, different vocabularies — the register shall represent the arrangement as cross-system membership, and shall connect the positions with mapping relations per EFS 2510 if a stated correspondence between the positions exists.

A-12 A register shall not represent one arrangement as both a multidimensional composition and a set of independent systems: where the dimensions are co-maintained, clause A-10 applies; where they are not, clause A-11 applies. The choice is recorded in the system description (EFS 2513, clause 5).

A-13 Cross-system membership shall not be used to place one concept twice within one system. Two positions that differ only in path — where one is reachable from the other through the system — belong to one system for the purposes of clause A-6.

## 5.5 Membership movement

Concepts move. A definition is tightened, a rake is re-criteried, a system is restructured — and the position of a concept changes. The movement is as significant to consumers as the position itself, because the vacated position may be cited in their systems and the taken position may contradict their assumptions. Group A governs movement with three requirements.

**The move is a pair.** A position change is recorded as the vacated position and the taken position (A-16): the vacated relation is deprecated with a replacement pointer (Q-10), and the new relation is asserted through the full placement procedure (Annex A). Consumers who followed the vacated position can trace where the concept went.

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**The reason is recorded.** A move without a recorded reason is a move that will be reverted by the next well-meaning reviewer. The move records what changed in the world that made the old position wrong: the definition change, the re-criterion decision, the scope change.

**The dependents are reviewed.** A move changes the rakes of two superordinate concepts: the rake that loses a coordinate and the rake that gains one. Both rakes are re-tested under the MECE suite (T1 to T6) before publication, because a rake that lost its only distinguishing coordinate can quietly fail coverage, and a rake that gained a coordinate can quietly fail exclusivity.

## 5.6 Roots, placeholders and orphans

Three boundary cases of membership recur, and the register states their treatment:

— **root concepts** carry no incoming hierarchical relation (A-6). A system states its roots in the system description; a system with several roots states the relation among the roots — usually a multidimensional composition rather than a hierarchy (A-10).

— **placeholder superordinates** are concepts introduced to give a rake a home where no natural superordinate concept exists — the "miscel- laneous" node. A placeholder is declared as such in the system description, carries the residual treatment of M-6, and is a liability: the register reviews placeholders at every arrangement review with the question of whether a real criterion now exists to replace them.

— **orphans** are concepts whose membership relation was deprecated without a replacement. The register detects orphans mechanically (T1) and holds them out of the arrangement view until re-placed or retired through change management. An orphan is never published as a member of the system, because a member without a position is an arrangement assertion the register cannot defend.

## 5.7 Membership and localization

Membership attaches to concepts, not to language entries: a concept is placed once, and every localization of the concept inherits the position (A-9, E-14). The inheritance has two consequences that registers get wrong:

— **language-specific systems are separate systems.** Where a language community maintains its own concept system — its own subdivisions, its own criteria — the system is a distinct concept system, not a localization of another one, and the correspondence between the systems is stated with mapping relations (A-11), following the multilingual requirements of EFS 2504. The register does not present a language-specific system as the translation of the authoritative system when the arrangements differ.

— **localization review re-checks position fit.** When a localization is accepted (EFS 2504; EFG 2519, clause 8), the reviewer confirms that the localized designation can carry the intension **in its position** — the concept-system check of the equivalence worksheet. A designation that fits the intension but not the position signals that the target-language concept system differs, and the finding is recorded on the mapping, not on the localization.

## 5.8 Membership in multidimensional systems

A multidimensional concept system (A-10) composes the positions of the system from dimensional coordinates. Membership in such a system differs from membership in a simple hierarchy in three respects, and the register records the difference:

— **membership is by composition.** A position in a composed system is identified by its coordinate values — one per dimension. The concept holds one membership record per dimension, each carrying the dimensional rake, and the composed position is derived from the set of dimensional memberships. A consumer reads the composed position without the register asserting it separately, which keeps the composition from being duplicated in records.

— **completeness is per dimension.** The MECE tests run per dimensional rake (M-11): each dimension partitions on its own criterion. Coverage of the composed system is the product of the dimensional coverages where the dimensions are independent; where two dimensions interact — a combination that

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the system excludes — the system states the excluded combinations in the system description, and the statement is part of the coverage claim (M-5).

— **absence of a coordinate value is a recordable state.** A concept that is undetermined along one dimension — the currency of a data set is not yet known — holds no membership record for that dimension, and the composed position is partial. The register distinguishes a partial position from a missing record mechanically (T1 flags concepts that lack a dimensional membership where the dimension applies to the concept's scope).

The multidimensional choice is structural: converting a flattened mixed rake into a composed system (the re-dimension path of M-9) is a change-management event per M-10, because it changes the records that consumers read.

## 5.9 Placement anti-patterns

The placement procedure fails in recognizable ways, and naming the failures makes them visible in review. Five anti-patterns recur in registers:

— **the convenient shelf.** A concept is placed where space exists rather than where the intension leads — the new concept joins the most recently edited rake because the proposer knew that rake. The signature is a placement whose tie-breaker is absent: only one candidate was examined. The remedy is procedural (V-5 re-derives positions) and cultural: proposals carry the candidate enumeration, and a single-candidate enumeration is a review finding.

— **the historical sediment.** A concept stays under a superordinate it outgrew because it has always been there. The signature is a membership whose source predates every revision of the definition it places. The remedy is the event trigger of V-4: definition revisions queue the affected memberships for review, and stale placements surface on schedule.

— **the mirror placement.** A concept is duplicated into a second system wholesale — same rake, same criterion, same definition — because a community wanted "its own copy". The signature is two systems whose mapping relations are all `equivalence` while their criteria differ in name only. The remedy is A-11 discipline: one maintained arrangement, the second system relating by mapping; or a genuinely distinct system whose differences are stated.

— **the orphaned branch.** A subtree's root is re-placed and its descendants are not re-tested. The signature is a rake that passes T1 while failing T6 — structurally present, no longer covered. The remedy is M-12 discipline: parent remediation triggers child retest, and the validation record shows the retest.

— **the loaded placeholder.** A placeholder superordinate accumulates coordinates until it is a real taxonomy nobody declared. The signature is a placeholder whose rake exceeds the breadth guideline (T13) or whose residual definition has grown positive content. The remedy is the placeholder review of clause Clause 5, and the honest options are to found a real dimension or to split the placeholder by re-criterion.

The anti-patterns inform review; they do not replace the tests. A register can carry every anti-pattern signature and still pass its MECE suite, and a placement that matches none of the signatures can still fail T3. The tests decide; the patterns speed the look.

## 5.10 Membership record

A-14 Each membership assertion shall be recorded as a relation record per EFS 2516 carrying, as a minimum: the relation type, the subject and object concepts, the criterion of subdivision, the qualifying metadata of clause Clause 7, and the lifecycle status of the assertion.

A-15 The membership record shall be machine-readable in the published register (EFS 2513, clause 10): a consumer shall be able to reconstruct the system — positions, rakes and criteria — from the published relation records without inspecting prose.

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A-16 A change to a membership assertion — a move of position, a change of criterion, a change of relation type — shall follow the proposal and review requirements of EFS 2513, clause 7, and shall record the position that is vacated as well as the position that is taken.

### 5.11 Requirement group A

a) Membership requirements (Group A)

**Table 1**

| ID | Requirement | Sources |
|---|---|---|
| A-1 | System membership is asserted only by generic or partitive relations of the ES relation vocabulary. | EFS 2510 |
| A-2 | Every membership assertion states concept, superordinate, relation type and criterion of subdivision. | ISO 704 |
| A-3 | The subordinate intension presupposes the superordinate intension and adds delimiting characteristics against every coordinate. | ISO 704, ISO 1087-1 |
| A-4 | Membership decisions are accepted through the change management procedure before publication. | EFS 2513, EFG 2519 |
| A-5 | Contested placements are recorded with reasons; the alternative position remains discoverable. | EFG 2519 |
| A-6 | One concept occupies exactly one position in one system, except for roots. | ISO 704 |
| A-7 | Equally plausible positions are resolved by the placement procedure; the rejected candidate is recorded. | Annex A |
| A-8 | Concepts without an adequate superordinate are held unplaced with a recorded placement need, not forced into place. | EFS 2513 |
| A-9 | Multi-system membership is a set of complete, independent assertions. | ISO 704 |
| A-10 | Co-maintained dimensions are represented as a multidimensional concept system. | ISO 704 |
| A-11 | Independently maintained systems use cross-system membership with mapping relations where correspondence exists. | EFS 2510 |
| A-12 | The composition-versus-independence choice is made once and recorded in the system description. | EFS 2513 |
| A-13 | Cross-system membership does not place a concept twice in one system. | ISO 704 |
| A-14 | Membership assertions are EFS 2516 relation records with criterion and qualification metadata. | EFS 2516, EFS 2510 |
| A-15 | Published relation records reconstruct the system without prose. | EFS 2513, EFS 2516 |
| A-16 | Membership changes record the vacated position and the taken position. | EFS 2513 |

## 6 Relationship establishment (Group E)

### 6.1 General

Relationship establishment is the act of connecting two concepts with a relation. The act has three parts: selecting a relation type from a vocabulary, directing the relation between its ends, and recording the assertion. Group E governs the three parts for the relations that carry arrangement — hierarchical relations — and states the discipline for the relations that annotate arrangement — associative and mapping relations.

### 6.2 Selection of relation type

E-1 Every relationship shall use a relation type defined in the ES relation vocabulary (EFS 2510) or in a vocabulary that the register declares as an extension of it under EFS 2513, clause 5. Relation types defined ad hoc in a proposal shall not be asserted.

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E-2 The relation type shall be selected by the semantic test of EFS 2510 for that type: a generic relation is asserted where the object concept's intension subsumes the subject concept's intension; a partitive relation is asserted where the subject concept names a part of the object concept; an associative relation is asserted where a non-hierarchical thematic connection exists and neither hierarchical type applies.

E-3 Where two candidate relation types both fit, the register shall assert the more specific type where one exists, and shall record the reason where the choice is not determined by the vocabulary.

## 6.3 Hierarchical relations

E-4 A generic relation shall be asserted only where the generic concept and the specific concept are concepts of the same kind: the specific concept is a narrowing of the generic concept, obtained by adding characteristics to the generic intension (ISO 704).

E-5 A partitive relation shall be asserted only where the part concept satisfies the part-whole test of ISO 704: the parts are separable in thought from the whole, the parts are essential to the whole, and each part is of a kind that the whole can contain.

E-6 A rake of coordinate concepts shall be produced by one criterion of subdivision. Where the coordinate concepts of one superordinate concept are produced by two criteria, the rake shall be split into two rakes along declared dimensions, per clause A-10, and the two rakes shall be tested separately under Group M.

E-7 A hierarchical relation shall not skip levels: where concepts B and C are asserted as superordinate concepts of A, and B is a superordinate concept of C, one of the two assertions shall be removed; the register shall not carry both the direct and the transitive placement.

## 6.4 Associative relations

E-8 An associative relation shall be asserted where a thematic connection exists that no hierarchical relation expresses, between concepts at the same or different positions in the system (EFS 2510; ISO 1087-1). The association shall not substitute for a hierarchy: where the concepts stand in a generic or partitive relation, the hierarchical relation is required, and the associative relation is optional.

E-9 An associative relation shall be recorded with the thematic connection stated in its qualification (clause Clause 7): the statement names the connection — cause, producer, product, instrument, opposition, or a domain-specific connection — so that a reviewer can test it.

## 6.5 Mapping relations

E-10 A mapping relation between positions of different systems shall be asserted only where the positions denote related concepts whose correspondence the mapping type of EFS 2510 expresses: equivalence, narrowness, broadness, overlap or dissociation.

E-11 A mapping relation shall not carry arrangement weight: the presence of a mapping relation shall not imply membership in the other system. Membership follows clause Clause 5 only.

## 6.6 Direction and locus

E-12 Relations shall be asserted in the direction that the relation type of EFS 2510 defines: from specific to generic, from part to whole, and from subject to object for associative and mapping types as the type defines. The register shall store the assertion once, in one direction, and shall derive the inverse view from the type definition rather than asserting the inverse.

E-13 A relation between two concepts shall be asserted in the system in which both concepts are members. A relation between concepts of different systems is a mapping relation per E-10, not a hierarchical relation.

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E-14 A relation shall be asserted between concepts, not between designations and not between entries in particular languages. The language-specific view of a relation is derived through the localizations of its concepts (EFS 2504).

## 6.7 Relations across editions and versions

A register evolves, and its relations evolve with it. Group E binds relation evolution to the record so that consumers can follow:

— **assertions survive edition changes.** A relation asserted in one edition carries into the next unchanged unless a change management decision modifies it. The relation record carries the dates of assertion and of last review (EFS 2516), and the arrangement view of an edition shows the relations as they stood at that edition.

— **deprecation keeps the trace.** A relation that no longer holds is deprecated with its replacement stated where one exists (E-16, Q-10). A deprecated generic relation whose superordinate concept was restructured carries a pointer to the relation that superseded it, so that a consumer citing the old position can resolve the new one.

— **assertion provenance is per assertion.** Two relations of the same type between the same pair of concepts in different systems are different assertions with different sources: the equivalence of positions across systems does not merge their evidence.

## 6.8 Relations and localizations

Relations connect concepts (E-14), and the localized entries of those concepts inherit the relations through concept identity (EFS 2504). Three localized cases need care:

— **a relation that holds in one language view only.** Some thematic connections are language-bound: two concepts that oppose in one language do not oppose in another where the target concepts differ. Where the difference is real, the concepts are not identical, and the register records distinct concepts with a mapping relation — not one concept with a language-specific relation.

— **a designation-level correspondence.** The relation between the designation of one language and the designation of another is not a concept relation; it is the equivalence question of EFS 2504, settled by the equivalence degree of the localization. The register does not assert concept relations from designation similarity.

— **script and writing-system variation.** Converted forms of a designation (ISO 24229) carry no relation information at all; they are localizations of one designation of one concept. The arrangement is untouched by script conversion.

## 6.9 Record of the assertion

E-15 Each established relationship shall be recorded per EFS 2516 with: the relation type, the subject and object concept identifiers, the direction as stored, the register or system in which the relation is asserted, and the qualification metadata of clause Clause 7.

E-16 A relationship shall be asserted once and only once per relation type and pair of concepts in one system. Duplicate assertions of the same type between the same concepts in the same system shall be merged; the merged record retains the union of the qualifying metadata.

## 6.10 Requirement group E

a) Relationship establishment requirements (Group E)

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**Table 2**

| ID | Requirement | Sources |
|---|---|---|
| E-1 | Relation types come from the ES relation vocabulary or a declared extension. | EFS 2510, EFS 2513 |
| E-2 | The relation type passes its semantic test. | EFS 2510 |
| E-3 | The more specific type wins; non-obvious choices record a reason. | EFS 2510 |
| E-4 | Generic relations connect concepts of the same kind by intension narrowing. | ISO 704 |
| E-5 | Partitive relations pass the part-whole test. | ISO 704 |
| E-6 | One criterion per rake; mixed rakes split along dimensions. | ISO 704, A-10 |
| E-7 | No direct and transitive placement of the same pair. | ISO 704 |
| E-8 | Associative relations annotate; they do not replace hierarchy. | ISO 1087-1, EFS 2510 |
| E-9 | The thematic connection of an association is stated in the qualification. | EFS 2510 |
| E-10 | Mapping relations express correspondences between systems. | EFS 2510 |
| E-11 | Mapping relations never imply membership. | EFS 2510 |
| E-12 | One stored direction per assertion; the inverse view is derived. | EFS 2510 |
| E-13 | Hierarchical relations live inside one system; cross-system pairs use mapping relations. | EFS 2510 |
| E-14 | Relations connect concepts, not designations or language entries. | EFS 2504 |
| E-15 | Every assertion is a complete EFS 2516 record with qualification metadata. | EFS 2516 |
| E-16 | One assertion per type and pair per system; duplicates merge. | EFS 2513 |

# 7 Relationship qualification (Group Q)

## 7.1 General

An assertion states that a relation holds. A qualification states why it holds, how far it holds, and how confident the register is that it holds. The distinction matters because consumers act on relations: a partitive relation with a count constraint tells a data modeller that a fixed number of parts exist; a generic relation with a cited source tells a reviewer where the position came from; a status marks an assertion that review has or has not confirmed. Group Q states the metadata that every hierarchical relationship carries, the additional metadata that specific relation types require, and the vocabulary for stating it.

## 7.2 Required qualification metadata

Q-1 Every hierarchical relationship shall carry a source: a citation of the document, proposal, decision record, or review action from which the position derives. Where the position derives from this register's own review, the source cites the decision record (EFG 2519, Annex B).

Q-2 Every hierarchical relationship shall carry the criterion of subdivision under which the subordinate concept is coordinate with its rake (A-2). The criterion is stated as a named dimension where the system declares dimensions, and as a free statement where it does not.

Q-3 Every hierarchical relationship shall carry a status from the lifecycle of EFS 2513, clause 8: `proposed`, `confirmed`, or `deprecated`. A relation becomes public only at status `confirmed`.

Q-4 A hierarchical relationship shall carry its normative force: **essential**, where the relation holds for every instance of the concepts under their definitions; **characteristic**, where the relation holds in the way the definitions characterize the concepts but is not necessary to every instance; or **contextual**, where the relation holds under conditions that the qualification states.

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## 7.3 Type-specific qualification

Q-5 A partitive relationship shall state the presence constraint (`obligatory` or `optional`) and, where the definitions fix it, the count constraint: a number, a range, or an open constraint (`one-or-more`, `zero-or-more`). The constraint follows the multiplicity of ISO 704 part-whole analysis and is recorded per EFS 2516 relation fields.

Q-6 A partitive relationship shall state the delimitation of the part: the criterion that separates the part from the other parts of the same whole, so that the parts of the whole are themselves mutually exclusive under Group M.

Q-7 An associative relationship shall state the thematic connection that motivates it (E-9), using a connection term from the ES relation vocabulary where one exists and a stated phrase where none does.

Q-8 A mapping relationship shall state the degree of the correspondence using the mapping types of EFS 2510 and, for non-equivalent correspondences, a note that states what differs and for whom (EFS 2504, equivalence notes).

## 7.4 Status and lifecycle of qualification

Q-9 The status of a relationship shall change only through the change management requirements of EFS 2513, clause 7: a proposal asserts the relation at `proposed`; review sets it to `confirmed`; deprecation retires it while keeping it visible.

Q-10 A deprecated relationship shall retain its full qualification. Deprecation removes the relation from the arrangement view; it does not remove the evidence that once justified the position, which remains load-bearing for the history of the system.

Q-11 Where a relationship's qualification becomes stale — the criterion is renamed, the source document is withdrawn, the count constraint is contradicted by a revision — the register shall raise a review task for the relationship under the cadence of EFS 2513, clause 11, and shall not silently inherit the stale qualification.

## 7.5 Qualification records

The qualification of a relationship is a set of fields on the relation record (EFS 2516). The following worked records show the shape for the three families that carry or annotate arrangement. The records are illustrative; field names follow the interchange record of EFS 2516.

**A generic relation with full qualification:**

```
relation:
  type: generic
  subject: data-set:current-data-set
  object: data-set
  system: data-resource-system
  qualification:
    criterion: currency
    normative_force: essential
    source: EFS-DM-0012, decision 2026-04-07
    status: confirmed
```

**Figure 1**

The record states where the concept sits, under what criterion, on what evidence, and at what weight. A consumer can test the position: the criterion names the rake, the source names the decision, and the force states that the relation is definitional.

**A partitive relation with constraints and delimitation:**

```
relation:
```

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```
  type: partitive
  subject: data-set:header-section
  object: data-set
  system: data-resource-system
  qualification:
    presence: obligatory
    count: "1"
    delimitation: metadata carried at the set level rather than the
      record level
    normative_force: essential
    source: EFS-DM-0015, review 2026-06-12
    status: confirmed
```

**Figure 2**

The record tells a data modeller that the part is mandatory and single-valued, and tells a reviewer what separates this part from the other parts of the whole — the input that test T4 consumes.

**An associative relation with its connection stated:**

```
relation:
  type: associative
  subject: data-set:header-section
  object: data-set:validation-rules
  system: data-resource-system
  qualification:
    connection: is-prerequisite-for
    note: header section carries the identifiers that the validation
      rules reference
    normative_force: characteristic
    source: proposal EFS-DM-0021, accepted 2026-08-30
    status: confirmed
```

**Figure 3**

The record annotates the arrangement without carrying placement weight (E-8), and the note states the connection specifically enough to test.

## 7.6 Qualification quality

Qualification is itself subject to quality expectations, and the register reviews it as such:

— a source that names no document, decision or review is not a source (Q-1): “agreed in discussion” does not qualify a position, because no one can re-derive it;

— a criterion that names no dimension and no characteristic is not a criterion (Q-2): “general” and “other” fail the test that T2 and T3 apply;

— a note that states no testable content is not a qualification note (E-9, Q-8): the note fails when no reviewer action would differ if the note were absent; and

— the score sheet practice of EFS 2522 applies to qualification records where a register scores entries: a position with defective qualification drags the consistency dimension of its entries.

## 7.7 Qualification vocabulary

Q-12 Qualification metadata shall use the vocabulary of Annex C: presence constraints, count constraints, normative force values, status values, and connection terms. The register may extend the vocabulary by declaring additional terms in the system description (EFS 2513, clause 5); undeclared terms shall not appear in published records.

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Q-13 Qualification metadata shall be recorded in machine-readable form per EFS 2516. A qualification that exists only in prose — a note in a document that the relation record does not carry — is unqualified for the purposes of this document.

### 7.8 Requirement group Q

a) Relationship qualification requirements (Group Q)

**Table 3**

| ID | Requirement | Sources |
|---|---|---|
| Q-1 | Every hierarchical relationship cites its source. | EFG 2519 |
| Q-2 | Every hierarchical relationship carries its criterion of subdivision. | A-2, ISO 704 |
| Q-3 | Every relationship carries a lifecycle status; public at `confirmed` only. | EFS 2513 |
| Q-4 | Normative force is stated as essential, characteristic or contextual. | ISO 704 |
| Q-5 | Partitive relations state presence and count constraints. | ISO 704, EFS 2516 |
| Q-6 | Partitive relations state the delimitation of the part. | ISO 704, Group M |
| Q-7 | Associative relations state their thematic connection. | EFS 2510 |
| Q-8 | Mapping relations state their degree and a difference note where non-equivalent. | EFS 2510, EFS 2504 |
| Q-9 | Status changes go through change management. | EFS 2513 |
| Q-10 | Deprecated relations retain their full qualification. | EFS 2513 |
| Q-11 | Stale qualifications raise review tasks; nothing silently inherits. | EFS 2513 |
| Q-12 | Qualification uses the Annex C vocabulary plus declared extensions. | Annex C, EFS 2513 |
| Q-13 | Qualification is machine-readable; prose-only qualification is unqualified. | EFS 2516 |

## 8 Mutual exclusivity of subdivision (Group M)

### 8.1 The MECE property

A subdivision satisfies the MECE property when it satisfies both of its parts:

— **mutual exclusivity**: no concept satisfies the intension of more than one coordinate concept of the rake; and

— **collective exhaustiveness**: the union of the extensions of the coordinate concepts covers the extension of the superordinate concept.

The first part separates; the second accounts. A rake that fails the first part makes the system ambiguous — a consumer cannot tell which designation applies to an object that falls in the overlap. A rake that fails the second part makes the system incomplete — objects exist that the system cannot describe. Group M states the tests for both parts, the evidence each test admits, and the remediation that applies when a test fails. Annex B gives the test suite in checklist form.

### 8.2 Tests for mutual exclusivity

M-1 The intensional disjointness test: for each pair of coordinate concepts in a rake, the intensions shall be disjoint — no characteristic set that satisfies both intensions exists. The test is performed by constructing candidate characteristic sets that satisfy both intensions; the absence of a construction, demonstrated in the review record, satisfies the test.

M-2 The extensional disjointness test: for each pair of coordinate concepts, the register shall account for at least one object or boundary statement that separates the extensions, whether by a delimiting characteristic pair, by a measured boundary, or by a stated convention that assigns every boundary object to exactly one coordinate.

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M-3 The single-criterion test: each rake shall be produced by one criterion of subdivision (E-6). The test names the criterion and verifies that every coordinate concept is differentiated from its coordinates by that criterion alone; where differentiating a pair requires a second criterion, the rake fails the test.

M-4 The coordinate designation test: where the criterion of subdivision is expressed in the designations of the coordinate concepts, the expression shall be uniform across the rake (EFS 2522, Group S). A rake whose designations express the criterion inconsistently signals an arrangement defect even where the intensions are disjoint.

## 8.3 Tests for collective exhaustiveness

M-5 The coverage test: for every rake, the register shall record the statement of coverage — the claim that every object satisfying the superordinate intension satisfies at least one coordinate intension — with the evidence: a derivation, a cited source, or the presence of a residual category.

M-6 The residual category rule: where coverage cannot be demonstrated by derivation or source, the rake shall include a residual category whose definition states that it holds what the other coordinates do not hold. A residual category is a last resort: its presence in a rake is recorded as a known limitation in the system description, and it shall not be used where a positive criterion is available.

M-7 The boundary convention rule: where the extension of the superordinate concept is continuous and the rake cuts it — sizes, ranges, durations — the rake shall carry the boundary convention that assigns every boundary value to exactly one coordinate. A rake that leaves a boundary value assignable to two coordinates fails exclusivity; a rake that leaves a boundary value assignable to none fails exhaustiveness.

## 8.4 Failure detection and remediation

M-8 The register shall run the mechanical subset of the MECE tests — the tests of Annex B that run over relation records without expert judgement — as part of publication validation (EFS 2513, clause 10). A rake that fails a mechanical test shall not be published until the failure is remediated or a waiver is recorded by the control body.

M-9 The remediation paths for a failing rake are, in order of preference:

- **re-criterion**: restate the criterion of subdivision so that the coordinates become disjoint, retaining the intended coverage;
- **re-dimension**: split the rake into rakes along declared dimensions, restructure as a multidimensional subdivision (A-10), and retest each rake;
- **re-boundary**: adopt or restate the boundary convention (M-7) that removes the overlap or the gap;
- **re-scope**: narrow the superordinate intension so that the failing objects leave the subdivision, recording the scope change in the system description; and
- **residual**: add a residual category (M-6), with the limitation recorded.

M-10 A remediation that changes intensions or scopes touches the definitions of published concepts and follows the change management requirements of EFS 2513, clause 7, before publication.

## 8.5 Classes of overlap

Reviewers diagnose exclusivity failures faster when they recognize the class of overlap. Five classes recur, each with its own signature and its own remediation:

- **criterion mixing.** Two coordinates differ along one criterion and share a second criterion unequally — the coordinates of a mixed rake. Signature: the regrouping test cannot state each coordinate as “superordinate + criterion-value” alone. Remediation: re-dimension (M-9, A-10).

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— **boundary ambiguity.** The coordinates partition a continuous extension and a value sits on the seam. Signature: the extension walk finds an object that both coordinates claim. Remediation: re-boundary (M-7, M-9).

— **intension entanglement.** One coordinate's intension presupposes a characteristic that the other coordinate excludes, but a third characteristic smuggles the exclusion back in — the coordinates are not independently defined. Signature: the disjointness argument for the pair relies on a characteristic that belongs to neither delimiting set. Remediation: re-criterion or re-author the defective definition under EFS 2522, clause 7.

— **residual leakage.** A residual category has grown a positive intension — "other X" now names a recognizable class — and the class competes with a positive coordinate. Signature: objects are consistently assigned to the residual although a positive coordinate exists for them. Remediation: promote the leaked class to a positive coordinate by derivation, or re-state the residual as an explicit catch-all with no positive definition.

— **scope drift.** The coordinates are disjoint within the original scope, but the system has grown and the superordinate's extension has widened past what the rake covers. Signature: coverage fails on objects the system did not originally intend to describe. Remediation: re-scope (M-9) — narrow the superordinate intension or extend the rake by derivation.

The classes are diagnostic aids, not tests: the tests of Annex B decide, and the class names the remediation path.

## 8.6 Overlap diagnosis procedure

When a rake fails a MECE test, the reviewer works the diagnosis in this order:

a) **Reproduce the failure as an object statement.** State the failing object — real or constructed — and the two coordinates that claim it. A failure that cannot be stated as an object statement is a test artifact, not an arrangement defect.

b) **Identify the characteristics in conflict.** Name the characteristics that pull the object toward each coordinate. The conflict set is usually short: one or two characteristics carry the overlap.

c) **Classify the overlap.** Match the conflict to the five classes. The class proposes the remediation path.

d) **Choose the remediation.** Apply the order of preference of M-9 against the class: re-criterion, re-dimension, re-boundary, re-scope, residual. The first path that resolves the failure without damaging sibling rakes is taken; damage to siblings is checked by re-running the suite (M-12).

e) **Record the diagnosis.** The finding records the object statement, the conflict characteristics, the class, the chosen path, and the re-test outcome. The record is the evidence that the published rake once failed and was fixed — which matters to consumers who adopted the pre-fix arrangement.

## 8.7 MECE and definitions

The MECE tests consume definitions. A rake that passes its tests under defective definitions passes falsely: disjointness argued from an incomplete intension, coverage claimed over an extension the definitions never bound. The dependency runs in one direction: entry quality (EFS 2522) is a precondition of arrangement quality, not a consequence. The register reviews the definitions of a failing rake under EFS 2522, Groups N and C, before remediation is chosen, because a remediation designed around a defective definition is a remediation that the next definition revision will invalidate. Conversely, a rake that passes under sound definitions can still fail later when a definition is revised: the revision triggers re-test under V-4.

## 8.8 MECE in multidimensional systems

In a multidimensional concept system (A-10), the MECE property holds through composition, and the tests apply at the dimensional rakes:

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— **dimensional exclusivity.** Each dimensional rake passes T1 to T5 on its own criterion, exactly as a single-system rake does. The composed positions inherit exclusivity from their dimensions: a composed position is unique because each of its coordinate values is unique within its dimension.

— **composition coverage.** The composed system covers the superordinate extension where every dimension covers: an object that each dimension classifies has exactly one composed position. The system description states excluded combinations — pairs of coordinate values that the domain does not admit — and the coverage claim runs subject to that statement (M-5).

— **dimension independence.** Exclusivity across dimensions is not required and does not make sense: two dimensions may produce coordinates that share characteristics, because they classify different things about the same object. The single-criterion test (T2) applies within a dimension and says nothing across dimensions. A reviewer who finds "overlap" between coordinates of different dimensions has compared along the wrong axis; the finding is the missing statement of which dimension the rake belongs to, and the fix is the criterion record (Q-2), not a re-arrangement.

— **conversion to composed form.** A flattened rake that fails T3 is re-dimensioned (M-9): the dimensions are named, the coordinates are regrouped per dimension, the dimensional rakes are tested, and the composed positions replace the flat ones. The conversion changes records and follows M-10.

## 8.9 MECE across the arrangement

M-11 The MECE property is a property of each subdivision, not of the whole system at once. A system is MECE when every one of its rakes passes the tests. The register shall be able to enumerate its rakes — from the relation records, per A-15 — and to state for each rake which tests it has passed and when.

M-12 Rakes at different depths are independent for the MECE tests: a rake passes or fails on its own criterion, not on the criterion of its parent rake. Where a parent rake fails and is remediated, the child rakes are retested, because re-criterion and re-scope change the extensions that the children subdivide.

M-13 The coordinate concepts of a rake may themselves be subdivided along different criteria than each other: a rake formed by size may contain one coordinate subdivided further by colour and another by material. Subdivision criteria need not be uniform across sibling subtrees; uniformity of criterion is required within a rake only (E-6).

## 8.10 Requirement group M

a) Mutual exclusivity requirements (Group M)

**Table 4**

| ID | Requirement | Sources |
|---|---|---|
| M-1 | Coordinate intensions are disjoint by construction argument. | ISO 704, ISO 1087-1 |
| M-2 | Extensions are separated by characteristics, boundaries or stated convention. | ISO 704 |
| M-3 | One criterion per rake, named and verified. | E-6, ISO 704 |
| M-4 | Criterion expression in designations is uniform across the rake. | EFS 2522 |
| M-5 | Coverage is stated with evidence: derivation, source or residual. | ISO 704 |
| M-6 | Residual categories are last resorts and are recorded as limitations. | ISO 25964-1 |
| M-7 | Continuous extensions carry boundary conventions. | ISO 704 |
| M-8 | Mechanical MECE tests run at publication validation. | EFS 2513 |
| M-9 | Remediation follows the ordered paths: re-criterion, re-dimension, re-boundary, re-scope, residual. | this document |
| M-10 | Remediations touching intensions go through change management. | EFS 2513 |
| M-11 | MECE is per rake; rakes are enumerable from published records. | A-15, EFS 2516 |
| M-12 | Child rakes are retested after parent remediation. | ISO 704 |

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*(continued)*

| ID | Requirement | Sources |
|---|---|---|
| M-13 | Criterion uniformity is required within a rake, not across sibling subtrees. | ISO 704 |

# 9 Arrangement validation (Group V)

## 9.1 General

Validation keeps the arrangement true after the day it was built. Concepts move, criteria are renamed, systems merge, and each event can break a property that held when the relations were last reviewed. Group V states what is checked, by what means, how often, and what the checks produce.

## 9.2 Mechanical validation

V-1 The register shall validate the mechanical properties of the arrangement as part of publication validation (EFS 2513, clause 10):

- every non-root concept of each system has exactly one incoming hierarchical relation within the system (A-6);
- every rake is enumerable from the relation records, and every rake carries its criterion of subdivision (A-15, Q-2);
- every hierarchical relation carries source, criterion and status (Q-1 to Q-3);
- no direct and transitive placement of the same pair exists (E-7); and
- no duplicate assertion of one relation type between one pair of concepts in one system exists (E-16).

V-2 The register shall validate the mechanical subset of the MECE tests at the same gate (M-8): intensional-disjointness checks that run on structured characteristic data, boundary-convention presence checks for rakes of ranged concepts, and residual-category flagging.

V-3 A validation failure blocks publication of the affected system view until remediated or waived by the control body (M-8). Waivers are recorded with reasons and carry an expiry: a waived failure is re-tested at the next scheduled review (EFG 2519, clause 12).

## 9.3 Review validation

V-4 The register shall review the non-mechanical properties of the arrangement on a schedule and on events:

- on a scheduled arrangement review, at the cadence the charter sets (EFS 2513, clause 11), a sample of rakes is tested under the full MECE suite (Annex B) and a sample of relationships is re-qualified against its recorded source (Q-1); and
- on events that can invalidate properties — a definition change, a system merge or split, a criterion rename, a system description change — the affected rakes and relationships are queued for review before the next publication (Q-11).

V-5 The review of an arrangement uses the placement decision procedure of Annex A as the review instrument: a reviewer re-derives the position of a concept from its intension and the rake criterion and compares the derivation with the recorded position. Divergence is a finding, and the finding follows the issue resolution of EFS 2513, clause 9.

V-6 A review shall test cross-system consistency where cross-system membership exists (A-11): the mapped positions shall correspond under the mapping relations asserted between the systems, and the mapping relations shall carry their degree and difference notes (Q-8).

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## 9.4 Sampling for review

The scheduled review (V-4) does not re-derive every position in a large register, and it does not need to: the mechanical tests already cover what is mechanical, and the review effort concentrates where judgement carries the property. The register samples:

— **by risk**: rakes with residual categories, rakes remediated within the period, rakes whose relations changed, and systems under active extension are sampled first;

— **by age**: relationships whose last review predates the charter cadence are sampled proportionally to their age; and

— **by coverage**: over a bounded number of review cycles, every rake of every system is visited at least once — the sampling is stratified to converge, so that no rake is exempt indefinitely.

The sample size and the stratification are charter decisions (EFS 2513, clause 4); the requirement is convergence plus risk-weighting, not a fixed percentage.

## 9.5 Validation record format

The record of a validation run (V-7) carries, at minimum:

```
validation:
  run: 2026-11-05T09:00Z
  systems: [data-resource-system, statistics-metadata-system]
  mechanical:
    tests: [T1, T2, T5, T7, T8, T9, T10]
    rakes_checked: 214
    failures: []
  waivers:
    - rake: delivery-time
      test: T5
      reason: boundary convention pending decision 2026-12-01
      expires: 2026-12-01
  review:
    rakes_sampled: 12
    findings: 2
    finding_ids: [EFSD-0031, EFSD-0032]
  publication:
    blocked: false
```

**Figure 4**

The format is illustrative; the requirement is the content set. A record that omits the waivers or the findings is an incomplete record under EFS 2513, clause 10, and the register's publication artifact carries the validation summary so that consumers can see the state of the arrangement they are reading.

## 9.6 Evidence of validation

V-7 Each validation run shall produce a record that states: the systems checked, the rakes tested, the tests applied, the failures found, the waivers granted, and the remediations applied. The record is a register record under EFS 2513, clause 10, and is discoverable with the register publication.

V-8 The arrangement quality of a register is observable from its validation records over time: the count of failing rakes, the count of waived failures, the count of re-qualified relationships, and the count of placement changes. EFG 2519, clause 12, consumes these figures in the improvement practice of a conforming concept management system.

## 9.7 Requirement group V

a) Arrangement validation requirements (Group V)

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**Table 5**

| ID | Requirement | Sources |
|---|---|---|
| V-1 | Mechanical arrangement properties are validated at publication. | EFS 2513, Group A, Group E, Group Q |
| V-2 | The mechanical MECE subset runs at the same gate. | M-8 |
| V-3 | Failures block publication pending remediation or recorded, expiring waiver. | M-8, EFG 2519 |
| V-4 | Non-mechanical properties are reviewed on schedule and on events. | EFS 2513, Q-11 |
| V-5 | Review re-derives positions with the Annex A procedure; divergence is a finding. | Annex A, EFS 2513 |
| V-6 | Cross-system consistency is reviewed where cross-system membership exists. | A-11, Q-8 |
| V-7 | Every validation run produces a discoverable record. | EFS 2513 |
| V-8 | Arrangement quality is observable from validation records over time. | EFG 2519 |

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# Annex A
(normative)

# Placement decision procedure

This annex gives the working procedure that decides the position of a concept in a concept system. The procedure applies when a concept enters a system, when a placement is contested (A-5, A-7), and when a reviewer re-derives a position as the review instrument (V-5). Each step states the inputs it consumes and the record it produces.

## A.1 Step 1: State the intension

Write the intension of the candidate concept: the set of characteristics that its definition supplies. Where the definition is absent or defective, the placement is premature; the entry returns to authoring under EFS 2522, and the placement decision waits for a definition that passes the completeness and clarity criteria of that document.

## A.2 Step 2: Enumerate candidate superordinates

Enumerate the concepts of the system whose intensions the candidate intension presupposes: the candidates are the concepts under which the candidate adds characteristics without removing any. Mechanical tooling can propose candidates from the structured characteristics of the register where characteristics are recorded as data; otherwise the proposer enumerates from the system view.

## A.3 Step 3: Test each candidate

For each candidate superordinate concept, perform three tests and record the outcome:

— **the subsumption test**: every characteristic of the candidate superordinate intension appears in the candidate concept intension. Where one does not, the candidate is not a superordinate concept of the concept being placed.

— **the differentiation test**: at least one delimiting characteristic of the candidate concept distinguishes it from every existing coordinate concept under the candidate superordinate. Where the candidate cannot be distinguished from a coordinate, the candidate and that coordinate are the same concept, and the placement resolves to entry deduplication, not placement.

— **the criterion test**: the distinguishing characteristics all express the one criterion of subdivision of the rake. Where a characteristic expresses a different criterion, the candidate rake is not the right rake; the correct rake is one step through the other criterion (A-10), or the rake is mixed and fails M-3.

## A.4 Step 4: Select and record

Select the position. Where exactly one candidate passes the three tests, that position is taken. Where several candidates pass, apply the tie-breakers in order and record the tie-break used:

— **the immediate-superordinate rule**: prefer the candidate whose intension the candidate concept most directly narrows — the one that adds the fewest characteristics between itself and the concept being placed. Deeper ancestors remain reachable through the hierarchy.

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— **the system-scope rule**: prefer the candidate that lies within the declared scope of the system (EFS 2513, clause 5); an equally correct position outside the system scope is recorded as a cross-system membership candidate (A-11), not as a second position.

— **the control-body rule**: where the tie survives, the control body decides and the decision record cites the candidates and the tie-breaker outcome (EFG 2519, Annex B).

## A.5 Step 5: Assert the membership

Assert the membership relation with the full metadata of Group A and Group Q: relation type (E-4 or E-5), superordinate concept, criterion of subdivision, source, normative force, and status `proposed`. The position becomes public at `confirmed` (Q-3).

## A.6 Step 6: Test the affected rakes

Run the MECE tests of Annex B on every rake the placement affects: the receiving rake gains a coordinate, and its exclusivity and coverage are re-tested (M-11, M-12). A failing rake is remediated per M-9 before publication.

## A.7 Placement worksheet

The worksheet records one placement decision. The register keeps the worksheet as part of the proposal record.

**Table A.1**

| Field | Content |
|---|---|
| Concept | identifier and designation of the concept being placed |
| Intension | the characteristic set, as recorded in the entry |
| Candidates | the enumerated candidate superordinates |
| Subsumption | pass or fail per candidate |
| Differentiation | pass or fail per candidate, naming the delimiting characteristics |
| Criterion | the criterion of subdivision that the passing characteristics express |
| Selected position | superordinate concept and relation type |
| Tie-breaker | the rule applied where several candidates passed |
| Rejected candidates | the remaining candidates and why they lost |
| MECE outcome | rake tests run and their results |
| Decision record | link to the proposal and decision records |

## A.8 Worked micro-example

The procedure in six steps, applied to the placement of `forecast data set` (the data set of expected future values) in the data-resource system of Annex D:

a) **Intension**: “data set whose values represent expected future states of the phenomena” — the definition supplies the characteristics: data set (presupposed) and expected-future temporal reference (added).

b) **Candidates**: `data set` (root), `current data set`, `historical data set` (existing coordinates).

c) **Tests**: `data set` passes subsumption — the intension presupposes it. It passes differentiation — expected-future reference distinguishes the concept from current reference and past reference. It passes the criterion test — the distinguishing characteristic expresses `currency`, the declared dimension. `current data set` fails subsumption: its intension carries present-state reference, which the candidate does not presuppose. `historical data set` fails subsumption likewise.

d) **Selection**: one candidate passes; the position under `data set` along `currency` is taken. No tie-breaker is needed.

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e) **Assertion**: a generic relation is asserted (E-4) with criterion `currency`, force `essential`, source citing the proposal, status `proposed`; it goes to review and ships at `confirmed` (Q-3).

f) **Rake test**: the receiving rake now holds three coordinates; T1, T2 and T3 pass — the three temporal references are disjoint, and T6 passes by derivation over the declared boundary convention. The worksheet records the two failed candidates and the subsumption results, which is the evidence a later reviewer reads when the rake is questioned.

The worksheet outcome for this placement, filled from the steps above, is exactly the record that A-5 and V-5 consume when a reviewer re-derives the position months later: the derivation reproduces the tests, and the recorded outcomes let the reviewer confirm rather than re-argue.

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# Annex B
(normative)

# MECE test suite

This annex states the MECE tests of clause Clause 8 in executable form: each test names its trigger, its inputs, its procedure, and its failure output. Tests marked **(mechanical)** run over the published relation records without expert judgement (M-8); tests marked **(review)** are procedures for reviewers and produce findings through the issue resolution of EFS 2513, clause 9.

## B.1 T1: rake enumeration (mechanical)

**Requirement:** M-11.

**Procedure:** group the hierarchical relations of the system by superordinate concept; each group is a rake; verify that every non-root concept appears in exactly one rake and that every rake carries a criterion value on each of its relations.

**Failure output:** concepts in no rake, concepts in several rakes, relations without criterion.

## B.2 T2: single criterion (mechanical where criteria are structured)

**Requirement:** M-3.

**Procedure:** for each rake, read the criterion value of its relations; verify that the rake carries one criterion.

**Failure output:** a rake with relations carrying different criteria. Where criteria are free statements, the test degrades to a review check (T3).

## B.3 T3: intensional disjointness (review)

**Requirement:** M-1.

**Procedure:** for each pair of coordinates in the rake, attempt to construct a characteristic set that satisfies both intensions. Record the construction that fails. The pair passes when the reviewer can state the reason no construction exists — a contradiction between characteristics, a boundary convention, or a delimiting pair.

**Failure output:** the pair, the attempted constructions, and the finding that no separating argument was produced.

## B.4 T4: extensional disjointness *(review; mechanical where boundaries

are structured)*

**Requirement:** M-2.

**Procedure:** for each pair of coordinates, read the separating evidence: the delimiting characteristic pair, the measured boundary, or the assignment convention. Verify that the evidence assigns every object to one coordinate.

**Failure output:** pairs whose evidence is absent or does not partition.

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## B.5 T5: boundary convention *(mechanical where ranges are

structured)*

**Requirement:** M-7.

**Procedure:** for rakes of ranged concepts, read the boundary values of the coordinates; verify that adjacent ranges share no open value and skip no value.

**Failure output:** overlapping boundaries, gapped boundaries.

## B.6 T6: coverage (review)

**Requirement:** M-5.

**Procedure:** read the coverage statement of the rake: the derivation, the source, or the residual marker. Verify that the statement exists and that its content is checkable — a derivation names the characteristics that partition, a source cites a document, a residual marker names the residual coordinate.

**Failure output:** rakes without coverage statements.

## B.7 T7: residual flag (mechanical)

**Requirement:** M-6.

**Procedure:** detect residual categories in rakes; verify that each is declared as a limitation in the system description.

**Failure output:** undeclared residual categories.

## B.8 T8: uniform criterion expression *(mechanical where designations

are structured)*

**Requirement:** M-4.

**Procedure:** where the criterion is expressed in designations, verify that the coordinate designations express it in a uniform form, per the consistency criteria of EFS 2522, Group S.

**Failure output:** coordinates whose designations express the criterion differently.

## B.9 T9: duplicate placement (mechanical)

**Requirement:** A-6, E-7.

**Procedure:** verify that each concept has at most one incoming hierarchical relation in the system, and that no direct and transitive placement of the same pair exists.

**Failure output:** multiply placed concepts, redundant paths.

## B.10 T10: cross-system consistency (mechanical)

**Requirement:** V-6, A-11.

**Procedure:** for each cross-system membership, verify that the mapped positions correspond under the asserted mapping relations and that each mapping relation carries its degree.

**Failure output:** memberships without mappings, mappings without degree.

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## B.11 T11: cycle detection (mechanical)

**Requirement:** A-6, E-7.

**Procedure:** traverse the hierarchical relations of the system from each root; verify that the traversal is acyclic — no concept is its own ancestor through the asserted relations.

**Failure output:** cycles, stated as the concept path that closes.

## B.12 T12: orphan detection (mechanical)

**Requirement:** A-8.

**Procedure:** identify concepts whose membership relations in the system are all deprecated and which carry no confirmed relation; verify that each such concept is either absent from the arrangement view or carries an open placement need.

**Failure output:** orphans published in the arrangement view; orphans without placement needs.

## B.13 T13: depth profile (mechanical)

**Requirement:** the depth and breadth practice of Clause 4.

**Procedure:** compute the depth of each root-to-leaf path and the size of each rake; flag single-child subdivisions and rakes exceeding the charter's breadth guideline.

**Failure output:** single-child subdivisions, oversized rakes. The test is advisory: its output feeds the review agenda and the re-dimension decisions of M-9, and does not block publication.

## B.14 T14: mapping symmetry (mechanical)

**Requirement:** A-11, E-10, Q-8.

**Procedure:** for each cross-system membership pair, verify that the mapping relations asserted in the two systems agree in degree — a membership mapped as `equivalence` in one system and as `overlap` in the other is a defect — and that non-equivalent mappings carry difference notes.

**Failure output:** asymmetric mappings, mappings without difference notes.

## B.15 T15: qualification completeness (mechanical)

**Requirement:** Q-1 to Q-5, Q-12.

**Procedure:** verify that every confirmed hierarchical relation carries source, criterion, normative force and, for partitive relations, presence and count constraints with values from the declared vocabulary (Annex C).

**Failure output:** relations with missing or undeclared qualification values.

## B.16 Test matrix

**Table B.1**

| Test | Requirement | Mode | Failure output |
|---|---|---|---|
| T1 | M-11 | mechanical | unplaced or multiply placed concepts; missing criterion |
| T2 | M-3 | mechanical / review | mixed-criterion rakes |
| T3 | M-1 | review | pairs without separating argument |

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*(continued)*

| Test | Requirement | Mode | Failure output |
|---|---|---|---|
| T4 | M-2 | review / mechanical | pairs without partitioning evidence |
| T5 | M-7 | mechanical / review | overlapping or gapped boundaries |
| T6 | M-5 | review | missing or unchecked coverage statements |
| T7 | M-6 | mechanical | undeclared residual categories |
| T8 | M-4 | mechanical / review | inconsistent criterion expression |
| T9 | A-6, E-7 | mechanical | duplicate placements, redundant paths |
| T10 | V-6, A-11 | mechanical | inconsistent cross-system mappings |
| T11 | A-6, E-7 | mechanical | cycles |
| T12 | A-8 | mechanical | published orphans; orphans without placement needs |
| T13 | Clause 4 | mechanical, advisory | single-child subdivisions, oversized rakes |
| T14 | A-11, Q-8 | mechanical | asymmetric mappings; missing difference notes |
| T15 | Q-1 to Q-5 | mechanical | missing or undeclared qualification values |

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# Annex C
(normative)

# Relationship qualification vocabulary

This annex states the controlled vocabulary that qualification metadata uses (Q-12). The register declares extensions per EFS 2513, clause 5; undeclared values do not appear in published records.

## C.1 Presence constraint (partitive relations)

**Table C.1**

| Value | Meaning |
|---|---|
| `obligatory` | every instance of the whole has the part |
| `optional` | instances of the whole may lack the part |

## C.2 Count constraint (partitive relations)

**Table C.2**

| Value | Meaning |
|---|---|
| `n` | exactly n parts |
| `n..m` | between n and m parts |
| `one-or-more` | at least one part |
| `zero-or-more` | zero or more parts |
| `unknown` | the definitions do not fix a count; the constraint is not asserted |

## C.3 Normative force

**Table C.3**

| Value | Meaning |
|---|---|
| `essential` | the relation holds for every instance of the concepts under their definitions |
| `characteristic` | the relation holds as the definitions characterize the concepts but is not necessary for every instance |
| `contextual` | the relation holds under the conditions stated in the qualification note |

## C.4 Lifecycle status

**Table C.4**

| Value | Meaning |
|---|---|
| `proposed` | asserted in a proposal; not public in the arrangement view |
| `confirmed` | accepted through review; public (Q-3) |
| `deprecated` | retired; removed from the arrangement view; qualification retained (Q-10) |

## C.5 Associative connection terms

The following connection terms annotate associative relations (E-9, Q-7). The set follows the associative relation practice of ISO 12620 data categories and the ES relation vocabulary (EFS 2510); the register declares further terms as extensions.

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| | |
|---|---|
| `causes` | the subject concept brings about the object concept. |
| `is-produced-by` | the subject concept results from the object concept. |
| `produces` | inverse of `is-produced-by`. |
| `is-prerequisite-for` | the object concept presupposes the subject concept. |
| `is-instrument-for` | the subject concept is used in realizing the object concept. |
| `opposes` | the concepts are contrastive in the domain. |
| `interacts-with` | the concepts stand in a thematic connection not covered by the terms above; the qualification note states the connection. |

## C.6 Mapping degree

The degree values of mapping relations are the mapping relation types of EFS 2510: `equivalence`, `narrower`, `broader`, `overlap`, `dissociation`. The difference note is required for every non- equivalent degree (Q-8).

## C.7 Criterion naming

The criterion of subdivision is qualification metadata (Q-2), and its name is part of the published record. A criterion is named well when the name passes three checks:

— **it names a characteristic family**: `currency`, `content type`, `generation mechanism` — not `type`, `category`, `other`;

— **it names the dimension, not a value**: the rake's criterion is `currency`, and `current` is a coordinate value, not a criterion; and

— **it is stable across the rake**: the same name appears on every relation of the rake (T2) and in the system description's dimension declaration (A-10).

A criterion name that fails the checks is a finding under T2 and is fixed by renaming the criterion in the system description and on the relations, which is a change-management event when it alters what consumers see (EFS 2513, clause 7).

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# Annex D
(normative)

# Worked examples

These examples apply the requirements of this document to four arrangements that recur in terminology work. The concepts are drawn from ordinary data-management vocabulary; the lessons are general.

## D.1 Example 1: a clean single-criterion rake

A register maintains a system of data-resource concepts. The superordinate concept is `data set`. The register subdivides by the dimension `currency` (the degree to which the data reflect the current state of the phenomena):

— `current data set` — a data set whose values reflect the current state;

— `historical data set` — a data set whose values reflect states of the past; and

— `forecast data set` — a data set whose values represent expected future states.

The rake passes T1 (three concepts, one rake, criterion recorded), T2 (one criterion: currency), and T3 (the intensions are disjoint by the temporal reference of the values: present, past, expected future). Coverage (T6) is derivable: every data set holds values of some temporal reference, and the three values partition the possibilities under the system's boundary convention that a data set mixing references is out of scope. The example shows the minimum passing arrangement: one criterion, disjoint intensions, derived coverage.

The relation records of the rake carry the arrangement:

```
relation:
  type: generic
  subject: data-set:current-data-set
  object: data-set
  system: data-resource-system
  qualification:
    criterion: currency
    normative_force: essential
    source: EFS-DM-0012, decision 2026-04-07
    status: confirmed
```

**Figure D.1**

with `historical-data-set` and `forecast-data-set` asserted identically under the same criterion. T9 passes: one incoming hierarchical relation per concept. T15 passes: every relation carries the full qualification.

## D.2 Example 2: a mixed rake and its re-dimensioning

The same register proposes to subdivide `data set` by content type and by currency at once:

— `current observation data set`;

— `current aggregate data set`;

— `historical observation data set`; and

— `historical aggregate data set`.

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The rake fails T3: separating `current aggregate data set` from `historical observation data set` requires two criteria. The failure is the arrangement defect that E-6 prohibits. Remediation follows the re-dimension path of M-9: the register declares the dimensions `currency` and `content type`, subdivides separately along each, and composes the positions — a multidimensional concept system per A-10. The composed positions are `observation, current`, `observation, historical`, `aggregate, current`, `aggregate, historical`. Each dimensional rake passes T3 on its own criterion, and the composition is tested as a whole under T1.

## D.3 Example 3: cross-system membership

A statistics system and a management system both place `data quality`. In the statistics system, `data quality` sits under `statistical metadata` through a generic relation; in the management system, it sits under `management characteristic` through a generic relation. The memberships are two complete assertions (A-9), each with its own criterion and source (Q-1, Q-2). The register asserts a mapping relation `equivalence` between the two positions (E-10, A-11), with source citations on both sides and the degree recorded (Q-8). T10 passes: the membership pairs and the mapping agree. T14 passes: the mapping degrees agree in both systems. The example shows that one concept can hold two truths, one per system, connected by an explicit correspondence — and that neither system inherits the other's position.

The cross-system records:

```
# statistics system
relation:
  type: generic
  subject: data-quality
  object: statistical-metadata
  system: statistics-system
  qualification:
    criterion: statistical-process-characteristics
    normative_force: essential
    source: EFS-STAT-0004, review 2026-02-19
    status: confirmed

# management system
relation:
  type: generic
  subject: data-quality
  object: management-characteristic
  system: management-system
  qualification:
    criterion: management-object-characteristics
    normative_force: essential
    source: EFS-MGT-0009, decision 2026-05-21
    status: confirmed

# mapping between the positions
relation:
  type: mapping
  subject: data-quality@statistics-system
  object: data-quality@management-system
  qualification:
    degree: equivalence
    source: EFS-STAT-0004 / EFS-MGT-0009, joint review 2026-09-03
    status: confirmed
```

**Figure D.2**

## D.4 Example 4: a boundary failure and its convention

A register subdivides `delivery time` (the duration from order to delivery) into `immediate delivery`, `short-term delivery` and `long-term delivery`, with ranges "under one day", "one to seven days", "more than seven days". T5 fails: a delivery of exactly one day is assignable to two coordinates — the open boundary. Remediation follows the re-boundary path of M-9: the register adopts the convention that ranges are closed

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on the lower bound and open on the upper bound, records the convention in the rake (M-7), and re-tests. The definitions of the coordinates are amended per EFS 2522 to state the convention, and the change follows change management (M-10). The example shows that MECE failures are often boundary failures, and that the fix is a stated convention, not a redesigned system.

## D.5 Example 5: the residual that was avoided

A register subdivides `identifier` by mechanism into `sequential identifier` and `random identifier`, then meets an identifier scheme that is neither sequential nor random in generation. The tempting fix is a third coordinate `other identifier`. The register resists (E-6, M-6): a residual category would trade a coverage failure for a permanent limitation. Instead the re-criterion path of M-9 applies: the criterion is restated as `generation mechanism` with coordinates `assigned identifier` and `derived identifier`, into which the existing scheme and the two original coordinates fall by derivation. The rake passes T3 and T6 without a residual. The example shows the order of preference in M-9 doing real work: the weaker remediation would have shipped a rake that every future new scheme would grow.

## D.6 Example 6: a multidimensional composition end to end

The register restructures the mixed rake of Example 2 as a composed system. The system description declares two dimensions:

— `currency` — the temporal reference of the values: `current`, `historical`, `forecast`; and

— `content type` — the form of the data: `observation`, `aggregate`.

Each dimension carries its own rake of coordinate concepts, each asserted under `data set` through a generic relation whose qualification names its criterion (Q-2):

```
# dimension: currency
relation:
  type: generic
  subject: data-set:current-data-set
  object: data-set
  qualification:
    criterion: currency
    normative_force: essential
    source: EFS-DM-0012, decision 2026-04-07
    status: confirmed

# dimension: content type
relation:
  type: generic
  subject: data-set:observation-data-set
  object: data-set
  qualification:
    criterion: content type
    normative_force: essential
    source: EFS-DM-0026, decision 2026-10-15
    status: confirmed
```

**Figure D.3**

The composed positions are the coordinate pairs: `observation/current`, `observation/historical`, `observation/forecast`, `aggregate/current`, `aggregate/historical`, `aggregate/forecast`. The system description declares the excluded combination `forecast/aggregate` — aggregates are computed from observed data and are never forecasts — which is the coverage statement of M-5 for the composition. The register introduces the composed concepts, each carrying its two dimensional memberships, and the MECE tests run per dimension (T1 to T3 pass on each; T6 passes with the exclusion statement). The conversion from the failed flat rake is recorded per M-10, with the flat rake's relations deprecated and the composition recorded as the replacement.

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A consumer of the system reads the composed position of any concept from its dimensional memberships without inspecting prose (A-15), and a reviewer re-derives any position by the placement procedure per dimension. The example closes the loop: the structure that fixed the overlap is the structure that the tests, the records and the review all speak in.

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# Annex E
(normative)

# Cross-reference to the ES terminology documents

This annex states where each requirement group of this document meets the requirements of the other ES terminology documents. The map is informative; the normative texts are the cited clauses.

a) Cross-reference map to the ES terminology documents

**Table E.1**

| Group | Meets | Relationship |
|---|---|---|
| Group A | EFS 2513, clause 7 (change management); EFS 2510 (relation vocabulary) | Membership assertions are relation records; their acceptance is change management |
| Group A | EFS 2516 (interchange) | Membership records are EFS 2516 relation records |
| Group A | EFS 2504 (multilingual terminology) | Membership is per concept; localizations inherit position |
| Group E | EFS 2510 (concept relations) | Relation types, semantic tests and direction are defined there |
| Group E | ISO 704 | Generic and partitive tests are the ISO theory of the two hierarchies |
| Group Q | EFS 2516 (interchange) | Qualification metadata is recorded in relation fields |
| Group Q | EFG 2519 (register operation guide) | Sources cite decision records; cadence is the guide's practice |
| Group Q | EFS 2504 (multilingual terminology) | Mapping difference notes follow the equivalence note practice |
| Group M | ISO 704 | Subdivision theory, regrouping and criteria are the ISO foundation |
| Group M | ISO 25964-1 (thesauri) | Residual and node-label practice informs the residual rule |
| Group M | EFS 2522 (entry quality) | Group S consistency feeds the designation form test; entry scores consume arrangement findings |
| Group M | EFS 2513, clause 10 (publication) | The mechanical tests run at the publication gate |
| Group V | EFS 2513, clause 11 (monitoring) and clause 9 (issues) | Reviews produce findings; findings resolve through issues |
| Group V | EFG 2519, clause 12 (improvement) | Validation records feed improvement practice |

## E.1 Identifiers in other documents

The requirement identifiers of this document are stable and are cited elsewhere:

— EFG 2519 cites Group A, Group E, Group Q, Group M and Group V in the self-assessment checklist of its Annex C; and

— EFS 2522 cites Group M in the consistency dimension (Group S) of its scoring model, where an entry inherits a finding from a rake that fails the MECE tests.

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# Bibliography

[1] ISO 10241-1, *Terminological entries in standards — Part 1: General requirements and examples of presentation*.

[2] ISO 19135-1[1)] , *Geographic information — Procedures for item registration — Part 1: Fundamentals*.

[3] ISO 24229, *Information and documentation — Codes for written language conversion systems*.

[4] ISO 25964-2, *Information and documentation — Thesauri and interoperability with other vocabularies — Part 2: Interoperability with other vocabularies*.

[5] ISO/IEC Directives, Part 2, *ISO/IEC Directives, Part 2, Principles and rules for the structure and drafting of ISO and IEC documents*.

[6] FERIN, *Framework for Extensible Registration of INformation*, https://www.ferin.org/

[7] EFS 2501:2025, *Terminology management — Principles and methods*

[8] EFS 2507:2025, *Terminology management — Concept relationships*

[9] EFG 2519:2026, *Concept registers — Operation guide*

[10] EFS 2522:2026, *Concept entry quality — Guidelines, requirements and scoring*

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