

The design and development of a classification system for BIM

J. E. Gelder

University of South Australia, Australia

Abstract

This paper examines the design and development, over a 15 year period, of a new classification system for the construction sector in the UK, which is now one of a suite of standards for BIM Level 2. The paper begins with some early work on specification structures at RIBA Enterprises. It provides a critique of Uniclass 1997 – the problem. It describes the revision of the classification standard, ISO 12006-2 – a framework for the solution. The development of the new classification system – Uniclass 2015 – the solution – is explored. This involved an interesting mix of dead ends and insights, praise and criticism, all part of the process of developing something completely new.

Keywords: classification, BIM, Uniclass.

1 Introduction

In developing the ‘BIM-ready’ specification library, NBS Create [1], the author realised that the UK’s construction classification system, Uniclass 1997 [2], was not adequate for the purpose [3]. This led to two proposals for a new classification system, made to the CPI (Construction Project Information) Uniclass Working Group [4]. The first was for a new ‘Work sections’ table. The second was for a complete overhaul of Uniclass. These were approved by the CPI Committee. The author, working for CPI’s contractor, RIBA Enterprises [5], began the design and development of a replacement classification system, with input from others in the company. The first ten tables of this system, including the new Work sections table, were published for comment on the CPI website in 2012. In mid-2014 the UK Government’s Technology Strategy Board (now Innovate UK) commissioned a team led by RIBA Enterprises to develop the classification system further, particularly with respect to infrastructure, as a part of what is now the NBS BIM



Toolkit [6]. The first four tables of Uniclass 2015 (formerly Uniclass2) were published in April 2015.

Uniclass 2015 will be embedded in tools such as NBS Create, the Construction Information Service [7], and RIBA Product Selector [8], and is already embedded in the NBS BIM Toolkit. As a key tool for the use of level 2 BIM in UK Government construction projects from 2016, the classification system is also expected to find its way overseas.

This paper draws mostly on published articles, which serve as the public record of milestones in the development of the classification system.

2 Outline and performance specification

One of the first tasks the author undertook when joining RIBA Enterprises was a review [9] of the structure of NBS Building [10], which is aligned to Uniclass 1997 Table J *Work sections for buildings* (i.e. trade-based). Table J had also been implemented in NES (National Engineering Specification) [11] and SMM7 [12].

The introduction of a standard section structure was one of the main recommendations, to enable collaborative working, but was rejected as too disruptive for the company and its customers. This idea (not an original one) was not abandoned, however. Some NBS Building work sections (written by the author) published in 2001 had the recommended structure, and by 2012 it had been implemented in a quarter of the sections in NBS Building [13]. It would inevitably have led to changes being needed in Table J.

Over 2002–2003 the author developed a standard Elemental (not trade) section structure for outline and performance specifications (unpublished – see Table 1), with a view to developing a specification that supported design-build procurement. The idea was that this would result in a tool separate to NBS Building, which is geared to ‘traditional’ procurement. What was missing was some way to map the one to the other. Restructuring NBS Building itself would have enabled this mapping, or even an integration of the two ideas.

3 NBS Engineering Services

NBS Engineering Services [14] was a new product for the company. Disruption was not an issue. The author decided to meld the ideas for the outline and performance specification with those of the conventional work section specification. This required a System-based version of the standard structure developed for the outline and performance specifications, well-suited to the design-build procurement usual in the services sector.

This project revealed a number of technical inadequacies in the services side of Uniclass 1997 Table J, particularly for electrical systems. NBS unilaterally amended this material, and submitted the amendments to CPI as a formal proposal for revision in 2005. This was approved several years later – CPI in 2005 had not thought that Uniclass 1997 might need to change, and had no mechanisms in place to deal with such changes.



Table 1: Extract from unpublished Elemental section structure, 2002–2003.

6	Floors, landings, balconies
6.1	General
6.1.1	Floor type A
	<ul style="list-style-type: none"> • Complete element: [.....]. • Core fabric: [.....]. • Coverings and finishes: [.....]. • Openings: [.....]. • Accessories: [.....].
6.1.2	Floor type B
6.2	Performance
6.2.1	Complete element
6.2.2	Core fabric
6.2.3	Coverings and finishes
	<ul style="list-style-type: none"> • Structural performance: [.....]. • Thermal performance: [.....]. • Acoustic performance: [.....]. • Durability: [.....]. • Slip resistance: [.....].
6.2.4	Openings
6.2.5	Accessories
6.3	Products
	<ul style="list-style-type: none"> • <i>Complete element</i> • <i>Core fabric</i>
6.3.1	Concrete [.....] to Floor type A /to Floor type B
	<ul style="list-style-type: none"> • Strength grade: [.....].
6.3.2	Steel [.....]
6.3.3	Timber [.....]
	<ul style="list-style-type: none"> • <i>Coverings and finishes</i>
6.3.4	Ceramic tiles, glazed [.....] to Floor type A /to Floor type B
	<ul style="list-style-type: none"> • Manufacturer: [.....]. (<i>Link to Product Selector Plus</i>) • Product reference: [.....].
6.3.5	Quarry tiles [.....]
6.3.6	Screed [.....]
6.3.7	Slates [.....]
6.3.8	Stone tiles [.....]
6.3.9	Timber decking [.....]
	<ul style="list-style-type: none"> • <i>Openings</i> • <i>Accessories</i>
6.4	Execution
6.5	Completion

The amended classification behind NBS Engineering Services clarified the concept of System (e.g. V14 Photovoltaic systems) and Product (e.g. R31 Refuse chutes) sections, where Systems are composed of Products.

Products were dealt with in various ways depending on their ‘commonality’ (we called this ‘four degrees of separation’), to keep Products as close as possible to the Systems they comprise. For example, Products unique to a System section were held in that section, whereas Products common to more than one Group of sections were located in Group Y. This approach, which classifies Products as parts-of Systems, has been replaced in Uniclass 2015.

However, several ideas are still in place in Uniclass 2015, and have been applied through the object hierarchy.

First, a standard section substructure was introduced for the Systems sections, building on the outline and performance work:

- General, for System type (compositional) clauses – these list the Products comprising each System.
- System performance, for contractor design – a common component of services contracting.
- Products, for Product type clauses.
- Fabrication, for bespoke offsite manufacture and assembly.
- Execution, for onsite assembly.
- Completion, for commissioning, spares and the like.

This structure allowed different audiences to easily find material of interest to them. For example supervisors, contract administrators, and installers would find content of interest in the Execution subsection.

It allowed descriptions for different forms of procurement to be prepared (for design-build, for example, the System performance subsection will be needed, but for construction with full-consultant design, it won’t). It enabled ‘horizontal’ reports across System sections (e.g. the Execution subsections reported together).

The inclusion of System and Product type clauses, and System performance, has major consequences for a BIM specification, though this was not recognised at the time. It allowed NBS Engineering Services to be used for build-only procurement, or for design-build procurement, or any mix of the two – it was procurement-neutral. It meant that pre-procurement design requirements could be recorded as the specification develops, even if the construction procurement specification is build-only. It was the beginning of the Uniclass 2015 object hierarchy, the redundancy of the work section concept, and implementation in a specification of the concept of composition or modelling.

Second, each System type clause in turn had a standard substructure (Table 1 shows this for fabric Systems), embedded in the Uniclass 2015 *Products* table:

- Sources.
- Distribution.
- Outlets.
- Controls.
- Accessories.

Third, all Systems sections had the word ‘systems’ in the title, to distinguish them from the Products sections (and, subsequently, from Elements).

4 Work sections

In 2006 CPI established a Uniclass Working Group, to deal with various proposals for change to Uniclass 1997, initially to support CAD layering and the Crossrail project – both needed a revised table for Elements. One of the CPI member institutions, RICS (Royal Institution of Chartered Surveyors), had begun the development of a new method of measurement to replace SMM7, but not using Uniclass 1997 Table G *Elements for buildings*. This became NRM 1 [15]. Change was afoot, at least to the classification of Elements.

The author was appointed to the Working Group, representing RIBA Enterprises, and proposed, first, a revised table for Work sections, arising from combining Uniclass 1997 Tables J and K *Work sections for civil engineering works*, and providing for process engineering – a single table for all sectors and disciplines. The revised table was to be extended to serve the entire project timeline, by providing homes for the description of Systems and Products, but also of buildings, facilities and districts (terminology has been changed in Uniclass 2015), and of soft FM (hard FM is provided for within each section). This proposal was seen as essential for the development of NBS Create [16, 17]. CPIc endorsed it in late 2011.

The coding was also revised, to provide the extra room needed. The capacity increased from 2400 sections, for Table J, to 8000 (with 20 items at each level, counting in fives, e.g. 00, 05, 10, 15 – an idea retained in part in Uniclass 2015).

In this proposal, all Products were located in two Product ‘supermarkets’, one Group (45) being reserved for fabric Products, and one (90) for services Products. Our experience with the ‘four degrees of separation’ showed that the business of assigning Products to Systems was fraught with difficulties. It is more neutral, and safer, to not classify Products as parts-of Systems. This is a surprisingly liberating idea, implemented more fully in Uniclass 2015.

The proposed Groups were:

- 00 Project management.
- 05 Districts, facilities and buildings.
- 10 Preparatory systems.
- 15 General structural systems.
- 20 Roof, floor and paving systems.
- 25 Wall and barrier systems.
- 30 Fixed access, tunnel, tower and vessel systems.
- 35 FF&E, signage and general finishing systems.
- 40 Flora and fauna systems.
- 45 Fabric, FF&E and landscape products.
- 50 Disposal systems.
- 55 Piped supply systems.
- 60 Heating, cooling and refrigeration systems.



- 65 Ventilation and air conditioning systems.
- 70 Electrical systems.
- 75 Communications, security, safety and protection systems.
- 80 Transport systems.
- 85 Process engineering systems.
- 90 Services and process engineering products.
- 95 Soft facility management.

Most of the Groups were for Systems, with higher-level object classes confined to just one Group (05). On the services side, the Groups align closely with those in Uniclass 1997, but the fabric side needed restructuring to accommodate the Systems concept. For example, Structural framing systems were introduced (in Group 15), and concrete was relocated to the fabric Product Group (45). Fabric System sections were restructured to allow for the description of new and old technologies, narrow-scope subcontracting (e.g. homes for type clauses for the different types of door Systems), procurement-neutrality, the pragmatic needs of procurement (e.g. splitting Stair systems into versions for architecture, landscape architecture and services engineering), consistent use of the Systems concept, alignment with Elements, and FM. These ideas all apply to Uniclass 2015.

The three-level structure of Table J was retained, and the idea that sections are always at the lowest level, an idea applied throughout Uniclass 2015.

Between 2006 and 2011, the ideas behind Group 00 had evolved from it being for construction Preliminaries (as in Uniclass 1997 Table J Group A), to having to serve the whole timeline, just like the rest of the classification system. Within this Group a basic restructuring was proposed in 2006, splitting the content into four parts. These requirements have since evolved and been implemented in the draft Uniclass 2015 *Project phases* and *Project management* tables.

The proposal also pointed out that Systems correspond to trades, effectively meaning that Systems sections, with their associated Product sections, replace traditional Work sections (in which Systems and Products are combined in the one section). Again, this was a hint that we would not also need Work sections.

5 Uniclass 1997

The author proposed, second, an overhaul of the whole of Uniclass 1997 [3]. CPIc endorsed this proposal, which was very welcome as without it NBS might have had to develop an equivalent to Uniclass 2015 unilaterally.

This proposal arose from a recognition, in the development of the proposals for the Work sections table, that Uniclass 1997 has a number of problems if one wants to use it for BIM, serving the entire timeline and all sectors. In spite of its subtitle, it was not ‘unified’.

We have seen the proposals to combine Tables J and K (*Work sections*), and Tables G and H (*Elements*). But the tables for other object classes don’t always achieve a comprehensive merge of architecture, civil and process engineering, either. All tables must do this.



Other than Table J and Table K *Work sections for civil engineering works*, the tables in Uniclass 1997 are numeric. Some go beyond the ‘limit of 10’ when it suits them, e.g. as in L-6-6-1-13-1 *Stained glass*, and some have just one level (e.g. Table K) but others might have anything between 3 and 6 levels – the object of interest is not at the same level throughout the table (e.g. Table D *Facilities*).

The tables do not align where they could – they are not ‘congruent’. For example Table J has Disposal systems in Group R and Transport systems in Group X, but Table G has Transport elements in Group 56 and Removal and disposal elements in Group 58 – different naming, coding and sequencing. Table G splits electric power and lighting into two Groups (53 and 54), but Table J combines them in one (Group V) – the bracketing is different. Though Table D combines three object classes in the one table – Complexes, Entities and Spaces – which is not helpful (they are split in Uniclass 2015) – at least they are congruent – all ‘administrative’ objects are in the same home (Group 3), for example. This good start has been extended in Uniclass 2015.

Some tables are more like sketches of possible approaches to classification, rather than a definitive classification for their object class. For example, table E is reasonably clear about civil entities, but for buildings it offers several alternatives within the one sub-Group – including by form, by relationship with adjoining buildings, and by special form of construction.

Some object classes are missing in Uniclass 1997, including Regions, Districts, Activities and Systems. Though Construction aids have a table (M), it does not include aids for design, documentation and maintenance.

There is no good reason for all these differences – they are just historical. It makes the tables difficult to use alongside each other, as they must be in BIM as we move through the timeline. Similar critiques have been made of CSI/CSC’s OmniClass [18–20] and of the classification behind NRM 1 [21]. Neither Uniclass 1997, nor these classification systems, are really fit for BIM, which is why a new classification system had to be developed.

One of the criticisms the author made at the time is invalid. Object granularity within tables in Uniclass 1997 can be inconsistent, e.g. in Table D we have both oil refineries (165 3) and signal boxes (116 1) at the lowest level. This was considered a fault, but Uniclass 2015 recognises that each object class must be scale-neutral – you can have very small Complexes, and very large ones too.

Uniclass 1997 has faced quite a bit of active competition in the UK – this is one reason that some tables are little used. For Elements, for example, RICS members use the NRM 1. For Products, CI/SfB [22] is used by RIBA Product Selector (alongside Uniclass Table J Groups), irrespective of the deficiencies identified in the Preface to Uniclass 1997.

BIM requires a single classification system to be used by all. Mapping between classification systems, while possible, is not helpful thanks to the inevitable many-to-many mappings and the like. This is why Uniclass 2015 is being implemented in a number of NBS products and services.



6 ISO 12006-2:2015

While all this activity was underway, ISO established a Working Group (ISO TC59/SC13/WG2) to revise ISO 12006-2:2001 [23]. The author was appointed to WG2 as UK expert, reporting to BSI committee B/555. Other members of WG2 were from Denmark (the convenors), Finland, Sweden, Norway and Japan. The first meeting was held in December 2011 and the last in October 2013. The revised standard, ISO 12006-2:2015, was published in May 2015.

The author's initial ideas on the subject explored five issues [24]:

- The standard does not offer a single definitive classification framework.
- The sequence of tables does not correlate well to the project sequence.
- A number of objects do not have tables at all.
- Some sectors are not represented in the examples.
- We do not need tables that classify objects by their composition.

The first was just a matter of careful editing, to ensure the same object class sequence was used throughout the new edition. The ISO's revised schema reflects this sequence, and matches the schema for Uniclass 2015.

The second has been dealt with similarly. Complexes followed Entities, but now they precede them, reflecting the ISO's schema. Uniclass 2015, however, has sidestepped the built-in sequencing of tables (dictated in Uniclass 1997 and in OmniClass) by giving each table a two-letter code corresponding to the section title, e.g. En for Entities. The tables can be listed in any order. The code is also informative, unlike 'table F', or 'table 23'.

The new object classes suggested haven't been implemented in the ISO, but some have been implemented in Uniclass 2015, even if only as 'planned' tables. The concept of 'designed Elements' has been dropped (all object classes move through the timeline from being non-, to partially, to fully designed).

Examples in the ISO have been extended to represent several sectors. This is reflected in the content of Uniclass 2015.

The last point is acknowledged in the ISO – the standard is about 'type-of' relationships (classification) rather than 'part-of' relationships (modelling). But Uniclass 2015 has a *Modelling* framework which standardises the mapping of high-level objects to low-level objects. This has been implemented, for Systems and Products, in NBS Create. This compositional view is a key to BIM.

One of the author's objectives on WG2 was to ensure that the Standard aligned with Uniclass 2015, and vice versa, as far as possible. But inevitably there are some differences. The major one is that the ISO has Elements with a recursion (to sub-Elements), but it doesn't have Systems, whereas Uniclass 2015 has both. The difference is a useful one for design and documentation – 'floor covering' is a sub-Element of the Element 'floor' (both are technically neutral), but 'Carpet tiling system' is a System (a technically specific implementation of 'floor covering', executed by a trade).

A BIM classification should align with ISO 12006-2:2015, if only because it would facilitate mapping between various complying national systems of

classification. For this reason alone, reiterated in the TSB brief, the UK needed a new classification system.

7 Developing Uniclass 2015

The author developed some basic principles for developing a genuinely unified edition of Uniclass, not all new [3]. All tables would cover buildings and landscape, and civil and process engineering. However, the initial drafts by NBS would just leave spaces for civil and process engineering objects, which were to be developed by others (this work has started).

All tables would use numeric coding below level 1. It was thought that coding for level 1 (table codes) may be numerical, but it has remained alphabetical. All level codes in all tables would be double-digit, from 00 to 99. Decimalization would not be used (though users might apply it, e.g. in project specifications).

All tables would have four levels, where possible, and five levels otherwise, from Table at the top, to Object at the bottom (this rule has not been adopted).

It was suggested that, for an application where it is obvious which table is being used, the first code could be dropped, the example being in a specification, which would use only the Work sections table. But, because this table has been withdrawn and because the timeline specification could describe objects of any class, all table codes will be needed. Even a manufacturer may make Products, Systems, Spaces or Entities, so will need to use the table codes.

All tables would set individual objects at the lowest level. Higher levels are for groups and subgroups of objects. It was thought that the Elements and Systems tables may include a lower level for ‘sub-objects’, i.e. sub-elements and subsystems. This has only been applied to Elements – this table is a special case as it includes both type-of (classification) and part-of (modelling): sub-Elements are parts of an Element.

Objects within a given table (i.e. at the lowest level) would have similar granularity, but Uniclass 2015 recognises that the classification of objects has to be scale-neutral.

Tables would be structured so that they align with each other, and their terminology revised so that it is consistent. If possible, coding would be matched across tables, though it was expected that this would only be possible in part. These ideas have been implemented in Uniclass 2015, but not the idea that the Work sections table would be pivotal for alignment between tables. It isn’t.

New tables would be created for missing object classes such as Activities (done). The tables were to be sequenced to reflect the project timeline, but this as noted this is not built-in to Uniclass 2015.

Each table would deliver just one, complete, approach to classification. In particular, function will be used as a unifying approach to the classification of higher level objects (from Regions down to Spaces, and to Fittings, furnishings and equipment (FF&E) systems – based on the Uniclass 1997 Table D), e.g. Agricultural regions, Agricultural districts, Agricultural facilities, Agricultural buildings, Agricultural activities, Agricultural spaces, and Agricultural FF&E systems. This has been done.



Finally, ideally the classification would align to the revised ISO 12006-2.

A key idea in this proposal was the use the Work sections table as an ‘armature’ for all the other tables. The class tables each drill down one more level than the corresponding part of the Work sections table, but the upper level codes and titles would be the same. It was thought that this would support mapping down the object class hierarchy, and allow just the Work sections table to be used. Uniclass tables defining composition would therefore not be needed (enabling all parent-child permutations for all objects is the job of project documentation libraries such as NBS Create). It was recognised that the outline clauses in the Work sections would deliver this. Uniclass 2015 has taken this idea and turned it into the *Modelling* framework – solving the problem in another way than the armature. There is actually no need for Uniclass 2015 to deal with all the permutations – the concern was wrong-headed.

8 Developing the section structure

The System section structure was revised [25] and then revised again for the launch of NBS Create, and comprised seven subsections [13]. Apart from a shift in terminology (some subsections are qualified with the word ‘System’, for example), the main difference is the addition of the (hard) FM subsection, recognising that the description of an object must serve the entire timeline:

- System outline.
- System performance.
- Products (held in Product sections, but presented here in the Systems view of NBS Create).
- Custom-made products.
- Execution.
- System completion.
- System facility management.

This structure might not seem to be anything to do with classification, but it shows that everything to do with a particular System (or object class) is intended to be in the one place in the BIM. This is not the case in North America, as can be seen from the content of OmniClass Table 22 *Work results*. For example, separate subgroups in Table 22 are used for operation and maintenance (subgroup 01) and commissioning (subgroup 08) of the various groups of Systems (e.g. ‘Thermal and moisture protection’), these topics not being in CSI/CSC’s three-part SectionFormat [26].

9 Publication and comment

Drafts of the first tranche of ten tables were posted online to the CPI website early in 2012, for comment. A description of the tables was published at around the same time [27]. The tables were as follows:



- WR: Work results, formerly called the Work sections table.
- WS: Work results subsections, now called *Modelling*.
- PP: Project phases.
- Co: Complexes.
- En: Entities.
- Ac: Activities
- Sp: Spaces.
- Ee: Elements.
- Ss: Systems.
- Pr: Products (easily the biggest table, and not published until later).

Comments made it clear that while some people just wanted to get on and use the tables (e.g. when will the tables be officially released?; can you help me map the codes to our asset management database?), others wanted to challenge the basic ideas (e.g. the Elements table does not classify elements; why bother seeking congruence?; why do we need a Products table?), and others engaged fully, accepting the tables in the spirit in which they were offered and offering useful comment (e.g. chiller batteries are not batteries; where are ceiling tiles?).

As always in this sort of exercise, some comments were implemented as made, some were set aside as poorly-informed (CPI/NBS workshops about Uniclass 2015 were held in London and Manchester in 2012 [28]), and others led to changes that addressed the problem in a way other than that suggested.

Comments on the Work results table made it clear that users were confused by having two tables with the same objects and similar codes in them, i.e. the Work results table, and the aligned table for the particular object class (e.g. Systems) [29]. The armature concept was difficult to explain. A given object surely needs only one code, especially when they are so similar? It was suggested by a colleague (Delany) that the Work results table was redundant, and that withdrawing it would make the whole concept of Uniclass 2015 clearer. It was realised that this was correct: all the object class tables can be used to structure descriptions of ‘work’ of some kind – a table specifically for this role is not needed (this broader concept of ‘work’ can also be found in ISO 12006-2:2015). And so Uniclass 2015 does not have a Work results table, perhaps alone among national classification systems, even though the revision of this table is where the whole process started [30].

This in turn removed a constraint on the number of levels that each other table could have, particularly for the high-level objects, which had all been confined to one Group in the Work results table. This had forced the classification in the Complexes and Entities tables to stop with too few levels, so that we had Transport interchanges, but not Railway stations (the next logical level down in the type hierarchy), for example. This had led to quite a bit of criticism, and has been remedied in Uniclass 2015 through the addition of an extra level in these tables. This could not have been done if the Work results table had been retained.

Doing away with the Work results table has allowed us to also do away with the concept of two Product supermarkets – we had found that Products cannot even be cleanly split between fabric and services.

The use of Uniclass 2015 for coordination (or integration, in a BIM environment) is different to that for Uniclass 1997, but is much simpler than the article describes, since the Work results table has been withdrawn. Systems will simply use the corresponding code from the Systems table, for example. This class code can be extended to deal with types (from the project specification) and instances (from the project geometry). The mapping from Elements to Systems that this article described is still correct, though the specific codes used in the example have changed.

10 TSB competition

At this point, CPI had been looking after the development of Uniclass 2015 for some time, but even though CPI had endorsed the project, not all CPI members were happy with it. CPI also faced some administrative difficulties, mostly to do with funding. Help was needed and came in the form of the UK Government's Technology Strategy Board (TSB), which acquired the rights to Uniclass from CPI, and offered £1 million in funding to the winner of a competition to develop a digital toolkit, including a classification system [31]. Three teams participated in the first phase (February to July 2014). The author was involved as part of the RIBA Enterprises-led team [29].

A question at this point was, if the RIBA Enterprises bid loses, what would be the future of Uniclass 2015? Fortunately this did not need to be addressed as this team, which proposed to develop Uniclass 2015 rather than any alternatives, won the contract, which was awarded in September 2014. This confidence in the classification system to support BIM was very welcome.

Indeed, the principles of Uniclass 2015 that particularly address BIM have led to a classification system unlike any other in the construction industry. As required in the competition brief, the classification system serves the entire project timeline, it is sector-neutral and discipline-neutral, it aligns with the ISO, it has a logical physical object hierarchy, it is dynamic, online and free, it is consistent between and within tables, it is relatively simple to use, and its objects can be mapped to synonyms and definitions [32].

The main changes to Uniclass 2015 during the contract period were ongoing development of the Products table, and addition of civil transport objects. The latter was a particular requirement in the TSB brief. Uniclass 2015 was officially published, as part of the NBS BIM Toolkit, in April 2015. Importantly, this is a 'public beta' version. It includes tables for just four object classes: Spaces, Elements, Systems and Products [33]. Table 2 shows the developmental timeline for each of the tables in Uniclass 2015.

This brings us to the present, but there is still much to do.



Table 2: The development of the Uniclass 2015 tables.

Table	ISO 12006-2:2015	Drafted 2011-2014	Online for comment 2012-2013	BS ISO 12006-2:2015 National Foreword	NBS BIM Toolkit website	Delay (33): next tables	Comment
Form of information	A.2 Construction information	-	-	Yes	-	Possible	
Agents	A.4 Construction agents						
Construction aids	A.5 Construction aids	-	-	Yes	-	Possible	
Project management	A.6 Management	Yes	-	Yes	-	Possible	Three options drafted
Project phases	A.7 Construction process	Yes	Yes	-	-	-	Can classify Plans of Work
Regions	-	Yes	-	-	-	-	
Districts	-	Yes	-	-	-	-	
Complexes	A.8 Construction complexes	Yes	Yes	Yes	-	-	
Entities	A.9 Construction entities	Yes	Yes	Yes	-	-	
Entities by form	-	Yes	Yes	-	-	-	Two options drafted
Activities	-	Yes	Yes	Yes	-	-	
Spaces	A.10 Built spaces	Yes	Yes	Yes	-	Yes	
Elements	A.11 Construction elements	Yes	Yes	Yes	-	Yes	Transport infrastructure incorporated
Systems	-	Yes	Yes	Yes	-	Yes	
Products	A.3 Construction products	Yes	Yes	Yes	-	Yes	
Work results	A.12 Work results	Yes	Yes	-	-	-	Withdrawn as redundant
Properties	A.13 Construction properties	-	-	Yes	-	Possible	
Modelling	-	Yes	Yes	-	-	-	



References

- [1] NBS Create, www.thenbs.com/products/nbsCreate/index.asp
- [2] CPI, *Uniclass: Unified classification for the construction industry*, RIBA Publications: London, 1997.
- [3] Gelder, J, 'Unifying Uniclass', November, 2011, online. www.thenbs.com/topics/practicemanagement/articles/unifyingUniclass.asp
- [4] CPI, www.cpic.org.uk/about-us/
- [5] RIBA Enterprises (formerly NBS Services), www.ribaenterprises.com/
- [6] NBS BIM Toolkit, www.thenbs.com/bimtoolkit/index.asp
- [7] CIS, www.ihs.com/products/uk-construction-information-service.html
- [8] RIBA Product Selector, www.thenbs.com/products/ribaProductSelector/index.asp
- [9] Gelder, J, *A review of the structure of NBS: Say it once, and in the right place*, NBS Services (unpublished), 2000.
- [10] NBS Building (formerly NBS Specification Manager), www.thenbs.com/products/nbsbuilding/
- [11] NES, www.amtech.co.uk/nbs
- [12] RICS, *SMM7: Standard Method of Measurement of building works*, 7th edition, RICS: London, 1998.
- [13] Gelder, J, 'Standard section structure revisited', January, 2012, online. www.thenbs.com/topics/DesignSpecification/articles/standardSectionStructureRevisited.asp
- [14] Gelder, J, 'NBS Engineering Services', *NBS Journal*, 03, pp. 5-6, 2003.
- [15] RICS, *NRM 1: Order of cost estimating and cost planning for capital building works*, RICS: London, 2012.
- [16] Gelder, J, 'Reclassification', *NBS Journal*, 08, pp. 8-9, 2006.
- [17] Gelder, J, 'The new Uniclass work sections table', *NBS Journal*, 19, pp. 9-10, 2011.
- [18] OmniClass, www.omniclass.org/
- [19] Gelder, J, 'OmniClass™ Work Results: a critique', May, 2013, online. www.thenbs.com/topics/PracticeManagement/articles/OmniClassWorkResults.asp
- [20] Gelder, J, 'OmniClass™: a critique', May, 2013, online. www.thenbs.com/topics/PracticeManagement/articles/OmniClassCritique.asp
- [21] Gelder, J, 'NRM1 classification: a critique', May, 2014, online. www.thenbs.com/topics/PracticeManagement/articles/nrm1-classification_a-critique.asp
- [22] Ray-Jones, A and Clegg, D, *CI/SfB Construction indexing manual 1976*, RIBA Publications: London, 1991.
- [23] *BS ISO 12006-2:2015 Building construction – Organization of information about construction works – Framework for classification*, BSI: London, 2015.

- [24] Gelder, J, 'Some thoughts on ISO 12006-2', *ICIS Newsletter*, August, pp. 2-6, 2011.
- [25] Gelder, J, 'Standard section structure', *NBS Journal*, 09, pp. 3-4, 2006.
- [26] CSI/CSC SectionFormat, <http://csinet.org/Home-Page-Category/Formats/SectionPageFormat.aspx>
- [27] Gelder, J, 'Ten tables in Uniclass 2', *NBS Journal*, 20, pp. 16-17, 2012.
- [28] Gelder, J, Delany, S and Chalmers, S, 'Developments in construction classification', February, 2012, online. www.thenbs.com/topics/PracticeManagement/articles/developmentsInConstructionClassification.asp
- [29] Gelder, J, 'Uniclass2: An update', May, 2014, online. www.thenbs.com/topics/PracticeManagement/articles/uniclass2-an-update.asp
- [30] Gelder, J, 'Using Uniclass2', *NBS Journal*, 21, pp. 13-14, 2012.
- [31] SBRI and TSB, *SBRI/TSB 189-010: Functional specification: A digital tool for building information modelling*, SBRI: London, 2014.
- [32] Gelder, J, 'The principles of a classification system for BIM: Uniclass 2015', *Proceedings of the 49th International Conference of the Architectural Science Association*, 2-4 December 2015, Melbourne, 2015 (forthcoming).
- [33] Delany, S, 'Classification', April, 2015, online. <https://toolkit.thenbs.com/articles/classification>

