

Livrable

Methodology to feed bSDD with a new Data Dictionary

Auteurs/Organismes

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I. ABSTRACT/RÉSUMÉ

Abstract

This document:

- Presents the method used to add concepts of any domain into the buildingSMART Data Dictionary (bSDD).
- Shows the work on the data dictionary with the concepts related to the bridge domain added in the bSDD.
- Aims to be used as a guide to manage a data dictionary by avoiding mistakes and loss of time.

Résumé

Ce document :

- Présente la méthode utilisée pour ajouter des concepts de n'importe quel domaine dans le dictionnaire de données buildingSMART (bSDD).
- Il présente le travail sur le dictionnaire de données avec les concepts liés au domaine des ouvrages d'art ajoutés au bSDD.
- Vise à être utilisé comme guide pour gérer un dictionnaire de données en évitant les erreurs et la perte de temps.

2. INTRODUCTION

Complete a data dictionary...

The purpose of a dictionary is to:

- Be clear.
- Avoid confusion.

BuildingSMART, an international organisation in charge of IFC development and promoting BIM, developed the platform 'bsdd.buildingsmart.org'.

This platform allows you to complete a data dictionary in a formal way.

... following several steps

Several steps must be followed to add concepts in the bSDD. They are described in this document. These steps are:

1. The understanding of the utility and the notions of a data dictionary.
2. The understanding of what the bSDD is.
3. The work on an Excel spreadsheet.
4. The transfer of the concepts from the Excel spreadsheet to the bSDD.

3. NOTIONS OF THE BUILDINGSMART DATA DICTIONARY

3.1. Elementary notions

FNOR's experimental standard XP P07-150

All the notions appearing in a data dictionary are described in the AFNOR's experimental standard XP P07-150. This standard aims to harmonise concepts related to the construction. The bSDD, and the steps before adding the concepts, includes these notions.

Dictionary

A dictionary is an informatic system storing concepts (properties and group of properties). To manage those concepts, a dictionary possesses a functionality.

Property

A property is any data related to the description of a product or a system.

Attributes

An attribute is a characteristic of a concept. The following notions are attributes.

Attributes

Unique identifier

Each concept has a Global Unique Identifier (GUID). The GUID assures bSDD users that different concepts do not share the same identifier.

Name

Name of the concept in English and at least in another language.

Description

Character string describing the concept in English and at least in another language.

Visual representation

Picture of the concept. It can be:

- A photograph.
- A schema.

Hierarchical link

Indicates the relationships between the concepts. It is the main difference between a dictionary and a data dictionary. Refers to two attributes: the parent group and the child group.

Group kind

Indicates the nature of the concepts. It can be:

- A subject which is any physical or logical thing.
- A nest which is a collection with the same type.
- A property which is any characteristic of an object or substance.

Table in the right-hand column shows hierarchical linked concepts and their group kind.


A concept positioned above another one is viewed as its 'parent'.


Property	Group Kind
Bridge substructure	Subject
Pier column	Subject
Pier column dimensions	Nest
Pier column diameter	Property


Example of concepts with hierarchical links and their group kind


3.2. bSDD presentation


<p>Interface</p> <p>Websites related to the bSDD</p> <p>Search menu</p> <p>Sign up/in</p> <p>One concept per page</p>	<p>The bSDD is a formal data dictionary. The interest of the bSDD is its openness and international aspect. Besides, its automatic rule checking prevents</p> <ul style="list-style-type: none"> • Miscommunication. • Data duplication. <p>The final aim is to create the data dictionary on an international tool in order to reinforce the visibility and credibility of the work.</p> <p>Two websites are related to the bSDD:</p> <table border="1"> <thead> <tr> <th colspan="2">Websites</th> </tr> </thead> <tbody> <tr> <td>http://test.bsdd.buildingsmart.org/</td> <td>Data dictionary sandbox. A non-formal bSDD allows you to test your working. It has the same functionality as the formal one.</td> </tr> <tr> <td>http://bsdd.buildingsmart.org/</td> <td>Formal bSDD.</td> </tr> </tbody> </table> <p>You can navigate through these two platforms and read the content using the 'Search' menu.</p> <p>To complete the bSDD, you need to create an account in the 'sign up' section. Once this is done, you can sign in to modify the content by adding concepts and hierarchical links.</p> <p>As seen below, each page presents one concept and contains the following information:</p> <ul style="list-style-type: none"> • Name. • Representation. • Hierarchical links to the other concepts. • Definition. • Type. 	Websites		http://test.bsdd.buildingsmart.org/	Data dictionary sandbox. A non-formal bSDD allows you to test your working. It has the same functionality as the formal one.	http://bsdd.buildingsmart.org/	Formal bSDD.
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http://bsdd.buildingsmart.org/	Formal bSDD.						





 **Pier column**
Cylindrical part or central part of a pier

 **Fût de pile**
Partie cylindrique ou partie centrale d'une pile











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
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 [Add comments...](#)

has members

-  [Properties](#) 
Bridge
-  [Location](#) 
Bridge
-  [Support condition](#) 
Bridge
-  [material](#) 
Bridge
-  [Dimensions](#) 
Bridge


is collection for

-  [Bridge substructure](#) 
Bridge

A concept with its hierarchical links as it appears in the bSDD

3.2 bSDD presentation

Organisation	<p>Before adding new terms, you need to know how the bSDD is organized and must be filled. The aim is to automatically transfer the concepts to the bSDD. Consequently, you must know exactly:</p> <ul style="list-style-type: none"> • The steps to add a concept. • The required information of each concept. 						
Guidelines	<p>BuildingSMART helps you in this procedure thanks to guidelines.</p> <div style="background-color: #333; color: white; padding: 2px;">bSDD Content Guidelines</div> <p>https://docs.google.com/document/d/1YUir07A27IK0UB8ImYoaoLKCUvh1QFG1FfcwLOYdP0</p>						
Mirror copy	<p>BuildingSMART has created a mirror copy of the dictionary for tests. The aim of this copy is:</p> <ul style="list-style-type: none"> • To discover the platform. • To learn how it reacts. 						
Add a concept	<p>▼ Steps</p> <p>To add a concept, follow these steps:</p> <div style="background-color: #333; color: white; padding: 2px;">Steps</div> <table border="1"> <tr> <td style="text-align: center;">1.</td> <td>Key in the name of the concept in English and at least in another language. The bSDD then looks for a duplicate of the concept just entered. If it is a new concept, then go on to the third step. Otherwise, follow the second step.</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Check if the existing concept describes the same concept. If not, you need to create a new one.</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Choose a concept type among the following ones (see figure below). The type of the concept depends on: <ul style="list-style-type: none"> • Its nature. • Its hierarchical level. <p>A description of the concept is required at least in English.</p> </td> </tr> </table>	1.	Key in the name of the concept in English and at least in another language. The bSDD then looks for a duplicate of the concept just entered. If it is a new concept, then go on to the third step. Otherwise, follow the second step.	2.	Check if the existing concept describes the same concept. If not, you need to create a new one.	3.	Choose a concept type among the following ones (see figure below). The type of the concept depends on: <ul style="list-style-type: none"> • Its nature. • Its hierarchical level. <p>A description of the concept is required at least in English.</p>
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bag	nest	subject	property	measure	value	units	document	classification	actor	activity

bSDD types and their symbol

	<p>▼ Descriptions</p> <p>The description of each concept is included in the document 'Content guidelines'.</p> <p>▼ Creation and inclusion in the bSDD</p> <p>The concept is created and included in the bSDD.</p> <p>▼ Add a picture</p> <p>Once the concept is created, it is possible to add a picture of the concept.</p>
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3.2 bSDD presentation

Hierarchy links between concepts

Add hierarchical relationships

Create the appropriate context to link concepts

Type of concept

Possible relationships between concepts

Example

Another important aspect of the bSDD is the hierarchical links between the concepts that appear under the definition of a concept.

To add hierarchical relationships, you must select the context thanks to the 'working context' that appear when logged in. You may need to create a new context.

Example

The context 'Bridge' was created to add concepts related to that domain. Håvard Bell is a member of Catenda. He can create contexts if you contact him: havard.bell@catenda.no.

It is a good choice to create the appropriate context to link the concepts between each other because:

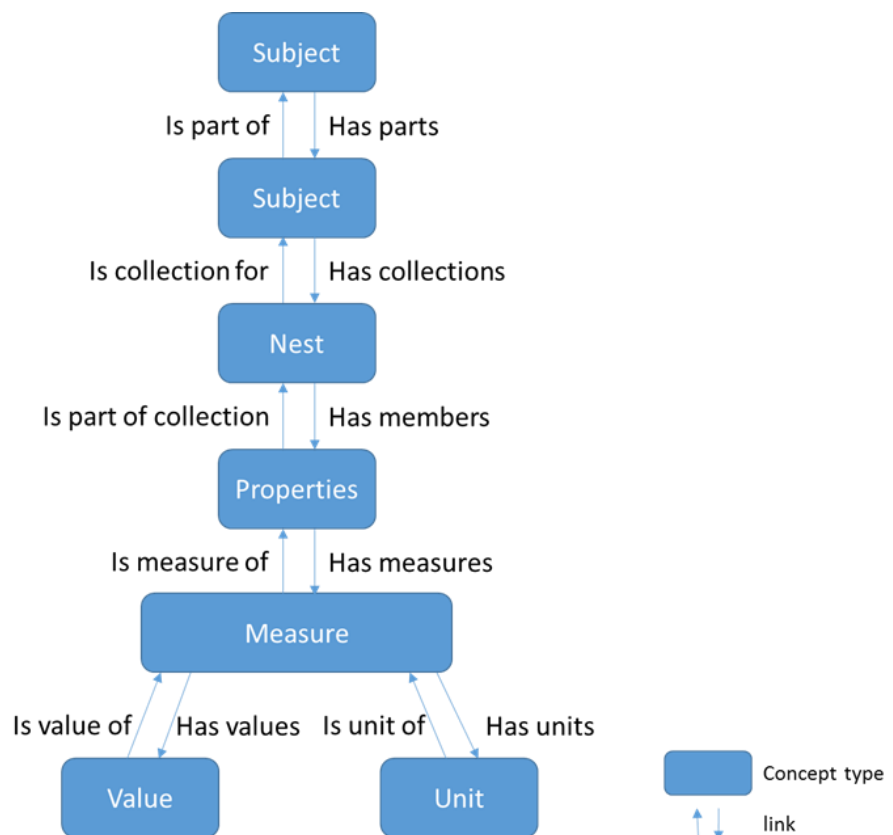
- The connection between concepts depends on the context. The aim of a context is to create links specifically to it.
- The definition of each concept is closely linked to the context.

The type of concept depends on:

- Its nature.
- Its hierarchical level.

The 'content guidelines' document provides a table with the possible relationships between concepts.

The figure below illustrates one example of hierarchy of concepts in a data dictionary. This structure is used for the bridge domain. If more hierarchical levels are needed, you can add 'subject' layers.



Concept types and links used in the data dictionary spreadsheet

3.2 bSDD presentation | Hierarchy links between concepts

Add a link of a concept

Once a context is selected, you can add a link of a concept from its own page following these steps:

Steps

1.	Click on tools/add relationships. A menu appears under the concept.
2.	Choose in this menu the kind of the relationship and the target concept using the search field.
3.	Select the link of the appropriate concept among the list of possible target concepts.

Additional comments

If you need advice, you can contact Håvard Bell: havard.bell@catenda.no.

This test phase was conducted with exchanges with the buildingSMART experts who provided us several points of advice.

4. DATA DICTIONARY IN EXCEL SPREADSHEET FORMAT

Creation of an Excel spreadsheet...

... consistent with the bSDD...

... and composed of five sheets

Once you are familiarised with the bSDD, you can create your own data dictionary using an Excel spreadsheet.

Learning the working of the bSDD makes the creation of the spreadsheet easier. Thus, the spreadsheet needs to be consistent with the bSDD.

The spreadsheet includes the five following sheets:

- Hierarchical links.
- Values.
- Units.
- Measures
- Dictionary.

'Hierarchical links' sheet

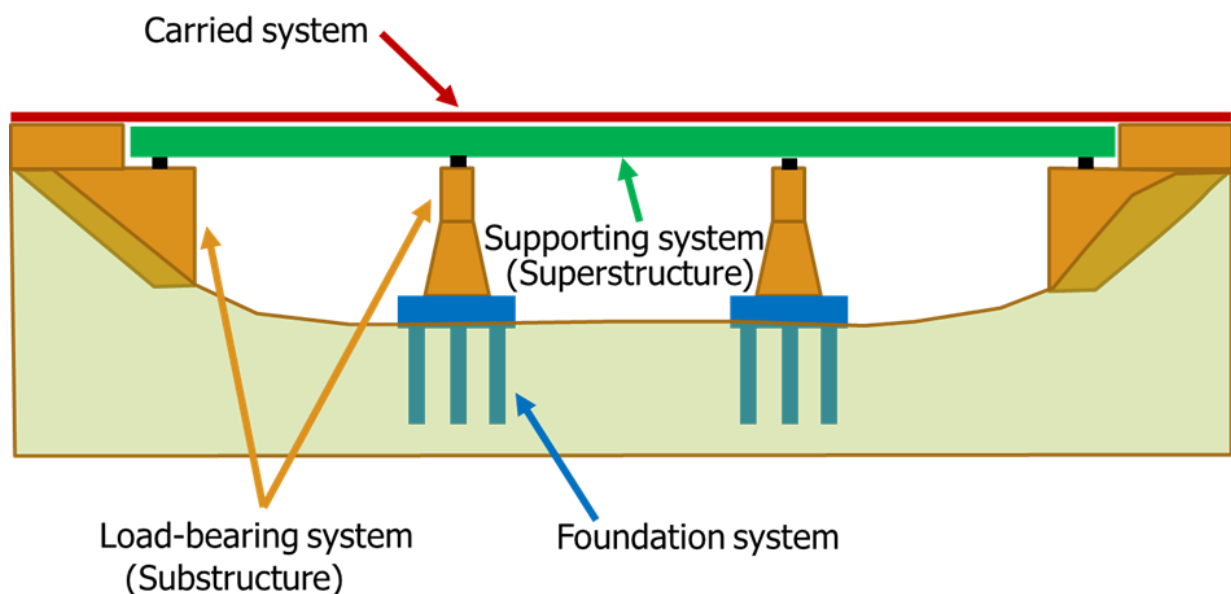
Creation of a hierarchical list

Division of structural concepts into systems

The first work is to create a hierarchical list of the concepts of the related domain (in the 'hierarchical links' sheets). This list includes the hierarchical level from 'subject' to 'properties'. The measure, values and units are treated later. This list includes:

- Geometry concepts.
- Manufacturing concepts.
- Structural concepts.
- Administrative concepts.

The structural concepts are divided into systems. Those systems are divided into several subsystems. For example, a bridge may be separated into systems as shown below.



Bridge with its major systems

Inclusion of duplicates

Example of 'hierarchical links'

This hierarchical list certainly includes several duplicates. Indeed, some characteristics are common to several parent concepts.

Example

The concept 'Web thickness' is the same property for a steel I shape than a steel channel shape.

The table below shows the shape of the 'hierarchical links' sheet with bridge terms as an example. There may be more 'subject' columns.

Subject	Subject	Nest	Properties
Bridge superstructure	Steel girder	Top flange properties	Top flange plate length
			Piece mark
			Shipping mark
			Set-back dimension
			CVN testing indicator
			Fracture Critical Material indicator
		Bottom flange properties	Bottom flange plate thickness
			Bottom flange plate width
			Bottom flange plate length
			Piece mark
			Shipping mark
			Set-back dimension
		Web properties	Web plate thickness
			Web plate depth
	Web plate length		
	Piece mark		
	Shipping mark		
	Set-back dimension		
	Web camber	Top line dimension (TL)	
		Bottom line dimension (BL)	
		Left end cut (LE)	
	Bill information	Right end cut (RE)	
		Camber ordinate	
Bearing	Haunch of girder properties	Page number	
		Line number	
	Bearing layout	Haunch at supports	
		Haunch length	
		Number of bearing	
	Bearing properties	Spacing	
		Distance from centerline of bearing to centerline of Centerline of bearing offset from HCL	
		Bearing type	
		Bearing station	
		Bearing bottom elevation	
Authorised translations			
Elastomeric bearing properties	Authorised rotations		
	Elastomeric bearing type		
	Elastomeric bearing shape		
	Elastomeric pad diameter		
	Elastomeric pad width		
Elastomeric pad height			
Elastomeric pad length			
Elastomeric pad material designation			

Extract of the 'hierarchical links' sheet for the bridge domain

Comprehensibility

You need to be as comprehensive as possible in order to facilitate the work.

Values, units and measures sheets**Values and units**

Once the hierarchy is established, you need basic elements to make the data dictionary. Therefore, values, units and measures sheets must be completed.

Each 'values' and 'units' sheet has five columns:

- GUID.
- English name.
- English description.
- French name.
- French description.

Each line is a unique value or unit. No duplicates must appear. All the values and units used in the dictionary must be registered here. The GUID is automatically completed during the transfer to the bSDD. That column must be left empty. The other columns are compulsory. Figures below illustrate these sheets.

GUID	English name	English description	French name	French description
	String	String	Chaîne de caractères	Chaîne de caractères
	Integer	Integer	Entier	Entier
	Logical	Boolean value	Logique	Valeur booléenne
	Real	Real	Réel	Réel
	Time	Date and time	Date et heure	Date et heure

GUID	English name	English description	French name	French description
	Degree	Degree	Degrés	Degrés
	Gradians	Gradians	Grades	Grades
	Meter	m	Mètre	m
	Meter per second	m/s	Mètre par seconde	m/s
	Vehicle per day	/d	Véhicules par jour	/j
	Dollar	\$	Dollar	\$
	Kilonewton metre per radian	kN.m/rad	Kilonewton mètre par radian	kN.m/rad

Extract of the 'values' sheet (left) and the 'units' sheet (right) used for the bridge domain

Measures

The 'measures' sheet gathers all the measures that are used in the dictionary. This sheet needs two more columns: 'value' and 'unit'.

Those columns are related to the values and units of the measure that are the child concepts. Creating a drop-down list in these columns from the concept of the 'units' and 'value' sheets is a good way to ensure the consistency of these columns. The figure below illustrates the 'measure' sheet.

GUID	English name	English description	French name	French description	Value	Unit
	Name or ident	String that defines the property	Nom ou identifiant	Chaîne de caractères définissant la propriété	String	
	Numerical value	Numerical value without any unit	Valeur numérique	Valeur numérique sans unité	String	
	State of the element	State that defines if the property is true or false	Etat de l'élément	Etat de l'élément qui définit si la propriété est vraie ou fausse	Logical	
	Angle in degrees	Part of plan defined by two half-lines, expressed in degrees	Angle en degrés	Portion de plan délimitée par deux demi-droites, exprimée en degrés	Real	Degree
	Angle in gradians	Part of plan defined by two half-lines, expressed in gradians	Angle en grades	Portion de plan délimitée par deux demi-droites, exprimée en grades	Real	Gradians

Extract of the 'measures' sheet used for the bridge domain

Dictionary sheet

You now have all the 'tools' to create the 'dictionary' sheet. This sheet registers the concepts' attributes.

Attributes

The dictionary sheet is composed of seven attributes (eight, including the picture):

- GUID.
- English description.
- French description.
- Group kind.
- English name.
- French name.
- Picture.
- Measure.

Below are rules and guidelines concerning the attributes of the dictionary sheet.

Rules and guidelines

All the attributes are compulsory except for the picture.

Measure is compulsory for the concept with the 'property' hierarchical level only. The other concepts are indeed groups of properties.

Headings may be frozen to facilitate navigation in the data dictionary.

Each line of this sheet is a concept that can be found in the 'hierarchical links' sheet.

Each concept must only appear once.

Each concept of the hierarchical list must be in the dictionary without any duplicate.

Concepts are added in the dictionary from the hierarchy:

- From the left to the right.
- From the top to the bottom.

If the concept has already been added in the case of a duplicate, then do not consider this duplicate.

In order to facilitate this process, it is highly recommended to use an Excel macro. Indeed, in case there are changes in the hierarchy, using a program facilitates the rewriting of the dictionary.

Names and descriptions

The description describes in English and French:

- The concept.
- The data appearing on the picture whenever there is a picture.

It does not consist in a copy paste of the name.

Picture

Although the picture is optional, it must be filled in whenever possible. Abbreviations, distances or characteristics may appear on the photograph or the schema if the description is used as a caption.

The picture is inserted as a hyperlink with a relative path to the directory in which the spreadsheet is saved. The jpeg pictures are saved there.

Group kind

Depending on its hierarchical link, the group kind of a concept is:

- 'Subject.'
- 'Nest.'
- 'Property.'

Measures

This column indicates the measures of the concepts. It could be, for example:

- 'Name or ident.'
- 'Angle in degrees.'
- 'Length.'
- 'Numerical value.'
- 'Angle in radians.'
- Etc.
- 'State of the element.'
- 'Linear distance.'

A good way to fill this attribute is to create a drop-down list in this column from the concept of the 'measures' sheet.

Figures below illustrate the 'dictionary' sheet for the bridge domain with the relative extract of the hierarchical links.

GUID	English name	English description	French name	French description	Picture	Group kind	Measure
	Roadway structure	Data set for roadway structure definition	Structure Chaussée	Groupe d'informations représentant la structure de la chaussée		Subject	
	Approach slabs	Data set for approach slabs definition	Dalle de transition	Groupe d'éléments représentant une dalle de transition		Subject	
	Approach slabs location	Data set for the approach slab location	Localisation Dalle de Transition	Groupe d'informations pour la localisation de la dalle de transition		Nest	
	Station at approach slab begins	Station at approach slab begins	Point Début Dalle de transition	Point Début Dalle de transition		Properties	Name or ident
	Station at approach slab ends	Station at approach slab ends	Point Fin Dalle de transition	Point Fin Dalle de transition		Properties	Name or ident
	Skew angle at approach slab begins	Skew angle at approach slab begins	Angle biais Début Dalle de transition	Angle biais Début Dalle de transition		Properties	Angle
	Skew angle at approach slab ends	Skew angle at approach slab ends	Angle biais Fin Dalle de transition	Angle biais Fin Dalle de transition		Properties	Angle
	Approach slabs dimensions	Data set for the approach slab dimensions	Dimensions de la dalle de transition	Groupe d'informations des dimensions de la dalle de transition	Approach_slab.jpg	Nest	
	Slab Cross section name	Slab Cross section name	Nom du profil en travers de la dalle de transition	Nom du profil en travers de la dalle de transition		Properties	Name or ident
	Slab effective thickness	Slab effective thickness	Epaisseur réelle de la dalle de transition	Epaisseur réelle de la dalle de transition	Approach_slab.jpg	Properties	Length
	Slab sacrificial thickness	Slab sacrificial thickness	Epaisseur de la dalle perdue	Epaisseur de la dalle perdue	Approach_slab.jpg	Properties	Length

Subject	Subject	Nest	Property
Roadway structure	Approach slabs	Approach slabs location	Station at approach slab begins
			Station at approach slab ends
			Skew angle at approach slab begins
			Skew angle at approach slab ends
		Approach slabs dimensions	Slab Cross section name
			Slab effective thickness
			Slab sacrificial thickness
		Material	Material designation
		Protective sealant	Sealant type
			Sealant thickness

Extract of the 'dictionary' sheet used for the bridge domain (top table) and its related 'hierarchical links' sheet (lower table). The gray lines in the 'dictionary' sheets are a group of properties. This colour makes the sheet clearer.

Completion of the data dictionary spreadsheet

Once the data dictionary spreadsheet is completed, **the next step is using the bSDD module.**

5. USING THE bSDD MODULE

Transfer concepts from a spreadsheet to the bSDD...

... using a Google spreadsheet module...

... and following several steps

Address

Catenda provided a tool to transfer concepts from a spreadsheet to the bSDD. The tool is a module of a Google spreadsheet. The address of the Google spreadsheet is:

Address

https://docs.google.com/spreadsheets/d/1HdngJfleyNsmYCYMrwCsOqrizP46cRbvstp6Mo6_UoY

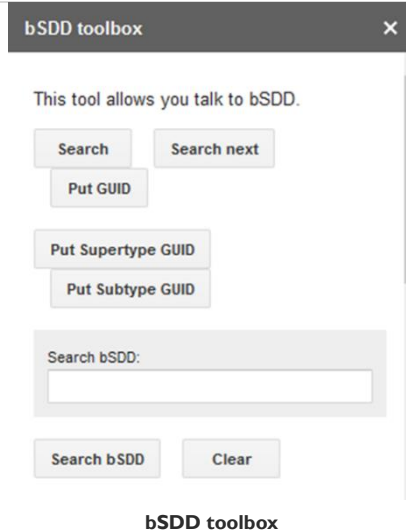
Terms and conditions

To join the Google spreadsheet, you need:

- A Google address.
- An authorisation from Håvard Bell (Catenda). The first time you try to connect to the Google sheet, an authorisation request is sent to Håvard Bell. You need to send him an email (havard.bell@catenda.no) explaining why you need to join the Google sheet.

The table below describes the steps to follow in order to transfer concepts from a spreadsheet to the bSDD. To follow these steps, you need to first have access to the module.

Step	Description
1.	Copy paste the Excel spreadsheet in the Google spreadsheet with all the sheets.
2.	<p>Click on Add-ons/bSDD/Show sidebar.</p> <p>The bSDD toolbox appears. The latter includes three sections:</p> <ul style="list-style-type: none"> • A verification of the GUID. • Transfer commands. • A bSDD connection. <p>The shape of the bSDD toolbox can be seen in the right-hand column. It may be a little bit different if Catenda made modifications.</p>



Step	Description
3.	<p>Verify the GUID for each concept, including 'measures', 'values' and 'units'. This verification aims to avoid having duplicates in the bSDD. To do this verification, you need to:</p> <ul style="list-style-type: none"> • Select the English name of a concept. • Click on the 'Search' button. The module looks for this concept in the bSDD. If some concepts in the bSDD include this string character, then they appear in the sidebar. • Choose the matching concept. • Click on 'put GUID'. The GUID of the concept in the bSDD is imported in the Google sheet. Consequently, that concept is not uploaded to the bSDD during the transfer. <p>If there is no matching concept, use the field 'Search bSDD' to look for a concept which can match but with another character string.</p> <p>Example</p> <p>'Names' and 'Name' can match. You can key in a character string in the field and then click on the 'Search bSDD' button. In this way, some concept of the bSDD may appear in the toolbox.</p> <p>If there is still no matching concept, then:</p> <ul style="list-style-type: none"> • It is a new concept that will be imported later. • The GUID column is left empty.
4.	<p>Connect to the bSDD with the same connection identifier as on the bSDD website. Once connected, the upload button can be used to upload the concepts to the bSDD. However, before clicking on the upload button, you need to:</p> <ul style="list-style-type: none"> • Warn Håvard Bell (havard.bell@catenda.no) that the data dictionary is ready. • Send the Excel version with the pictures. <p>In this way, Catenda can:</p> <ul style="list-style-type: none"> • Check the dictionary. • Insert the pictures in the bSDD after the transfer.

Add new concepts from an already existing domain

Three solutions allow you to add concepts into the bSDD:

Solutions

Work on a dedicated sheet in the Excel spreadsheet.

This solution is very similar to what has been described previously:

- New concepts appear in a 'Dictionary' sheet and are linked to measures, values and units.
- The 'hierarchical links' sheet brings order between them.

When the parent concept is already in the bSDD, it must appear in the dictionary and in the hierarchy. This solution is best suited for the implementation of concepts for an entire system.

Work on the 'hierarchical links' and 'dictionary' sheets.

This solution is best suited for the implementation of few concepts:

- With hierarchical links.
- When there are already concepts in the bSDD.

The hierarchical links must be corrected. The concepts must be added to the dictionary thanks to the macro or manually (concepts 'name must really match).

Work directly on the bSDD

This solution is best suited when you only have a few items to add.

For each of these solutions, the attributes and hierarchical links with the concepts are necessary. For the first two solutions, the transfer to the bSDD is done with the bSDD module.

6. CONCLUSION

Summary

To add concepts of a new entire domain in the bSDD, carefully follow these steps:

Step	Action
1.	Create identifiers to connect to the bSDD.
2.	Study how it works by: <ul style="list-style-type: none"> • Reading the content guidelines: (https://docs.google.com/document/d/1YUiR07A27IK0UB8ImYoaoLKCUvh1QFG1FfcwvLOYdP0). • Adding few concepts with their hierarchical links in the bSDD sand box: (http://test.bsdd.buildingsmart.org/).
3.	Create the bSDD Excel spreadsheet by completing: <ul style="list-style-type: none"> • The 'Hierarchical links' sheet. • The 'values' and 'Units' sheets. • The 'Measures' sheet. • The 'Dictionary sheet' thanks to a macro command to import the concepts from the 'hierarchical links' sheet.
4.	Copy paste the previous sheets to the Google sheet data dictionary: (https://docs.google.com/spreadsheets/d/1HdngJfleyNsmYCyMrwCsOqrizP46cRbvstp6Mo6_UoY).
5.	Use the bSDD toolbox to make sure there are no duplicates in the bSDD.
6.	Transfer the concepts to the bSDD using the button appearing after logged in.

Cautions

Be careful:

- Not to create duplicates in the bSDD.
- To use the same character string in the Excel spreadsheet between:
 - The 'Dictionary' sheet.
 - The 'Hierarchical links' sheet.