



Reference Designation Systems

It's all about creating a common language™

INCOSE Webinar

2017-03-15

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AGENDA

1. RDS & SYSTEMS ENGINEERING
2. RDS FUNDAMENTALS
3. RDS EXAMPLES

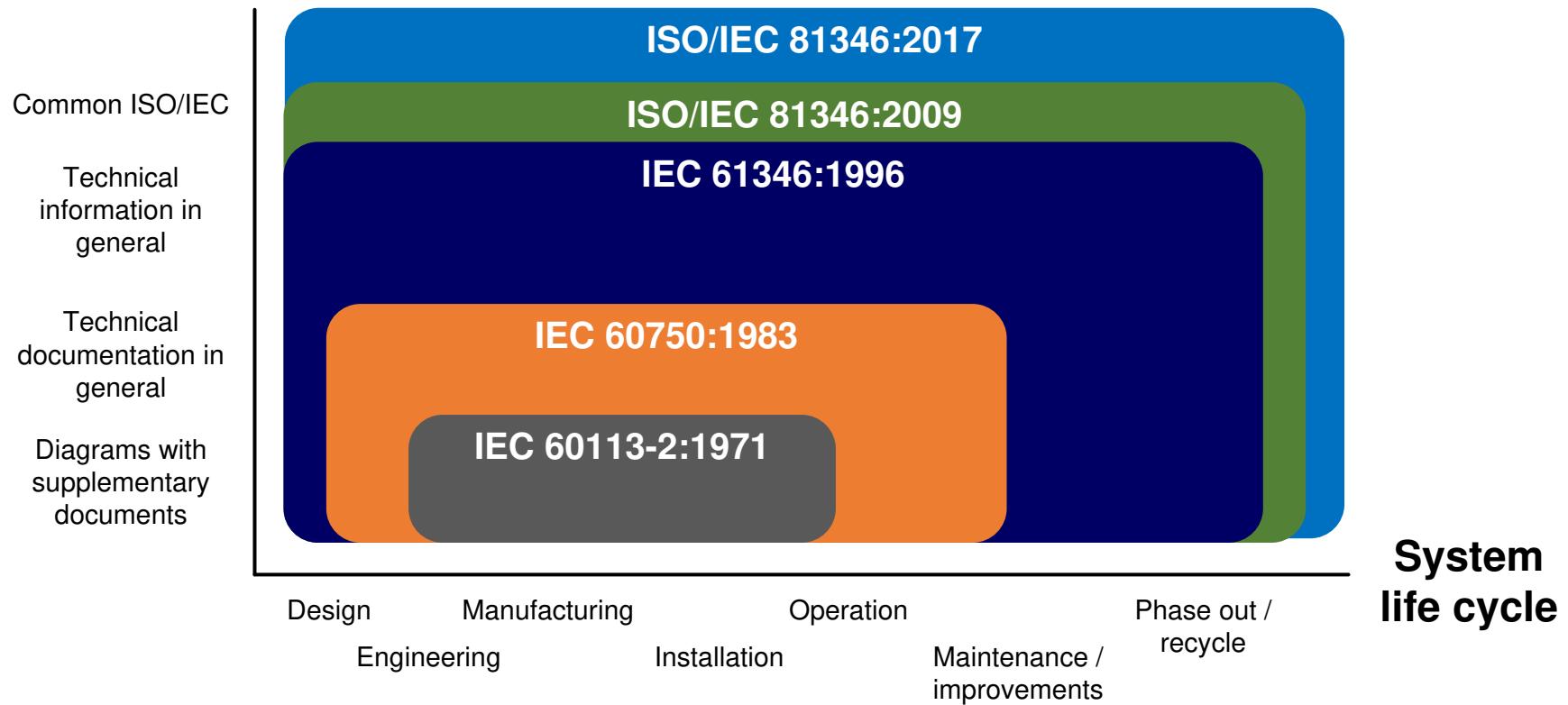


1. RDS AND SYSTEMS ENGINEERING

The ISO/IEC 81346 series

Industrial systems, installations and equipment and industrial products

Application domain



The ISO/IEC 81346 series

Industrial systems, installations and equipment and industrial products

RDS

RefERENCE DESIGNATION SYSTEM



International principles



Not stakeholder specific



IT compatible



Scalable for small and large projects



Life-cycle stable code



Easy to understand and implement

The ISO/IEC 81346 series

Industrial systems, installations and equipment and industrial products

RDS is a **common naming convention** for systems and their elements

RDS is a **system of its own** which is used to **designate systems** and their elements

The output from RDS is a **reference designation**, also known as a TAG number



Part 1+2:

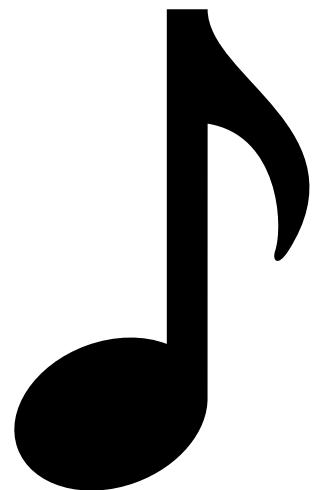
Fundamental rules

Part 10+12:

Industry specific applications

The mission

a common language





RDS and ISO/IEC/IEEE 15288

Technical processes



Business or mission analysis process	<input type="button" value="OFF"/>
Stakeholder requirements definition process	<input type="button" value="OFF"/>
System requirements definition process	<input type="button" value="OFF"/>
Architecture definition process	<input type="button" value="OFF"/>
Design definition process	<input type="button" value="OFF"/>
System analysis process	<input type="button" value="OFF"/>
Implementation process	<input type="button" value="OFF"/>
Integration process	<input type="button" value="OFF"/>
Verification process	<input type="button" value="OFF"/>
Transition process	<input type="button" value="OFF"/>
Validation process	<input type="button" value="OFF"/>
Operation process	<input type="button" value="OFF"/>
Maintenance process	<input type="button" value="OFF"/>
Disposal process	<input type="button" value="OFF"/>

Technical management processes



Project planning process	<input type="button" value="OFF"/>
Project assessment and control process	<input type="button" value="OFF"/>
Decision management process	<input type="button" value="OFF"/>
Risk management process	<input type="button" value="OFF"/>
Configuration management	<input type="button" value="OFF"/>
Information management process	<input type="button" value="OFF"/>
Measurement process	<input type="button" value="OFF"/>
Quality assurance process	<input type="button" value="OFF"/>

Organisational project-enabling processes



Life cycle model management process	<input type="button" value="OFF"/>
Infrastructure management process	<input type="button" value="OFF"/>
Portfolio management process	<input type="button" value="OFF"/>
Human resources management process	<input type="button" value="OFF"/>
Quality management process	<input type="button" value="OFF"/>
Knowledge management process	<input type="button" value="OFF"/>

Agreement processes



Acquisition process	<input type="button" value="OFF"/>
Supply process	<input type="button" value="OFF"/>

RDS and ISO/IEC/IEEE 15288

Technical processes



- Business or mission analysis process
- Stakeholder requirements definition process
- System requirements definition process
- Architecture definition process
- Design definition process
- System analysis process
- Implementation process
- Integration process
- Verification process
- Transition process
- Validation process
- Operation process
- Maintenance process
- Disposal process

Technical management processes



- Project planning process
- Project assessment and control process
- Decision management process
- Risk management process
- Configuration management
- Information management process
- Measurement process
- Quality assurance process

Organisational project-enabling processes



- Life cycle model management process
- Infrastructure management process
- Portfolio management process
- Human resources management process
- Quality management process
- Knowledge management process

Agreement processes

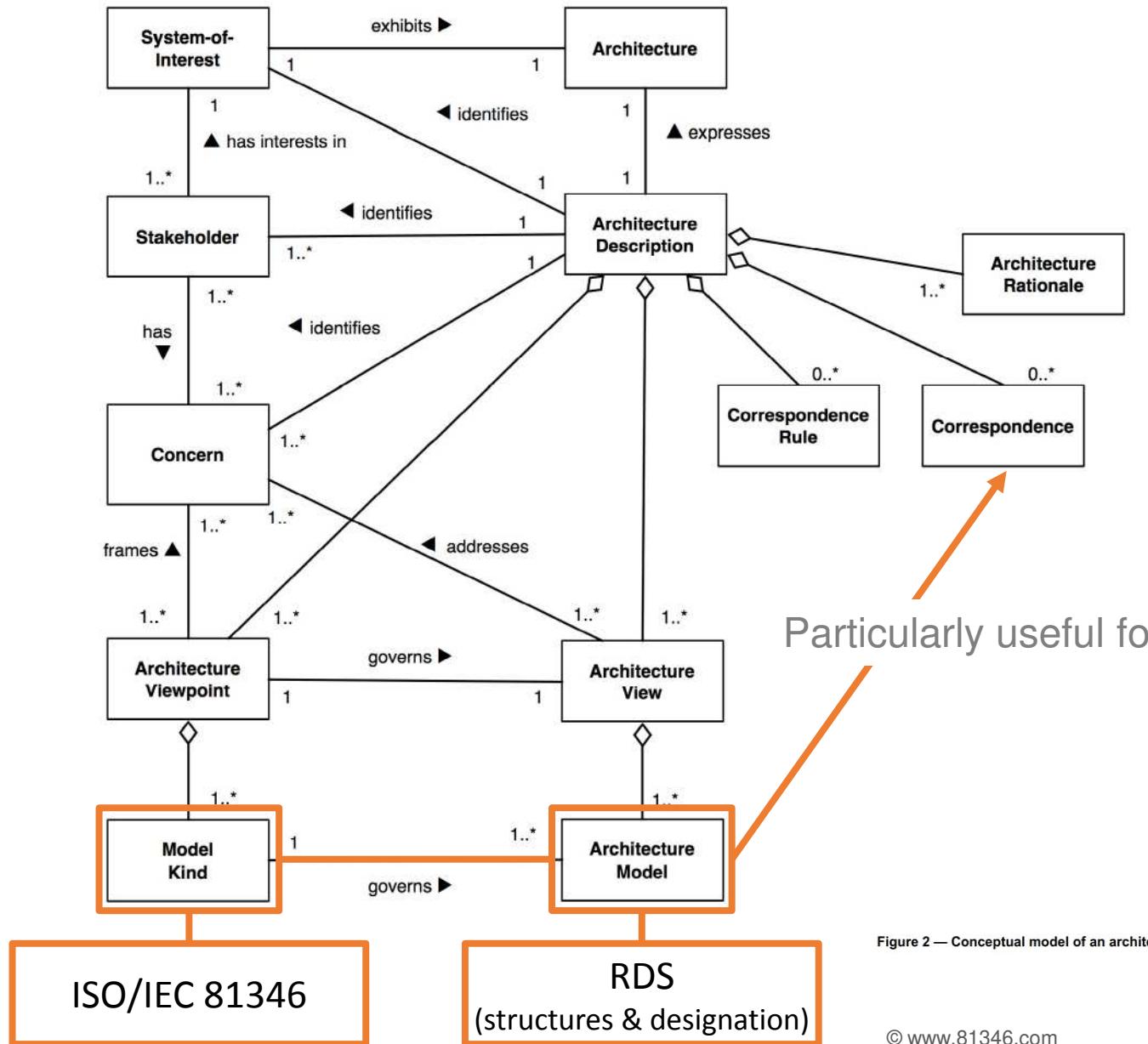


Acquisition process

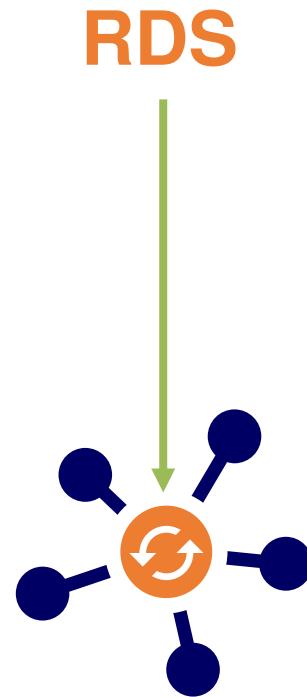
Supply process

[Source: ISO/IEC/IEEE 15288]

RDS and ISO/IEC/IEEE 42010



Model Correspondance



Point of synchronization across...
... data sources & models
... life cycle
... stakeholders

Model Correspondance

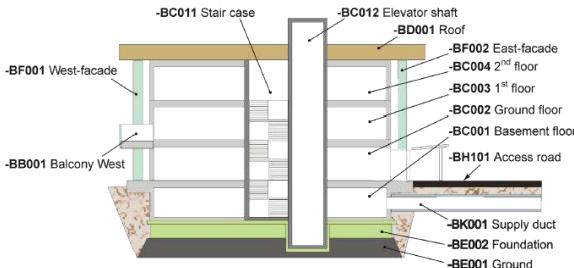
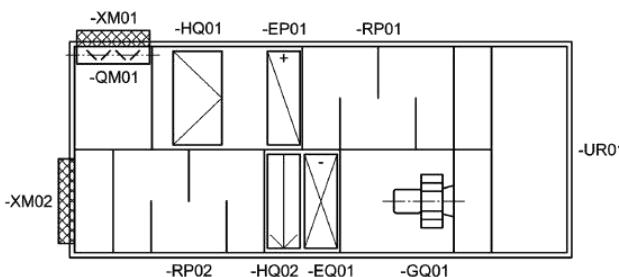
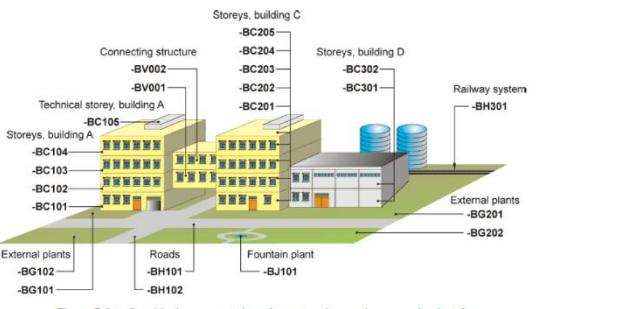


Figure B.1 — Graphical representation of construction works, example plant 1

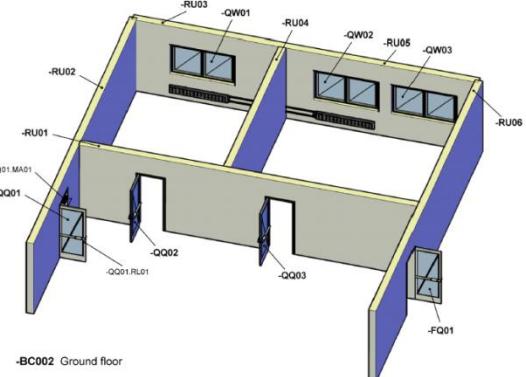


Der er i CCS valgt en klassificering, der har til formål at kunne skelne bygningsdele fra hinanden i en form for "grovsortering", fx kunne skelne mellem dør, vindue, kabel, rør etc. Dette medvirker dels til at lave en enkelt og stabil klassifikation, dels at begrænse antallet af nødvendige klasser betragteligt.

Inddelingskriteriet i CCS klassifikationen er den *egenfunktion*, som en given bygningsdel har "indbygget". Ved egenfunktion forstås "hvad et objekt egentlig gør, isoleret set", eller mere teknisk korrekt "objekts idøende tekniske funktion". Egenfunktionen af et objekt anses for stabil, set over livscyklus.

Øvrige egenskaber, fx type af materiale (stål, træ, beton), form ("Dannebrogsvindue", "Sadeltag", "Spidstag") etc. håndteres i CCS som selvstændige egenskaber, og medtages ikke som en del af den klassificerende kode. Det gør klassificeringen mere enkel og frem for alt stabil.

Fordelen ved en helt stabil klassifikationskode er, at koden ikke skal ændres undervejs. Det betyder i praksis, at alle objekter kan koddes på forhånd i et objektbibliotek, og at CCS objektklassen altid er kendt, når et objekt vælges og indsættes i et projekt.



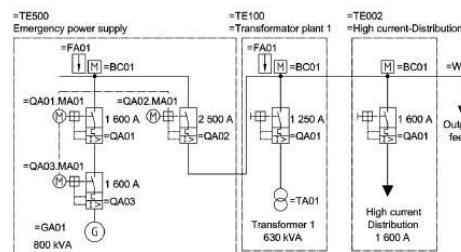
-BC002 Ground floor

Freshair inlet
Supply from power grid

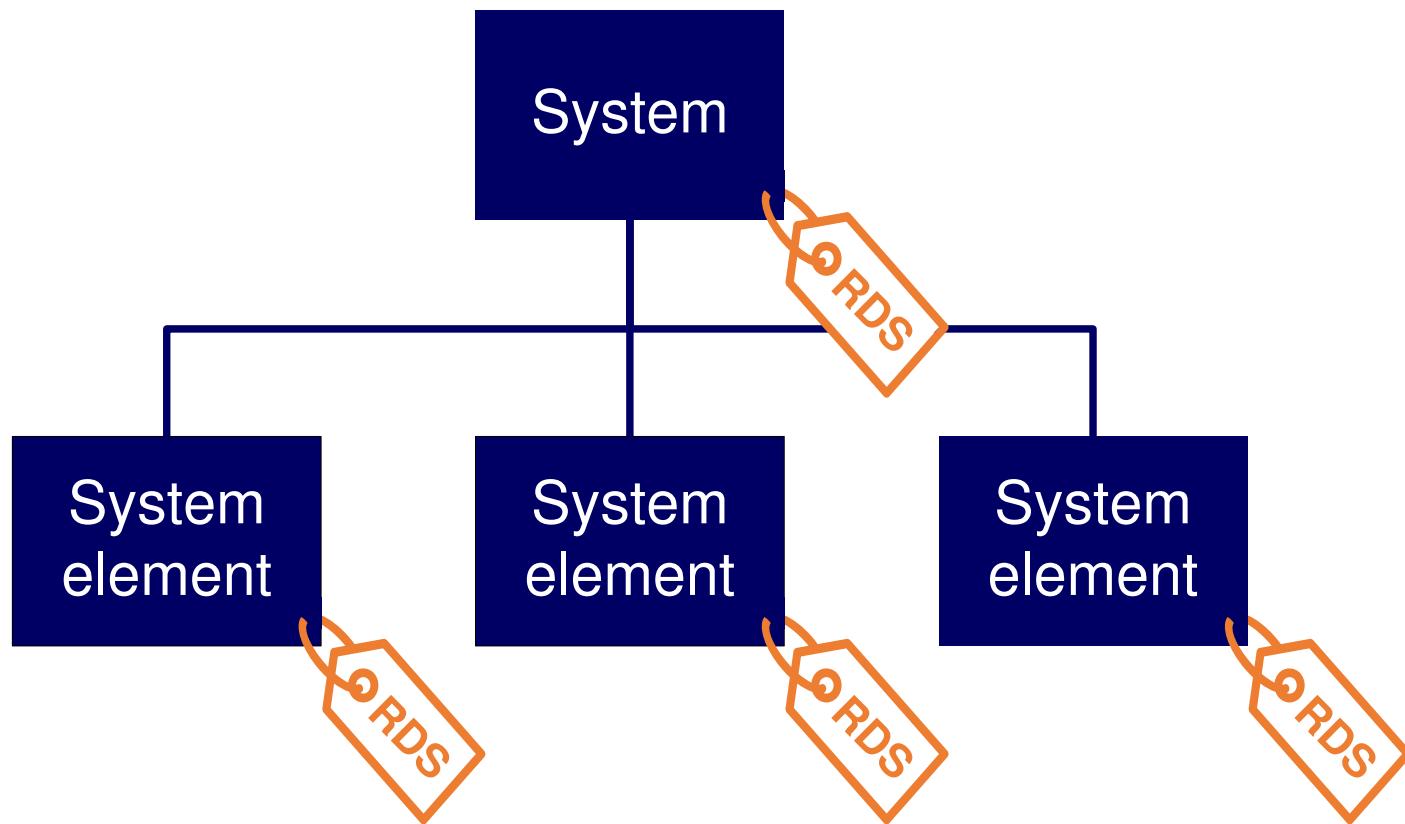


Discharge ←

Cooling & Heating System	Cooling Heating	Design parameters	Status signals
Design parameters	Ventilation System	Design parameters	Status signals
Power supply	Power supply	Electrical System	Power supply, Status
Control signals	Control signals	N/A	Control System



RDS designates systems



2. RDS FUNDAMENTALS

Objects and relations

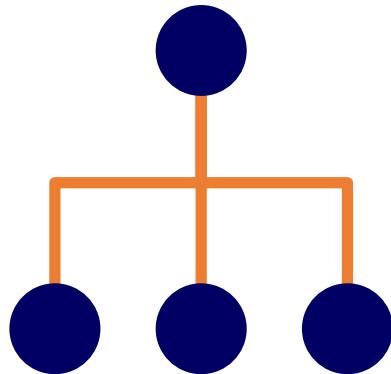
Hierarchical

Part-of

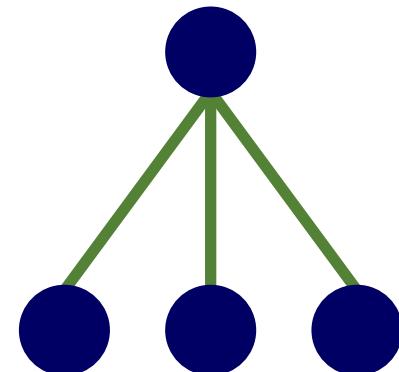
Type-of

Non-hierarchical

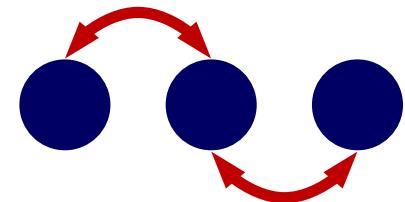
Pragmatic



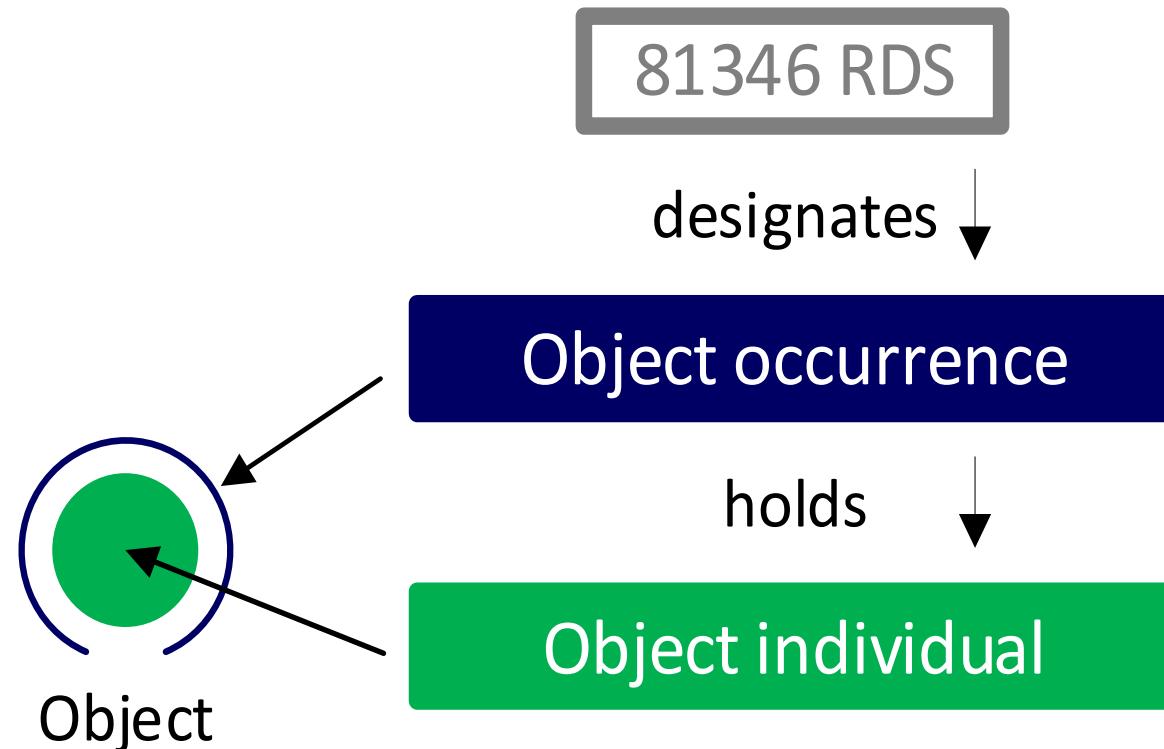
ISO/IEC 81346-1



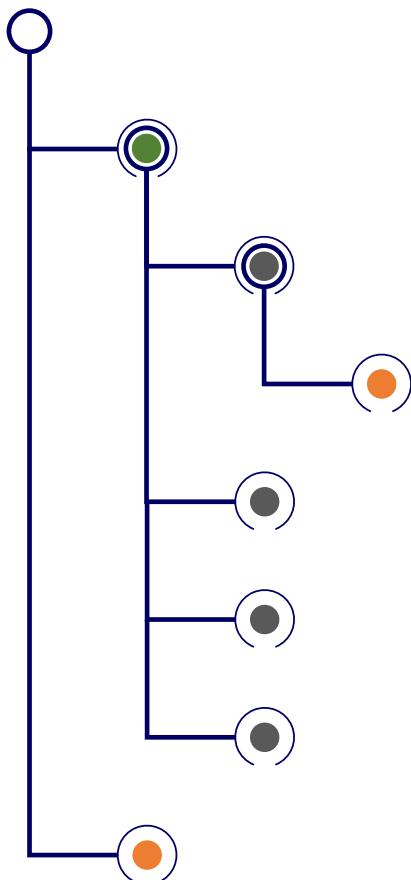
ISO/IEC 81346-2



RDS Designates Object Occurrence

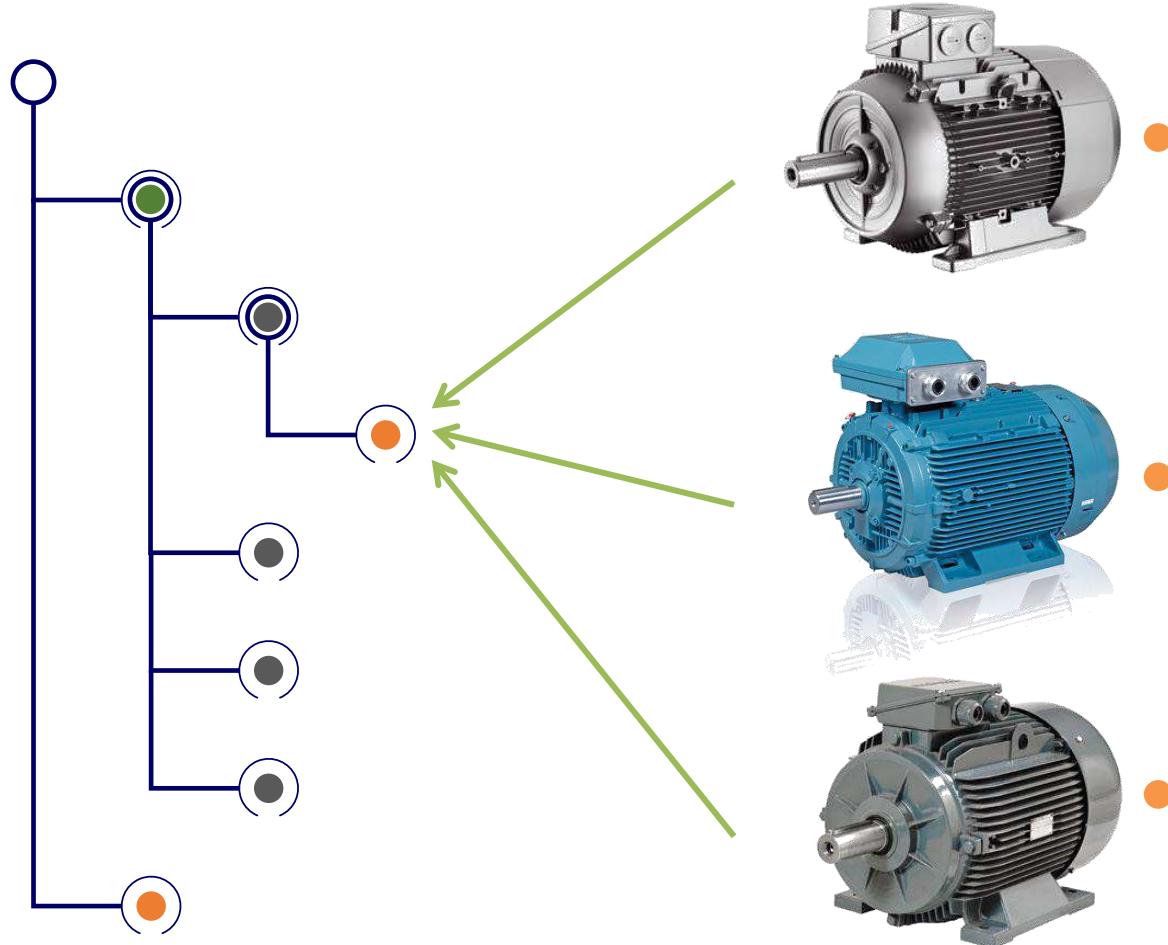


Object occurrences & individuals



- Object individual: A sub-system
- Object individual: A sub-sub system
- Object individual: A component

Object occurrences & individuals



Object occurrences & individuals

Context	Types	Occurrences	Individuals
Component manufacturer's engineering and support	OEM manufacturer's type designation Article (part) number	Reference designation	Order number OEM manufacturer's serial number
Component manufacturer's sales organisation	Internal type designation Article (part) number	Not applicable	Internal serial number
Technical system planner (investigator, surveyor, etc)	Letter codes for generic types	Reference designation	Not applicable
	Identifier of typicals		
Technical system assembler (contractor)	Manufacturer's type designation	Reference designation	Order number Manufacturer's serial number
Technical system user	Manufacturer's type designation, User's internal article (part) number	Reference designation	Manufacturer's serial number User's inventory number
NOTE The shaded areas show the context of reference designations and the classification provided by the letter codes.			

[ISO/IEC 81346-1, Table 1]

The **three** core elements of RDS

Aspect

How the system is viewed

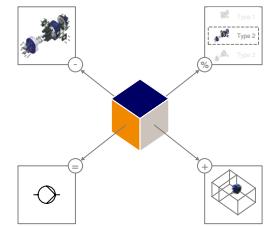
Structure

How system elements are related
(part-of relations)

Classification

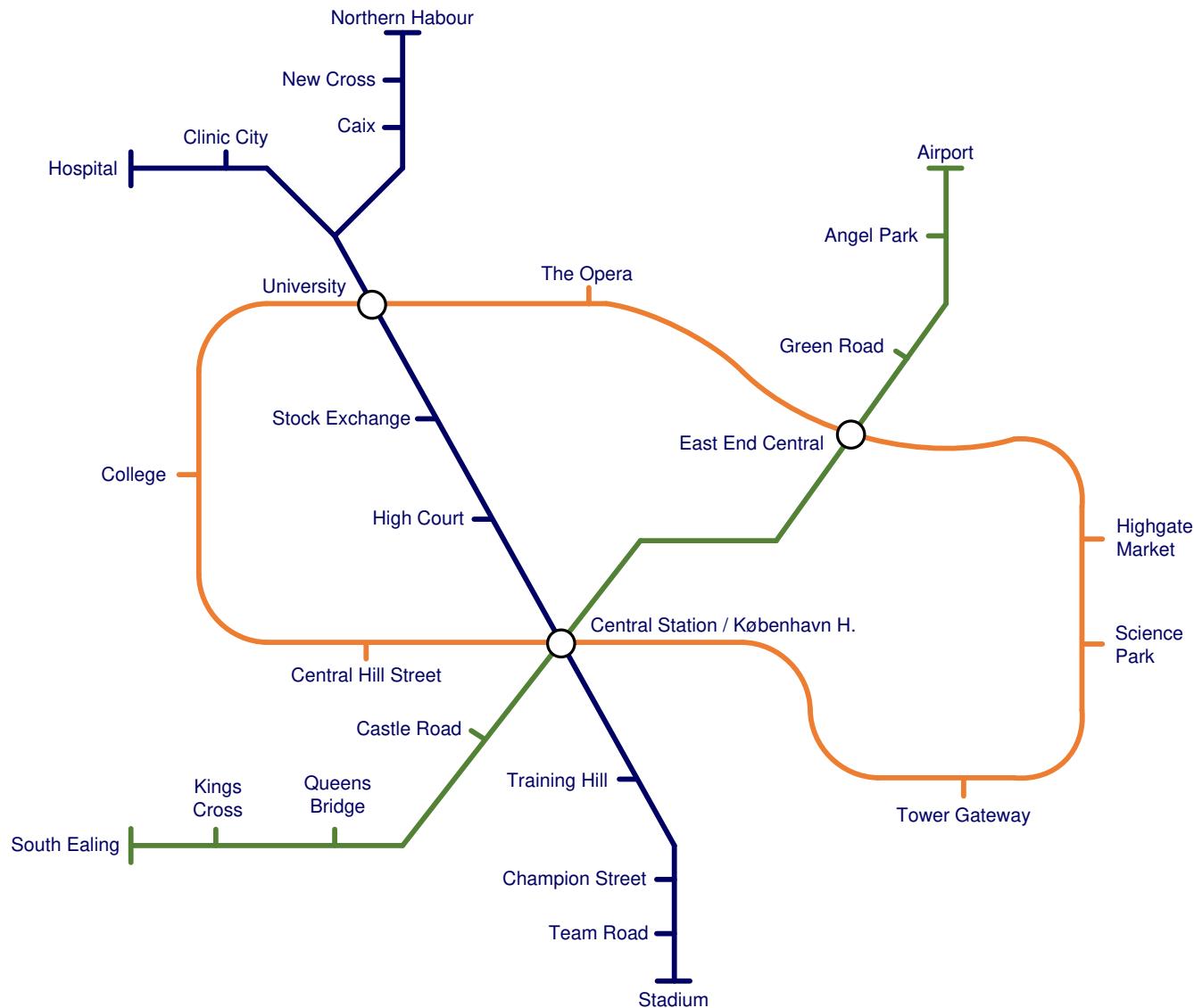
What kind of system elements
(type-of relations)

RDS is Aspects & Structure & Classification



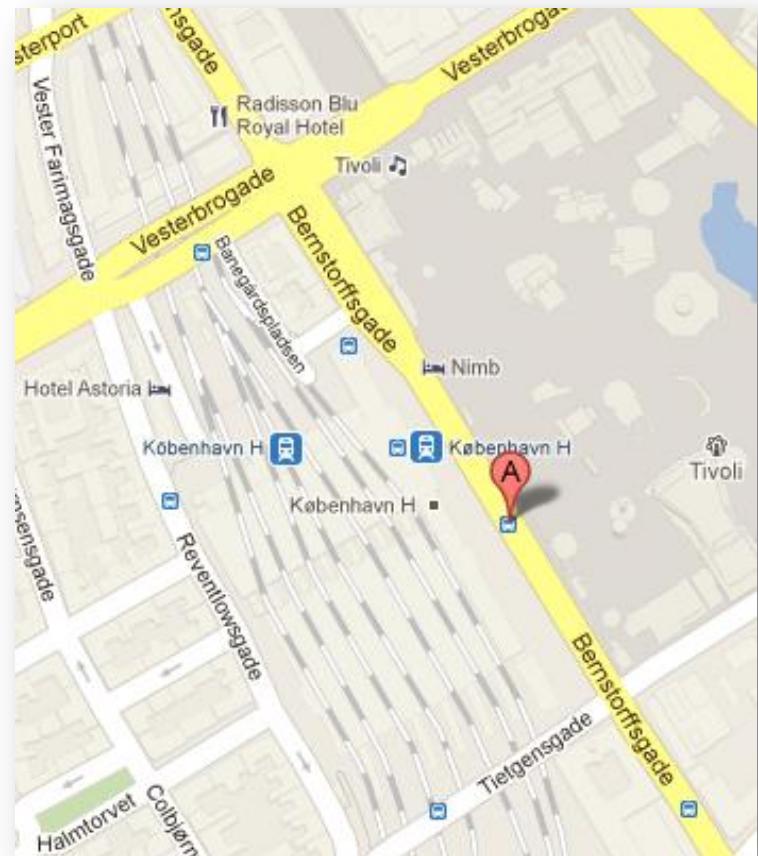
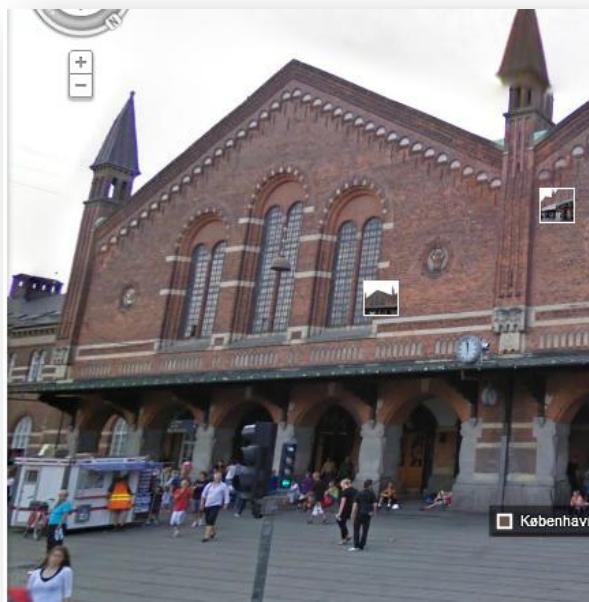
ASPECTS

Aspects – a way of viewing the world



Aspects – a way of viewing the world

C Klampenborg	
	Klampenborg
06 16 26 36 46 56	Klampenborg
08 18 28 38 48 58	Ordrup
10 20 30 40 50 00	Charlottenlund
14 24 34 44 54 04	Hellerup
16 26 36 46 56 06	Svanemøllen
18 28 38 48 58 08	Nordhavn
21 31 41 51 01 11	Østerport
23 33 43 53 03 13	Nørreport
25 35 45 55 05 15	Vesterport
28 38 48 58 08 18	København H
29 39 49 59 09 19	Dubbelshavn



The four RDS aspects

Structuring based on..

Function

what a system is designed to do

Product

how the system is built

Location

the intended or actual location of the system

Type

the commonality of systems with common properties

Typical terminology

Function

System, Function, Functional system

Product

System, Product, Module, Assembly, Unit, Plant

Location

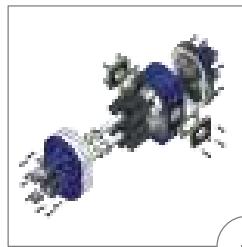
Space, Area, Volume, Section, Floor, Room

Type

Type, Design type, Group, Master, Family, Platform

The four RDS aspects

Product



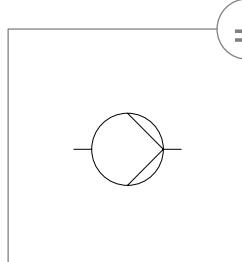
-

Type



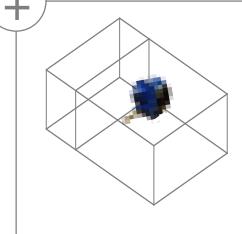
%

Function



=

Location

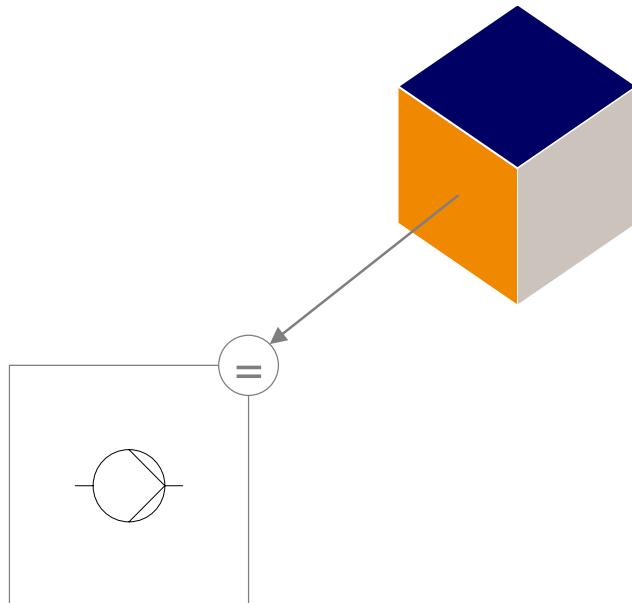


+

RDS aspects

Function

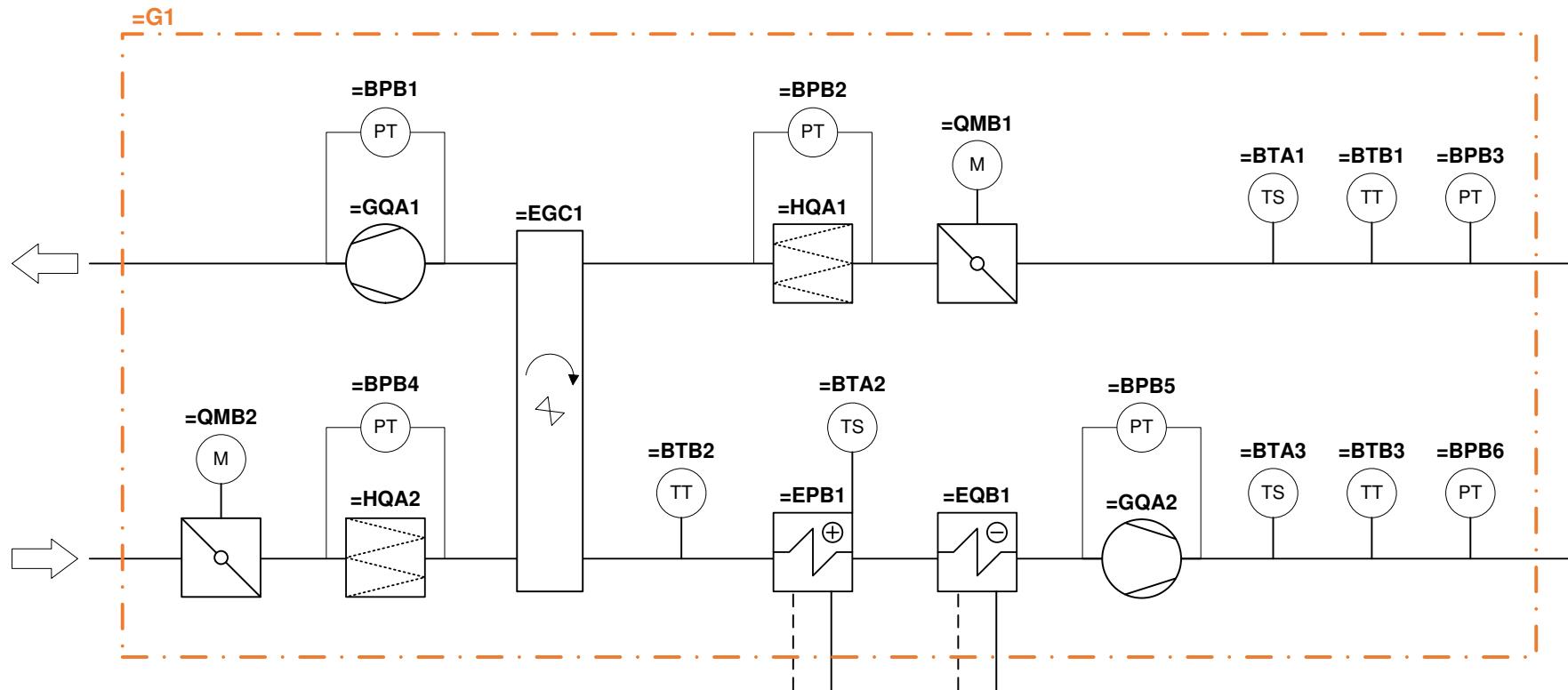
what a system is designed to do



RDS aspects

Function

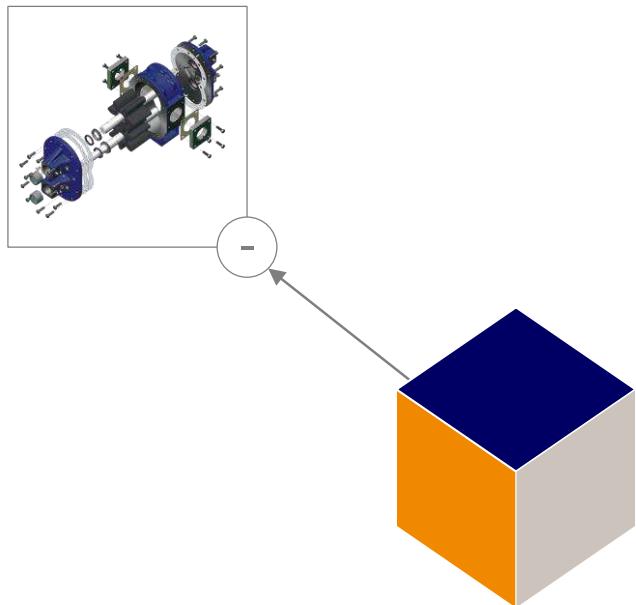
what a system is designed to do



RDS aspects

Product

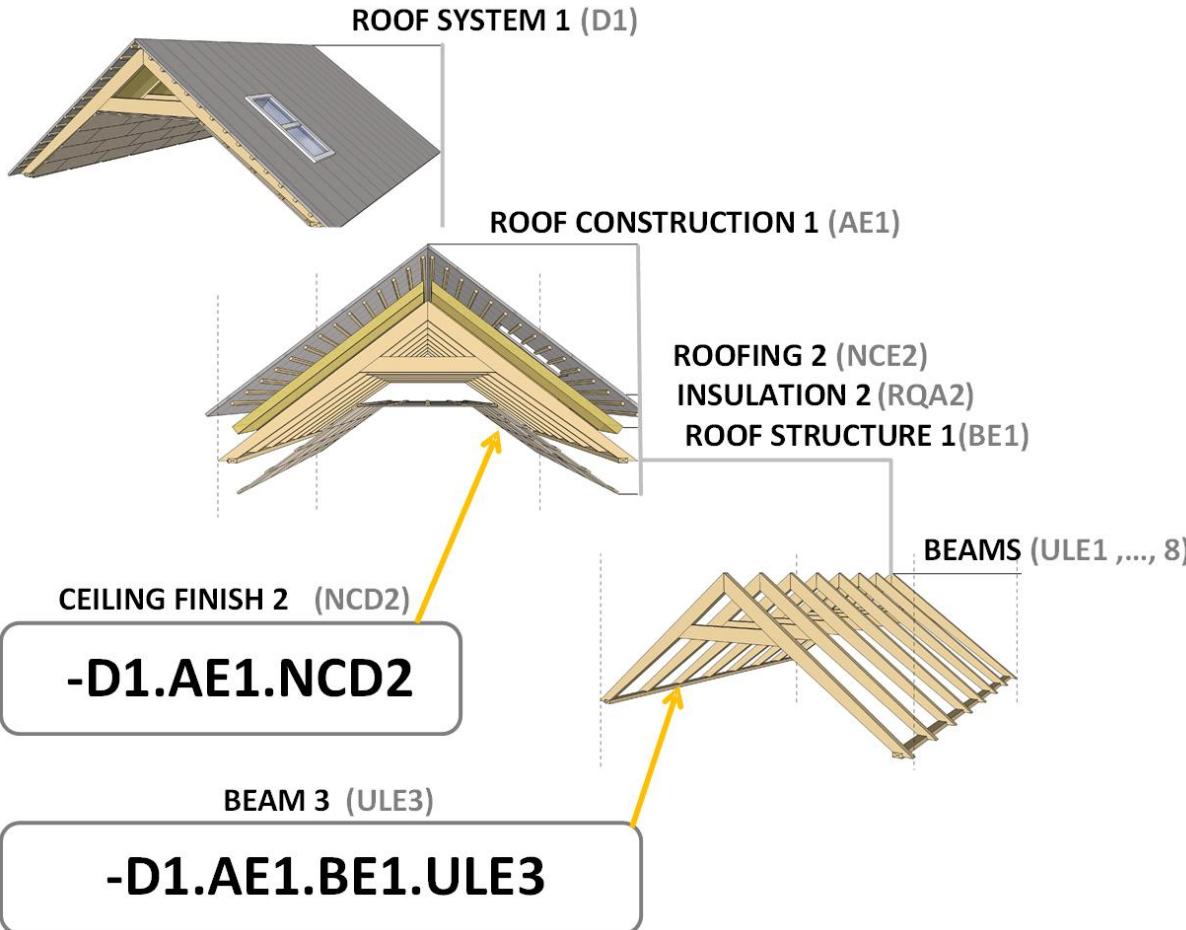
How the system is built



RDS aspects

Product

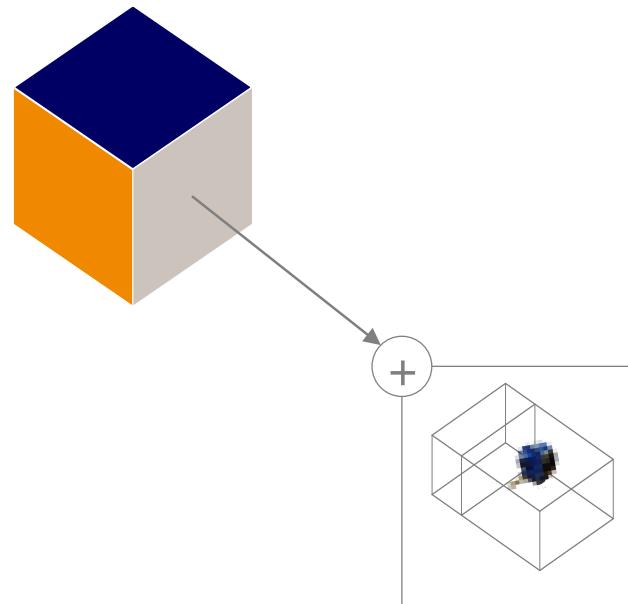
How the system is built



RDS aspects

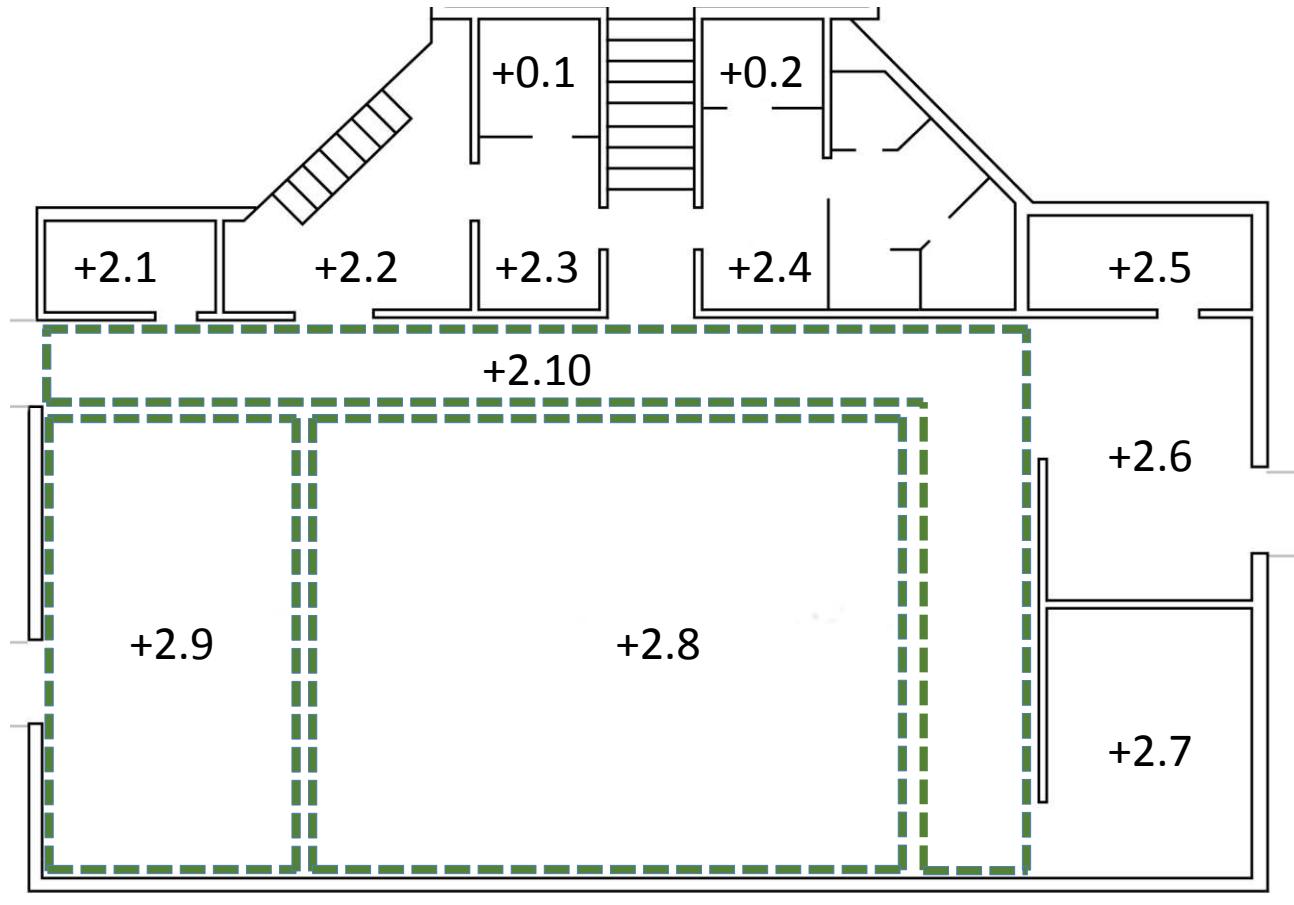
Location

the intended or actual location of the system



RDS aspects

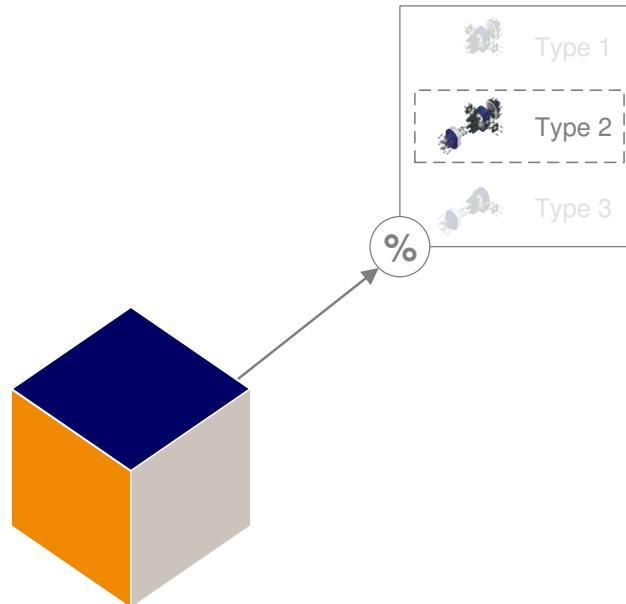
Location the intended or actual location of the system



RDS aspects

Type

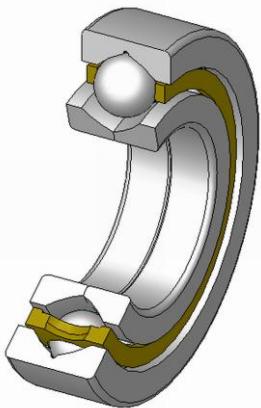
the commonality of systems with common properties



RDS aspects

Type

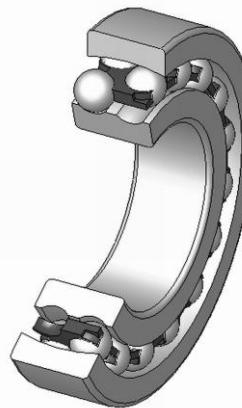
the commonality of systems with common properties



%UPA1

Bearing type
no.1

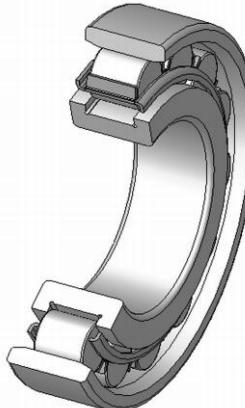
Four point
contact bearings



%UPA2

Bearing type
no. 2

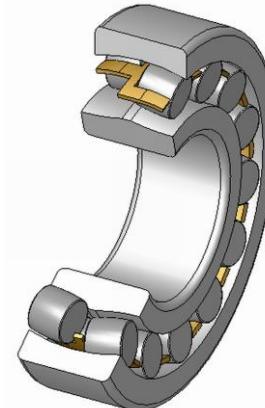
Spherical ball
bearings
(double row)



%UPA3

Bearing type
no. 3

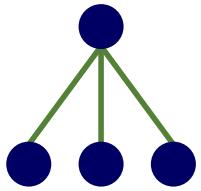
Cylindrical
roller bearings



%UPA4

Bearing type
no. 4

Spherical roller
bearings
(double row)



Classification A, B, C...

... so you can recognize objects within and across aspects

Other classification systems

OmniClass **211**

18 doors in Elements

66 doors in Products

127 doors in Work result

Uniformat **29**

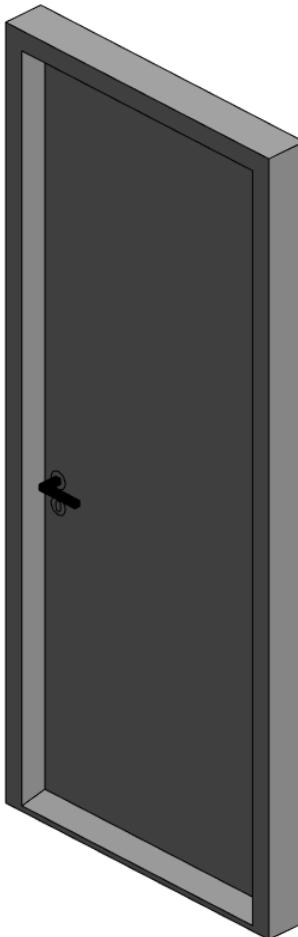
Uniformat Classification	Revit Category
No classification	
B - Shell	
B20 - Exterior Enclosure	
B2030 - Exterior Doors	
B2030100 - Glazed Doors & Entrances	Doors
B2030110 - Exterior Glazed Doors - Aluminum	Doors
B2030120 - Exterior Glazed Doors - Steel	Doors
B2030130 - Exterior Glazed Doors - Wood	Doors
B2030200 - Solid Exterior Doors	Doors
B2030210 - Exterior Solid Doors - Aluminum	Doors
B2030220 - Exterior Solid Doors - Steel	Doors
B2030230 - Exterior Solid Doors - Wood	Doors
B2030300 - Revolving Doors	Doors
B2030400 - Overhead Doors & Roll-up Grilles	Doors
B2030410 - Overhead Doors	Doors
B2030420 - Roll-up Grilles	Doors
B2030500 - Door Wall Opening Elements	Doors
B2030900 - Other Exterior Doors	Doors
C - Interiors	
C10 - Interior Construction	
C1020 - Interior Doors	
C1020100 - Interior Doors	Doors
C1020110 - Interior Doors - Metal	Doors
C1020120 - Interior Doors - Wood	Doors
C1020200 - Interior Door Frames	Doors
C1020210 - Interior Door Frames - Metal	Doors
C1020220 - Interior Door Frames - Wood	Doors
C1020300 - Interior Doors with Frames	Doors
C1020310 - Interior Metal Doors with Metal Frames	Doors
C1020320 - Interior Wood Doors with Metal Frames	Doors
C1020330 - Interior Wood Doors with Wood Frames	Doors
C1020400 - Interior Door Hardware	Doors
C1020410 - Door Hardware	Doors
C1020500 - Interior Door Wall Opening Elements	Doors
C1020600 - Interior Door Sidelights & Transoms	Doors
C1020700 - Interior Hatches & Access Doors	Doors

RDS Classification System

A door is a door!

1

... with many properties!



Classification by Inherent Function

some benefits...



a lifecycle stable code



all objects can be pre-coded



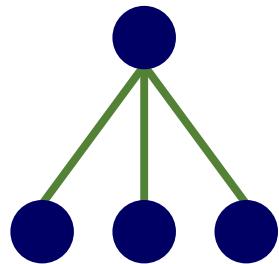
simple coding – easy for humans to recognise

Classification – “A door is a door”

81346-2
(2017)

	Class	QQC
	Definition	<i>space access object</i> for use by persons
	Class name	Door
	Synonyms	entrance, exit, ...
Properties	Material: Glass, wood, steel, ... Width: 600...2500mm Height: 2000...2500mm	User specified

Classification: type-of relations

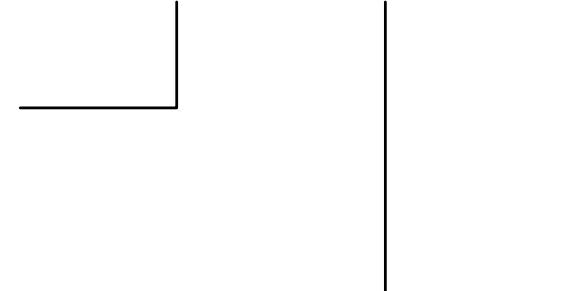


Q **Q** **C**

Entry class IEC 81346-2:2017 table 1



Sub-class IEC 81346-2:2017 table 2
(option)



Sub-class IEC 81346-2:2017 table 3
(option)



Entry classes

	Code	Class definition (ISO/IEC 81346-2 2017-edition)	Class name
	B	<i>object for picking up information and providing a representation</i>	sensing object
	C	<i>object for storing for subsequent retrieval</i>	storing object
	E	<i>object for emitting</i>	emitting object
	F	<i>object for protecting against the effects of dangerous or undesirable conditions</i>	protecting object
	G	<i>object for providing a controllable flow</i>	generating object
	H	<i>object for treating matter</i>	matter processing object

Entry classes

Code	Class definition (ISO/IEC 81346-2 2017-edition)	Class name
	K <i>object for treating input signals and providing an appropriate output</i>	information processing object
	M <i>object for providing mechanical movement or force</i>	driving object
	N <i>object for enclosing partly or fully another object</i>	covering object
	P <i>object for providing perceptible information</i>	presenting object
	Q <i>object for controlling access or flow</i>	controlling object
	R <i>object for restricting or stabilising</i>	restricting object

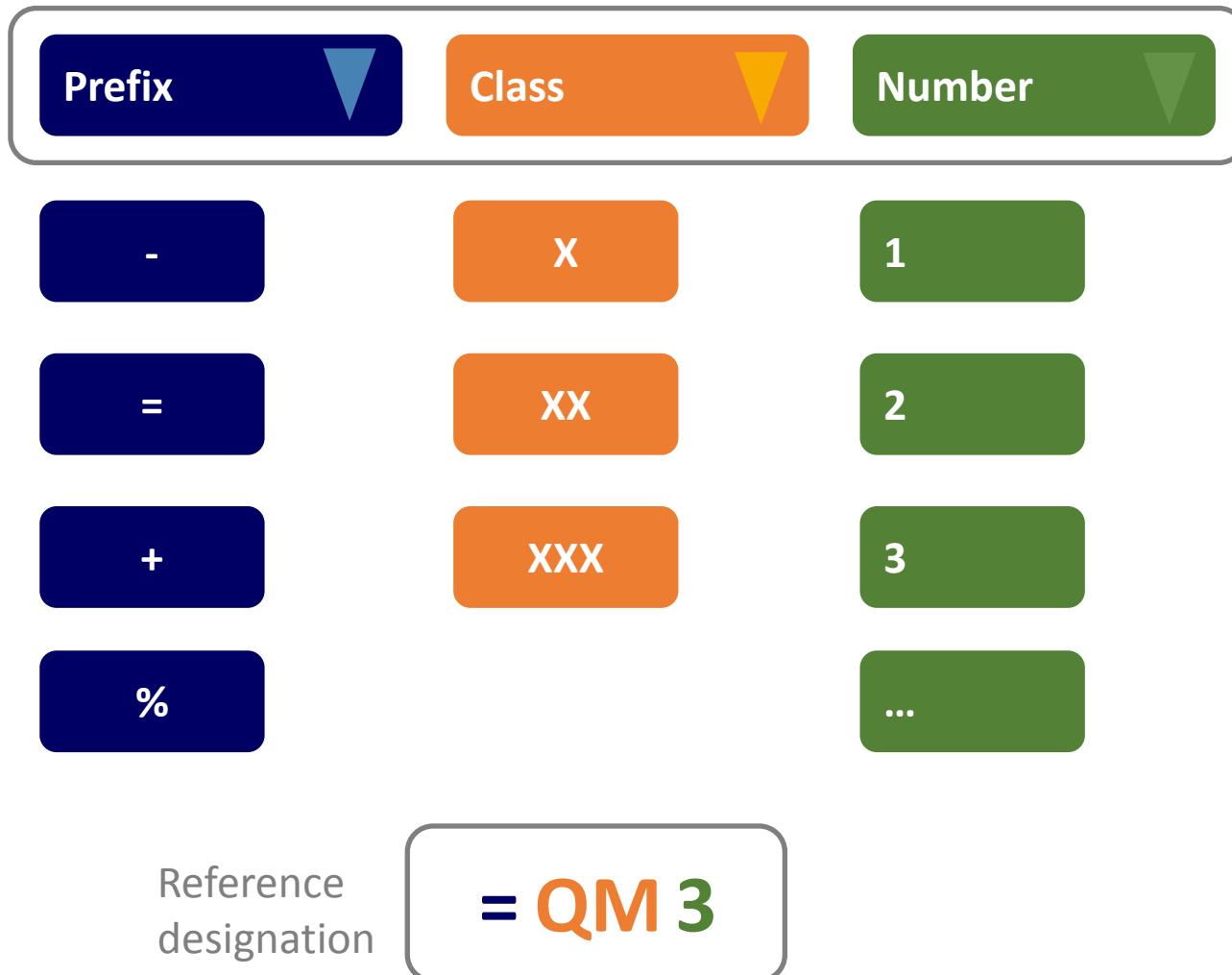
Entry classes

Code	Class definition (ISO/IEC 81346-2 2017-edition)	Class name
	S <i>object for detecting a manual action and providing an appropriate response</i>	manual interacting object
	T <i>object for transforming</i>	transforming object
	U <i>object for structural positioning of other objects</i>	holding object
	W <i>object for leading from one place to another</i>	guiding object
	X <i>object for interfacing an object</i>	interfacing object

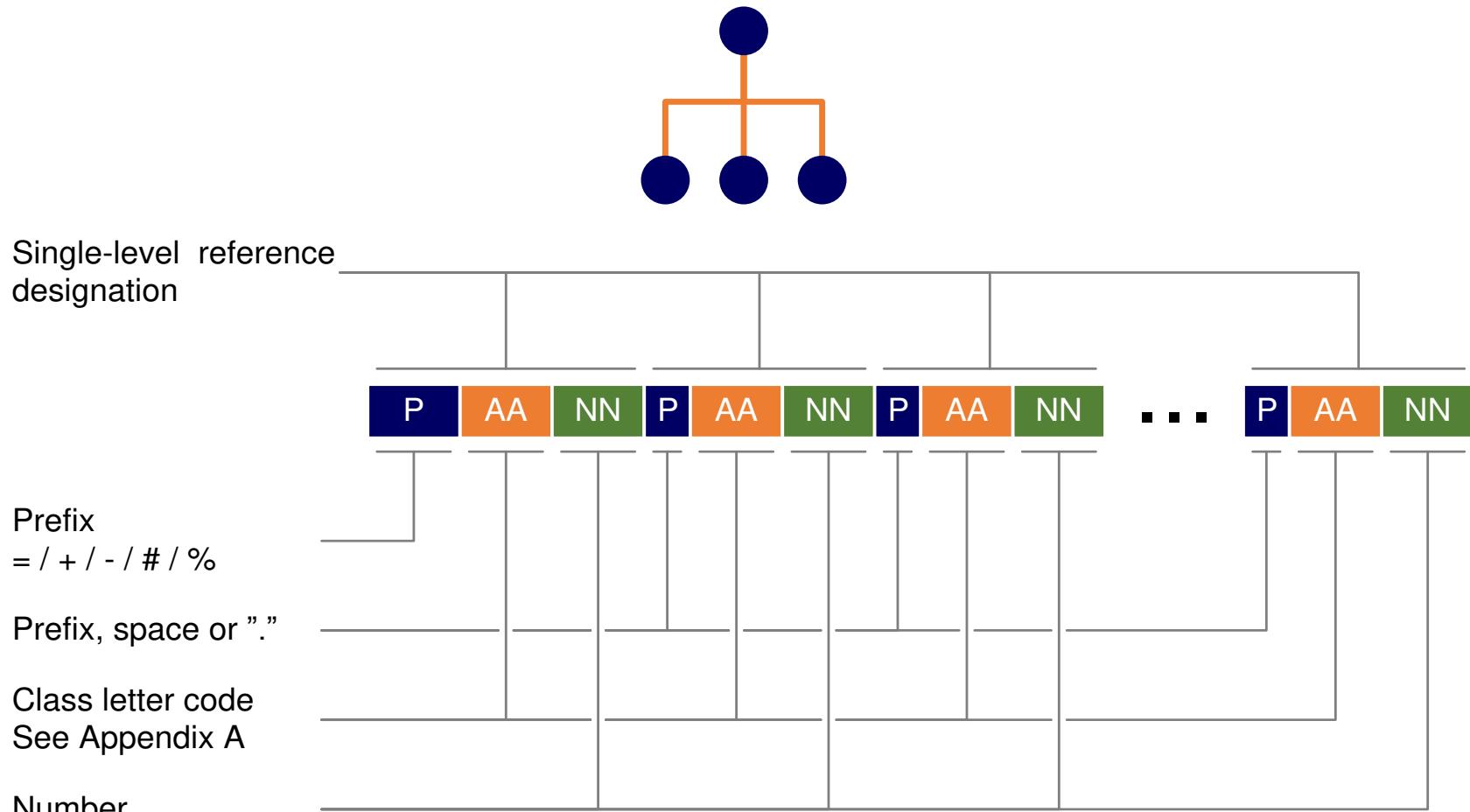
%ULE4
=QMA5
+8
-RNC2

RDS SYNTAX

Creating reference designations



Multi-level reference designation



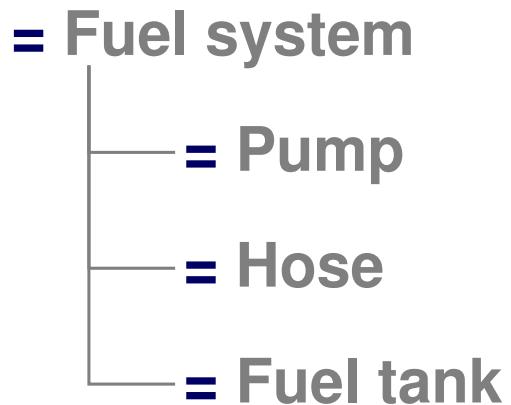
RDS reflects the system breakdown – this means no FIXED RDS structure!

3. RDS EXAMPLES

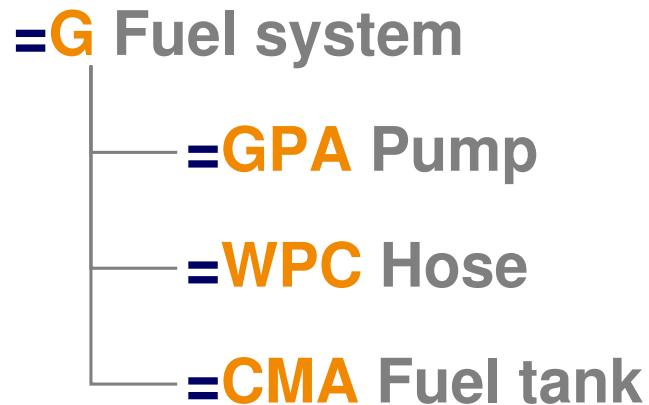
Aspect selection

= Function

Structuring in part-of



Classification from type-of



Numbering

=G1 Fuel system

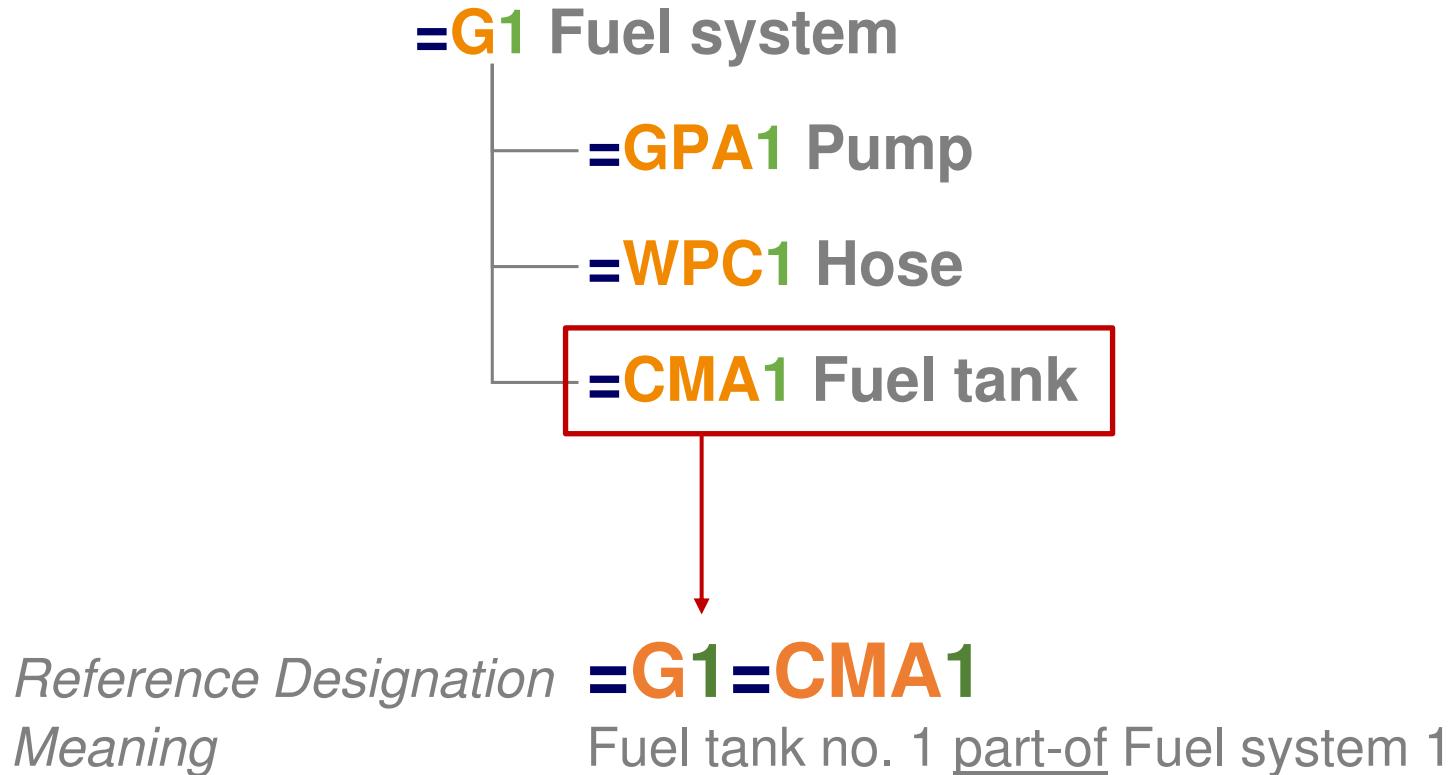
```
graph TD; G1["=G1 Fuel system"] --- GPA1["=GPA1 Pump"]; G1 --- WPC1["=WPC1 Hose"]; G1 --- CMA1["=CMA1 Fuel tank"];
```

=GPA1 Pump

=WPC1 Hose

=CMA1 Fuel tank

The Reference Designation



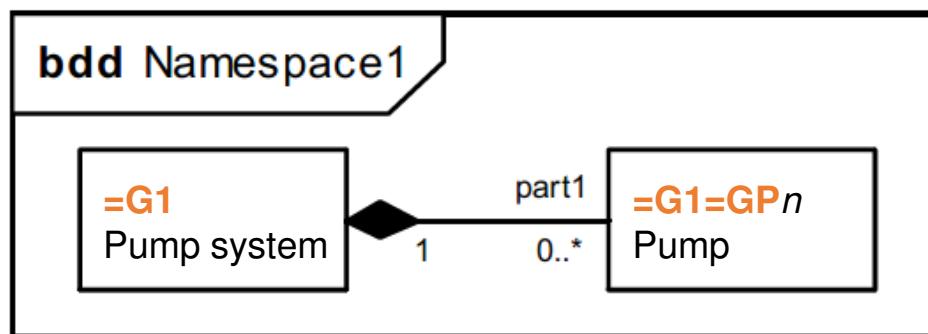
ISO/IEC 81346 and SysML



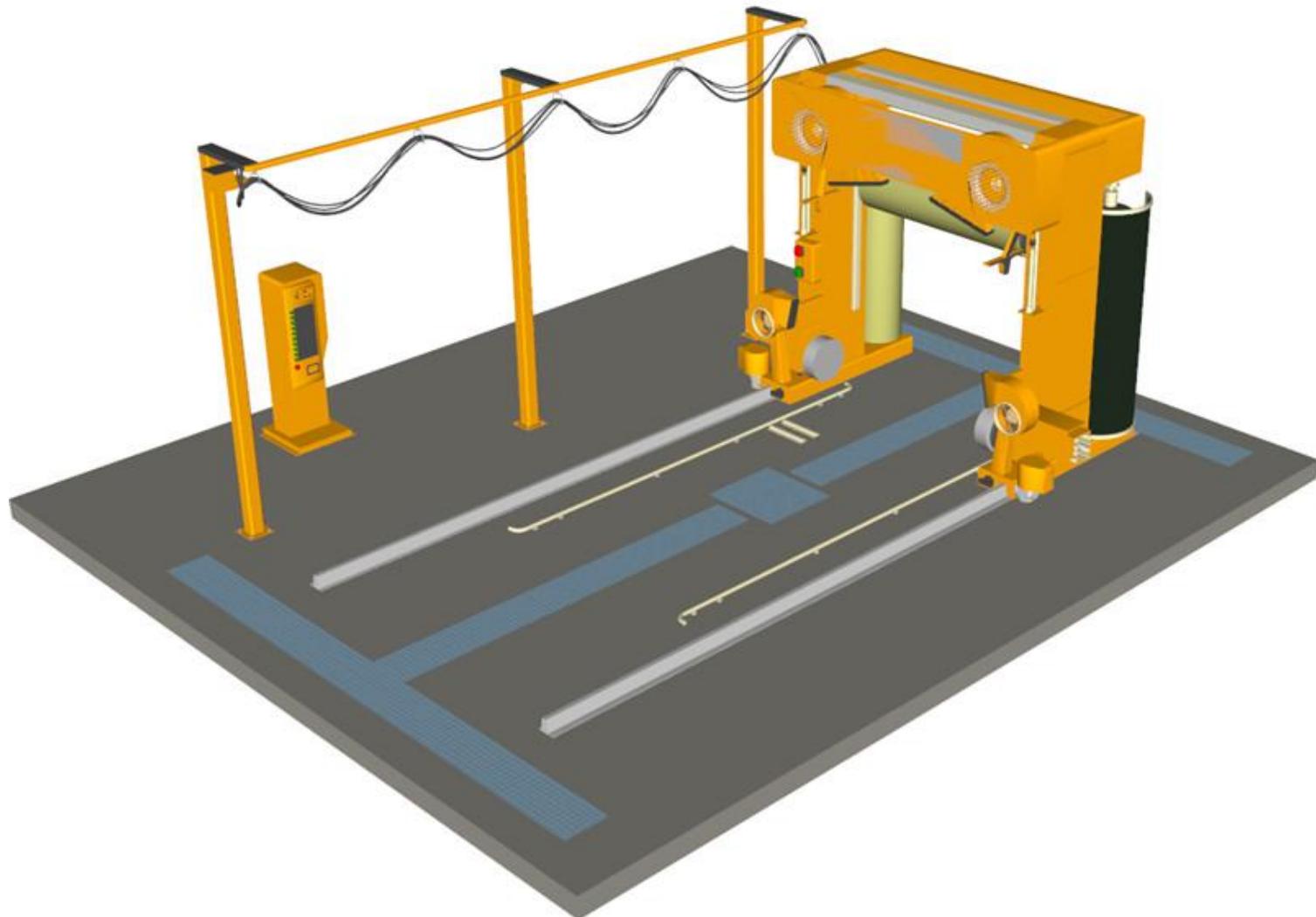
81346 &



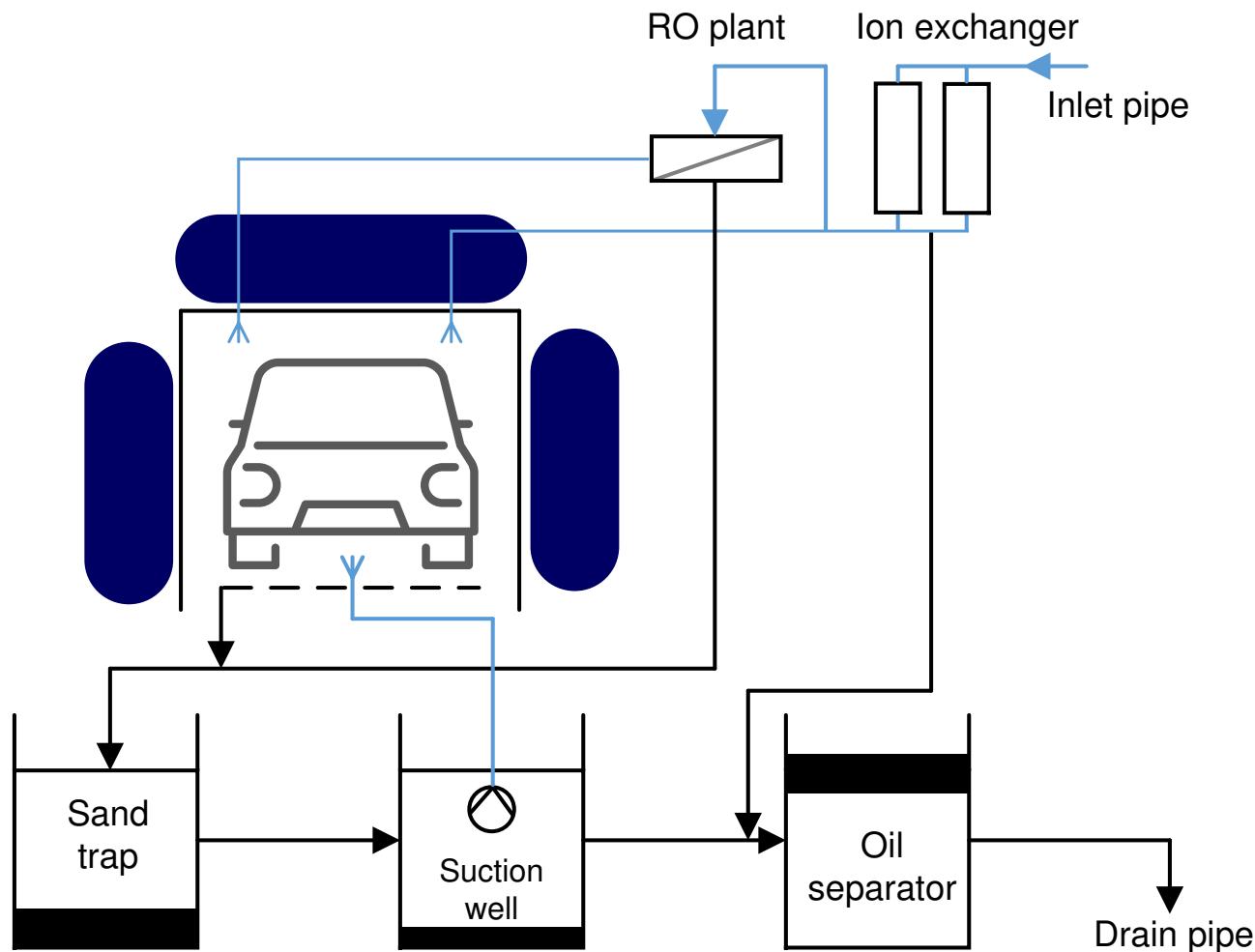
ISO/IEC 81346 offers a means of establishing a namespace for model elements based on system structures and element classification



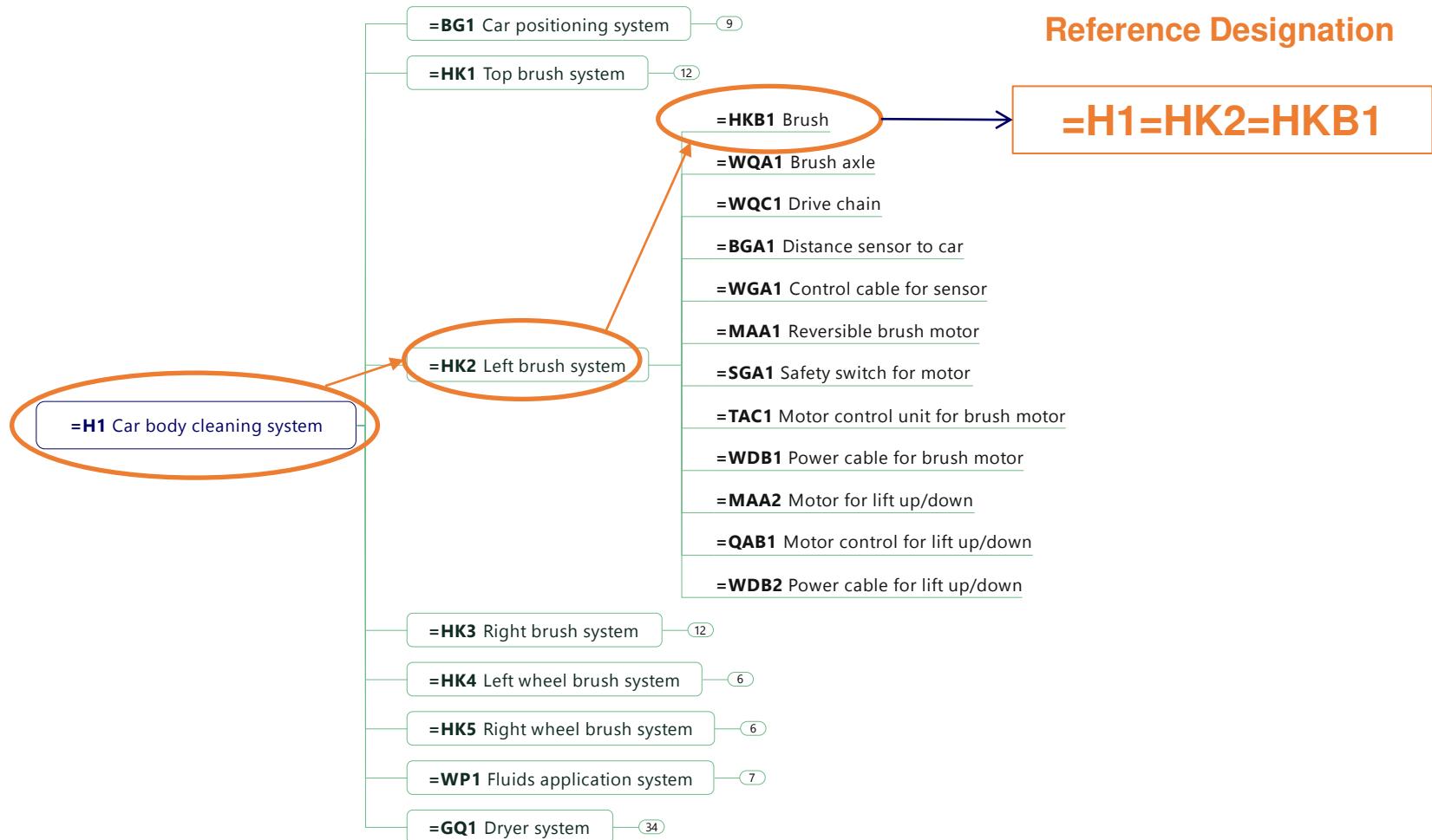
Portal Car Wash 3D Model



Portal Car Wash Water Diagram

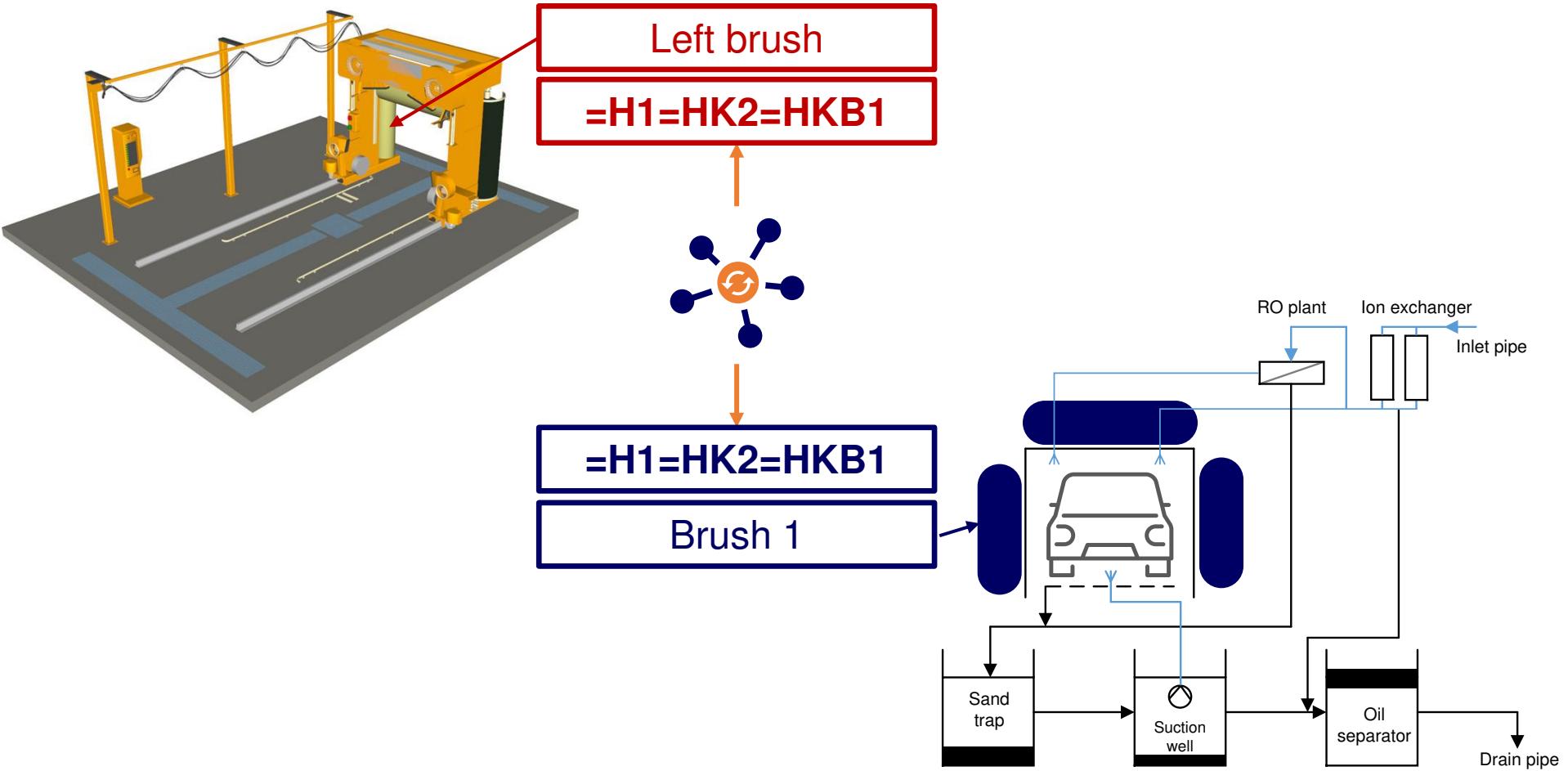


RDS Functional Structure





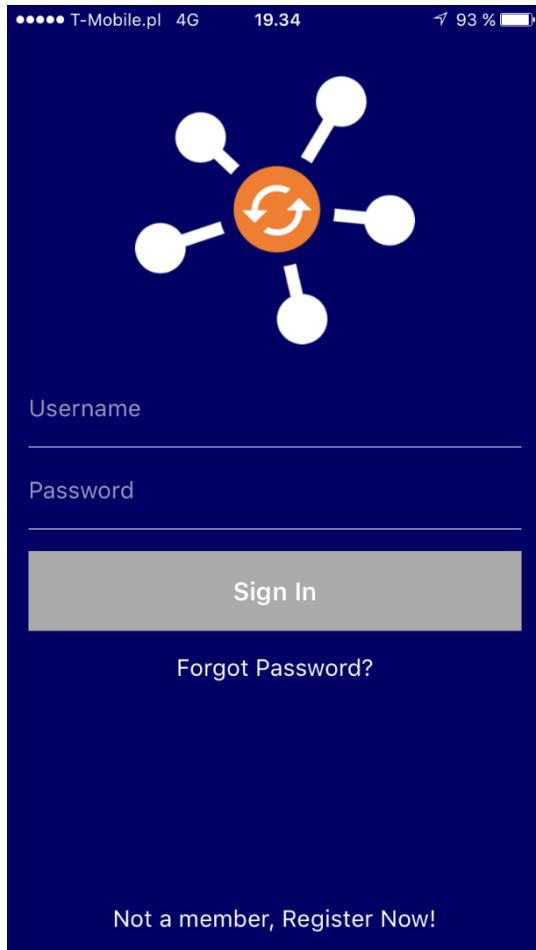
Model Correspondence





EXPLORE RDS

The RDS 81346 app



Free to use!

ISO/IEC 81346-2 (system classification)

IEC 61355 (document classification)



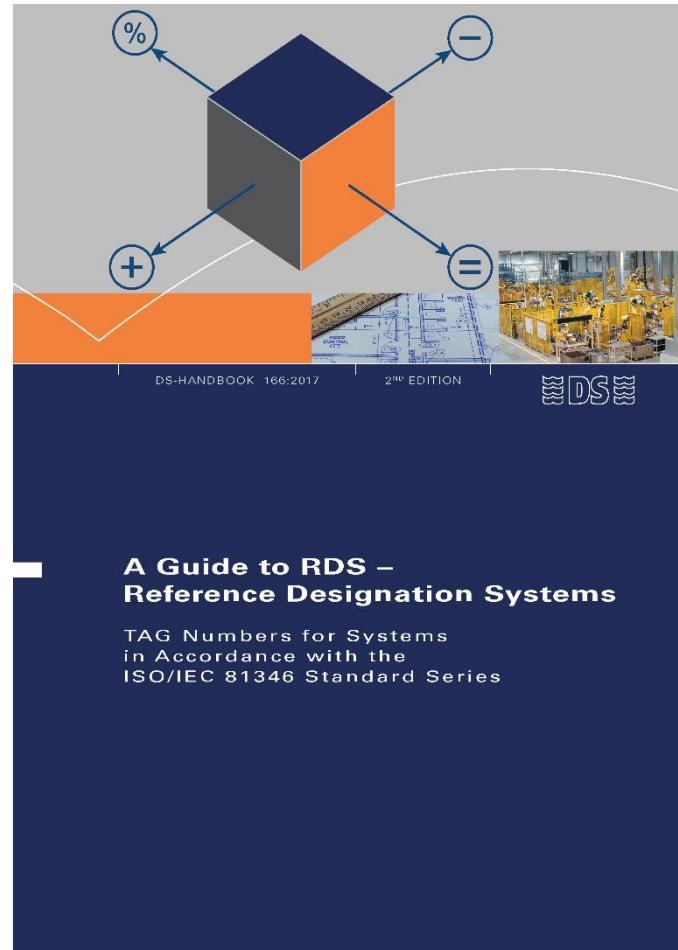
The 81346 Handbook

Complements the 81346 series

A guide on how to establish system awareness and subsequently prepare reference designations, structuring, and modularization.

Free downloads and newsletter!

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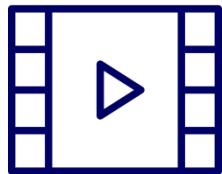
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And see the
81346 movie

on YouTube!

“It’s all about creating a common language”