

# CSI Formats and **B**uilding Information **M**odeling

Federal Facilities Council  
Government/Industry Forum  
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**Roger J Grant**

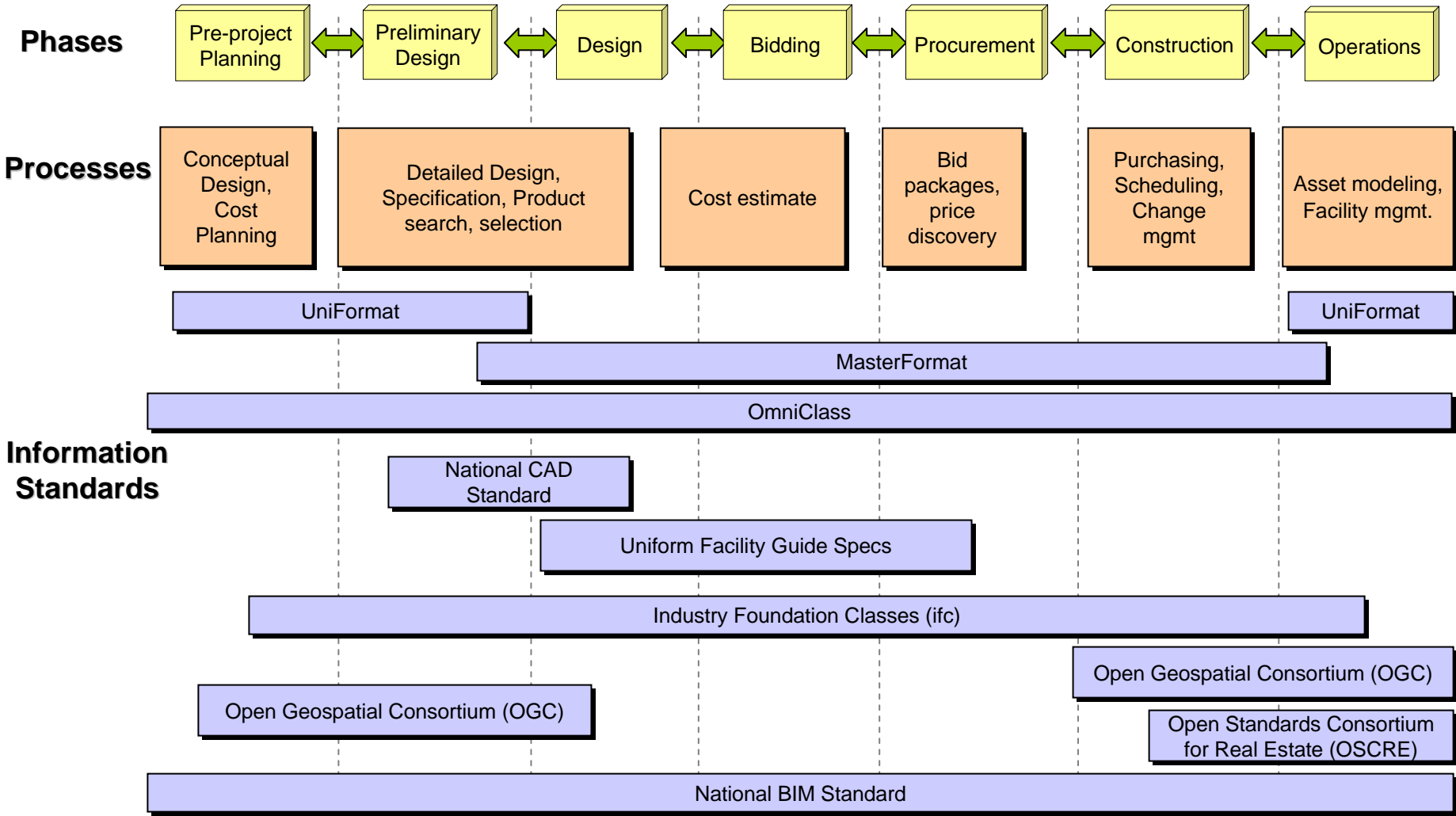
Director Technical Services and Development,  
The Construction Specifications Institute



The Construction  
Specifications Institute



# North American Information Standards



# UniFormat

## Elemental Classification System

A Substructure

A10 Foundations Level 2

**A1010 Standard**

**Foundations** Level 3

A1010.XX Wall

Foundations Level 4

A1010.XX Column

Foundations

Level 5

B Shell

C Interiors

D Services

E Equipment and  
Furnishings

F Special Construction and  
Demolition

G Building Sitework

Z General



# Work Results by Element

System Components - based upon National Average Costs		
System A1010 110 2300	Quantity	Unit
Strip footing, load 3.9 KLF soil cap, 3 KSF, 24"wide x 8"deep, plain		
Excavating, trench or continuous footing, common earth, 3/8 C.Y. tractor loader/backhoe, 1' to 4	0.099	B.C.Y.
Excavating, trench, common earth, vibrator plate, trim sides and bottom for concrete pours, excl	2.000	S.F.
C.I.P. concrete forms, footing, continuous wall, plywood, 4 use, includes erecting, bracing, str	1.340	SFCA
C.I.P. concrete forms, footing, keyway, tapered wood, 2" x 6", 4 use, includes erecting, bracing	1.000	L.F.
Reinforcing steel, in place, footings, #4 to #7, A615, grade 60, incl access. Labor	1.000	Lb.
Reinforcing steel, in place, dowels, deformed, 2' long, #4, A615, grade 60	1.000	Ea.
Structural concrete, ready mix, normal weight, 3000 psi, includes material only	0.050	C.Y.
Structural concrete, placing, continuous footing, shallow, direct chute, includes vibrating, exc	0.050	C.Y.
Concrete finishing, floors, monolithic, screed and bull float(darby) finish	2.000	S.F.
Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with vibrating roller	0.049	E.C.Y.
<b>Total</b>		

Materials

Properties

Source: RS Means CostWorks

# MasterFormat

## Work Results

### Classification System

#### 50 Divisions



*MasterFormat is organized to integrate the Life-Cycle of the Facility*

#### Division Numbers and Titles

#### *Procurement and Contracting Requirement Group:*

Div. 00 Procurement and Contracting Requirements

#### Specification Group:

#### *General Requirements Subgroup*

Div. 01 General Requirements

#### *Facilities Construction Subgroup*

Div. 02 Existing Conditions

Div. 03 Concrete

Div. 04 Masonry

Div. 05 Metals

Div. 06 Wood, Plastics, and Components

Div. 07 Thermal and Moisture Protection

Div. 08 Openings

Div. 09 Finishes

Div. 10 Specialties

Div. 11 Equipment

Div. 12 Furnishings

Div. 13 Special Construction

Div. 14 Conveying Equipment

Div. 15 – 19 Reserved for Future Expansion

#### *Facility Services Subgroup:*

Div. 20 Reserved for Future Expansion

Div. 21 Fire Suppression

Div. 22 Plumbing

Div. 23 HVAC

Div. 25 Integrated Automation

Div. 26 Electrical

Div. 27 Communications

Div. 28 Electronic Safety and security.

#### *Site and Infrastructure:*

Div. 30 - 39

#### *Process Equipment Subgroup*

Div. 40 Process Integration

Div. 41 Material Processing and handling

Div. 43 - 49

# Why Revise *MasterFormat*?



# SectionFormat

Provides a uniform approach to organizing specification text contained in a Project Manual

## PART 1 GENERAL

SUMMARY  
 REFERENCES  
 DEFINITIONS  
 SYSTEM DESCRIPTION  
 SUBMITTALS  
 QUALITY ASSURANCE  
 DELIVERY, STORAGE,  
 AND HANDLING  
 PROJECT/SITE\*  
 CONDITIONS  
 SEQUENCING  
 SCHEDULING  
 WARRANTY  
 SYSTEM STARTUP  
 OWNER'S INSTRUCTIONS  
 COMMISSIONING  
 MAINTENANCE

## PART 2 PRODUCTS

MANUFACTURERS EXISTING  
**PRODUCTS**  
**MATERIALS**  
 MANUFACTURED UNITS  
 EQUIPMENT  
 COMPONENTS  
 ACCESSORIES  
**MIXES**  
**FABRICATION**  
 FINISHES  
 SOURCE QUALITY CONTROL

## PART 3 EXECUTION

INSTALLERS EXAMINATION  
 PREPARATION  
 ERECTION  
 INSTALLATION  
 APPLICATION  
 CONSTRUCTION  
 REPAIR/RESTORATION RE-  
 INSTALLATION  
 FIELD QUALITY CONTROL  
 ADJUSTING  
 CLEANING  
 DEMONSTRATION  
 PROTECTION  
 SCHEDULES

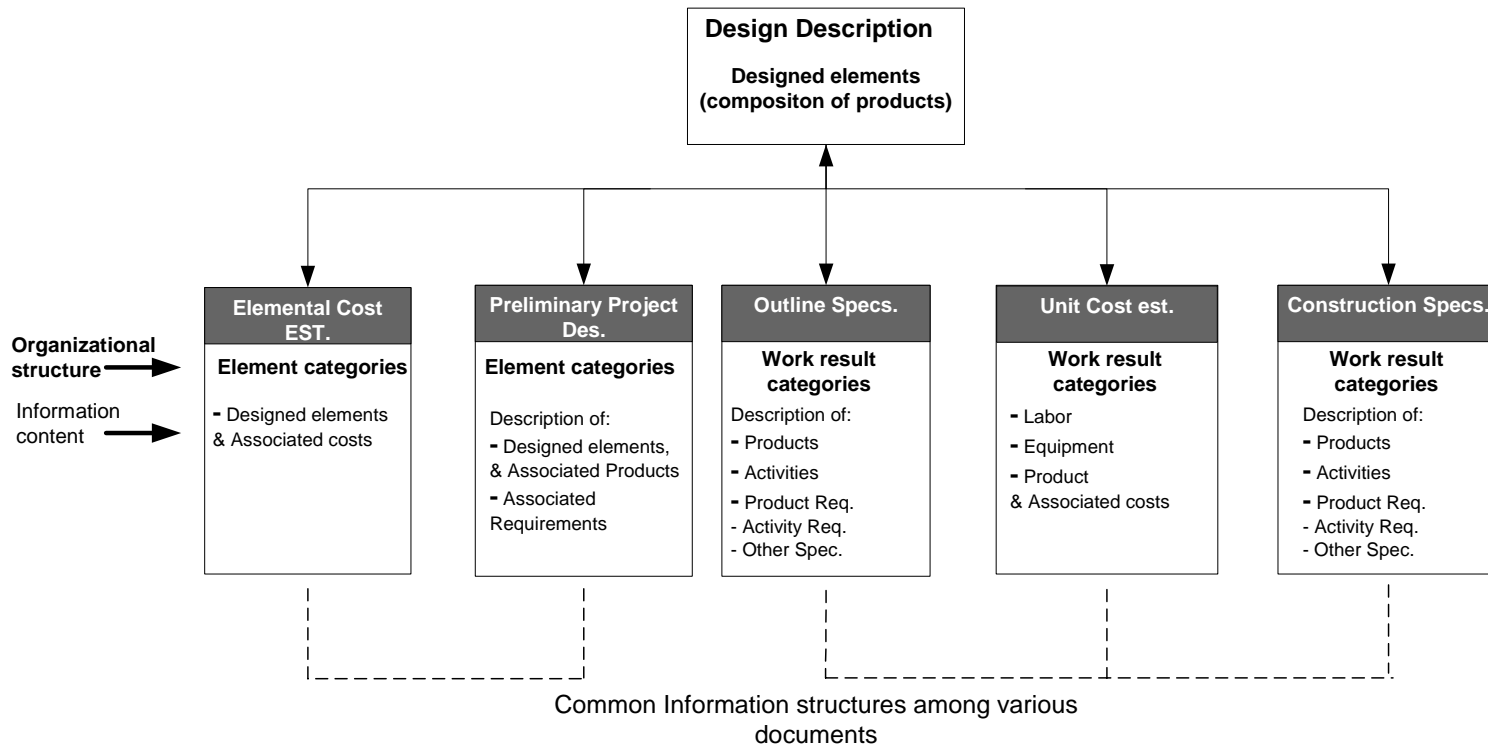
**Products**

**Materials**

**Properties**



# Need – Bi-directional Information Flow and Cross-referencing



Various documents share same information structures , however, information generated in each document cannot directly be transferred to another application or cross-referenced



# *OmniClass – Classification System for the Built Environment*

## **WorkGroup 1:**

- 11 Construction Entities by Function
- 12 Construction Entities by Form
- 13 Spaces by Function
- 14 Spaces by Form

## **WorkGroup 2:**

- 21 Elements - UniFormat
- 22 Work Results – MasterFormat 04
- 23 Products

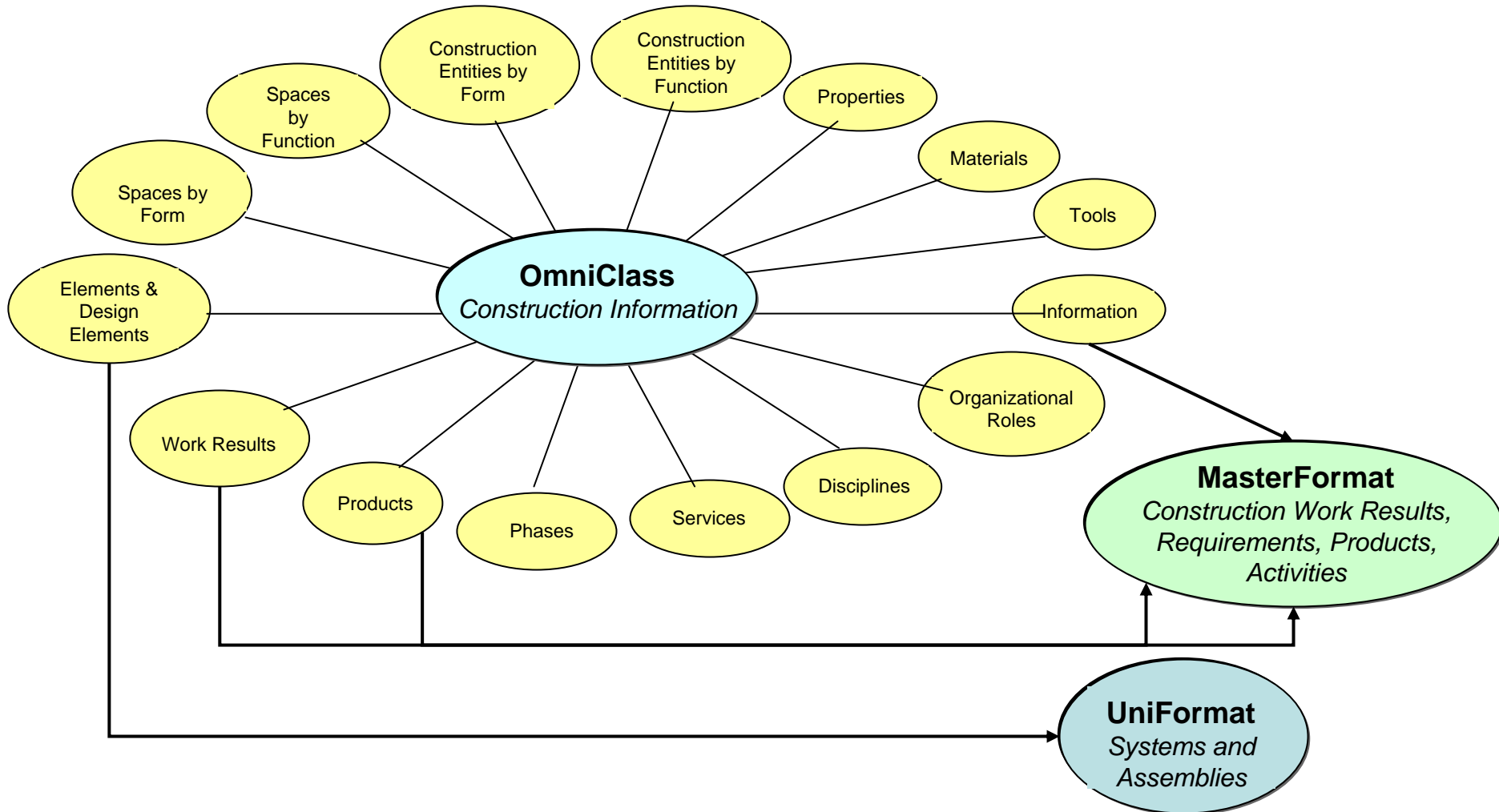
## **WorkGroup 3:**

- 31 Phases
- 32 Services
- 33 Disciplines
- 34 Organizational Roles
- 35 Tools
- 36 Information

## **WorkGroup 4:**

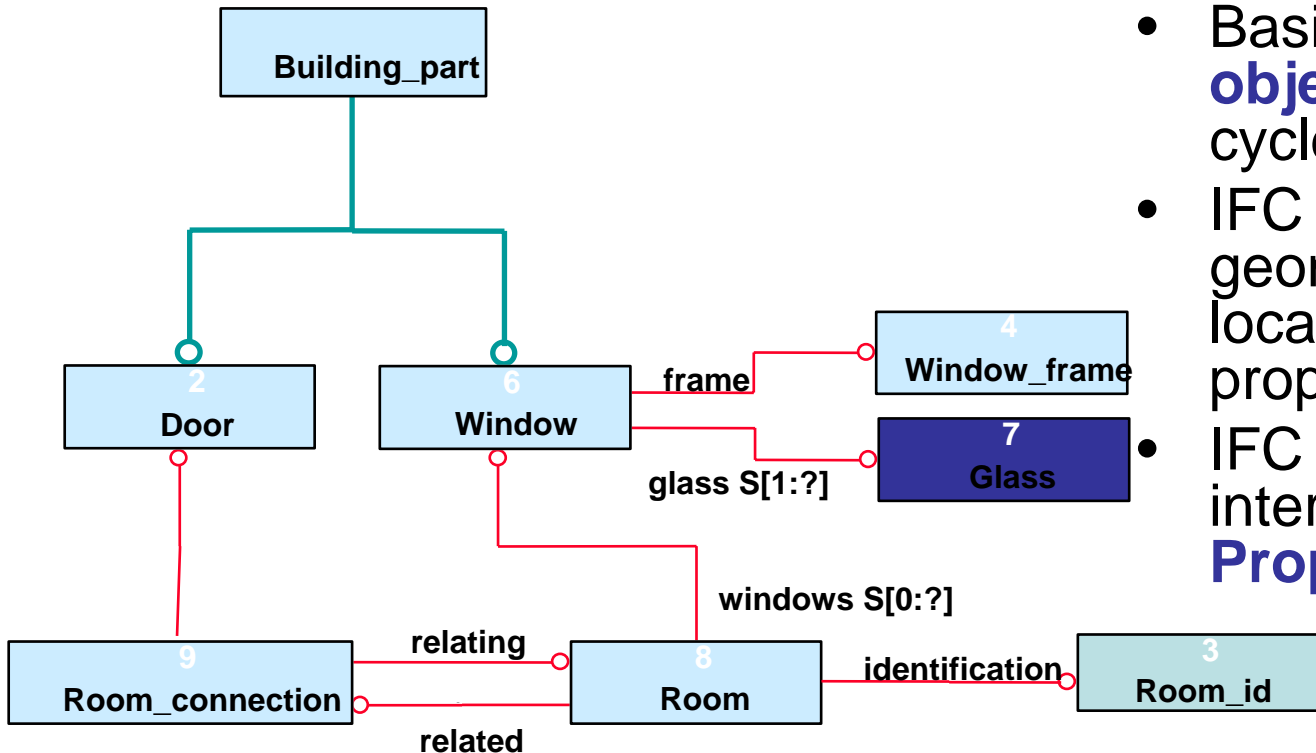
- 41 Materials
- 49 Properties

# Relation of *MasterFormat* and *UniFormat* to *OmniClass*



# Industry Foundation Classes

- Set of internationally standardized **construction industry object definitions**
- Basis – **integration of objects** across project life cycle using a single model
- IFC stores **object data** – geometry, 3D dimensions, location, relationships, properties
- IFC and *OmniClass* intersect in **Elements** and **Properties Table**



International Open Standard = IFC model

**IfcElement:** Generalization of all components that make up an AEC product.

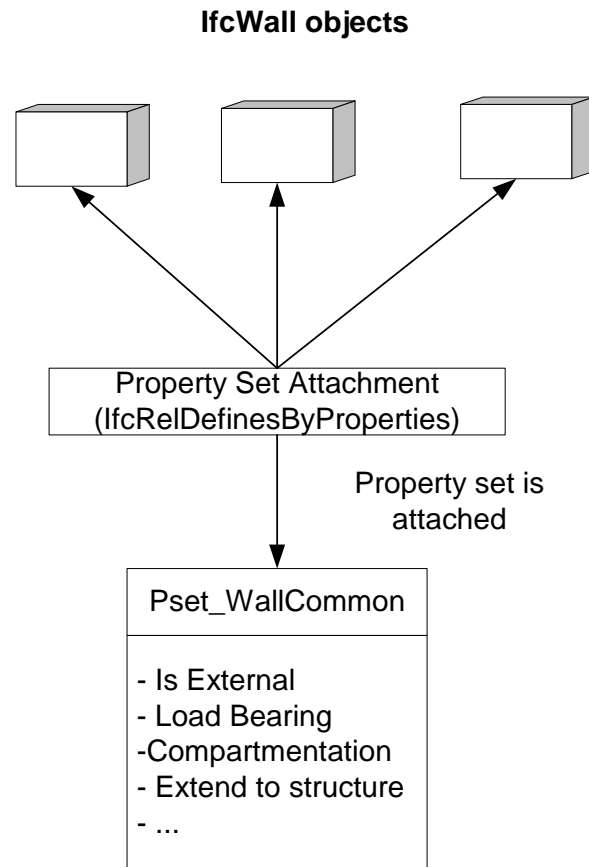
**IfcBuildingElement:** The building element comprises all elements that are primarily part of the construction of a building, i.e., its structural and space separating system.

<b>IfcElement</b>	<b>IfcBuildingElement</b>
IfcBuildingElement	IfcBeam
IfcDistributionElement	IfcBuildingElementComponent
IfcElectricalElement	IfcBuildingElementProxy
IfcElementAssembly	IfcColumn
IfcElementComponent	IfcCovering
IfcEquipmentElement	IfcCurtainWall
IfcFeatureElement	IfcDoor
IfcTransportElement	IfcFooting
IfcVirtualElement	IfcMember
	IfcPile
	IfcPlate
	IfcRailing
	IfcRamp
	IfcRampFlight
	IfcRoof
	IfcSlab
	IfcStair
	IfcStairFlight
	IfcWall
	IfcWallStandardCase
	IfcWindow



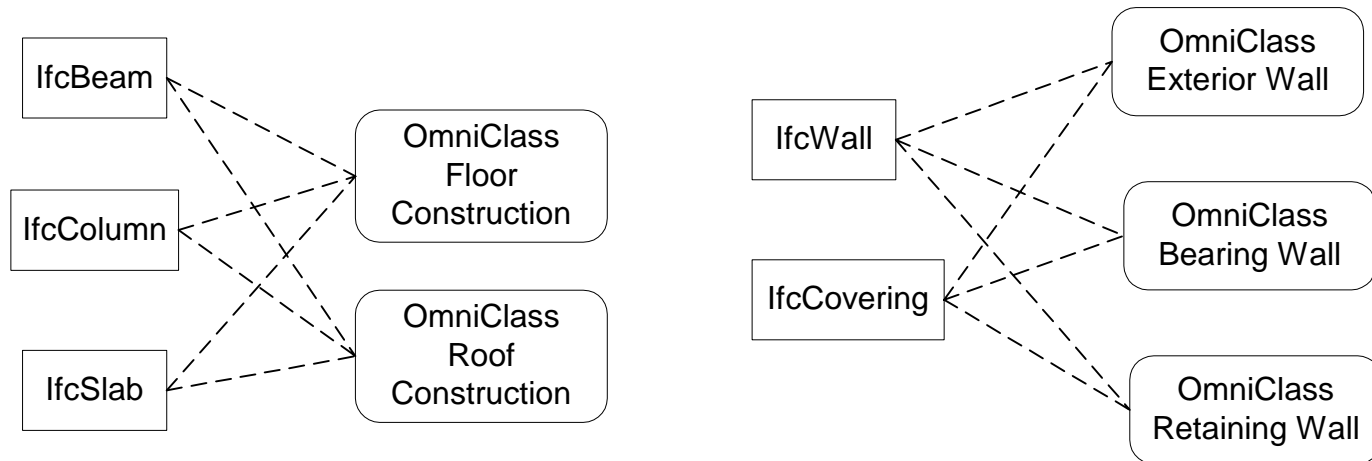
# Building elements - IFC

In IFC functions are defined as properties rather than the basis of their classification.



# Relation of OmniClass & UniFormat to IfcElements

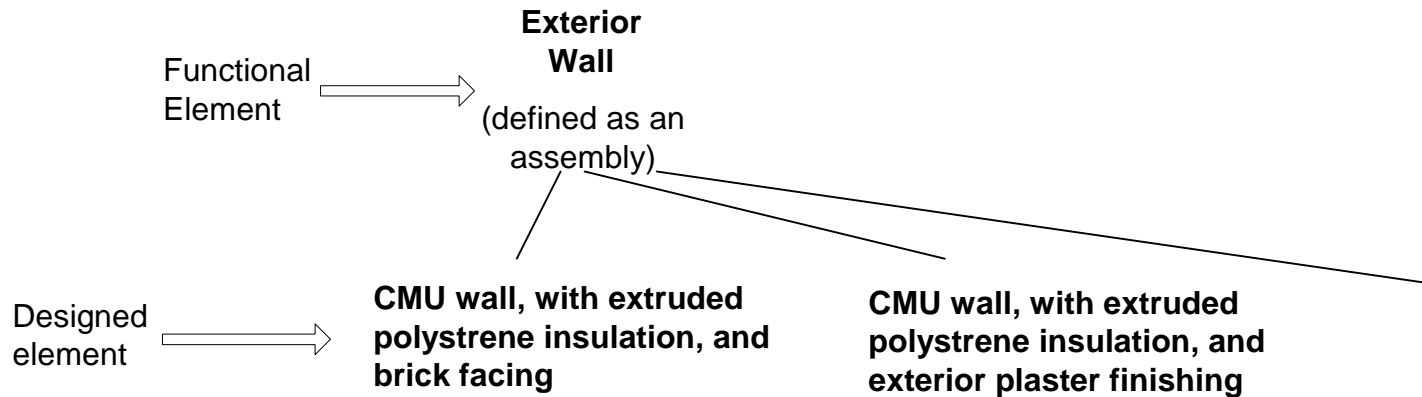
Currently OmniClass elements (which are very close to UniFormat Elements) represents assemblies rather than individual elements. Thus, some elements in OmniClass correspond to aggregation of a number of elements in IFC such as :



- many to many relations

# *OmniClass* elements table – Requirements for incorporating designed elements

Identifying the designed types for elements which represents assemblies might result in infeasible number of designed elements.



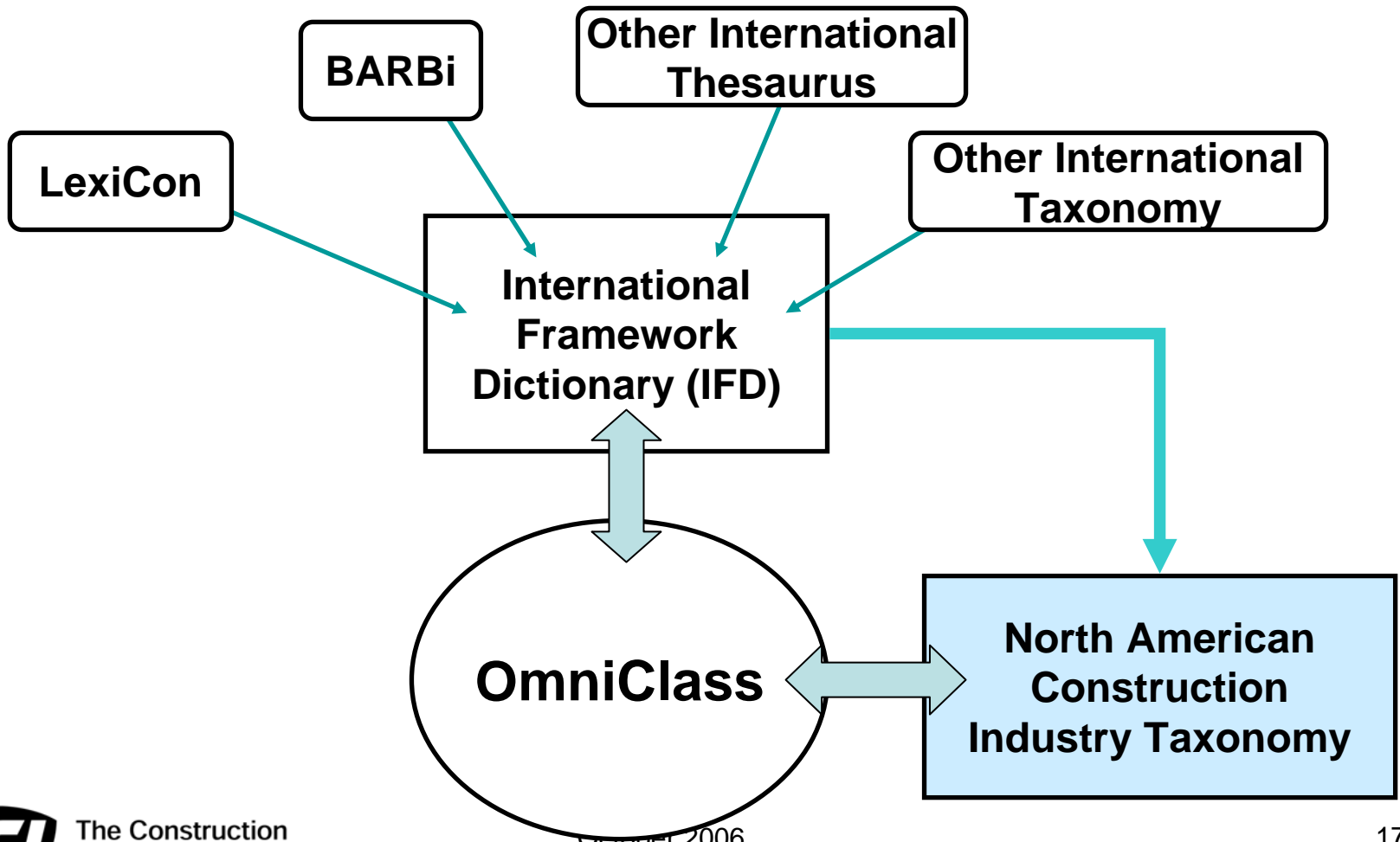
# Taxonomies

- Taxonomies are **hierarchical thesauri** – relating **broader and narrower concepts** and providing terminology alternatives for identifying these concepts
- Taxonomies can help establish a **controlled vocabulary**
- *OmniClass* and the IFD provide a basis for establishing a taxonomy

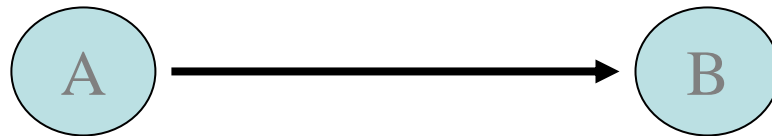




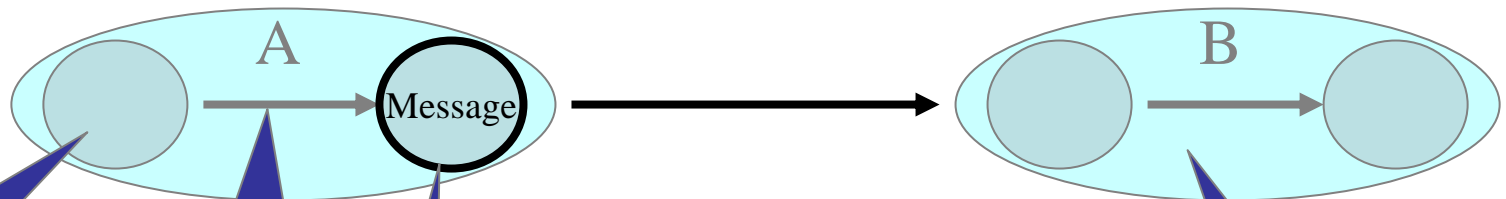
# International Framework for Dictionaries (IFD)



# Point-to-point Communication



Communication is  
Conveying meaning



Concepts  
to be com-  
municated

Encoding

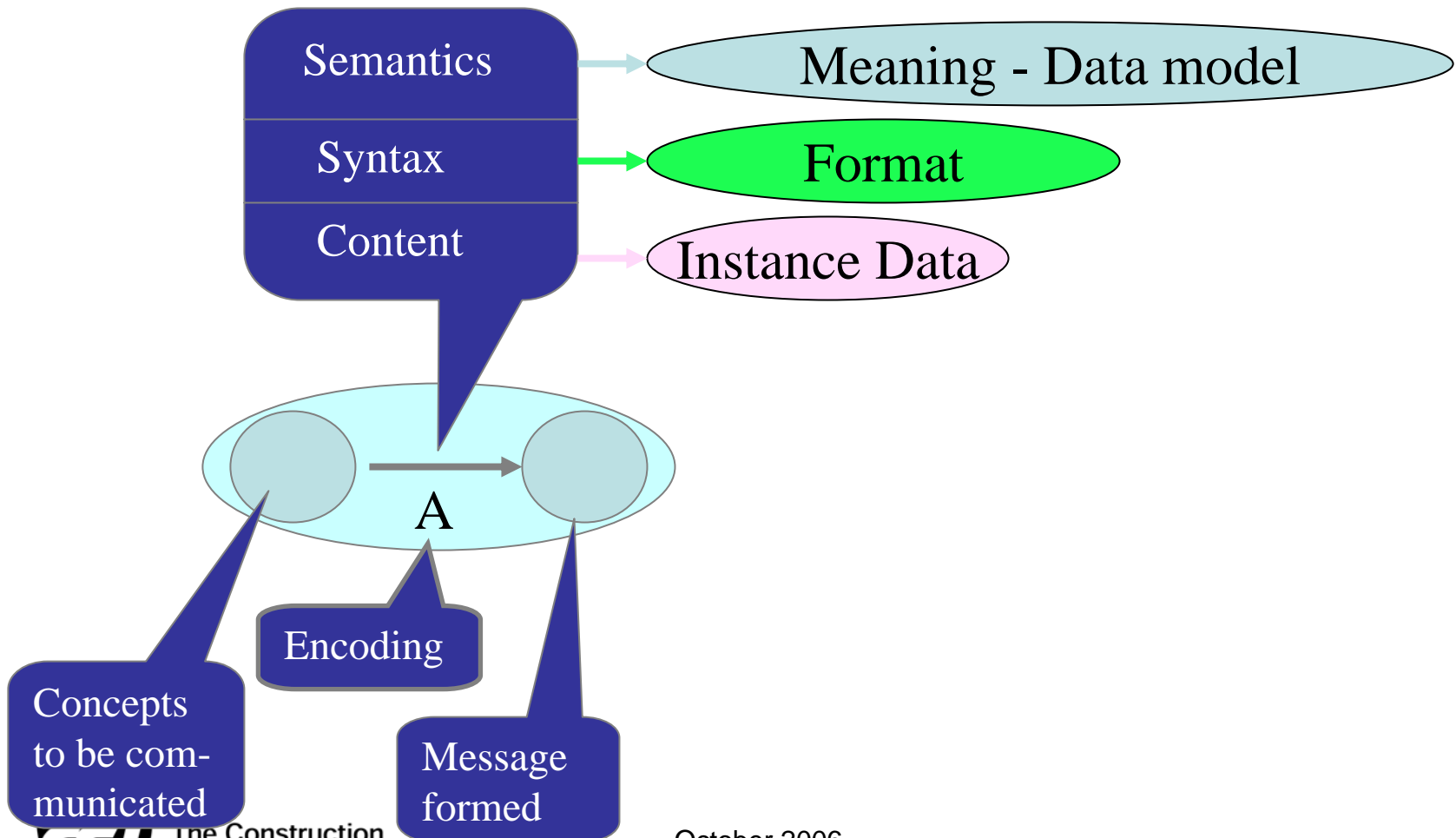
Message  
formed

Communication medium

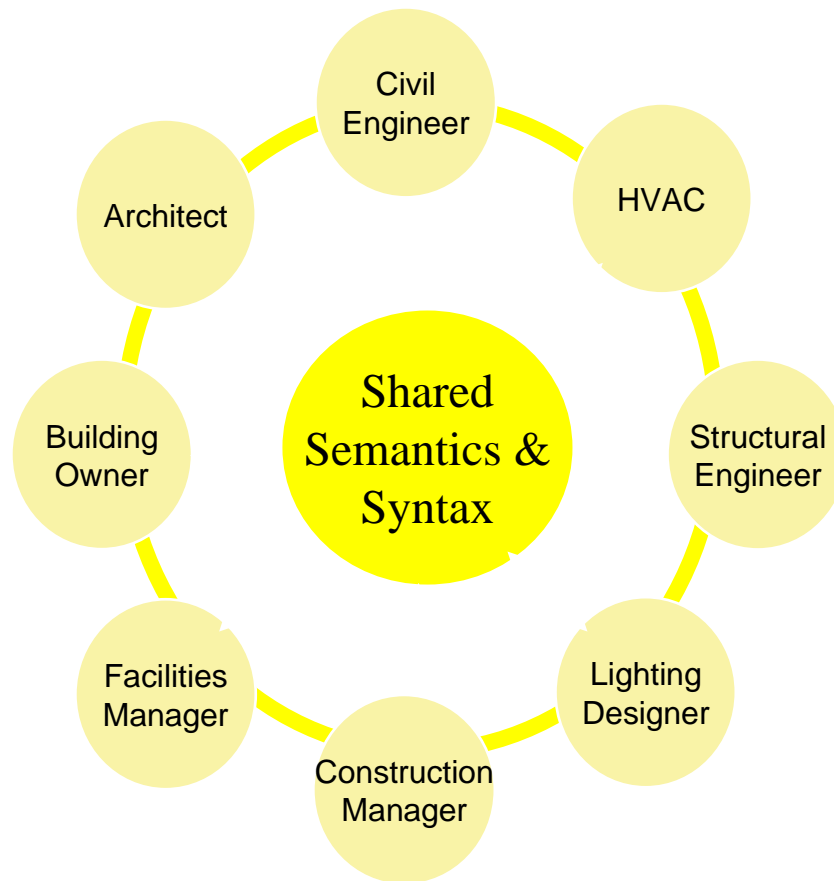
Message  
received,  
decoded,  
concepts  
understood



# Encoding of a Message



# Agree on Semantics and Syntax



- *Participants can communicate using a common language*
- *Any participant can communicate with any other participant*
- *Facilitates high performance teams*

# Goal of Using Standards

