



Future-proofing Civil models

Open BIM

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Director: Software Development, Civil Designer

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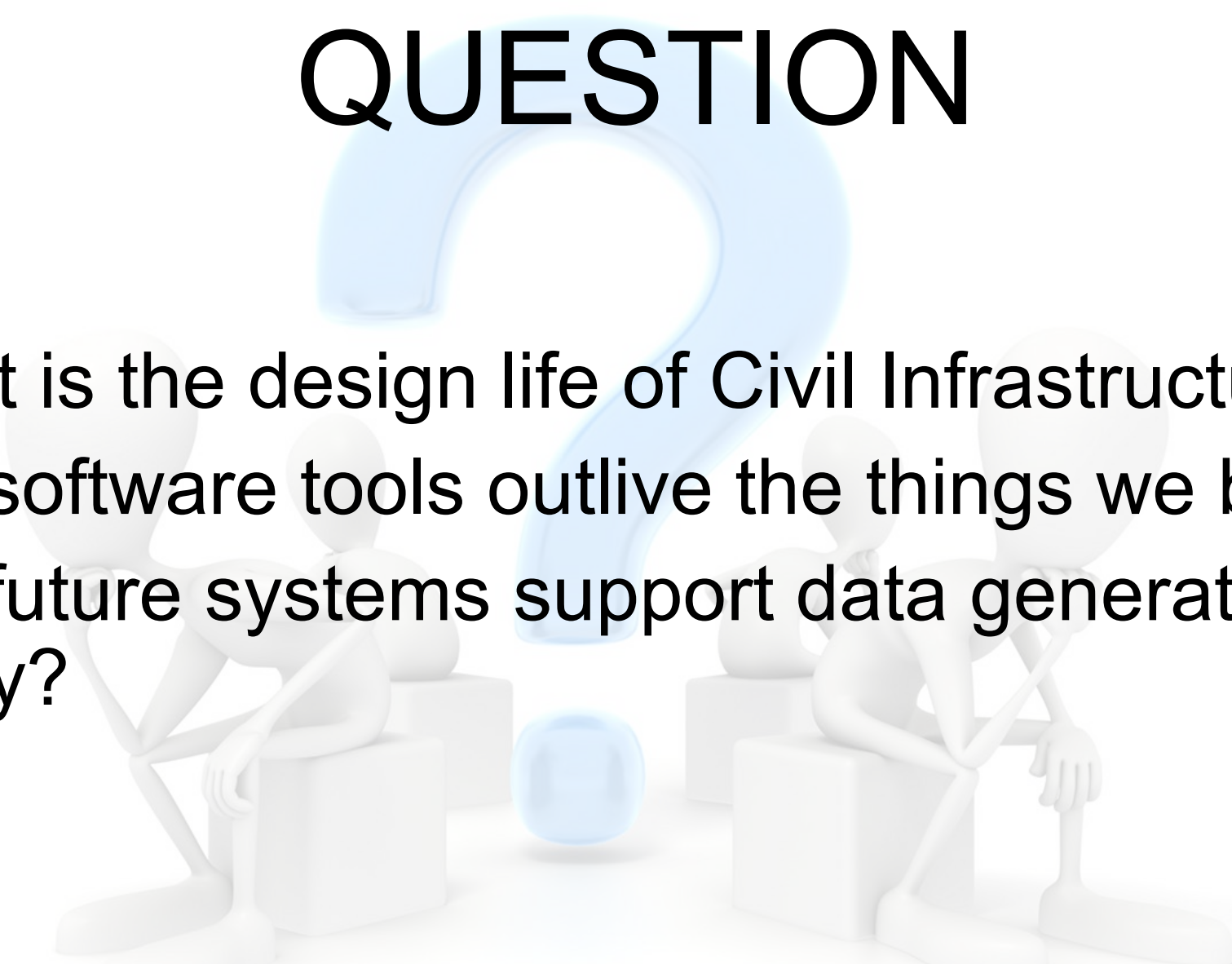
GOLD SPONSORS



BRONZE SPONSORS

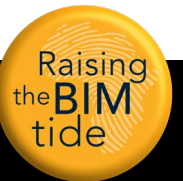


QUESTION



- What is the design life of Civil Infrastructure?
- Will software tools outlive the things we build?
- Will future systems support data generated today?

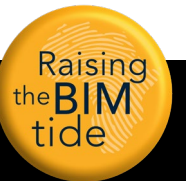
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My reality: 2026



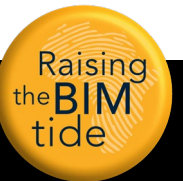
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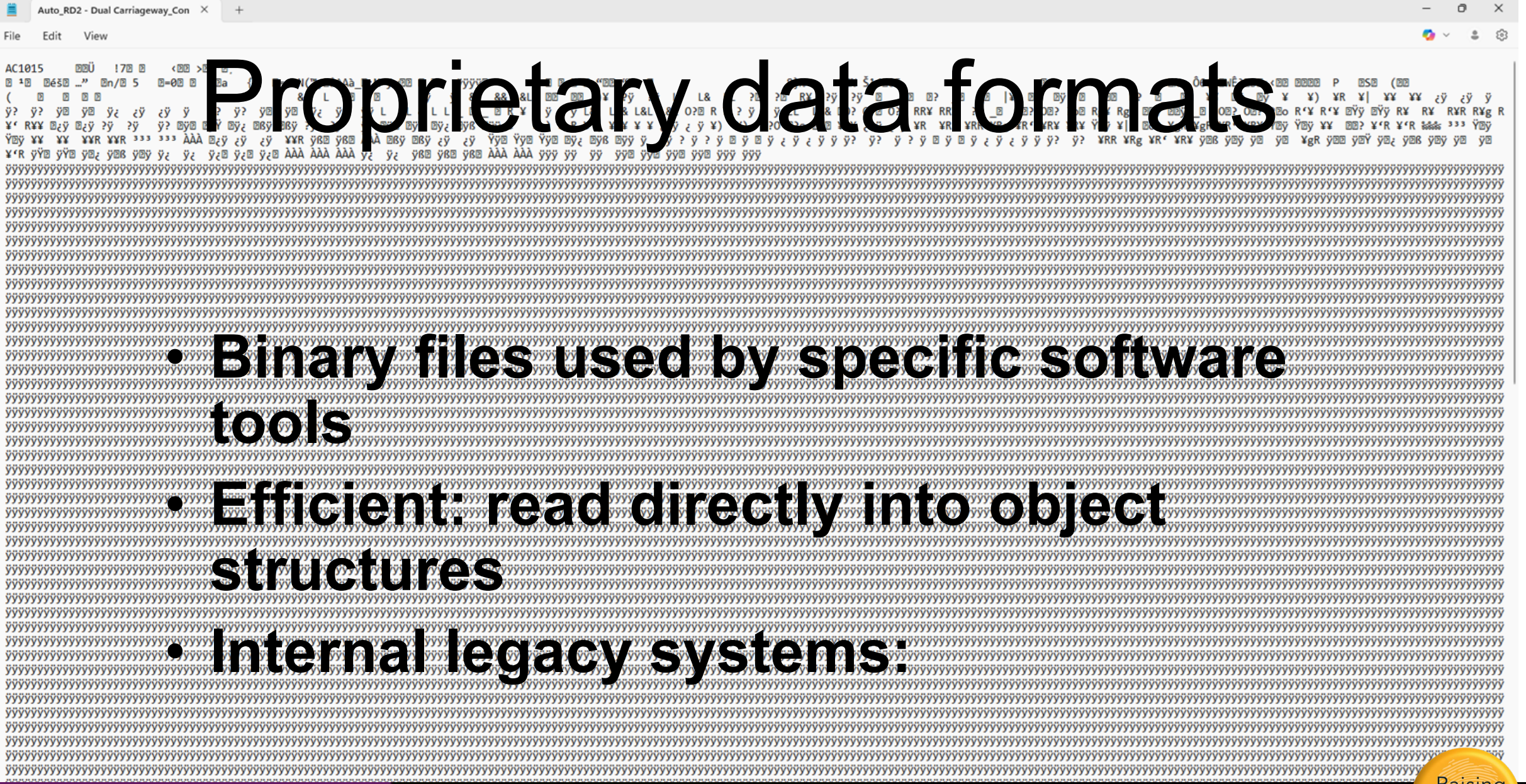


My dad's reality: 1970



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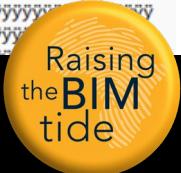




Proprietary data formats

- Binary files used by specific software tools
- Efficient: read directly into object structures
- Internal legacy systems:

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Kier A13 Upgrade_12_RR2.ifc

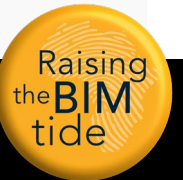
File Edit View

```
ISO-10303-21;
HEADER;
FILE_DESCRIPTION(('ViewDefinition [ReferenceView]' '2;1');
FILE_NAME('Kier A13 Upgrade_12_RR2.ifc', '2025-09-26 14:22:57', ('david', 'david'), ('ODA OAI 25', 'Civil Designer - Civil Designer 9.1.101', 'Administrator'));
FILE_SCHEMA(('IFC4X3_ADD2'));
ENDSEC;

DATA;
#1=IFCCARTESIANPOINT((0.,0.,0.));
#2=IFCCCLASSIFICATION('RIBA', '2021', $, 'Uniclass', $, $, $);
#3=IFCPROJECT('1vJP8oAGD958ALraGYXc1y', #4, 'HIGHWAY DESIGN', 'Civil Designer Project', $, 'HIGHWAY DESIGN', $, (#23), #9);
#4=IFCOWNERHISTORY(#7, #5, .READWRITE., .NOTDEFINED., $, $, $, 1758889184);
#5=IFCAPPLICATION(#6, '9.1 (Release 1)', 'Civil Designer 9.1', 'Civil Designer 9.1');
#6=IFCORGANIZATION($, 'Knowledge Base', 'Knowledge Base', $, $, $);
#7=IFCPERSONANDORGANIZATION(#8, #6, $);
#8=IFCPERSON($, 'Base', 'Knowledge', $, $, $, $, $);
#9=IFCUNITASSIGNMENT((#10, #11, #12, #13, #14));
#10=IFCSIUNIT(*, .LENGTHUNIT., $, .METRE.);
#11=IFCSIUNIT(*, .AREAUNIT., $, .SQUARE_METRE.);
#12=IFCSIUNIT(*, .VOLUMEUNIT., $, .CUBIC_METRE.);
#13=IFCSIUNIT(*, .SOLIDANGLEUNIT., $, .STERADIAN.);
#14=IFCCONVERSIONBASEDUNIT(#17, .PLANEANGLEUNIT., 'DEGREE', #15);
#15=IFCMEASUREWITHUNIT(IFCPLANEANGLEMEASURE(0.017453292519943295), #16);
#16=IFCSIUNIT(*, .PLANEANGLEUNIT., $, .RADIANT.);
#17=IFCDIMENSIONALEXONENTS(0,0,0,0,0,0,0);
#18=IFCDIRECTION((0.,1.));
#19=IFCAXIS2PLACEMENT3D(#20, #21, #22);
#20=IFCCARTESIANPOINT((0.,0.,0.));
#21=IFCDIRECTION((0.,0.,1.));
#22=IFCDIRECTION((1.,0.,0.));
#23=IFCGEOMETRICREPRESENTATIONCONTEXT('Plan', 'Model', 3, 1.E-008, #19, #18);
#24=IFCMAPCONVERSION(#23, #25, 0., 0., 0., $, $, $);
#25=IFCPROJECTEDCRS('EPSG:32734', $, $, $, $, $);
#26=IFCGEOMETRICREPRESENTATIONSUBCONTEXT('Body', 'Model', *, *, *, #23, $, .MODEL_VIEW., $);
#27=IFCDIRECTION((0.,0.,1.));
#28=IFCDIRECTION((1.,0.,0.));
#29=IFCAXIS2PLACEMENT3D(#1, #27, #28);
#30=IFCLOCALPLACEMENT($, #29);
#31=IFCSITE('1lyEsZ0CnFN8fwBqNfBAan', #4, 'Default Site', '', $, #30, $, $, .ELEMENT., (24,28,0), (54,25,0), 10., $, $);
#32=IFCRELAGGREGATES('2KzrhxvurEaRsnQTPYAmfu', #4, $, $, #3, (#31, #59));
#33=IFCRELAGGREGATES('0zt9Q2$OLF2AhD9xqaDSVh', #4, $, $, #31, (#34));
#34=IFCROAD('09XPqAzLv8vrfhtkjee2E3', #4, 'Road Project', 'Collection of all Road objects', $, $, $, $, $);
#35=IFCROAD('1W_SJVH5T9sgZ982r5vZ$P', #4, 'RR2', 'Dual Carriageway', $, $, $, $, $);
#36=IFCRELAGGREGATES('0qpXUZacX78ejVXX7e74VX', #4, $, $, #34, (#35));
#37=IFCRELDEFINESBYPROPERTIES('3UXJThVrRBYulHMd6i0NIZ', #4, $, $, (#35), #38);
#38=IFCPROPERTYSET('2C6AY6Cm5CrPxxvT1Wsk9CK', #4, 'CD_RoadMeshProps', $, (#39, #41));
#39=IFCPROPERTYSINGLEVALUE('Start Chainage', $, IFCREAL(0.), #40);
#40=IFCSIUNIT(*, .LENGTHUNIT., $, .METRE.);
#41=IFCPROPERTYSINGLEVALUE('End Chainage', $, IFCREAL(0.), #40);
#42=IFCRELDEFINESBYPROPERTIES('2u1f0RKFD3RAXMIKRWdQc2', #4, $, $, (#35), #43);
#43=IFCPROPERTYSET('3SCH0VQxb0ROGAqU2vUnsY', #4, 'Pset_RoadDesignCriteriaCommon', $, (#44, #45, #54, #55, #56, #57, #58));
```

- Human readable
- Human interpretable
- Data Continuity
- Conform to Standards
- Based on open data formats and schema

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International Information management standards

ISO 19650-4:2022(E)

The information provider shall review and confirm the selected authoring software to use during mobilization (ISO 19650-2:2018, 5.4 and ISO 19650-3:2020, 5.4).

To facilitate the information development process, the information provider shall select authoring software that supports:

- import of the schemas and data formats of relevant reference information;
- export of the requested schemas and data formats; and
- interaction with any agreed issue and risk registering and agreed management tools.

The information receivers and information reviewers shall review and confirm the versions of open data formats and proprietary data formats to be used.

The information receivers shall consider the need and benefits for information exchange using:

- open schema and data format standards that allow cross-party collaboration and
- proprietary or native data formats where this does not disadvantage any information receivers' immediate or future needs.

NOTE Open schemas and data formats are summarized in [Annex A](#).

The information receivers shall check and confirm the selected review and integration software (ISO 19650-2:2018, 5.4 and ISO 19650-3:2020, 5.4) capable of the appropriate handling of information exchanges including:

Annex A (informative)

Open schema and data format standards

A.1 Open schema

[Table A.1](#) provides examples of open schemas enabling interoperability.

Table A.1 — Open schema

Name	ISO standard	Data format	File suffixes
IFC	ISO 16739-1 ^[6]	spf xml rdf/owl	.ifc .ifcxml
GML	ISO 19136 (all parts) ^[9]	xml	.gml
Posc/Cesar	ISO 15926 (all parts) ^[10]	.spf	

Other regionally or sector specified open schemas and data formats are in use such as:

- CAFMconnect^[11] for built asset orientated handover;
- COBie^[12] for built asset orientated equipment and impact handover;
- CFIHOS^[13] for plant-orientated handover;
- Oscre^[14] for various property related transactions.

Open schema and data formats can be checkable using formal requirements definitions such as ISO 29481-3^[5] mvdXML/IDS (forthcoming)

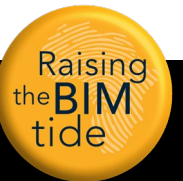
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What is openBIM® ?

- Registered trademark owned by BuildingSMART International Limited
- Global initiative that encourages the use of open standards and workflow in the AEC industry
- Allows for seamless data sharing among stakeholders using different tools and platforms
- Open standards such as
 - Industry Foundation Classes (IFC)
 - BIM Collaboration Format (BCF)
 - Information Delivery Standards (IDS)

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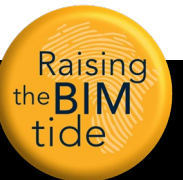


Who is



- World wide industry body driving the digital transformation of the built environment
- They drive the creation and adoption of open, international standards
- Their board of directors has representation across the world
- Vision: *The seamless exchange of trusted information across the built environment*

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What does



do?

- Mission: *To create and maintain open and reliable digital standards for the built environment and support their global adoption*
- IFC:
 - Deals with process, data, terms and change management
 - Over 1300 entities, 2500 properties in over 750 sets, extendable by industry
 - IFC 4.3 became ISO16739 in 2024 and supports infrastructure.
- BCF:
 - Standard for model-based communication between project stakeholders
 - Issue tracking and management
 - *BIM tools implement either via file-based exchange or API support*
- IDS:
 - Information Delivery Specification – machine readable
 - Used for automated data compliance checking
- BuildingSMART provides governance, guidance, certification and training
 - IFC Validation
 - Software certification

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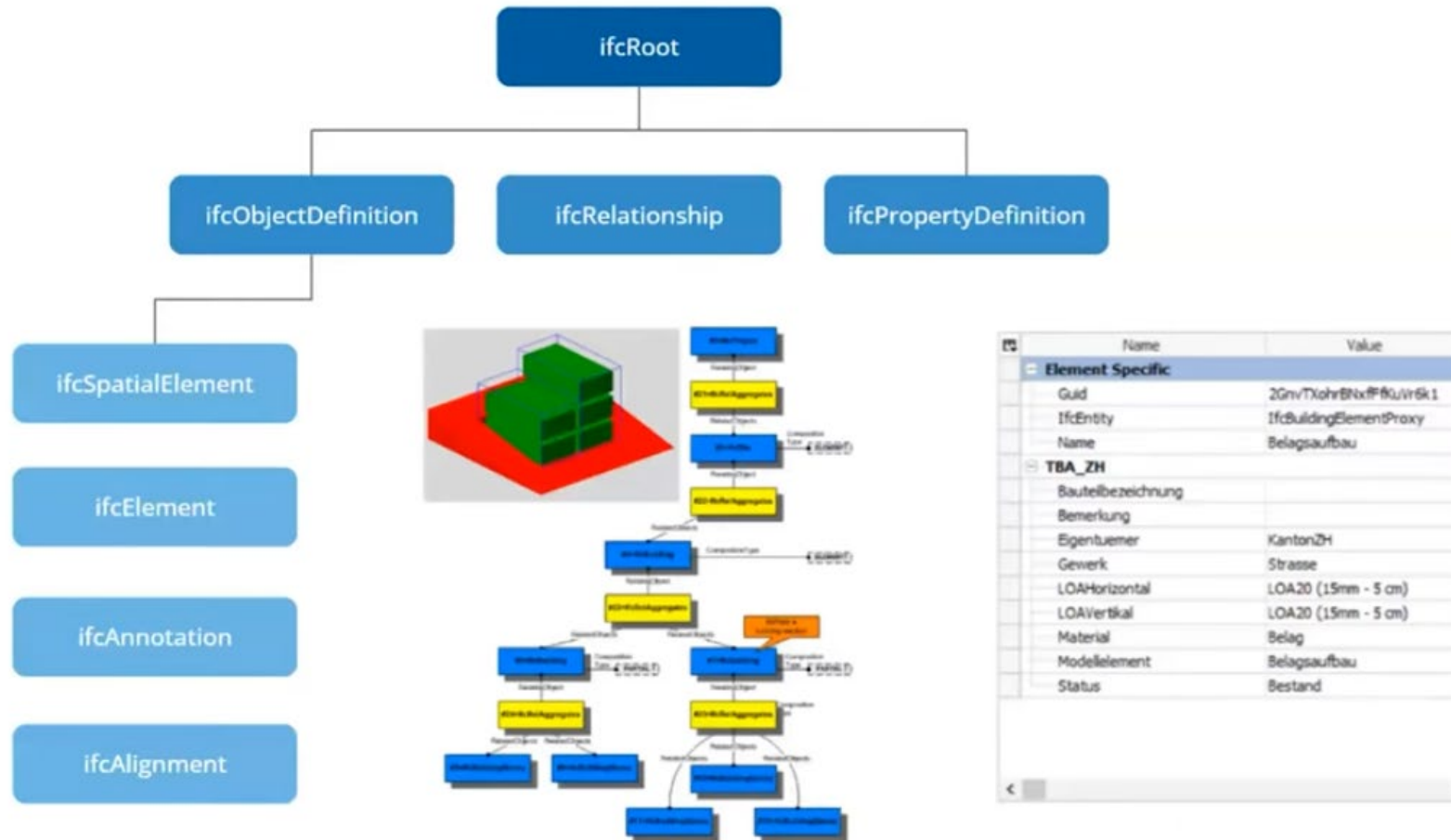
What can be stored in an IFC file?

- MUCH more than just a file with 3D geometry!
- IFC is a **data scheme** explaining how to organize objects, properties, relations and more...
- <https://ifc43-docs.standards.buildingsmart.org/>
 - A: Core data schemas
 - B: Shared element data schemas
 - C: Resource specific data schemas
 - D: Domain specific schemas

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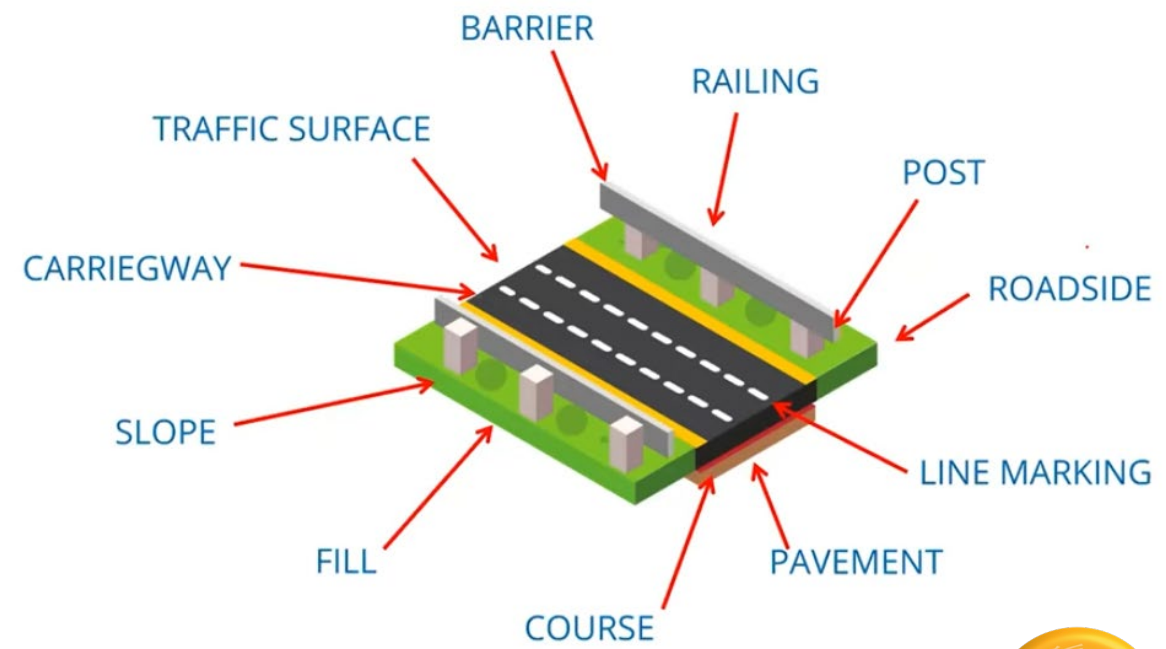
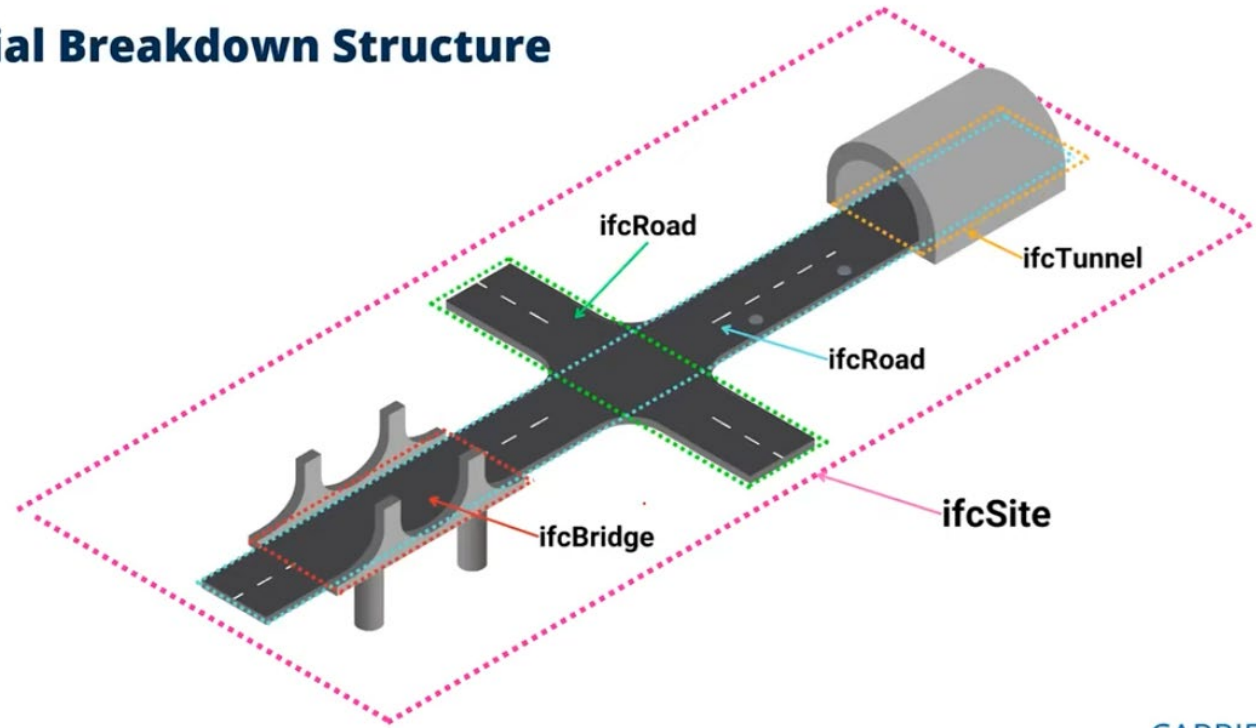
Main abstract types



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Spatial Breakdown Structure



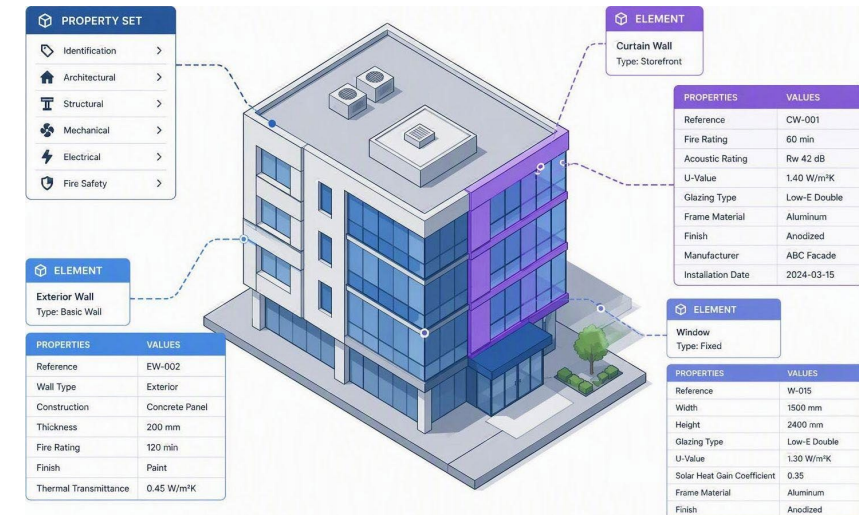
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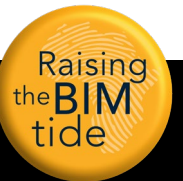
Property sets

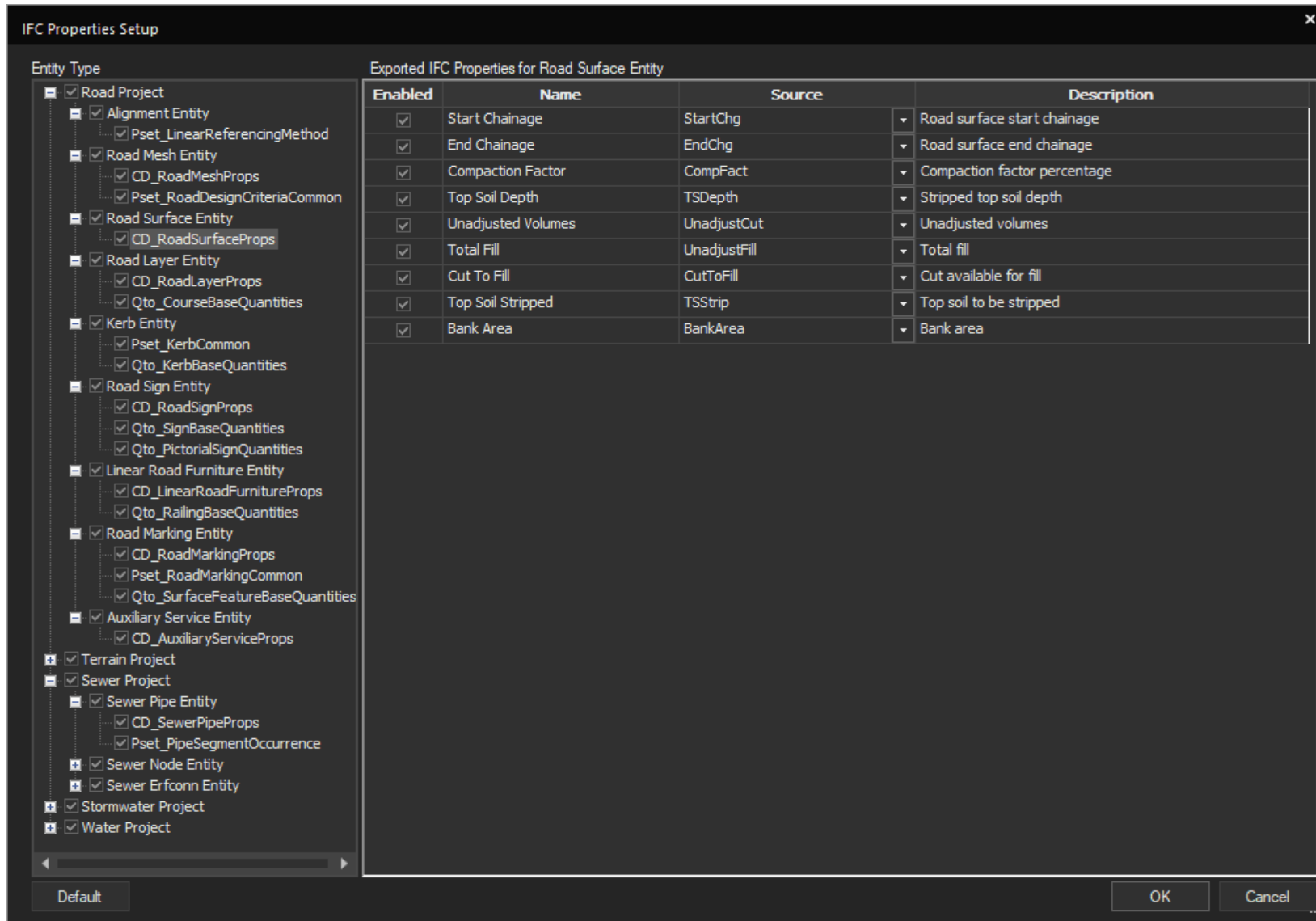


- Each entity or part can have a set of properties
- Property Sets facilitates the exchange of information in BIM
- P.Sets can be user defined, via authoring software



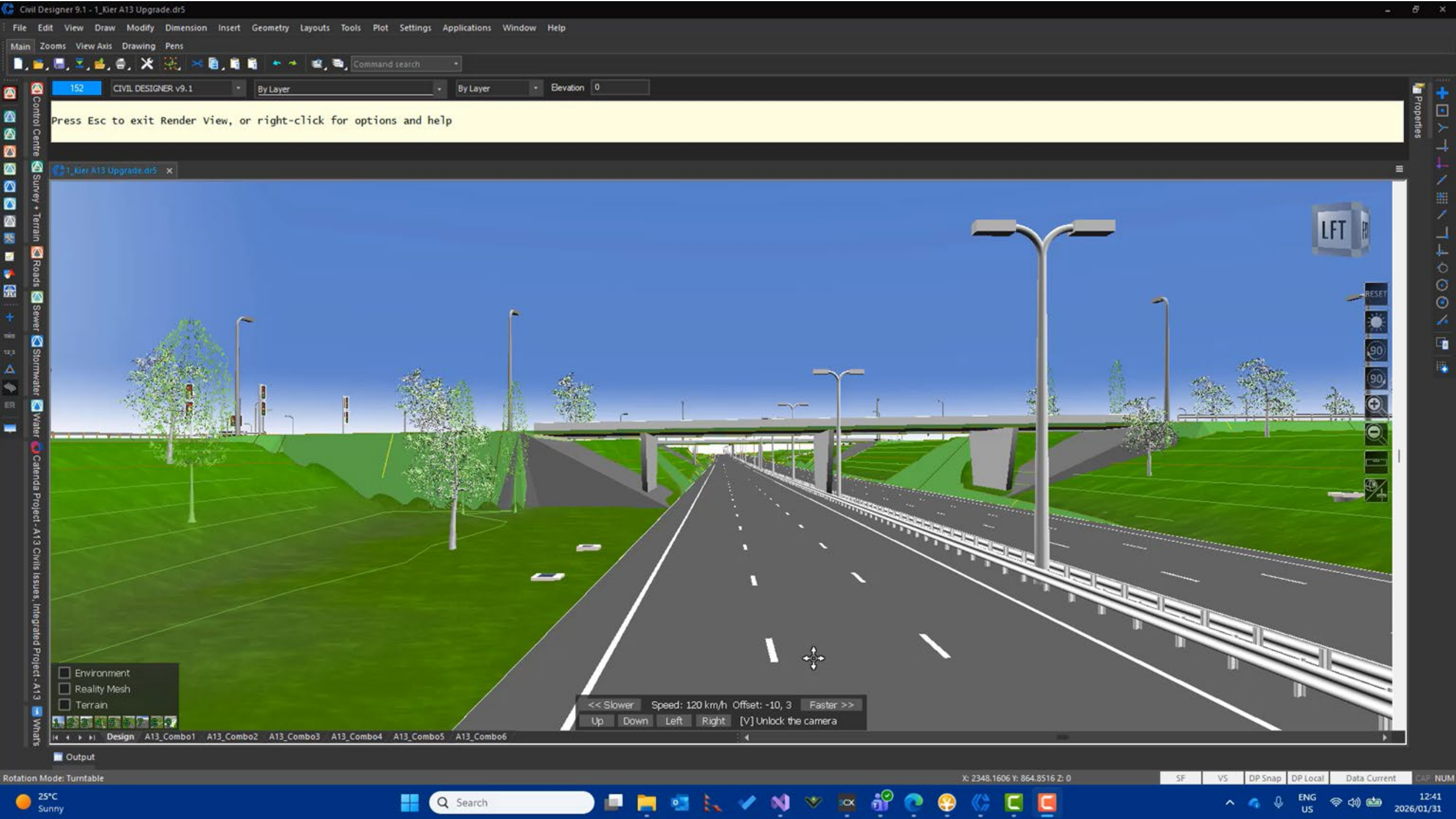
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Securing compliance via



- Asset Owner specifies their Information Requirements (OIR – PIR - EIR)
- Translates into a computer-interpretable IDS (Information Delivery Specification)
- Ensures the effective delivery of data by setting expectations and providing clear guidance for what needs to be exchanged
- IDS allows for automatic compliance checking of IFC models.



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What does



Contain?

- **<info>** Metadata about the author, tool, purpose, version
- **<application>** Filters the IFC entity type – what to target
- **<requirements>** Explicit rules

```
<?xml version="1.0" encoding="utf-8"?>
<ids xmlns="http://buildingsmart.org"
      xmlns:xsi="http://w3.org"
      xsi:schemaLocation="http://buildingsmart.org http://buildingsmart.org/ids_0!

<!-- FILE METADATA AND INFO -->
<info>
  <title>Project Information Delivery Requirements</title>
  <copyright>Building Owner Corp</copyright>
  <version>1.0</version>
  <description>Mandatory data specifications for architectural asset submission
</info>

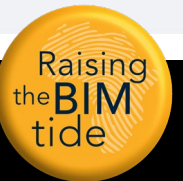
<!-- LIST OF SPECIFICATIONS -->
<specifications>
  <specification id="WALL-FIRE-01" name="External Wall Fire Rating Requirement"
    <description>All external concrete walls must possess a valid technical fi

  <!-- APPLICABILITY: What objects are targeted? -->
  <applicability>

    <name>IFCWALL</name>

    <propertyset>
      <propertySetName>Pset_WallCommon</propertySetName>
      <property>
        <name>IsExternal</name>
        <value>TRUE</value>
      </property>
    </propertyset>
  </applicability>
```

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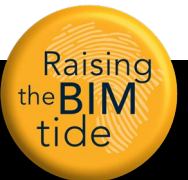


The governance layer

- This was an example of OpenBIM in action.
- But for scalability beyond individual projects
- Requires a robust global infrastructure
- This brings us to the governance layer behind these standards.
- The BuildingSMART network spans the globe through....



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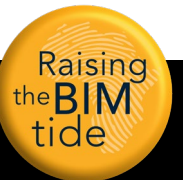


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International

Chapters

- **National membership organizations sharing the vision and goals of BuildingSMART**
- **They develop and promote the use of open data standards in their countries**
- **Support the local demand for openBIM**

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What does a

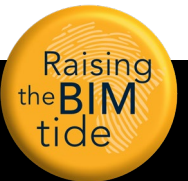


Chapter do?

- Play a pivotal role in aligning openBIM with local government frameworks
- Act as the localized technical authority
- Manage the deployment of standardized educational frameworks locally
- Unite a fragmented domestic AEC market through targeted community action



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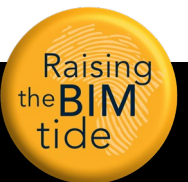


In closing

- OpenBIM is implied in ISO 19650
- A shared, open, model-based representation reduces risk and enable long-term sustainability.
- **Software tools should serve as contributors in an openBIM ecosystem.**
- Prevent vendor lock-in and allow professionals to use the software of their choice.



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- Will the digital data we generate today, outlive the things we build?

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