

LCADesign

An integrated approach to automatic eco-efficiency assessment of commercial buildings

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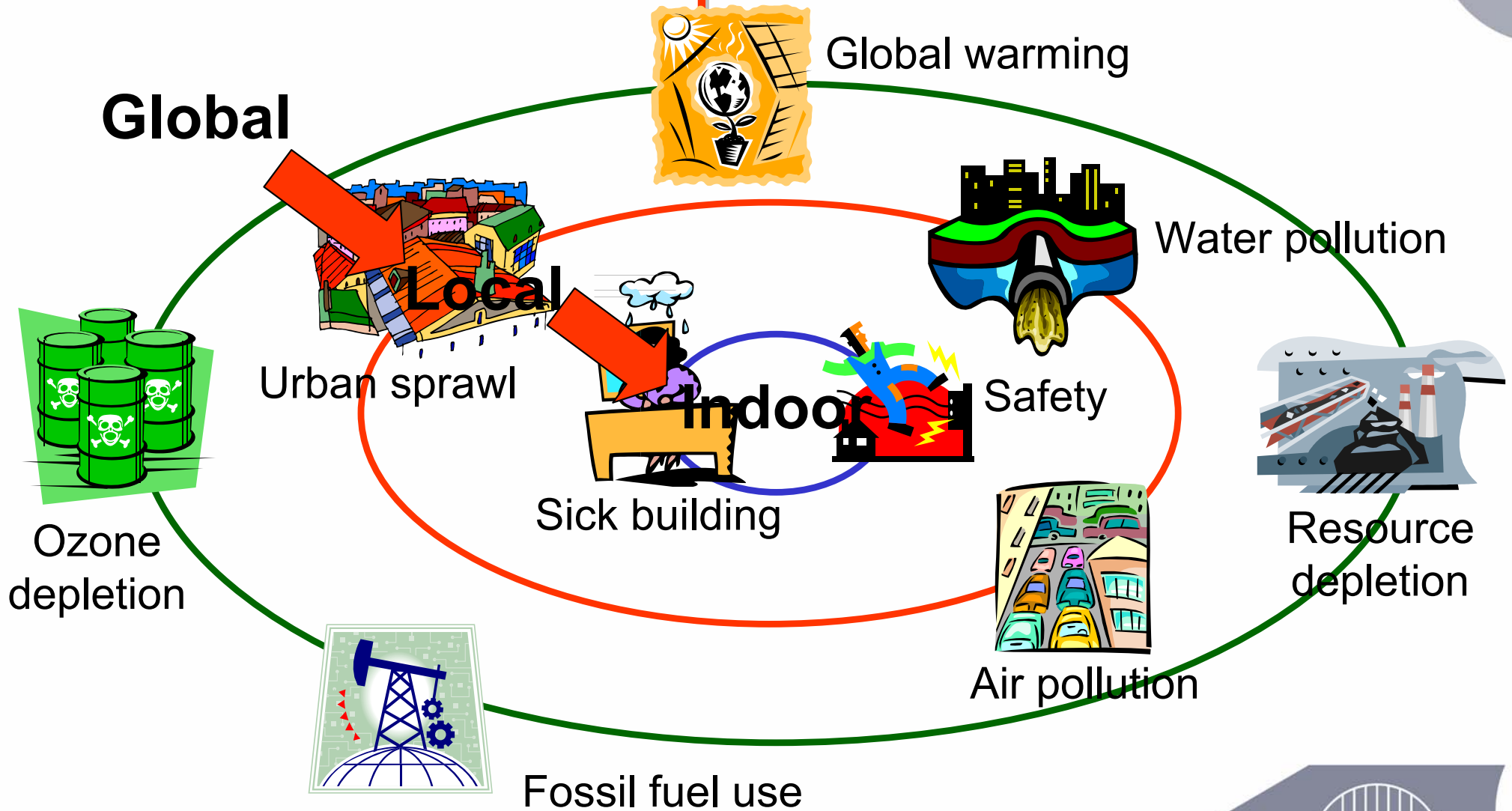
Life Cycle Assessment

“LCA is a technique for assessing the environmental aspects and potential impacts associated with a product by:

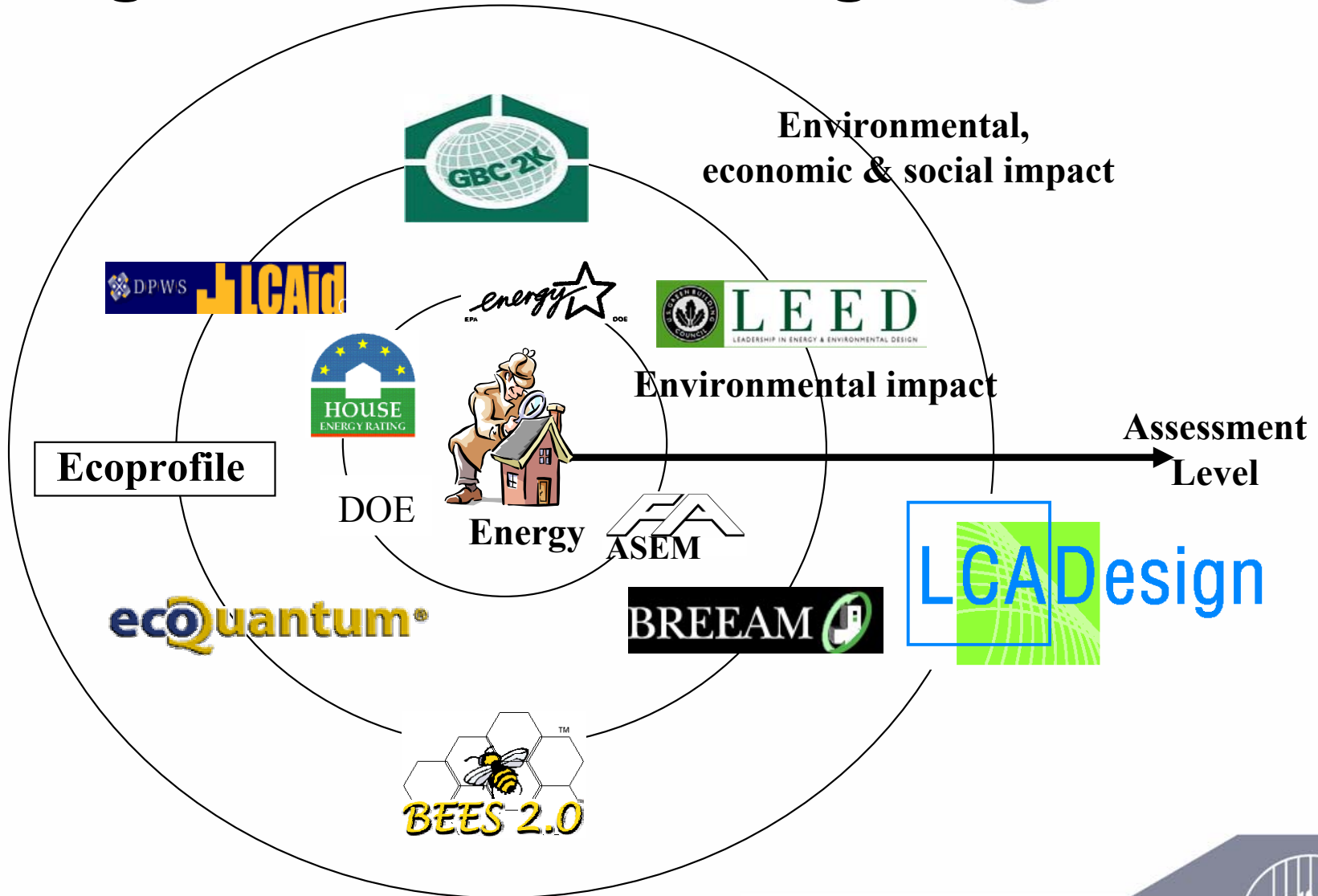
- compiling an inventory of relevant inputs and outputs of a product system;
- evaluating the potential environmental impacts associated with those inputs and outputs;
- interpreting the results of the inventory analysis and impact assessment phases in relation to the objectives of the study.”

ISO 14040 (1997)

Environmental Impacts



Existing Models for Building



Limitations of existing tools

- Restriction of tools to specific aspects
- Lack of ability for in-depth and elaborate assessment
- Need of a specially educated assessor and thus unable be used by different/ other parties.
- Time-consuming and demanding data input
- Lack of consideration of economic criteria
- Lack of a transparent weighting system

Quantification

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- Absolute values
- Evidence-based calculation (repeatable)
- Building component aggregation
- Cost effectiveness
- Full life cycle

Existing Tools

- Relative values (Ratings)
Some models (BEAT)
- LCA models only
- Aggregate building descriptions
- Occasionally (BEES)
- Some models (ENVEST)

Assessment

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- Objective
- Comparative ratings
- Detailed environmental impacts
- Performance of building components
- Acceptable for standards, codes etc
- Choice of performance measures
- Transparency to user e.g. weightings

Existing Tools

- Subjective and objective
- Comparative ratings
- Rarely drill down
- Little performance of building components
- Some acceptable for standards, codes etc
- Usually only one performance indicator
- Variable transparency to user

Functionality

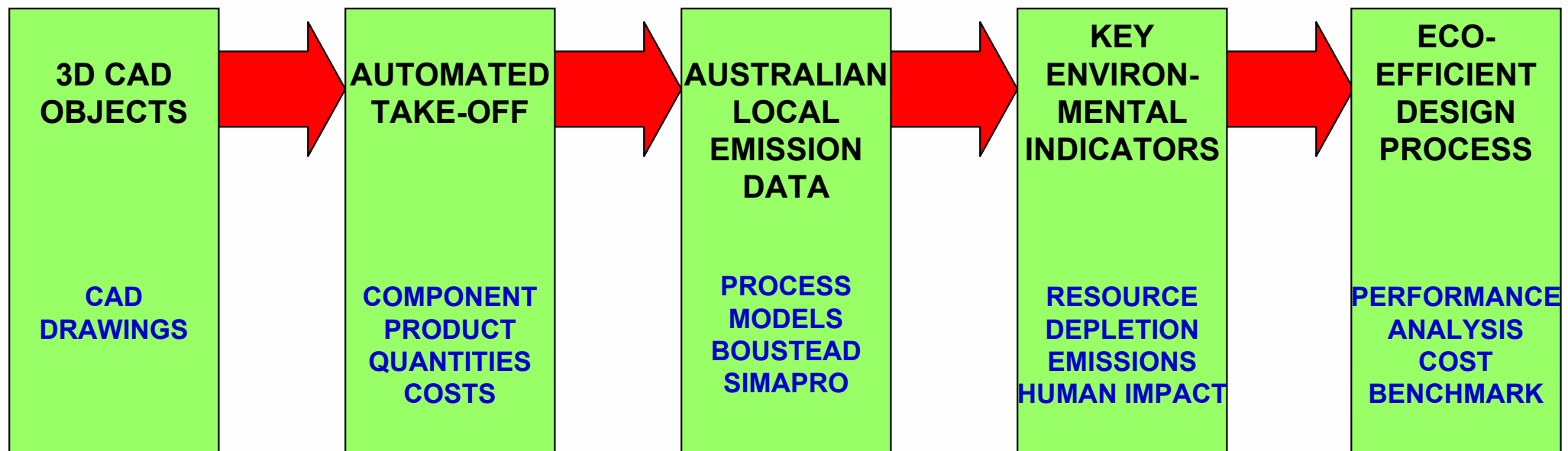
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- Data direct from CAD
- Comprehensive products database
- Detailed building design evaluation
- User verification at any level of detail
- Easy alternative scenarios
- Extensive calculations

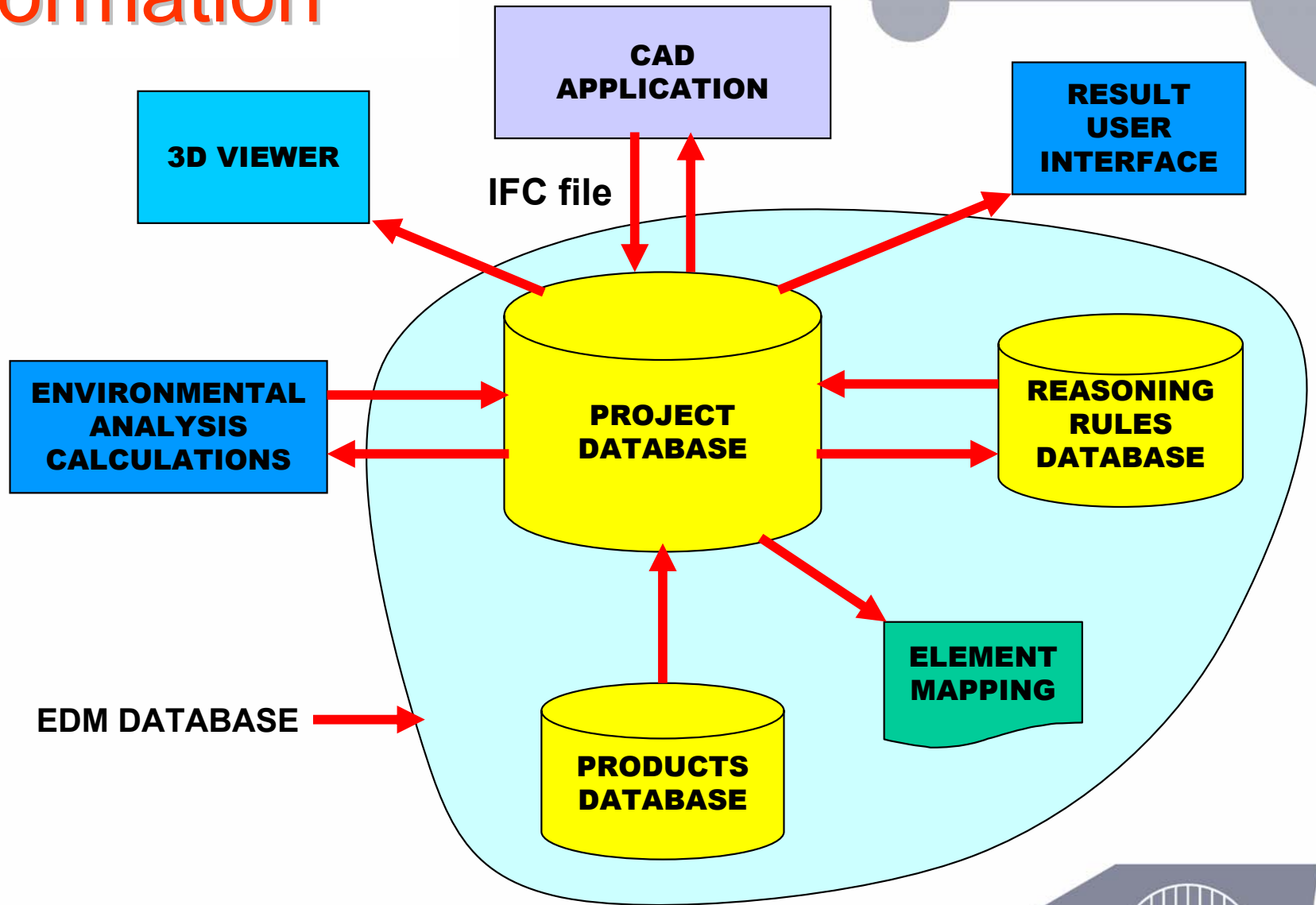
Existing Tools

- No integrated data direct from CAD
- LCA models only
- No detailed building design evaluation
- Some user verification at selected level of detail
- Some easy alternative scenarios (Athena)
- Calculations limited to focus of tool

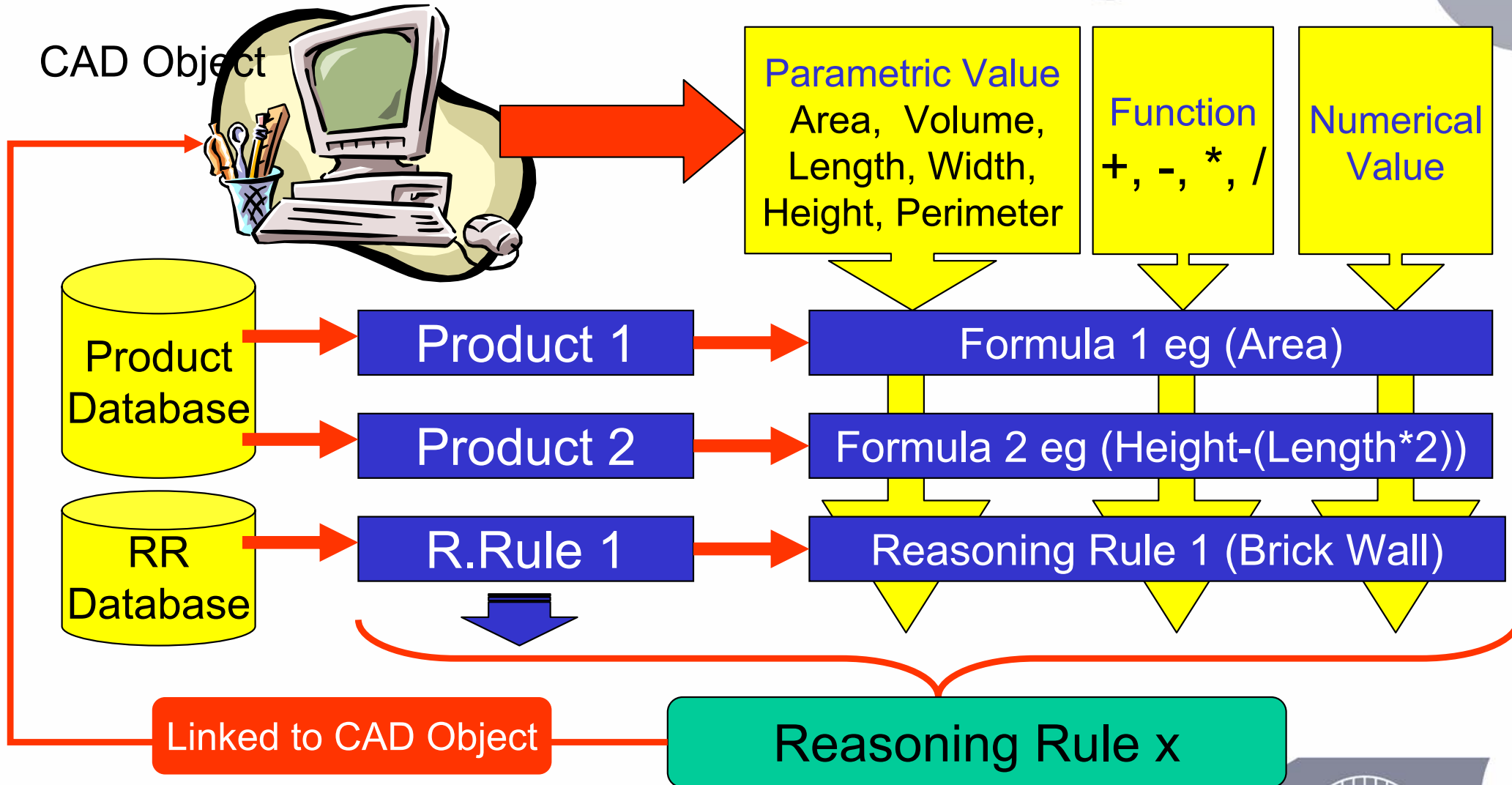
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Data information flows

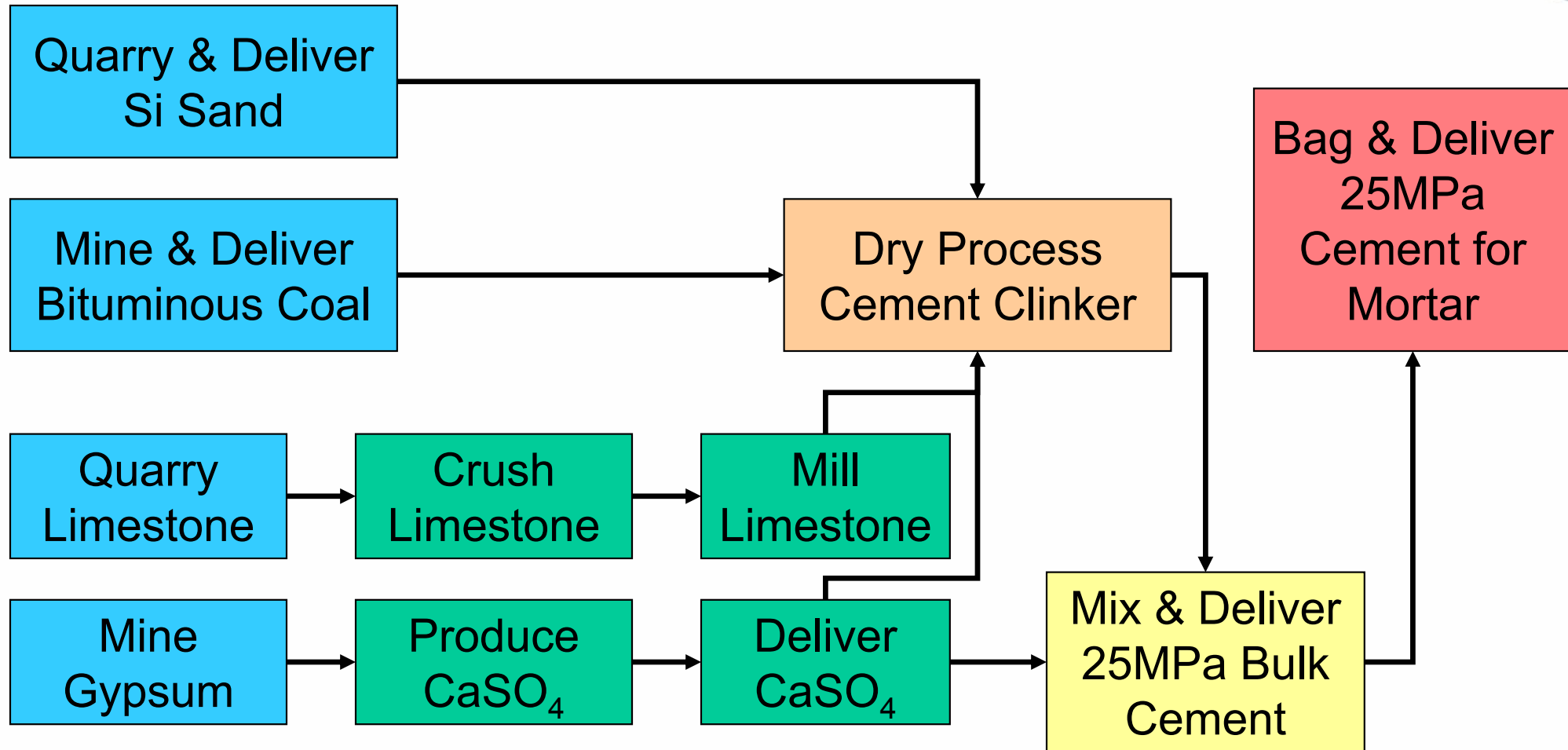


Reasoning Rules

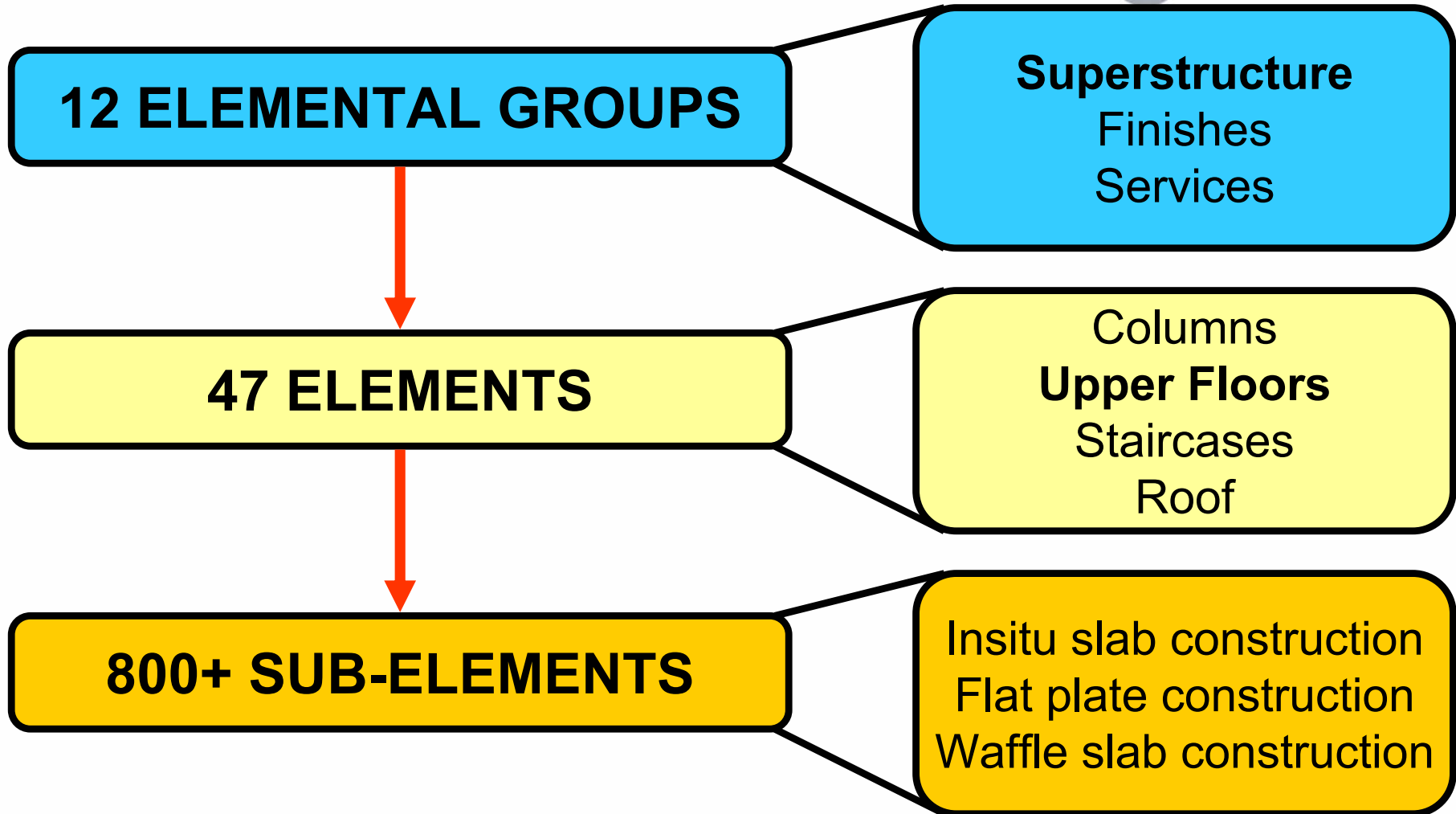


Product process map

(eg bag of cement)



ACM Elemental Codes



EDM Database EXPRESS Data Manager

“...main feature is to manage information independently of any proprietary application.”

Achieved through compliance with international standards:

- ✓ **ISO TC184/SC4**
- ✓ **ISO 10303 (STEP)**
- ✓ **IFC Schema**

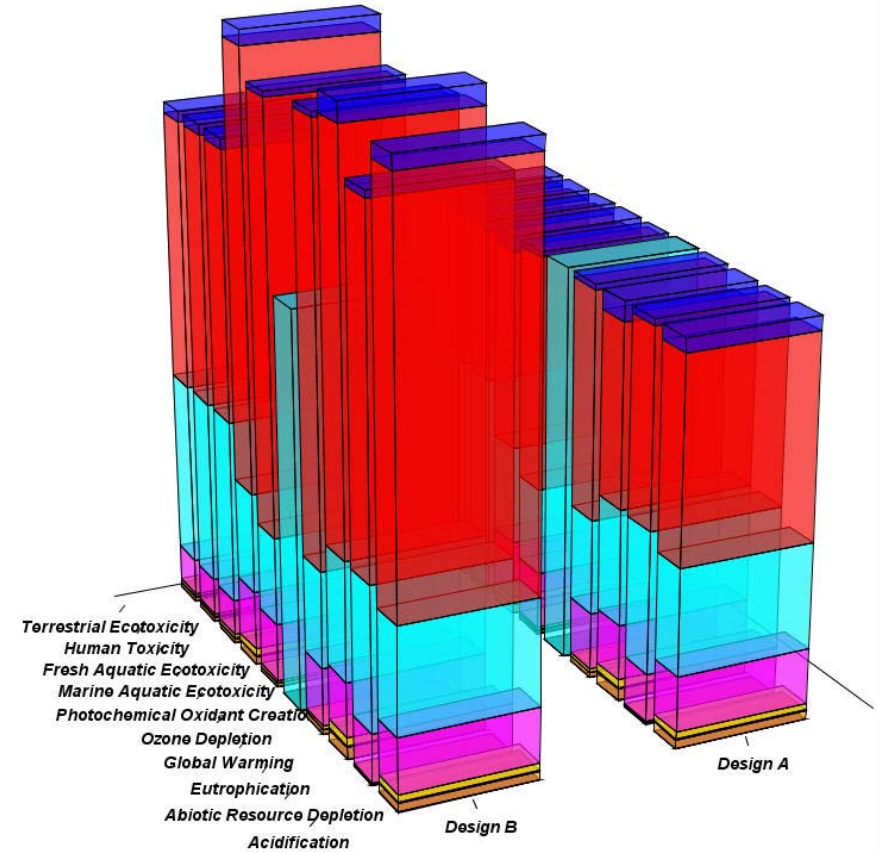
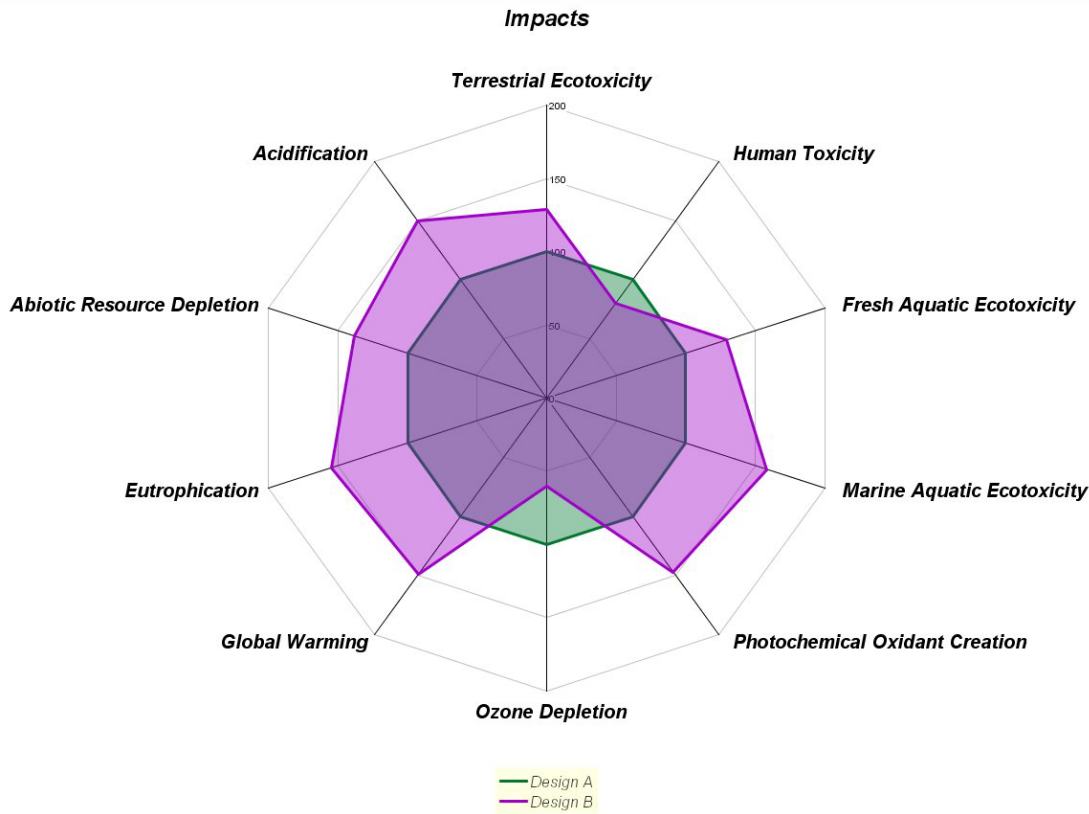
Example Building



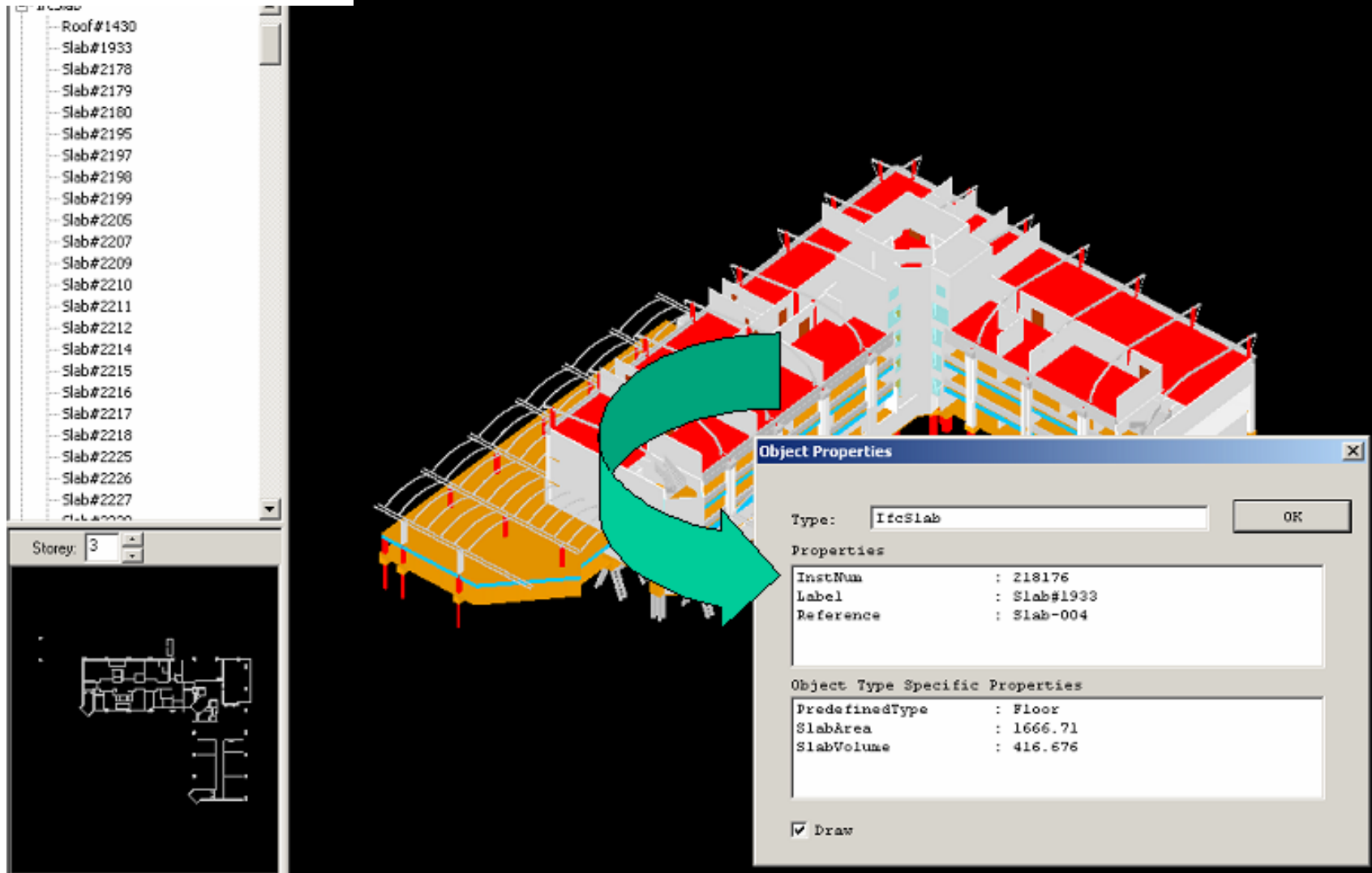
Building into ArchiCAD



LCA Design indicators



3D Viewer



Conclusions

- ✓ Benefits of automated assessments
- ✓ Possibilities of 3D CAD – drafting to design tool
- ✓ Benefits of IFC file exchange
- ✓ Use of project database for detailed analysis

Thank You

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