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# Building Data Exchange Software Interoperability

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# Overview

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- **What is software interoperability?**
- **What does interoperability offer?**
  - **In general**
  - **For building simulation**
- **Current interoperability data standards.**
- **Current state of these standards.**
- **Current software implementation status.**

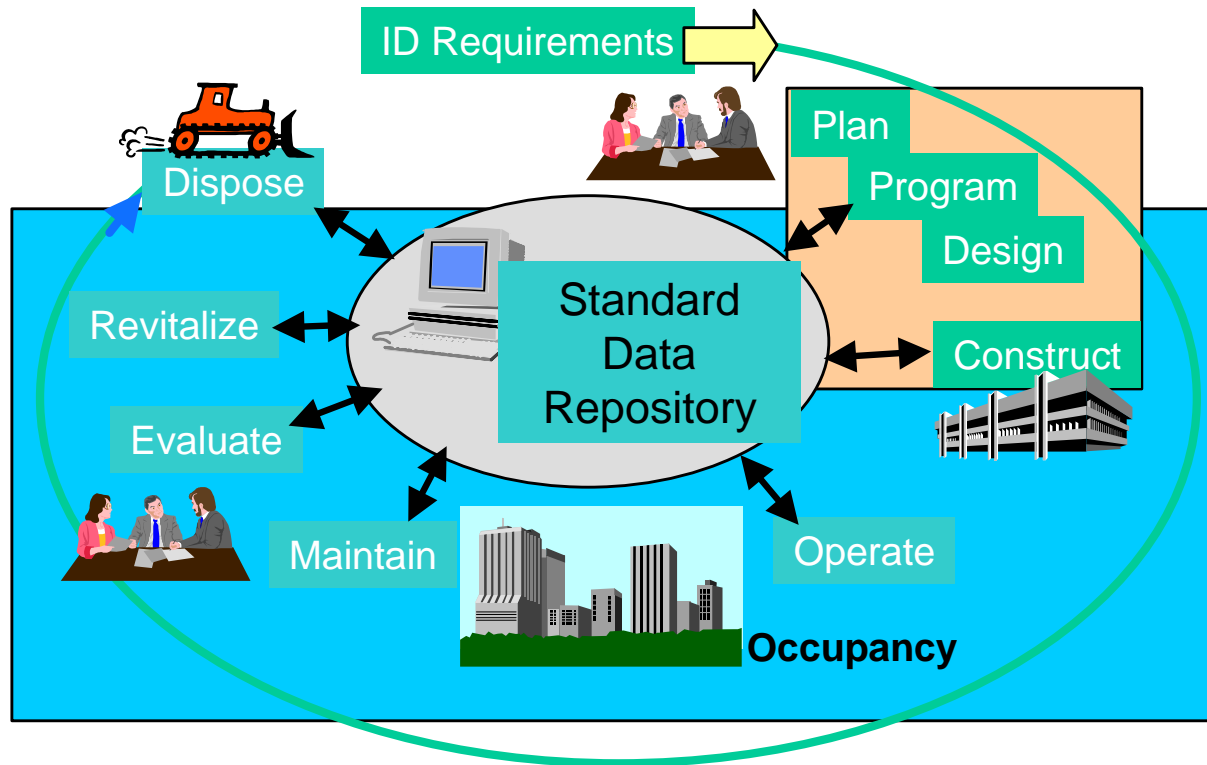
# What Is Software Interoperability?

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- Ability to archive and exchange detailed building data between project participants and their various software tools.
- Exchange is based on commonly agreed upon building data model standards.
- Different software tools import/export common data by mapping their internal representation to the data model standard.

# What Does Interoperability Offer?

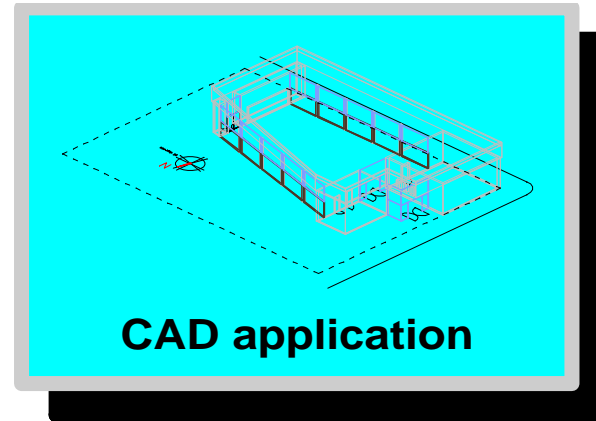
- Data Acquisition from Upstream Participants & Tools



- Data Archival for Downstream Participants & Tools

# Data Acquisition from Upstream

- Geometric Data
  - Building Elements
  - Building Equipment



- Non-Geometric Data

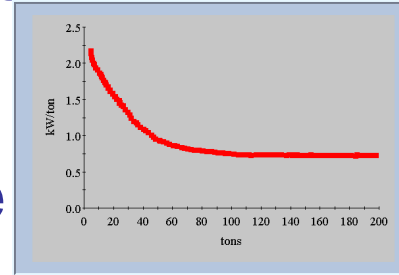
- Material Properties
- Building Services Equipment Properties
- Building Systems Operation

Group Code	Description of Construction	U-Value
	Heavyweight concrete wall plus (finish)	
E	4 inch concrete	0.58
D	4 inch concrete + 1 or 2 inch insulation	0.12-0.20
C	2 inch insulation + 4 inch concrete	0.12
C	8 inch concrete	0.49
B	8 inch concrete + 1 or 2 inch insulation	0.12-0.19
A	2 inch insulation + 8 inch concrete	0.12
B	12 inch concrete	0.42
A	12 inch concrete + insulation	0.11

# Data Archival for Downstream

## ➤ Building and System Design Performance

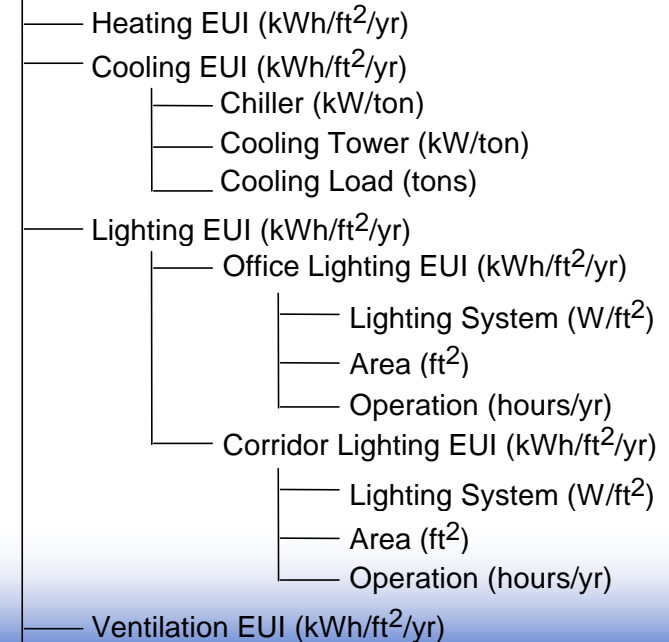
- Expected Loads
- Equipment Performance
- Design Performance Benchmarks



## ➤ Simulation Context Data

- Occupancy & Usage
- Thermal Zoning
- Building Systems Operation
- Weather

### Energy Use Intensity (kWh/ft<sup>2</sup>/yr)



# Current Interoperability Data Standards

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## ➤ Object Data Model

- Object-oriented model of the entire building
  - Elements (e.g., Walls) and Relationships (e.g., Walls->Space)
- Archive and exchange complete project data set
- Industry Foundation Classes (IFC)

## ➤ Internet Data Exchange Models

- Extensible models of data subsets
  - Product libraries (e.g., Chillers)
- Exchange of product and other data subsets to support transactions over the Internet
- XML: aecXML, ifcXML

# Current State of Object Data Model

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## ➤ Geometric Data

- Location, Shape, and Relationships of Building Elements
  - Site, Building, Building Story, Space, Wall, Window, Door, Column, Beam, Stair, Furniture, Boiler, Chiller, Pump, Fan, etc.

## ➤ Non-Geometric Data

### ➤ Material Properties

- Thermal Conductivity, Specific Heat Capacity, Boiling Point

### ➤ Equipment Properties

- e.g., Boiler: Type, Heat Output, Pressure Rating, Energy Input Rate, Heat Transfer Rate, Thermal Efficiency, Energy Source

### ➤ Building Services Project 8 – HVAC for Simulation

- <http://eetd.lbl.gov/btp/iai/bs8>

# Current State of XML Data Model

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- E-Commerce
  - Initial draft based on existing models
- Building Simulation
  - Initial draft based on existing simulation tools
- IFC to XML conversion
- GPC 20 - Definitions for HVAC&R
  - Monday 8:30am-12noon CC/208

# Implementation Status

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- CAD including HVAC Design
- Model Viewing/Checking
- Energy Simulation
- Energy Code Checking
- Cost Estimation
- Construction Planning
- Software Development Toolboxes

# Implementation Caveats

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- Certified Compliance vs. Full Functionality
- Focused on Geometry
- Different Released Versions of Standard
- Not Mature Implementations
- Minimal Real Project Experience