

openBIM

*...reducing risk and costs
beyond construction...*

By

Thomas A. Gay

Assistant Vice President

FM Global

Engineering Plan Services

Chairman

Board of Direction

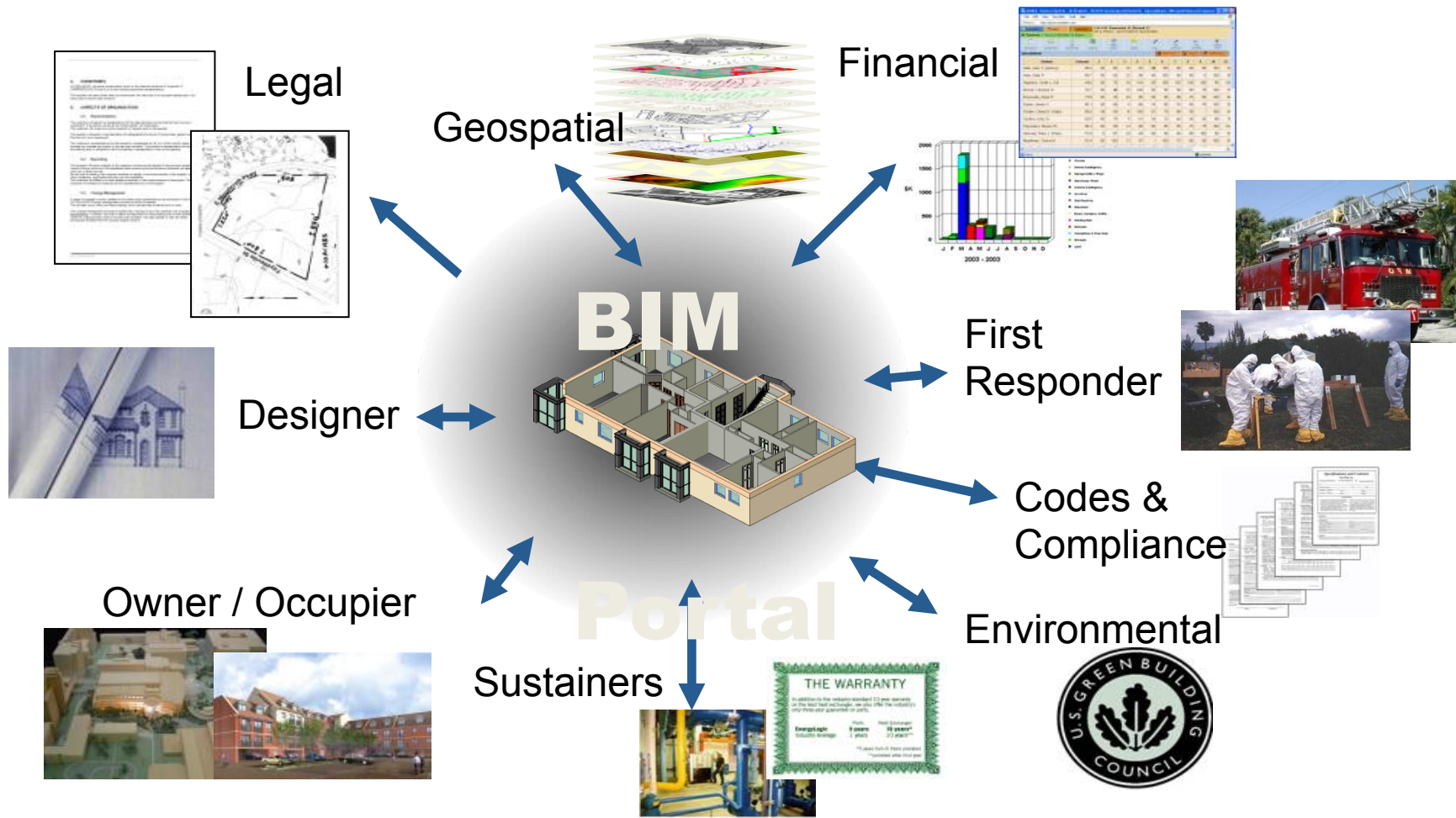
buildingSMART alliance



BIM for AEC is only 30% of a Building's Cost
(So use of the model should not end at the "C")

Open format object models can contain data from and be applied to
all Domains and life-cycle stages.

But only if the format and structure are standardized; IFC being the key!



Cover the Lifecycle and Expand the Opportunities...

Geospatial Data

Pre-Fabrication

Product Selection

Invoicing/Payment

Conflict Analysis

Scheduling

Computerized Maintenance Management System (CMMS)

Personnel & Asset Mgmt - moves, adds and changes

Demolition

Planning Design Construction Operations Sustainment

Engineering Analysis

Legal Data

Simulation

Code Compliance Checking

Lifecycle Estimating

COBIE

Computer Aided Facility Management

Operations Center

First Responders

Years

Design

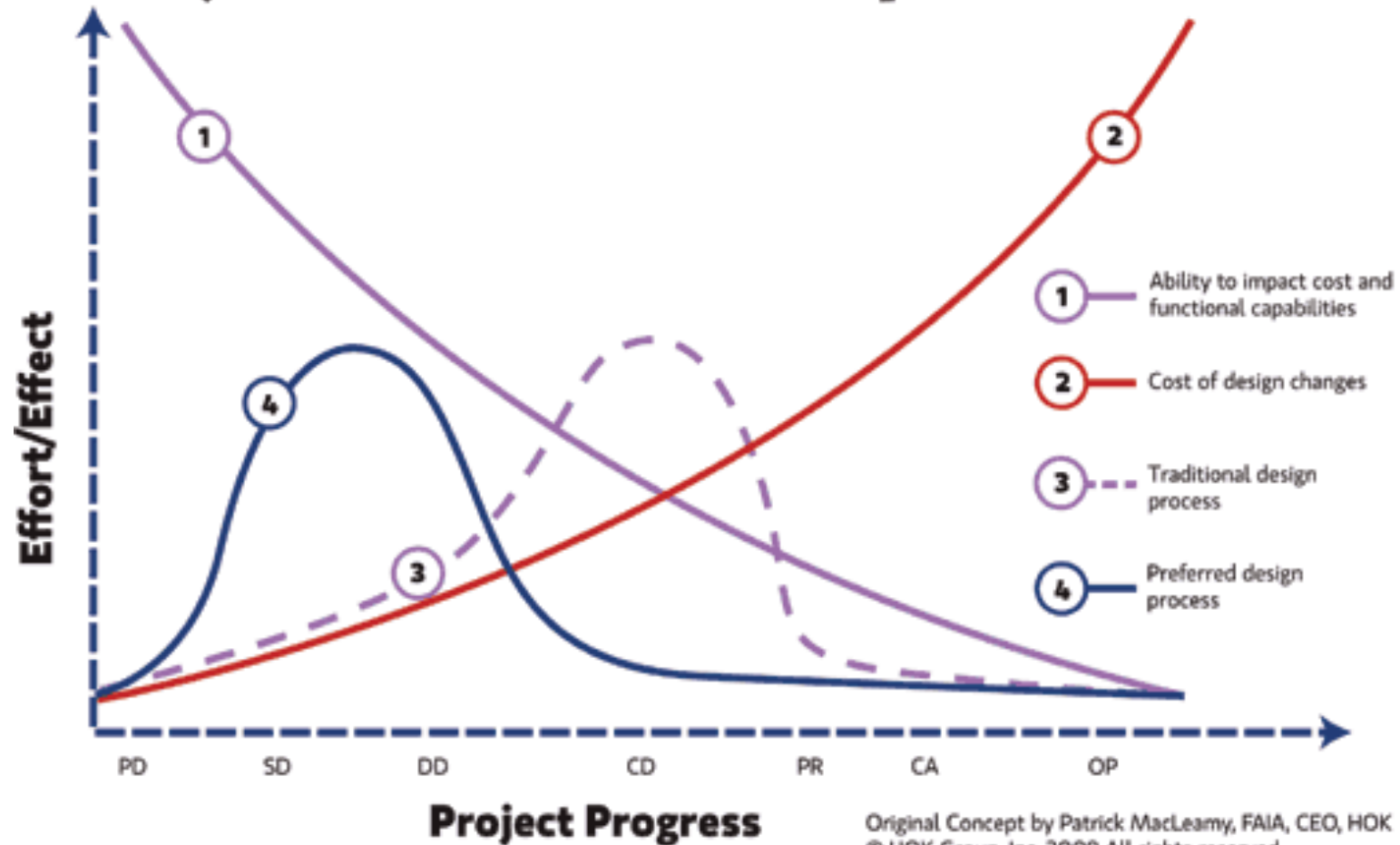
Construction Capital

Facilities Management

Operating

Financing

Project Effort and Impact



The BIM software industry, much like the CAD software industry of 30 years ago, has been “discipline” specific with very little “interoperability” built in.

FM Global alone (and this is not uncommon) requires multiple software platforms to service our client base...



True “BIM” Authoring

- Autodesk Revit Architecture
- Autodesk Revit Structure
- Autodesk Revit MEP
- Autodesk AutoCAD Architecture
- Autodesk AutoCAD MEP
- Autodesk AutoCAD Structural Detailing
- Graphisoft ArchiCAD

CAD/3d Modeling

- Autodesk AutoCAD
- Autodesk Inventor + Fusion
- Bentley MicroStation
- Informatix MicroGDS
- Avia Scan2CAD
- IMSI TurboCAD
- Google SketchUp
- Eos Systems PhotoModeler
- Autodesk Photofly (now called 123D Catch)

BIM Analysis/Viewing

- Autodesk Navisworks Manage
- Autodesk Navisworks Freedom
- Autodesk Quantity Takeoff
- Autodesk Revit Architecture Viewer
- Tekla BIMsight
- Solibri Model Viewer
- NIST IFC File Analyzer

Presentation/Viewing

- Autodesk 3ds Max Design
- Composite (Film compositing and visual effects add-on)
- Backburner (Render farm utility add-on)
- FBX (file import/export utility)
- Autodesk Showcase (Interactive 3d presentation tool)
- Graphisoft Virtual Building Explorer
- Graphisoft BIM Explorer
- Autodesk SketchBook Designer (illustration and markup)
- RasterEx Rx Highlight
- Autodesk Design Review
- Autodesk DWG True View
- Adobe Acrobat Pro Extended

...all for the lack of a solid and fully implemented suite of standards!



The GIS Industry on the other hand does not suffer from such issues.

FM Global uses only 2 GIS Software Suites:

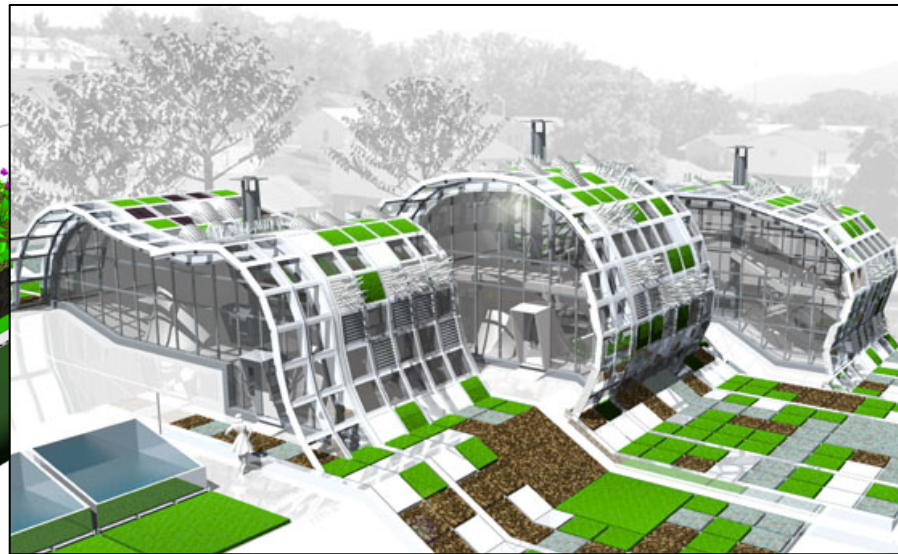
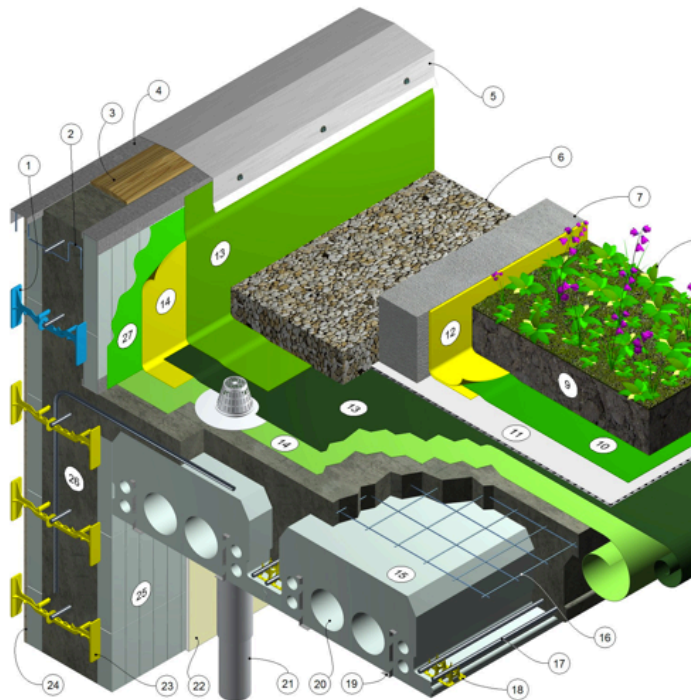
Cadcorp SIS

ESRI ArcInfo

**Implemented under the Open Geospatial Consortium (OGC)
Open GIS Standards like WMS, WFS, CityGML, etc.**

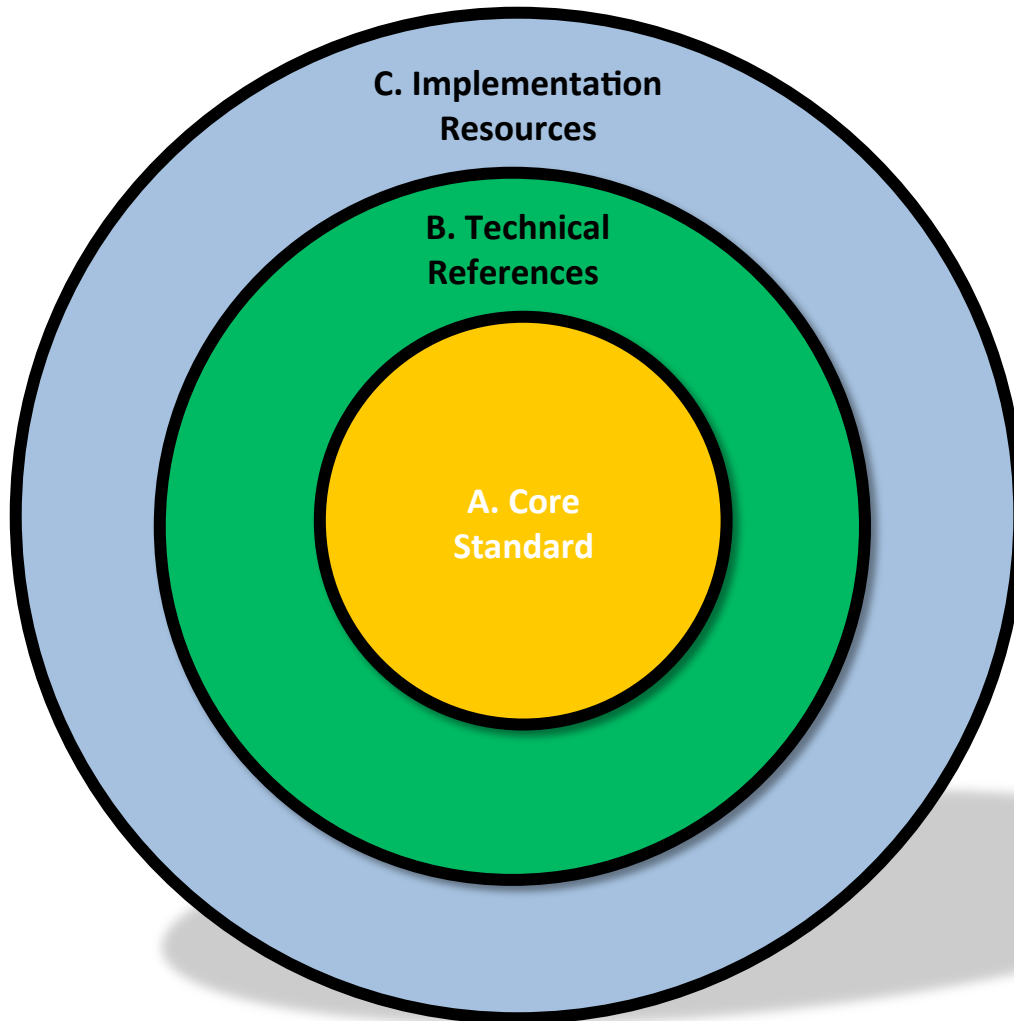


The building industry is faced with a need for change
...and future requirements for not just “construction” but
improved costing, functional and performance efficiency!!



Enter NBIMS!
The National Building Information Modeling Standard
It's foundational core:
buildingSMART International's IFC
It's implemented definitions:
COBie
SPie
IFCxml
...and more.

“National” BIM Standard US & International Content Model



A. Core Standards (International Foundation - bSI)

- A.1. ISO Standards (IFC4 – ISO16739)
- A.2. Normative Standards
- A.3. Information Exchanges
- A.4. Conformance Specifications
- A.5. Test Suite

B. Technical References

- B.1. Reference Processes
- B.2. Reference Specifications
- B.3. Reference Examples

C. Implementation Resources

- C.1. Contract Specifications
- C.2. Best Practice Guides

Companies and Agencies are already benefitting from the Virtual Environment and requiring Open Standards BIM

General Services Administration
Norwegian Directorate of Public Construction and Property
US Army Corps of Engineers
The Norwegian Defense Estates Agency
General Motors
UC Denver Health Sciences – R2
University of Texas Health Sciences Center
Sydney Opera House



Virtual Design, Construction & Ownership

Procurement from openBIM
 Plan, Visualize and Coordinate
 e-trade from openBIM
 Construct
 Facilities Management/Handover
 Financial Planning and Impact Analysis

Element	AF Beskrivelse	
Dekker	Betongdekke 300	
	B-U050, Betongdekke, t = 200 mm. Utvendig dekke over kjeller. Slakkeant 100kg armering / m ³	
Søyle	Søyle sirkulær 500	
Djelke	Betongjelke	
	Ståbjelke	
Yttervegg	B-VV1, Betong yttervegger. Kjeller, 250mm. Armering 90kg/m ³ H=2,9m	
	B-VV2, Betong yttervegger. Bolig, 250mm. Armering 80 kg/m ³	
	B-VV3, Betong yttervegger. Kjeller redkjøringsrampe 250mm. Armering 90kg/m ³ . H= 2,9m - 4,5m	
	YV1 Klimavegg 250 mm treverk (200+50mm) for tegl fasade	
	YV 2 Klimavegg 200 mm treverk (150+50mm) for tegl fasade	
	YV 3 Klimavegg 200 mm treverk for tegl fasade	
	YV 4 Klimavegg 250 mm treverk (200+50mm) utlekket for platen/panel	
	YV 5 Klimavegg 200 mm treverk (150+50mm) utlekket for platen/panel	
	YV 6 Klimavegg 200 mm treverk utlekket for platen/panel	
	YV 7 Klimavegg påføringsvegg 200mm for tegl fasade	
	YV 8 Klimavegg påføringsvegg 200mm utlekket for platen/ panel	
Innervegg	B-IV1, Betong innervegger. Bolig 200mm Armering 80kg/m ³	

FM Global

...some opportunities...

Corporate Values
Facilities Management – Preventative Maintenance
Construction/Tenant Fit Up
Construction Coordination
Property Valuations
Data Collection
Pre-Visit Products
FE/AE Effectiveness
Approvals – BIM Objects
Virtual Visits/Training
Plan Review



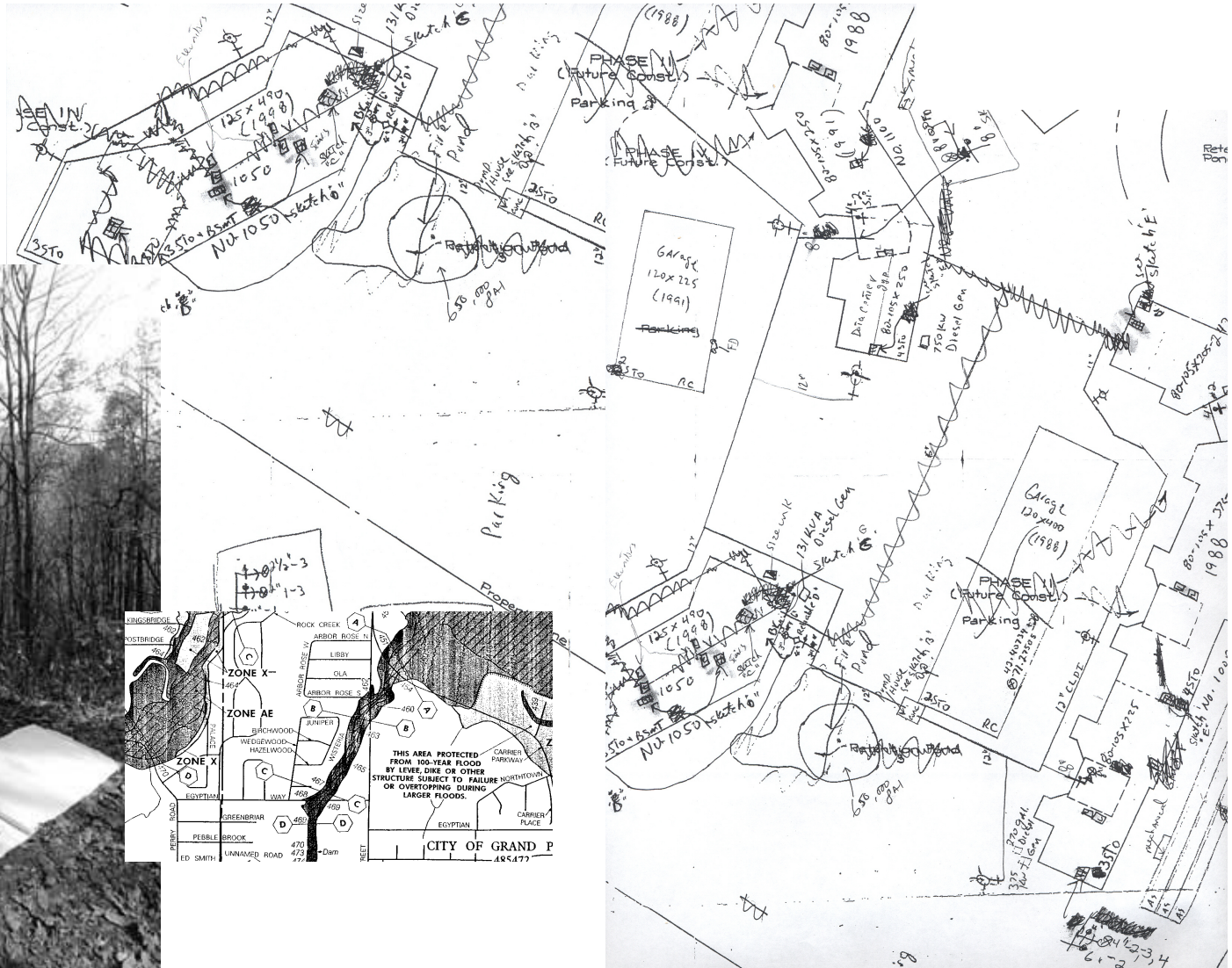
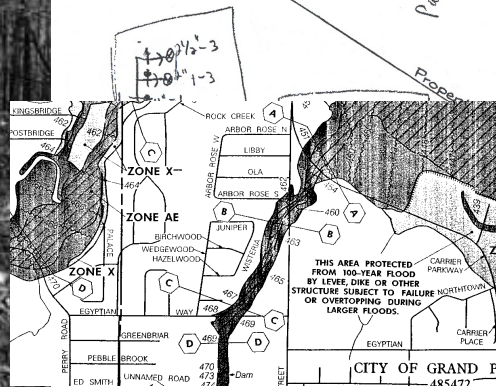
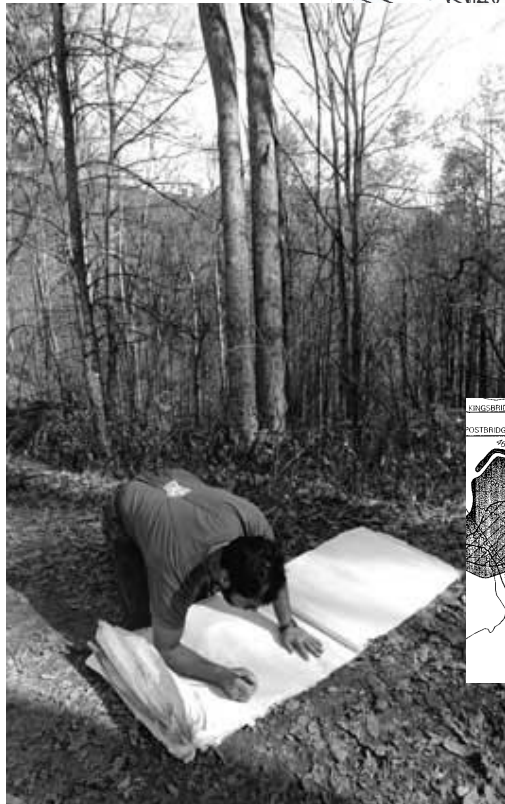
In today's world we must be prepared to adapt our process
To Insure Our Clients Investment

...and be prepared to do it more than
50,000 times a year...

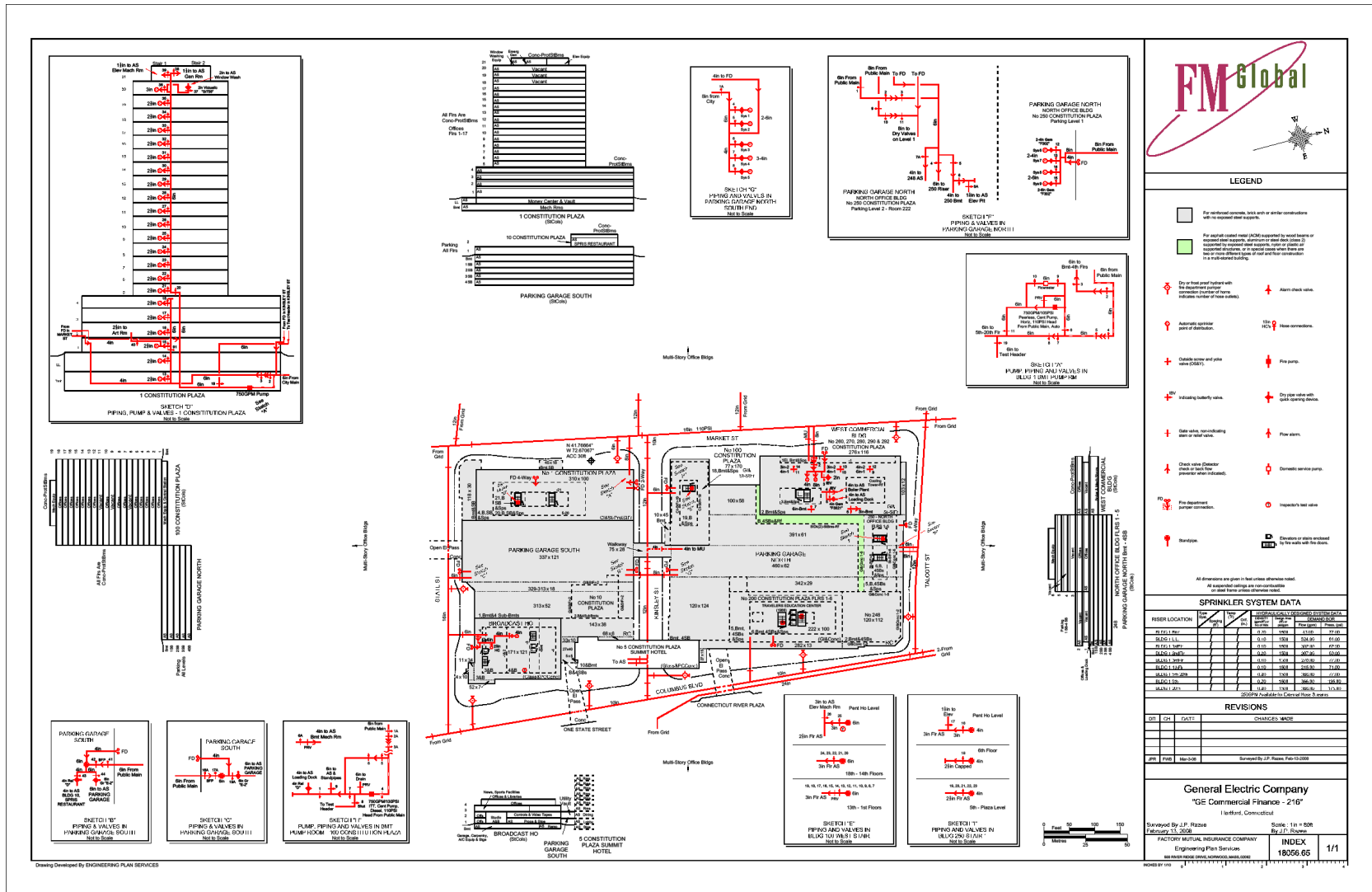
But where to start?



How about going from this...



...to this...



...for a very diverse client base.

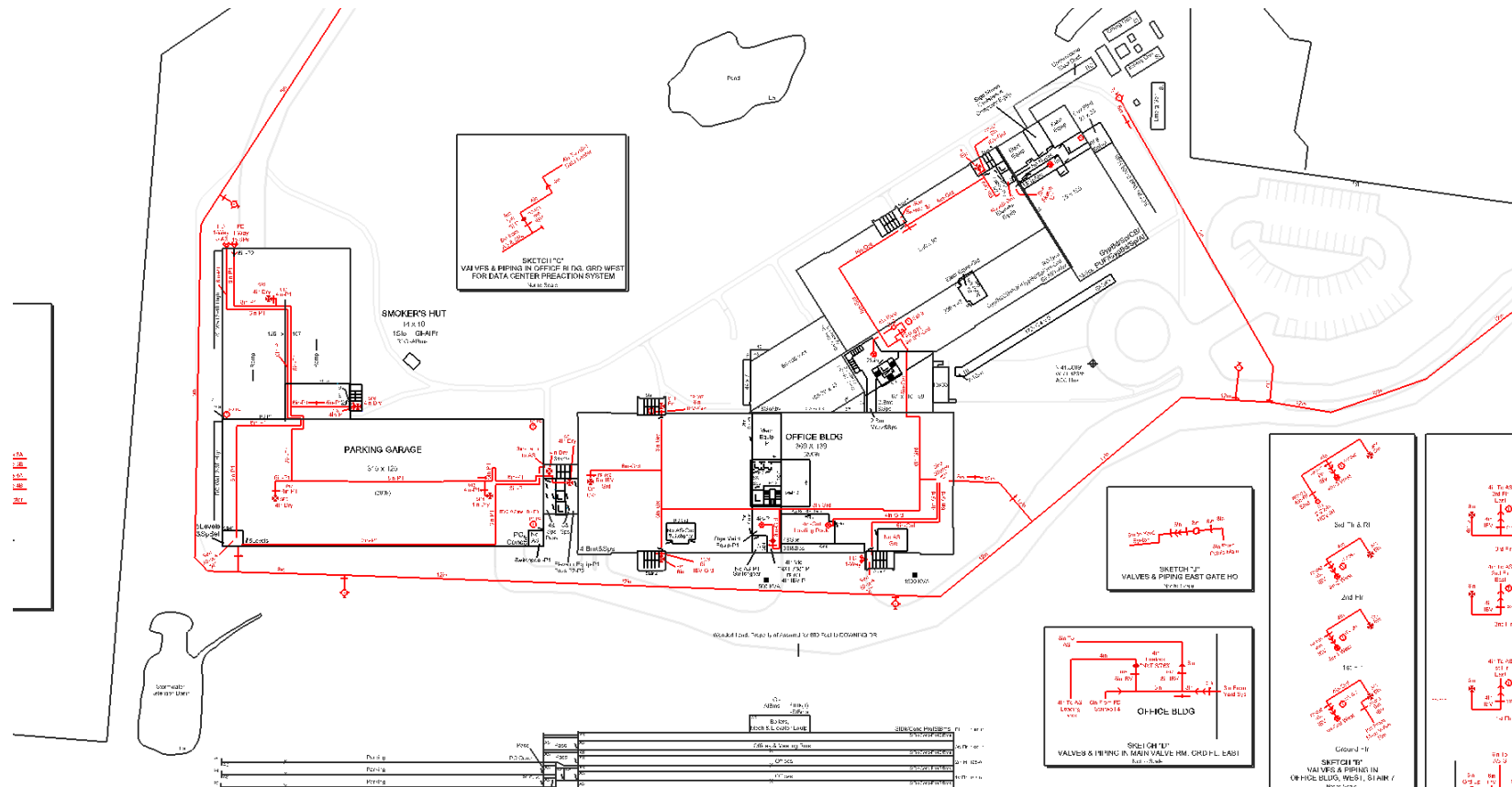
The image displays a comprehensive set of architectural and engineering drawings for a university campus project. The drawings include:

- Site Plans:** Large-scale site plans showing building footprints, parking lots, roads, and landscaping. One plan is titled "Northwestern University New Campus" and another is titled "SPECIAL PLAN".
- Floor Plans:** Detailed floor plans of various buildings, showing room layouts, corridors, and service areas. Some are color-coded to indicate different functional zones.
- Photograph:** A photograph of a grand, multi-story stone building with large arched windows, likely a central part of the university campus.
- Tables and Schedules:** Numerous tables and schedules providing technical specifications, material lists, and equipment details. One table is titled "Site Plan, 1/8\"
- Legends:** Detailed legends explaining the symbols and colors used throughout the drawings.
- Revisions:** A section titled "REVISIONS" detailing changes made during the design process.
- Technical Details:** Small-scale drawings showing specific construction or installation details for various components.

The drawings are presented in a grid-like layout, with the site plans and floor plans occupying the larger areas, and the tables, legends, and technical details filling the remaining space. The FM Global logo is visible in the top right corner of several drawing sheets.

...to this!

Insurance, Loss Prevention and Pre-Incident Planning



GIS NatHaz Overlays (flood)

The screenshot displays a GIS NatHaz overlay map for flood data within Adobe Acrobat Pro Extended. The map shows a building footprint with various colored overlays representing different flood risk levels. The interface includes a Layers panel on the left, a legend on the right, and a title block at the bottom right.

Layers Panel:

- 1: Aerial View
- 2: Client Drawing
- 3: Constructions
- 4: MFL
- 5: Core Logic Flood Data (Selected)
- 6: VCE
- 7: Building Note
- 8: Building Exteriors
- 9: Building Interiors
- 10: Site Info
- 11: Elevations
- 12: Fire Protection
- 13: Title Sheet Info

Legend:

- Core Logic Flood Data (Pink)
- Other Flood Risk Levels (Yellow, Orange)
- Building Footprint (Black)
- Other Site Elements (Blue, Green)

Title Block:

SPONSOR SYSTEM DATA

PROPERTY	OWNER	ADDRESS	CITY	STATE	ZIP	DATE	SCALE	DATE
1234567890	XYZ Company	1234 Main St	Anytown	CA	90000	10/1/2023	1/8" = 1'-0"	10/1/2023

REVISIONS

NO.	DATE	DESCRIPTION
1	10/1/2023	Initial Design
2	10/15/2023	Revised Flood Data

XYZ Company
Anytown, CA

Scale: 1/8" = 1'-0"

North Arrow



Building Hazard (explosion) with NatHaz Exposure

The screenshot displays a layered PDF document in Adobe Acrobat Pro Extended. The central focus is an aerial view of a building complex with various hazard exposure zones overlaid in red, orange, yellow, and purple. The 'Layers' panel on the left shows the following layers:

- 1: Aerial View
- 2: Client Drawing
- 3: Constructions
- 4: MFL
- 5: Core Logic Flood Data
- 6: VCE** (Selected)
- 7: Building Note
- 8: Building Exteriors
- 9: Building Interiors
- 10: Site Info
- 11: Elevations
- 12: Fire Protection
- 13: Title Sheet Info

The right-hand side of the document contains a legend with symbols for different hazard types and a metadata section including:

- SPRINKLER SYSTEM DATA** table
- REVISIONS** table
- XYZ Company** logo and contact information

At the bottom of the page, there are two logos: **FM Global** on the left and **buildingSMARTalliance™** on the right, with the tagline "a council of the National Institute of Building Sciences".



Highlighting Maximum Foreseeable Loss

The screenshot displays the Adobe Acrobat Pro Extended interface with a layered PDF document. The 'Layers' panel on the left lists various layers, with '4: MFL' (Maximum Foreseeable Loss) selected. The main drawing area shows a technical drawing of a building with a purple highlight on a specific section, indicating the MFL. The drawing includes various annotations, a legend, and a table of data.

Layers Panel:

- 1: Aerial View
- 2: Client Drawing
- 3: Constructions
- 4: MFL**
- 5: Core Logic Flood Data
- 6: VCE
- 7: Building Note
- 8: Building Exteriors
- 9: Building Interiors
- 10: Site Info
- 11: Elevations
- 12: Fire Protection
- 13: Title Sheet Info

Legend:

- Red symbols and text indicating various flood-related data points and annotations.

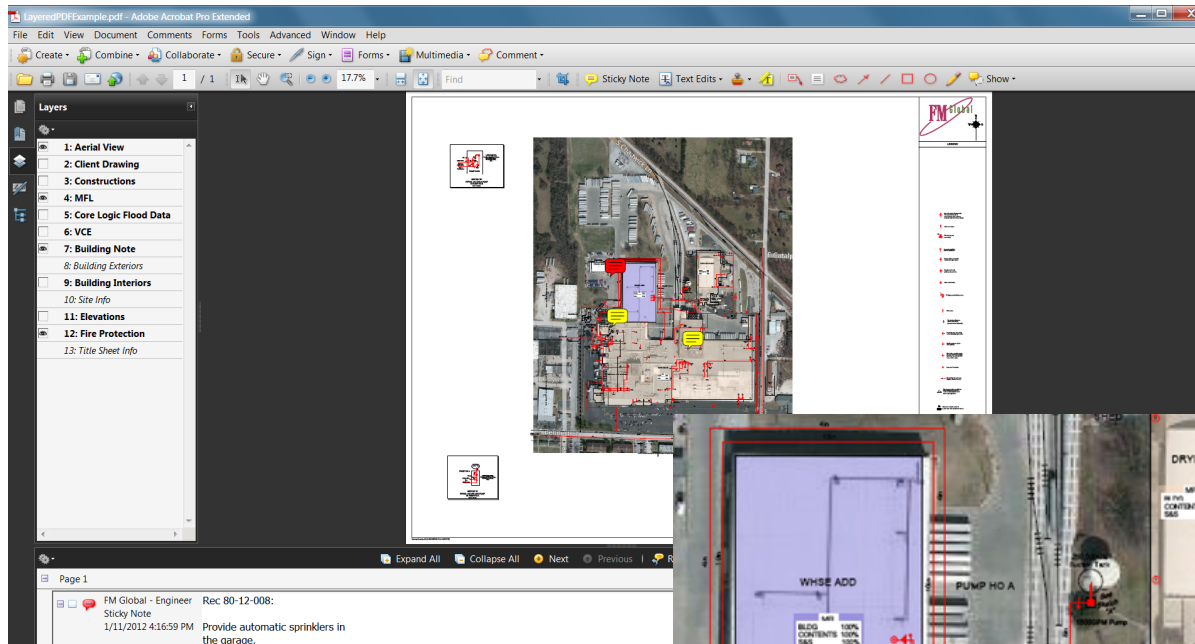
Table:

NO.	DESCRIPTION	DATE	BY	CHKD BY	APP. DATE	APP. TYPE
1	Issue for Review	01/01/2010	J. Smith	M. Jones	01/01/2010	Review
2	Issue for Approval	01/01/2010	J. Smith	M. Jones	01/01/2010	Approval
3	Issue for Construction	01/01/2010	J. Smith	M. Jones	01/01/2010	Construction
4	Issue for Final Review	01/01/2010	J. Smith	M. Jones	01/01/2010	Final Review

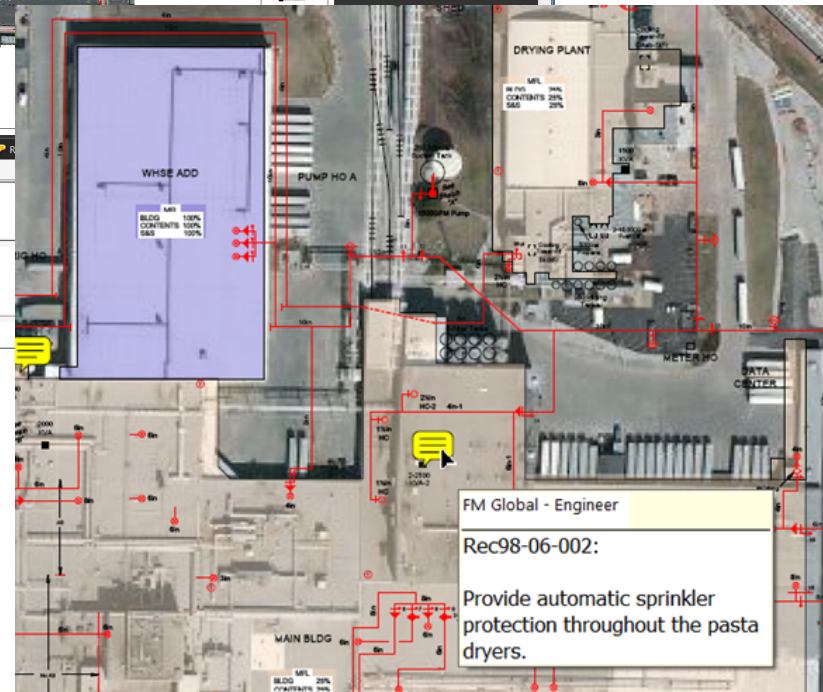
XYZ Company
 1234 Main Street
 Anytown, USA



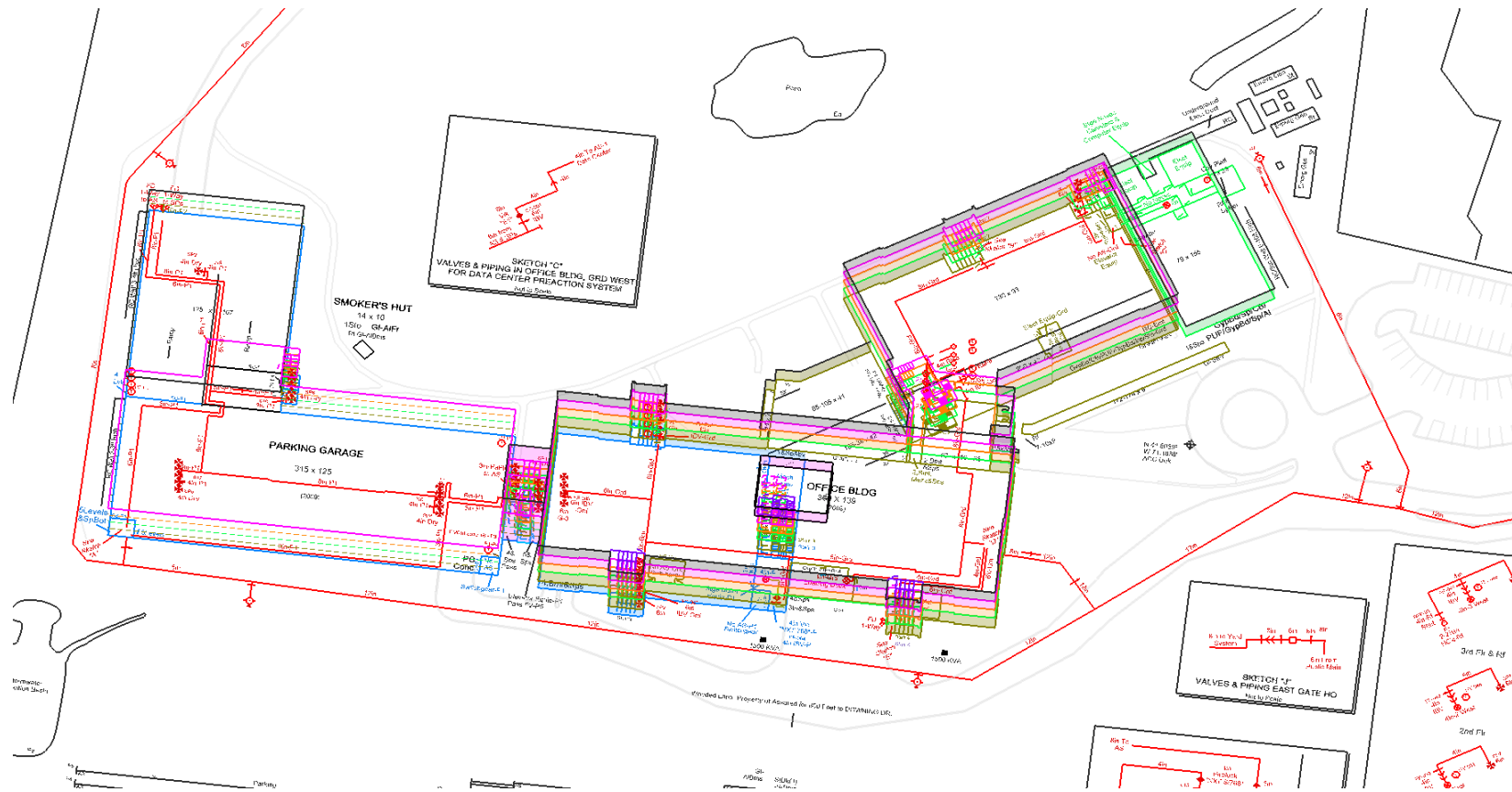
Recommendations for Improvement

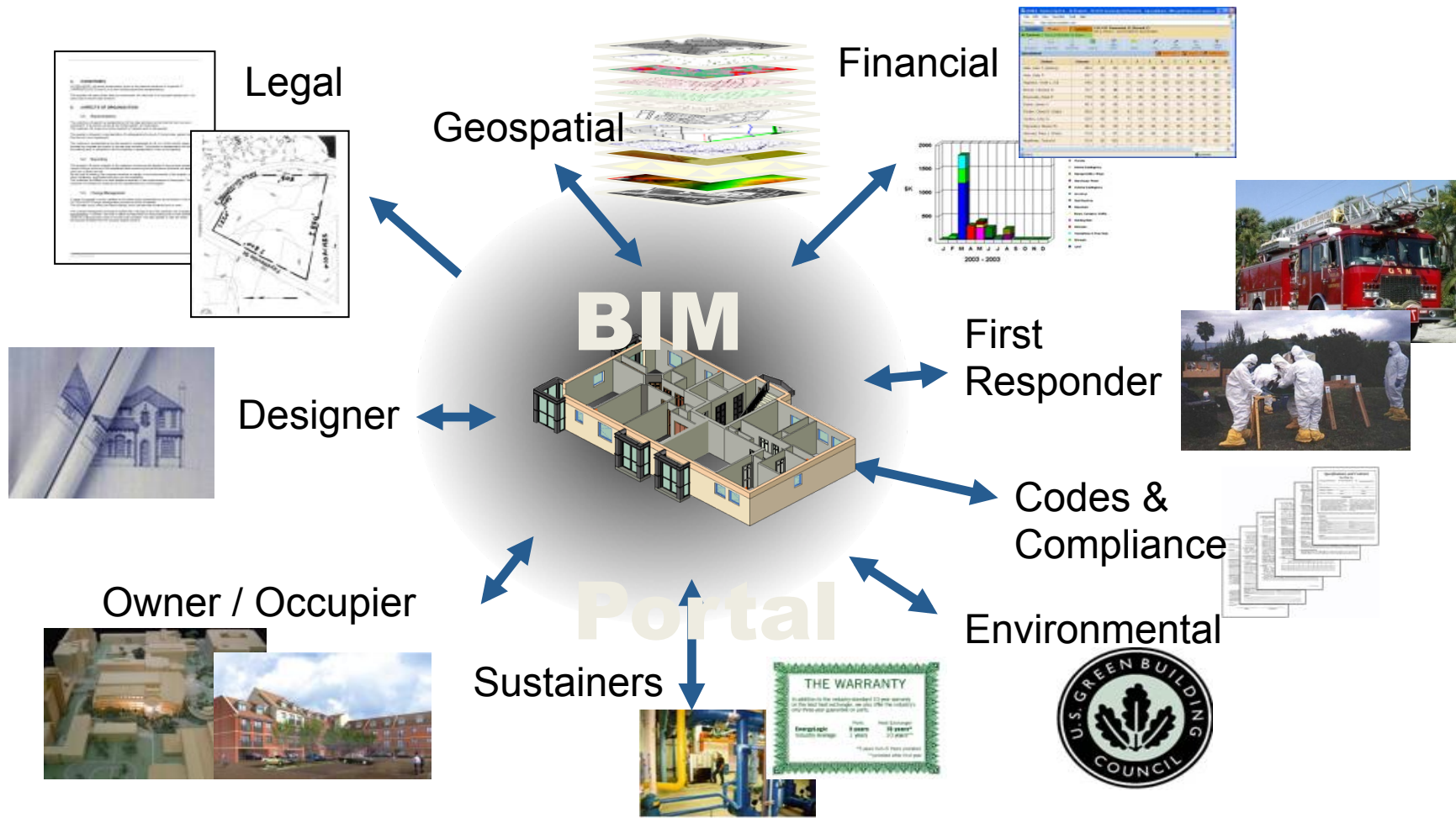


Page 1	
FM Global - Engineer Sticky Note 1/11/2012 4:16:59 PM	Rec 80-12-008: Provide automatic sprinklers in the garage.
FM Global - Engineer	Rec 96-07-001: Provide damage-limiting construction for the ammonia compressor room.
FM Global - Engineer	Rec98-06-002:

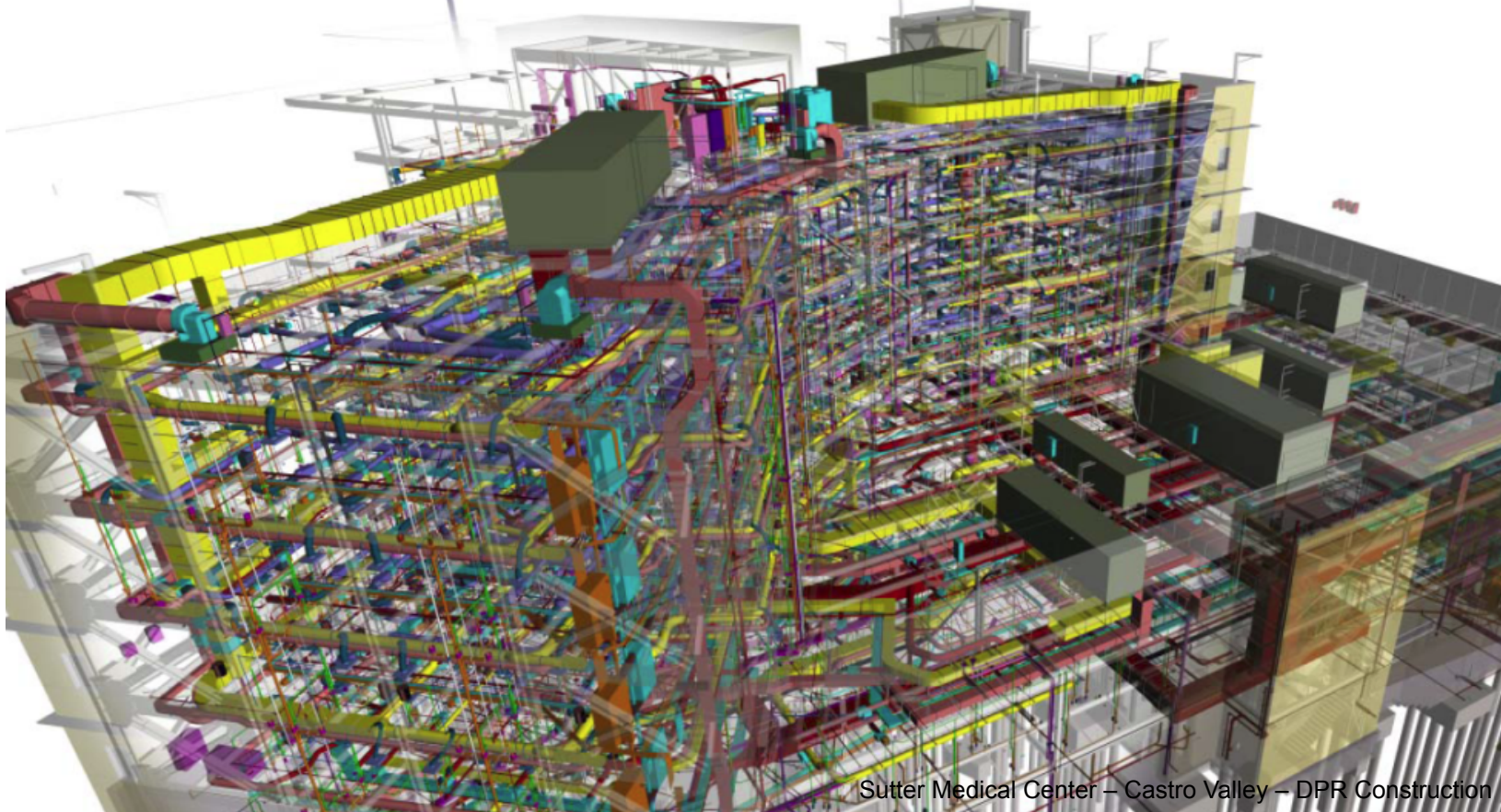


Insurance, Loss Prevention and Pre-Incident Planning

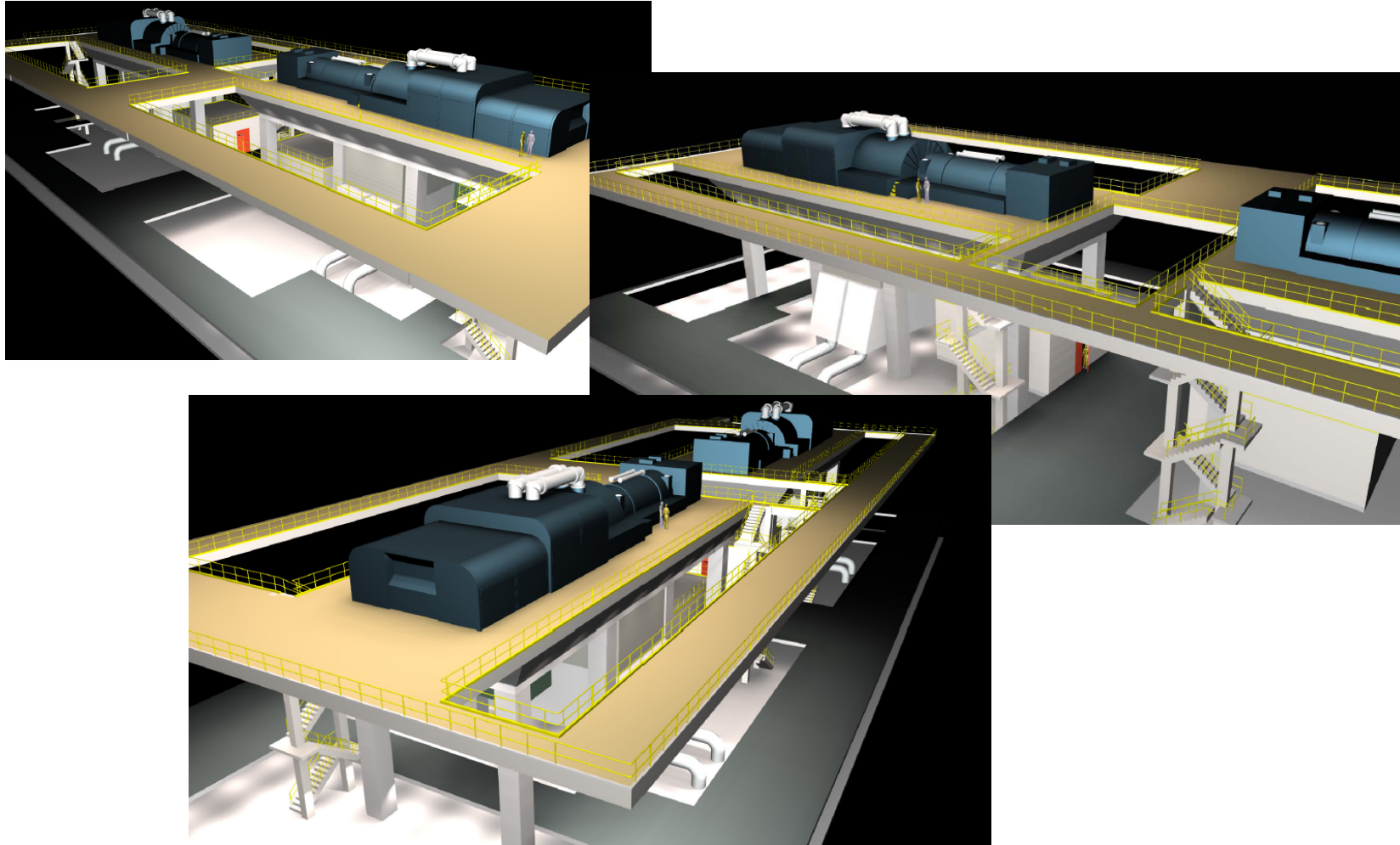




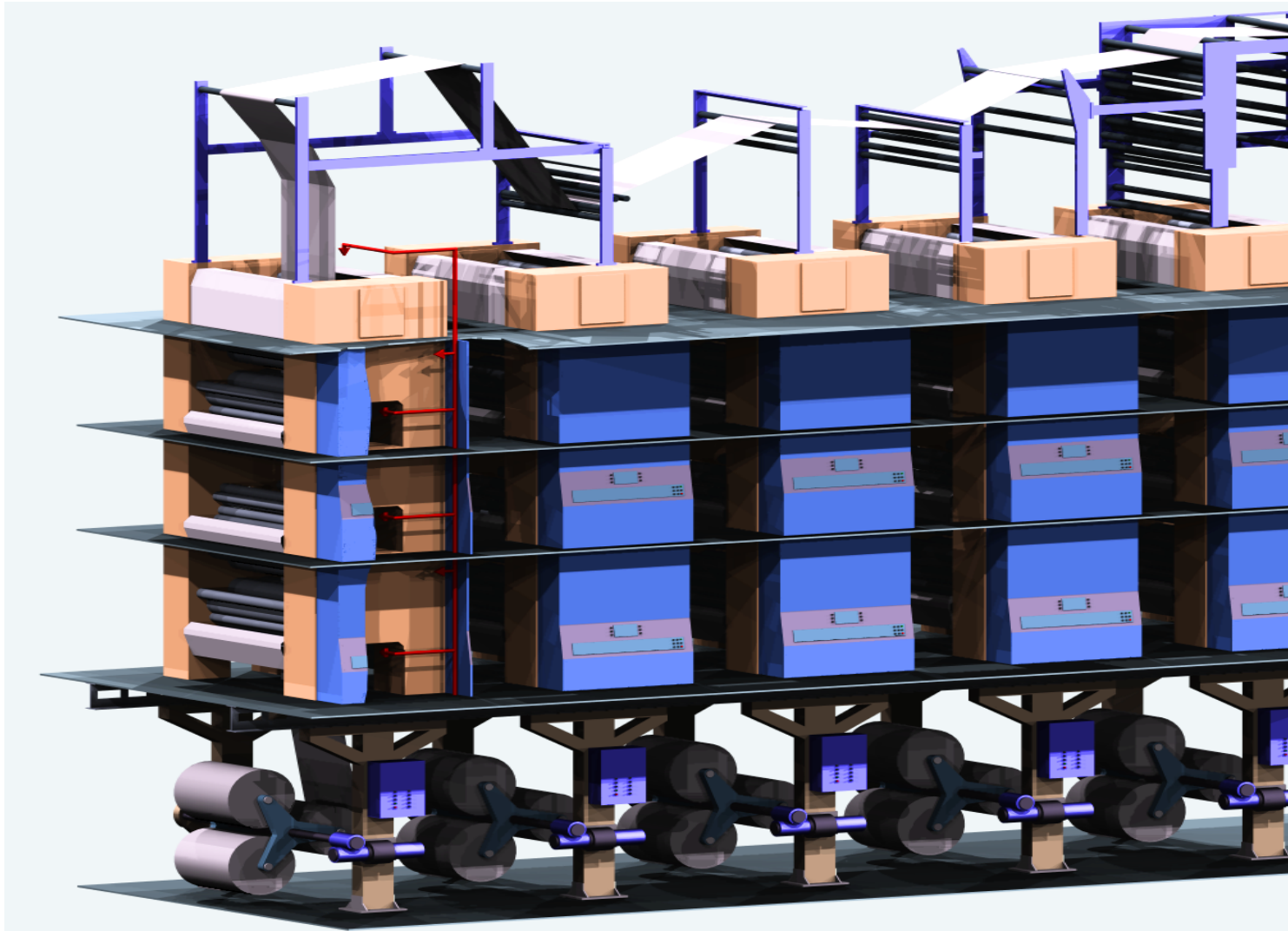
In today's "BIM" world an **OpenBIM (IFC)**
Digital Model can become the Building



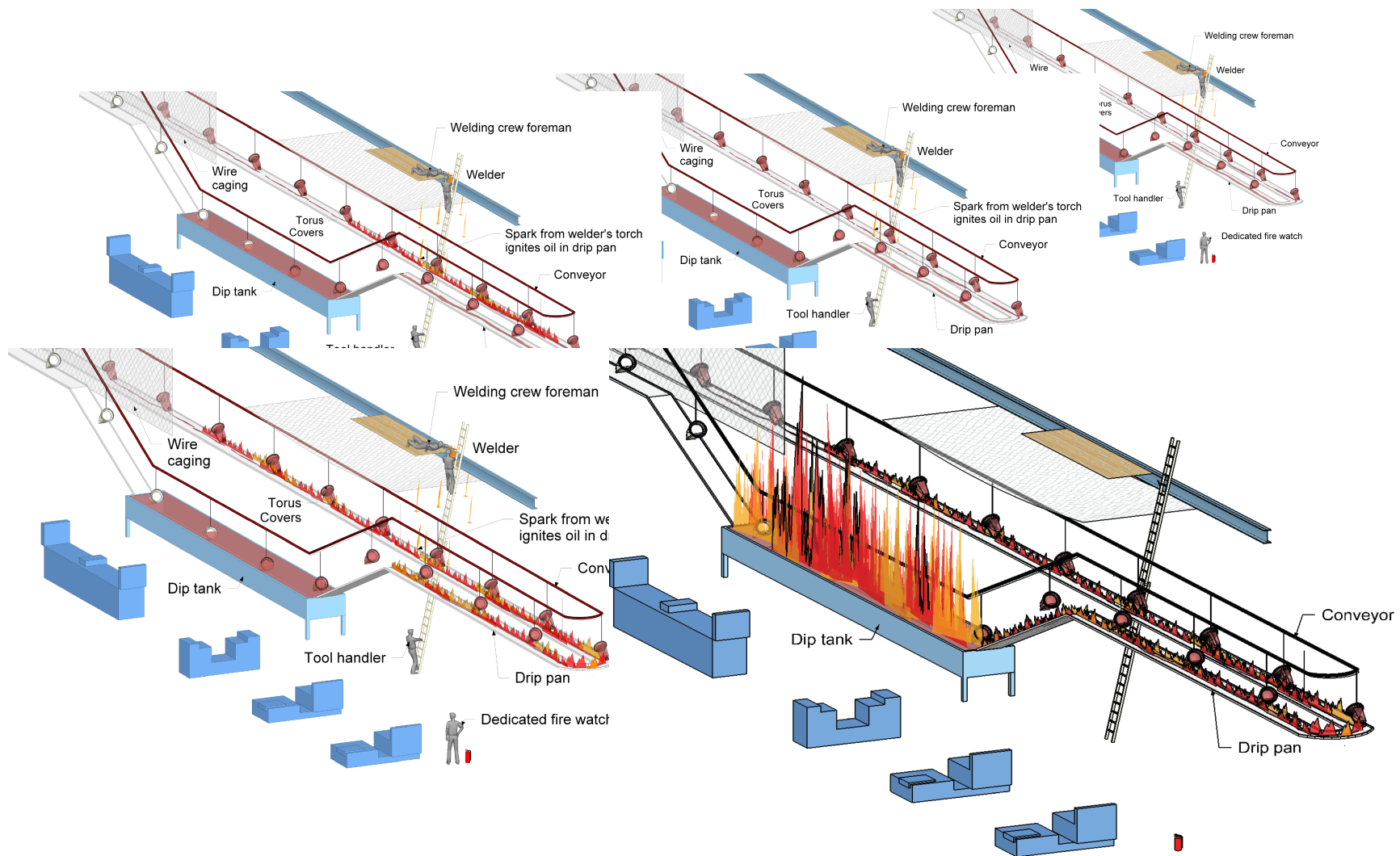
...to realistic depictions...



...and even virtual reality

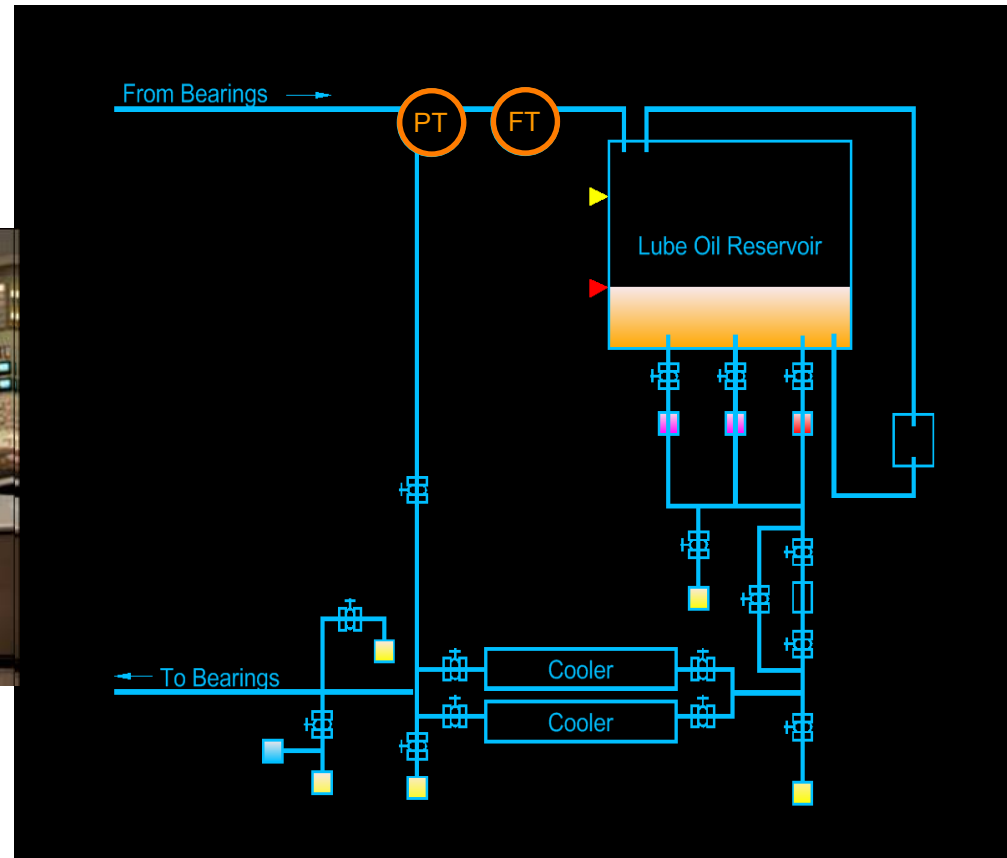


Training Graphics



Scenario Based Training Graphics

Animating graphics,
pictures and
illustrations...



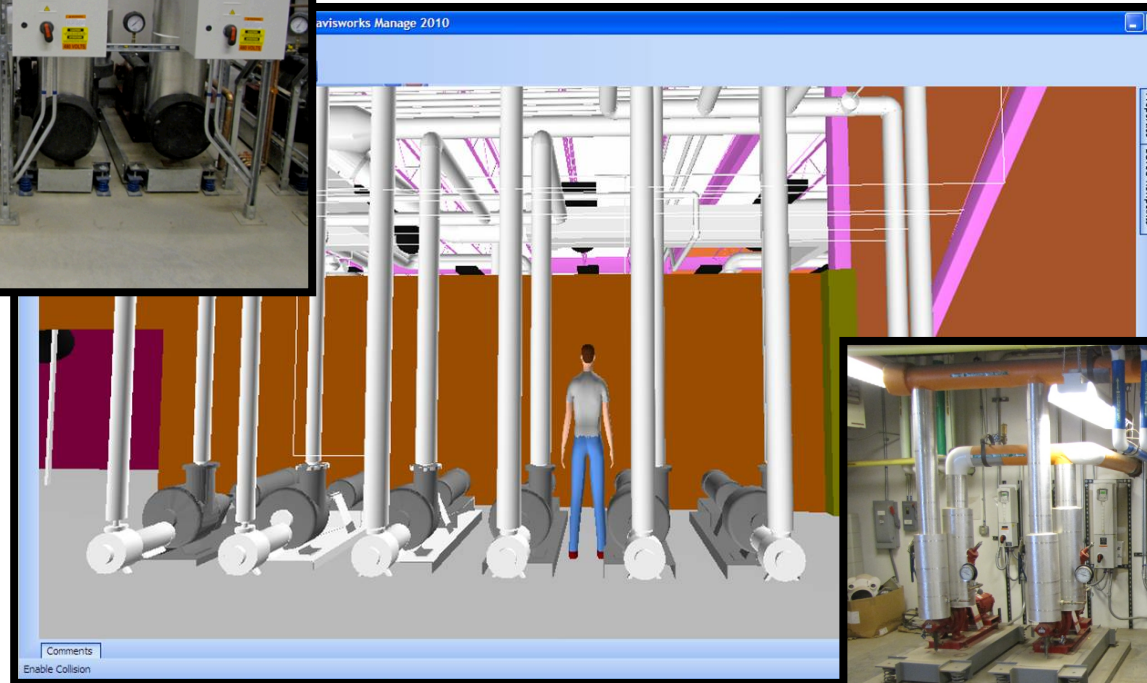
...to depict potential loss scenarios at
client locations

In today's world we must
Design To Maintain



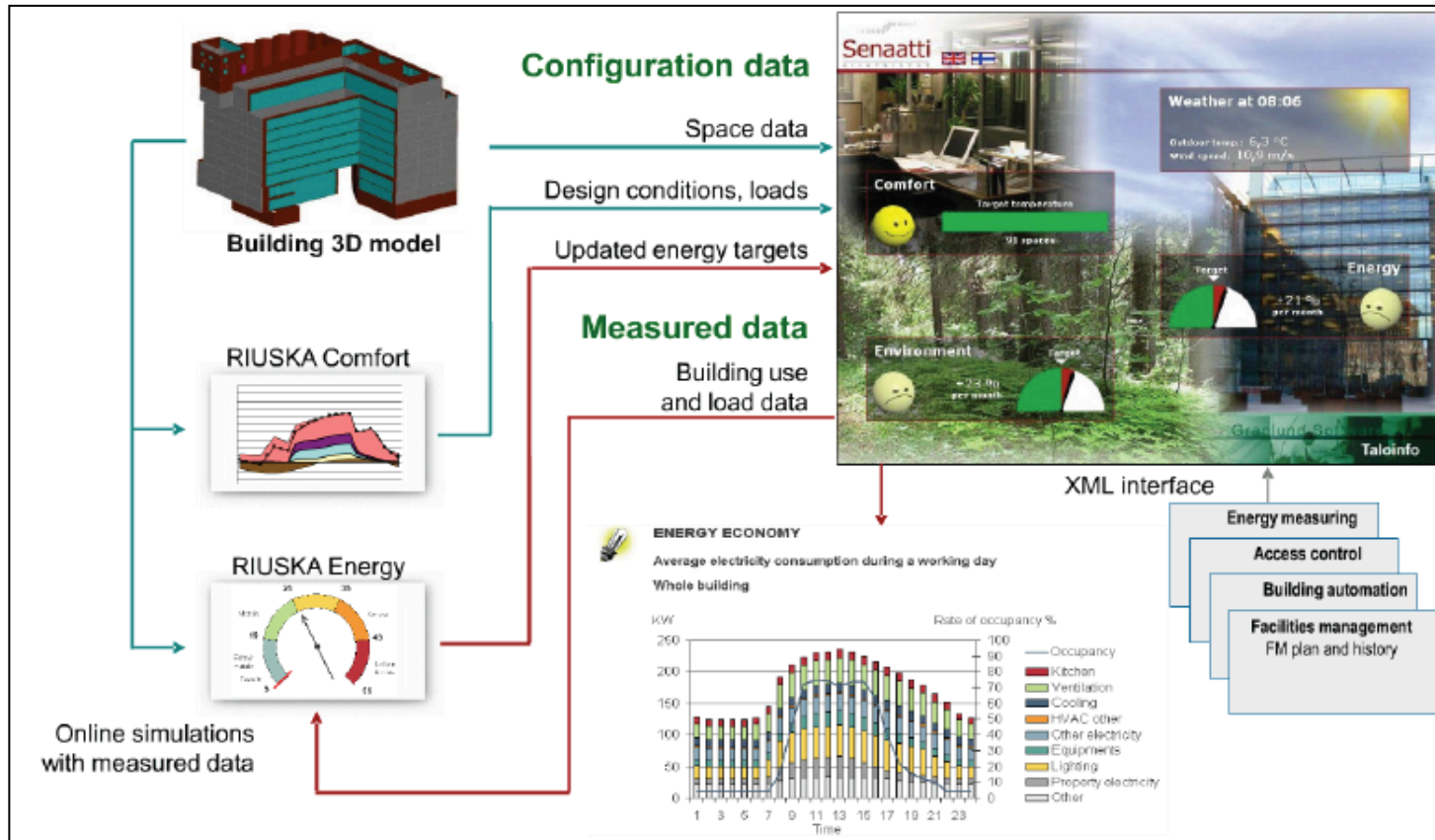


NOT "Maintenance Friendly"



"Maintenance Friendly"

All graphics courtesy of Birgitta Foster and Sandia National Labs



FM from openBIM

openBIM is the FM documentation... Coordinate HVAC

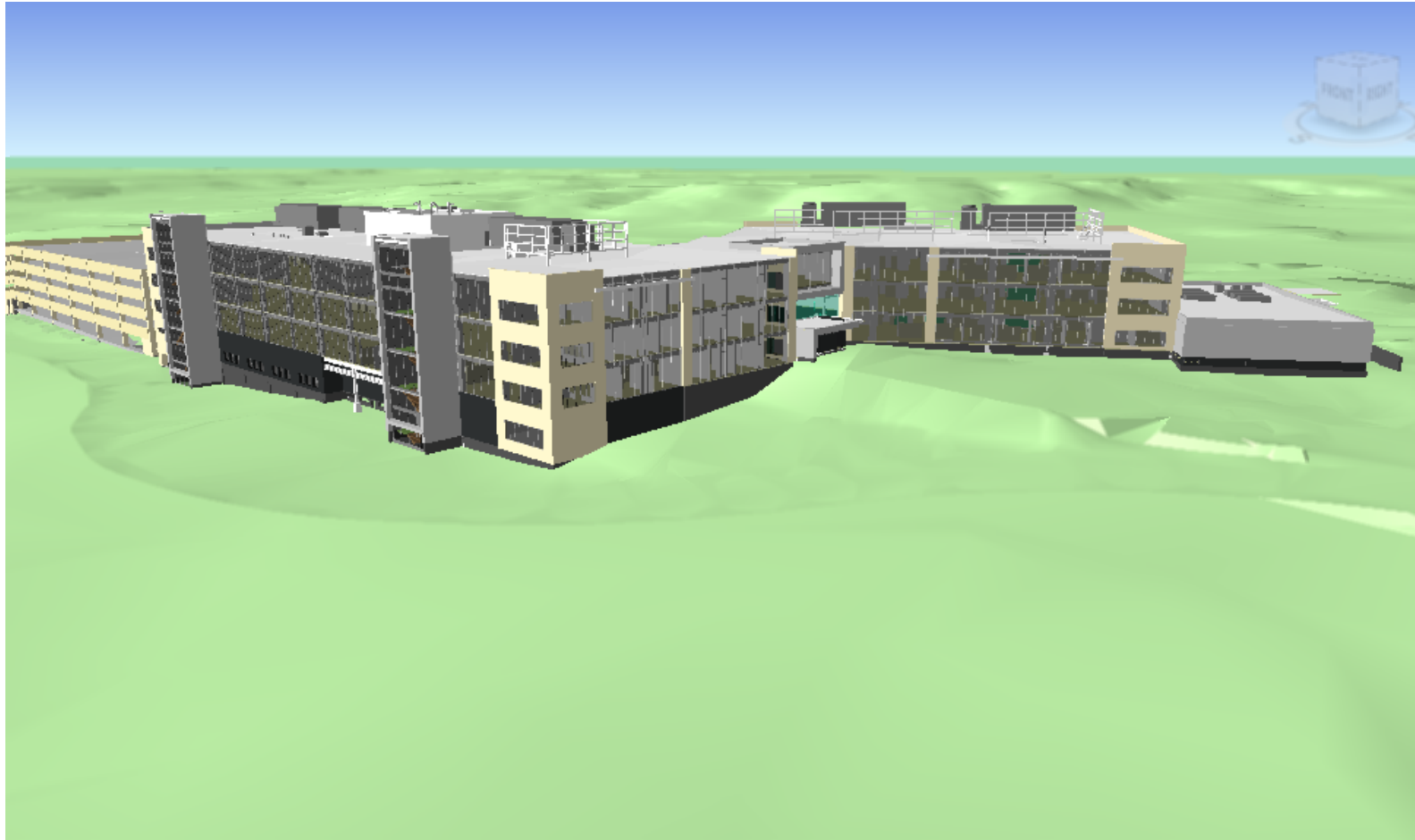
In today's world we must
Design to Occupy



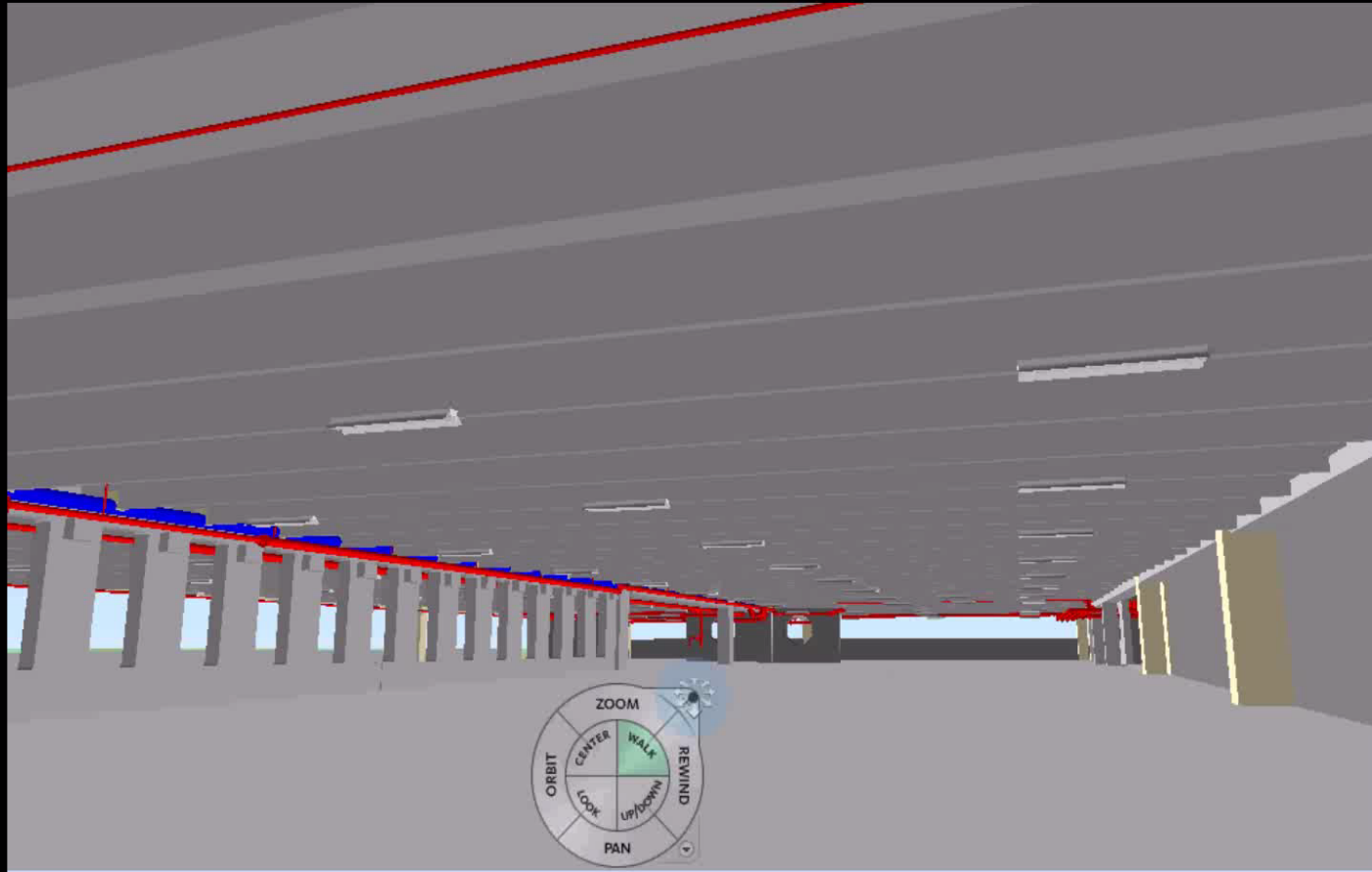
Work through Site Selection and Orientation...



Monitor the Project Progress...



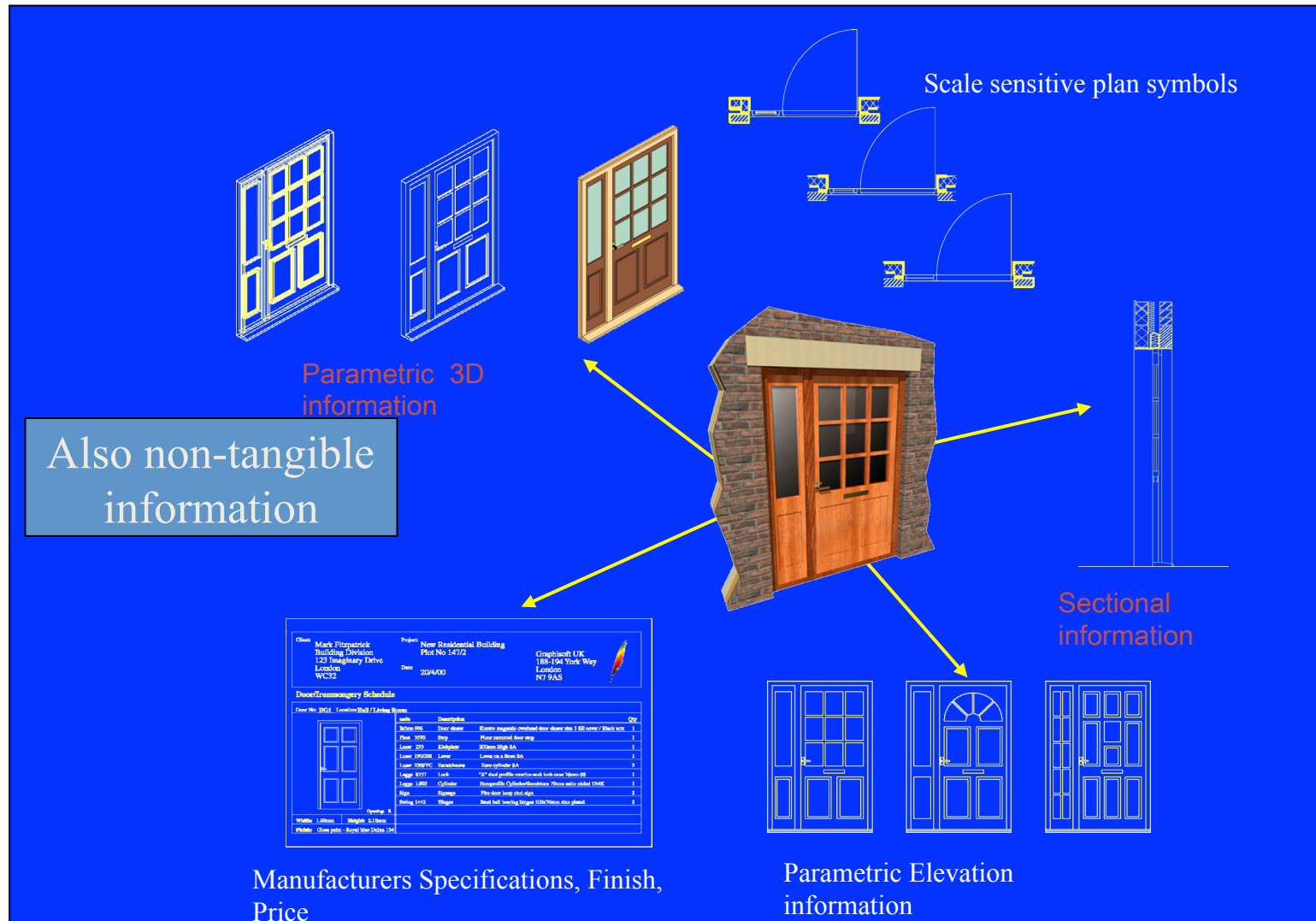
And develop a Virtual Understanding of the Facility...



In today's world we must
Specify and Purchase Components Early



IFC = finding the right “Virtual Building Pieces”



Search ARCAT BIM Families, Systems, Profiles and Annotations For:



[Add BIM Search Engine to your](#)

[browser](#)

Browse BIM building product objects:

- 01. General Requirements [17]
- 02. Site Construction [259]
- 03. Concrete [6]
- 04. Masonry [28]
- 05. Metals [130]
- 06. Wood and Plastics [138]
- 07. Thermal and Moisture Protection [279]
- 08. Doors and Windows [1589]
- 09. Finishes [54]
- 10. Specialties [512]
- 11. Equipment [245]
- 12. Furnishings [106]
- 13. Special Construction [143]
- 14. Conveying Systems [95]
- 15. Mechanical [41]

Browse BIM By type:

- Alternative Energy Equipment [8]
- Annotations [13]
- Appliances [11]
- Architectural Finish Components [31]
- Athletic Equipment [36]
- Audio Visual Equipment [41]
- Awnings and Canopies [5]
- Bird Control [3]
- Casework [106]
- Ceilings [6]
- Columns [24]
- Commercial Equipment and Electronics [48]
- Communications, Data and Network Equipment [57]
- Concrete Finishes, Waterproofing, and Admixtures [5]
- Conveying Equipment and Lifts [25]
- Countertops [5]
- Curtain Walls [5]
- Decorative Metals [1]
- Details [48]
- Detention Specialties [8]
- Doors and Hardware [1412]
- Electrical Devices [140]
- Exterior Trim Components [158]
- Interior Partitions [1]
- Interior Specialties [191]
- Laboratory Equipment [25]
- Ladders [1]
- Lighting [16]
- Loading Dock and Vehicular Equipment [86]
- Lockers [6]
- MEP [5]
- Mailboxes [61]
- Paints and Coatings [7]
- Panels [2]
- Plumbing Equipment and Components [15]
- Plumbing Fixtures [20]
- Pre-Engineered Structures [12]
- Profiles [29]
- Radiation Protection Equipment [24]
- Railings [27]
- Registers and Grilles [11]
- Retail and Food Service Equipment [4]
- Roofs and Roof Accessories [97]
- Seismic and Movement Control [6]
- Signs [172]
- Site Improvements and Equipment [232]

New BIM Families

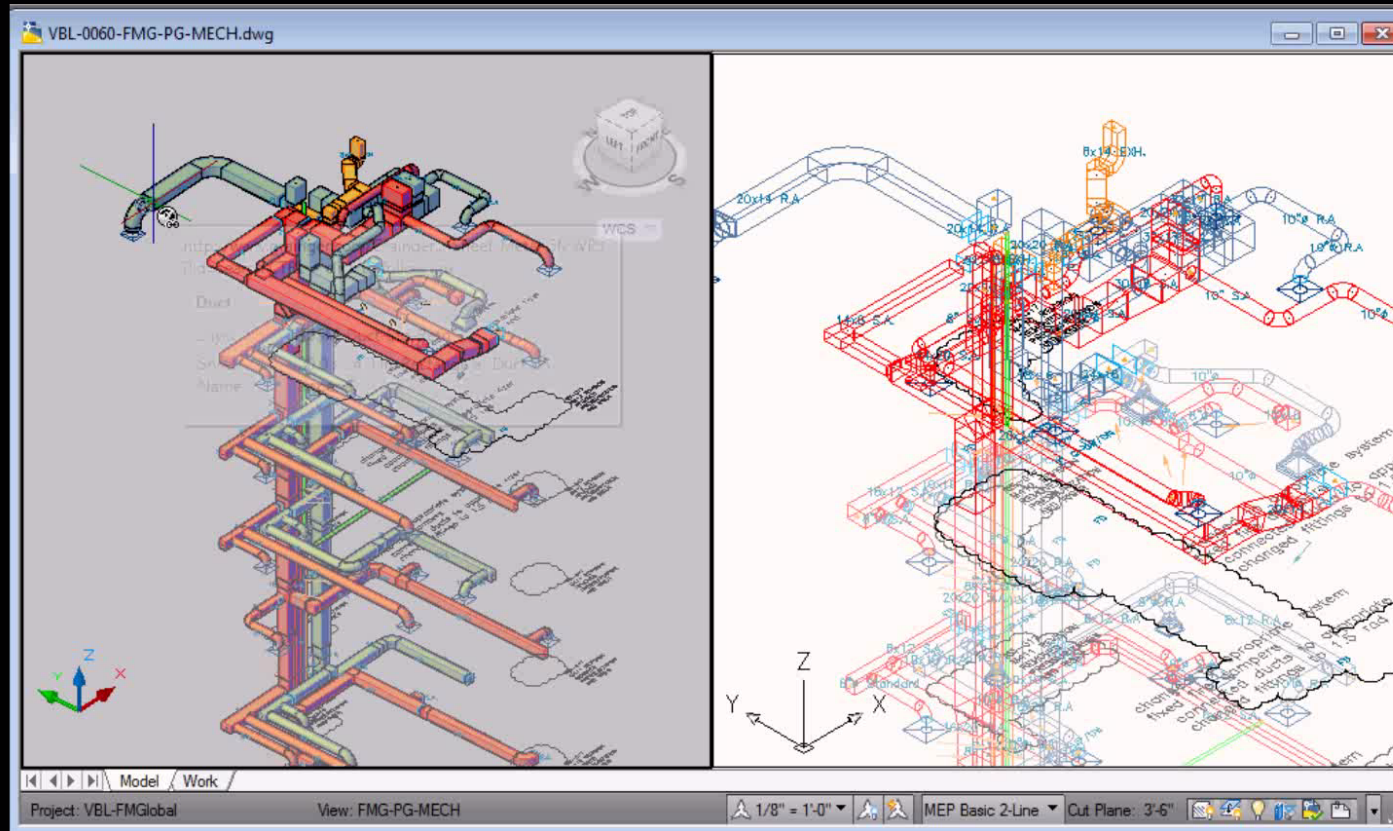
click image to download



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125%

Design Review



In today's world we must accomplish the
Re-Engineering of the Building Process
to realize all of the benefits across the lifecycle...
It's not just AEC.



...and achieve the

