INTEGRATED PROJECT DELIVERY

AIA / AGC JOINT COMMITTEE
03.24.09

INTRODUCTION: PRESENTERS

CLYMER CEASE, AIA, LEED AP / PRINCIPAL / **PEARCE BRINKLEY CEASE + LEE ARCHITECTURE**

SHANN RUSHING, AIA / ASSOCIATE / **PEARCE BRINKLEY CEASE + LEE ARCHITECTURE**

BILL SMITH, PE, LEED AP / PRINCIPAL / **STANFORD WHITE**

ADAM SPACH, PE, LEED AP / MECHANICAL ENGINEER / **STANFORD WHITE**

ROB STEVENSON, PE / SENIOR PROJECT ENGINEER / **LHC STRUCTURAL ENGINEERS**

MICHAEL B. CLARK / VDC/BIM COORDINATOR / **SKANSKA USA**

WAYNE MAIORANO / PARTNER / **SMITH ANDERSON**

INTRODUCTION:
DEFINITION

INTEGRATED PROJECT DELIVERY (IPD)

A project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction.

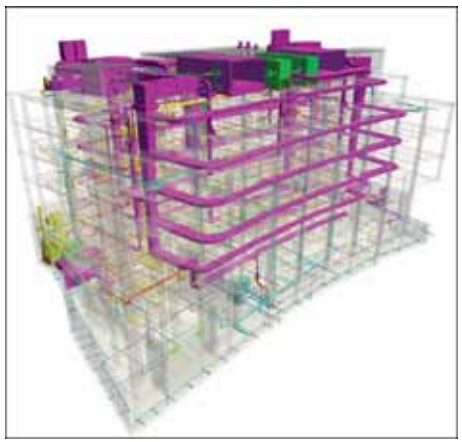
- Early Collaboration
- Clear Communication

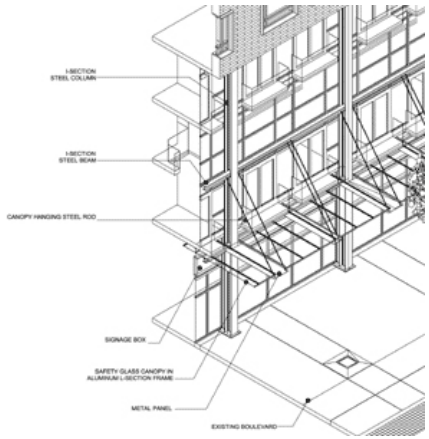
Definition from the Integrated Project Delivery Task Force - an interdisciplinary group sponsored by McGraw-Hill Construction and the AIA California Council.

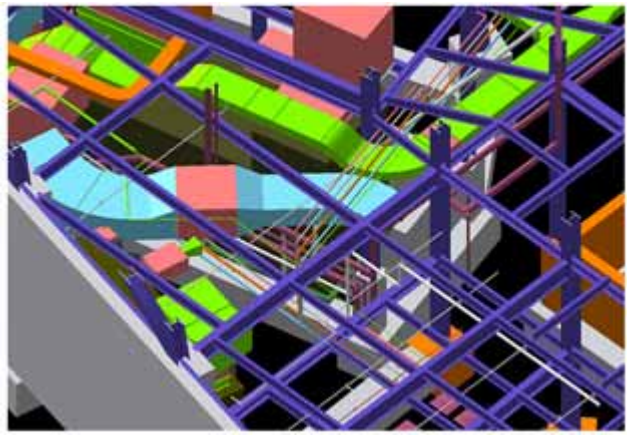
INTRODUCTION:
DEFINITION

BUILDING INFORMATION MODELING (BIM)

A data rich, object oriented and intelligent digital representation of the facility from which views and data can be extracted and analyzed to generate information that can be used to make decisions and improve the process of delivering the facility.







Definition from the Integrated Project Delivery Task Force - an interdisciplinary group sponsored by McGraw-Hill Construction and the AIA California Council.

INTRODUCTION: DEFINITION

BIM SOFTWARE

- Revit Architecture
- Revit MEP
- Revit Structure
- Civil 3D
- Graphisoft Composer
- ArchiCAD Modeler
- ArchiCAD MEP Modeler
- CAD Duct / CAD Pipe
- Navisworks
- Bentley
- Sketchup
- Rhino
- FormZ

INTRODUCTION: DIFFERENCES

TRADITIONAL

INTEGRATED

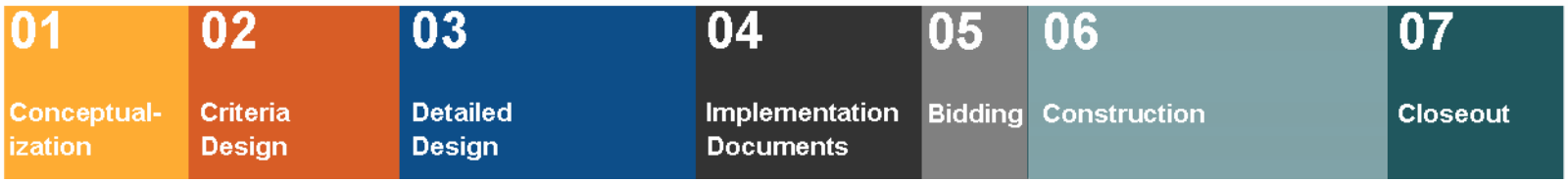


Chart from the Integrated Project Delivery Task Force - an interdisciplinary group sponsored by McGraw-Hill Construction and the AIA California Council.

INTRODUCTION:
TIMELINE CURVE

- Integrated Design enables informed decisions earlier in the process.

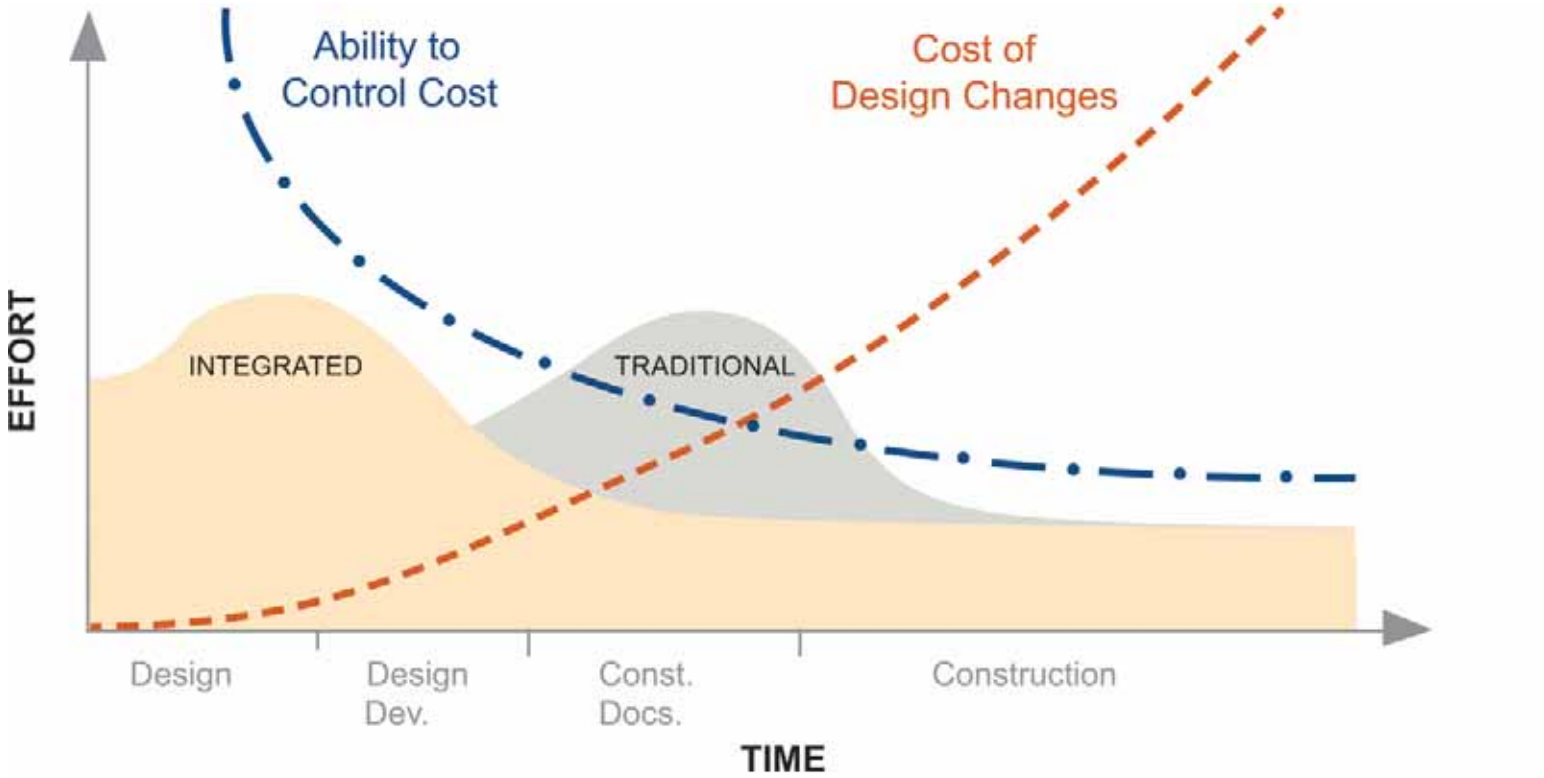
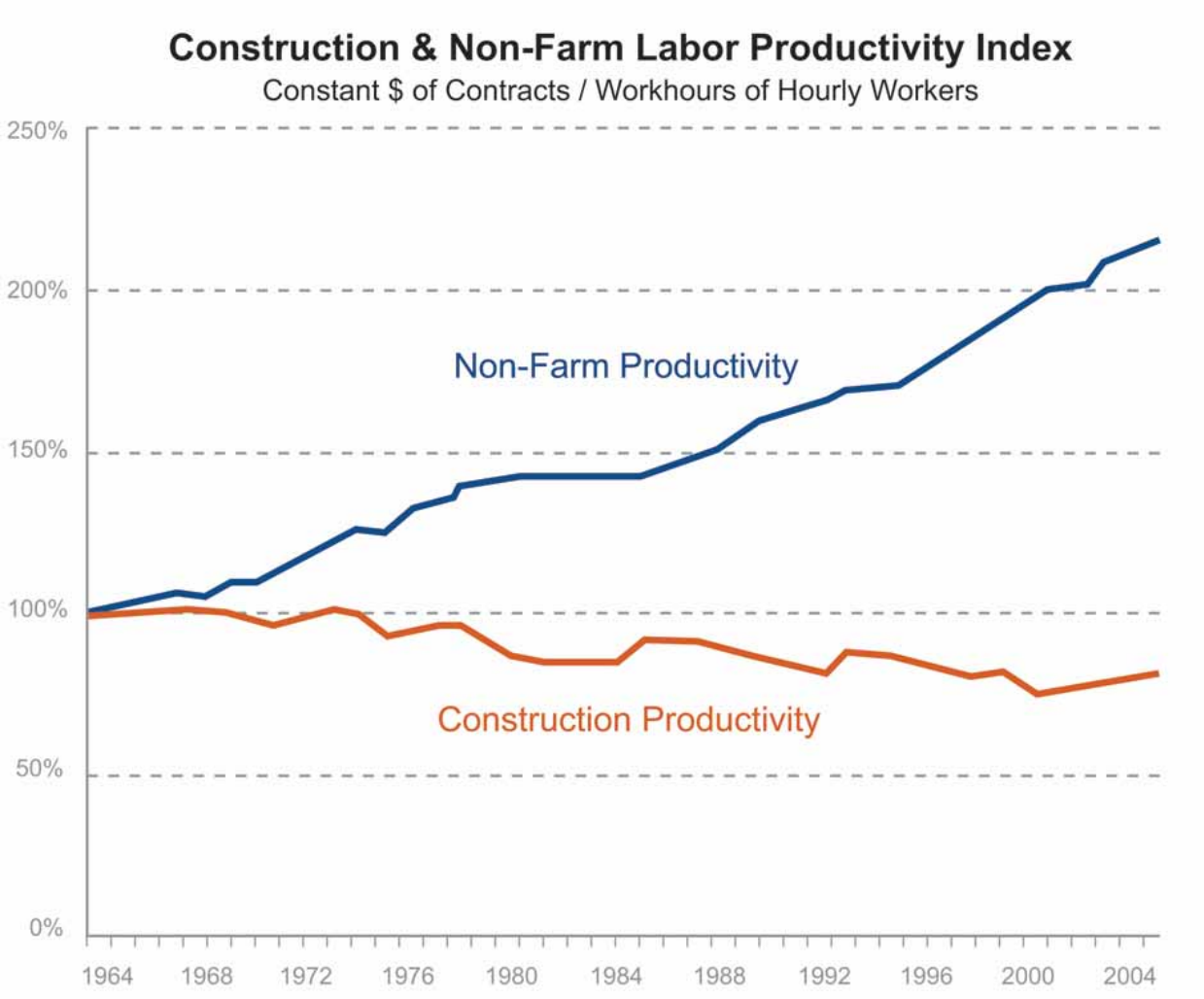


Chart from the Integrated Project Delivery Task Force - an interdisciplinary group sponsored by McGraw-Hill Construction and the AIA California Council.

INTRODUCTION: PRODUCTIVITY



Reference: Paul Teicholz, Ph.D., Professor (Research) Emeritus, Dept. of Civil and Environmental Engineering, Stanford University

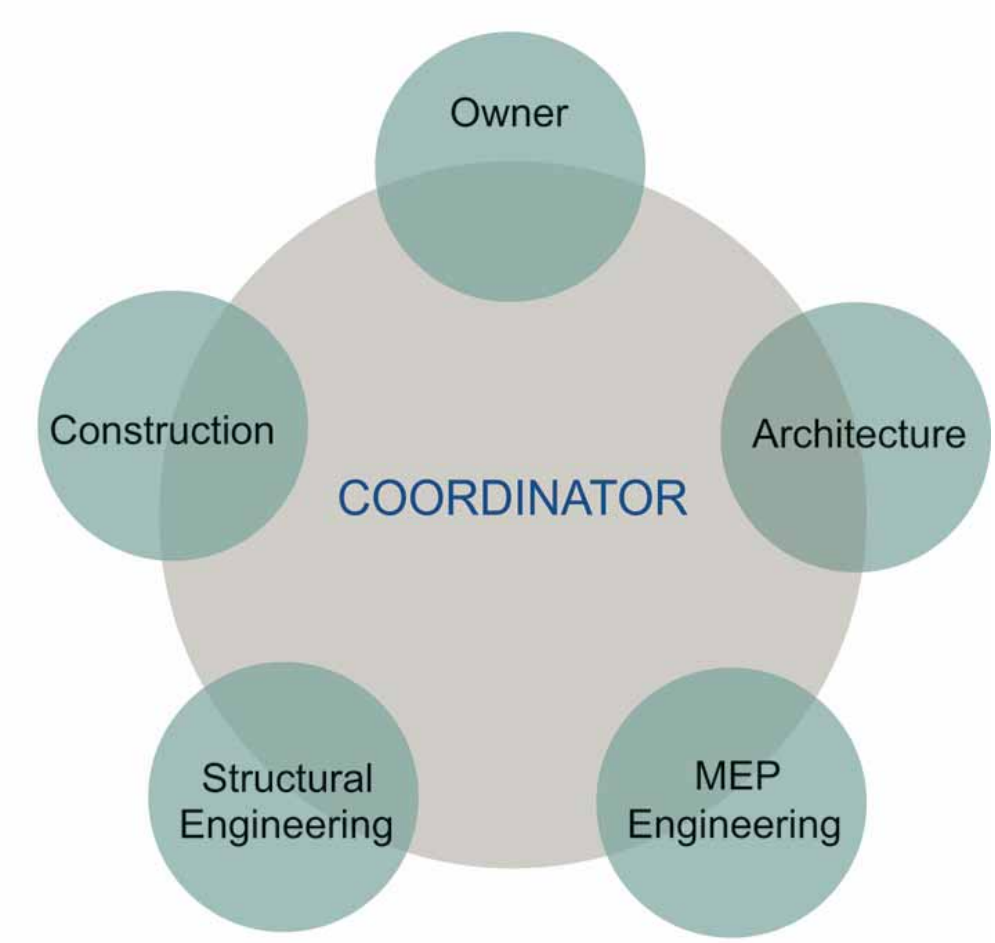
PRE-DESIGN

TRADITIONAL

INTEGRATED

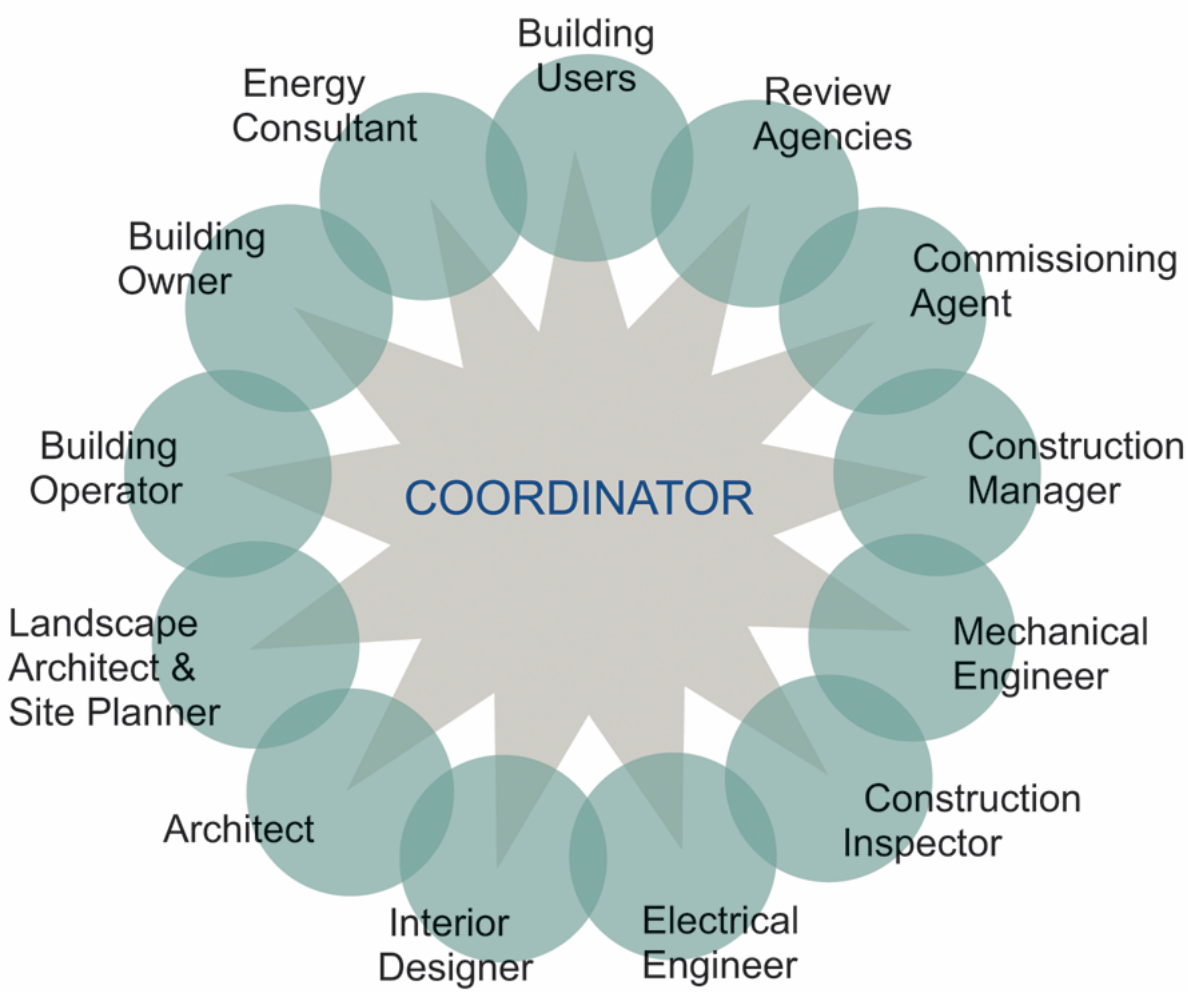
PRE-DESIGN

TRADITIONAL TEAM



PRE-DESIGN

INTEGRATED TEAM



PRE-DESIGN

LEGAL CONSIDERATIONS

- Changing of Project Team Roles and Responsibilities?
- Information Exchange – Control and Accuracy of Information

  Technology – Interoperability

  Audit Trail

  Develop Protocols

PRE-DESIGN

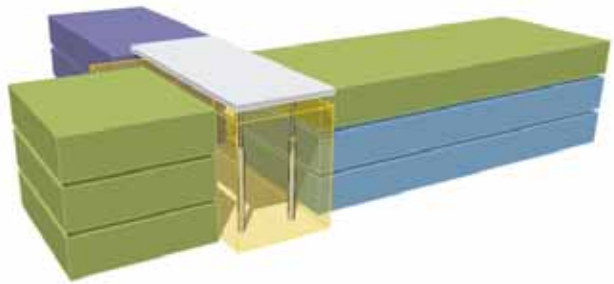
LEGAL CONSIDERATIONS

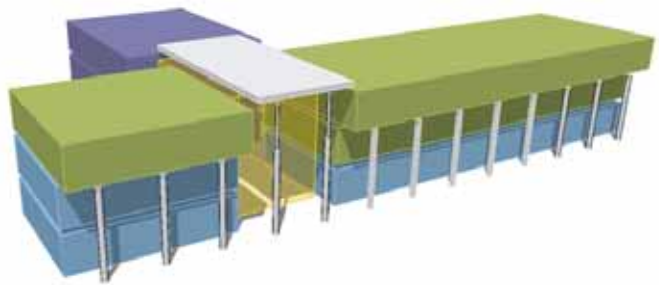
- Managing the Risks – Contracting Issues
  - Responsibility
  - Reliability
  - Release
  - Industry Efforts – ConsensusDOCS; AIA Forms, AISC Code, GSA, AGC
- Insurance / Surety Issues

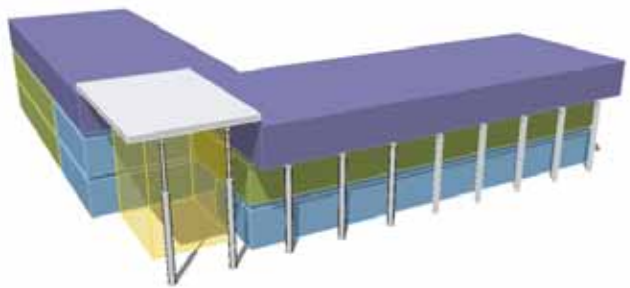
PRE-DESIGN

CONCEPTUALIZATION

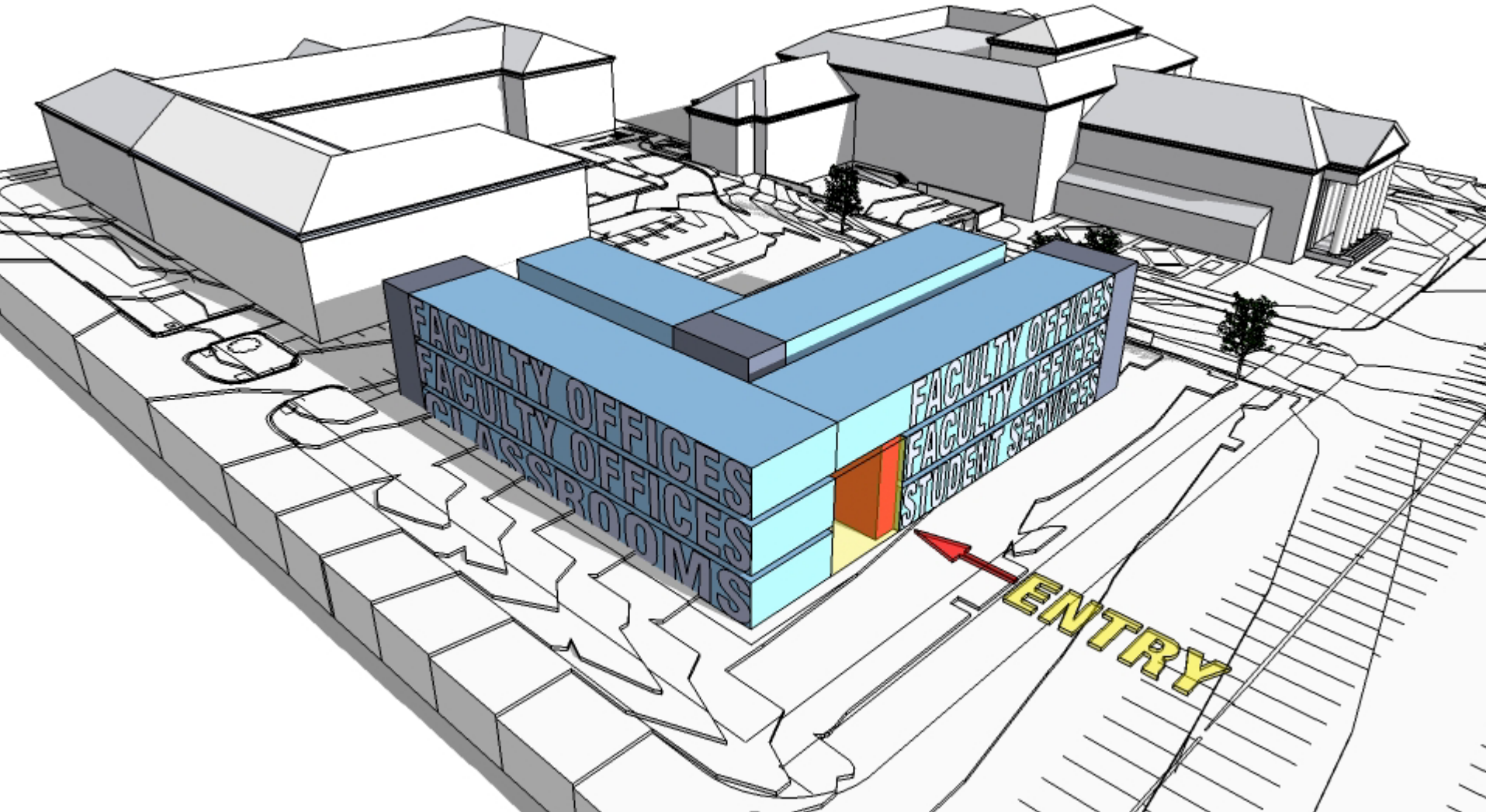
- Generate Multiple Concepts/Options
- Building Organization
- Blocking/Stacking Diagrams
- Building Massing







CONCEPTUALIZATION



SCHEMATIC DESIGN

TRADITIONAL

INTEGRATED

SCHEMATIC DESIGN: ARCHITECTURE

PROJECT VISUALIZATION

- 3-Dimensional Representation
- Early Participation by All Team Members
- Understanding of Design Decisions and Implications
- Existing Site Conditions

SCHEMATIC DESIGN: ENGINEERING

BEYOND THE NARRATIVE

In contrast to traditional design methods, the integrated team approach embraces more SD engineering input through:

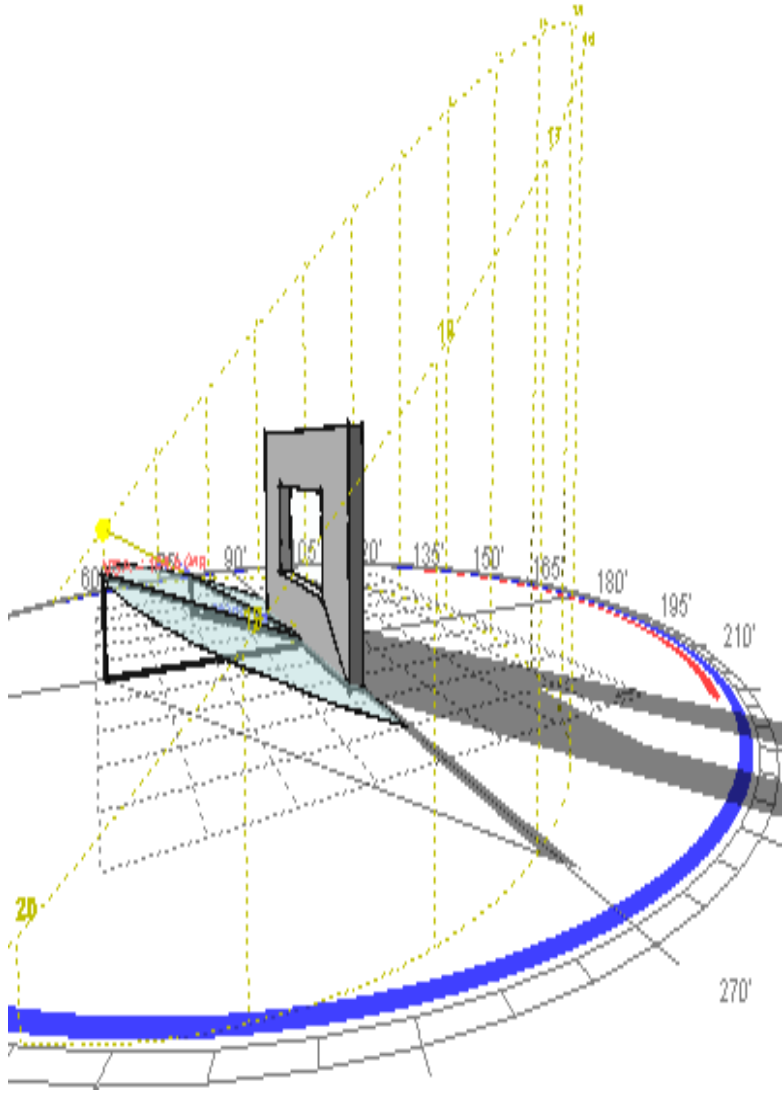
- Early Dialogue
- Early Analysis
- Early Opinions

SCHEMATIC DESIGN:
MECHANICAL & ELECTRICAL ENGINEERING

COLLABORATION + SOFTWARE

Validate early design decisions:

- Efficiency Strategies
- Energy Modeling
- Life Cycle Costing
- Daylighting
- Commissioning Coordination

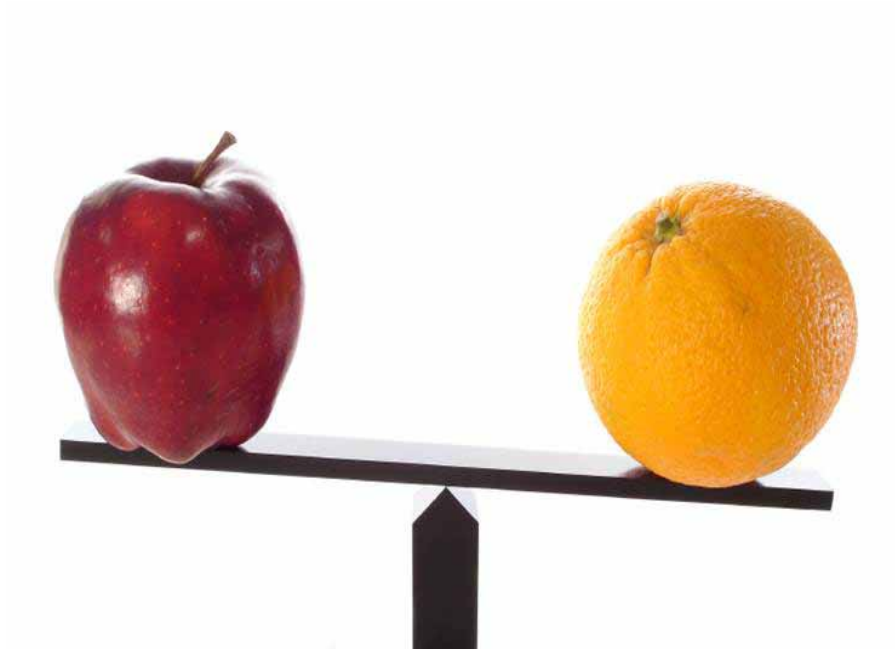


SCHEMATIC DESIGN:
MECHANICAL & ELECTRICAL ENGINEERING

ENERGY MODELING

Allows comparisons of building design features, while predicting facility energy consumption. Prompts team discussion of a host of design criteria:

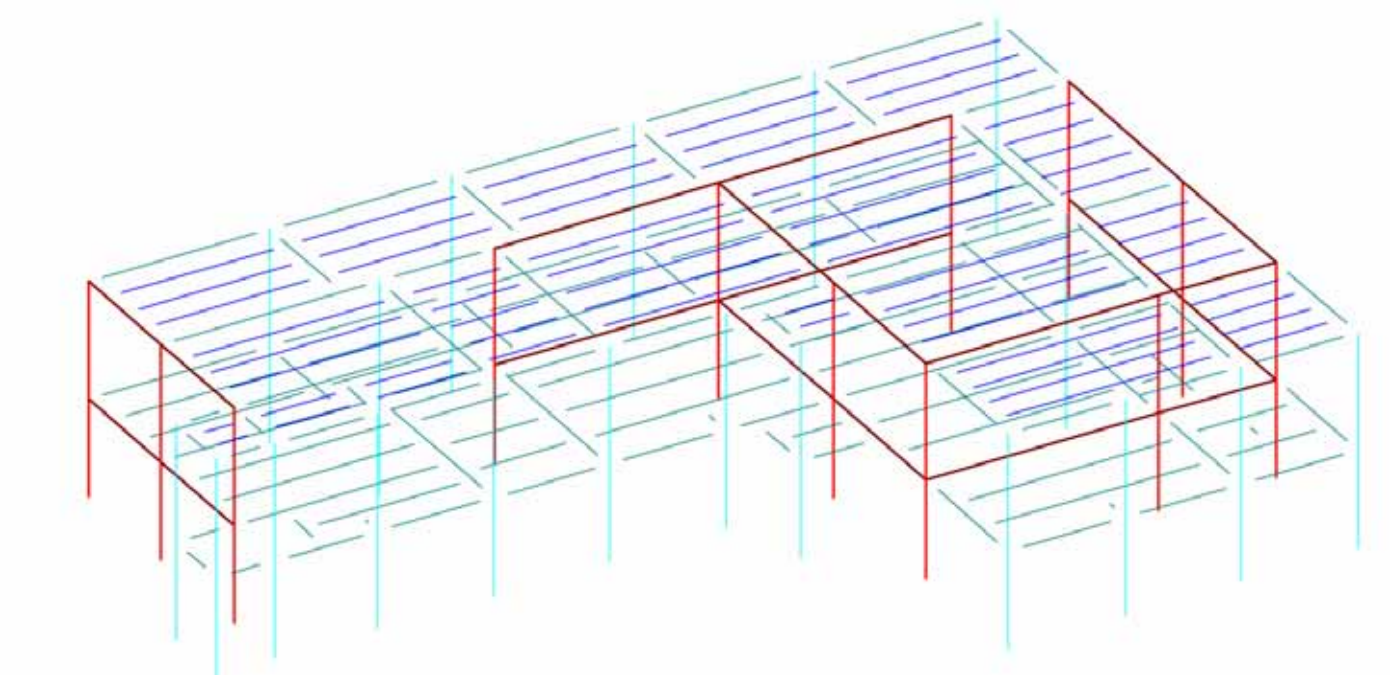
- HVAC
- Lighting
- Water Heating
- Orientation
- Sizes
- Shapes
- Roof
- Walls
- Windows
- Shading
- Skylights
- Floors



SCHEMATIC DESIGN: STRUCTURAL

VISUALIZATION ENABLES…

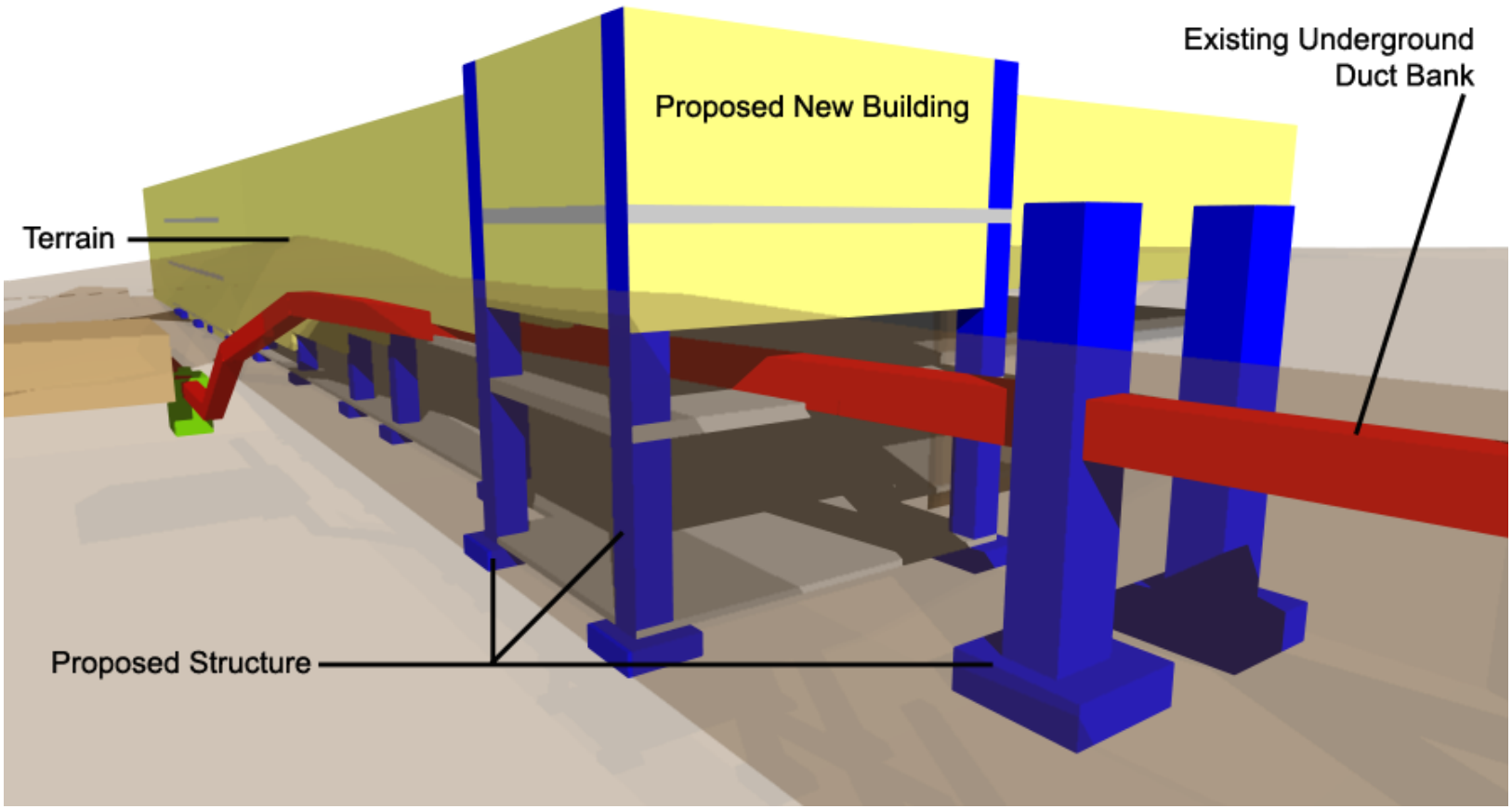
- Enlightenment and Early Input
- Enhanced Analysis of Systems and Layouts
- Simple Stick Models and “Single Line” Drawings



SCHEMATIC DESIGN

CONSTRUCTABILITY

- Proposed Design vs. Existing Conditions



SCHEMATIC DESIGN

COST

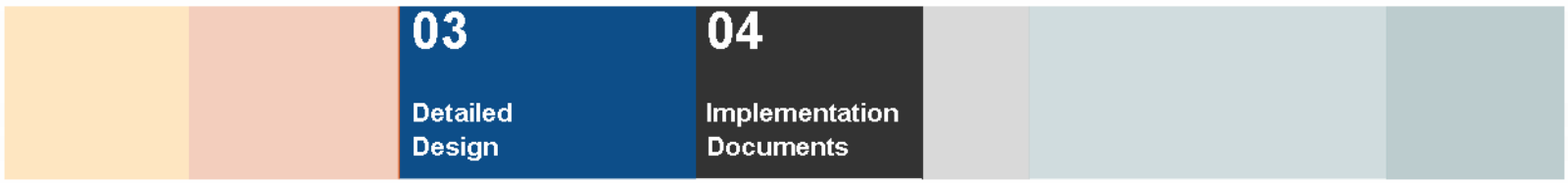
- Better Defined Estimates
- Reduce Valued Engineering

B2010 - EXTERIOR CLOSURE SYSTEMS				
Assembly Code	Assembly Description	Family and Type	Type	Area
B2010	Exterior Walls	Basic Wall: 12" Concrete	12" Concrete	424 SF
B2010	Exterior Walls	Basic Wall: 12" Concrete 2	12" Concrete 2	397 SF
B2010	Exterior Walls	Basic Wall: 12" Concrete 3	12" Concrete 3	301 SF
B2010	Exterior Walls	Basic Wall: Exterior - 10" Concrete	Exterior - 10" Concrete	446 SF
B2010	Exterior Walls	Basic Wall: Exterior - Hokie Stone on CMU- 1'-6"	Exterior - Hokie Stone on CMU- 1'-6"	3208 SF
B2010	Exterior Walls	Basic Wall: Exterior - Metal Panel on Stud	Exterior - Metal Panel on Stud	4298 SF
B2010	Exterior Walls	Basic Wall: Exterior - Precast on CMU	Exterior - Precast on CMU	1264 SF
B2010	Exterior Walls	Basic Wall: Exterior - Precast on Stud	Exterior - Precast on Stud	1828 SF
B2010	Exterior Walls	Basic Wall: Exterior - Precast on Stud - 1'-4-1/2"	Exterior - Precast on Stud - 1'-4-1/2"	7090 SF
B2010	Exterior Walls	Basic Wall: Exterior - Precast on Stud -tower	Exterior - Precast on Stud -tower	80 SF
B2010	Exterior Walls	Basic Wall: Exterior - Precast on Stud Inset 2"	Exterior - Precast on Stud Inset 2"	935 SF
B2010	Exterior Walls	Basic Wall: Exterior - Precast on Stud Inset 4"	Exterior - Precast on Stud Inset 4"	120 SF
B2010	Exterior Walls	Basic Wall: Exterior - Precast on Stud Inset 4" 2	Exterior - Precast on Stud Inset 4" 2	1329 SF
B2010	Exterior Walls	Basic Wall: Generic - 1'-2" Precast Window Surrounds	Generic - 1'-2" Precast Window Surrounds	1856 SF
B2010	Exterior Walls	Basic Wall: Generic - 1'-4" Precast Window Surrounds	Generic - 1'-4" Precast Window Surrounds	747 SF
B2010	Exterior Walls	Basic Wall: Generic - 1'-6" Hokie Stone on CMU	Generic - 1'-6" Hokie Stone on CMU	2612 SF
B2010	Exterior Walls	Basic Wall: Generic - 5"	Generic - 5"	116 SF
B2010	Exterior Walls	Basic Wall: Generic - 8 1/2"	Generic - 8 1/2"	209 SF
B2010	Exterior Walls	Basic Wall: Generic - 8"	Generic - 8"	2895 SF
B2010	Exterior Walls	Basic Wall: Generic - 9"	Generic - 9"	30 SF
B2010	Exterior Walls	Basic Wall: Generic - 10"	Generic - 10"	34 SF
B2010	Exterior Walls	Basic Wall: Generic - 12"	Generic - 12"	362 SF
B2010	Exterior Walls	Basic Wall: Generic - 12" Precast Window Surrounds	Generic - 12" Precast Window Surrounds	128 SF
B2010	Exterior Walls	Basic Wall: VTPrecast - 1'5"	VTPrecast - 1'5"	4860 SF
B2010156	Ext. Wall - Brick Composite	Basic Wall: Exterior - Hokie Stone Deep Sill	Exterior - Hokie Stone Deep Sill	330 SF
B2010156	Ext. Wall - Brick Composite	Basic Wall: Exterior - Hokie Stone on CMU	Exterior - Hokie Stone on CMU	5647 SF
B2010156	Ext. Wall - Brick Composite	Basic Wall: Exterior - Hokie Stone on Stud	Exterior - Hokie Stone on Stud	25 SF
B2020200	Curtain Walls	Curtain Wall: Curtain Wall 1	Curtain Wall 1	332 SF
B2020200	Curtain Walls	Curtain Wall: Exterior Glazing	Exterior Glazing	1499 SF

DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

TRADITIONAL

INTEGRATED



DESIGN DEVELOPMENT / CONSTRUCTION DOCUMENTS:

BEYOND ONE-LINE DRAWINGS

- The goal is to finalize design decisions with no ambiguities.
- Work product becomes more fixed such that CD phase is more of a refinement.

DESIGN DEVELOPMENT / CONSTRUCTION DOCUMENTS:

INCREASED SOPHISTICATION OF MODEL

- More Informed Decision Making
- Earlier Resolution of System Conflicts

DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

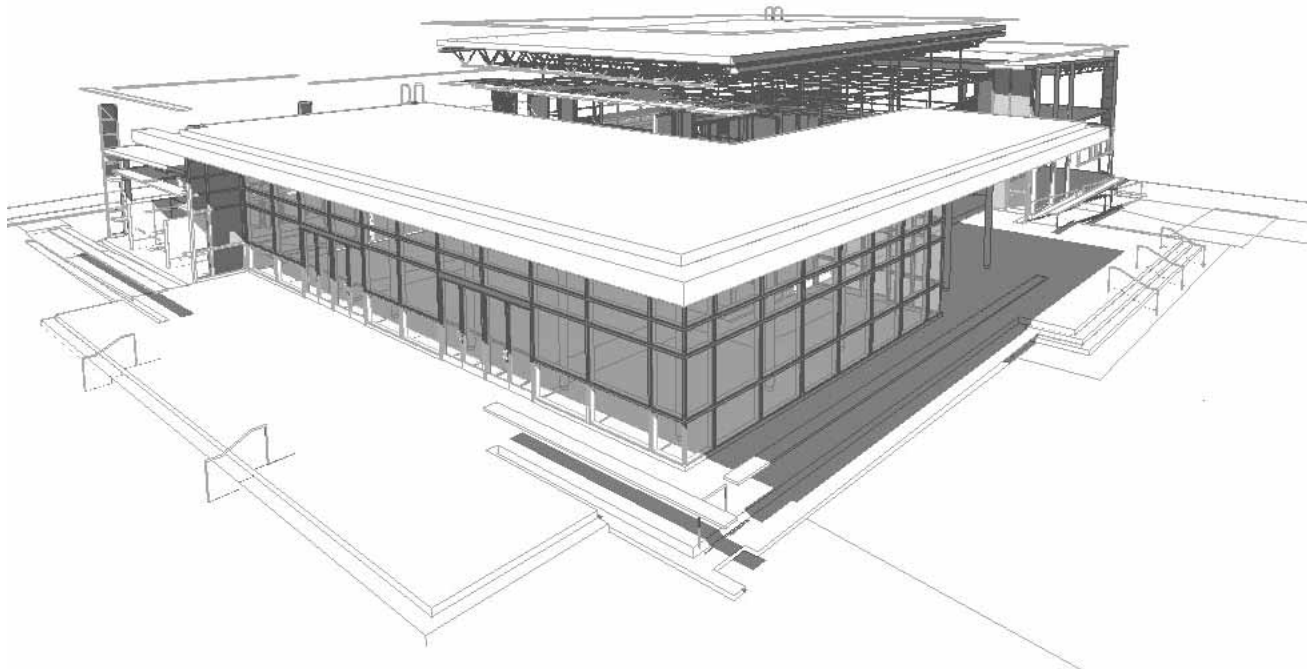
BIM MODEL

- 3D representation of building construction systems
- Multiple disciplines can be combined in a single model

DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

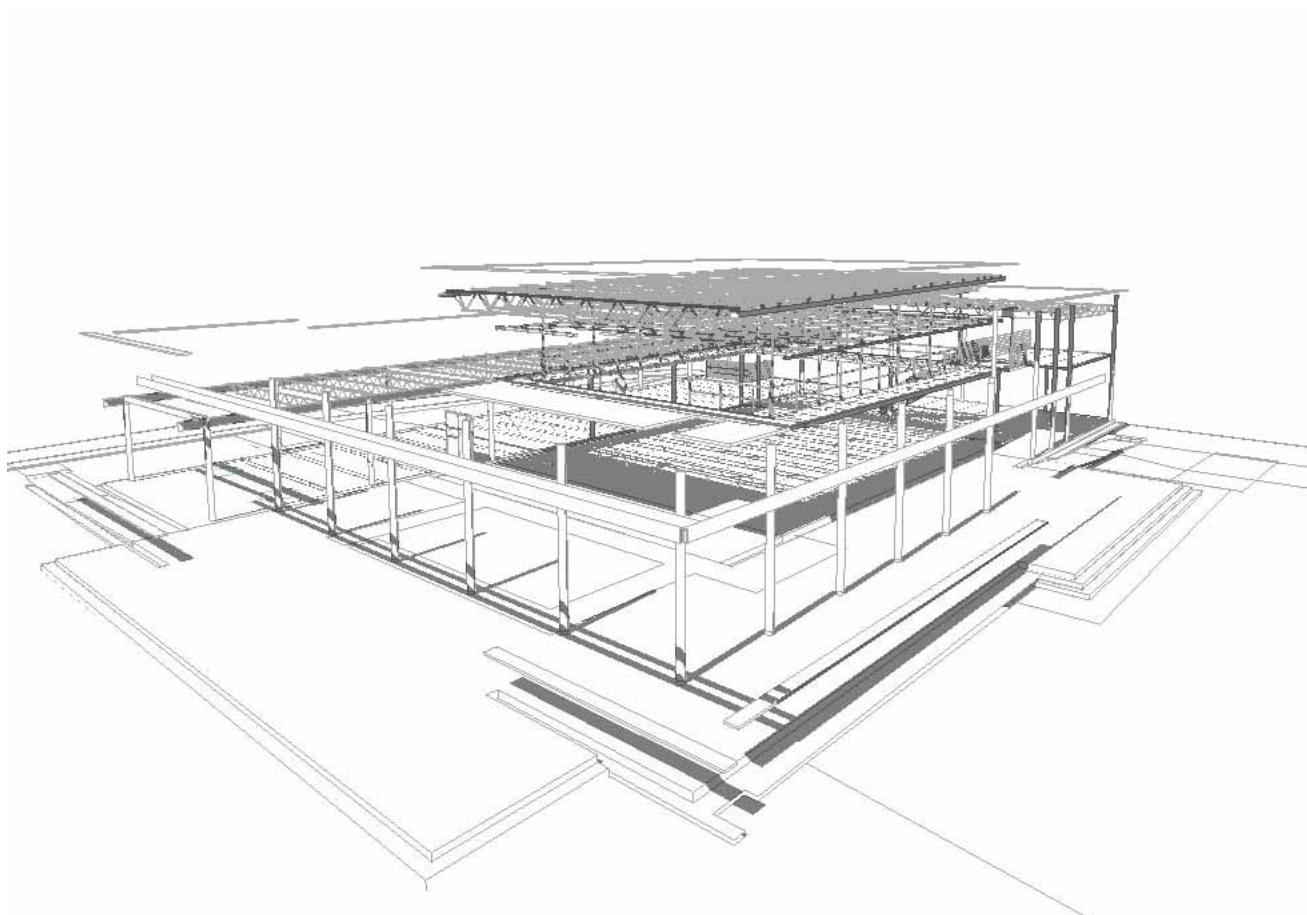
BUILDING COMPONENTS

- Architectural systems
- Structure
- Mechanical, Electrical, Plumbing systems
- Site Elements



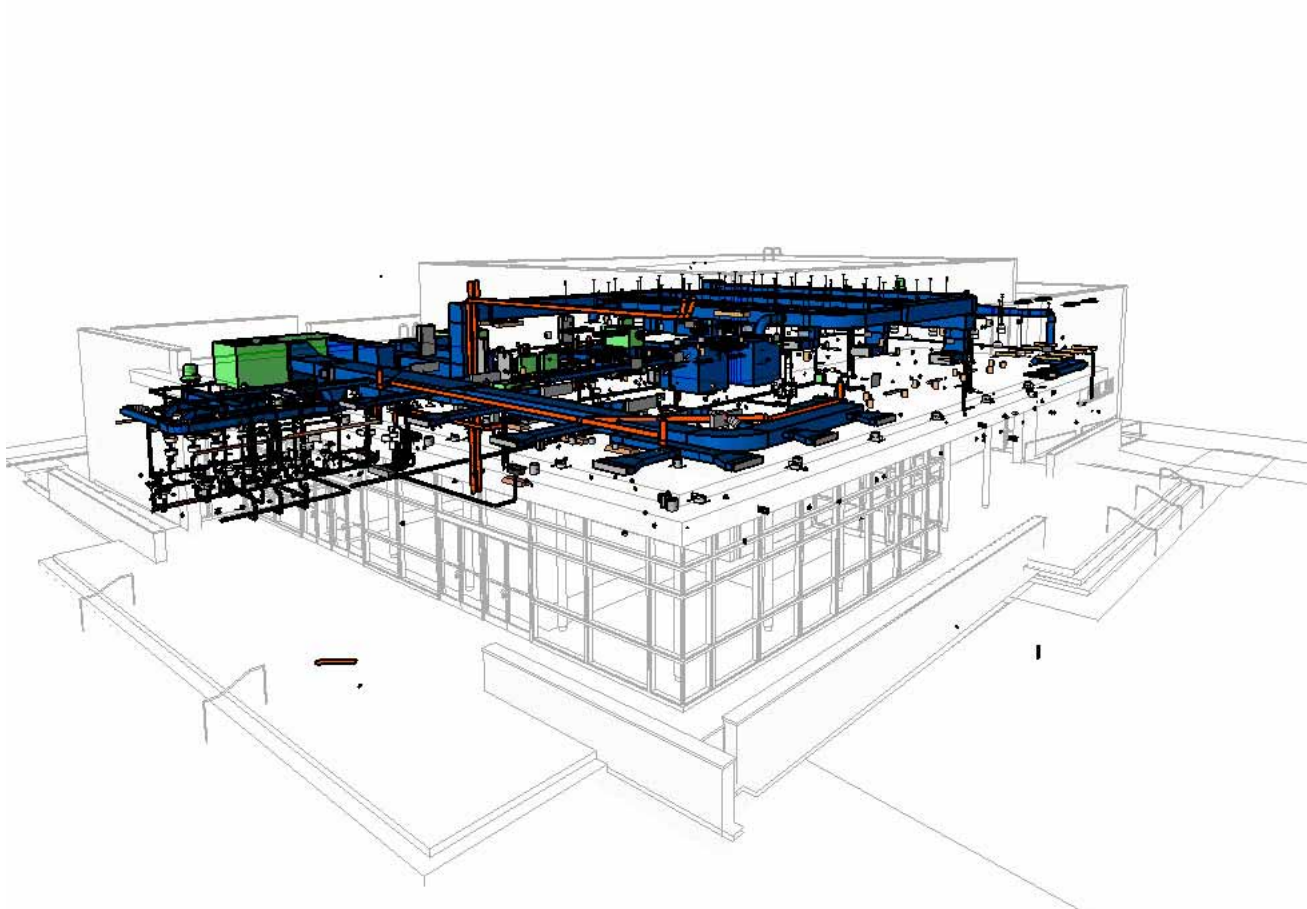
DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

STRUCTURE



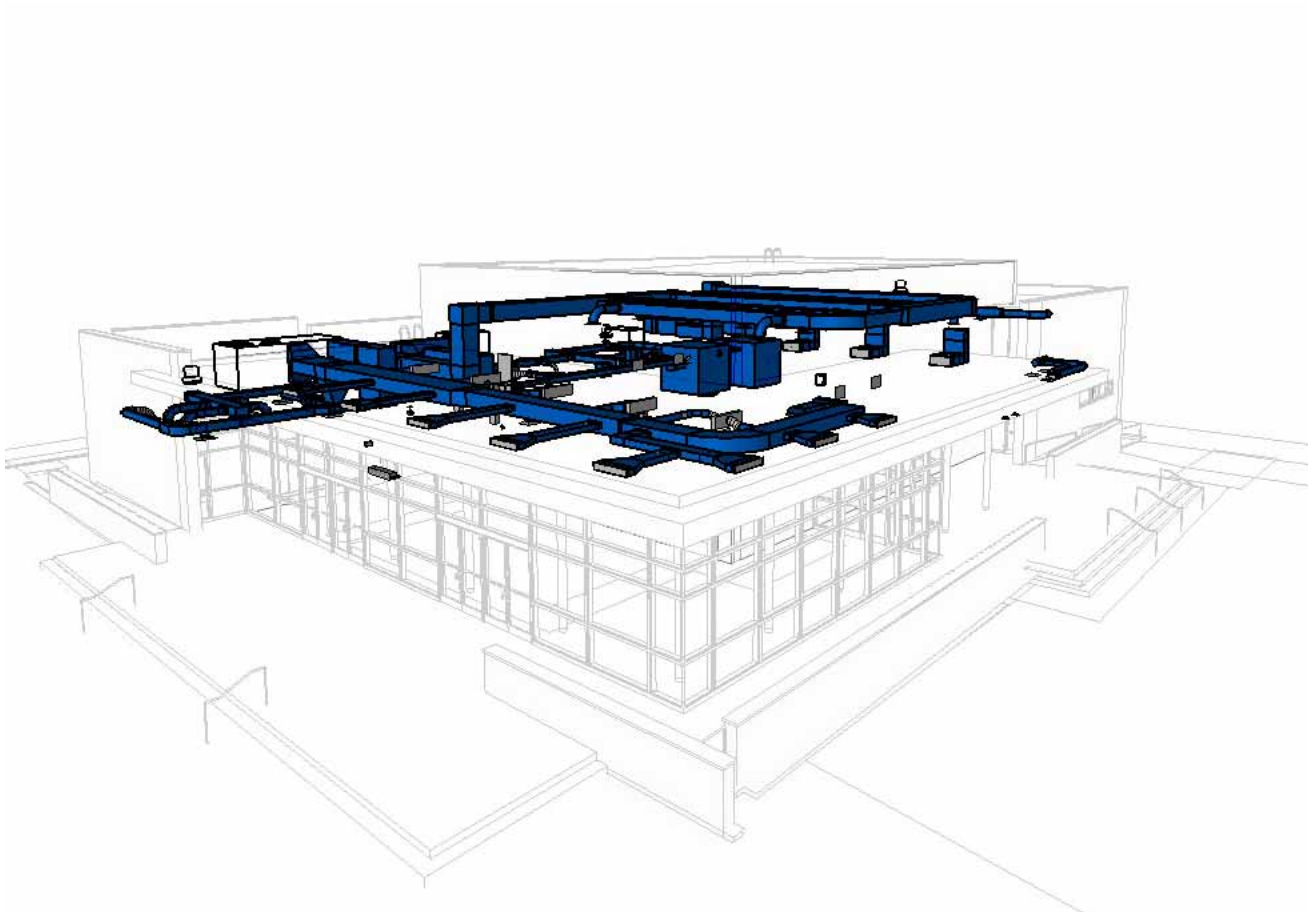
DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

PME SYSTEMS



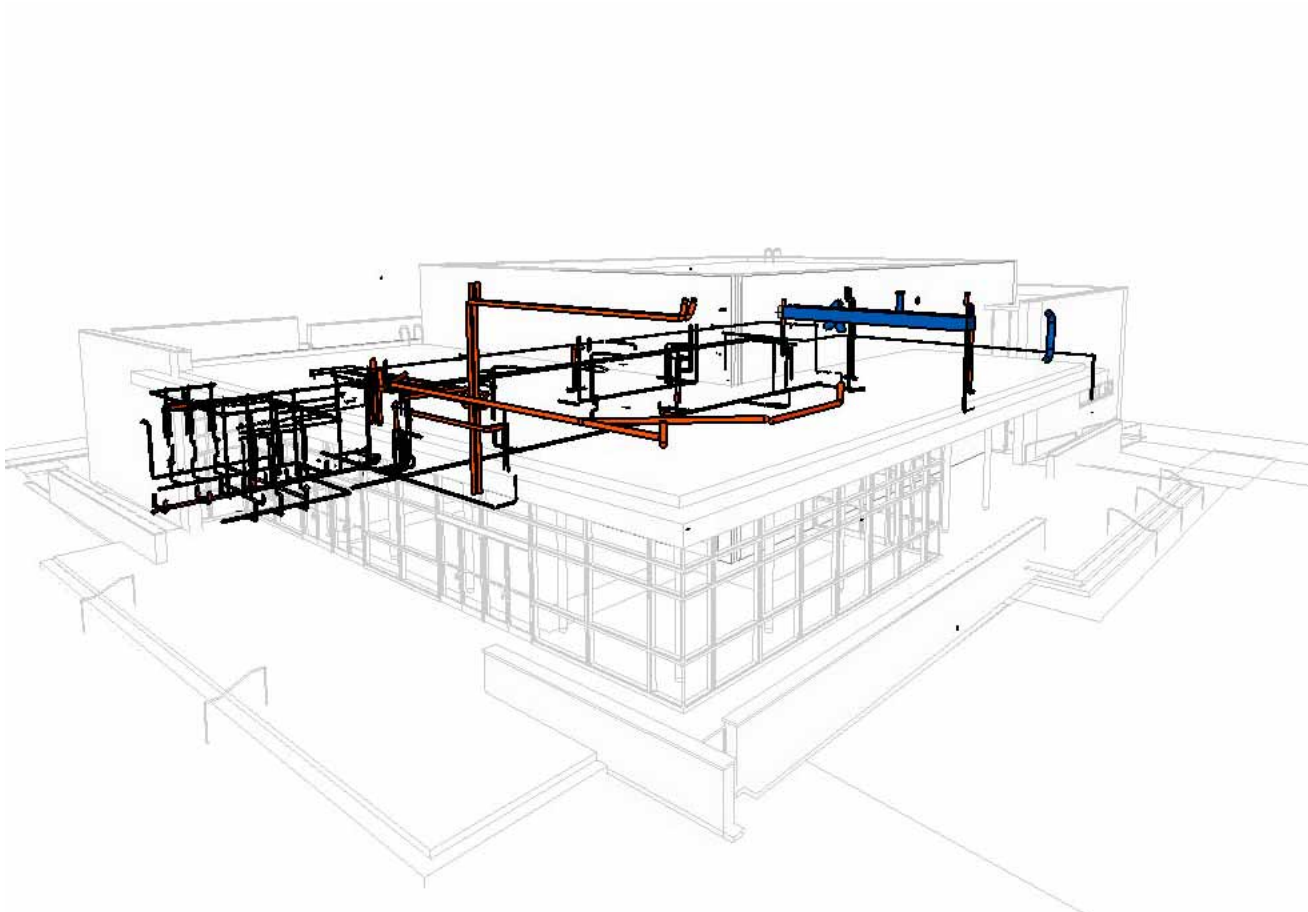
DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

MECHANICAL



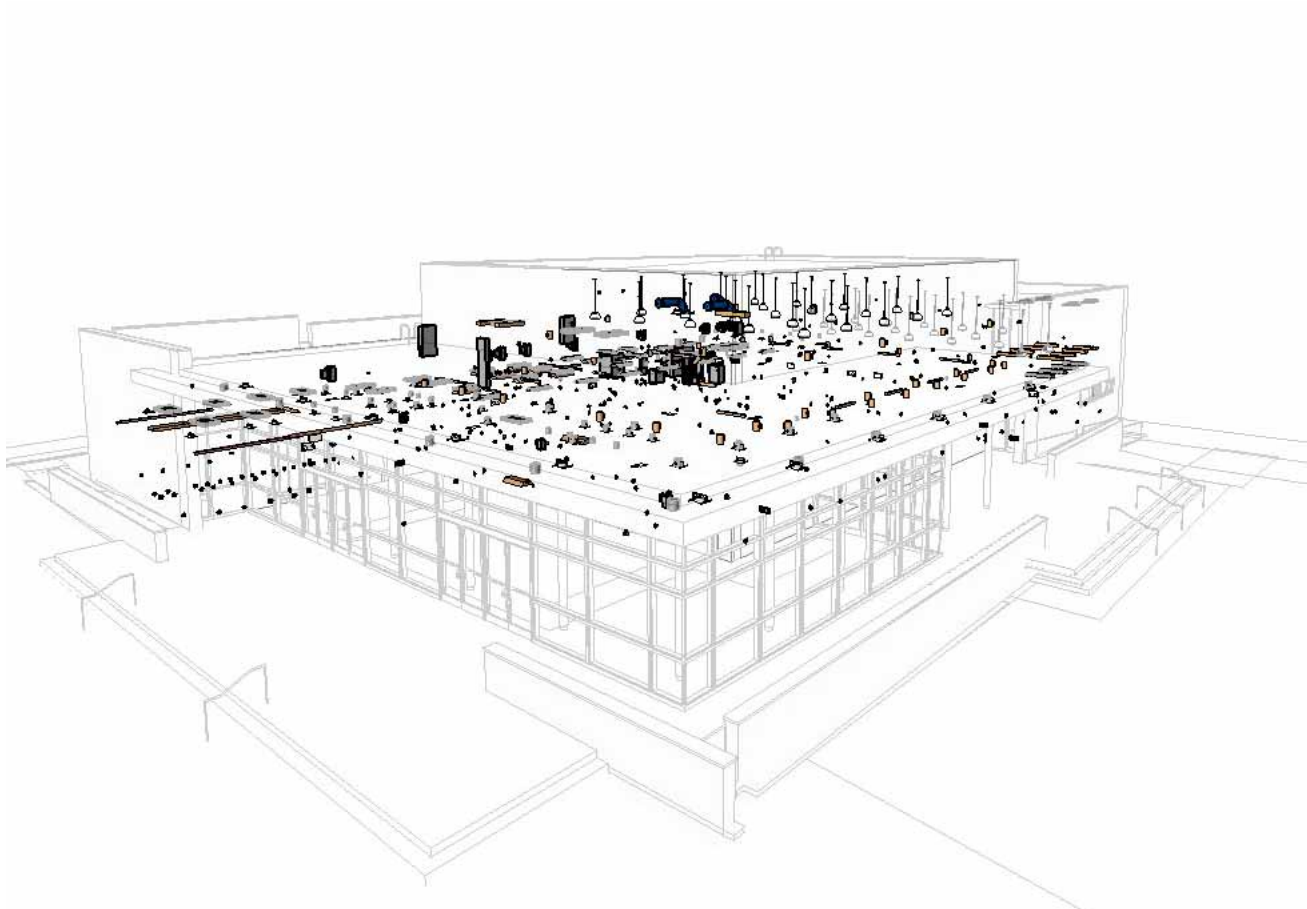
DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

PLUMBING



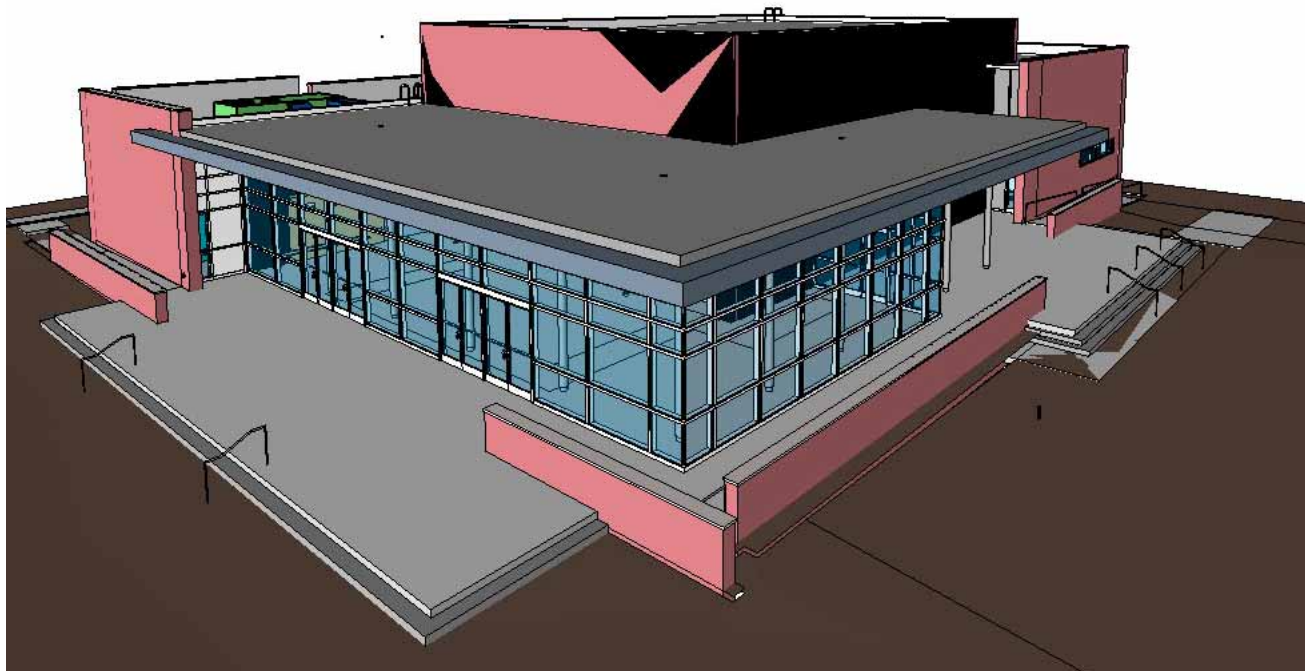
DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

ELECTRICAL



DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

VISUALIZATION



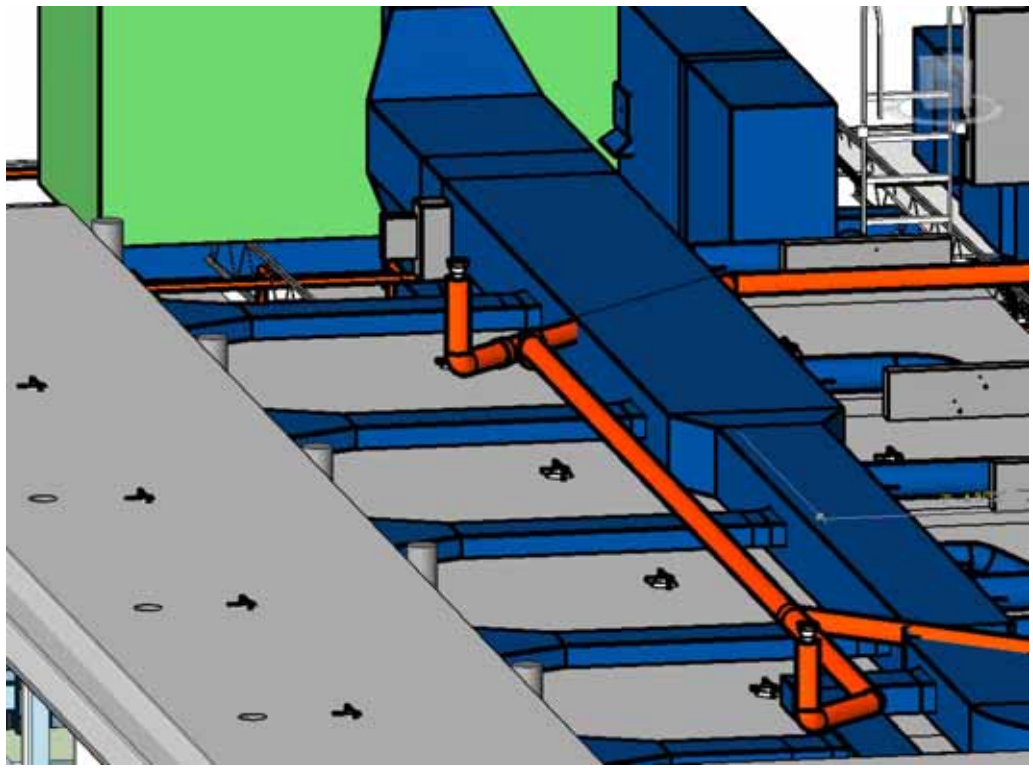
DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

VISUALIZATION

DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

COORDINATION

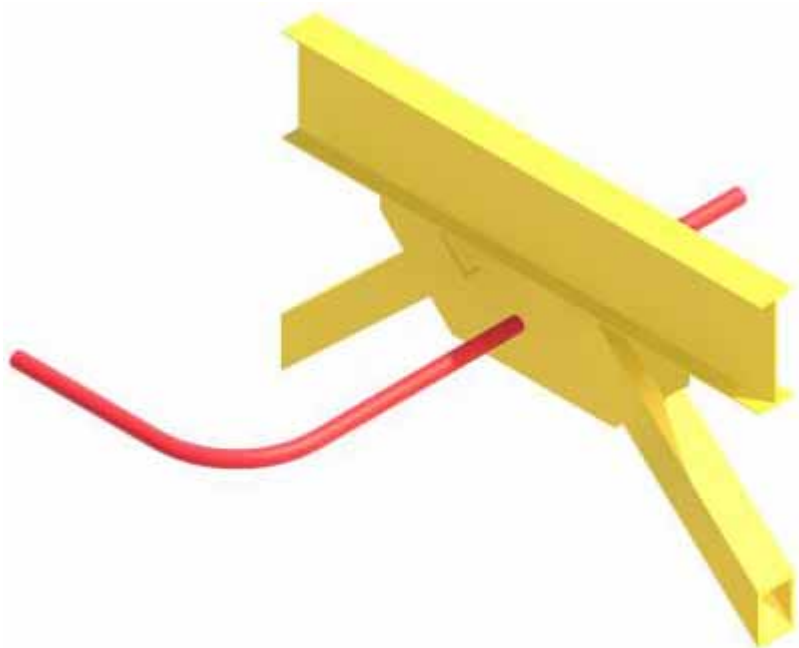
- Help identify conflicts among the trades.
- React quickly and efficiently to changes made to the model over the entire design process.



DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

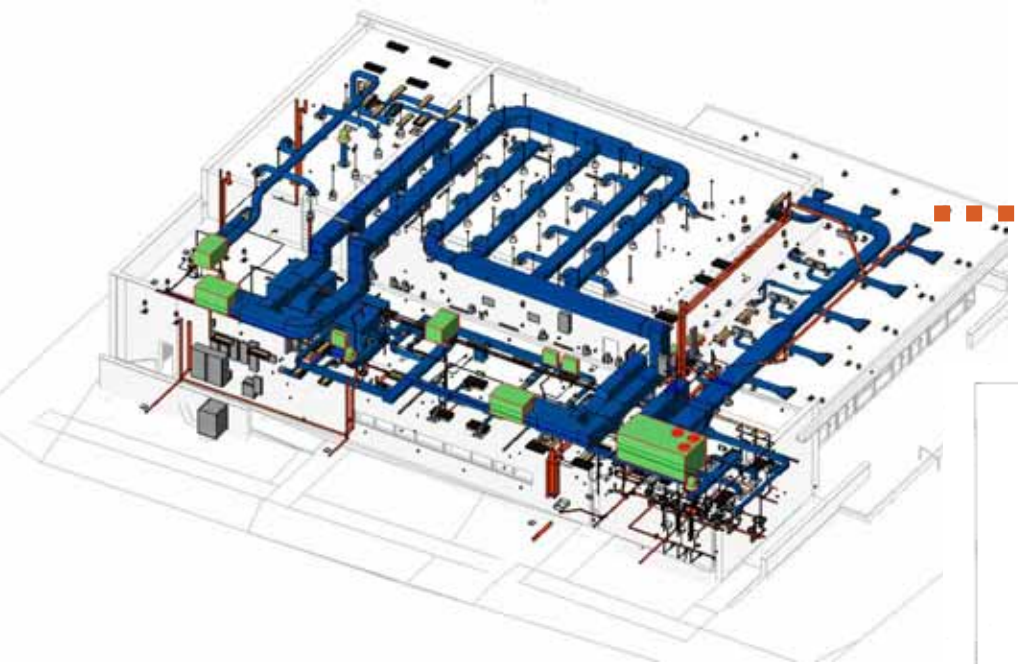
STRUCTURAL ENGINEERING

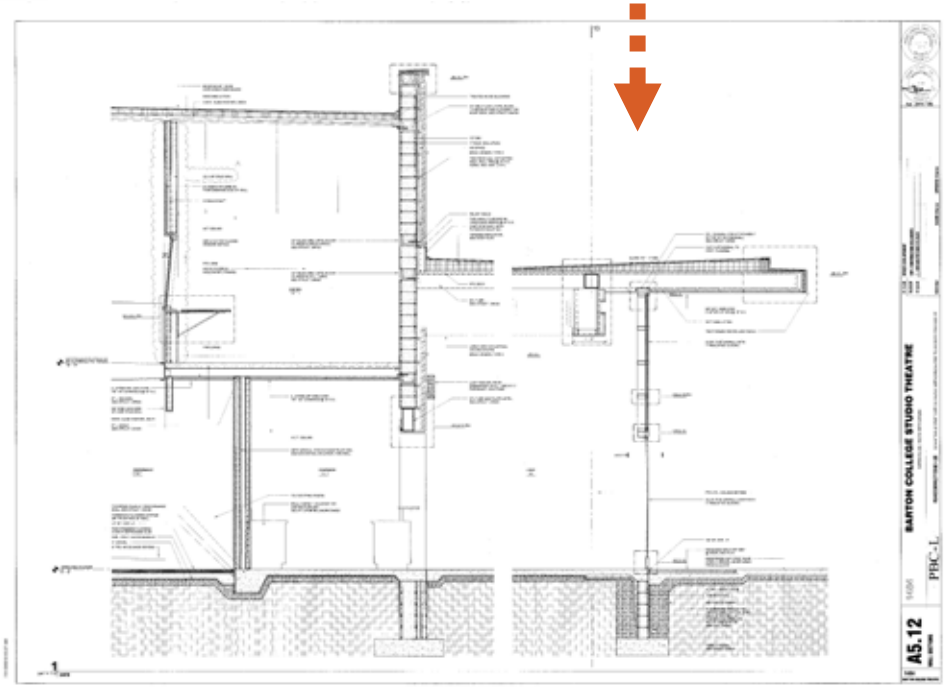
- Your Model, Your Way
- Discipline Pays Off (Maximize Accuracy)
- Knowing When to Stop (Minimize Detail)
- Involving the CM / Building Trades
- Picking Up the Phone / Getting Together



DESIGN DEVELOPMENT / CONTRACT DOCUMENTS

BIM MODEL = CONSTRUCTION DOCUMENTS





BIDDING

TRADITIONAL

INTEGRATED

BIDDING

NOW VS. FUTURE

- Current Bidding Process Remains Unchanged
- In the Future Sub-Contractors to take a Design Assist Role

CONSTRUCTION

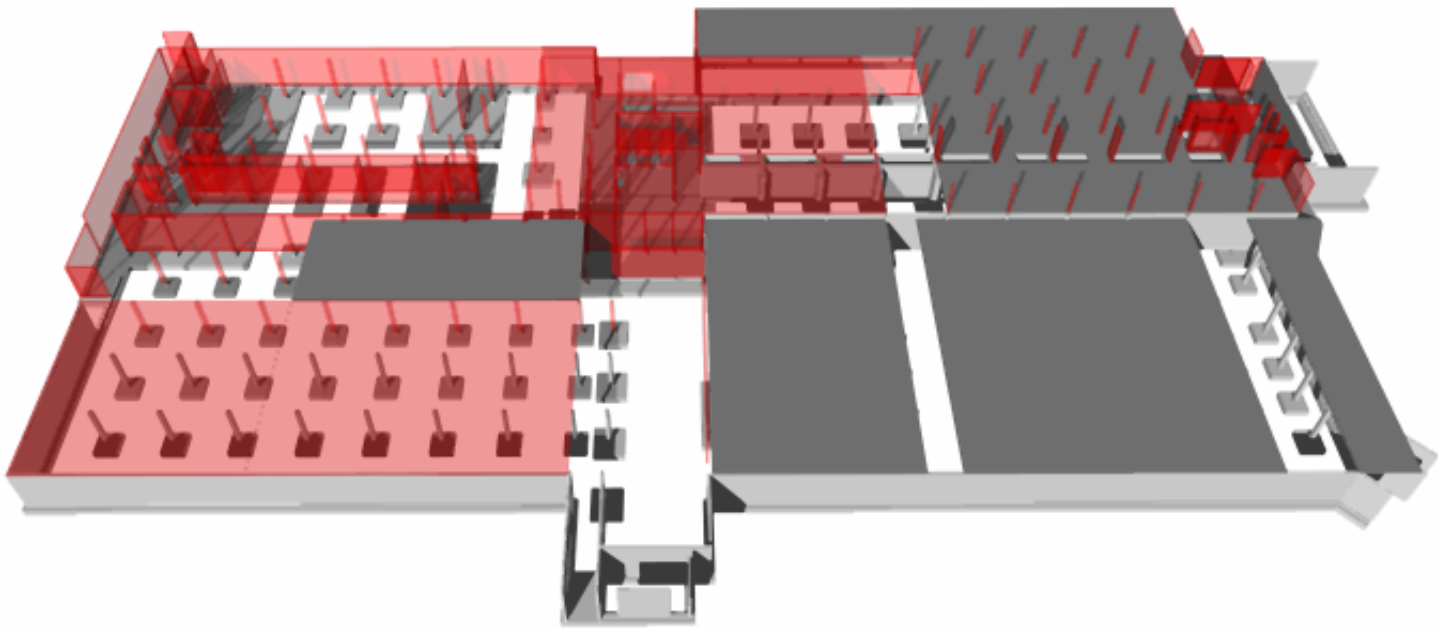
TRADITIONAL

INTEGRATED

CONSTRUCTION

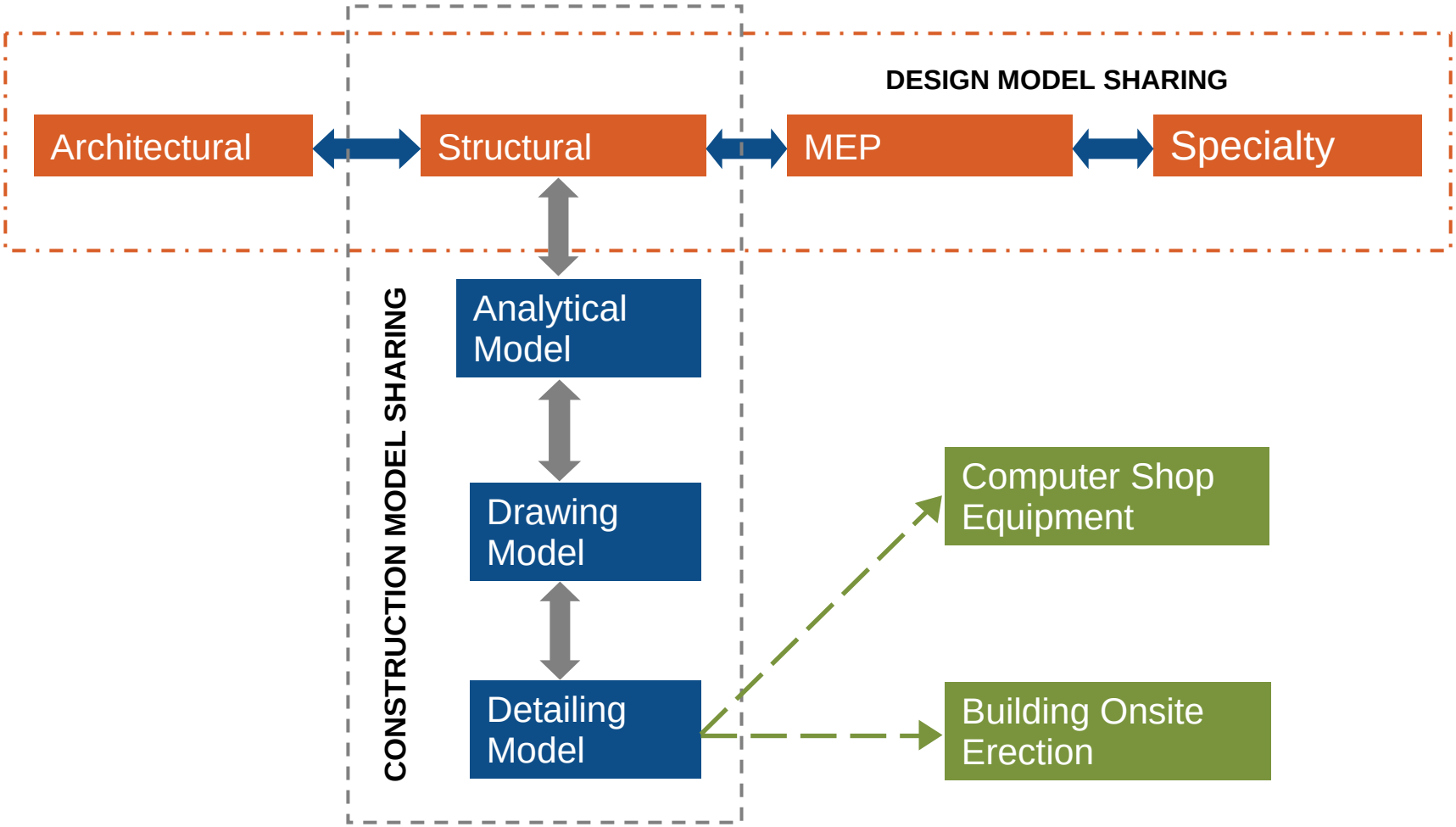
4D SCHEDULE SIMULATION

- 3D + Time
- Construction Schedule Linked to Model
- Clarity of Deliverables
- Simulation Update Automated with Schedule

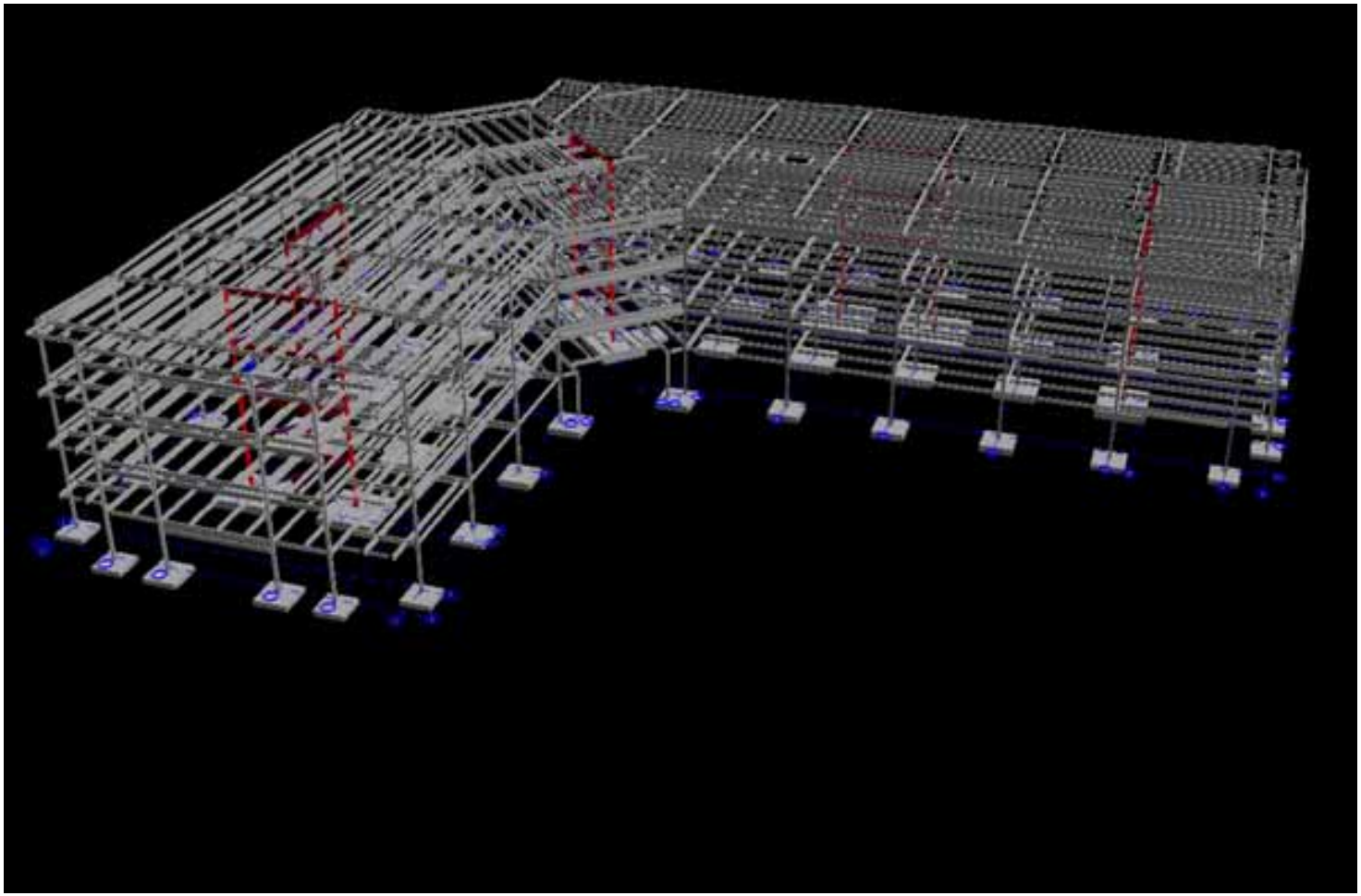


CONSTRUCTION

STREAMLINED SUBMITTALS, FABRICATION & INSTALLATION



DESIGN MODEL



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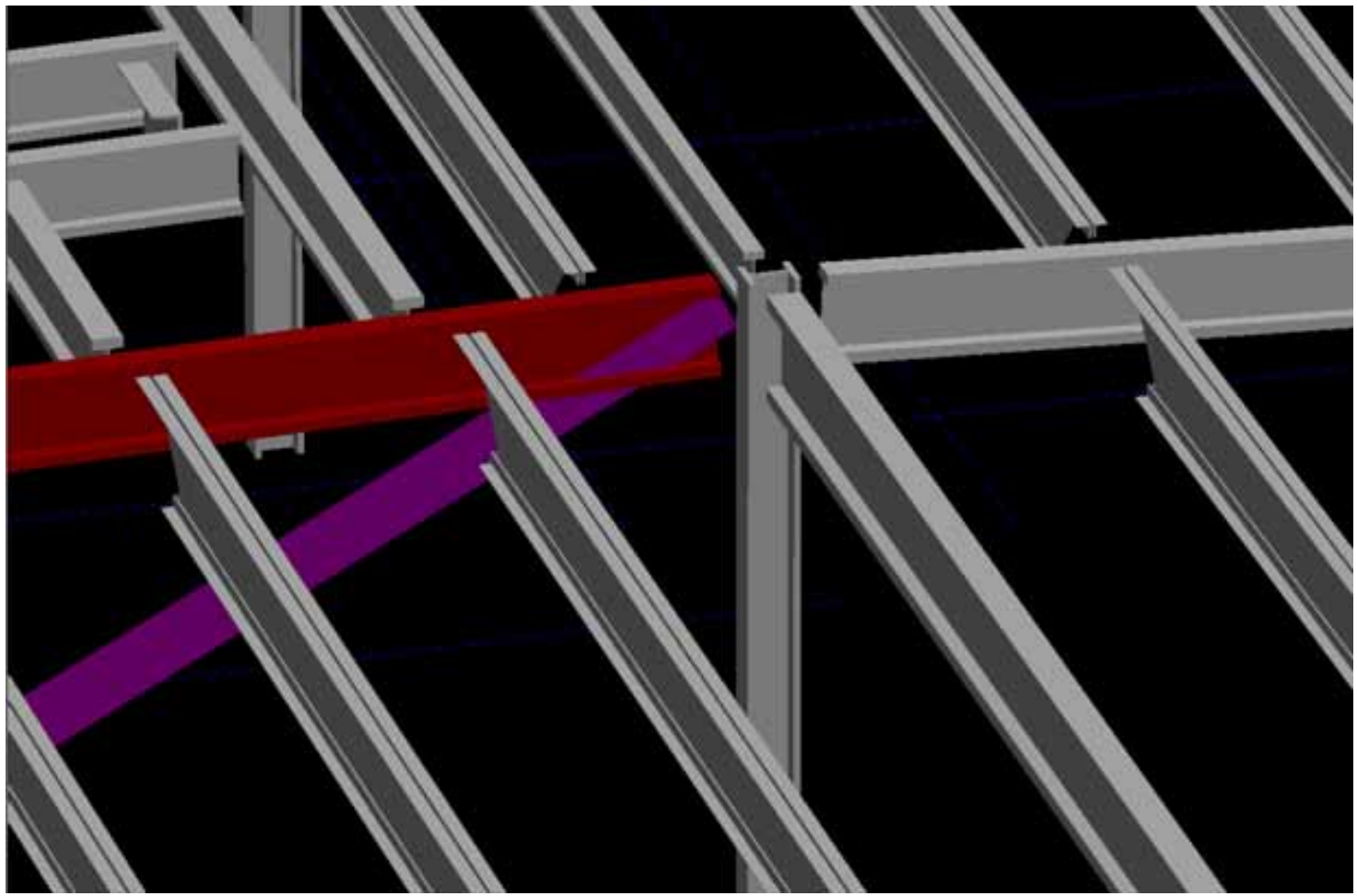
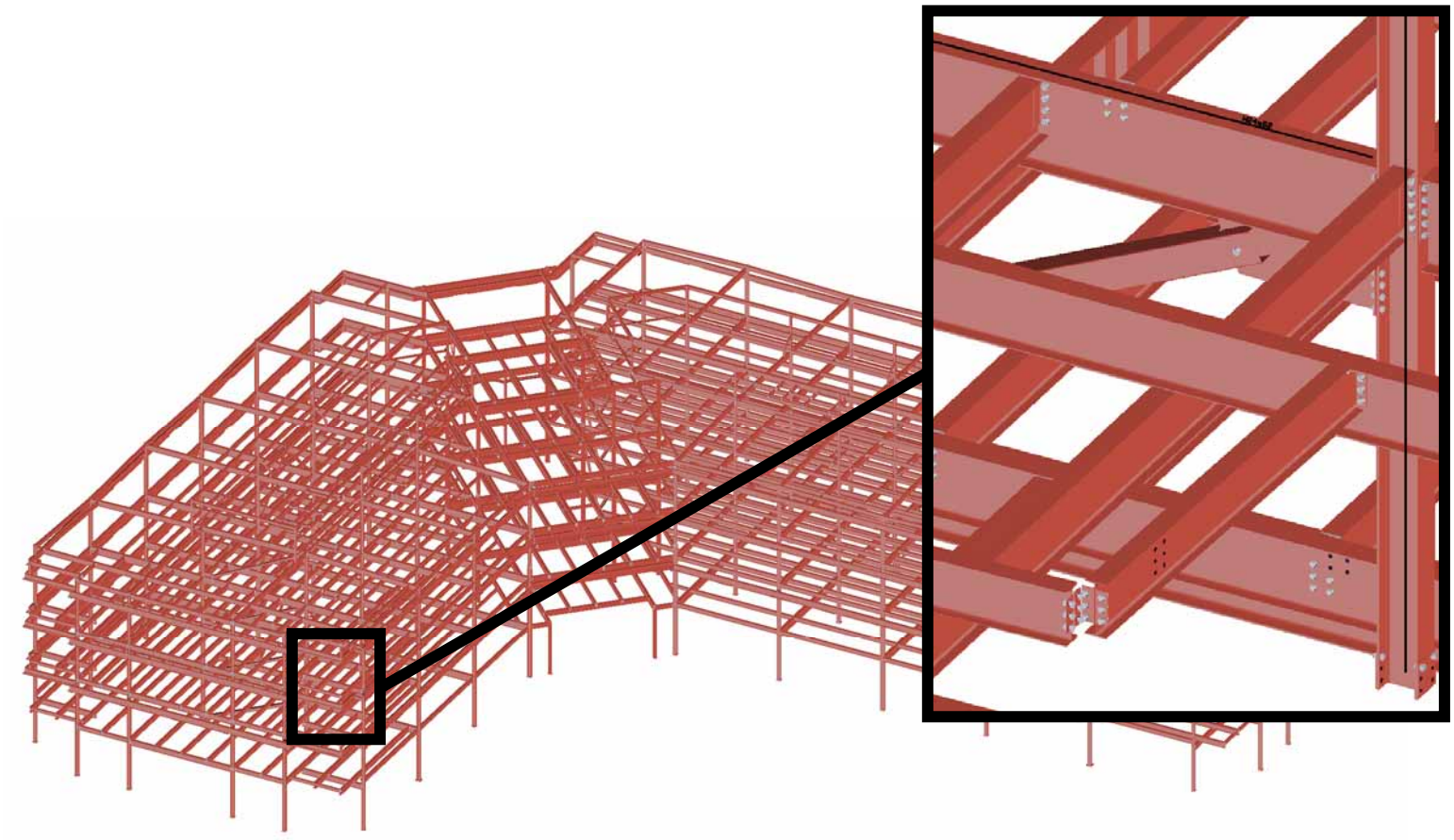


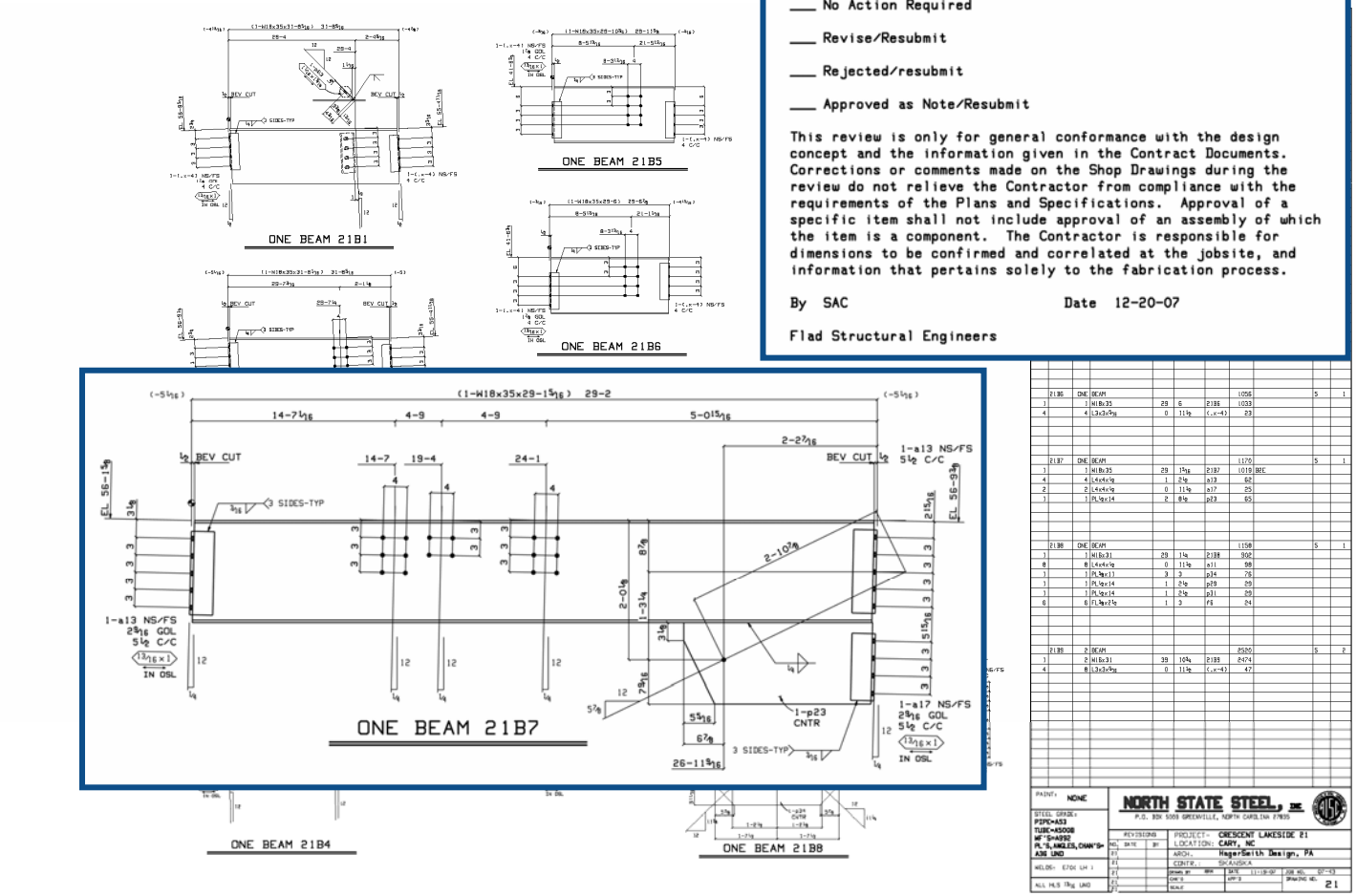
CONSTRUCTION MODEL



Courtesy North State Steel, Inc.

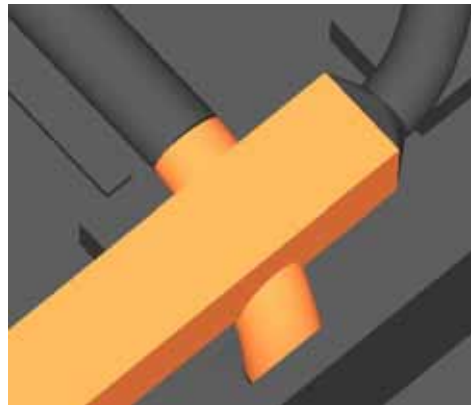
CONSTRUCTION

ELECTRONIC SUBMITTAL



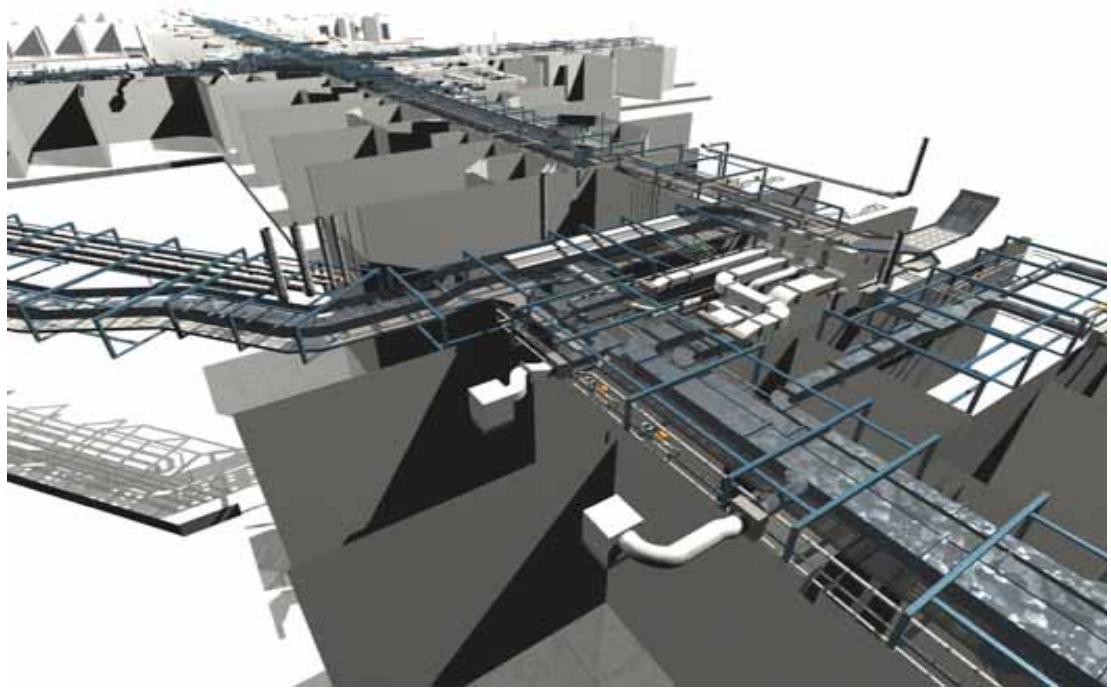
Courtesy North State Steel, Inc.

CONSTRUCTION



BENEFITS

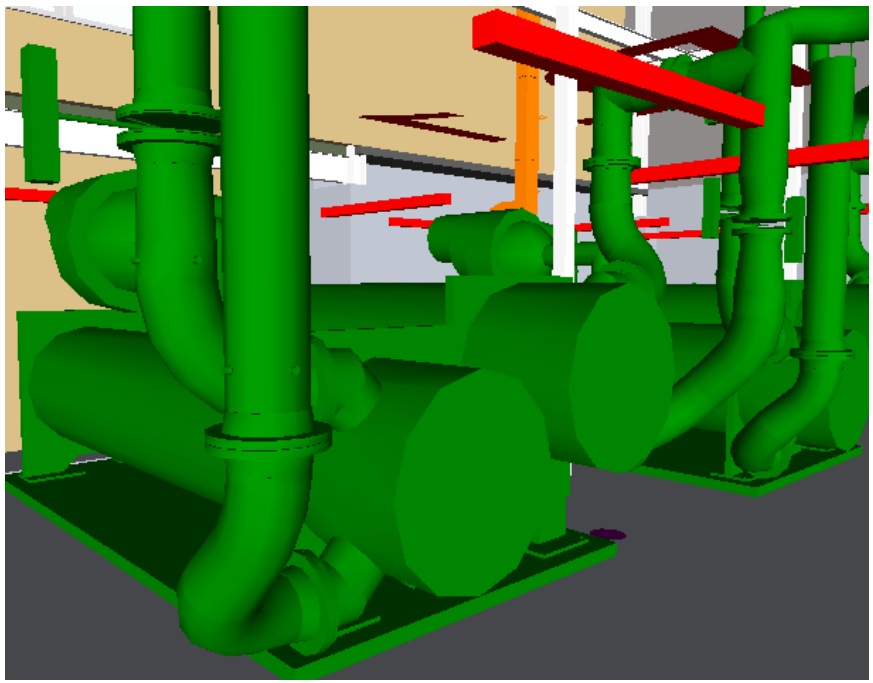
- Virtual Constructability Review
- Trade Collision Prevention
- Coordination Drawings are Shop Drawings
- RFI Reduction
- As Built Model



CONSTRUCTION

BENEFITS

- Less Re-Work
- Installation Time Reduction
- Waste Reduction



POST-CONSTRUCTION

TRADITIONAL

INTEGRATED

POST-CONSTRUCTION

- Future Use and Ownership
- Product vs. Instrument of Service
- Certifications

WHAT’S NEXT?

QUESTIONS?

CLYMER CEASE, AIA, LEED AP / PRINCIPAL / **PEARCE BRINKLEY CEASE + LEE ARCHITECTURE**
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SHANN RUSHING, AIA / ASSOCIATE / **PEARCE BRINKLEY CEASE + LEE ARCHITECTURE**
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