Conceptual approach for

Integrated Project Delivery (IPD)
& Building Information Modeling (BIM)
Traditional Processes

**Design Bid Build:** contracts separately Traditional processes

**Design-Bid**-traditional approach – owner with all parties. Occasionally referred to as Design-Bid-ReDesign-ReBid-Build.

**Design-Build:** One entity performs both architectural/engineering design and construction under one contract. Either an architect-led or contractor-led approach.

**CM-at Risk, or GMP:** Construction Manager is a consultant to the owner during design phases, and acts as general contractor during construction with a commitment to deliver the project within a guaranteed maximum price.

**Turnkey Project Delivery:** frequently used in power plants, manufacturing facilities, a method to provide an owner with a complete facility, ready to operate and turn out product.
Design- Bid- Build

Most common form of Project Delivery

• Three phases, three prime players

• Independent contracts between architect/owner and contractor/owner

• Linear sequence of work

• Common with public owners with **requirements** to select low bid
Design- Bid- Build

pros
• Common and familiar
• Linear process
• Design complete prior to construction
  • i.e., fully-defined scope
• Clear roles assigned to each party
• Competition leads to lowest price
• Both design and construction teams accountable to Owner

cons
• Relatively lengthy process – longer schedule
• Price not known until bids received – may lead to redesign and rebidding if budget exceeded
• Lowest price ("first cost") does not necessarily produce lowest final cost or best quality
• Change orders and delay claims are more likely
• No design phase input from Contractor
Design-Build

- One entity hired by Owner to complete design and construction
- May all be Contractor's in-house design expertise or Contractor may engage outside Architect
- Early cost commitment is made (GMP) by Contractor based upon preliminary design
Design-Build

**pros**
- Single point of accountability for design and construction
- Selection flexibility — qualifications based
- Team Concept — contractor assists with planning and budget during design phase
- Enables fast-track delivery — construction begins before design is complete
- Early GMP reduces Owner concern with cost overruns

**cons**
- Architect is not under separate contract w/Owner. Who is watching out for Owner?
- Owner selects a team rather than the best architect and best builder
- Design is completed after GMP is given, making change more difficult and costly
- Potential for compromises in quality to meet budget
Problems inherent in traditional processes

• Inability to fully coordinate the project

• Good ideas are held back, and enter the project too late (Re-Design as part of the “Value Engineering” process)

• Assumes that cheaper is better

• Owner is at risk to the contractor for design errors

• Transactional contracting limits cooperation and innovation (by creating an adversarial team structure)
Waste in the construction is, at a minimum, a **399 Billion dollar** annually.
What can a project team do to eliminate waste & build better buildings?

1. Use better tools:
   - **BIM** improves communication within a project team, by simulating to a higher degree project design and construction

2. Lean Construction :
   - Maximize value and to reduce waste at the project delivery level.
   - Improving total project performance
   - No trade-off between time, cost, and quality

3. Integrated Project Delivery:
   (Continue in next page)
What is a Building Information Model (BIM)?

- A set of information and work collaboration tools
- A shared database of information
- A 3D CAD model with added information
- A use of 3D geometry models coupled with analysis and simulation tools to prototype the building on the computer—to simulate the building, its performance, and its construction before breaking ground.
WHO IS USING BIM AND WHAT TOOLS ARE THEY USING?

ARCHITECTS
MECHANICAL ENGINEERS
STRUCTURAL ENGINEERS
CONTRACTORS
FABRICATORS
OWNERS

- Revit
- RAM Steel
- Innovaya
- MagiCAD
- FINEhvac
- ArchiCAD
- Solibri Model Checker
- CATIA
- Green Building Studio
- Bentley Architecture
- Revit Structure
- VectorWorks Architect
- Digital Project
- AutoCAD 3D
- Ecotect
- Constructor
- Tekla Structures
- Timberline
- RAM Steel – Bentley
- ABS
- AutoCAD MEP
- VICO
- Revit MEP
- CADPipe
- FINEhvac
- IES
- Innovaya
- Energy Plus (DOE-2)
- NavisWorks
- Autodesk Design Review
What does “Integrated” mean to a building project?

“Integrated practice is a holistic approach to building in which all project stakeholders and participants work in highly collaborative relationships throughout the complete facility life cycle to achieve effective and efficient buildings.”

George Elvin, AIA “Integrated Practice in Architecture”
<table>
<thead>
<tr>
<th>Traditional (Today)</th>
<th>Integrated Project Delivery (Tomorrow)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Fragmented, assembled on “just-as-needed” or “minimum necessary” basis, strongly hierarchical, controlled</td>
<td>TEAMS</td>
<td>An integrated team entity composed of all project lifecycle stakeholders, assembled early in the process, open, collaborative</td>
</tr>
<tr>
<td>Linear, distinct, segregated; knowledge gathered “just-as-needed”; information hoarded</td>
<td>PROCESS</td>
<td>Concurrent, multi-level, integrated; early contributions of knowledge and expertise; information openly shared</td>
</tr>
<tr>
<td>Individually managed, transferred to the greatest extent possible</td>
<td>RISK</td>
<td>Collectively managed, appropriately shared</td>
</tr>
<tr>
<td>Individually pursued; minimum effort for maximum return; (usually) first-cost based</td>
<td>COMPENSATION REWARD</td>
<td>Team success tied to project success; value-based</td>
</tr>
<tr>
<td>Paper-based, 2 dimensional; analog</td>
<td>COMMUNICATIONS TECHNOLOGY</td>
<td>Digitally based, virtual, 4 dimensional; BIM</td>
</tr>
<tr>
<td>Minimum effort for maximum return; minimize or transfer risk; don’t share</td>
<td>AGREEMENTS</td>
<td>Encourage, foster, promote and support open sharing and collaboration, full integration</td>
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<tr>
<td>Individually focused, emphasis on composition</td>
<td>EDUCATION</td>
<td>Team-based, integrated, collaborative; technologically inclusive; materials and methods focus in addition to composition</td>
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</tbody>
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It's about Productivity

- Owner Leadership
- Integrated Project Structure
- Open Information Sharing
- Virtual Building Models

Legend:
1. Ability to impact cost and functional capabilities
2. Cost of design changes
3. Traditional design process
4. Preferred design process

PD: Pre-design
SD: Schematic design
DD: Design development
CD: Construction documentation
PR: Procurement
CA: Construction Administration
OP: Operation

Graphic originated by Patrick McLeay, AIA / HOK
IPD – a process evolution

Traditional

Integrated

Image: AIA California Council
More information:

AIA IPD guide: [http://www.aia.org/contractdocs/AlAS077630](http://www.aia.org/contractdocs/AlAS077630)

AIA Integrated Practice Website: [http://aia.org/ip.default](http://aia.org/ip.default)


Thank you!!!!