Integrated Digital Delivery
What is IDD?

Digital Design

Digital Manufacturing & Fabrication

Digital Construction

Digital Asset Delivery & Management

Conclusion
What is IDD?

**Outcomes**
To achieve timely, cost effective, productive and high quality project delivery – design, manufacturing, fabrication, construction and asset delivery

**Technological Solutions**
By developing and adopting BIM/VDC and other digital solutions to convey relevant, accurate, and timely digital information

**Collaboration (people + platform)**
Through collaborative working approaches & integrated platforms
Collaborative and coordinated design via BIM/VDC and other computational tools to achieve design objectives and ease and optimize downstream manufacturing, fabrication, construction and maintenance.
Rule-Based Design

- Parametricism
- Computational Design
- Generative Design

https://www.youtube.com/watch?v=Fe64EMAfY3c
Use of Intelligent Objects

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<td>Wall Closure</td>
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<tr>
<td>Show : Handling Space in Plan</td>
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<td>Show Interference Exclusions</td>
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<td>Materials and Finishes</td>
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<td>Door - Frame / Mullion</td>
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**ARCHICAD 20 Template (v20.2)**
- ARCHICAD 20 Template Guide
- ARCHICAD 21 Template (v21.1)
- ARCHICAD 21 Template Guide
- ARCHICAD 22 Template (v22.1)
- ARCHICAD 22 Template Guide (r1)

**Revit 2016 (NEW)**
- ARCHICAD 21 Template
- ARCHICAD 21 Template Guide
- ARCHICAD 22 Template
- ARCHICAD 22 Template Guide

**Bentley AECOSim v8i**
- Bentley AECOSim v8i Template

**Tekla Structures v18**
- Tekla Structures v18 Template

**ARCHICAD 21 MEP Template**
- Revit MEP Template v2010
- Revit MEP Template v2011
- Revit MEP Template v2012
- Revit MEP Template v2013
- Bentley AECOSim V8i MEP Template
**Automate Quality Checks**

**STANDARDS**
Check model conformance with pre-established project standards and guidelines

**STANDARDS CHECK**
- File naming, object naming, and view naming convention
- Templates, line weights, etc.
- Browser organization
- System colours

**CONTENT**
Check suitability of model information for its intended use

**CONTENT CHECK**
- Completeness of modelled objects
- Correct modelling technique
- Complete and correct core information
- Drawings, schedules, and views from BIM model

**CONTROL ELEMENTS**
Check alignment and adherence of control elements across all models

**CONTROL ELEMENTS CHECK**
- Origin point
- Orientation
- Setting out
- Grids
- Levels

**FILE WORKABILITY**
Check suitability of model for model sharing

**FILE WORKABILITY**
- Model in agreed format and version
- Detached from central file
- Model has been purged
- Unnecessary link have been removed
- Extraneous sheets, views, legends, and schedules removed
- Optimized file size

**INTRA-DISCIPLINE GENERAL MODEL QUALITY**
Check general model quality within each discipline model.

**INTRA-DISCIPLINE GENERAL MODEL QUALITY CHECK**
- Modelled using correct objects
- No significant overlapping of objects
- No duplication of objects
- No floating or misplaced objects
- Objects are defined by storey*

*May be more suitable during towards design detailing or construction phase, where defining by storey is required for planning. Also this may not be applicable to building elements such as full height facade, walls, or columns.

**INTER-DISCIPLINE COORDINATION**
Check coordination between disciplines.

**INTER-DISCIPLINE COORDINATION CHECK**
- Geometric hard clashes
- Soft or installation and maintenance clearance issues
- Alignment and consistency between trades
Automated Code Compliance Checker

- Solibri
- Visicon
- iConstruct
Computational Fluid Dynamics (CFD) Simulations

- Energy
- Solar
- Wind
- Pedestrian
Virtual Reality

- Enscape3D
- InsiteVR
- LumenRT VR
- Revit Live
- Eyecad VR
- Iris VR

https://www.youtube.com/watch?time_continue=11&v=X1phaYMWqtw
Collaboration Platforms

- Autodesk BIM 360 Design
- GRAPHISOFT BIMcloud
- Bentley ProjectWise
Integration of BIM/VDC design to off-site production, fabrication and component management through automation, robotics optimization.
Manufacturing & Fabrication Process

- BIM to Shop Floor (e.g. using mobile device)
- Robotics installation
- Quality Control
- Storing & Tagging (e.g. using RFID linked To BIM elements)
- Delivery (e.g. Fleet Tracking)
- Production Management System (e.g. from BIM to machinery)
- Fabrication Model Creation (e.g. Detailing & BBS)
Prefabricated Kitchen Units (PKU)

Prefabricated Bathroom Units (PBU)

Prefabricated Pre-Finished Volumetric Construction (PPVC)

Integrated Prefabricated M&E (Horizontal / Vertical)

Precast Elements (Structural / Architectural)

Cross Laminate Timber (CLT)
PUMP SKIDS
Smaller pump arrays (chemical dosage etc) can be pre-assembled and factory tested before delivery

PRE-ASSEMBLED DUCTS
Foul air, ACMV ductworks can be supplied as spooled assemblies to minimize jointing on-site

INSTRUMENT PANELS
Pre-assembled wherever applicable (example: water panel for OCF)
Entrance Canopy

- ETFE Roof
- Steel Structure
- Design
DfMA

Entrance Canopy

RHINO
DESIGN

REVIT
COORDINATION

TEKLA
DETAIL

STEEL FRAMING

25mm

5mm

ETFE ROOF
1. Rhino BIM

2. Revit

3. Tekla

4. CNC & Robotic Welding

CNC Machining stands for Computer Numerical Control. CNC Machining is a process used in the manufacturing sector that involves the automated use of computers to control machine tools.
5. On-site Assembly
Import Revit Model to Tekla

Rebar Modelling in Tekla

A. Procurement
B. CNC Fabrication
C. Payment Claim

Tekla Rebar Fabrication
Integration of BIM/VDC design and off-site manufacturing / fabrication to delivery and installation on-site through use of real-time ICT solutions, as part of project management and Lean construction.
Online monitoring of Facial recognition biometric system

- Daily headcount and name list of personnel
- Productivity
- Emergency roll call
- Control of access of:
  - Unauthorised personnel (not enrolled to biometric system);
  - Debarred person from Project Site;
  - Worker with expired WP
Equipment & Material Tracking
Drone for Aerial Site Safety Inspection

Licensed UAV pilot to conduct aerial safety inspection using drone for all project sites.

**Monitoring:** UAV can be deployed to send video footage of site conditions to construction management faster and more efficiently than can on-the-ground personnel.

**Inspection:** UAV detection of hazardous conditions, materials and dangerous structures can aid in construction site hazard identification without placing a worker at risk.
Drone for Progress Monitoring
Drone for Progress Monitoring
Virtual Reality

- InsiteVR
- VRcollab
- Revit Live
- LumenRT
- Iris VR
Design for Safety
Safety Management System

PTW and Safety Inspection
Collaboration Platform

Drawing Management

Document Management

Model Sharing

Digital Collaboration
BIM to Field

3D Model & Approved Drawings

Digital Collaboration

BIM to Field
BIM to Field
Verification and handing over of the asset for operations and maintenance through effective use of digital tools.
Quality Management System

Example: Façade Glass Distortion Check

Traditional QA/QC Check

Machine QA/QC Check
Asset Data

Asset Data is input into the Model

Asset Data is export in COBie Format

Asset Data to be imported into the CMMS

CMMS – Computerised Maintenance Management System
As-Built Laser Scanning
BIM Essential Guides

The BIM Essential Guide Series provides references on good BIM practices in an illustrated, easy-to-read format, and are targeted at new BIM users in Singapore. It also includes BIM implementation documents by our Trade Associations and Chambers (TACs).

- BIM Essential Guide for Adoption in Organization
- BIM Essential Guide for Execution Plan
- BIM Essential Guide for Architectural Consultants
- BIM Essential Guide for Collaborative Virtual Design and Construction
- BIM for DFA (Design for Manufacturing and Assembly) Essential Guide
- BIM Guide for Asset Information Delivery
- Industry Leaders Quick Start Guide to IDD
- BIM Essential Guide for C & S Consultants
- BIM Essential Guide for MEP Consultants
- BIM Essential Guide for Contractors
- BIM Essential Guide for Building Performance Analysis
- BIM Essential Guide for Land Surveyors
- Standard and Specifications for 3D Topographic Surveying (Mapping) in Singapore
- SS3VQS BAR (Quantity Surveying BIM Attribute Requirements)
- Excel
Thank You