VINCI CONSTRUCTION | GRANDS PROJETS

BIM BOOK
2016

Editorial

Performance is a fundamental value of the Group; accordingly, VINCI Construction Grands Projets is committed to using innovative techniques and solutions on the leading edge of technology. VINCI Construction Grands Projets provides both clients and partners with tools and methods that are designed to optimise projects throughout their life cycle.

By adopting the BIM (Building Information Modelling) methodology, VINCI Construction Grands Projets reasserts its pledge to use innovative approaches to implement projects and control costs more effectively – through the optimisation of design, construction, safety, and maintenance.

VINCI Construction Grands Projets has deployed BIM and demonstrated its effectiveness in delivering advanced and even ambitious use cases (BIM combined with operations and maintenance software solutions) in various building and infrastructure projects, including airports in Tajikistan (Dushanbe), Cambodia (Phnom Penh, Siem Reap), and Chile (Santiago), the Mandarin Oriental Hotel in London, the National Research Oncology Center in Astana, Kazakhstan, and major infrastructure projects such as Thames Tideway Tunnel in UK, Atlantic Bridge in Panama, and, Doha metro and Lusail Light Rail Transit both in Qatar.

VINCI Construction Grands Projets was awarded the 2016 BIM d'Or in the International category for the Mandarin Oriental Hotel project in London.

VINCI Construction Grands Projets
winner in the International Category
2016

For the third year in a row, Groupe Moniteur organised BIM d'Or, an event that rewards the best BIM and digital modeling initiatives by French companies. After being listed, our project to renovate the five-star Mandarin Oriental Hotel in London was awarded a prize at the ceremony held on September 19.

In this complex project – prestigious establishment with stringent requirements, heritage building with an intricate layout and structure, work on a busy site, and other challenges – BIM deployment facilitates technical validation,enabled painstaking and comprehensive spatial coordination, and as a result, reduces uncertainty during the construction.

Table of contents

What is BIM ?

BIM

Building Information Modeling

DEFINITION

« […] The **creation**, **distribution** and **re-use** of well-structured Building **digital project data**, based on Open Standards for Industry, (including Client and Project Standards) to support **each stage** of a **project life-cycle** »

WHAT IS BIM ?

A **digital model**, created at the start of the project and used by project stakeholders

➔ Linked to a **database**

➔ On a **collaborative platform** which allows each user access to BIM data with his own tools / software

> BIM is the **unique source of information** used by the stakeholders involved in the project

BIM LIFECYCLE

DESIGN
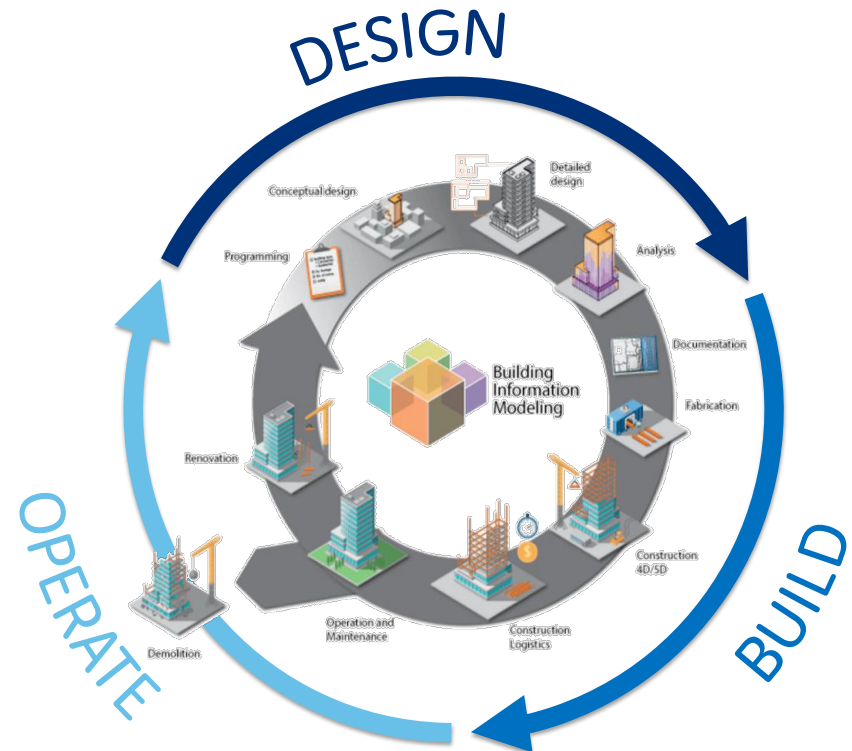
OPERATE

BUILD

Use of BIM goes beyond the **planning** and **design phase** of the project, extending throughout the building life cycle, supporting processes including **cost management**, **construction management**, **project management** and **facility operation**.

A few BIM aspects

BIM MANAGEMENT

The **BIM Management team** is **integrated** in the Project Team
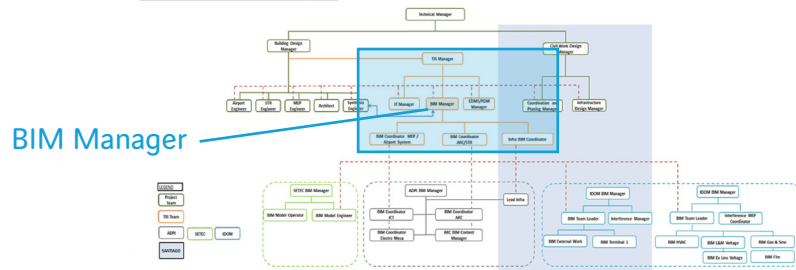
BIM Manager

➔ **Organization** of BIM processes
➔ Project **coordination**
➔ **Training** of stakeholders
➔ BIM production **Management** including QA/QC

LOD (LEVEL OF DEVELOPMENT)

Level of Development

=

Level of Details

+
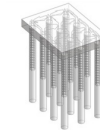
Level of Information

Asset Type Manufacturer ModelNumber

Asset Type Manufacturer ModelNumber

The **«level of details»** is the description of **graphical** content of models at each of the stages defined.
The **«level of information»** is the description of **non-graphical** content of models at each of the stages defined.
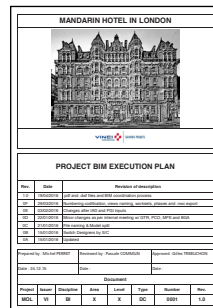
BIM EXECUTION PLAN

The BIM Execution Plan (BEP) is a document created in order to successfully implement BIM on a project. It defines :

According to the PAS 1192-2 (UK) §7.2 :
· Management and Organization
· Planning and Documentation
· Standard methods and procedures for modeling
· IT Solution

Plus, according to our experience :
· Task Information Delivery Plan (TIPD)
· BIM objectives and related process

The BEP is created at the stard of the project and will be continuously updated.

INTEROPERABILITY

These systems can be connected together as they share **Common Data** and API. The **connection** could be done via an **Integration platform** which allows **interoperability** between BIM, EDMS (*Electronic Data Management System*), CMMS (*Computerized Maintenance Management System*) and GIS (*Geographical Information System*).

BIM uses

Design Authoring
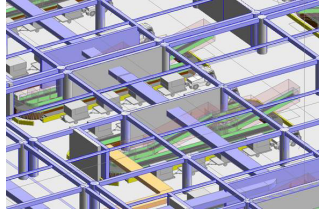
Existing conditions modeling
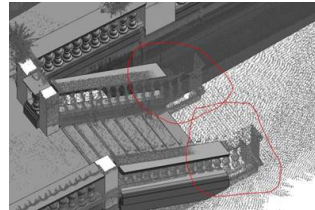
On-Site Training
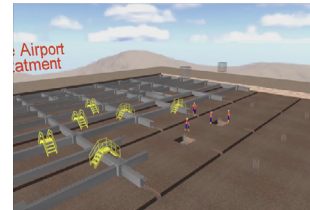
Site Management

Design Review
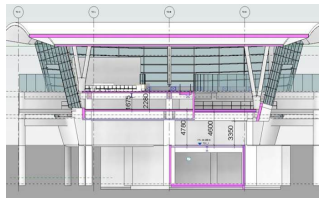
3D Coordination
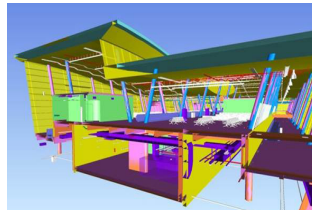
As-Built conditions modeling
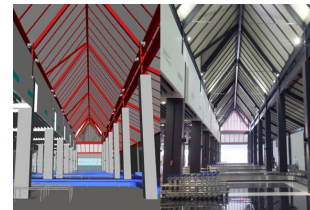
Link to Facility Management
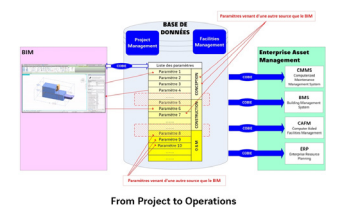
2D Drawings Production
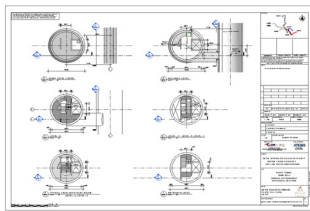
Schedule Production & Information take-off

Rendered visuals

Animation movies

Issue Tracking
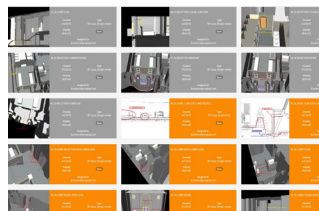
4D Simulation
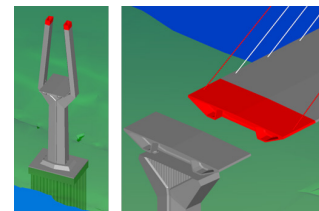
Immersion

3D Printing

BIM projects map

THAMES TIDEWAY TUNNEL, LONDON, UK

MANDARIN ORIENTAL HOTEL, LONDON, UK

SILVER FOREST VILLA, MOSCOW, RUSSIA

JOUKOVKA VILLA, MOSCOW, RUSSIA

NATIONAL RESEARCH ONCOLOGY CENTER, ASTANA, KAZAKHSTAN

INTERNATIONAL AIRPORT, DUSHANBE, KAZAKHSTAN

TRINITY TOWER, PARIS, FRANCE

INTERNATIONAL AIRPORT, SIEM REAP, CAMBODIA

EOLE – LA DEFENSE STATION, PARIS, FRANCE

INTERNATIONAL AIRPORT, PHNOM PENH, CAMBODIA

DOMESTIC AIRPORT, PHNOM PENH, CAMBODIA

ATLANTIC BRIDGE, GATUN, PANAMA

INTERNATIONAL AIRPORT, SANTIAGO, CHILE

RED LINE SOUTH METRO, DOHA, QATAR

TRANSFER PACKAGES CP01, LUSAIL, QATAR

LUSAIL LIGHT RAIL TRANSIT, LUSAIL, QATAR

KING'S HARBOUR RESORT, SIHANOUKVILLE, CAMBODIA

National Research Oncology Center
Astana, Kazakhstan | 2016 - 2018

PROJECT DESCRIPTION

This design-build project involves the "turn-key" construction of a cancer research center, with a total surface area of 60,000 m² in the city of Astana in Kazakhstan. The client, the Nazarbayev University, wants to develop this research center to promote scientific research for state-of-the-art cancer services and treatments that would place Kazahkstan on the forefront of cancer research. This project must comply with the latest international design-build standards in the field of healthcare institutions for cancer research and treatments.

HIGHLIGHTS

Project
- **€195 M**
- **13 months** of design
- **36 months** of execution
- Involvement : **100%**
- Client : Nazarbayev University

Key figures
- **60 000 m²**
- **1** hospital
- **1** healthcare center
- **1** research center
- **1** hotel complex

BIM KEYWORDS

Design Review	4D simulation
3D coordination	QTO
2D drawings production	

PROJECT BIM FEATURES

- Studies conducted 100% in BIM

- BIM models development including all trades, execution level (LOD 300)

- Design Review

- 3D coordination directly based on the BIM models produced

- 2D drawings extracted from the BIM models (in English and in Russian)

- Quantity take-off (QTO) based on the SMETA classification (Kazak normative document)

- BIM models used to present the project to the client, facilitate communication and obtain validations

- 4D animations to facilitate the work sequences understanding

BIM CHALLENGES

FULL BIM - MULTICULTURAL TEAM - ADAPTATION TO THE LOCAL STANDARDS SYSTEM - COMMUNICATION

➔ Conduct all trades studies in BIM while taking into account the BIM maturity of the different stakeholders and their distribution world-wide

➔ Extract quantities (QTO) in a specific format to meet the Kazakhstan standard requirement (SMETA)

➔ Provide the client with an effective communication tool

King's Harbour Resort
Sihanoukville, Cambodia | 2016 - 2018

PROJECT DESCRIPTION

This design-build project involves the development of a major hotel complex in Sihanoukville, located in the south-western coast of Cambodia, which is experiencing a significant tourist growth. The contract includes the construction of three hotels with over 800 rooms, including 100 five-star rooms. The construction of an entertainment center along with Immigration offices within the same complex is also expected, as is the set-up of outdoor spaces with a total surface area of around 90,000 m².

HIGHLIGHTS

Project
- **€110 M**
- **30 months** of execution
- Involvement : **100%**
- Client : JSM Indochina Limited

Key figures
- **90,000 m²**
- **3** hotels
- **800** rooms

BIM KEYWORDS

Design Review	4D simulation
3D coordination	QTO
2D drawings production	

PROJECT BIM FEATURES

- Studies conducted 100% in BIM

- BIM models development including all trades (LOD 300)

- Design Review

- 3D coordination directly based on the BIM models produced

- 2D drawings extracted from the BIM models

- Quantity take-off (QTO) for cost estimation purposes

- 4D animations to effectively set up the work breakdown structure and show on-site sequencing to better the client understanding of operations

BIM CHALLENGES

FULL BIM - CLIENT COMMUNICATION - COST ESTIMATION

➡ Conduct studies 100% in BIM as of project startup

➡ Define and organise many BIM uses (Design Review, 3D coordination, 4D, QTO)

➡ Monitor cost evolution with project modifications with a quick, reliable and flexible process

➡ Master the study process despite the complexity and size of the project

➡ Provide an effective communication tool to work with the client and obtain validations

EOLE - CNIT La Défense Train Station
Paris, France | 2016 - 2021
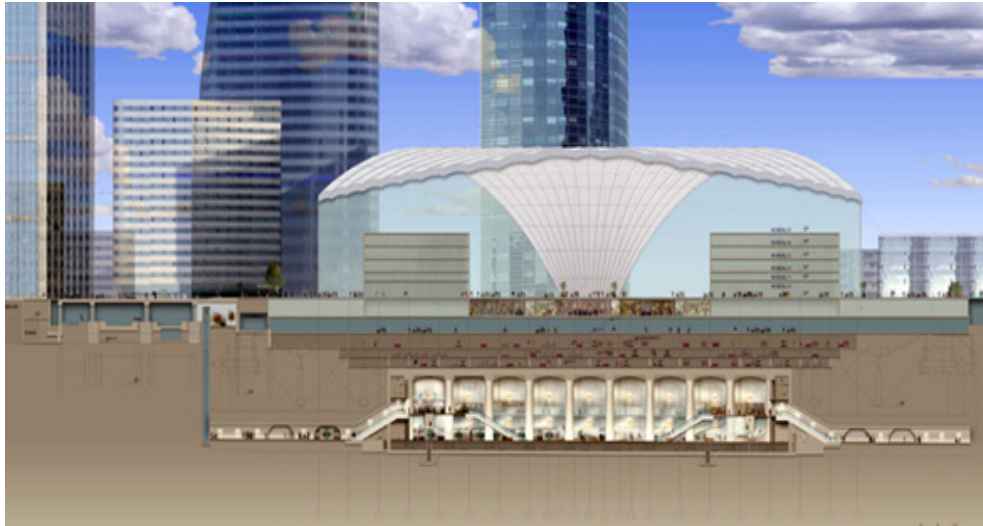
PROJECT DESCRIPTION

This operation involves creating a new train station at La Défense under the CNIT dome for the EOLE line. This highly technical project involves building an underground cathedral, while supporting the existing structures and keeping the site up and running. The CNIT offices, businesses and hotel will therefore continue to operate during the work. In addition to the work to be done throught the underpinning of the CNIT, there will also be a kilometre of tunnels, a 40-meter deep and 15-meter diameter shaft, and several underground pedestrian corridors built, in particular the connection between RER E and A, the L and U lines for the Transilien and Tramway T2.

HIGHLIGHTS

Project
- **€446 M**
- **61 months** of execution
- Involvement : **14%**
- Client : SNCF Réseau

Key figures
- **1 km** tunnel
- **140 m** deep shaft
- **350,000 m²** of backfill

BIM KEYWORDS

Design Review	2D drawings production
3D coordination	4D simulation

PROJECT BIM FEATURES

- Execution studies conducted 100% in BIM
- BIM models development including all trades, execution level (LOD 300/350)
- Design Review
- 3D coordination directly based on the BIM models produced
- 2D execution drawings extracted from the coordinated BIM models
- 4D animations to effectively set up the work breakdown structure and show on-site sequencing to better the client understanding of operations

BIM CHALLENGES

INFRASTRUCTURE MODELING - PROJECT COMPLEXITY - INTERFACE MANAGEMENT

➔ Define the most appropriate tools for modeling an infrastructure project for which the methods and standards have currently no national definition

➔ Master the project complexity and interfaces between the different trades and existing structures by leveraging the advantages provided by the 3D coordination process which allows the integration of all trades along with a semi-automatic management of openings, thus facilitating the clash-detection process

Mandarin Oriental Hotel
London, United Kingdom | 2016 - 2018

BIM D'OR

BIM KEYWORDS

3D scanning process	3D Coordination	QTO
Modeling of existing structures	Issue Tracking	Visuals - Images
Design Review	2D drawings production	As-Built Models

PROJECT BIM FEATURES

- Survey of the existing structures using 3D laser scanning process

- Studies conducted 100% in BIM

- Design Review

- 3D coordination (clash detection using NAVISWORKS) directly base on the BIM models produced

- Monitoring and digital management of issues (BIMTrack)

- 2D execution drawings extracted from the BIM models

- Quantity Take-Off (QTO)

- To come: As-Built BIM models, associated with a database to be subsequenty linked with Facility Management (option to be confirmed by the client)

PROJECT DESCRIPTION

This design-build project consists of renovating the Mandarin Oriental Hotel***** in London, which comprises a basement, two main floors, eight floors on the Hyde Park side, and nine floors on the Knightsbridge side. The renovation work relates to all rooms, the creation of a ninth floor with two new suites, for a total of 134 rooms and 34 suites, as well as renovation work for architectural and technical trades in all zones concerned. The operation will be carried out without interrupting hotel activities, which will mean an additional, but fundamental constraint.

HIGHLIGHTS

Project
- **£58 M**
- **19 months** of execution
- Involvement : **50%**
- Client : Mandarin Oriental Hotel Group

Key figures
- **12 600 m²**
- **134** rooms and **34** suites
- Winner of the **BIM d'Or 2016** Competition (International Category)

BIM CHALLENGES

FULL BIM IN THE EXE PHASE - VERY HIGH ACCURACY REQUIREMENTS IN ORDER TO REDUCE ON-SITE CONTINGENCIES

➜ Conduct all trades studies in BIM while taking into account the distribution throughout Europe of the different stakeholders

➜ Reduce the inherent risks for the renovation using:
  ➜ BIM model production following surveys of the existing structures done by 3D scanning process
  ➜ Efficient 3D coordination process by using BIM models

➜ Optimize purchases and supplies by using QTO

➜ Provide clients with structured As-Built models to be linked with O&M software

International Airport
Santiago, Chile | 2015 - 2020

PROJECT DESCRIPTION

Design-build project consisting in the construction of a new international terminal and renovation of the existing infrastructures of the Santiago International Airport in Chile, thus bringing the capacity of the airport to 30 million passengers per year between now and 2020 (current capacity is 15 million). The projects stands out with its size and the complexity of its phasing as it includes extending and renovating 60,000 m² of the existing terminal, building the new international terminal of 217,000 m², two covered parking building of 90,000 m², as well as major airport platform work (500,000 m²), streets, surface parking, various networks (380,000 m²) and 14,000 m² of auxiliary buildings (police stations, power stations, etc.).

HIGHLIGHTS

Project
- **€783 M**
- **14 months** of design
- **48 months** of execution
- Involvement : **50%**
- Granter : Public Works Department

Key figures
- New terminal: **217,000 m²**
- Existing renovation terminal: **60,000 m²**
- Airport platforms: **500,000 m²**
- Streets and parking: **380,000 m²**
- Concession: Nuevo Pudahel

BIM KEYWORDS

3D scanning	2D drawings production	BIM on site with tablet
Existing conditions modeling	4D simulation	As-Built models
Design Review	3D methods	COBie Extraction
3D coordination	QTO	Link with Facility Management

PROJECT BIM FEATURES

- Surveying existing conditions using 3D laser scanning process
- Carrying out design studies directly in BIM by developing BIM models of all trades
- Design Review
- 3D coordination directly based on the BIM models produced
- 2D drawings extracted from BIM models
- 4D animations for the client in order to validate the construction sequencing
- Implementation of collaborative tools (LASCOM and Trimble Connect) to exchange and manage a very large number of models to ensure reliability, flexibility and traceability of information flows
- Use of the Digital Site tool to be able to carry out site inspections using BIM support on table
- As-Built BIM models creation
- Extractions in COBie format to be linked with the client's O&M software (MAXIMO)

BIM CHALLENGES

FULL BIM - COMPLEX PROJECT - HIGH BIM CLIENT REQUIREMENTS - INTEROPERABILITY

→ Conduct studies 100% in BIM, since project start-up

→ Use many different BIM features (3D scan, Design Review, 3D and 4D coordination, QTO, COBie extraction, etc.)

→ Master the study process despite the complexity and size of the project

→ Master information flows with the help of collaborative platforms

→ Deliver to the client As-Built BIM models and information, interoperable with its O&M software (MAXIMO)

Trinity Tower
Paris La Défense, France | 2015 - 2018

3D scanning
Existing conditions modeling
Design Review
3D coordination

BIM KEYWORDS

3D scan	3D coordination	QTO
Existing conditions modelling	2D drawings production	Link with Facility Management
Design Review	4D simulation	

PROJECT BIM FEATURES

- Surveying existing conditions using 3D scans

- Execution studies 100% conducted in BIM

- BIM models development including all trades, execution level (LOD 300/350)

- 3D coordination directly based on the BIM models produced

- 2D execution drawings extracted from the BIM models

- 4D animations to facilitate the understanding and validation of the work sequences

- Quantity Take-Off (QTO)

- As Built BIM models creation, associated with a database that can be subsequently linked with Facility Management

PROJECT DESCRIPTION

The purpose of the Trinity Tower project is to develop in the cities of Courbevoie and Puteaux, in the Coupole-Regnault district at La Défense, a new high-rise building, including offices, businesses and services, with an innovative environmental and architectural overall design. The project represents a total surface area of 50,600 m² including 600 m² of additional businesses and services, which will be integrated into the area. The tower will overhang the Avenue de la Division-Leclerc, from the end of the tunnel at the ramps of A14 to the Boulevard Circulaire crossroad.

HIGHLIGHTS

Project
- **€173 M**
- **33 months** of execution
- Contract : **BATEG**
- BIM Support : **BIM Department**, VINCI Construction Grands Projets
- Client : SCI Trinity Défense

Key figures
- **50 000 m²**
- **3 500 m²** esplanade
- Nominated for the **BIM d'Or 2016**, Competition

BIM CHALLENGES

FULL BIM IN THE EXE PHASE - PROJECT COMPLEXITY - REDUCTION OF ON-SITE CONTINGENCIES - OPENINGS MANAGEMENT PROCESS

➔ Master project complexity in the execution phase via the following means:
  ➔ Modeling neighbouring parts based on 3D scan surveys
  ➔ Efficient 3D coordination process for all trades
  ➔ 4D animations to validate the work breakdown structure

➔ Develop an automatic integration process for openings in the BIM – STR, based on requests issued by different stakeholders

➔ Provide clients with structured As-Built models to be linked with O&M software

Joukovka Villa
Moscow, Russia
| 2015 - 2016

PROJECT DESCRIPTION

The Joukovka Villa project in Russia is a "turn-key" design-build of a two-storey villa with a surface area of approximately 1,650 m². The contract also involves building a guard's house (350 m²), garages and technical rooms, as well as landscaping of the park, which covers nearly 10,000 m².

HIGHLIGHTS

Project
- **€15 M**
- **24 months** of execution
- Involvement : **100%**
- Client : Mr. Tsveltkov

Key figures
- **2,000 m²**
- **10,000 m²** of land
- **5,000** moulded stones for façade

BIM KEYWORDS

2D drawings production	Visuals - Images
3D printing	Real-time rendering - Immersion

PROJECT BIM FEATURES

- Architectural BIM models development based on 2D drawings and program defined by the architect (Scope: envelope, part of the interior spaces and landscaped surroundings)

- Furnishings modeling

- Visual rendering production

- Real-time rendering creation based on all modeled items: architectural BIM model, 3D furnishings and landscaped surroundings

- Immersion setting for viewing the real-time visualizations (with HTC Vive)

- 3D colour printing, scaled 1/100 and based on the BIM model

BIM CHALLENGES

CLIENT COMMUNICATION - DECISION SUPPORT USING REAL-TIME IMMERSION - 3D PRINTING

➔ Create a BIM model that has a high level of detail (LOD 350-400) within a very short period

➔ Create immersive real-time visualizations

➔ Provide the client with a BIM model and real time visualizations so that the client can better understand the project, and therefore more easily and quickly validate it

➔ Set up proper and flexible exchange processes between BIM models and tools for computer graphics, visual renderings and 3D colour printing

Extension of the Domestic Terminal
Phnom Penh, Cambodia | 2016 - 2017

PROJECT DESCRIPTION

The project to extend the domestic terminal in Phnom Penh is part of the program to improve Cambodian airports, initiated by Cambodia Airports with the expansions of the international Phnom Penh and Siem Reap terminals. This project phase involves the renovation and extension of the current domestic flights terminal at the Phnom Penh Airport, which will have a total surface area of 11,500 m² over two floors. With the new enlarged areas and improved services, this new terminal will meet the current and future needs of passenger traffic and limit congestion at the international terminal.

HIGHLIGHTS

Project
- **$22,2 M**
- **18 months** of execution
- Involvement : **70%**
- Client : Cambodia Airports

Key figures
- **11,500 m²**
- **4,160 m²** of poured concrete
- **1,120 m²** of curtain wall façades

BIM KEYWORDS

Design Review	4D simulation	As-Built models
3D coordination	Real-time rendering	Link with Facility Management
2D drawings production		

PROJECT BIM FEATURES

- Execution studies carried out directly in BIM for the architecture and structure trades
- BIM models development including all trades, execution level (LOD 300-350)
- Design Review
- 3D coordination directly based on the BIM models produced
- 2D execution drawings extracted from BIM models
- 4D animations to facilitate the understanding of the work sequences
- Real-time rendering as a decision-making tool
- As-Built BIM Models creation, associated with a database that can be subsequently linked with Facility Management

BIM CHALLENGES

CLIENT COMMUNICATION - AIRPORT OPERATION MANAGEMENT - 4D - AS-BUILT BIM MODELS

➜ Conduct all trades studies in BIM

➜ Provide the client with BIM models allowing him to study and ensure the safety of the flow of travellers since the work is being done on occupied sites

➜ Study work phases to ensure continuity of operations at the existing airport terminals

➜ Provide the client with structured As-Built models to be linked with O&M Software

Thames Tideway Tunnel
London, United Kingdom | 2015 - 2022

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PROJECT DESCRIPTION

Design-build of two tunnel sections and the related hydraulic structures (5.5 km main tunnel and 4.6 km connection tunnel) in East London. Located at a depth of between 45 and 65 m, both tunnels will be dug using pressurized mud TBMs. The Thames Tideway program consists in building a storage and transfer system for sewage and rainwater in central London. It includes 25 km of tunnels for increasing the capacity of the existing network, intercepting sewage and rain water, sending them to treatment stations, thereby preventing discharge into the Thames. The East-C415 package is one of the three Thames Tideway Tunnel project packages. It will connect Chambers Wharf with the Abbey Mills pumping station, which connects to the Lee Tunnel in East London.

HIGHLIGHTS

Project
- **€821 M**
- **85 months** of execution
- Involvement: **40%**
- Client : Bazalgette Tunnel Limited

Key figures
- **615, 000 m³** of excavation
- **5** shafts (diam: 17 - 25m)
- **15.5 km** tunnel (diam: 7.2m)
- **14.6 km** tunnel (diam: 5.0m)

BIM KEYWORDS

3D scan	3D coordination	3D methods
Existing conditions modeling	2D drawings production	Visuals - Images
Design Review	4D simulation	As-Built model

PROJECT BIM FEATURES

- Survey of the existing conditions using 3D scanning process and to be incorporated in the BIM models
- Execution studies conducted directly in BIM
- Design approbation workflow integrated into the BIM platform (ProjectWise)
- Design Review

- 3D coordination directly on the BIM models produced
- 2D drawings production extracted from the BIM models
- 4D animations to develop and validate construction methods
- As-Built BIM Models creation

BIM CHALLENGES

FULL BIM EXE - 3D/4D COORDINATION - AS-BUILT BIM MODELS

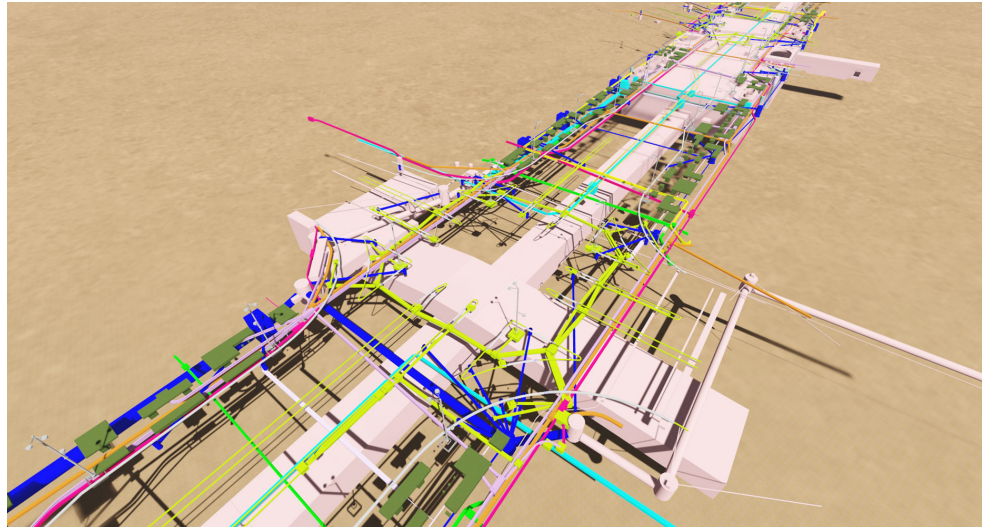➜ Conduct all trade execution studies directly in BIM

➜ Produce all 2D documentation from BIM models

➜ Master the project complexity and interfaces between the different trades and existing structures by leveraging the advantages provided by the 3D coordination process

➜ Create useful 4D sequences for the site by integrating temporary structures

➜ Provide the client with accurate As-Built BIM Models

Transfer Packages CP01

Lusail, Qatar | 2015 - 2017

BIM KEYWORDS

Existing conditions modeling	2D drawings production	QTO
Design Review	4D simulation	As-Built models
3D coordination		

PROJECT DESCRIPTION

Project CP01 is a design-build mandate for a 2.4-km roadway segment with a dual 3-lane configuration running alongside the Lusail LRT system in the Marina District north of Doha. Work includes underground networks, road signs, lighting, landscaping, and four 11-kV power substations. This initiative is part of the global Lusail project developed by Qatari Diar, which calls for the creation of the new city of Lusail, which will cover an area of 35 km² north of Doha and be home to 200,000 people.

PROJECT BIM FEATURES

- BIM models development including all trades, execution level (LOD 300-350) based on 2D drawings issued by the designers

- 3D coordination directly based on the BIM models produced

- 4D animations to track monthly work progress

- Quantity Take-Off (QTO)

- As-built BIM models creation

HIGHLIGHTS

Project
- **€78 M**
- **22 months** of execution
- Involvement : **49%**
- Client: Lusail Rail Estate Development Company

Key figures
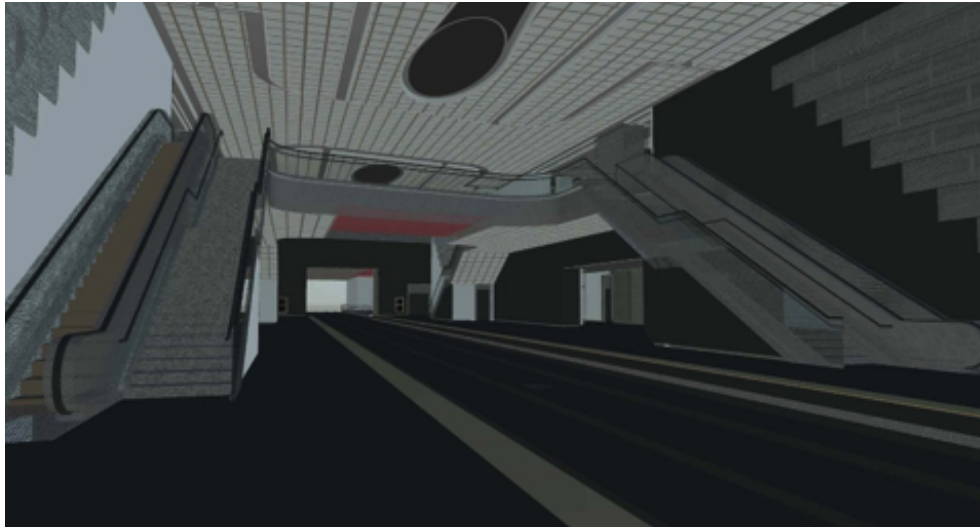- **2.4 km** of roadway
- **4** substations

BIM CHALLENGES

FULL BIM IN THE EXE PHASE / 3D COORDINATION / 4D TRACKING

➔ Ensure seamless design and coordination thanks to BIM models

➔ Satisfy client requirements in terms of 4D visualisation for monthly tracking of project progress

Light Rail Transit 2C2 & 2C3
Lusail, QATAR | 2013 - 2018

PROJECT DESCRIPTION

Construction of tunnels for the Light Rail Transit system, including underground station structures, was carried out in multiple phases. The final phases are phases 2C2 and 2C3, which encompass all remaining works to ensure delivery of a turn-key project. The contract includes construction of 37 stations and a depot, architectural and electrical and mechanical lots, integrated project management, and delivery by Alstom of 35 railcars equipped with catenary-free technology along with track-laying, power supply, and train control and communication systems.

HIGHLIGHTS

Project
- **€2,100 M**
- **65 months** of execution
- Involvement: **44.92%**
- Client : Qatar Rail Company

Key figures
- **4** tramway operating lines
- **10** underground + **26** at grade stations
- **7.4 km** underground **+ 22 km** at-grade
- **1** viaduct + station over Al Khor Highway
- **1** depot, operation & maintenance workshop

BIM KEYWORDS

3D coordination

2D drawings production

PROJECT BIM FEATURES

- Survey of the existing conditions using 3D scanning process and to be incorporated in the BIM models

- BIM models for all construction works using 2D plans established by the designers

- 3D coordination directly based on the BIM models produced

- 2D execution drawings extracted from the coordinated BIM models

It is worth noting that the client's recent request for production of an as-built model for all infrastructure for the purposes of linking with Facility Management system developed using MAXIMO, in combination with spatial geolocation for the project as a whole, is under review.

BIM CHALLENGES

3D COORDINATION

➔ Ensure seamless design and coordination thanks to BIM models

Phnom Penh and Siem Reap Airports
Cambodia | 2013 - 2016

PROJECT DESCRIPTION

The international Siem Reap and Phnom Penh airports serve the two main economic and tourist regions of Cambodia, and play an active role in the development and visibility of the Kingdom of Cambodia. Doubling the total surface area of the terminals will allow to handle up to five million passengers per year. The design-build contract includes the extension and renovation work of the passenger terminal in Siem Reap on one level (26,000 m²) and the terminal in Phnom Penh on two levels (31,000 m²).

HIGHLIGHTS

Project
- **$82 M**
- **26 months** of execution
- Involvement : **70%**
- Client: Cambodia Airports

Key figures
- **57 000 m²**
- **13,800 m²** of poured concrete
- **1,900 T** of steel framework

BIM KEYWORDS

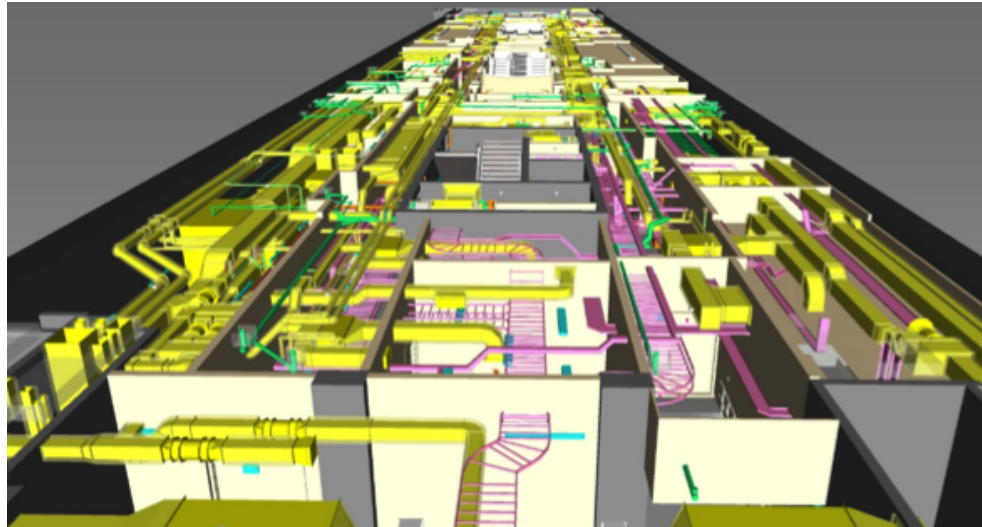|		
Design Review	4D simulation	As-Built models
3D coordination	Visuals - Images/Films	Link with Facility Management
2D drawings production	Real time rendering	

PROJECT BIM FEATURES

- [Phnom Penh] BIM models development from 2D drawings (except for structure studies that were carried out 100% in BIM)
- [Siem Reap] Studies conducted 100% in BIM, with direct creation of BIM models right from the design stage
- Design Review
- 2D drawings production extracted from the BIM models
- 3D coordination directly based on the BIM models produced
- 4D simulation of details of the structure, walls and roofing
- Visual rendering production
- BIM As-Built models creation, associated with a database, that can be subsequently linked with facility management

BIM CHALLENGES

CLIENT COMMUNICATION - ORGANIZATION OF AIRPORT OPERATION - 4D - AS-BUILT BIM MODELS

➔ Conduct all trades studies in BIM while taking into account the BIM maturiy of the different stakeholders and their distribution world-wide

➔ Study work phases to ensure continuity of operations at the existing airport terminals

➔ Provide the client with BIM models allowing him to study and ensure the safety of the flow travellers, since the work is being done on occupied sites

➔ Provide the client with structured As-Built models to be linked with O&M software

Metro, Red Line South
Doha, QATAR | 2013 - 2018

BIM KEYWORDS

Design Review
3D coordination
2D drawings production

4D simulation
QTO
As-Built models

PROJECT BIM FEATURES

- BIM models development from 2D drawings (except for structure studies that were carried out 100% in BIM)

- Design and Execution studies conducted directly with BIM

- 3D coordination and interface resolution among the various work teams from the design to the as-built phase

- Models development for tunnel lining to show segment/ring connections

- and detail electrical and mechanical works along with the installation of steel bridges

- 2D execution drawings extracted from the coordinated BIM models

- Quantity Take-Off (QTO)

- 4D animations development to highlight construction sequences and equipment installation

- As-built models

PROJECT DESCRIPTION

Design and construction of a dual-tube line 13.8 km long between Doha Airport and the district of Msheireb in the historic centre of the Qatari capital. The future Red Line will run along the Gulf coast. Five earth-pressure TBMs with an outside diameter of more than 7 metres operated concurrently. The contract also includes the design and construction of 5 underground stations, 34 inter-tube safety connections, 4 emergency evacuation shafts, and 5 railway-crossing areas.

BIM CHALLENGES

EXECUTION STUDIES CONDUCTED IN BIM FOR A TUNNUL PROJECT / 3D COORDINATION

➔ Conduct tunnel studies with the use of BIM in the execution phase

➔ Conduct coordination process of all trades, encompassing multiple participants, including consultants and subcontractors, by using BIM models

➔ Train personnel with little experience of BIM processes and procedures

➔ Make the transition from conventional design and project-management methods to BIM methodologies

HIGHLIGHTS

Project
- **€1,800 M**
- **61 months** of execution
- Involvement: **26.95%**
- Client: Qatar Rail Company

Key figures
- **600,000 m³** of poured concrete
- **20,500** voussoirs
- **3,500 km³** excavated

Atlantic Bridge
Colón, Panama | 2013 - 2016

PROJECT DESCRIPTION

This project involves building a concrete cable-stayed bridge located three kilometres north of the Gatún locks, near the city of Colón. In particular, it will allow large "Post-Panamax" type container ships to pass through the widened Canal. It will also allow vehicles to cross the Panama Canal, on the Atlantic side, regardless of the locks' operating position. In order not to interfere with canal traffic, the bridge deck will have to be poured on site. The contract also includes the construction, on each side of the bridge, of 2-km-long approach viaducts, as well as roads connecting to the existing network.

HIGHLIGHTS

Project
- **€308 M**
- **42 months** of execution
- Involvement : **100%**
- Client : Panama Canal Authority

Key figures
- **175 000 m²** of poured concrete
- **35,000 T** of steel
- **245,000 m²** of formwork

BIM KEYWORDS

Link between BIM - STR / Analytical model	3D methods
4D simulation	QTO
3D coordination	

PROJECT BIM FEATURES

- Model development of formworks, launching beams and pre-stressed cables using Digital Project. Models are then used for 3D coordination and srtuctural analysis purposes via a direct link to the Finite Element Model calculation software used by VINCI Construction Grands Projets Structural Department

- 4D animations to facilitate the understanding of the work sequencing

- Model development of the derricks

- supporting the formwork tubes and anchorages of stay cables in the pylons. This allows producing the steel framing elements as well as studying the interaction with reinforcement

- 3D methods: modeling of certain specific formwork tools

- Quantity Take-Off (QTO) and estimates using Primavera P6

BIM CHALLENGES

COMPLEX MODELING - LINK WITH FEM CALCULATION SOFTWARE

- ➡ Identify the most appropriate design software to overcome project complexity as well as incorporate all design intents in a 3D model

- ➡ Develop the links between modeling software and calculation software to facilitate exchanges and limit re-entry errors

Silver Forest Villa
Moscow, Russia | 2013 - 2014

PROJECT DESCRIPTION

The Silver Forest Villa project is a PCSA (Pre-Construction Service Agreement) whose first phase involves developing the Detailed Design of all trades for a luxurious villa located in Moscow, and more specifically, interior design (choice of materials, furnishings and equipment), as well as determining construction costs. Studies conducted during the project also involve an architect and French decorator, as well as local estimation offices for the Russification of the project and application for building permit.

HIGHLIGHTS

Project
- PCSA: **€1 M** - Total (estim) : **€35 M**
- **12 months** of design
- Involvement: **100%**
- Client: Mr. Tsvetlkov

Key figures
- **4,500 m²**
- **1 Ha** park to develop

BIM KEYWORDS

3D printing
Visuals - Images/Films

PROJECT BIM FEATURES

- BIM model development based on volumetric aspects and facade proposed by the architect and to be approved by the client)
- Use of BIM models to present the client the architectural concepts (size and proportions) and improve them based on the client feedback
- Quick and flexible creation of variations with BIM, as an effective decision-making tool for both façade designs developed for the villa (French and Italian style)
- Creation of two mock-ups (1:20 scale) of parts of the façade (French and Italian style), using black-and-white 3D printing and having a professional painter to add the texture
- Communication with the client: 3D Photoshop images, volumetric presentation films (bird's eye view) and solid mock-up

BIM CHALLENGES

CLIENT COMMUNICATION - DECISION SUPPORT

➔ Create a BIM model on a tight schedule, based on the architectural drawings that were in 2D Autocad format

➔ Provide the client with a BIM model, allowing the better understanding of the project and therfore more easily and quickly carry out validations

➔ Set up different processes for efficient exchanges between the BIM model and the 3D printer that supports the largest 3D printing sizes in Spain (1m)

International Airport
Dushanbe, Tadjikistan | 2012 - 2014

PROJECT DESCRIPTION

This design-build project involves the construction of the new Dushanbe International Airport terminal in Tajikistan. By meeting the platform development requirements, this new terminal will be able to handle up to 1.5 million passengers per year. It will offer a higher quality of service to passengers and airlines in compliance with the international standards. VINCI Construction Grands Projets is in charge of the design-build of the building, as well as the implementation of equipment and operational systems.

HIGHLIGHTS

Project
- **€36 M**
- **23 months** of execution
- Involvement: **100%**
- Client: Dushanbe International Aiport

Key figures
- **12 000 m²**
- **4** Loading bridges
- **3 500 m²** of concrete
- **12,000 T** of building structures

BIM KEYWORDS

Design Review	4D simulation	Visuals - Images, Films
3D coordination	3D methods	Real Time rendering
2D drawings production	QTO	

PROJECT BIM FEATURES

- BIM model creation based on the 2D drawings during design phase
- Design Review
- 3D coordination and clash detection process
- 2D drawings production extracted from the BIM models
- 4D animations to facilitate the understanding of the work sequences
- Quantity Take-Off (QTO)
- Visuals and real-time rendering as a decision-making tool

BIM CHALLENGES

OUR FIRST PROJECT IN BIM! - CLIENT COMMUNICATION - CONSTRUCTION SEQUENCING

➔ Study and optimize construction phasing using 4D animations

➔ Use BIM as a decision-making tool (visuals)

➔ This project, initiated in 2012, is the first BIM project for VINCI Construction Grands Projets, thus driving the BIM implementation within the company and setting up the first processes and procedures

REAL SUCCESS IS THE SUCCESS YOU SHARE

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