

Msc. ALEXANDRE V.
Architect | BIM Specialist

Introdução

Arquiteto e especialista em BIM com mais de 12 anos de experiência gerenciando projetos multidisciplinares, incluindo edifícios de alto padrão, reformas e projetos de fachadas. Sou especialista em implementação BIM, estimativa de custos 5D, detecção de conflitos e otimização de fluxo de trabalho entre equipes de arquitetura e engenharia. Minha experiência inclui a liderança de equipes, o treinamento do Revit e o estabelecimento de padrões BIM para agilizar os processos de projeto. Implementei com sucesso soluções BIM em projetos internacionais, melhorando a precisão e colaboração entre as partes interessadas. Sou apaixonado por integrar ferramentas avançadas como o BIM para planejamento de projetos e automação de projeto para oferecer soluções funcionais e econômicas que atendam aos objetivos do cliente, ao mesmo tempo em que aumentam a eficiência geral do projeto.

Education

Universidade Federal de Minas Gerais - Brazil

August 2007 - December 2012
BR - Bachelor of Architecture and Urban Planning

Universidade Federal de Minas Gerais - Brazil

January 2019 - August 2019
Masters in Engineering - Design Management

École de Technologie Supérieure – Montréal Canada

August 2024 – Estimated finish August 2028
Doctorate in Construction – Project Management and BIM

Additional Courses

Virtual Modeling (CAD 3D and 3ds). Trena Ensino. 2009.

Autodesk AutoCAD. Estação Cad. 2008

Autocad 2012 Associate Certificate, Autodesk, #00282618

Autodesk Revit. Trena Ensino. 2009.

Revit Architecture 2012 Associate Certificate, Autodesk, #00289834

Revit Architecture 2014 Professional Certificate, Autodesk, #00373678

Fuzor Training. Kalloc Studios Online. 2021.

Capture, Analysis, and Visualization of Construction Big Data. USP. 2017.

Software

Revit | Advanced

Recap | Advanced

Navisworks | Advanced

Synchro | Intermediate

Autodesk Construction Cloud | Advanced

Solibri Model Checker | Intermediate

Languages

English | Advanced

Portuguese | Advanced

French | Intermediate

Spanish | Intermediate

Progen Gerenciamento e Engenharia | São Paulo, Brazil | Architect / BIM Manager | August 2012 - October 2014 | In-person

Main task list:

- **Mining and industrial support buildings:** Served as the architect, responsible for project designs and ensuring technical compliance.
- **Oceanography Hangar for USP** (São Paulo State University): Led architectural Revit modeling efforts and provided BIM support for design management and coordination.
- **BIOM Manguinhos, Santa Cruz (Largest Pharmaceutical Project in Latin America):** Provided support for design teams by training and implementing BIM processes to enhance coordination, modeling accuracy, and project documentation. Design standards, templates, and annotation families to streamline project workflows.

Engmex | São Paulo, Brazil | BIM Manager | October 2014 – November 2016 | In-person

Main task list:

- **Managed high-standard office, commercial, and residential building projects.**
- **Led Autodesk Revit implementation**, including the development of: user guides and standards for Revit Architecture, Revit Structure (Concrete and Steel), and Revit MEP (Plumbing). Design standards, templates, and annotation families to streamline project workflows.
- **Conducted Revit training** sessions for integrated teams, promoting collaborative workflows across architecture and engineering disciplines.
- **Implemented Autodesk Navisworks Manage** for project compatibility, using model-checking tools to identify and resolve clashes across disciplines.

Cidade Matarazzo | São Paulo, Brazil | BIM Manager | February 2017 - October 2022 | In-person

- Liderou o gerenciamento de BIM para o maior projeto de proteção e modernização do patrimônio na América Latina.
- Utilizou a tecnologia LiDAR para modelar as condições existentes e apoiar novos fluxos de trabalho de construção e gerenciamento de projetos.
- Gerenciou uma equipe de 12 profissionais em um projeto de 30 pessoas, garantindo a colaboração entre as disciplinas.
- **Ambiente de dados comum (CDE) implementado usando o Autodesk Construction Cloud (ACC), Revit e Recap para facilitar a coordenação do modelo para arquitetura, estrutura e MEP.**
- Permitiu o intercâmbio de projetos entre equipes multidisciplinares em todo o Brasil, EUA e Reino Unido, melhorando a eficiência do projeto e a comunicação.

Ideia! Zarvos | São Paulo, Brasil | BIM Manager / Consultant | Outubro 2022 - Presente | Home-Office - Part Time

- Gerenciou processos BIM para projetos residenciais e comerciais de alto padrão, alinhando a intenção do projeto com o orçamento e os cronogramas do projeto.
- **Desenvolveu e implementou modelos de estimativa de custos 5D, melhorando a precisão e permitindo uma melhor tomada de decisão durante as fases de design e licitação.**
- Aplicação de estratégias de engenharia de valor, conseguindo até 30% de redução de custos desde a fase de projeto preliminar até à fase de licitação.
- Fluxos de trabalho BIM coordenados para otimizar a entrega do projeto e promover a colaboração entre equipes de design multidisciplinares.
- Suporte aos processos de design e modelagem de fachadas, garantindo resultados de alta qualidade que atendem às expectativas do cliente e aos padrões do projeto.

University



01

Oceanography
Hangar
2012

Industrial



02

Niobium Mine
expansion
2014

Pharmaceutical



03

BIOM -
Pharmaceutical
2013

Commercial



04

Parque da Cidade
Gleba C
2015

Hospitality



05
2017

Mix Use



06
2018 - 2022

Mix Use

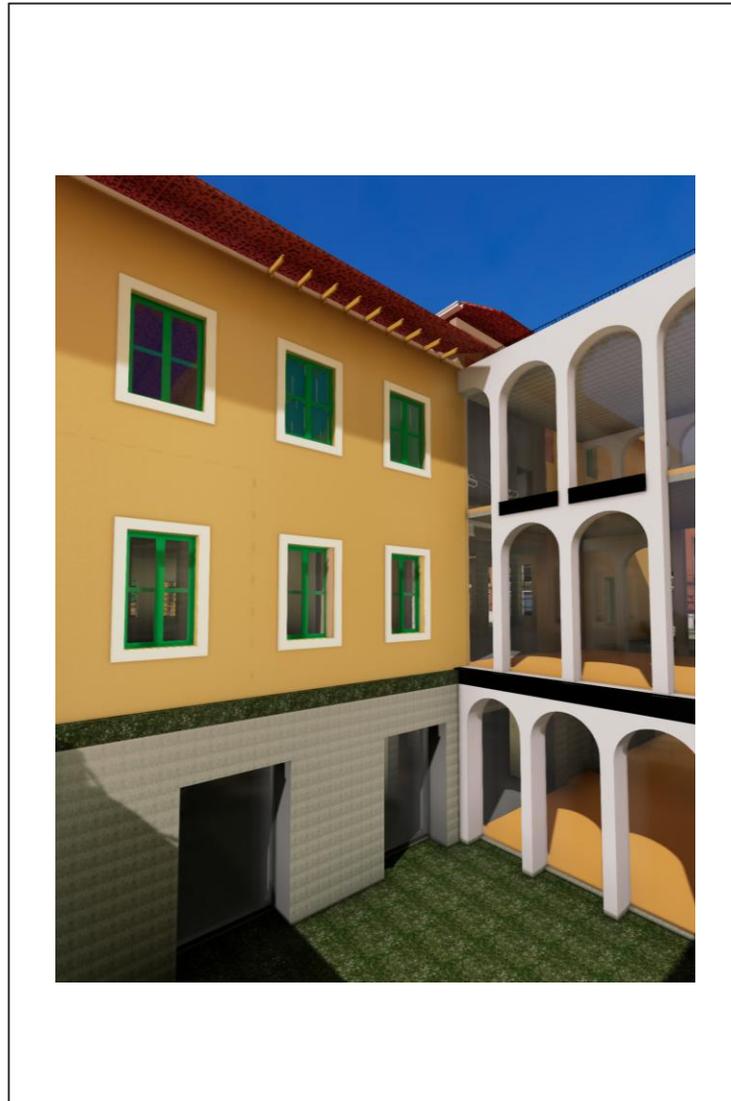


07
2020 - 2021

Commercial

idea!
zarvos

08
2024



06

Cidade Matarazzo – Retail Village

2015

Brief description:

The Village of Cidade Matarazzo is a vibrant retail and lifestyle destination in São Paulo, Brazil, located within a meticulously restored complex of buildings with over 100 years of history. This ambitious retrofit project spans an impressive 24,000 square meters of construction area, seamlessly blending heritage architecture with modern sophistication. Organized across Blocks A to E, it offers a dynamic mix of culture, gastronomy, fashion, and art. Block A features fine dining restaurants and the exclusive Soho House, offering a blend of culinary and social experiences. Block B hosts the Soho House alongside curated footwear boutiques, while Block C combines the Soho House with upscale menswear stores, catering to refined tastes. Block D focuses on gastronomy, housing a variety of exceptional restaurants, and Block E stands out as a cultural hub, featuring restaurants and spaces for theater, exhibitions, and artistic events. Together, these spaces create a unique destination, preserving its historical essence while offering a contemporary and elevated urban experience.

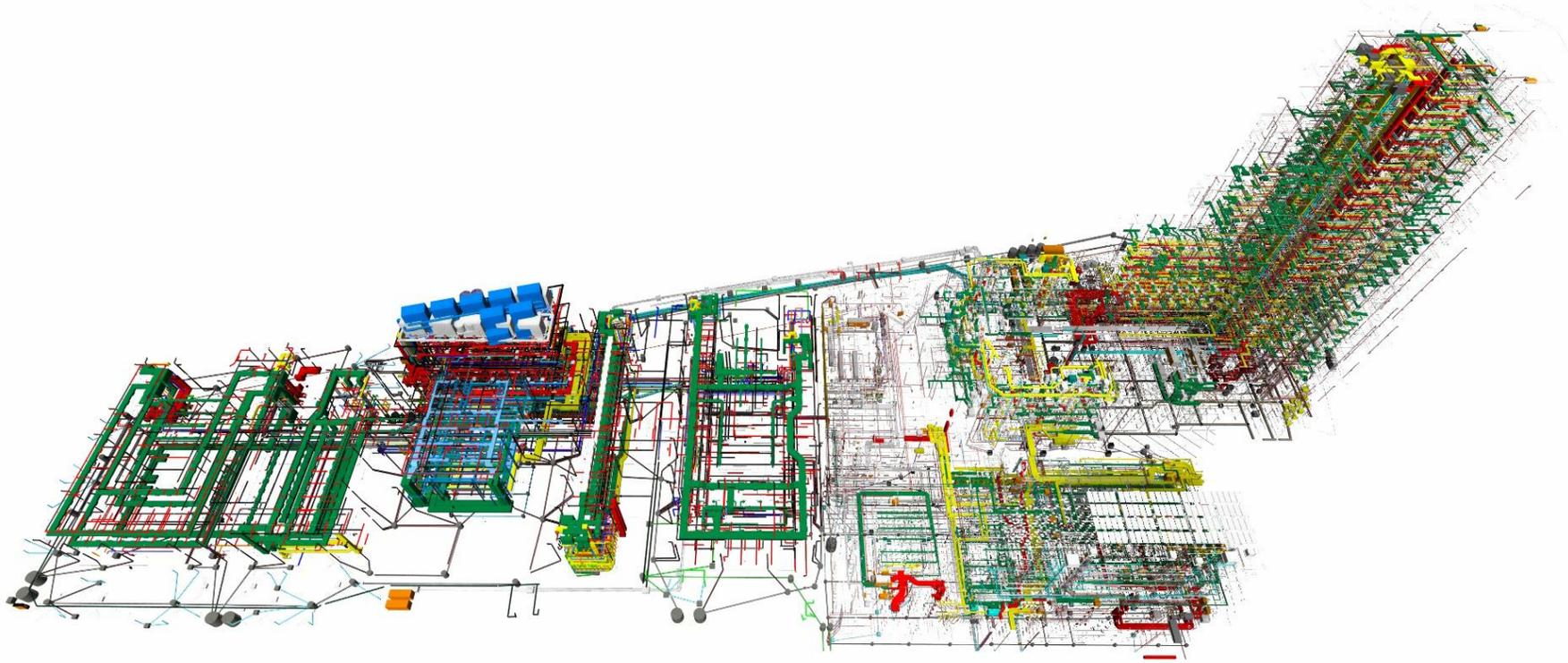
Location: São Paulo, Brazil.

Duration: 6 years

Created with: Revit, Recap, Autodesk Collaboration Cloud

Team: Cidade Matarazzo

05. BIM Modeling



A área de atuação dentro da Incorporadora estava voltada para **gestão de risco na metodologia executiva, orçamentos, quantidades, planejamento e controle.**

Abordagem inicial: Imersão no escritório de Arquitetura para mapeamento dos processos e melhores práticas, dando suporte para as dificuldades da equipe no desenvolvimento de famílias e processos de modelagem.

Resultados: Modelo BIM de arquitetura atendendo às premissas de orçamento/contratação. Automatização das extrações de quantidades importantes para orçamentação como vedações, acabamentos, acústica, etc.

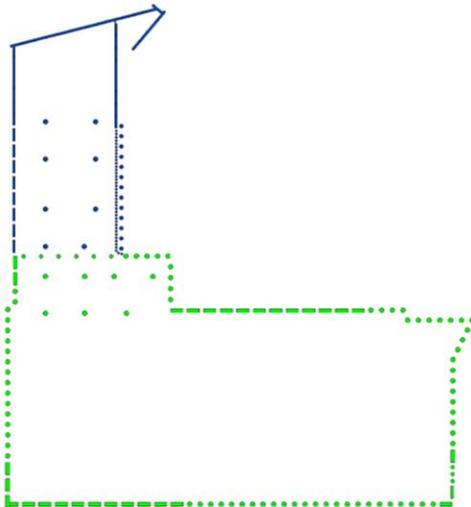
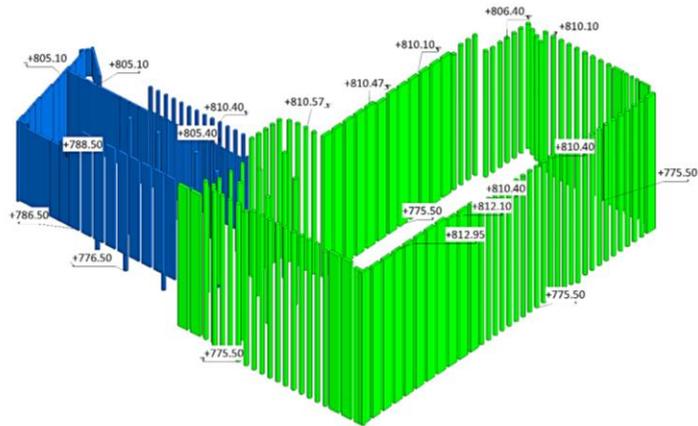
Usos do BIM

- Estudo de viabilidade;
- Projeto de Arquitetura;
- Projeto de Estrutura;
- Projeto de instalações (MEP);
- Coordenação de projeto;
- Visualização;
- Detecção de interferências;
- Demolição e escavação;
- Orçamento e quantidades;
- Planejamento e logística;

BIM 5D - QUANTIFICAÇÃO

TECHNICAL TEAM MANAGEMENT

MODELO BIM CONTRATUAL REVERSO - T3A EXECUÇÃO DE ESTACÃO / BARRETE / DIAFRAGMA



00-BM-TRECHO A - TUBULÃO				00-BM-TRECHO B - BP-04 A BP-10 - ESCAVACAO				00-BM-TRECHO B - EP-03 A EP-05			
TR-01	Comments	ALTURA		BP-04	DESCRICAÇÃO	ALTURA		EP-03	DESCRICAÇÃO	ALTURA	
TR-02		7.40		BP-05		17.45		EP-04		20.00	
TR-03		7.40		BP-06		17.45		EP-05		20.00	
TR-04		7.40		BP-07		17.45		Grand total 3		62.70	
TR-05		7.40		BP-08		17.45					
TR-06		7.40		BP-09		17.45					
TR-07		7.40									
TR-08		7.40		Grand total 7		20.15		EP-06		20.00	
TR-09		7.40						EP-07		20.00	
TR-10		7.40						EP-08		20.00	
TR-11		7.40						EP-09		20.00	
TR-12		7.40						EP-10		20.00	
TR-13		7.40		Grand total 1		37.70		EP-11		20.00	
13				Grand total 8		98.30		EP-12		20.00	

00-BM-TRECHO A - BP-32 A 36				00-BM-TRECHO B - BP-11 - ESCAVACAO				00-BM-TRECHO B - BP-12 A BP-15			
BP-32	DESCRICAÇÃO	ALTURA		BP-11	DESCRICAÇÃO	ALTURA		BP-12	DESCRICAÇÃO	ALTURA	
BP-33		24.80		BP-12		38.00		BP-13		38.00	
BP-34		24.80		BP-14		35.30		BP-14		35.30	
BP-35		24.80		BP-15		35.30		BP-15		35.30	
BP-36		24.80		Grand total 4		148.20		EP-16		14.00	
BP-37		24.80						EP-17		14.00	
BP-38		24.80						EP-18		14.00	
BP-39		24.80						EP-19		14.00	
BP-40		24.80						EP-20		14.00	
BP-41		24.80						EP-21		14.00	
BP-42		24.80						EP-22		14.00	
Grand total 5		199.20		Grand total 5		207.60		EP-23		14.00	

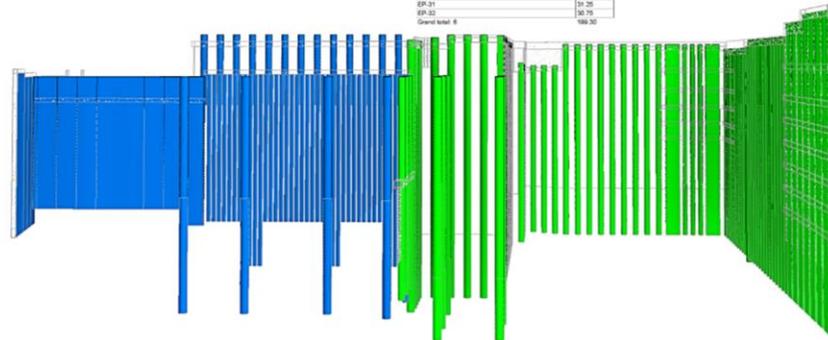
00-BM-TRECHO A - L12-L1, L1-05				00-BM-TRECHO B - BP-16 A BP-21				00-BM-TRECHO B - EP-24 A EP-27			
LF-04	DESCRICAÇÃO	ALTURA	MTZ_LARGURA	MTZ_AREA	BP-16	DESCRICAÇÃO	ALTURA		EP-24	DESCRICAÇÃO	ALTURA
L1-01		19.80	2.00	40.50 m²	BP-17		34.80		EP-25		14.00
L1-02		19.80	2.00	40.50 m²	BP-18		34.80		EP-26		14.00
L1-03		19.80	2.00	40.50 m²	BP-19		34.80		EP-27		14.00
L1-04		19.80	2.00	40.50 m²	BP-20		34.80		EP-28		14.00
L1-05		19.80	2.00	40.50 m²	BP-21		34.80		EP-29		14.00
L1-06		19.80	2.00	40.50 m²	BP-22		34.80		EP-30		14.00
L1-07		19.80	2.00	40.50 m²	BP-23		34.80		EP-31		14.00
L1-08		19.80	2.00	40.50 m²	BP-24		34.80		EP-32		14.00
Grand total 8				408.90 m²	BP-25		34.80		EP-33		14.00

00-BM-TRECHO A - L12-L1, L1-10				00-BM-TRECHO B - BP-22 A BP-27				00-BM-TRECHO A - ESTACA RAZ DIAMETRO=80cm			
LF-04	DESCRICAÇÃO	ALTURA	MTZ_LARGURA	MTZ_AREA	BP-22	DESCRICAÇÃO	ALTURA		EST-01	DESCRICAÇÃO	ALTURA
L1-10		19.80	2.00	40.50 m²	BP-23		34.80		EST-02		28.40
L1-11		19.80	2.00	40.50 m²	BP-24		34.80		EST-03		28.40
L1-12		19.80	2.00	40.50 m²	BP-25		34.80		EST-04		28.40
L1-13		19.80	2.00	40.50 m²	BP-26		34.80		EST-05		28.40
L1-14		19.80	2.00	40.50 m²	BP-27		34.80		EST-06		28.40
Grand total 4				242.40 m²	Grand total 6		207.60		EST-07		28.40

00-BM-TRECHO A - L1-13, L1-15				00-BM-TRECHO B - EP-01 A EP-17			
LF-14	DESCRICAÇÃO	ALTURA	MTZ_LARGURA	MTZ_AREA	EP-01	DESCRICAÇÃO	ALTURA
L1-15		8.55	1.40	12.00 m²	EP-02		38.00
L1-16		8.55	1.40	12.00 m²	EP-03		38.00
L1-17		8.55	1.40	12.00 m²	EP-04		38.00
L1-18		8.55	1.40	12.00 m²	EP-05		38.00
L1-19		8.55	1.40	12.00 m²	EP-06		38.00
L1-20		8.55	1.40	12.00 m²	EP-07		38.00
L1-21		8.55	1.40	12.00 m²	EP-08		38.00
L1-22		8.55	1.40	12.00 m²	EP-09		38.00
L1-23		8.55	1.40	12.00 m²	EP-10		38.00
L1-24		8.55	1.40	12.00 m²	EP-11		38.00
L1-25		8.55	1.40	12.00 m²	EP-12		38.00
L1-26		8.55	1.40	12.00 m²	EP-13		38.00
L1-27		8.55	1.40	12.00 m²	EP-14		38.00
L1-28		8.55	1.40	12.00 m²	EP-15		38.00
L1-29		8.55	1.40	12.00 m²	EP-16		38.00
L1-30		8.55	1.40	12.00 m²	EP-17		38.00
Grand total 17				204.00 m²	Grand total 17		664.80

00-BM-TRECHO A - L1-01, L1-02				00-BM-TRECHO B - EP-18 A EP-28			
LF-04	DESCRICAÇÃO	ALTURA	MTZ_LARGURA	MTZ_AREA	EP-18	DESCRICAÇÃO	ALTURA
L1-01		19.80	2.00	40.50 m²	EP-19		34.20
L1-02		19.80	2.00	40.50 m²	EP-20		34.20
L1-03		19.80	2.00	40.50 m²	EP-21		34.20
L1-04		19.80	2.00	40.50 m²	EP-22		34.20
L1-05		19.80	2.00	40.50 m²	EP-23		34.20
L1-06		19.80	2.00	40.50 m²	EP-24		34.20
L1-07		19.80	2.00	40.50 m²	EP-25		34.20
L1-08		19.80	2.00	40.50 m²	EP-26		34.20
L1-09		19.80	2.00	40.50 m²	EP-27		34.20
L1-10		19.80	2.00	40.50 m²	EP-28		34.20
Grand total 7				281.52 m²	Grand total 9		310.80

00-BM-TRECHO B - BP-01 A BP-03 - ESCAVACAO				00-BM-TRECHO B - EP-27 A EP-32			
BP-01	DESCRICAÇÃO	ALTURA		EP-27	DESCRICAÇÃO	ALTURA	
BP-02		36.80		EP-28		34.00	
BP-03		36.80		EP-29		34.00	
BP-04		36.80		EP-30		34.00	
BP-05		36.80		EP-31		34.00	
BP-06		36.80		EP-32		34.00	
Grand total 3		106.80		Grand total 6		199.30	

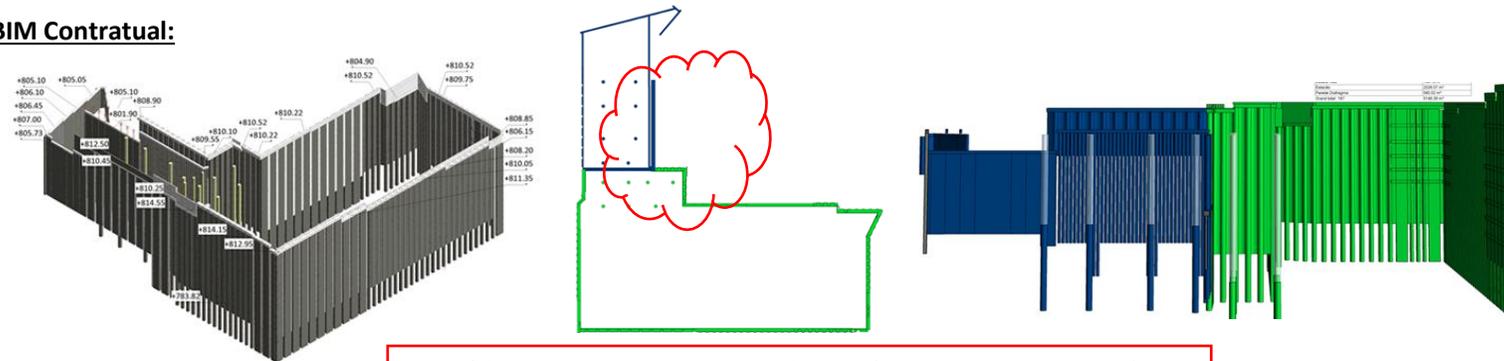


MODELAGEM 5D

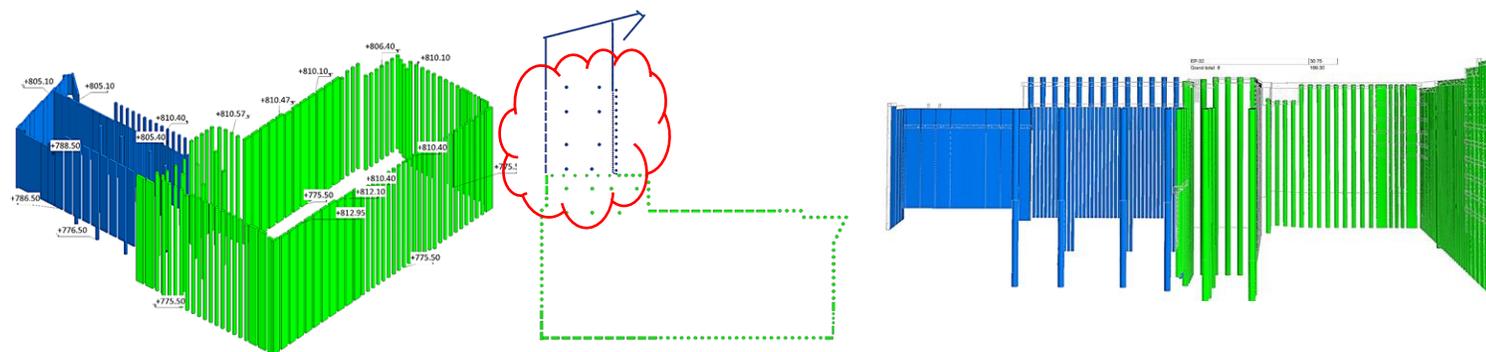
Cidade Matarazzo

Participação: Modelagem 5D para gestão de contratos e controle de aditivos

BIM Contratual:



BIM Executado:



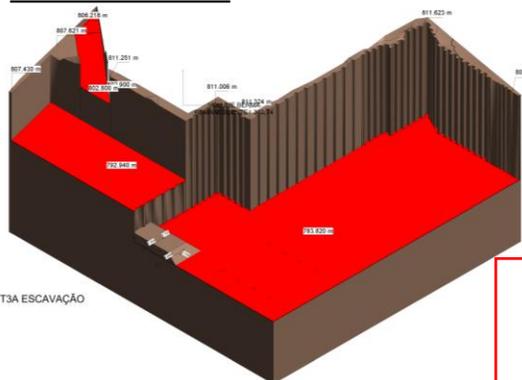
Análise das quantidades e identificação de desperdício de concreto além do contratual.
Diferença de 300m³ (~38 betoneiras)

MODELAGEM 5D

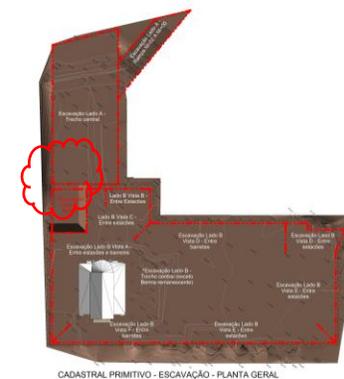
Cidade Matarazzo

Participação: Modelagem 5D para gestão de contratos e controle de aditivos

BIM Contratual:

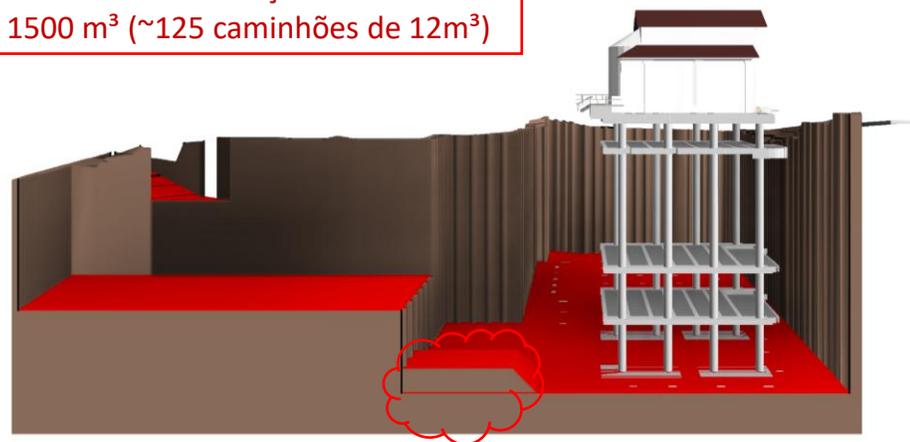
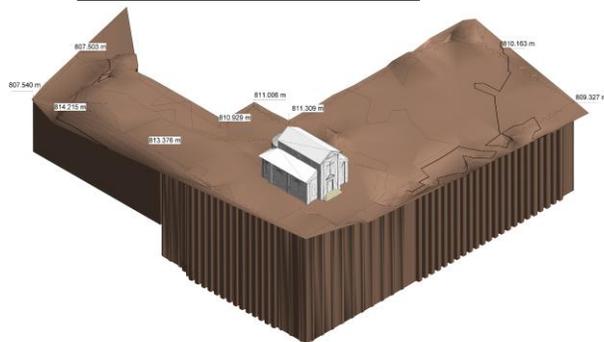


00-BM-VOLUME DE ESCAVAÇÃO	
SETOR	QTNDE (m³)
*Escavação Lado B - Trecho central (exceto Berma remanescente)	102334.09
Escavação Lado A - Rampa N0-02	543.74
Escavação Lado A - Trecho casa de bombas	145.06
Escavação Lado A - Trecho central	16260.04
Escavação Lado B - Trecho solução sinistre	107.81
Escavação Lado B Vista A - Entre estações e barretes	621.16
Escavação Lado B Vista B - Entre barretes	228.43
Escavação Lado B Vista B - Entre estações	149.88
Escavação Lado B Vista C - Entre estações	153.56
Escavação Lado B Vista D - Entre barretes	139.77
Escavação Lado B Vista D - Entre estações	347.26
Escavação Lado B Vista E - Entre estações	375.74
Escavação Lado B Vista F - Entre estações	696.65
Escavação Lado B Vista F - Entre barretes	20.81
	122108.61
*Escavação Lado B - Berma remanescente	340.74
TOTAL :	122449.35



Controle de bota-fora de escavação
 CONTRATO X EXECUÇÃO
 Economia de 1500 m³ (~125 caminhões de 12m³)

Levantamento Primitivo:

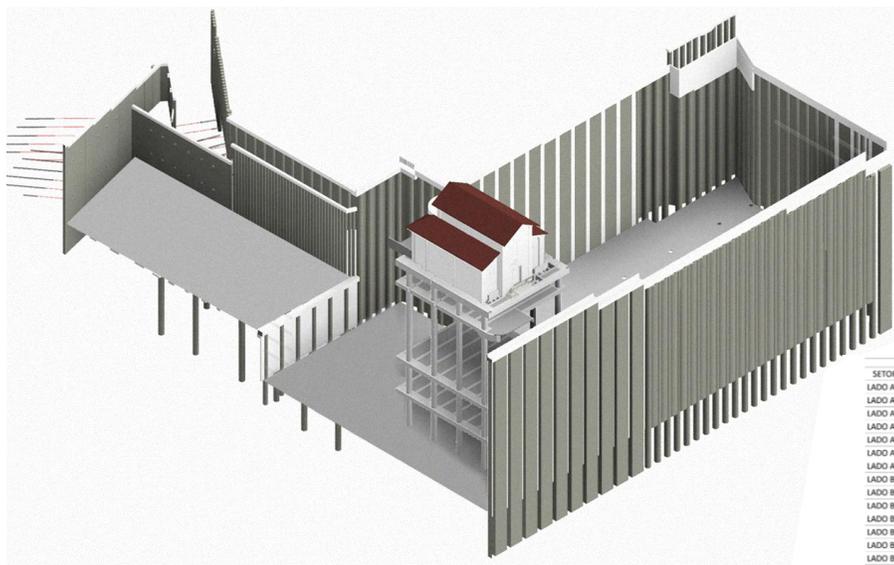


MODELAGEM 5D

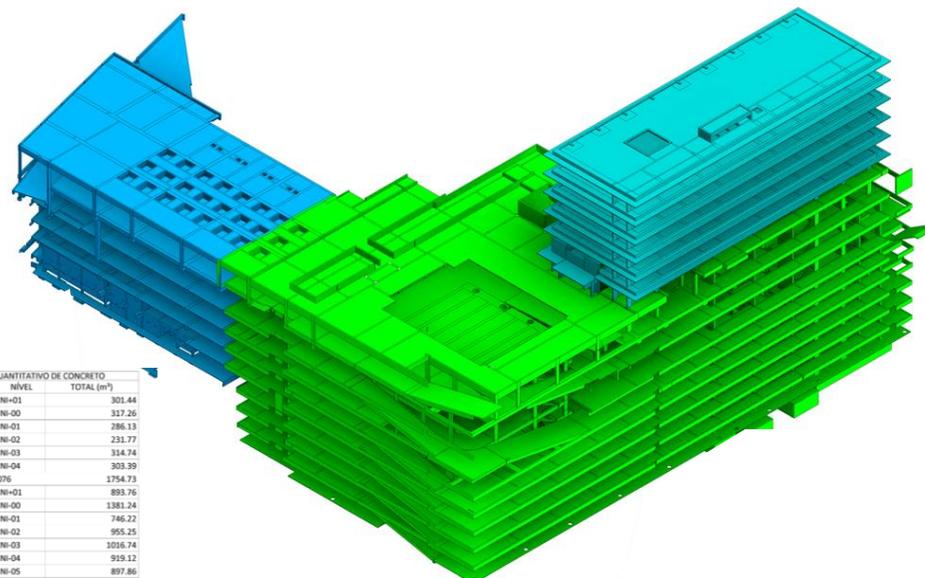
Cidade Matarazzo

Participação: Modelagem 5D para gestão de contratos e assertividade na contratação por empreitada global

ESTRUTURA DE CONCRETO PARKING + OFFICE
CONTRATAÇÃO POSTERIOR A EXECUÇÃO DAS
CONTENÇÕES E DA ESTRUTURA DA CAPELA



QUANTITATIVO DE CONCRETO		
SETOR	NIVEL	TOTAL (m³)
LADO A	NH+01	301.44
LADO A	NH-00	317.26
LADO A	NH-01	286.13
LADO A	NH-02	231.77
LADO A	NH-03	314.74
LADO A	NH-04	303.39
LADO A:	1076	1754.73
LADO B	NH+01	893.76
LADO B	NH-00	1381.24
LADO B	NH-01	746.22
LADO B	NH-02	955.25
LADO B	NH-03	1016.74
LADO B	NH-04	919.12
LADO B	NH-05	897.86
LADO B	NH-06	897.10
LADO B	NH-07	902.39
LADO B:	4238	8609.69
OFFICE	NH+02	267.54
OFFICE	NH+03	222.92
OFFICE	NH+04	222.99
OFFICE	NH+05	222.99
OFFICE	NH+06	223.22
OFFICE	NH+07	229.21
OFFICE:	759	1388.87
TOTAL:	6073	11753.29



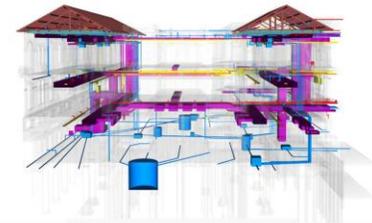
06. Cidade Matarazzo | CDE and Model Coordination

The compatibility of geometric interferences is one of the most relevant processes to mitigate waste and rework on site. For this process, a BIM coordination software (Navisworks) is used where the report of project interferences (clash detection) is made. This report is uploaded to the common cloud work platform (CDE | BIM 360), where information from:

- 1 Report Subjects (Example: EST x ARC | EST x ELE | EST x HID, etc);
- 2 Brief description of the problem (issue);
- 3 Responsible for correcting the problem (issue);
- 4 Location in the development (Block A | Level +02 | Sector – Hotel)
- 5 Relevance of interference (High | Medium | Baixa);
- 6 Deadline for correcting the problem;



FEDERADO BLA – 55 CLASHES



NAVISWORKS



AUTODESK
BIM 360



Issue #15

DETAILS ATTACHMENTS ACTIVITY

1 ARCKEST ✓

2 Description
Sugerimos FID 4,11m, desviando das poucas vigas no ambiente. Previsão em trecho sob viga V6a FID 3,26m. Verificar e validar ✓

3 Assigned to
Teknika ✓

Type
Compatibilização / Coordenação BIM ✓

6 Due Date
Jul 1, 2022

Owner
Lilian Wexler Arquitetura ✓

4 Location
A +811,00-N+01 ✓

Root Cause
Unspecified ✓

Location Details
Bloco A ✓

Linked document
[MTZ-BLC-CMP-PE-11301-PL-1-r00_TETO.pdf \[V1, current\]](#) ...

5 Priority
High ✓

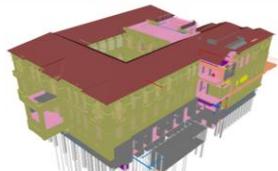
Disciplina
ARC ✓

Disciplina 1
EST ✓

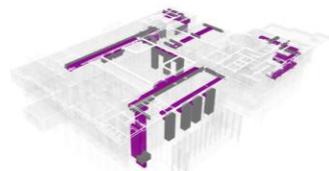
AUTODESK
BIM 360

06. Cidade Matarazzo | CDE and Model Coordination

Result of the report generated by the federated BIM model:



FEDERADO BLA – 55 CLASHES



ARC x EST – 25 CLASHES



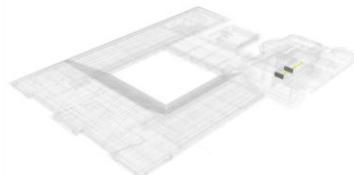
ELE x EST – 12 CLASHES



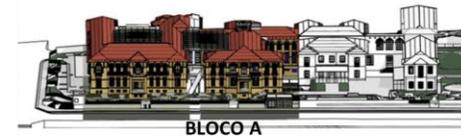
HID x EST – 08 CLASHES



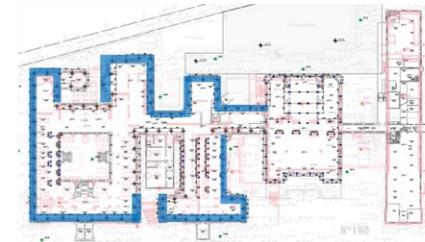
INC x EST – 06 CLASHES



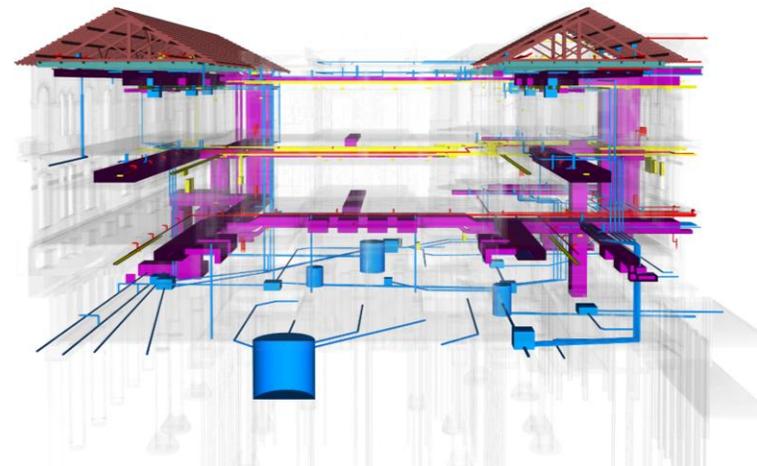
MAD x EST – 03 CLASHES



BLOCO A



PLANTA GERAL



06. Cidade Matarazzo | Retrofit process | Laserscanning



From the survey of the point cloud, the existing BIM model was developed, where several relevant information were inserted, for use both in design and in the planning and execution of the works.

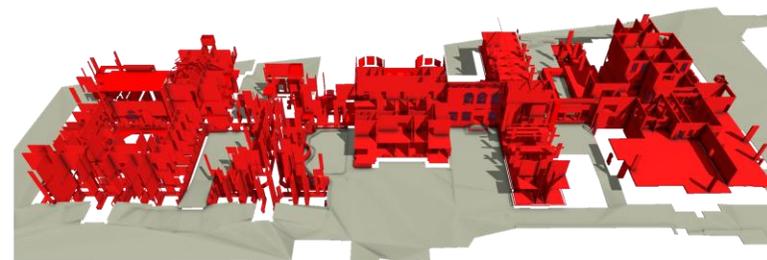
The sections to be demolished were mapped and demarcated, enabling visualization, extraction of quantities and generation of project documents.

This organization of the process adds value to BIM models to facilitate the construction team to visualize and plan the best executive sequence.

In the final project situation, compatibility is made with between disciplines and identification of interferences.



MODELO BIM EXISTENTE



MODELO BIM A SER DEMOLIDO



MODELO BIM SITUAÇÃO FINAL

The logo for Idea! Zarvos is displayed within a thin black rectangular border. The word "idea!" is written in a large, bold, lowercase sans-serif font. Below it, the word "zarvos" is written in a smaller, lowercase sans-serif font, with each letter spaced out.

08

Idea! Zarvos

2015

Brief description:

Idea!Zarvos is a São Paulo-based real estate developer renowned for its distinctive architectural projects that stand out from the city's conventional designs. Collaborating with award-winning architects, the company emphasizes innovative design, functionality, and seamless integration with urban surroundings. Idea!Zarvos's commitment to architectural excellence and urban integration has garnered international recognition, with publications like Wallpaper* highlighting their transformative impact on São Paulo's urban landscape.

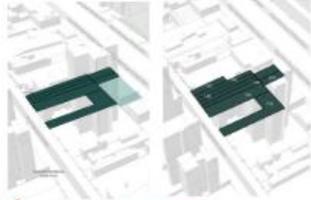
Location: São Paulo, Brazil.**Duration:** 2 years**Created with:** Revit, Navisworks, Cost Data Bank, Construction contract.**Team:** IZ.



Nov/23

Client+
Development

Cancellation of initial project and rearrangement of investors participation for new project version



Dec/23

Development

New Briefing meeting and decision of new plots for new project study



Dec/23

Legalization

Constructive potencial identified and establishment of initial parameters for initial study



Jan/24

Development

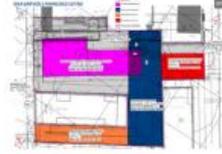
Initial report from DSS Platform for site and cost analysis



Jan/24

Client
Technical Team

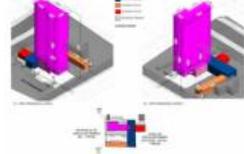
DSS Initial report with limited information and lack of explainability. Decision to develop conceptual model



Fev/24

Technical Area

Based on cancelled project decision, suggestion for initial study with parking building with 1 underground+2 above ground levels+ 80m height to residential tower and 2 comercial units



Fev/24

Design
Technical Area

Proposition of initial conceptual model and program based on initial legal parameters

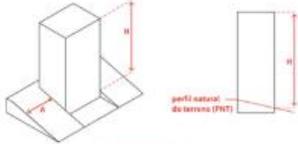


Fev/24

Design

Use of AI renderer for realistic views of conceptual mass study

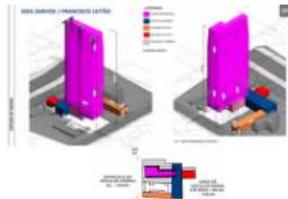
LEGENDA:
TORRE RESIDENCIAL
EDIFICIO GARAGEM
FACHADA ATIVA 01
FACHADA ATIVA 02
PROJEÇÃO TERRENO



Fev/24

Technical Area

Establishment square meter estimating groups per use: parking building, common areas / residential common area, residential apartments area, comercial area.



Fev/24

Development
Legalization

Reanalysis of constructive potential and new input parameters for a comparative version of study. Change of residential tower height from 80m to 100m

Fev/24

Design

Revision of conceptual model based on revised input parameters



Fev/24

Design

Use of AI renderer for realistic views of conceptual mass study

SÍNTESE DE REQUISITOS E RESTRITÕES									
ÁREA ÚTIL (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
ÁREA DE PAREDE (m²)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000

Mar/24

Technical Area

Change of project demands new emergency lift. Inclusion of cost estimates, reduction of sellable area and final estimates

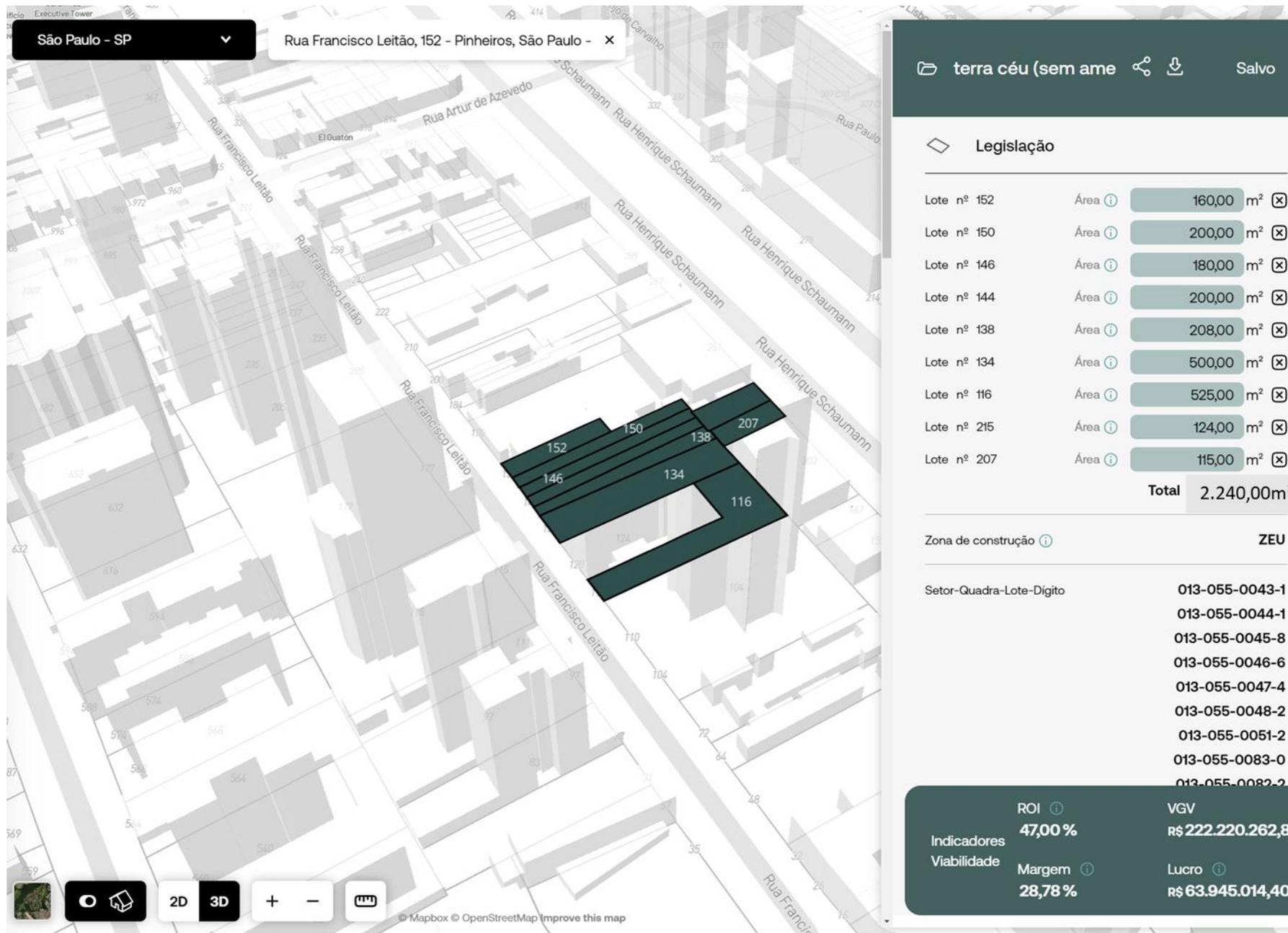
Apr/24

Client+
Development

Decision to acquire more new plots for new project study

Análises lotes OSPA

FORMA INEFICIENTE



Análises lotes OSPA

FORMA INEFICIENTE

São Paulo - SP

Rua Francisco Leitão, 150 - Pinheiros, São Paulo - X

Nome do estudo Salvar

reco de fundo reco lateral reco frontal

Zona de construção ZEU

Altura do envelope aplicar limitação 0,00 m

Reco frontal 0,00 m

Gerar envelope Apagar

Resultados

Restrições Volumétricas

Altura máxima alcançada 157,50 m

Número de pavimentos obtidos 52

Potencial Volumétrico Estimado

A volumetria produzida por esta funcionalidade não considera permissões de balanço sobre recuos

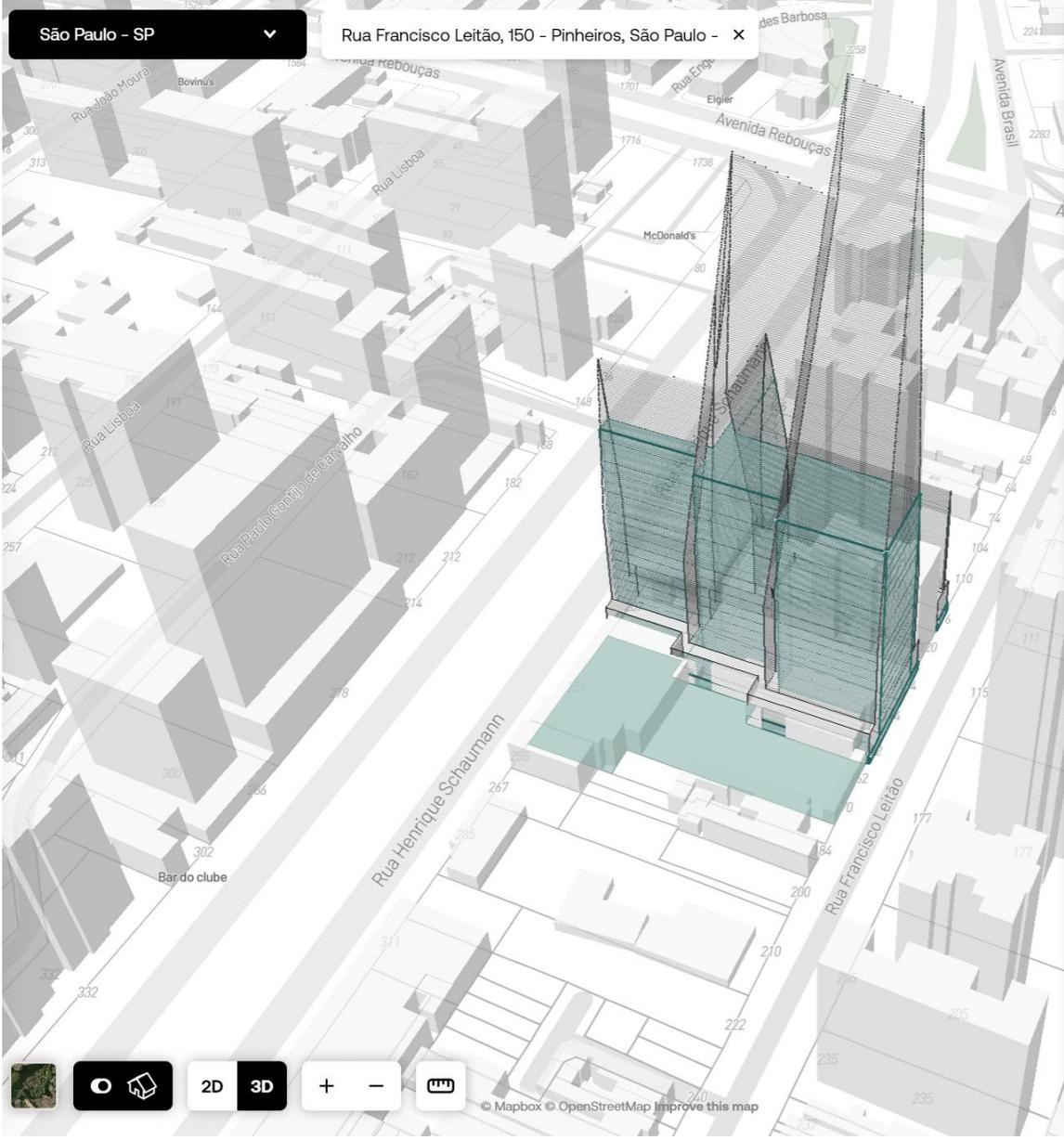
Número de pavimentos 20

Área por pavimento (base) 2.240,10 m²

Área por pavimento (corpo) 912,47 m²

Área total obtida 19.577,05 m²

O que achou desta funcionalidade?



Nome do estudo 🔗 📄 📌 Salvar

recuo de fundo h1
recuo lateral
recuo frontal

Zona de construção ZEU ▼

Altura do envelope aplicar limitação 👁
0,00 m

Recuo frontal 0,00 m

Gerar envelope Apagar

Resultados

Restrições Volumétricas 🔗

Altura máxima alcançada 157,50 m

Número de pavimentos obtidos 52

Potencial Volumétrico Estimado 🔗

A volumetria produzida por esta funcionalidade não considera permissões de balanço sobre recuos

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Área por pavimento (corpo) 912,47 m²

Área total obtida 19.577,05 m²

💬 [O que achou desta funcionalidade?](#)

Análises lotes IZEPA

FORMA INEFICIENTE

São Paulo - SP

Rua Francisco Leitão, 150 - Pinheiros, São Paulo - X

Nome do estudo

recuo de fundo

recuo lateral

recuo frontal

Zona de construção

ZEU

Altura do envelope

aplicar limitação

0,00 m

Recuo frontal

3,00 m

Gerar envelope

Apagar

Resultados

Restrições Volumétricas

Altura máxima alcançada

157,50 m

Número de pavimentos obtidos

52

Potencial Volumétrico Estimado

A volumetria produzida por esta funcionalidade não considera permissões de balanço sobre recuos

Número de pavimentos

20

Área por pavimento (base)

2.240,10 m²

Área por pavimento (corpo)

912,47 m²

Área total obtida

19.577,05 m²

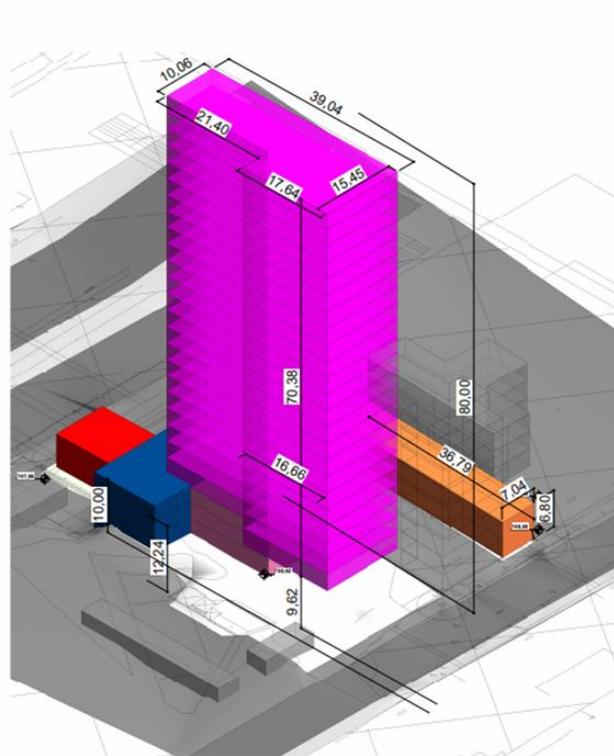
O que achou desta funcionalidade?

2D 3D

© Mapbox © OpenStreetMap Improve this map

Modelagem BIM
Isométrica
Francisco Leitão
Cenário Residencial
h=80M

Proposal A
Scenario with Residential h=80M



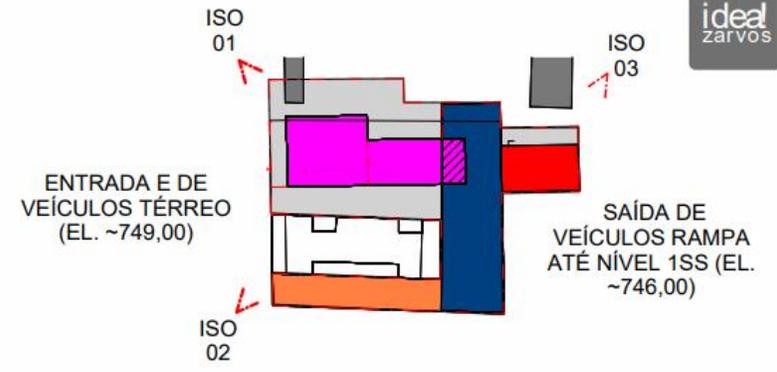
Proposal B
Scenario with Residential h=100M



LEGENDA:

- TORRE RESIDENCIAL
- EDIFÍCIO GARAGEM
- FACHADA ATIVA 01
- FACHADA ATIVA 02
- PROJEÇÃO TERRENO

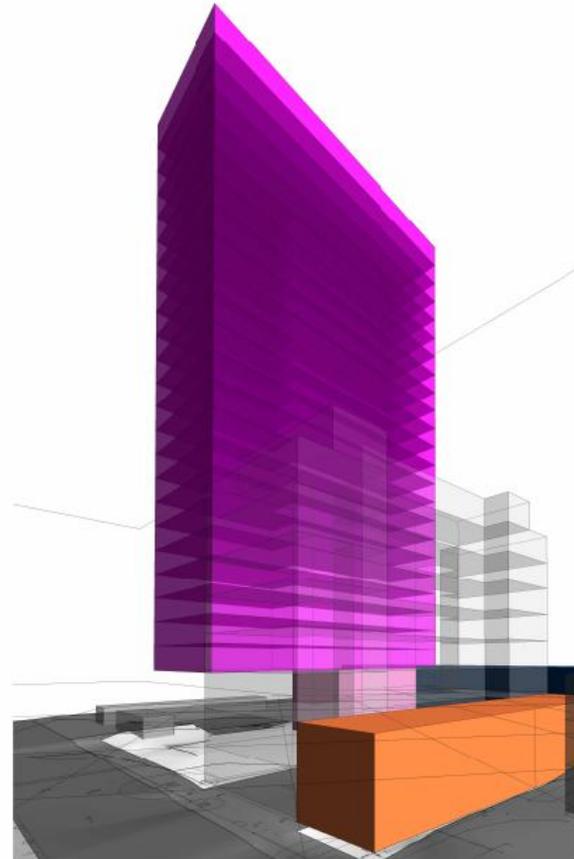
LEGENDA MASSA



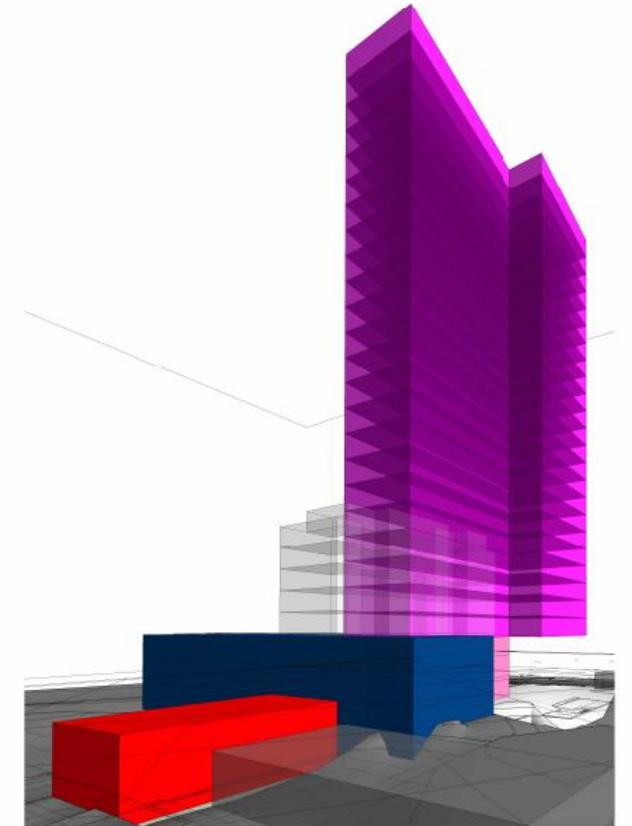
Modelagem BIM
Perspectiva
Francisco Leitão
Cenário Residencial
h=80M



ISO 01 - VISTA FRANCISCO LEITÃO 1 - PERSPECTIVA



ISO 02 - VISTA FRANCISCO LEITÃO 2 - PERSPECTIVA



ISO 03 - VISTA FRANCISCO LEITÃO 3 - PERSPECTIVA HENRIQUE SHC.

Renderização com uso de IA

Isométrica Francisco Leitão

EXPLORE COMPOSE **REFINE**

📁 ⚙️ ⏴ ⏵ 🔄

📁 👁️ ↻



Geometry Override ⓘ 37

Material Override ⓘ 100

Width ⓘ 1024

Height ⓘ 1024

Is Interior Is Aerial View

Turbo Nature Atmospheric

Prompt ⓘ

Residential building with late 80's modernist brazilian architecture

Prompt Strength ⓘ 60

Seed ⓘ automatic



Render Time: 27.254s

RENDER



EXPLORE

COMPOSE

REFINE



Geometry Override ⓘ

37

Material Override ⓘ

100

Width ⓘ

1024

Height ⓘ

1024

Is Interior

Is Aerial View

Turbo Nature

Atmospheric

Prompt ⓘ

Residential building with late 80's modernist brazilian architecture. Ground volumes with glazing

Prompt Strength ⓘ

78

Seed ⓘ

automatic



Render Time



RENDER

Renderização com uso de IA

Isométrica Francisco Leitão



EXPLORE

COMPOSE

REFINE



Geometry Override 21

Material Override 100

Width 1024

Height 1024

Is Interior Is Aerial View

Turbo Nature Atmospheric

Prompt

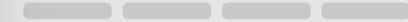
Residential building with late 80's modernist brazilian architecture. Ground volumes with glazing. Make perimetral wall with 1.50meter.

Prompt Strength 100

Seed automatic



Render



RENDER

Renderização com uso de IA

Isométrica Francisco Leitão



EXPLORE

COMPOSE

REFINE



Geometry Override ⓘ 21

Material Override ⓘ 100

Width ⓘ 1024

Height ⓘ 1024

Is Interior Is Aerial View

Turbo Nature Atmospheric

Prompt ⓘ

More landscape on every level

Prompt Strength ⓘ 100

Seed ⓘ automatic



Render Time: 50.219s

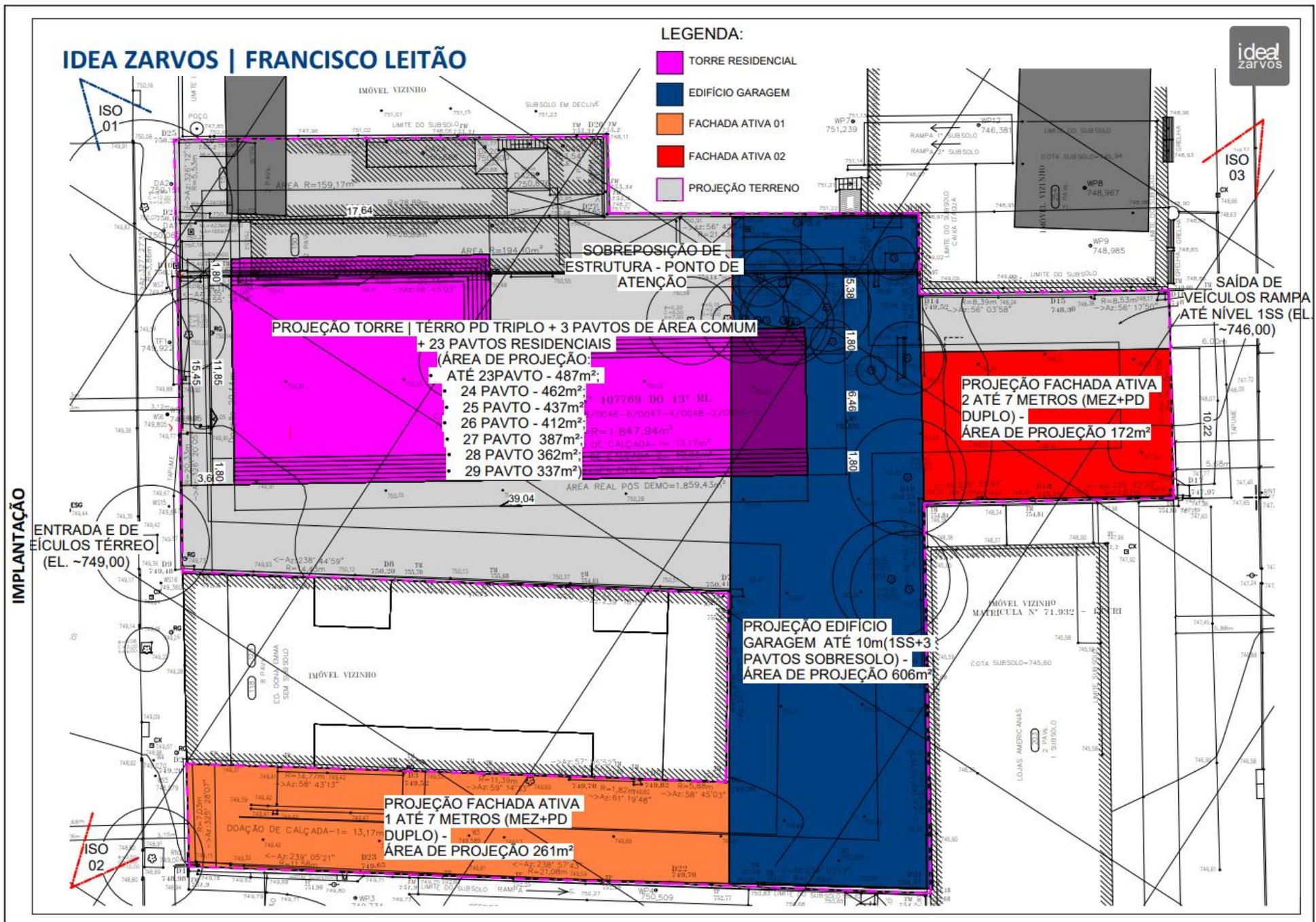


RENDER

Renderização com uso de IA
Isométrica Francisco Leitão



Modelagem BIM
 Planta
 Francisco Leitão
 Cenário Residencial
 h=100M

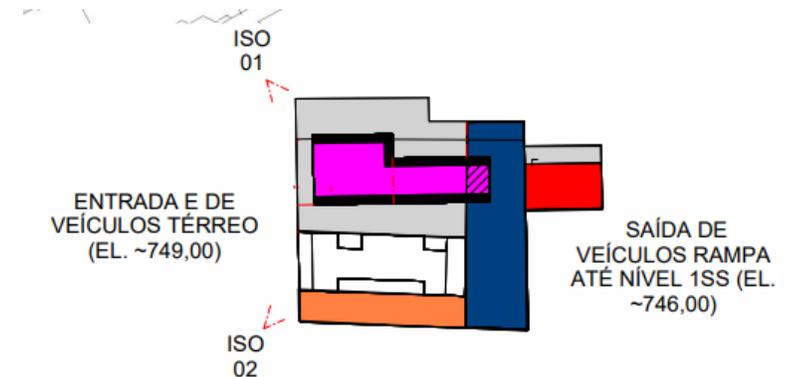
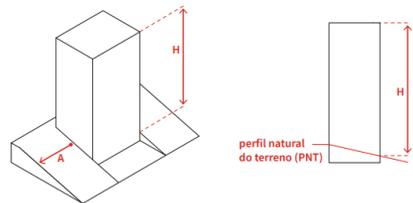


Modelagem BIM
Isométrica
Francisco Leitão
Cenário Residencial
h=100M

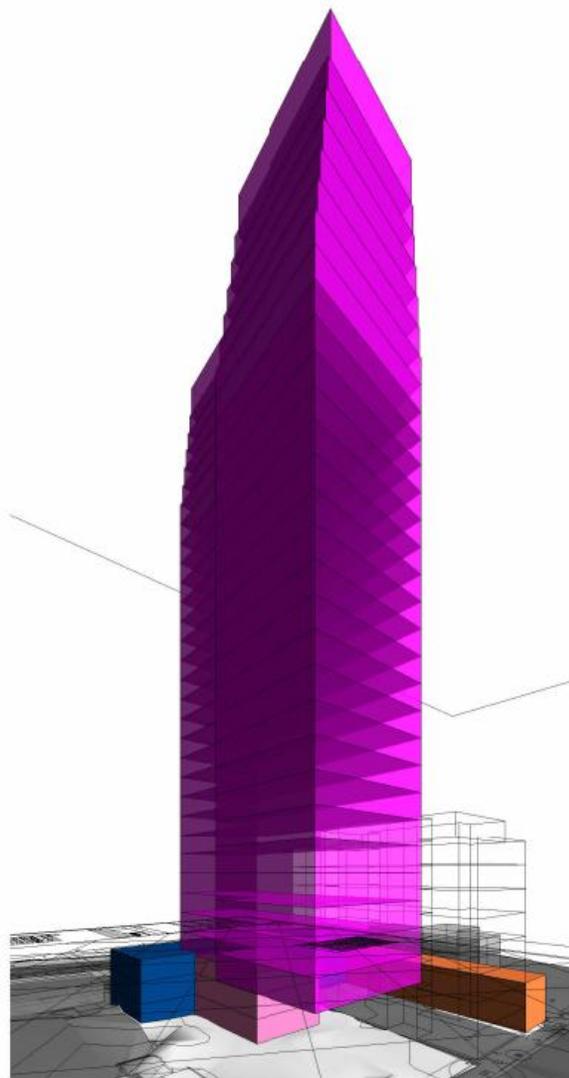
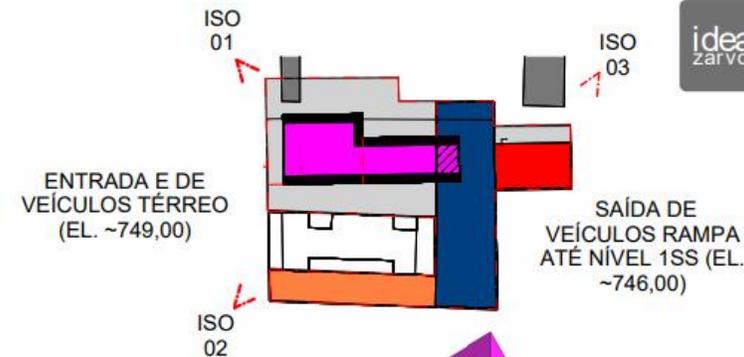
ESTUDO DE MASSA



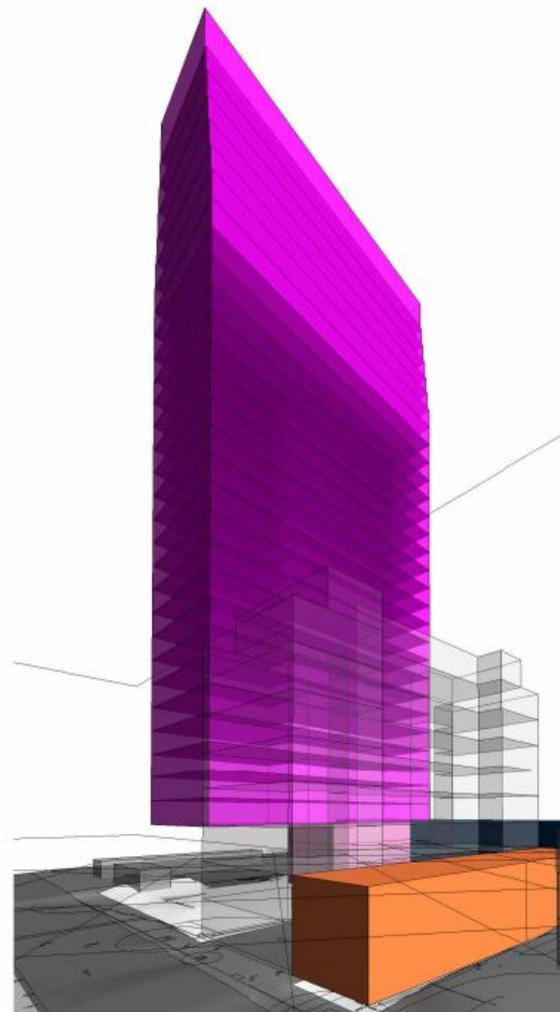
6.G.4. A previsão do elevador de emergência no uso residencial multifamiliar será obrigatória quando a altura da edificação for superior a 80 m (oitenta metros).



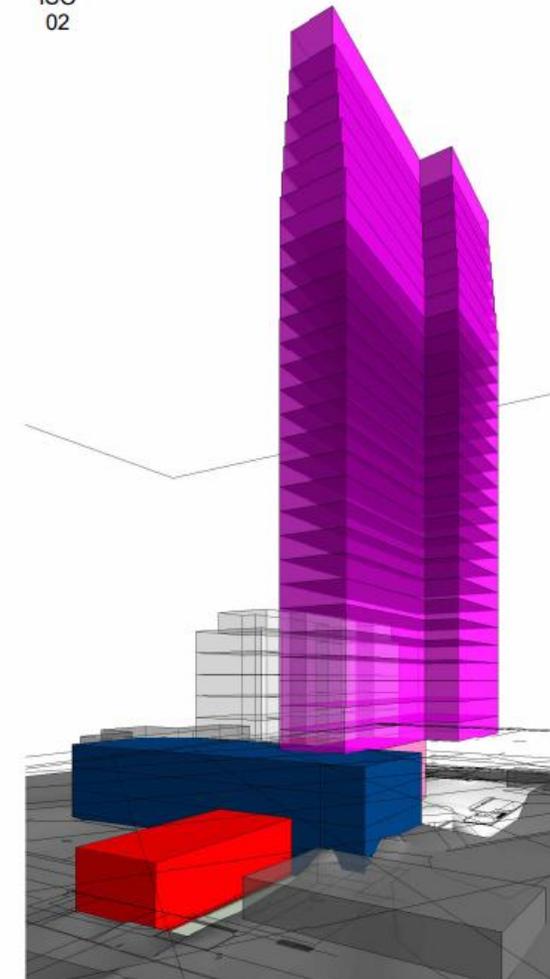
Modelagem BIM
Perspectiva
Francisco Leitão
Cenário Residencial
h=100M



ISO 01 - VISTA FRANCISCO LEITÃO 1 - PERSPECTIVA



ISO 02 - VISTA FRANCISCO LEITÃO 2 - PERSPECTIVA



ISO 03 - VISTA FRANCISCO LEITÃO 3 - PERSPECTIVA HENRIQUE SHC.

Renderização com
uso de IA
Isométrica Henrique
Schauman

COST STUDY - FRANCISCO LEITÃO I							
LABEL	DESCRIPTION	ÁREA / LEVEL (m ²)	NUMBER LEVEL	TOTAL CONSTRUCTED AREA (m ²)	SALEBLE AREA (m ²)	COST/ m ² AC (R\$)	TOTAL COST (R\$)
MAGENTA	TORRE RESIDENCIAL	487,00	23,00	11.201,00	10.051,00	7.000,00	78.407.000,00
ROSA	TORRE RESIDENCIAL (ÁREA COMUM)	167,00	3,00	501,00	0,00	7.000,00	3.507.000,00
AZUL	EDIFICO GARAGEM	606,00	4,00	2.424,00	0,00	4.125,00	9.999.000,00
LARANJA	FACHADA ATIVA	261,00	1,30	339,30	339,30	5.000,00	1.696.500,00
VERMELHO	FACHADA ATIVA 2	172,00	1,30	223,60	223,60	4.500,00	1.006.200,00
TOTAL GARAGEM+FACHADA 1 + FACHADA 2+ÁREA COMUM				3.487,90	562,90		16.208.700,00
TOTAL				14.688,90	10.613,90		94.615.700,00
APROVEITAMENTO (AC/AP)						72%	
COST / m² AP						8.914,32	
COST / m² AC						6.441,31	

COST STUDY - FRANCISCO LEITÃO II							
LABEL	DESCRIPTION	ÁREA / LEVEL (m ²)	NUMBER LEVEL	TOTAL CONSTRUCTED AREA (m ²)	SALEBLE AREA (m ²)	COST/ m ² AC (R\$)	TOTAL COST (R\$)
MAGENTA	TORRE RESIDENCIAL (PAVTOS ESCALONADOS 24 A 29)	400,30	6,00	2.401,80	1.981,80	9.000,00	21.616.200,00
MAGENTA	TORRE RESIDENCIAL	487,00	23,00	11.201,00	9.591,00	7.000,00	78.407.000,00
ROSA	TORRE RESIDENCIAL (ÁREA COMUM)	167,00	3,00	501,00	0,00	7.000,00	3.507.000,00
AZUL	EDIFICO GARAGEM	606,00	4,00	2.424,00	0,00	4.125,00	9.999.000,00
LARANJA	FACHADA ATIVA	261,00	1,30	339,30	339,30	5.000,00	1.696.500,00
VERMELHO	FACHADA ATIVA 2	172,00	1,30	223,60	223,60	4.500,00	1.006.200,00
TOTAL GARAGEM+FACHADA 1 + FACHADA 2+ÁREA				3.487,90	562,90		16.208.700,00
TOTAL				17.090,70	12.135,70		116.231.900,00
APROVEITAMENTO (AC/AP)						71%	
COST / m² AP						9.577,68	
COST / m² AC						6.800,89	



Renderização com uso de IA
Isométrica Henrique Schauman



Geometry Override 14

Material Override 100

Is Interior Is Aerial View

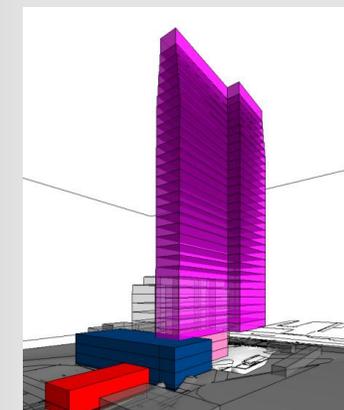
Turbo Nature Atmospheric

Prompt

Consider a project made by Jean Nouvel, in a sunny day, in São Paulo, with birds in the sky

Prompt Strength 60

Seed automatic



Render Time: 28.647s

RENDER SELECTION

Renderização com
uso de IA
Isométrica Henrique
Schauman

EXPLORE COMPOSE REFINE

Geometry Override 14

Material Override 100

Is Interior Is Aerial View

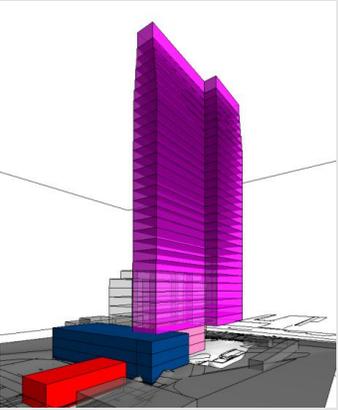
Turbo Nature Atmospheric

Prompt

Considere a project made by Lina Bo Bardi, in a sunny day, in São Paulo, with birds in the sky

Prompt Strength 60

Seed automatic



Render Time: 11.336s

RENDER SELECTION

Four small thumbnail images showing different views and lighting conditions of the skyscraper.



Geometry Override 14

Material Override 100

Width 1024

Height 1024

- Is Interior
- Is Aerial View
- Turbo Nature
- Atmospheric

Prompt ARchitecture of Oscar Niemeyer sunny birds in the sky. avenue in São Paulo background

Prompt Strength 60

Seed automatic

Render Time: 02.732s

RENDER

Renderização com uso de IA
Isométrica Henrique Schauman



EXPLORE

COMPOSE

REFINE



Geometry Override 14

Material Override 100

Width 1024

Height 1024

Is Interior Is Aerial View
Turbo Nature Atmospheric

Prompt
ARchitecture of I M Pei sunny birds in the sky, Sao Paulo

Prompt Strength 60

Seed automatic

Render Time: 15.12s

RENDER

Renderização com
uso de IA
Isométrica Henrique
Schauman



idea!
zarvos

OROBÓ
ESTUDO DE MASSA

DSS PLATFORM

oroobo ospa | São Paulo, SP | Rua Orobo - Alto de Pinheiros, São Paulo - SP, DC

Setor-Quadra-Lote-Digito: 081-104-0001-9, 081-104-0022-2, 081-104-0022-1, 081-104-0022-3, 081-104-0028-4

Codig: 150819, 58858

Coefficiente de aproveitamento da zona: Básico 1,00, Máximo 1,00

Gabarito de altura: 10,00 m

Cota parte: N.A.

Incentivos: Fachada ativa 20,00%, Uso não residencial 0,00% da área computável, Varandas 5,00% da área do lote por andar

Observações: De acordo com o art. 60 da Lei 10.050/2004, alterado pelo art. 21 da Lei 17.976/2023, são concedidos incentivos aos empreendimentos com área destinada a HIS ou HMP, de acordo com os parâmetros estabelecidos pela lei. Terreno em área inundável.

Indicadores Visibilidade: ROI 47,00%, VGV R\$ 88.000.822,78, Margem 28,78%, Lucro R\$ 28.200.048,84

oroobo ospa | São Paulo, SP | Rua Orobo - Alto de Pinheiros, São Paulo - SP, DC

Setor-Quadra-Lote-Digito: 081-104-0001-9, 081-104-0022-2, 081-104-0022-1, 081-104-0022-3, 081-104-0028-4

Codig: 150819, 58858

Coefficiente de aproveitamento da zona: Básico 1,00, Máximo 1,00

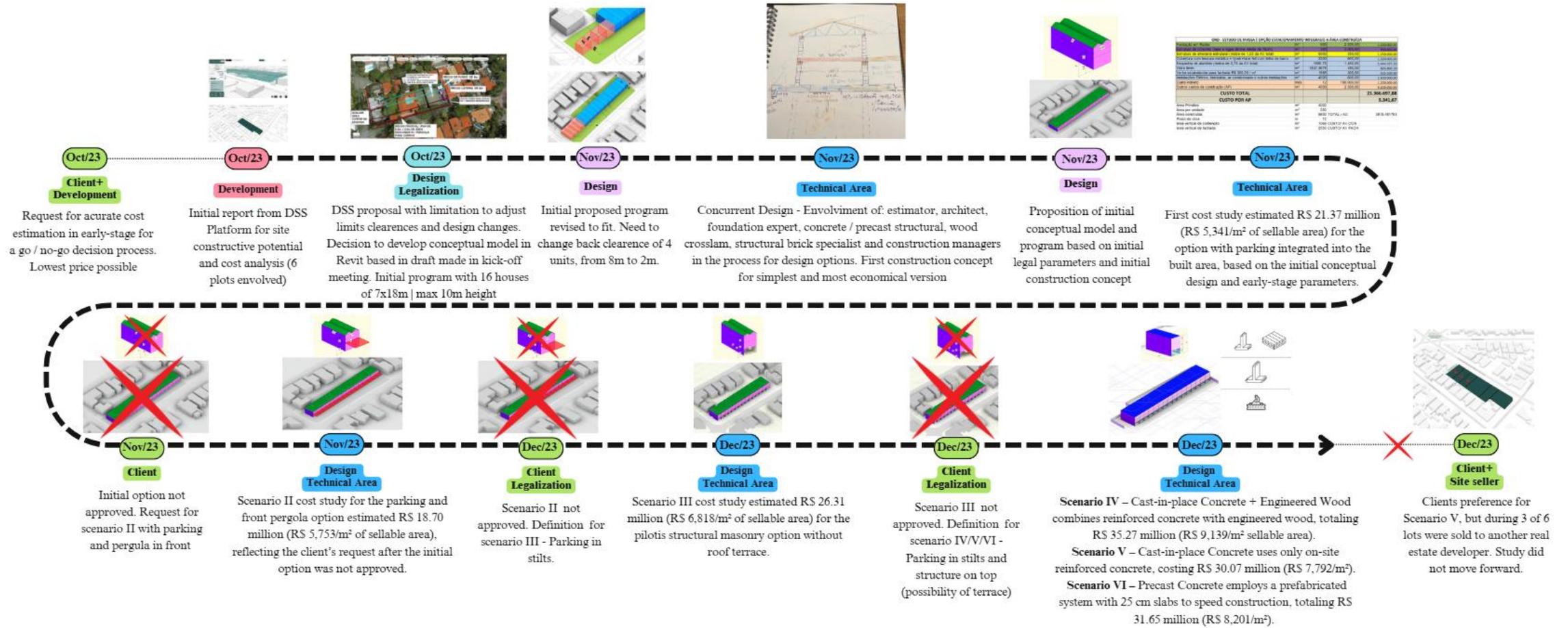
Gabarito de altura: 10,00 m

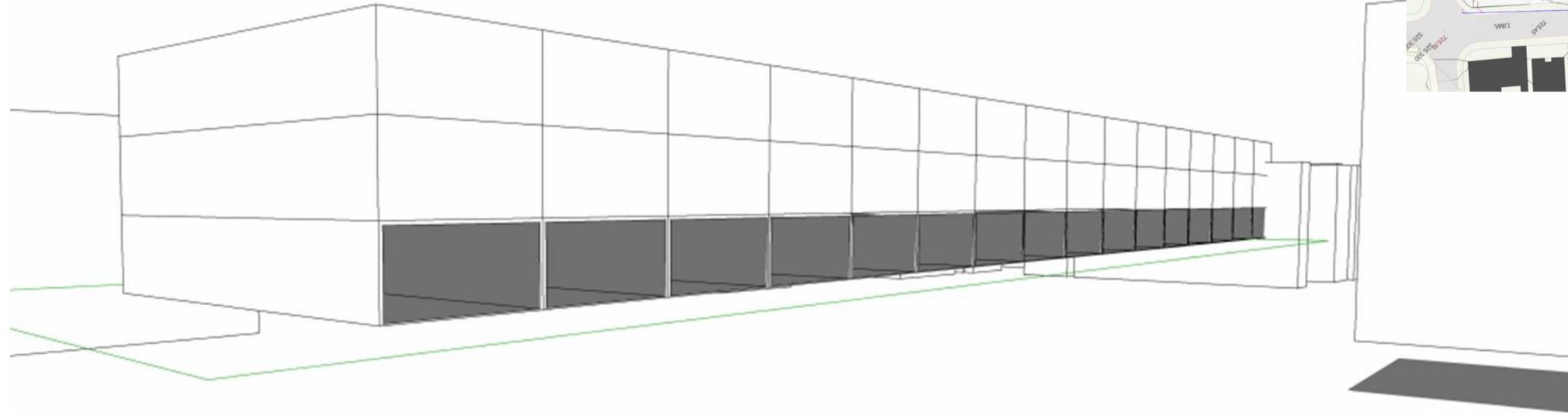
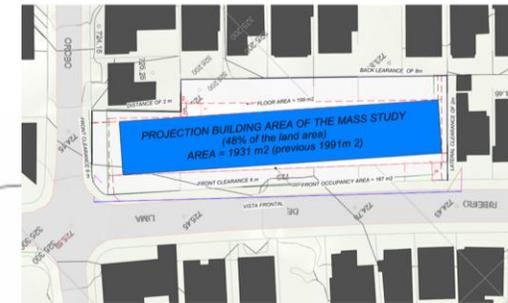
Cota parte: N.A.

Incentivos: Fachada ativa 20,00%, Uso não residencial 0,00% da área computável, Varandas 5,00% da área do lote por andar

Observações: De acordo com o art. 60 da Lei 10.050/2004, alterado pelo art. 21 da Lei 17.976/2023, são concedidos incentivos aos empreendimentos com área destinada a HIS ou HMP, de acordo com os parâmetros estabelecidos pela lei. Terreno em área inundável.

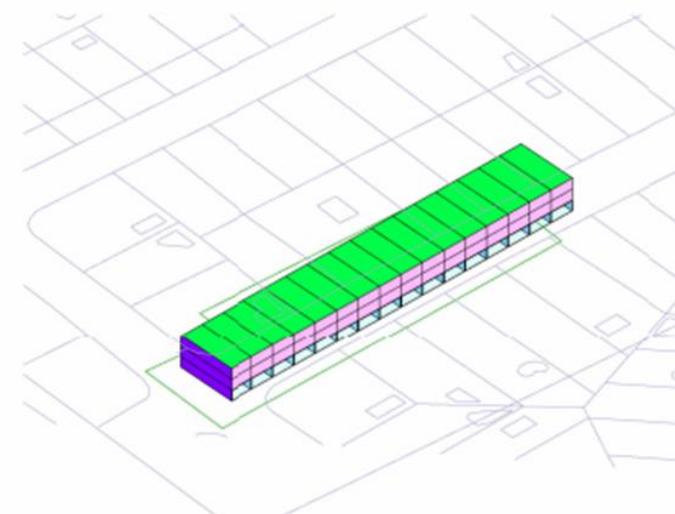
Indicadores Visibilidade: ROI 47,00%, VGV R\$ 88.000.822,78, Margem 28,78%, Lucro R\$ 28.200.048,84





00-ÁREA CONSTRUÍDA (VERDE)	
Material: Description	Area
01-Área piso pavimento pilotis	1.995,68
02 - Área do pavimento 2	1.994,86
03 - Área do pavimento 3	1.994,86
04 - Área cobertura (possível utilização como terraço)	1.994,86
	7.980,25

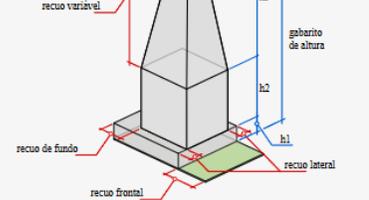
00-ÁREA DE PROJEÇÃO VERTICAL (ROXO E ROSA)	
Material: Description	Area
Área de projeção vertical	5.683,73
Área de projeção vertical de fachada (frente e fundo)	1.857,19
	7.540,92



Nome do estudo 🔗 📄 Salvar

São Paulo, SP ▼ Rua Orobó - Alto de Pinheiros, São Paulo - SP, BR 📍 🗑️ ✎

Alexandre De Almeida Vasconcelos ▼



Zona de construção ZCOR-1 ▼

Altura do envelope aplicar limitação

10,00 m

Recuo frontal 6,00 m

Gerar envelope Apagar

Resultados

Restrições Volumétricas 🔗

Altura máxima alcançada 10,00 m

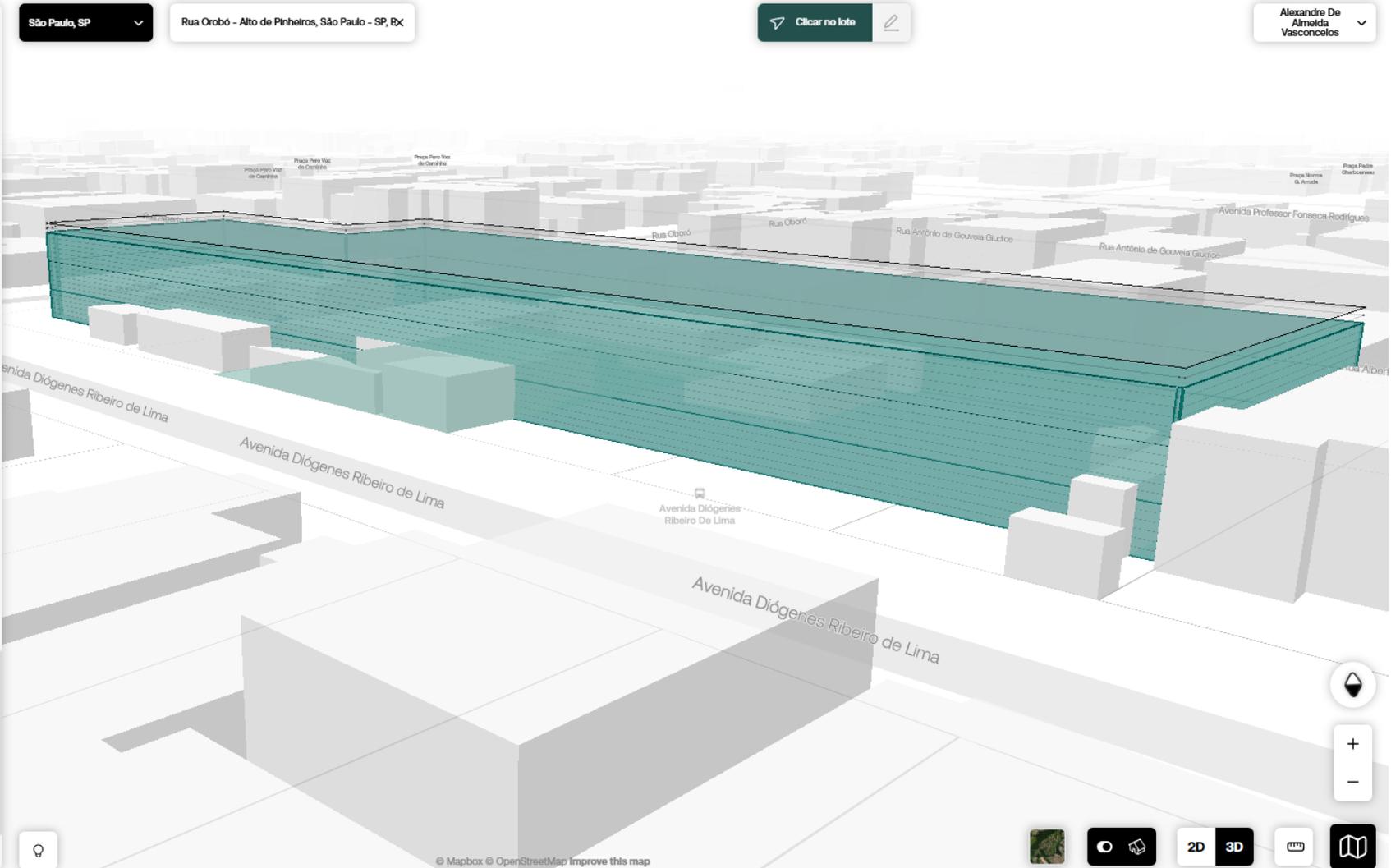
Número de pavimentos obtidos 3

Potencial Volumétrico Estimado 🔗

A volumetria produzida por esta funcionalidade não considera permissões de balanço sobre recuos

Número de pavimentos 3

Indicadores Viabilidade	ROI 📈	4700 %	VGV	R\$ 98.000.162,78
	Margem 📈	28,78 %	Lucro 📈	R\$ 28.200.048,84



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Nome do estudo Salvar

Legislação

Lote nº 965	Área	815,00 m²
Lote nº 1269	Área	1.071,00 m²
Lote nº None	Área	526,00 m²
Lote nº None	Área	532,00 m²
Lote nº 1245	Área	523,00 m²
Lote nº None	Área	560,00 m²
Total		4.027,00 m²

Zona de construção **ZCOR-1**

Setor-Quadra-Lote-Digito

- 081-104-0001-9
- 081-104-0027-2
- 081-104-0022-1
- 081-104-0023-1
- 081-104-0021-3
- 081-104-0026-4

Codlog: 150819, 58858

Coefficiente de aproveitamento da zona: Básico 1,00 / Máximo 1,00

Gabarito de altura: 10,00 m

Cota parte: N.A.

Incentivos	Fachada ativa	20,00 %
	Uso não residencial	0,00 % da área computável

Indicadores Viabilidade

ROI	47,00 %	VGV	R\$ 98.000.162,78
Margem	28,78 %	Lucro	R\$ 28.200.046,84

Nome do estudo Salvar

Cota parte: N.A.

Incentivos	Fachada ativa	20,00 %
	Uso não residencial	0,00 % da área computável
	Varandas	5,00 % da área do lote por andar

Observações

De acordo com o art. 60 da Lei 16.050/2014, alterado pelo art. 21 da Lei 17.975/2023, são concedidos incentivos aos empreendimentos com área destinada a HIS ou HMP, de acordo com os parâmetros estabelecidos pela lei.

Terreno em área inundável.

Viabilidade

Terreno

Área do terreno: 4.027,00 m²

Pagamento em permuta financeira: 0,00 % VGV

Indicadores Viabilidade

ROI	47,00 %	VGV	R\$ 98.000.162,78
Margem	28,78 %	Lucro	R\$ 28.200.046,84

Nome do estudo Salvar

Método de precificação

O objetivo desta análise é precificar o lote com foco na incorporação imobiliária, sem levar em consideração o valor de seus imóveis existentes.

Precificação realizada em parceria com a URBEM, baseada em:

- Investimento de em tesouro direto, corrigido pelo IPCA pós fixado em um tempo de 3 anos. Multiplicando pelo nível de risco a depender do padrão do investimento.

Estimativas

Nesse terreno, o ROI levado em consideração para esta estimativa será 47,00%

De R\$ 2.373.502,20 em dinheiro, até R\$ 3.489.048,23 em permuta

Potencial Construtivo

Coefficiente de aproveitamento utilizado	100
Eficiência	90,00 %
Área computável	4.027,00 m²
Fachada ativa	20,00 % da área do lote
	805,40 m²
Uso não residencial	0,00 % área computável
	0,00 m²

Atividades que configuram uso misto alteradas pelo art. 34 da Lei 18.081/2024.

Áreas adicionais não computáveis	604,05 m²
Área privativa estimada	5.436,45 m²
Área privativa / Área do terreno	1,35
Área total construída	6.040,50 m²

Outorga Onerosa

Outorga onerosa por m² adicional: 2.336,36 R\$/m²

Coefficiente V: 3.337,06

Fator de interesse social (Fi): 1,00

Fator de planejamento (Fp): 0,70

Recursos

Valor de m² de venda: 18.026,50

Receita bruta: 98.000.162,78

Permuta física do terreno: 0,00

Comissões: 6,00 % VGV / 5.880.009,77

Impostos: 4,00 % VGV / 3.820.006,51

Total abatimentos de receita: 9.800.016,28

Outorga Onerosa

Outorga onerosa por m² adicional: 2.336,36 R\$/m²

Coefficiente V: 3.337,06

Fator de interesse social (Fi): 1,00

Fator de planejamento (Fp): 0,70

Recursos

Valor de m² de venda: 18.026,50

Receita bruta: 98.000.162,78

Permuta física do terreno: 0,00

Comissões: 6,00 % VGV / 5.880.009,77

Impostos: 4,00 % VGV / 3.820.006,51

Total abatimentos de receita: 9.800.016,28

Despesas

Compra do terreno: 26.511.845,65

Obra por m² construído: 4.895,00

Total de obra estimado: 29.568.247,50

Custo outorga onerosa: 0,00

Projetos/Aprovações: 2,00 % VGV / 1.960.003,26

Marketing: 2,00 % VGV / 1.960.003,26

Custos extras: 0,00 % VGV / 0,00

Total custos: 60.000.099,86

Volumétrico

A volumetria produzida por esta funcionalidade leva em conta a altura máxima e os recuos estabelecidos pela legislação municipal. As possíveis observações mostradas na seção de Legislação não afetam na volumetria construída.

recuo variável, recuo de fachada, recuo frontal, recuo lateral, gabarito de altura

Zona de construção: ZCOR-1

Altura do envelope: aplicar limitação / 10,00 m

Recuo frontal: 6,00 m

Gerar envelope / Apagar

Gerar envelope Apagar

Resultados

Restrições Volumétricas

Altura máxima alcançada: 10,00 m

Número de pavimentos obtidos: 3

Potencial Volumétrico Estimado

A volumetria produzida por esta funcionalidade não considera permissões de balanço sobre recuos

Número de pavimentos: 3

Área por pavimento: 3.244,47 m²

Área total obtida: 9.733,40 m²

que achou desta funcionalidade?

Indicadores Viabilidade

ROI	47,00 %	VGV	R\$ 98.000.162,78
Margem	28,78 %	Lucro	R\$ 28.200.046,84

Terreno e Legislação

Lote n° 965	Área	815,00 m²
Lote n° 1269	Área	1.071,00 m²
Lote n° None	Área	526,00 m²
Lote n° None	Área	532,00 m²
Lote n° 1245	Área	523,00 m²
Lote n° None	Área	560,00 m²
Total		4.027,00 m²

Zona de construção ZCOR-1

Setor-Quadra-Lote-Dígito
 081-104-0001-9
 081-104-0027-2
 081-104-0022-1
 081-104-0023-1
 081-104-0021-3
 081-104-0026-4

Codlog 150819, 58858

Coefficiente de aproveitamento da zona
 Básico 1,00
 Máximo 1,00

Gabarito de altura 10,00 m

Cota parte N.A.

Incentivos
 Fachada ativa 20,00 %
 Uso não residencial 0,00 % da área computável
 Varandas 5,00 % da área do lote por andar

Observações

De acordo com o art. 60 da Lei 16.050/2014, alterado pelo art. 21 da Lei 17.975/2023, são concedidos incentivos aos empreendimentos com área destinada a HIS ou HMP, de acordo com os parâmetros estabelecidos pela lei.

Terreno em área inundável.

orobo ospa

Elaborado em 12/08/2025

Estudo de Viabilidade

Área do terreno	4.027,00 m ²
Pagamento em permuta financeira	0,00 % VGV
	R\$ 0,00
Pagamento em dinheiro	R\$ 26.511.845,65

Coefficiente de aproveitamento utilizado	1,00
Eficiência	90,00 %
Área computável	4.027,00 m ²
Fachada ativa	20,00 % da área do lote
	805,40 m ²
Uso não residencial	0,00 % área computável
	0,00 m ²

Atividades que configuram uso misto alteradas pelo art. 34 da Lei 18.081/2024.

Áreas adicionais não computáveis	604,05 m ²
Área privativa estimada	5.436,45 m ²
Área privativa / Área do terreno	1,35
Área total construída	6.040,50 m ²

Outorga onerosa por m ² adicional	2.336,36 R\$/m ²
Coefficiente V	R\$ 3.337,66
Fator de interesse social (Fs)	1,00
Fator de planejamento (Fp)	0,70

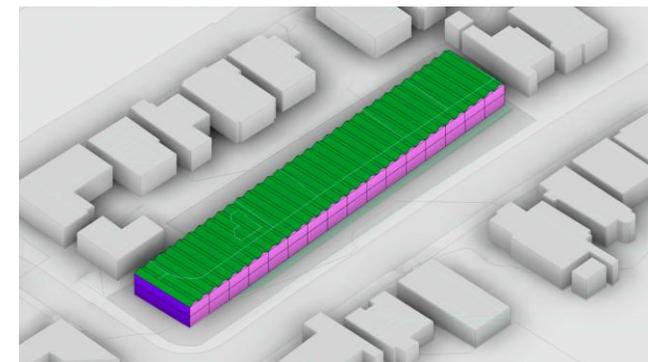
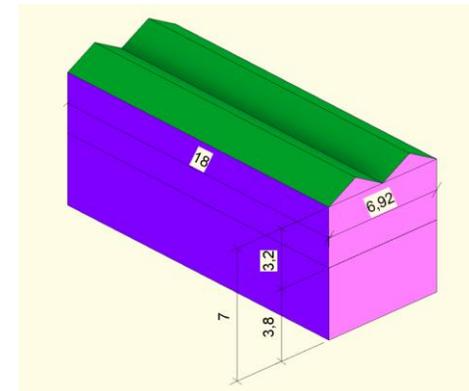
Valor de m ² de venda	R\$ 18.026,50
Receita bruta	R\$ 98.000.162,78
Permuta física do terreno	R\$ 0,00

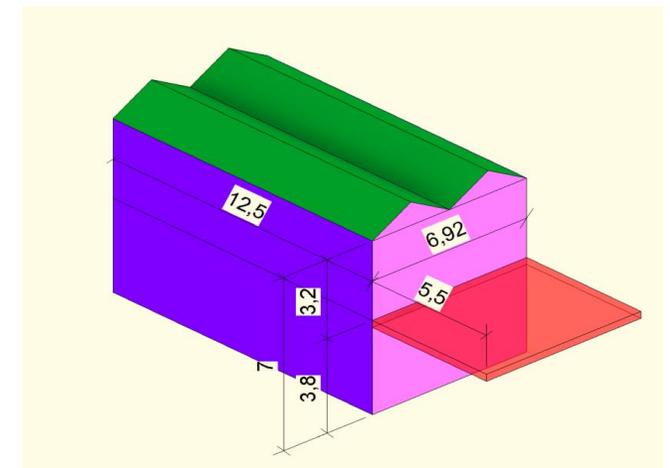
Comissões	6,00 % VGV
	R\$ 5.880.009,77
Impostos	4,00 % VGV
	R\$ 3.920.006,51
Total abatimentos de receita	R\$ 9.800.016,28
Receita líquida	R\$ 88.200.146,50
Compra do terreno	R\$ 26.511.845,65
Obra por m ² construído	R\$ 4.895,00
	by PRO
Total de obra estimado	R\$ 29.568.247,50
Custo outorga onerosa	R\$ 0,00
Projetos/Aprovações	2,00 % VGV
	R\$ 1.960.003,26
Marketing	2,00 % VGV
	R\$ 1.960.003,26
Custos extras	0,00 % VGV
	R\$ 0,00
Total custos	R\$ 60.000.099,66

Indicadores Viabilidade	ROI	47,00 %	VGV	R\$ 98.000.162,78
	Margem	28,78 %	Lucro	R\$ 28.200.046,84

ORO - ESTUDO DE MASSA | OPÇÃO ESTACIONAMENTO INTEGRADO A ÁREA CONSTRUÍDA

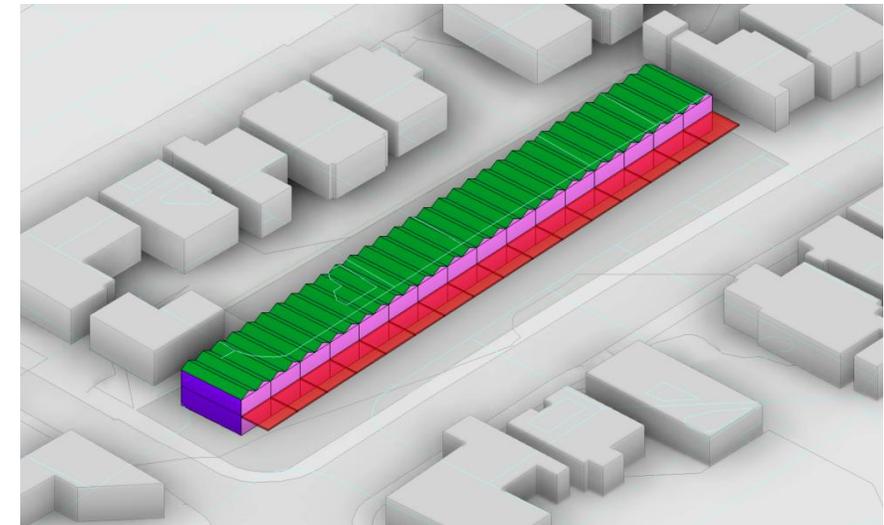
Fundação em Radier	m ³	600	2.200,00	1.320.000,00
Estrutura de concreto (lajes e vigas lâmina média de 15cm)	m ³	300	3.000,00	900.000,00
Estrutura de alvenaria estrutural (índice de 1,25 da AV total)	m ²	5000	250,00	1.250.000,00
Cobertura com tesoura metálica + tyvek+face felt com telha de barro	m ²	2200	600,00	1.320.000,00
Esquadria de alumínio (índice de 0,75 da AV total)	m ²	1685,75	1.450,00	2.444.337,50
Vidro 8mm	m ²	1837,4675	450,00	826.860,38
Verba estabelecida para fachada R\$ 300,00 / m ²	m ²	1685	300,00	505.500,00
Instalações Elétrica, hidráulica, ar condicionado e outras instalações	m ²	4000	600,00	2.400.000,00
Custo indireto	mês	12	100.000,00	1.200.000,00
Outros custos de construção (AP)	m ²	4000	2.300,00	9.200.000,00
CUSTO TOTAL				21.366.697,88
CUSTO POR AP				5.341,67
Área Privativa	m ²	4000		
Área por unidade	m ²	250		
Área construída	m ²	5600	TOTAL / AC	3815,481763
Prazo da obra	m	12		
área vertical de contenção	m ²	1069	CUSTO/ AV CON	
área vertical de fachada	m ²	2550	CUSTO/ AV FACH	

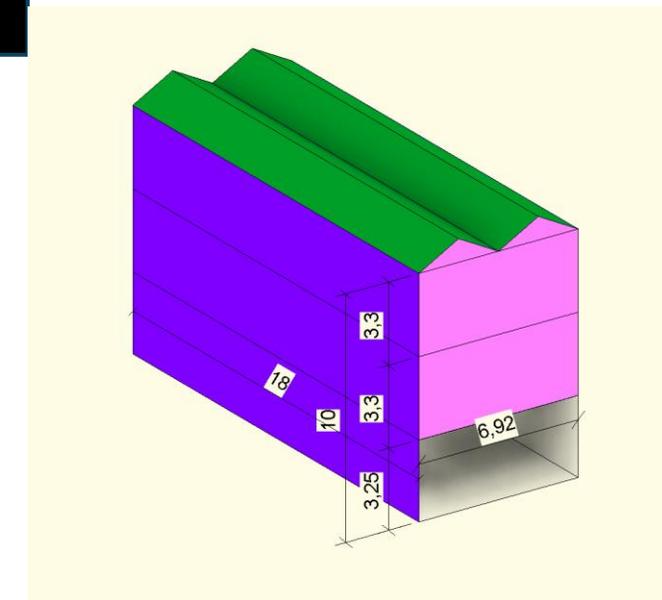




ORO - ESTUDO DE MASSA | OPÇÃO COM PERGOLADO

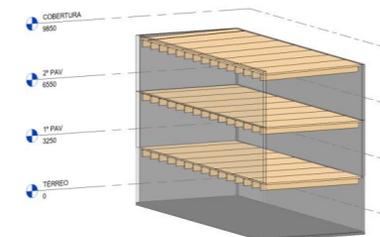
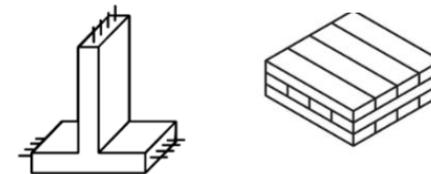
Fundação em Radier	m ³	420	2.200,00	924.000,00
Estrutura de concreto (lajes e vigas lâmina média de 15cm)	m ³	210	3.000,00	630.000,00
Estrutura de alvenaria estrutural (índice de 1,25 da AV total)	m ³	3500	250,00	875.000,00
Cobertura com tesoura metálica + tyvek+face felt com telha de barro	m ²	1573	1.300,00	2.044.900,00
Pérgolado em madeira	m ²	1300	1.450,00	1.885.000,00
Esquadria de alumínio (índice de 1,10 da AV total)	m ²	1685	1.450,00	2.443.250,00
Vidro 8mm	m ²	1836,65	450,00	826.492,50
Verba estabelecida para fachada R\$ 300,00 / m ²	m ²	1427	300,00	428.100,00
Instalações Elétrica, hidráulica, ar condicionado e outras instalações	m ²	2600	600,00	1.560.000,00
Custo indireto	mês	11	100.000,00	1.100.000,00
Outros custos de construção (AP)	m ²	2600	2.300,00	5.980.000,00
CUSTO TOTAL				18.696.742,50
CUSTO POR AP				5.752,84
Área Privativa	m ²	3250		
Área por unidade	m ²	203,125		
Área construída	m ²	4550	TOTAL / AC	4109,174176
Prazo da obra	m	12		
área vertical de contenção	m ²	1069	CUSTO/ AV CON	
área vertical de fachada	m ²	2550	CUSTO/ AV FACH	



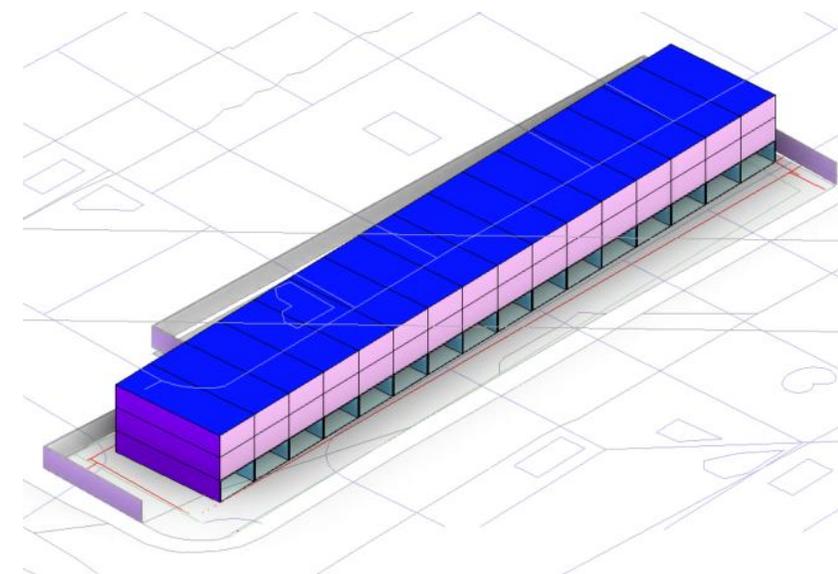


ORO - ESTUDO DE MASSA OPÇÃO PILOTIS COM ESTRUTURA DE ALVENARIA ESTRUTURAL (sem terraço na cobertura)				
Fundação em estaca + bloco + piso sobre solo	m³	964,5	300,00	289.350,00
Estrutura de concreto (lajes e vigas lâmina média de 15cm)	m³	578,7	3.000,00	1.736.100,00
Estrutura de alvenaria estrutural (índice de 1,25 da AV total)	m²	7875	250,00	1.968.750,00
Cobertura com tesoura metálica + tyvek+face felt com telha de barro	m²	2200	600,00	1.320.000,00
Esquadria de alumínio (índice de 0,75 da AV total)	m²	1443	1.450,00	2.092.350,00
Vidro 8mm	m²	1572,87	450,00	707.791,50
Verba estabelecida para fachada R\$ 300,00 / m²	m²	1443	300,00	432.900,00
Instalações Elétrica, hidráulica, ar condicionado e outras instalações	m²	3859,2	600,00	2.315.520,00
Custo indireto	mês	14	100.000,00	1.400.000,00
Paisagismo	m²	3859,2	298,48	1.151.898,62
Outros custos de construção (AP)	m²	3859,2	2.001,52	7.724.261,38
Outros custos de construção (AP)	m²	3859,2	840,00	3.241.728,00
Outros custos de construção (Pilotis)	m²	1929,6	1.000,00	1.929.600,00
CUSTO TOTAL				26.310.249,50
CUSTO POR AP				6.817,54
Área Privativa	m²	3859,2		
Área por unidade	m²	241,2		
Área construída	m²	6000	TOTAL / AC	4385,041583
Prazo da obra	m	12		
área vertical de contenção	m²	1069	CUSTO/ AV CON	
área vertical de fachada	m²	2550	CUSTO/ AV FACH	



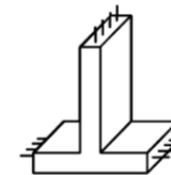


Perspectiva 1
(Estudo)

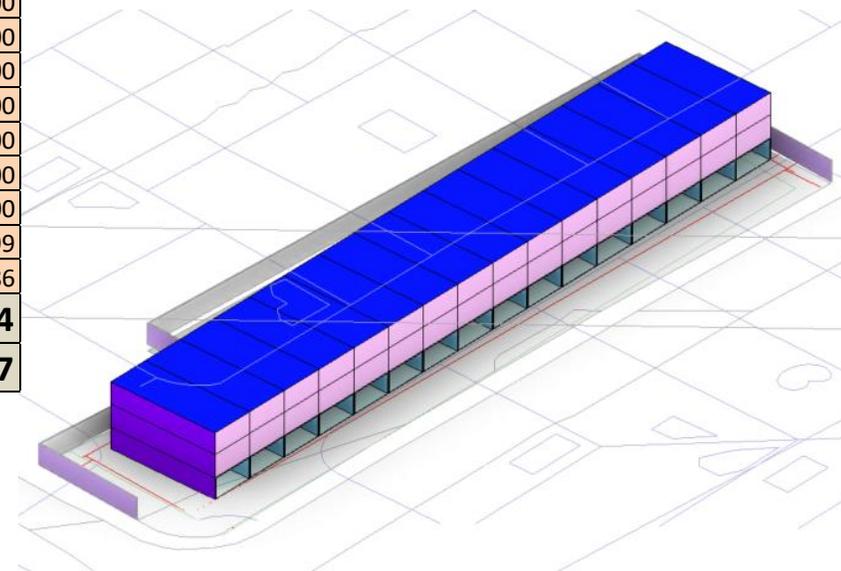
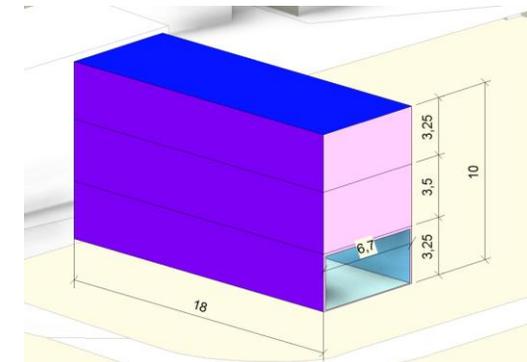


ORO - ESTUDO DE MASSA | OPÇÃO PILOTIS COM ESTRUTURA CONCRETO ARMADO + MADEIRA (com terraço na cobertura)

Fundação em estaca + bloco + piso sobre solo	m³	964,5	3.000,00	2.893.500,00
Estruturas de Madeira Engenheirada (Urban)	m³	776	10.693,94	8.298.500,00
Estrutura de concreto (lajes e vigas lâmina média de 5cm)	m³	192,9	3.000,00	578.700,00
Estrutura de concreto armado (pilares)	m³	489	3.000,00	1.467.000,00
Custos de construção pilotis	m²	1929	1.000,00	1.929.000,00
Impermeabilização e cobertura	m²	1992	1.300,00	2.589.600,00
Esquadria de alumínio (índice de 0,75 da AV total)	m²	1443	1.450,00	2.092.350,00
Vidro 8mm	m²	1572,87	450,00	707.791,50
Verba estabelecida para fachada R\$ 300,00 / m²	m²	1443	300,00	432.900,00
Custo indireto	mês	14	125.000,00	1.750.000,00
Paisagismo	m²	3859,2	300,00	1.157.760,00
Alvenaria, paredes e painéis	m²	3859,2	250,00	964.800,00
Impermeabilização e cobertura	m²	3859,2	125,00	482.400,00
Pintura	m²	3859,2	145,00	559.584,00
Piso	m²	3859,2	190,00	733.248,00
Pedras, mármore e granitos	m²	3859,2	100,00	385.920,00
Instalações e iluminação geral	m²	3859,2	1.350,00	5.209.920,00
Esquadria de madeira	m²	3859,2	50,00	192.960,00
Esquadria metálica	m²	3859,2	60,00	231.552,00
Administração da obra	%	7%	32.657.485,50	2.286.023,99
Assistência técnica	%	1%	32.657.485,50	326.574,86
CUSTO TOTAL				35.270.084,34
				9.139,22



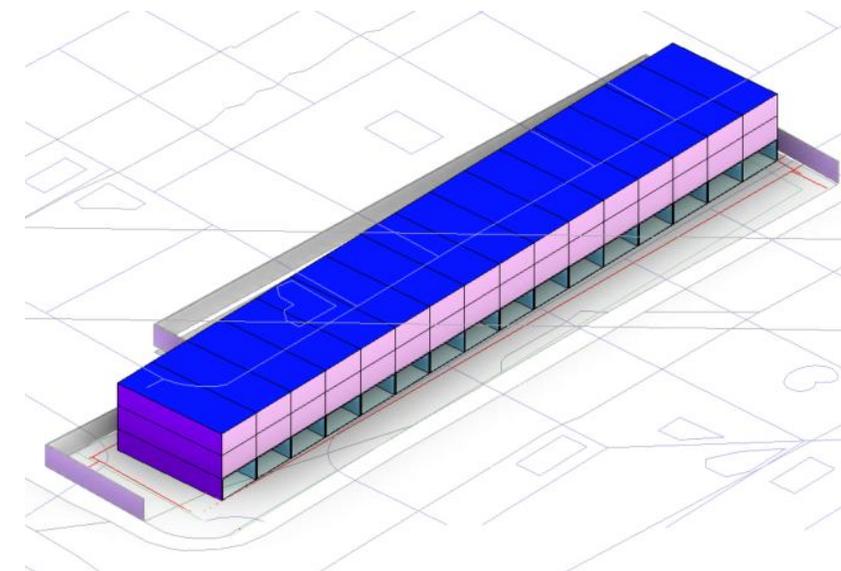
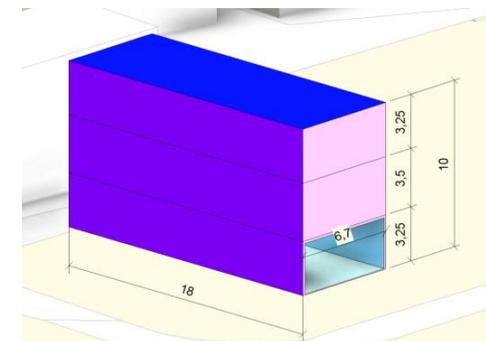
ORO - ESTUDO DE MASSA OPÇÃO PILOTIS COM ESTRUTURA CONCRETO ARMADO (com terraço na cobertura)				
Fundação em estaca + bloco + piso sobre solo	m³	964,5	3.000,00	2.893.500,00
Estrutura de concreto (lajes e vigas lâmina média de 15cm)	m³	1354,7	3.000,00	4.064.100,00
Estrutura de concreto armado (pilares)	m³	489	3.000,00	1.467.000,00
Custos de construção pilotis	m²	1929	1.000,00	1.929.000,00
Impermeabilização e cobertura	m²	1992	1.300,00	2.589.600,00
Esquadria de alumínio (índice de 0,75 da AV total)	m²	1443	1.450,00	2.092.350,00
Vidro 8mm	m²	1572,87	450,00	707.791,50
Verba estabelecida para fachada R\$ 300,00 / m²	m²	1443	300,00	432.900,00
Custo indireto	mês	14	125.000,00	1.750.000,00
Paisagismo	m²	3859,2	300,00	1.157.760,00
Alvenaria, paredes e painéis	m²	3859,2	250,00	964.800,00
Impermeabilização e cobertura	m²	3859,2	125,00	482.400,00
Pintura	m²	3859,2	145,00	559.584,00
Piso	m²	3859,2	190,00	733.248,00
Pedras, mármore e granitos	m²	3859,2	100,00	385.920,00
Instalações e iluminação geral	m²	3859,2	1.350,00	5.209.920,00
Esquadria de madeira	m²	3859,2	50,00	192.960,00
Esquadria metálica	m²	3859,2	60,00	231.552,00
Administração da obra	%	7%	27.844.385,50	1.949.106,99
Assistência técnica	%	1%	27.844.385,50	278.443,86
CUSTO TOTAL				30.071.936,34
				7.792,27



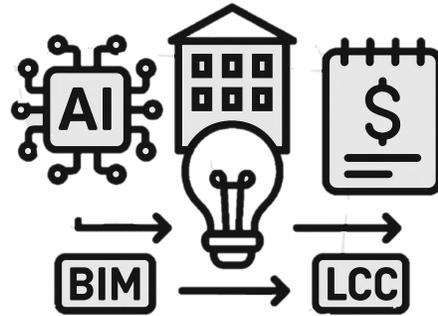


ORO - ESTUDO DE MASSA | OPÇÃO PILOTIS COM ESTRUTURA PRÉ + LAJE PRÉ-MOLDADA

Fundação em estaca + bloco + piso sobre solo	m³	964,5	3.000,00	2.893.500,00
Estrutura de concreto (lajes e vigas lâmina média de 25cm)	m³	1.450,00	3.000,00	4.350.000,00
Estrutura pré-moldada	m³	489	5.000,00	2.445.000,00
Impermeabilização	m²	1900	450,00	855.000,00
Esquadria de alumínio (índice de 0,75 da AV total)	m²	1443	1.450,00	2.092.350,00
Vidro 8mm	m²	1572,87	450,00	707.791,50
Verba estabelecida para fachada R\$ 300,00 / m²	m²	1443	300,00	432.900,00
Instalações Elétrica, hidráulica, ar condicionado e outras instalações	m²	3859,2	1.000,00	3.859.200,00
Custo indireto	mês	14	125.000,00	1.750.000,00
Paisagismo	m²	3859,2	300,00	1.157.760,00
Alvenaria, paredes e painéis	m²	3859,2	250,00	964.800,00
Impermeabilização e cobertura	m²	3859,2	125,00	482.400,00
Pintura	m²	3859,2	145,00	559.584,00
Piso	m²	3859,2	190,00	733.248,00
Pedras, mármore e granitos	m²	3859,2	100,00	385.920,00
Instalações e iluminação geral	m²	3859,2	1.350,00	5.209.920,00
Esquadria de madeira	m²	3859,2	50,00	192.960,00
Esquadria metálica	m²	3859,2	60,00	231.552,00
Administração da obra	%	7%	29.303.885,50	2.051.271,99
Assistência técnica	%	1%	29.303.885,50	293.038,86
CUSTO TOTAL				31.648.196,34
CUSTO POR AP				8.200,71



Optimizing Life-Cycle Cost Decision-Making in Building Construction Projects



MONTREAL, MARCH, 2025

Alexandre De Almeida Vasconcelos

Program: Doctorate in Engineering (3014)

RESEARCH DIRECTOR: : Silvio Melhado (ÉCOLE DE TECHNOLOGIE SUPÉRIEURE)

RESEACH CO-DIRECTOR: Érik Poirier (ÉCOLE DE TECHNOLOGIE SUPÉRIEURE)

ÉCOLE DE TECHNOLOGIE SUPÉRIEURE

UNIVERSITÉ DU QUÉBEC



DGA 1031 - Preliminary Research Specifications

Milestone and deliverable II - Oral presentation

Presentation Index

Part I – General Context

Part II – Introduction And Objectives

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- Objective
- Specific Objectives

Part III – Research Framework And Theoretical Foundations

- Literature Review
- Research Steps
- Type Of Research
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DGA 1031 - Preliminary Research Specifications

Milestone and deliverable II - Oral presentation

Presentation Index

Part I – General Context

DOCTORATE RESEARCH

Introduction

Brazil social-economical information;

Indicator	Brazil (2023)	Canada (2023)
 <p data-bbox="601 411 970 451">Age Since Discovery</p>	523 years (since 1500)	486 years (since 1537)
 <p data-bbox="601 586 1059 626">Geographic Area (sq km)</p>	8.516 million km ²	9.985 million km ²
 <p data-bbox="601 765 932 805">Population (2023)</p>	~203 million	~40 million
 <p data-bbox="601 943 1016 983">Life Expectancy (2023)</p>	76.6 years	82.4 years
 <p data-bbox="601 1093 988 1190">Unemployment Rate (2023)</p>	8.9%	5.5%
 <p data-bbox="601 1243 1085 1393">Source: IBGE, World Bank; Canada: Statistics, World: United Nations, IMF</p>		

DOCTORATE RESEARCH

Introduction

Brazil and Canada social-economical information;

Indicator	Brazil (2023)	Canada (2023)
 <p data-bbox="586 406 968 456">2023 GDP (Nominal)</p>	<p data-bbox="1095 406 1401 456">USD 2.17 trillion</p>	<p data-bbox="1783 406 2089 456">USD 2.14 trillion</p>
 <p data-bbox="586 556 930 664">2023 GDP Growth Percentage</p>	<p data-bbox="1095 585 1197 635">2.3%</p>	<p data-bbox="1783 585 1885 635">1.5%</p>
 <p data-bbox="586 763 1031 813">Sectorial GDP (Services)</p>	<p data-bbox="1095 763 1668 813">70% of GDP (~USD 1.52 trillion)</p>	<p data-bbox="1783 735 2204 842">70% of GDP (~USD 1.50 trillion)</p>
 <p data-bbox="586 942 1031 992">Sectorial GDP (Industry)</p>	<p data-bbox="1095 942 1656 992">22% of GDP (~USD 477 billion)</p>	<p data-bbox="1783 913 2204 1021">29% of GDP (~USD 620 billion)</p>
 <p data-bbox="586 1113 1082 1163">Sectorial GDP (Agriculture)</p>	<p data-bbox="1095 1113 1630 1163">8% of GDP (~USD 174 billion)</p>	<p data-bbox="1783 1085 2153 1192">1% of GDP (~USD 21 billion)</p>



Source: IBGE, World Bank;
 Canada: Statistics, World:
 United Nations. IMF

DOCTORATE RESEARCH

Introduction

Brazil and Canada Construction GPD participation

Indicator	Brazil (2023)	Canada (2023)
 <p>2023 GDP (Nominal)</p>	USD 2.17 trillion	USD 2.14 trillion
 <p>Sectorial GDP (Industry)</p>	22% of GDP (~USD 477 billion)	29% of GDP (~USD 620 billion)
 <p>Contribution to GDP (Construction)</p>	6.5% of GDP (~USD 141 billion) (part of Industry)	5.6% of GDP (~USD 119.03 billion) (part of Industry)



Source: IBGE, World Bank;
 Canada: Statistics, World:
 United Nations, IMF,
 Statista

Indicator	Brazil (2023)	São Paulo (2023)	Correlation (São Paulo / Brazil)
 Population	~203 million	~46 million	22.7%
 Nominal GDP	USD 2.17 trillion	USD 650 billion	30%
 GDP (Agriculture)	8% of GDP (~USD 174 billion)	1% of GDP (~USD 6.5 billion)	3.7% of national agriculture GDP
 GDP (Services)	70% of GDP (~USD 1.52 trillion)	74% of GDP (~USD 481 billion)	31.6% of national services GDP
 GDP (Industry)	22% of GDP (~USD 477 billion)	25% of GDP (~USD 162.5 billion)	34% of national industry GDP
 Contribution to GDP (Construction)	6.5% of GDP (~USD 141 billion)	6.15% of GDP (~USD 40 billion)	28% of national construction GDP

DOCTORATE RESEARCH

Introduction

Importance of São Paulo in Brazil

	Indicator	Brazil (2023)	São Paulo City (2023)	Correlation (São Paulo / Brazil)
	Population	~203 million	~12.4 million	6.1%
	Nominal GDP	USD 2.17 trillion	USD 240 billion	11%
	GDP (Agriculture)	8% of GDP (~USD 174 billion)	Negligible	-
	GDP (Services)	70% of GDP (~USD 1.52 trillion)	8% (~USD 169 million)	Heavier focus on services
	GDP (Industry)	22% of GDP (~USD 477 billion)	~15-16% of GDP (~326 million)	Smaller industrial base
	Contribution to GDP (Construction)	6.5% of GDP (~USD 141 billion)	USD 21-23 billion	~15% of national construction GDP
	Source: IBGE, World Bank; Canada: Statistics, World: United Nations, IMF, CBIC			

- Building construction projects are classified into five main categories: **residential, commercial, industrial, institutional, and mixed-use.** (Construction Industry Institute, 2011)
- In 2024 new building construction projects represented a **\$153.9 billion** in Canada’s annual GDP, marking a **5.8% increase** from 2023.
- Divided in:
 - \$54.6 billion in **multi-dwelling residential projects,**
 - \$47.8 billion in **single-family homes,**
 - \$25.9 billion in **commercial construction**
 - \$10.5 billion in **industrial facilities,**
 - \$15.3 billion in **institutional buildings,**

(Statistics Canada, 2024)

BRASIL x SÃO PAULO **OK!**
 CANADÁ x QUEBEC **PENDENTE!**
 SÃO PAULO x QUEBEC **PENDENTE!**

	<p>Residential Structures intended for private living</p>
	<p>Commercial Buildings designed for business activities</p>
	<p>Industrial Facilities related to production, storage, and logistics</p>
	<p>Institutional Projects serving public, educational, or healthcare</p>
	<p>Mixed-Use Developments combining residential and commercial functions</p>

- Building construction projects are inherently diverse, which makes it difficult to measure the complexity or compare them across categories. As Safa et al. (2015) note, **“fully categorizing construction projects is impossible”** due to wide **variations in size, complexity, technology, and investment scale.**
- Despite the diversity, most building construction projects follow the same **coherent planning structure.** (RIBA Plan of Work, 2020)

	<p>Residential Structures intended for private living</p>
	<p>Commercial Buildings designed for business activities</p>
	<p>Industrial Facilities related to production, storage, and logistics</p>
	<p>Institutional Projects serving public, educational, or healthcare</p>
	<p>Mixed-Use Developments combining residential and commercial functions</p>

That framework is divided into key phases: **Strategic Definition and Preparation, Concept and Developed Design, Technical Design and Documentation, Construction, Handover and Close-Out, and In Use.** This sequence provides a consistent **project coordination** regardless of **project type** or **geographic location.**
(RIBA Plan of Work, 2020)

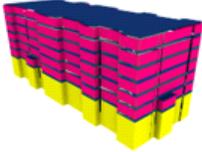
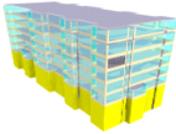
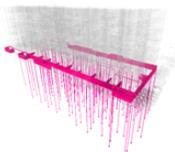
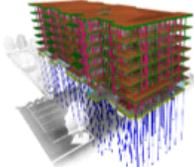
							
	Pre-Design	Concept Design	Design Development	Technical Design / Documentation	Construction	Close-Out / Handover	In Use / Post-Occupancy
RIBA (UK)	Strategic Definition / Preparation and Brief	Concept Design	Developed Design	Technical Design	Construction	Handover & Close Out	In Use
CHOP (Canada)	6.1 – Predesign	6.2 – Schematic Design	6.3 – Design Development	6.4 – Construction Documents	6.5 – Bidding & 6.6 – Construction	6.7 – Post Construction / Close-Out	Not formally defined
Manual de Escopo (Brazil)	Preliminary Study	Preliminary Design	Legal Design	Executive Design	Construction Supervision	Delivery and Technical Assistance	Post-Occupancy / Maintenance

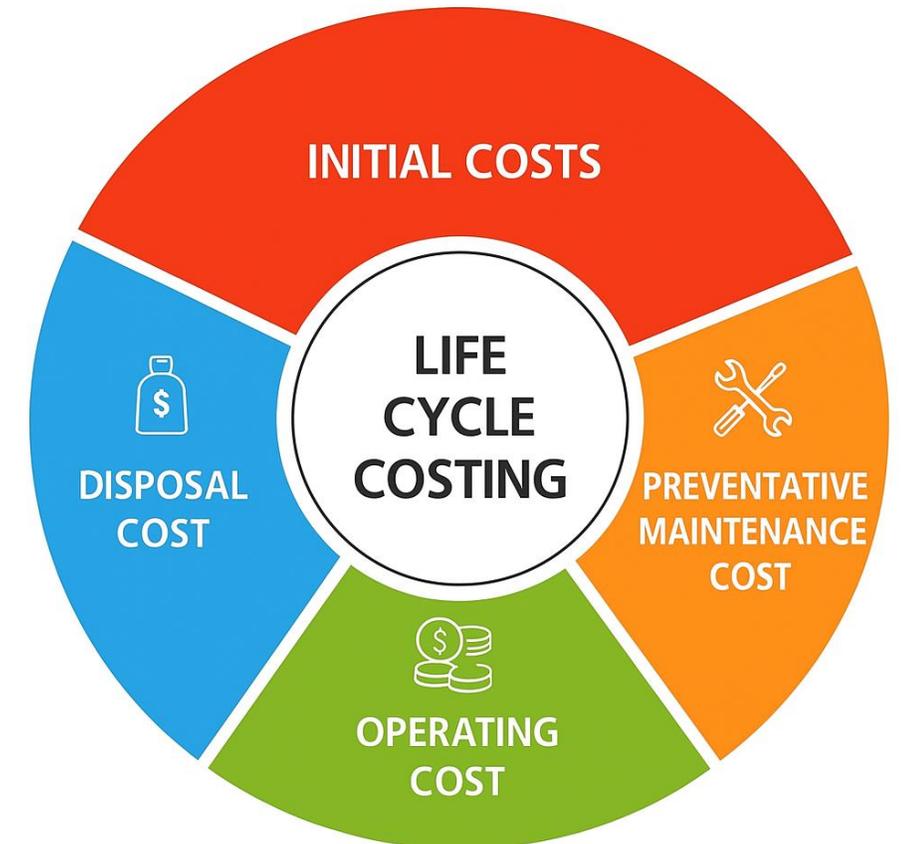
Image 02 – Project Phase Comparison table
 Source: The author

Context – Life Cycle Cost (LCC)

- Life Cycle Costing (LCC) is a method for evaluating the **total ownership cost** of a building or system across its lifespan, including initial investment, operation, maintenance, and disposal (Viscuso et al., 2022). Unlike traditional approaches focused on upfront costs, LCC provides a **long-term financial view**, supporting better decision-making through cost comparisons of alternatives. The typical LCC formula is:

$$LCC = C_i + \sum_{t=1}^N \frac{C_{o,t} + C_{m,t}}{(1+d)^t} + \frac{C_d}{(1+d)^N}$$

- Where, C_i the **initial cost**, $C_{o,t}$ and $C_{m,t}$ are the **operating and maintenance costs** per year t C_d is the **disposal cost**, d the **discount rate**, and N the **analysis period** (Viscuso et al., 2022).



- Çetin et al. (2021) highlight that the construction industry’s dependence on **short-term, linear cost models** hinders progress toward a circular digital built environment.
- A key barrier identified is the **lack of cross-sector coordination tools**, with digital technologies suggested as potential enablers. (Çetin et al., 2021).

Life Cycle Costing Stages (ISO 1586-5)		
Pre-construction	A0	Land and associated fees / early design cost
Production	A1	Raw material supply
Production	A2	Transport and all upstream processes from cradle to gate
Production	A3	Manufacturing of products
Construction	A4	Transportation to the site
Construction	A5	Construction of the civil engineering works
N/A	N/A	N/A
Use	B1	Use
Use	B2	Maintenance
Use	B3	Repair
Use	B4	Replacement
Use	B5	Refurbishment
Use	B6	Use of energy resources
Use	B7	Use of material resources
Use	B8	Water and waste
End of Life	C1	Deconstruction /
End of Life	C2	Transport to waste
End of Life	C3	Waste processing
End of Life	C4	Disposal of waste
End of Life	C5	Re-landscaping

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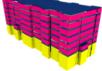
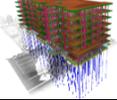
Project Phase Universal Structure		Life Cycle Costing Stages (ISO 1586-5)		
	Pre-Design	Pre-construction	A0	Land and associated fees / early design cost
	Concept Design			
	Design Development			
	Technical Design / Documentation			
	Construction	Production	A1	Raw material supply
		Production	A2	Transport and all upstream processes from cradle to gate
		Production	A3	Manufacturing of products
		Construction	A4	Transportation to the site
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	Close-Out / Handover	N/A	N/A	N/A
	In Use / Post-Occupancy	Use	B1	Use
		Use	B2	Maintenance
		Use	B3	Repair
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		End of Life	C1	Deconstruction /
		End of Life	C2	Transport to waste
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End of Life	C4	Disposal of waste		
End of Life	C5	Re-landscaping		

Image 04 – Project Phases x Life Cycle Costing Stages (adapted from ISO-1586-5)
Source: Author

- Çetin et al. (2021) highlight that the construction industry’s dependence on **short-term, linear cost models** hinders progress toward a circular digital built environment.
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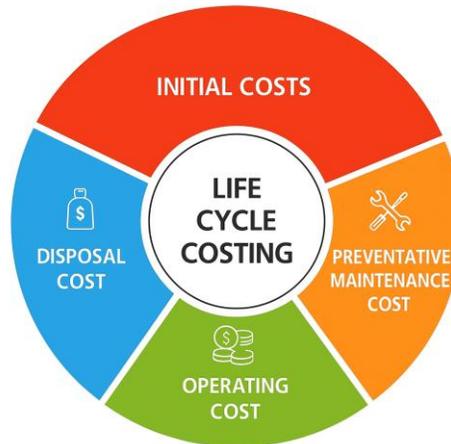


Image 03 – Life Cycle Costing components (adapted from Ooi & Mohammed, 2015)
Source: <https://www.researchgate.net/publication/282464221>

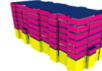
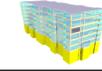
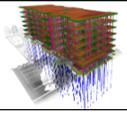
Project Phase Universal Structure		Life Cycle Costing Stages (ISO 1586-5)		
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	Concept Design			
	Design Development			
	Technical Design / Documentation			
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	Close-Out / Handover	N/A	N/A	N/A
	In Use / Post-Occupancy	Use	B1	Use
		Use	B2	Maintenance
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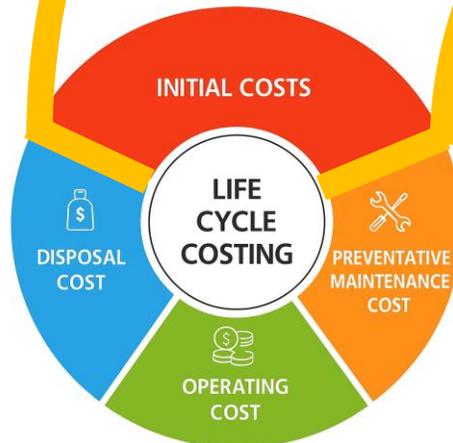


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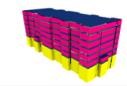
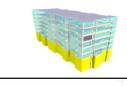
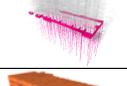
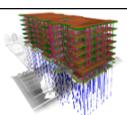
Project Phase Universal Structure		Life Cycle Costing Stages (ISO 1586-5)		
	Pre-Design	Pre-construction	A0	Land and associated fees / early design cost
	Concept Design			
	Design Development			
	Technical Design / Documentation			
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Image 04 – Project Phases x Life Cycle Costing Stages (adapted from ISO-1586-5)
Source: Author

Context – Initial Cost

This image compares **cost estimation practices** across three countries—**UK (RICS)**, **Canada (PWGSC)**, and **Brazil (ABDI)**—through different **project phases**, from **Pre-Design** to **In Use/Post-Occupancy**.

Pre-Design to Design Development:

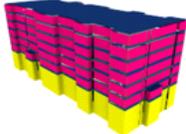
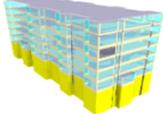
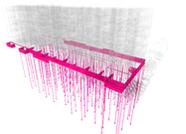
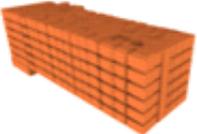
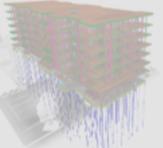
- All three systems begin with **rough estimates** ($\pm 25\text{--}40\%$) and gradually move to more **detailed budgets** ($\pm 10\text{--}15\%$) as project information improves.

Technical Design:

- At this stage, cost plans become **very accurate** ($\pm 5\text{--}10\%$) and often include **market quotations** or are **tender-ready**.

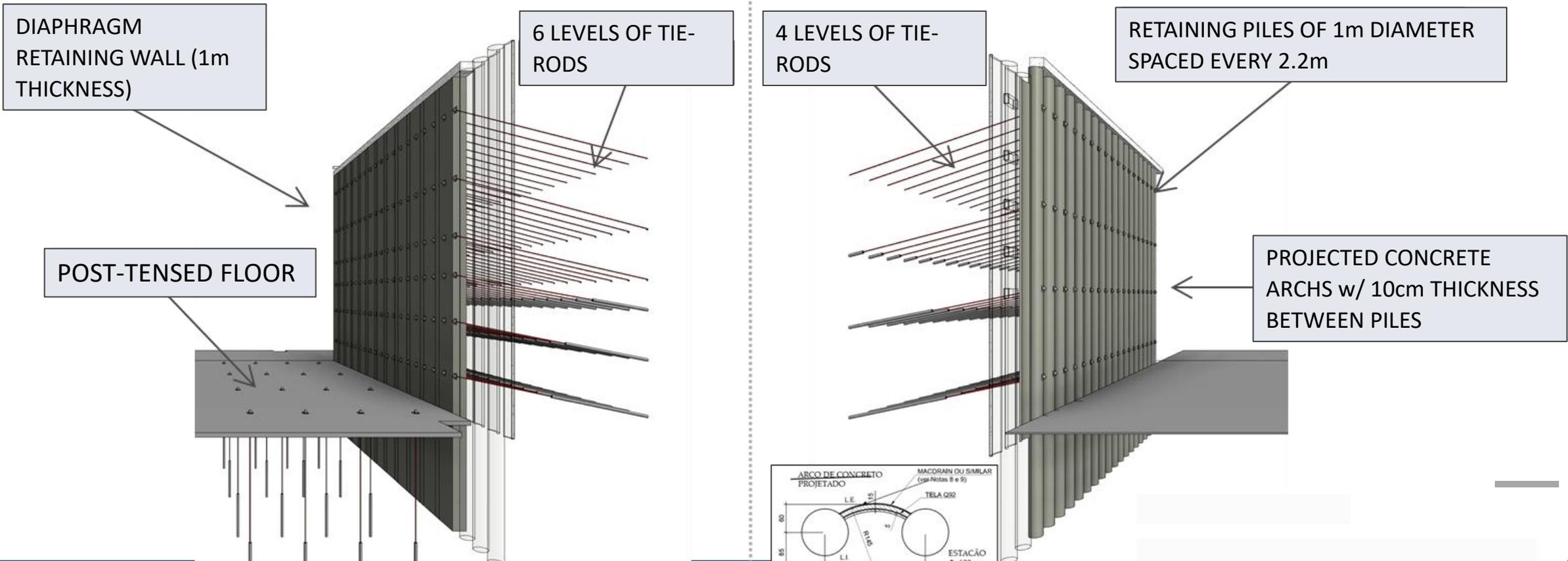
Construction:

- The focus shifts to **cost control and tracking** during execution.

							
	Pre-Design	Concept Design	Design Development	Technical Design / Documentation	Construction	Close-Out / Handover	In Use / Post-Occupancy
RICS (UK)	Order of Cost Estimate - based on benchmarks, $\pm 25\text{--}40\%$	Cost Plan 1 - initial cost plan, $\pm 15\text{--}25\%$	Cost Plan 2 - revised cost plan, $\pm 10\text{--}15\%$	Cost Plan 3 / Pre-Tender Estimate - detailed, $\pm 5\text{--}10\%$	Cost control / cost reporting	Final account / agreement of cost	Post-occupancy evaluation and cost-in-use
PWGSC (Canada)	Class D Estimate - order of magnitude, based on area/volume, $\pm 25\text{--}40\%$	Class C Estimate - preliminary, some system info, $\pm 15\text{--}25\%$	Class B Estimate - pre-tender, detailed, $\pm 10\text{--}15\%$	Class A Estimate - tender-ready, fully detailed, $\pm 5\text{--}10\%$	Cost control updates	Final account reconciliation	Lifecycle and maintenance planning
ABDI (Brazil)	Cost estimation ($\pm 30\%$) based on area and indicators	Preliminary budget ($\pm 20\%$) with data from the preliminary project	Detailed budget of the basic project ($\pm 10\%$) with unit compositions	Executive project budget ($\pm 5\%$) with actual quotations	Cost control and measurements	Commissioning and closure	Management and maintenance

Context – Initial Cost – Value Engineering

	INITIAL SOLUTION	ADOPTED SOLUTION	REDUCTION
LEVELS OF TIE RODS	6	4	33%
CONCRETE VOLUME	35m ³ /m wall	16.7m ³ /m wall	53%
REBARS	3500KG/m wall	2505KG/m wall	29%
POST-TENSED FLOOR	YES	NO	-
DRAINAGE	NO	YES	-



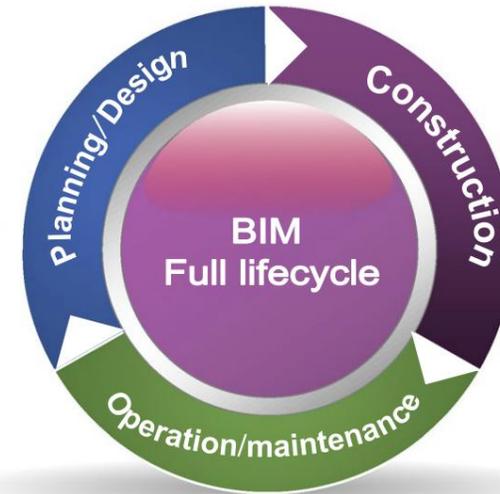
- Artificial intelligence (AI), especially **Deep Neural Networks (DNNs)**, offers potential to improve **early-stage construction cost estimation** by modeling complex relationships.(Xie et al., 2024).
- Techniques like CNNs, RNNs, GANs, and **Large Language Models (LLMs)** such as ChatGPT can support tasks from quantity takeoff to **cost prediction** using **text inputs**. However, practical adoption remains limited due to **data and expertise demands** (Xie et al., 2024).
- **BIM and AI in the Planning and Design phase** of a building’s lifecycle. BIM supports **design, analysis, and documentation**, while AI enhances these tasks through **automated design generation, model checking**, and improved collaboration. This integration improves **early-stage accuracy and decision-making** (Zhou et al., 2023).

BIM functionality:

- Design
- Analysis
- Documentation

AI potential:

- Automated plan/design
- Automated checking
- Close collaboration



BIM functionality:

- Fabrication
- Construction 5D
- Construction logistics

AI potential:

- Inter-discipline decision making
- Risk prediction and responding measure development
- Better understanding of logistics information and construction progress
- Smart robotics

BIM functionality:

- Operation
- Maintenance
- Renovation

AI potential:

- Green and sustainable buildings
- Intelligent control of day-to-day services
- Time-based preventive and corrective maintenance

Image 06 – Potential of BIM-AI integration in three phases throughout a project’s lifecycle
 Source: <https://doi.org/10.1007/s11831-022-09830-8>



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Part II – Introduction And Objectives

Top Causes of Delays and Conflicts:

- **Financial problems**, change orders/variations, and lack of communication/poor relationships are among the **top five global causes of delays and conflicts in construction projects.** (Tariq, J., & Gardezi, S. S. S.,2023)
- **Lack of Communication:** Poor communication and relationships among project stakeholders significantly contribute to project delays and conflicts, leading to **inefficiencies and productivity losses.** (Heizer et al, 2017)

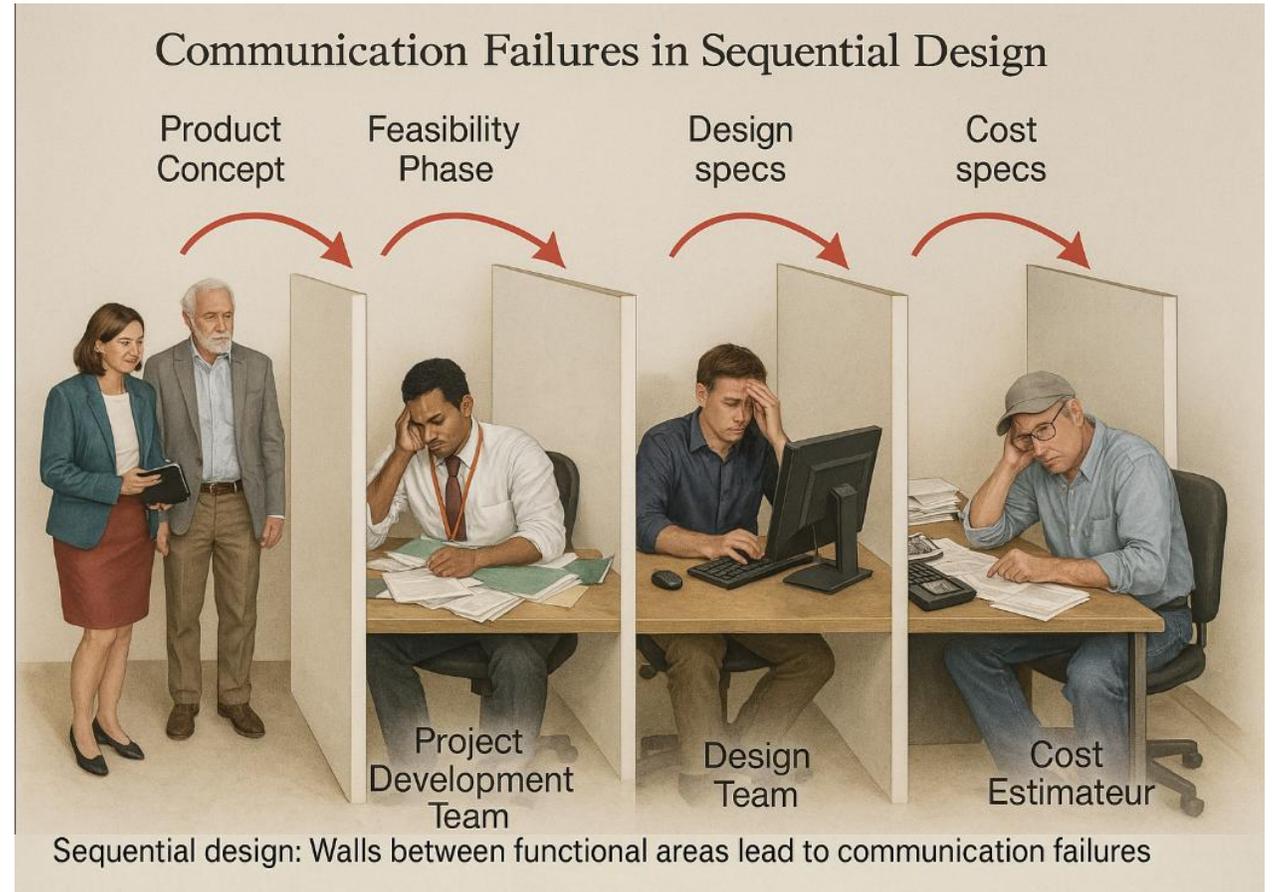


Image 08 – Sequential Design process

Source: Heizer, J., Render, B., & Munson, C. (2017). Operations Management (12th ed.). Pearson Education

OBJECTIVES

This research aims to develop a **decision-support framework for building construction projects integrating Artificial Intelligence (AI), Building Information Modeling (BIM), and Life Cycle Cost (LCC) analysis**. The goal is to establish a **structured system linking design process and cost data** through a **parameterized database** to enable **forecasting** and informed **decision-making** from **early design stages**.

SPECIFIC OBJECTIVES

<p>1. Conduct a bibliometric analysis to map the evolution of research on AI, BIM, and LCC integration in construction, identifying theoretical gaps and opportunities for framework development.</p>	<p>2. Design and prototype a structured decision-support framework linking BIM components (based on LOIN/LOD) with AI-driven cost modeling and LCC data leveraging AI Large Language Models (LLMs) to assess and retrieve cost-related information during the modeling phase for real-time decision support.</p>	<p>3. Validate the proposed AI-BIM-LCC framework through real-world case studies across diverse project typologies (e.g., Brazil and Canada), analyzing its impact on design-phase decision-making, buildability, sustainability, and cost predictability.</p>
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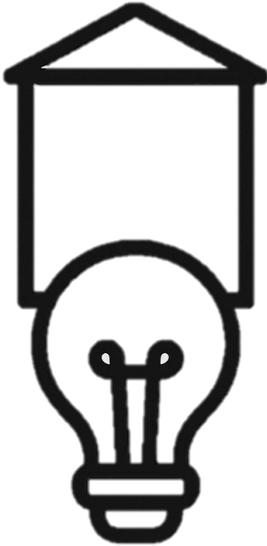


Image 09 –Initial idea icon
Source: Generated by AI.

OBJECTIVES

This research aims to develop a **decision-support framework for building construction projects integrating Artificial Intelligence (AI), Building Information Modeling (BIM), and Life Cycle Cost (LCC) analysis**. The goal is to establish a **structured system linking design process and cost data** through a **parameterized database** to enable **forecasting** and informed **decision-making** from **early design stages**.

SPECIFIC OBJECTIVES

PAPER I

1. Conduct a bibliometric analysis to map the evolution of research on AI, BIM, and LCC integration in construction, identifying theoretical gaps and opportunities for framework development.

PAPER II

2. Design and prototype a structured decision-support framework linking BIM components (based on LOIN/LOD) with AI-driven cost modeling and LCC data leveraging **AI Large Language Models (LLMs)** to assess and retrieve cost-related information during the modeling phase for real-time decision support.

PAPER III

3. Validate the proposed AI-BIM-LCC framework through real-world case studies across diverse project typologies (e.g., Brazil and Canada), analyzing its impact on design-phase decision-making, buildability, sustainability, and cost predictability.

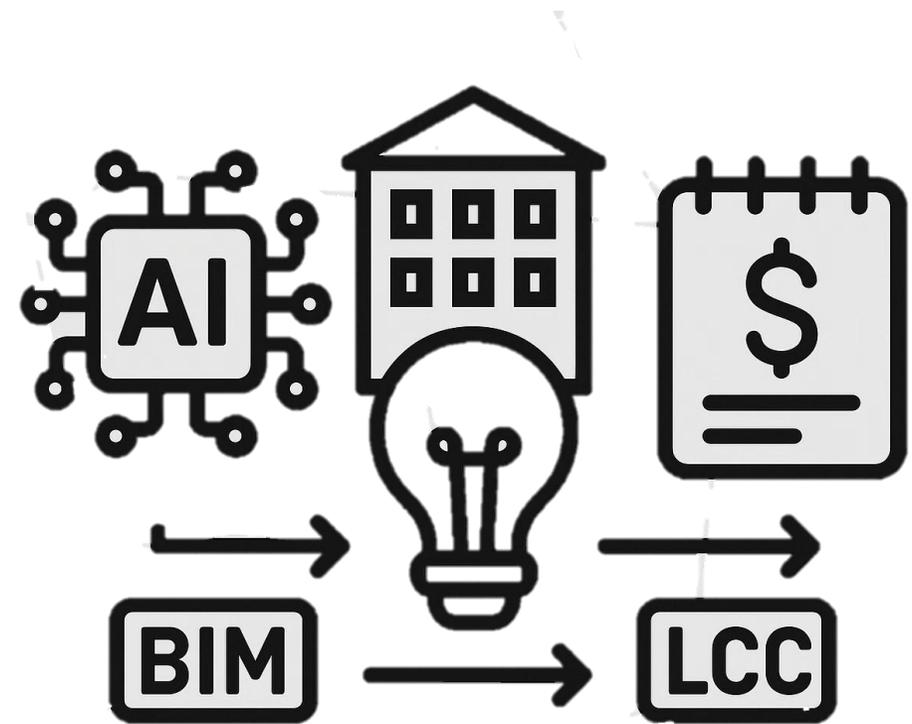


Image 10 –Final idea icon
Source: Generated by AI.



Part III – Research Framework And Theoretical Foundations



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Bibliometric – Artificial Intelligence

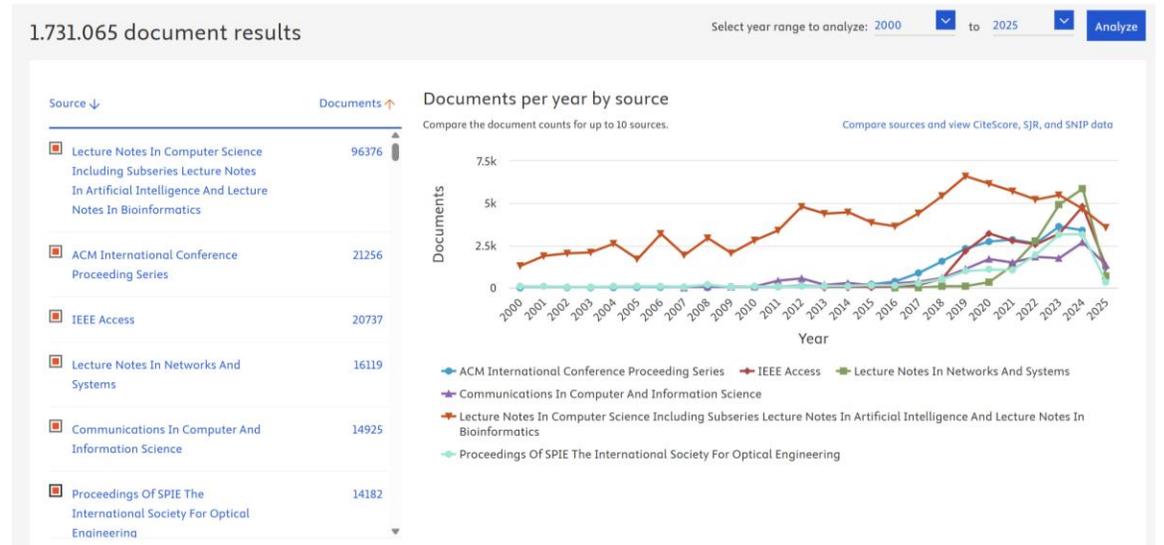
Scopus Search Query:

TITLE-ABS-KEY("artificial intelligence" OR "ai" OR "machine learning" OR "deep learning" OR "LLM" OR "Large Language Model")

Date Range: 2000–2025

Results: 1,731,065 documents

A comprehensive search in **Scopus** returned over 1.7 million documents related to AI. Publications surged after 2018, with most contributions coming from **computer science and engineering outlets** like IEEE and ACM. **China and the U.S.** lead in volume. While AI is widely explored, few studies focus on its integration into the construction sector.



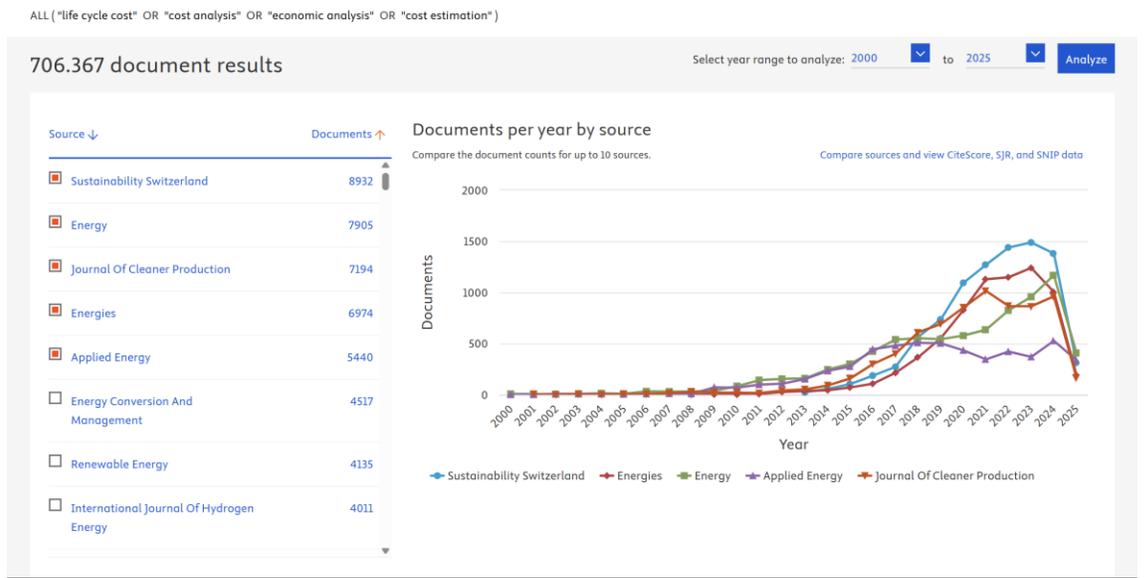
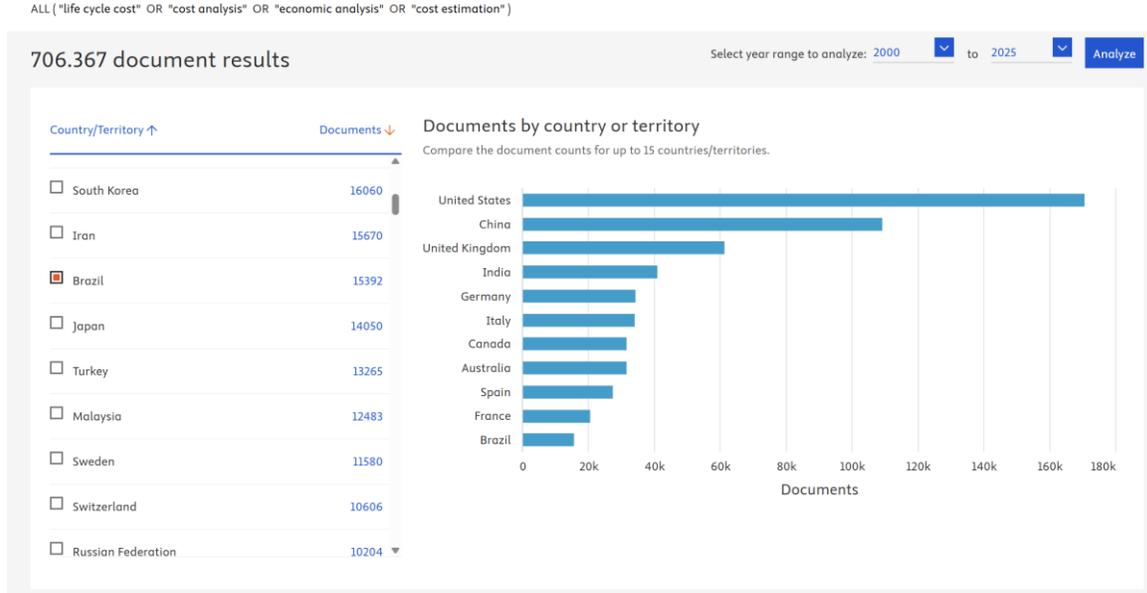
Scopus Search Query:

ALL("life cycle cost" OR "cost analysis" OR "economic analysis" OR "cost estimation")

Date Range: 2000–2025

Results: 706,367 documents

Using **Scopus**, the LCC and cost estimation search yielded over 700k results. Research is heavily represented in **energy and sustainability journals** like *Sustainability* and *Journal of Cleaner Production*. The **U.S., China, and the UK** are the leading contributors. Despite the volume, cost research remains loosely connected to AI and BIM applications.





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Bibliometric – BIM

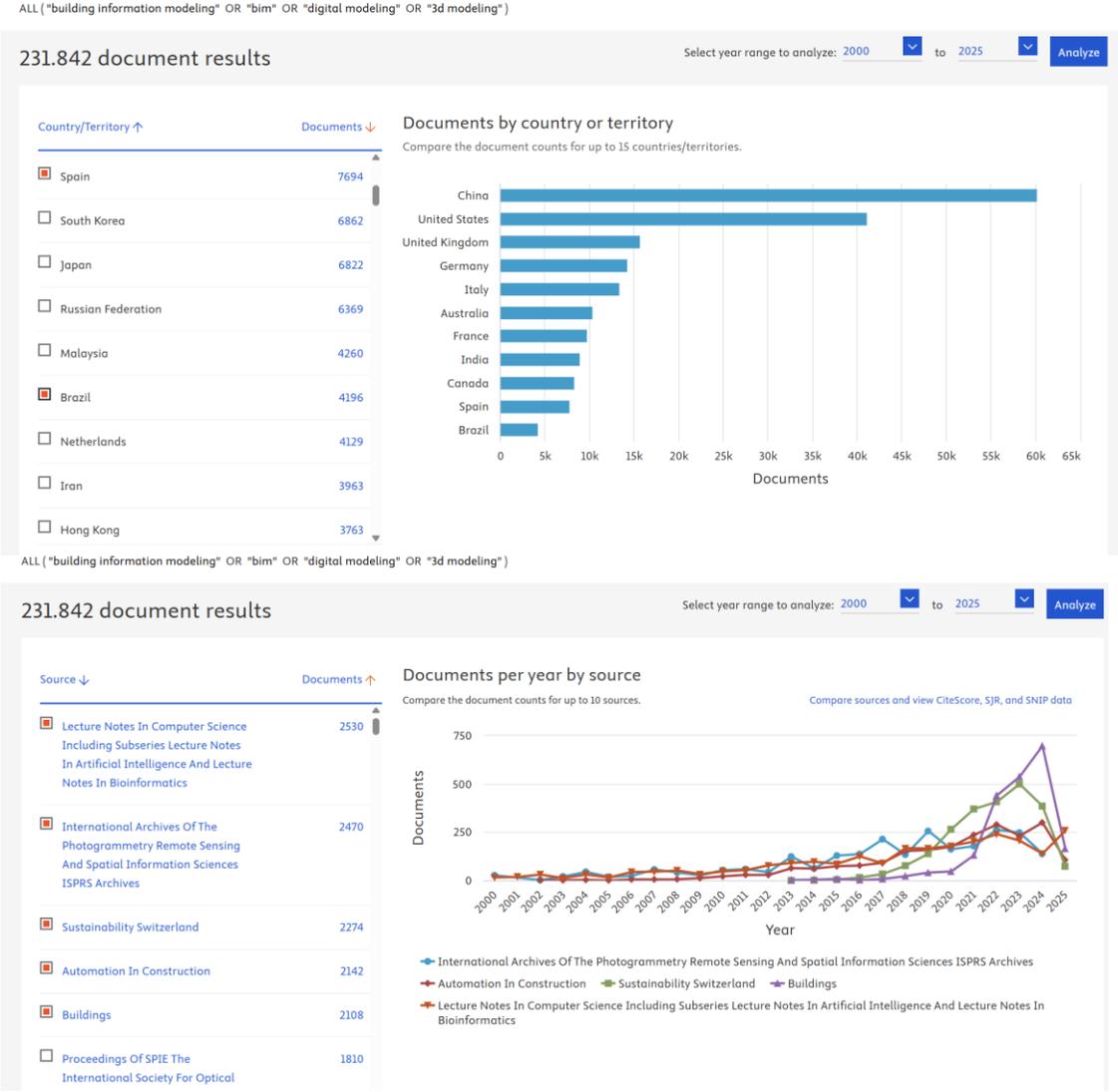
Scopus Search Query:

ALL("building information modeling" OR "BIM" OR "digital modeling" OR "3D modeling")

Date Range: 2000–2025

Results: 231,842 documents

The **Scopus** search for BIM-related literature produced over 230k documents. The field has grown steadily since 2015, with key sources including *Automation in Construction* and *Buildings*. Research is application-focused and concentrated in construction contexts, but often lacks integration with AI or life cycle cost considerations.



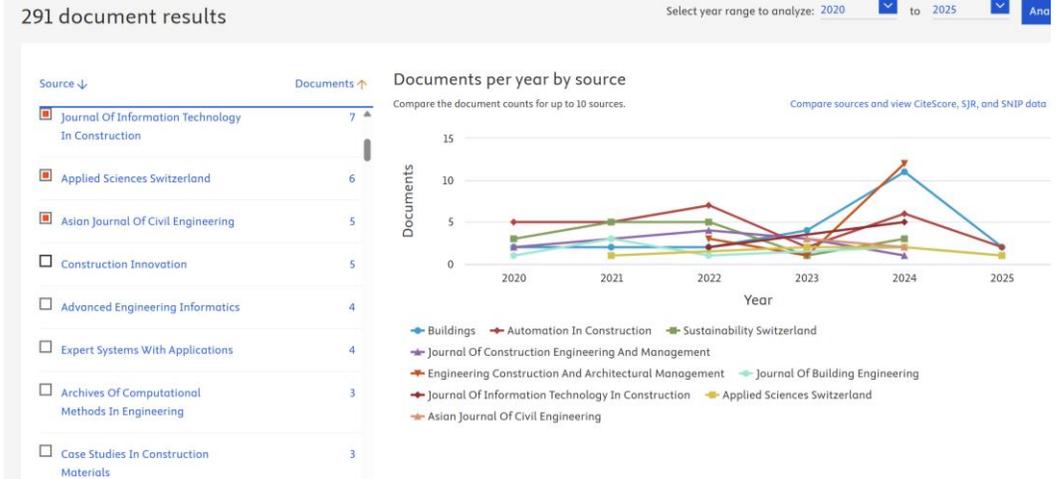
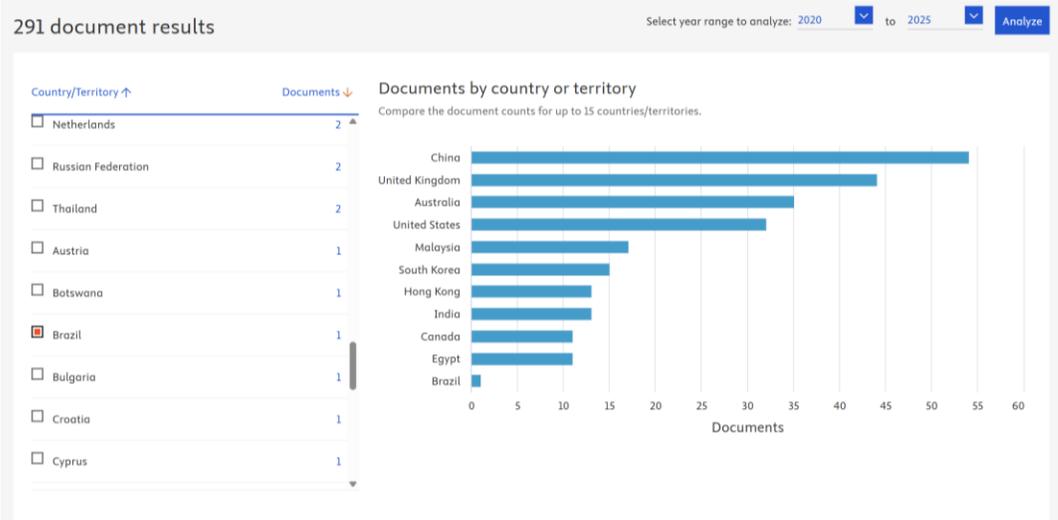
Scopus Search Query:

TITLE-ABS-KEY("artificial intelligence" OR "ai" OR "machine learning" OR "deep learning" OR "LLM") AND ("building information modeling" OR "BIM" OR "digital modeling" OR "3D modeling") AND ("life cycle cost" OR "cost estimation" OR "economic analysis") AND ("construction building" OR "project management" OR "asset management")

Date Range: 2020–2025

Results: 291 documents

This refined search in **Scopus** aimed to identify literature that intersects **AI, BIM, and Life Cycle Costing (LCC)** within the **construction management context**. The narrowed output of **291 documents** highlights the emerging but limited body of research addressing this integration. This confirms a significant **research gap** and justifies the development of a structured framework linking **cost decision-making, AI tools (including LLMs), and BIM-based modeling**.



Manual Screening Process:

From the initial 291 results retrieved using the combined **Scopus search query** integrating AI, BIM, and LCC within the context of building construction and project management, a **targeted manual screening** was conducted.

Selection Criteria:

- Relevance to **AI + BIM + LCC** integration
- Explicit mention of **cost modeling, design-phase support, or decision frameworks**
- Use of **AI techniques** (ML, DL, DNN, GAN, LLMs, etc.) in project modeling
- Applied contributions: conceptual frameworks, case studies, or computational methods
- Exclusion of purely theoretical, off-topic, or duplicate publications

Result: 35 documents selected

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Research Extent - LCC

This research narrows LCC analysis to the **Pre-Use** (design, construction, component-level flows) and **Use Phases**. It excludes material extraction, end-of-use, and broader water and land cycles. Broader circularity aspects are reserved for future work.

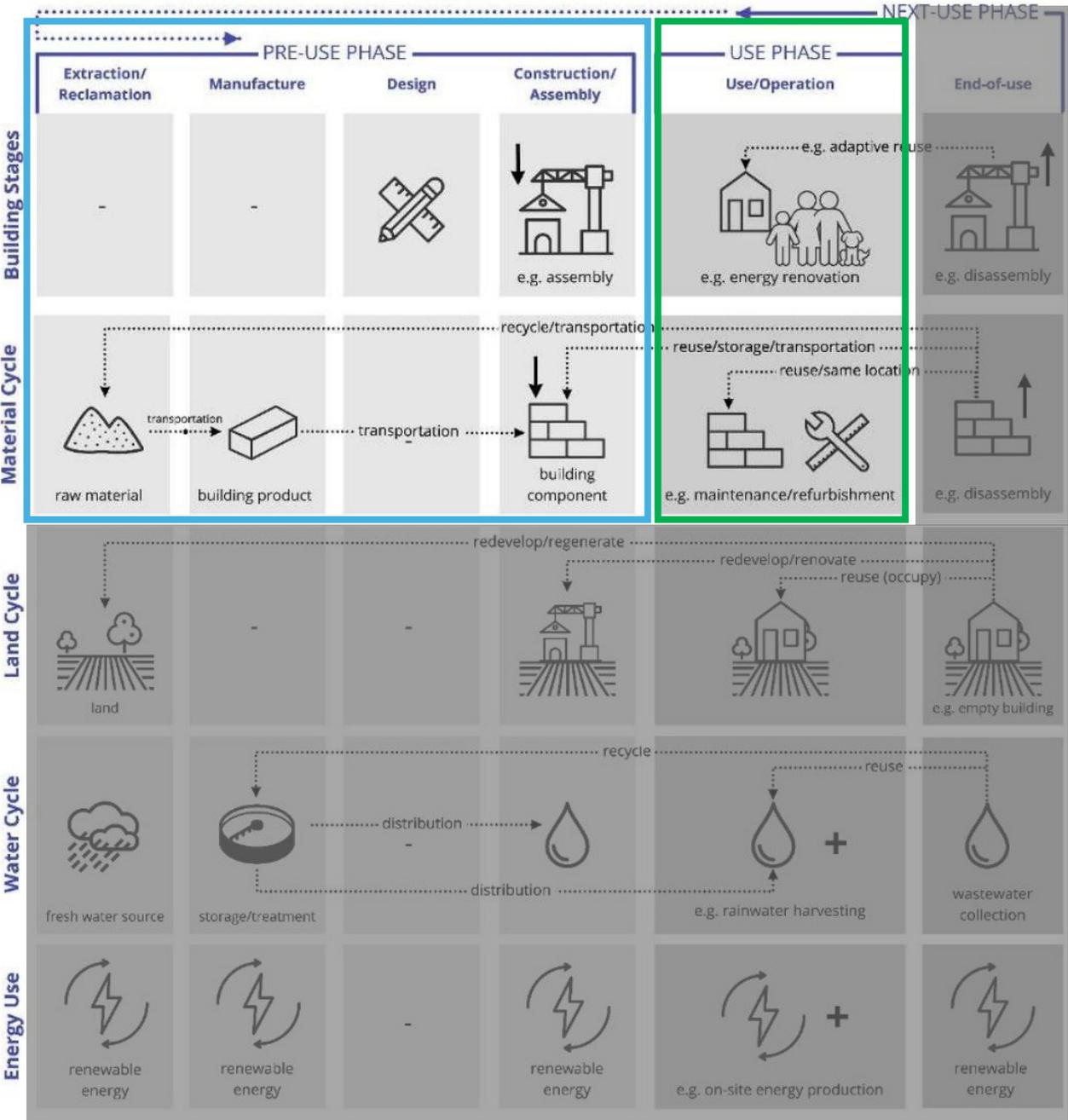


Image 09 –Life cycle stages in a circular built environment
 Source: Cetin, De Wolf, and Bocken (2021).

This research focuses on a **Large Language Model (LLM)**-based assistant that supports designers during modeling by linking project data to a cost database. Rather than generating layouts, the LLM helps estimate initial and life cycle costs in real time, improving early-phase decision-making with natural language interaction.



Image 10 –AI-BIM Driven Framework projection
Source:AI Generated



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Hypotesis | Research Steps

HYPOTHESIS

A structured **AI-BIM-LCC** framework will **improve** decision-making **accuracy**, **enhance cost predictability**, optimize resource allocation, and **reduce inefficiencies** throughout the **project lifecycle**.

HYPOTHESIS

A structured **AI-BIM-LCC** framework will **improve** decision-making **accuracy**, **enhance cost predictability**, optimize resource allocation, and **reduce inefficiencies** throughout the **project lifecycle**.

RESEARCH STEPS

- Conduct a bibliometric review to explore how AI, BIM, and LCC have evolved in construction research.
- Identify key knowledge clusters, theoretical gaps, and innovation opportunities.
- Justify the creation of a decision-support framework integrating these technologies.
- Design and prototype the framework by linking BIM objects with cost and LCC data.
- Integrate AI reasoning and Large Language Models (LLMs) for real-time cost support during modeling. Apply the framework in real-world case studies across Brazil and Canada.
- Evaluate its effectiveness in improving cost predictability, sustainability, and design-phase decision-making.

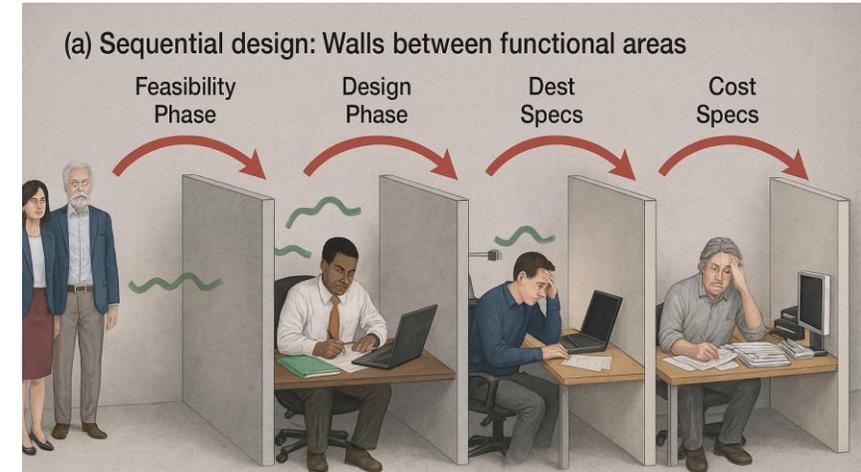


Image 08 – Sequential Design process

Source: Heizer, J., Render, B., & Munson, C. (2017). Operations Management (12th ed.). Pearson Education



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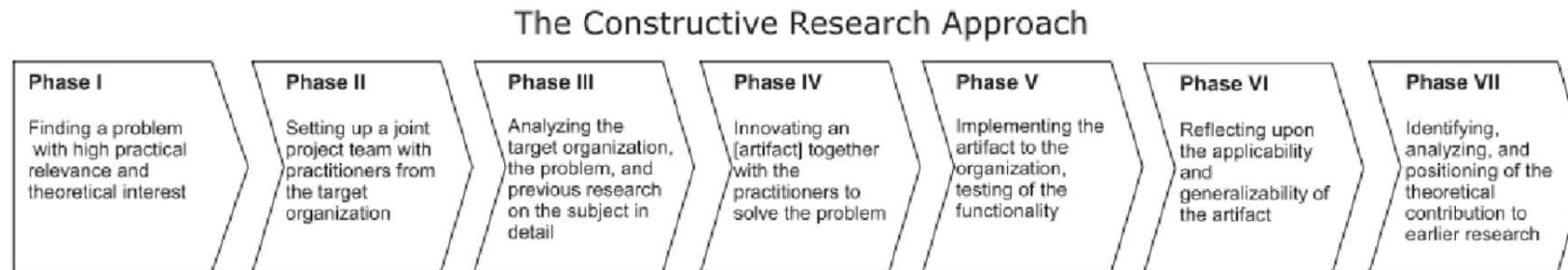
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Part IV – Methodology And Conclusion

RESEARCH METHOD

The research follows the Constructive Research Approach (CRA), a structured methodology that focuses on developing and validating a practical solution to a real-world problem. In this study, CRA is applied to develop an AI-driven BIM and Life Cycle Cost (LCC) framework aimed at optimizing cost estimation and decision-making throughout the design and construction phases. The methodology consists **of seven sequential stages, ensuring a rigorous, iterative process for framework development, implementation, and validation.**



8. CONCLUSION

The proposed framework will be tested in real-world construction projects to evaluate its effectiveness in enhancing cost estimation, supporting decision-making, and improving communication throughout the early stages of the project lifecycle. The research aims to contribute to increased cost accuracy, reduced design-phase rework, and more sustainable planning outcomes. However, this study does not address detailed design, construction execution, or end-of-use phases such as disassembly and recycling. **These exclusions highlight important directions for future research.** Subsequent work could **expand the framework's scope** to include dynamic construction scheduling (BIM-4D), **full life cycle analysis**, and **post-occupancy cost tracking**. Additionally, future development may strengthen the **integration of AI assistants** with **real-time BIM** environments and **diverse cost** data sources, **fostering continuous** improvement and **broader applicability** across **building typologies**.

KEYWORDS

Project Phases, BIM 5D, Artificial Intelligence, Life Cycle Costing, LOIN, Parametric Analysis, Building Construction Industry, Cost Database, LLM.

Thank you!
Obrigado!
Merci!



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