FIG WORKING WEEK 2025
AND Locate25 THE NATIONAL GEOSPATIAL CONFERENCE
Collaboration, Innovation and Resilience: Championing a Digital Generation
FIG Geospatial Council of Australia
Brisbane, Australia 6–10 April

From Regulations to Reality:

Automating Building Code Compliance through Geospatial AI and BIM



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A System Under Stress: Housing Approvals, Delays, and Demand

THE WALL STREET JOURNAL.

World Business U.S. Politics **Economy** Tech Markets & Finance Opinion Arts Lifestyle

Australian Building Approvals Fall, Denting Hopes of Housing Supply Recovery

The total number of dwellings approved fell 3.6% in November

By James Glynn Follow
Jan. 6, 2025 8:45 pm ET

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Housing supply in Australia is a big issue for the economy and ahead of a federal election due by mid-May. PHOTO: TARA MALHOTRA/ZUMA PRESS

SYDNEY—Australian building approvals were weaker than expected in November, denting hopes of a big recovery in housing supply to meet surging immigration.

AUSTRALIAN PROPERTY UPDATE

Australian Real Estate & Housing Market News

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New home price record as building approvals struggle

Scott Kuru
December 3, 2024 4 min read

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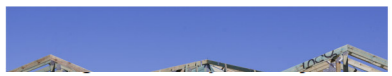
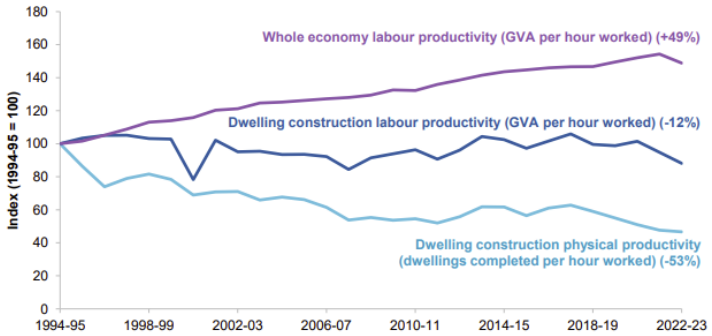


Latest Articles

Interest rate cut fuels price surge
April 2, 2025

Proxies for dwelling construction productivity between 1994-95 and 2022-23



a. GVA is sourced from the national accounts supply-use tables, while the output measure for dwellings completed is sourced from building activity data. **b.** The deflator is constructed using building activity data. **c.** The hours worked measure for both productivity measures is constructed by apportioning two-digit building construction and construction services hours worked from the labour account using shares of residential building construction and non-residential building construction from the labour force survey (building construction) and shares of construction services purchases in the national accounts supply-use tables (construction services).

Source: PC estimates using ABS (2024c, 2024e, table 37) (output); ABS (2024e, tables 3 and 21) (deflator); ABS (2024c, 2024i, data explorer, 2024j, EQ06) (hours worked).

Victoria behind' housing,

Grattan Rents co 13% if ho targets a

Published in 2024

New analysis inc achieving Victor could a significa

for 800,000 ks social

Taylor & Francis Online

Victoria's 2023 Housing Policy Agenda: Addressing Decades of...

Published in 2023

AustralianBroker

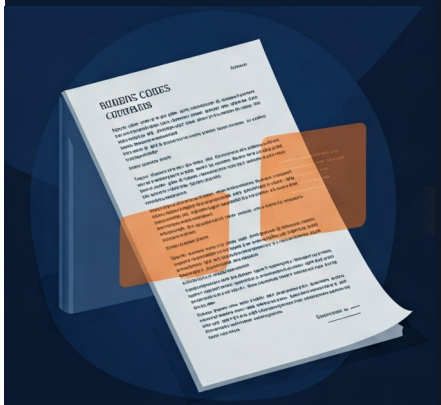
News Construction delays threaten national housing targets

Construction delays threaten national housing targets

Insufficient building pace risks missing government targets, PropTrack says

The Challenge: A System Built on Silos

Manual. Fragmented. Risky.



BUILDING CODE / REGULATION

Dense, static legal text

DIGITAL BUILDING MODEL (BIM)

Complex, data-rich digital model

MANUAL INTERPRETATION

No automated connection

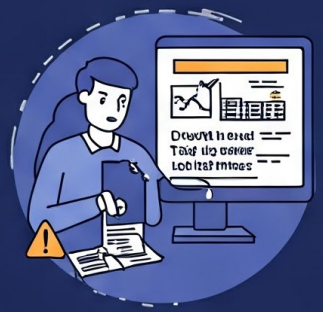
Today's compliance process relies on disconnected systems and human guesswork.

Industry

Permit Delays

Government &

Home Makers

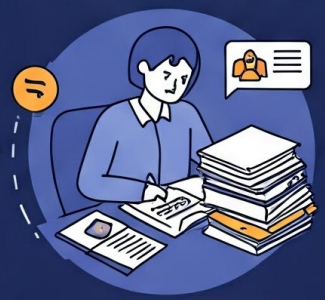


Target Missed: 1.2M Homes by 2029

Overloaded Planning

Cost Pressure

Government Planners



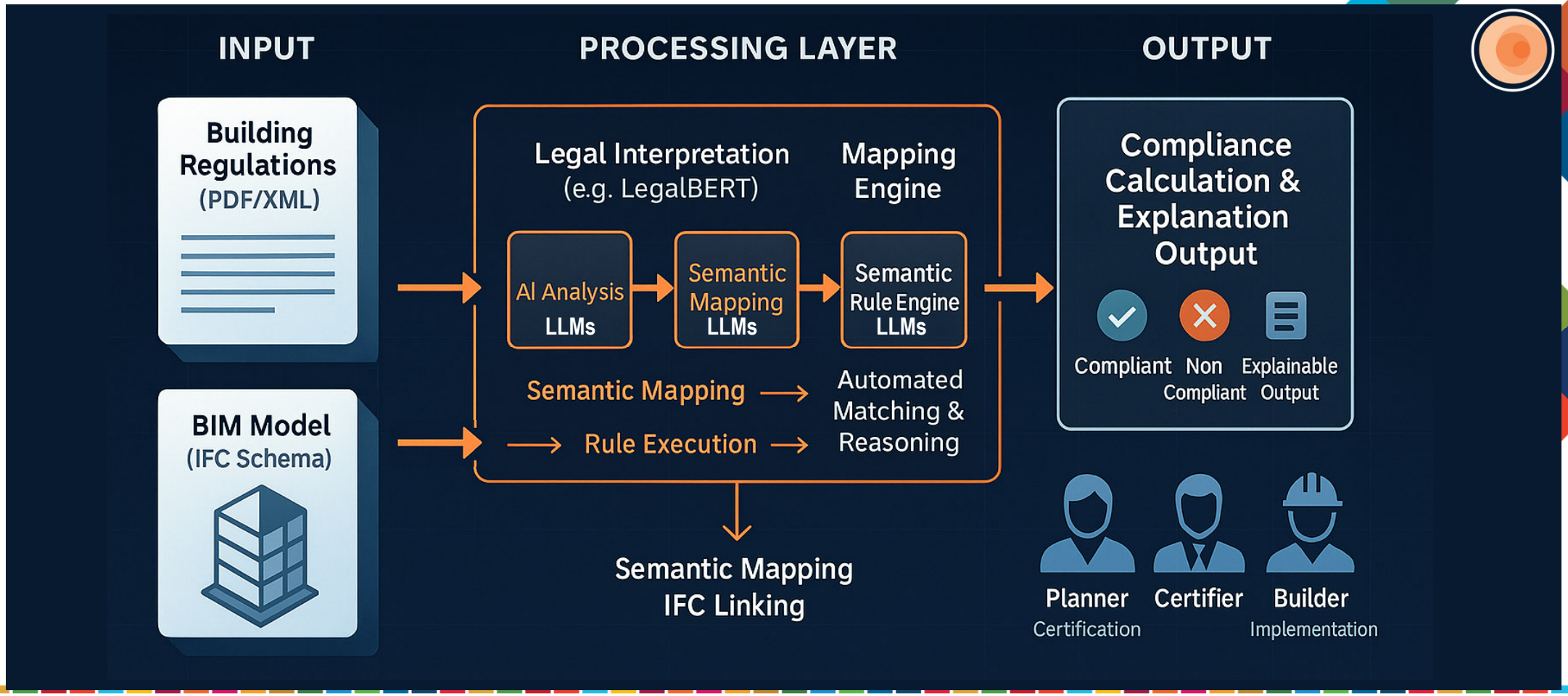
Overload & Risk

Certifiers/Planners

Overload & Risk

Public

Families left Waiting


INPUT
PROCESSING LAYER
OUTPUT
Building Regulations (PDF/XML)
BIM Model (IFC Schema)
Legal Interpretation (e.g. LegalBERT)
Mapping Engine
AI Analysis LLMs
Semantic Mapping LLMs
Semantic Rule Engine LLMs
Semantic Mapping
Rule Execution
Automated Matching & Reasoning
Semantic Mapping IFC Linking
Compliance Calculation & Explanation Output
Compliant
Non Compliant
Explainable Output
Planner
Certification
Certifier
Builder
Implementation

- Detected: 1.2m
- "Validation: ✅ Compliant"

Prototype in Action

TestBed – Regulation Input & BIM Model

Balustrades must be 1 m high

Non-Compliant

Result:
Non-Compliant

Reason:
Height = 0,85m <
Required 1.0 m

⚠ EXPLANATION

Builded

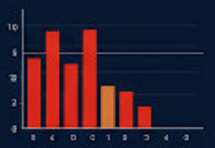
Regulation:
Balustrades must be
≥ 1 m high

90%

Compliance detected in seconds.

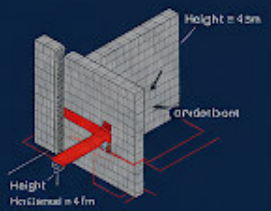
Sample Section
Walls hation & BIM Inneuts elements.

Matching tono BIM Imput



"Matching regulation to BIM geometry and elements"

Regulation Reut



Evaulation: Non Result

Regulation

- "Detected: Wall height = 4m"
- "Detected: No horizontal tie beam"
- "Regulation: Wall > 3m must include tie beam"

AM Complimant

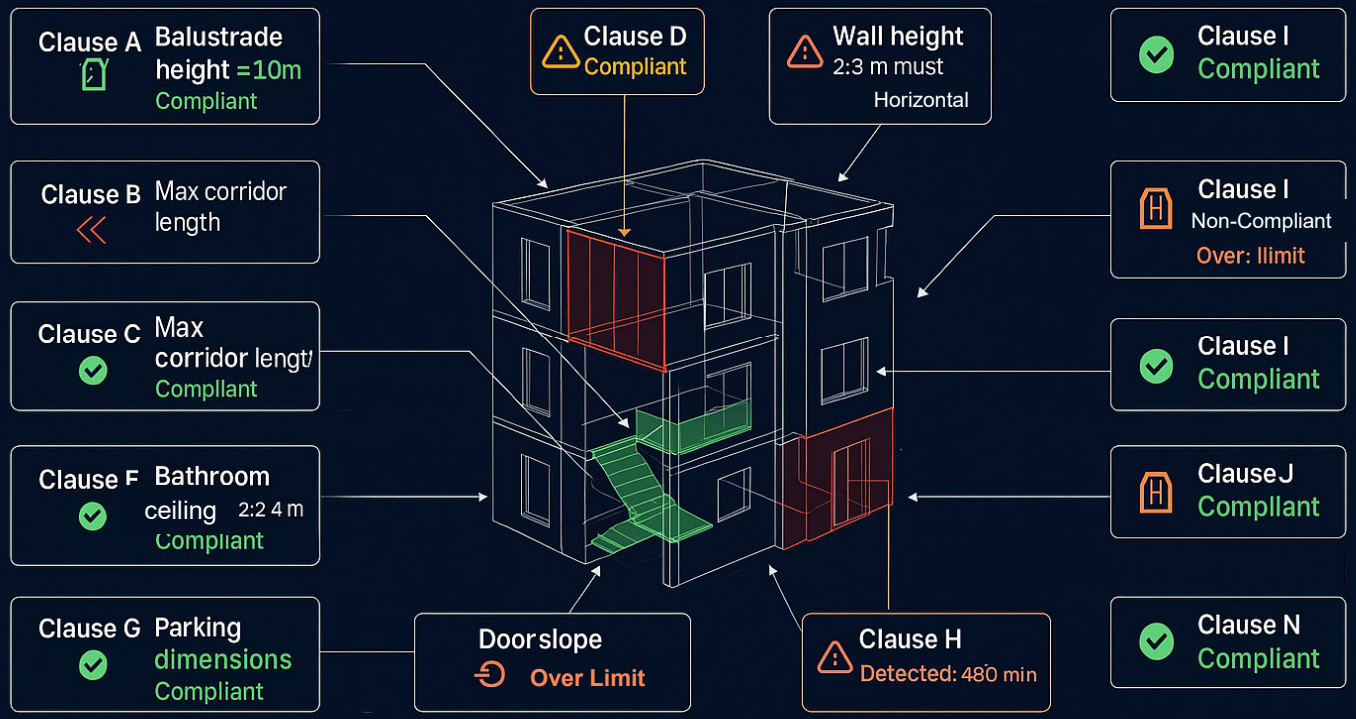
Evauation Compliant

- "Regulation: Stair width ≥ 1.0m"
- "Detected: 1.2m"
- "Validation: ✅ Compliant"

Two claylees:
One flaget: < 1.0m
All in: seccunnds.

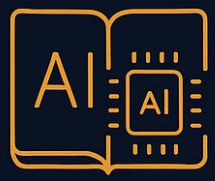
Upcediiy sattion & cuplienry by ind secrriares.

MULTI-CLAUSE COMPLIANCE CHECKER



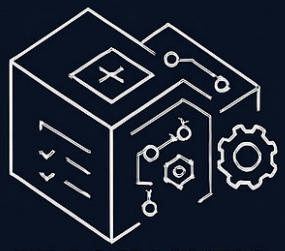
15 clauses checked. 4 flagged. 1 fix suggested. Full compliance map in seconds.

Innovation Highlights



AI-BASED LEGAL INTERPRETATION

LegalBERT reads codes like a human expert



BIM SEMANTIC INTEGRATION

Map rules to geometry and object data (IFC)

AUTOMATED RULE MATCHING

Instantly detect non-compliance, suggest fixes

The first system combining NLP, legal reasoning, and BIM – for scalable, explainable compliance.

Evaluation & Impact

Early Testing Results

Overall: 85% average accuracy

BIM + Legal NLP TestBed – 15 clauses evalu

Research Contribution

- Novel method for NLP-to-BIM mapping
- LegalBERT + IFC ontology fusion

- Legal method тfor NLP-to-BIM mapping
- Submitted to: [conference or journal]

Practical Impact

- 80% reduction in checking time
- Minimized human error
- Explainable results for planners & certifiers

Tested on real data. 15 clauses. 85% accurate. Results — ready for action.

The Hard Stuff

- Legal text ambiguity & complexity
- Inconsistent BIM model structure
- Difficulty in mapping vague rules to digital geometry
- Maintaining explainability while using AI

What We Learned

- Use modular, explainable NP blocks
- Design flexible rule-matching for variable BIM data
- Collaborate across disciplines: law, AI, construction
- Build trust through transparent outputs

Obstacles became insights. Friction created function.

Future Work

More Data, More Codes

- Multi-code support
- Multiple jurisdictions
- Complex clause handling

Planner-Friendly UI

- Interactive BIM viewer
- Rule breakdowns
- Explanations on-click

Real-World Pilots

- Partner with councils
- Government integration
- Industry testbeds

Compliance, reimagined — as a collaborative, intelligent layer in the building process.

CONTRIBUTION TO FIG + LOCATE25 THEMES

COLLABORATION

Interdisciplinary team
Law + AI + BIM + Planning
Bridging domains together

INNOVATION

First LegalBERT-BIM fusion
Automated rule reasoning
Semantic mapping engine

RESILIENCE

- Faster approvals

Fewer risks, better decisions
Support for sustainable growth

A contribution aligned with the spirit of Locate25 + FIG: smart cities, empowered planning, and digital trust.

Thank you for your attention



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