



AI and Its Impact on the Building Industry

2025

Speaker



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Session Objectives

1. Provide a core understanding of Large Language Model AI.
2. Look at how the ICC has harnessed unique AI architecture for its AI Navigator tool
3. Discuss an applied “pilot” project using ICC code content with a partner’s AI application.
4. Peer into the future of possibilities for AI, building codes, and applications that support the building industry

Session outline

1. AI Basics
2. Application – AI Navigator
3. Application – AI Plan Review Pilot
4. What's Next for AI?
5. ICC Innovation Highlights
6. Your Questions

AI Basics



AI / LLM Vocabulary

Large Language Model (LLM) – A term for machine-learning tools that can ingest large amounts of material and use it to generate new text

Generative AI (GenAI) – This refers to AI models that craft fresh content—reflecting styles and patterns derived from its training data.

ChatGPT – The most famous LLM (created by OpenAI), and the one used by AI Navigator. There are many others such as Gemini (Google), Watson (IBM), and Claude (Amazon)

Digital Codes – The ICC’s platform that hosts over 1,800+ code resources and advanced tools

Hallucination – An LLM’s tendency to conflate or invent information when it has low-confidence in its answer to a query.

Evaluative (“Evals”) modeling – Using a set of “control” output you expect to be generated to evaluate the performance of an AI tool. This type of modeling can improve AI tools and teach them to evaluate themselves.



<https://youtu.be/f70ME-lfeMU>

What Did We Just Learn?

- ✓ Large Language Model (LLM) tools like Chat GPT are trained on large sets of words, and use that training to pick “most likely” words needed
- ✓ LLM’s **are not sentient** and cannot fact check themselves
- ✓ Chatbots have limits, and understanding those limits helps you use them
- ✓ There is no broad agreement on what the ultimate future of these types of AI tools are



Questions Are Keys to Unlock AI

- Most AI will try to answer any question
- More highly trained AI may have an “intercept” reply for unclear/irrelevant questions
- Focus questions into a sequence that divides fundamentally different requests

Application



2024 IBC®



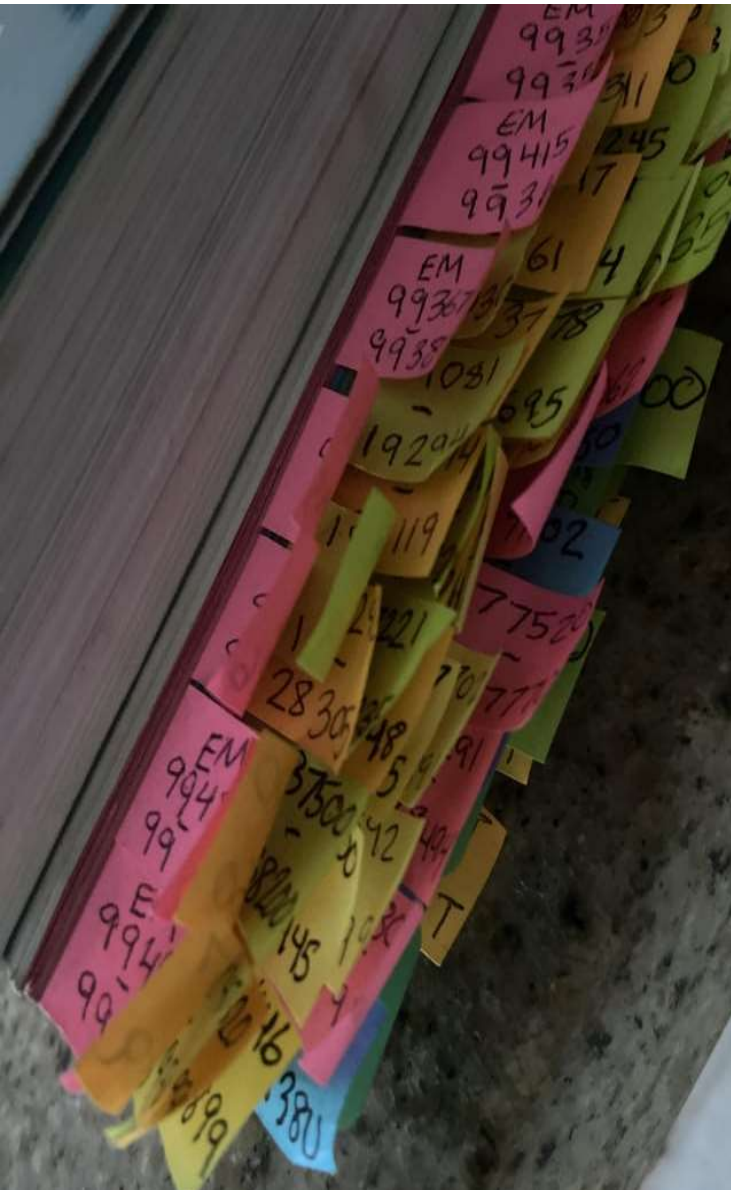
INTERNATIONAL
BUILDING CODE®



AI for Building Codes – This Will Work!

- ICC codes are published online
- Nearly all answers are not subjective
- Codes and standards are notoriously hard to search





AI for Building Codes – This is Tricky!

- LLM tools struggle with sources when there are many options
- Building codes repeat terminology often
- Code language uses “tricky” structures like exceptions that LLMs struggle with

Tricky you Say? Let's check out the IBC...



[F] 915.2.5 Private garages. CDP

Carbon monoxide detection complying with Item 3 of Section 915.1.1 shall be installed within enclosed occupiable rooms or spaces that are contiguous to the attached *private garage*.

Exceptions:

1. In *buildings* without communicating openings between the *private garage* and the *building*.
2. In rooms or spaces located more than one story above or below a *private garage*.
3. Where the *private garage* connects to the *building* through an *open-ended corridor*.
4. An *open parking garage* complying with Section 406.5 or an enclosed parking garage complying with Section 406.6 shall not be considered a *private garage*.
5. *Dwelling units* that comply with Section 915.2.1.

Exceptions

Repeated terminology

Cross-section referencing

Why AI Tools Should be Specialized

Sample Response from a “Name Brand” general LLM chatbot...

Q Is there a minimum temperature that a home heating system must be able to provide heat for?

A The minimum temperature that a home heating system must be able to provide heat for can vary depending on the region, climate, and local building codes. In general, the heating system should be capable of maintaining a comfortable indoor temperature, typically **around 68°F** (20°C) during the heating season.

However, in colder climates, especially in regions that experience harsh winters, the heating system **may need to be capable of maintaining higher indoor temperatures** to ensure the occupants' safety and well-being. Some areas may have specific requirements for heating systems, and building codes may dictate minimum standards for indoor temperature levels to prevent issues like frozen pipes or health risks associated with extremely cold conditions.

It's important to consult with local authorities or a licensed HVAC (Heating, Ventilation, and Air Conditioning) professional to determine the specific requirements and recommendations for heating systems in your area. They can provide guidance on the appropriate heating system size and capacity for your home, taking into account local climate conditions and building regulations.

Why AI Tools Should be Specialized

Answer with a trained chat tool with a defined knowledgebase

Q Is there a minimum temperature that a home heating system must be able to provide heat for?

A The minimum temperature requirement for a home heating system is 68°F (20°C) in all habitable rooms, bathrooms, and toilet rooms. **This is stated in the 2021 International Residential Code, Part 03, Chapter 03, SecR303.10**, and the 2021 International Property Maintenance Code, Chapter 06, Section 602.2 and 602.3.

However, in areas **where the average monthly temperature is above 30°F (-1°C), a minimum temperature of 65°F (18°C) shall be maintained**. The use of portable space heaters or cooking appliances is not considered a valid means to achieve this required heating.

The ICC tackles AI to Improve Code Discovery

The beginning

- We conducted an analysis of code questions using ChatGPT 3.5 – showed under 30% accuracy of core answers and less than 10% on citing sources.

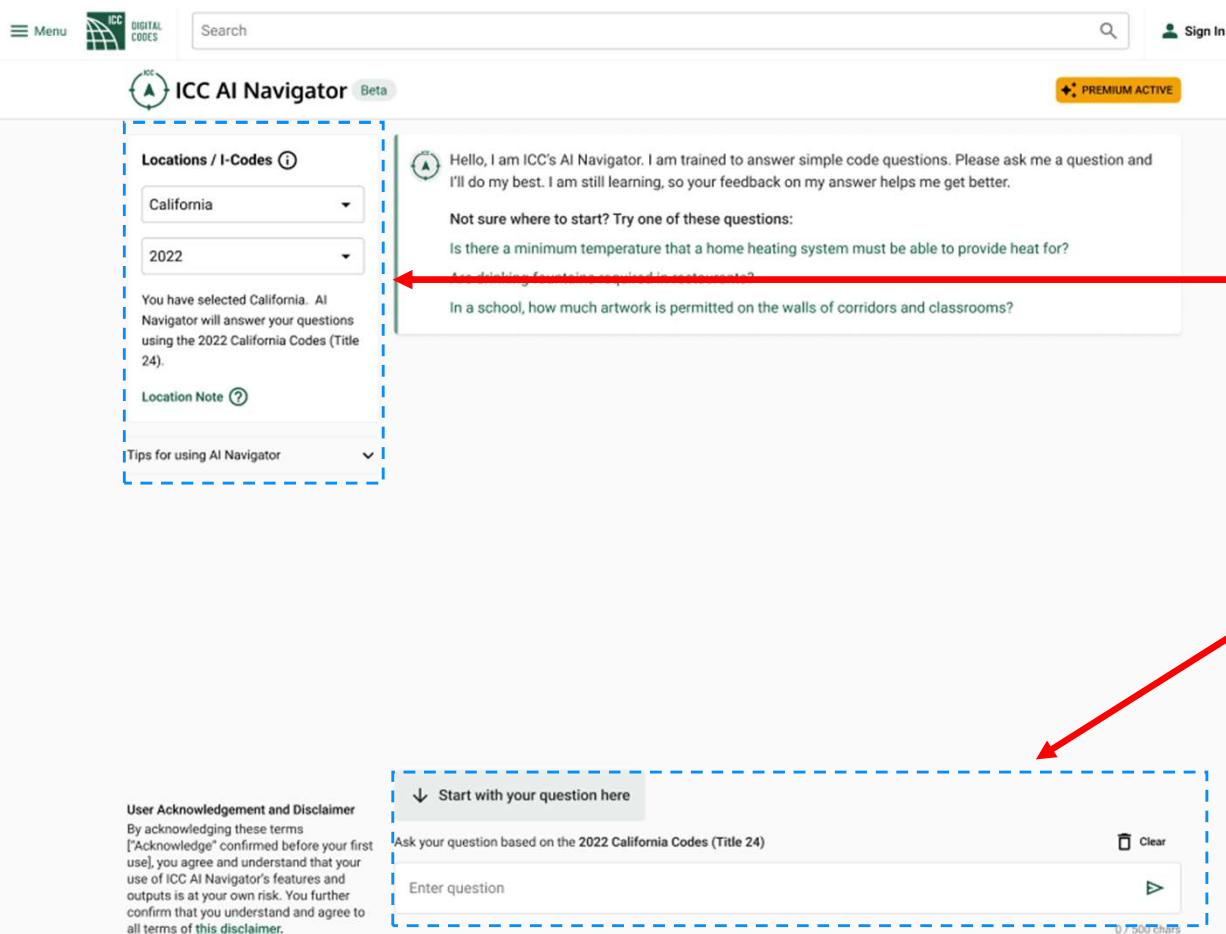
The middle



- The team develops the first rollout of [AI Navigator](#) in 5 months
- Our beta launch is a hit! We see 85% + accuracy at launch, and it has improved



The now

- Use has grown steadily. Over 45,000 questions have been asked, and we are averaging over 3,000 AI Navigator questions per month

The ICC Tackles AI to Improve Code discovery



Menu  Search  Sign In

 **ICC AI Navigator** Beta 

Locations / I-Codes ⓘ

California

2022

You have selected California. AI Navigator will answer your questions using the 2022 California Codes (Title 24).

Location Note ⓘ

Tips for using AI Navigator

ⓘ Hello, I am ICC's AI Navigator. I am trained to answer simple code questions. Please ask me a question and I'll do my best. I am still learning, so your feedback on my answer helps me get better.

Not sure where to start? Try one of these questions:



Is there a minimum temperature that a home heating system must be able to provide heat for?

Are drinking fountains required in restaurants?

In a school, how much artwork is permitted on the walls of corridors and classrooms?

↓ Start with your question here

Ask your question based on the 2022 California Codes (Title 24)

Enter question  

0 / 500 chars

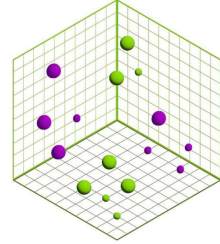
User Acknowledgement and Disclaimer
By acknowledging these terms ["Acknowledge" confirmed before your first use], you agree and understand that your use of ICC AI Navigator's features and outputs is at your own risk. You further confirm that you understand and agree to all terms of [this disclaimer](#).

The now

- AI Navigator has expanded to cover I-Codes and US states.
- Users select their codes and submit questions.

This isn't ChatGPT...it has a secret sauce

Ingredient 1 - A vector database



Ingredient 2 – Highly customized prompts

You ask: “Are drinking fountains required in restaurants”

AI Navigator hears:

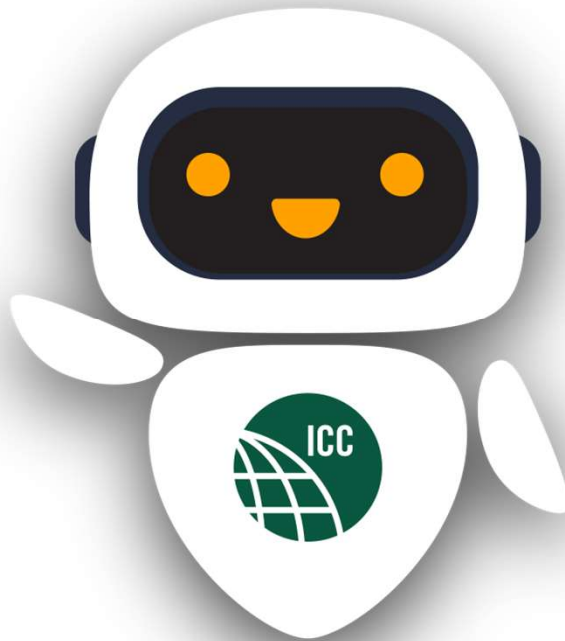
For this question, provide a clear citation and link to ICC code content. Do not speculate or guess. Many, many more words. If necessary, differentiate code that applies to commercial or residential applications. Many, many, many more words. Return the three best sections direct from your source material. Many, many, many, many, many more words.

Ingredient 3 – Exhaustive testing and “perfect” answers

Is a charcoal grill permitted on a wood balcony of a two-family house?

According to exception 1 of Section 308.1.4 of the 2021 International Fire Code, charcoal burners and other open-flame cooking devices are permitted for one- and two-family dwellings.





The Bot is good...it will get better!

Try is at <https://codes.iccsafe.org/features/ai-navigator>

In development...

- ICC Commentary and expert answers integrated
- Improved Q & A history
- “Conversation” mode

Application

ICC | Archistar

AI Plan
Review Pilot





Participating Cities



- City of Austin TX
- City of North Las Vegas NV
- Central Florida Tourism Oversight FL
- City of San Jose
- City of Irving TX
- City of Tampa FL
- City of San Francisco CA
- City of Los Angeles CA
- Los Angeles County, CA
- City of Seattle, WA
- City of Houston, TX

Can AI help?

Challenges for Permitting

1. Inconsistency in Submission Completeness and Quality
2. Staff Shortages / Turnover
3. Permit approvals can take more than 6 months and often over a year
4. Applicants may need to submit 3+ times to resolve non-compliance issues
5. Permitting is typically associated with poor customer satisfaction
6. Delays in permit approvals add significant costs to applicants



**image generated with AI on Dall.E.3
prompt generate an image representing slow building permit processes*

Scope of the Pilot



Pilot Details

This pilot program offered participants the chance to use Archistar's AI tools to conduct checks on plans.

Participants were asked to submit sample mid-rise residential projects for processing. The evaluation covered key aspects of the International Building Code, including a partial assessment of the following chapters:

- Chapter 3: Occupancy Classification and Use
- Chapter 5: General Building Heights and Areas
- Chapter 6: Types of Construction
- Chapter 10: Means of Egress
- Chapter 12: Interior Environment

Both an interactive drawing set and a standard PDF report was generated for each submission, facilitating a comprehensive review of the platform's effectiveness.



Example – dynamic checking from a drawing

Viewing property from Alec Saguinsin

Reports Summary

5612 Grover Ave, Austin, TX, 78756

Submission: IBC_IRC_dev-2E9D964E09

Summary **Results** Comments Submit

Showing Relevant Sections

2024 International Building Code

Chapter 5 General Building Heights and Areas

✖ 504 Building Height and Number of Stories

✖ 506 Building Area

Chapter 10 Means of Egress

✔ 1004 Occupant Load

✔ 1006 Number of Exits and Exit Access Doorways

✖ 1009 Accessible Means of Egress

✔ 1017 Exit Access Travel Distance

✔ 1020 Corridors

Chapter 12 Interior Environment

✖ 1208 Interior Space Dimensions

2021 International Residential Code

Prepare for Application



Level - Level 1 [T1 BP1 L1]

Viewing property from Alec Saguinsin

Reports / Summary / Detail

5612 Grover Ave, Austin, TX, 78756

Submission: IBC_IRC_dev-2E9D964E09

Summary Results Comments Submit

Showing Relevant Sections

504 Building Height and Number of Stories

Building height shall be limited where construction is permitted by Section 1511.2.4. Such structures shall not be used for habitation or storage. The structures shall be unlimited in height where of noncombustible materials and shall not extend more than 20 feet (6096 mm) above the allowable building height where of combustible materials (see Chapter 15 for additional requirements).

Failed

The building height(s) exceeded the allowable maximum height

Occupancy	Sprinkler System	Construction Type
R2	S13R	VA

Fire Area 1: Maximum Height

Allowable Height Above Grade Plane (ft)	60"
Maximum Height(ft)	78'1 1/8"
Result	FAIL

Add explanatory comment

504.4 Number of stories.

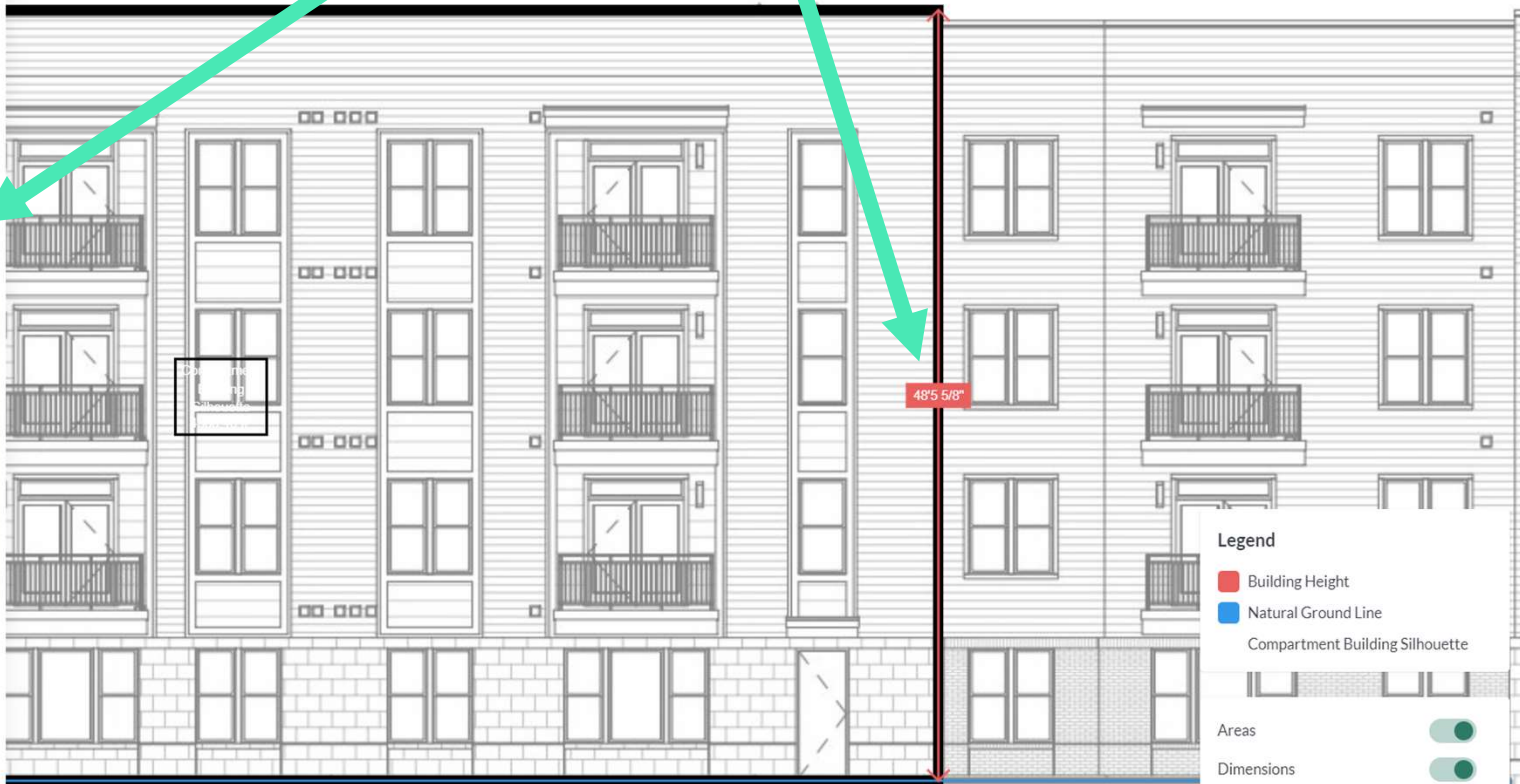
Back to Results Summary

Elevation - Elevation 1 [T1 BP1]

Elevation - Elevation 2 [T1 BP1]

Elevation - Elevation 3 [T1 BP1]

Example – code detail presented by AI tool



Building Height

Natural Ground Line

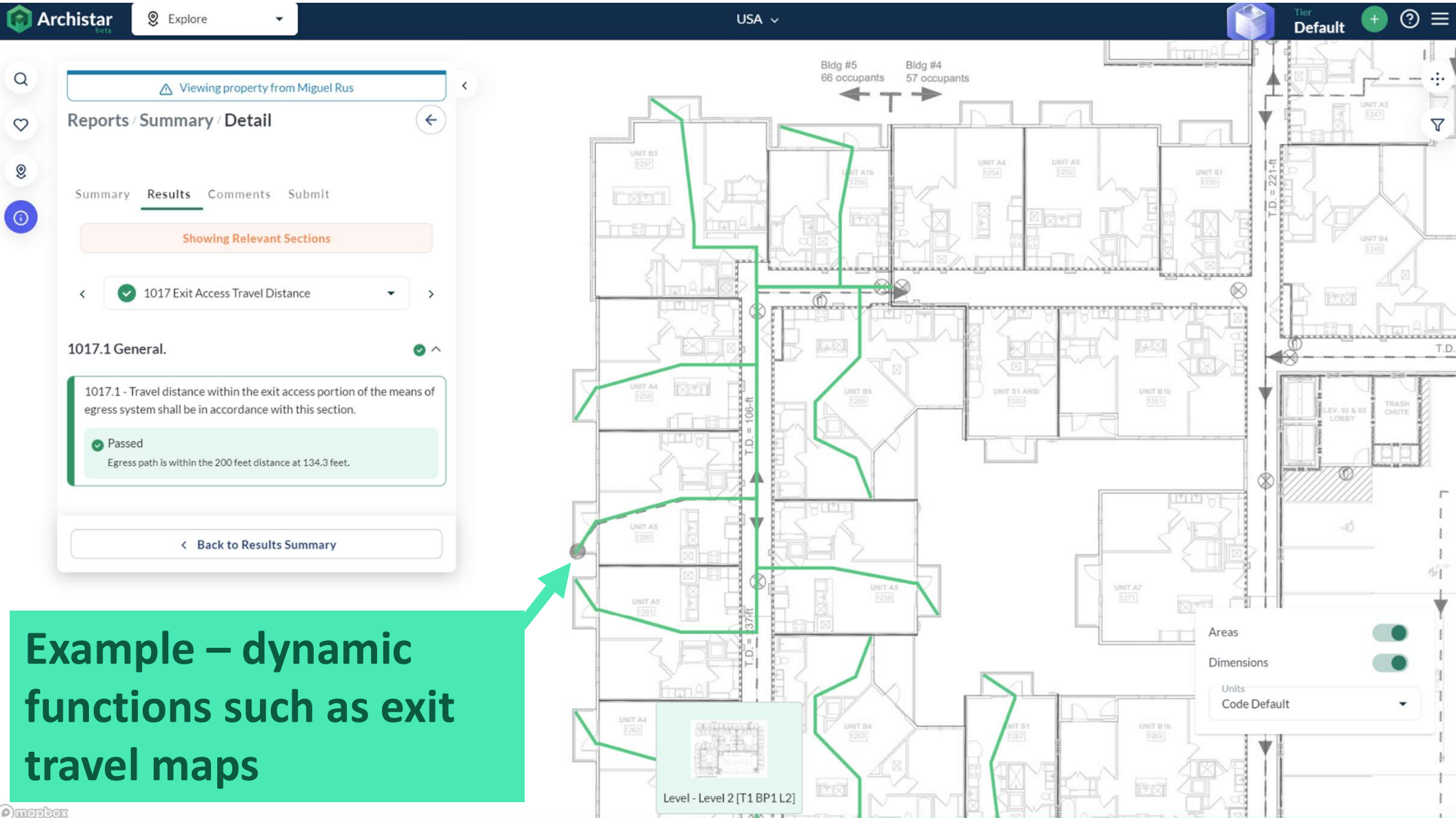
Compartment Building Silhouette

Areas

Dimensions

Units

Feet and Inches



Benefits



1. **Reduction of assessment approval time** by automating a portion of the process
2. **Fewer requests for information** and rework between city staff and the submitter
3. **A faster initial assessment** means more bandwidth to process additional applications
4. **Standardizing measurements** and reporting on submissions
5. **Increased customer satisfaction** and a better customer experience.



Next Steps



1. **Use of feedback testing** to update the tool for best accuracy
2. **Localization** introduced for Beta adopters to trial the tool with their codes
3. **Integration** testing with ICC's Digital Codes platform



What's Next for AI?





What's Next – Live AI tools for inspections

Visual measurement

“Picture to vocabulary” identification

Integration with code/standard guidance

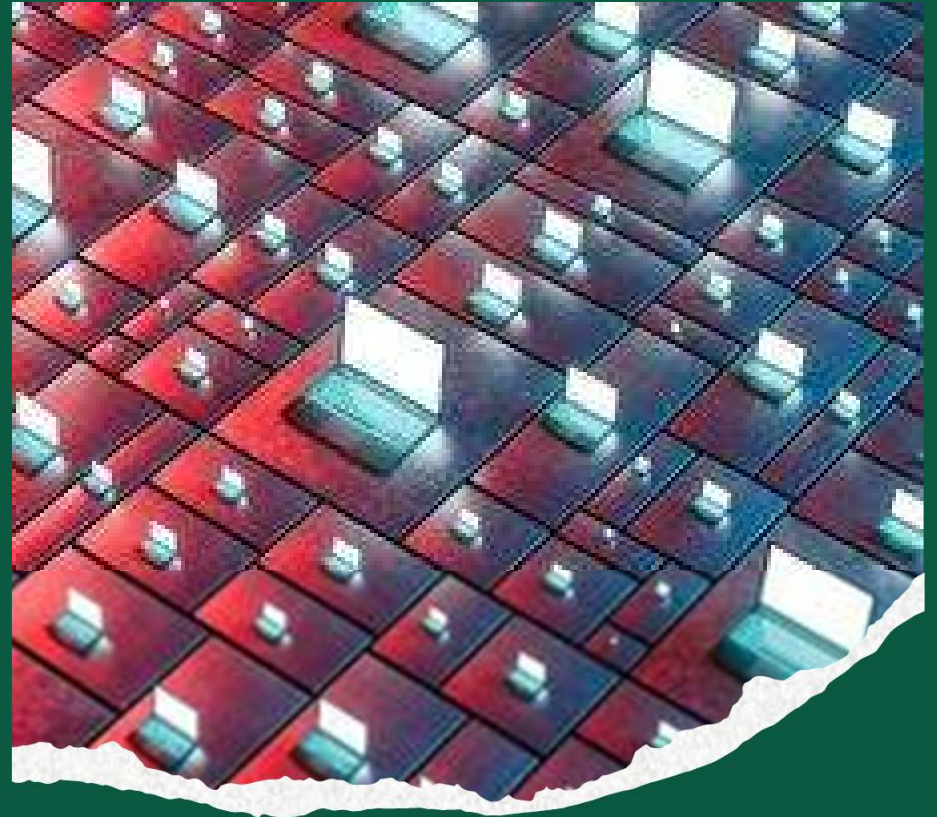
Automatic form completion

What's Next – Many data sources get utilized together

AI enables much simpler combination of different data sources and formats

Tools are built using sets of data that would have been difficult to combine in the past

Software providers offer “smart” tools that can quickly access information users would spend a lot of time researching



What's Next – AI design tools

A person with glasses is sitting at a desk in a dimly lit office, working on a computer. There are multiple monitors on the desk, and the person is looking at one of them. The background is dark and out of focus, showing some office equipment and a window.

“Pre-drawing”

Quick updates / variants

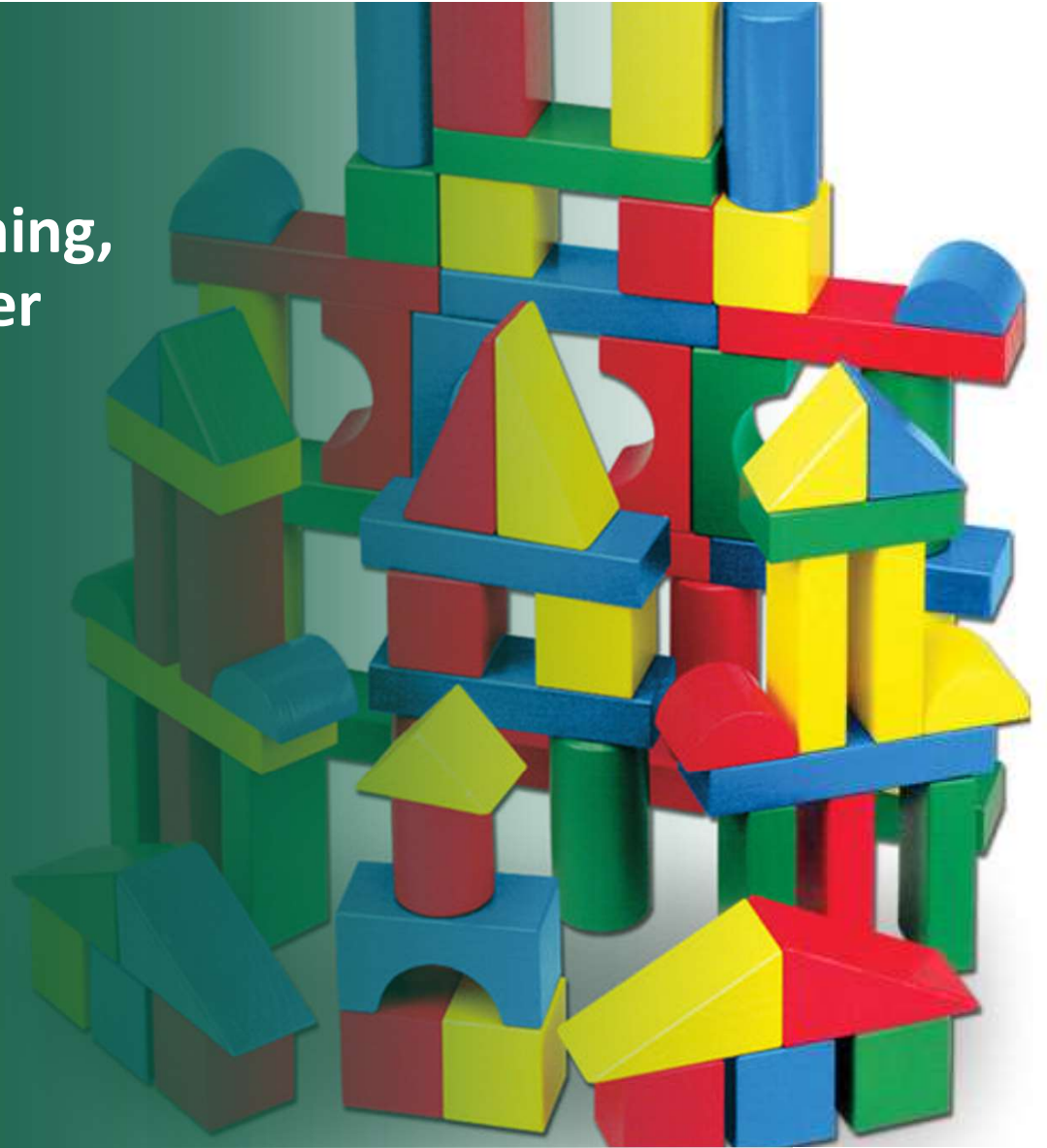
**Dynamic checks for a growing list of
code / safety concerns**

What's Next – Design, planning, and execution come together

The rules can and will change

AI enables everyone responsible for design and review to work quicker and smarter

Data will be compiled and published much more easily



ICC Innovation

AI tools and
much more





ICC INNOVATION

Digital Solutions to Empower
Growth & Efficiency

CODE
SOLUTIONS

COMMUNITY
DEVELOPMENT

PROFESSIONAL
DEVELOPMENT


CONTENT,
CODIFICATION &
TOOLS

Stay ahead with our content and constantly updated resources tailored to meet the needs of building safety professionals.

Digital Codes Premium | eCode360 | ICC Code Connect™ API | Maplink | eCodeALP

Automate your procedures,
and digitize any data,
including paper documents.

Laserfiche®


RECORDS
MANAGEMENT

SOLUTIONS & SERVICES


INTEGRATED
SOLUTIONS

Maximize your potential
by integrating with 3rd-party
applications.

3rd-party Integrations

Switch to virtual permitting and
inspections with a highly configurable
web-based software solution.

Municipity®


PERMITTING &
CODE
ENFORCEMENT


TRAINING &
CREDENTIALING


The Code Council offers a variety of
professional development options for
any point in your career.

**ICC Online Learning | PRONTO |
S.K. Ghosh Webinars | LearnLive**



DIGITAL CODES
PREMIUM[®]

ICC's Digital Codes Platform

 Authoritative resource of codes and standards for the building safety community

 Trusted source of content and a growing list of featured tools

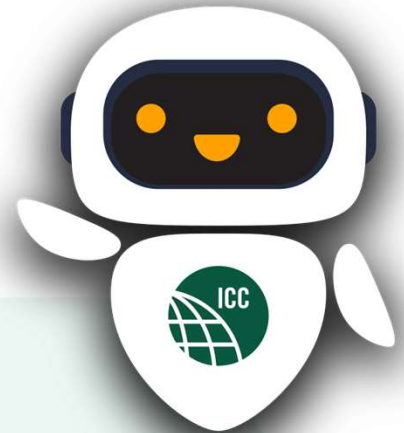
 Used by 7.5 million unique visitors in 2024





Provides users real-time answers to their code compliance questions from a highly trained AI service:

- **45,000+** questions asked since release with positive feedback.
- Location and year selector allows state-specific questions
- Continued development and optimization of quality responses





Premium Answers Q&A Database

Searchable Database of Code Compliance Questions and Answers provided from ICC's team of technical experts.

- Real opinions from ICC team of experts
- Additional questions added regularly
- Links to relevant code sections
- Broad collection of topics



Premium Answers Quick Consult

Our paid service providing users with expert crafted code opinions

- Web-based experience to submit and track progress
- Expert analysis and insight
- 48-hour response time
- ICC-branded PDF with code opinion

On the way! New Graphics Search

- AI leveraged for improved results, graphic context summaries, and interpretation of embedded content within images.
- Filters to narrow graphic results by category
- Release in 2025

TITLES CONTENT GRAPHICS

155 graphic results for "accessibility"
Share your feedback

Categories (2) X

1104.4 Accessible Multistory Buildings
2021 Significant Changes to the Inter...

1006.3 Egress from Occupied Roofs
2021 Significant Changes to the Inter...

1006.3, 1006.3.1, 1006.3.2, 1017.3.2.3 Exit Access Stairways in Atriums
2022 Significant Changes to the Calif...

1006.3.2, Exception 7; 1006.3, 1006.3.1 Egress from Occupied Roofs
2022 Significant Changes to the Calif...

1006.3 Egress from Occupied Roofs
2022 Significant Changes to the Calif...

Accessible space provisions of Section 1107.3 address accessibility
• Within a story level
PART PART
2015 Significant Changes to the Inter...

1006.3.2, Exception 7; 1006.3, 1006.3.1 Egress from Occupied Roofs
2022 Significant Changes to the Calif...

1006.3.4, Table 1006.3.4(1), Table 1006.3.4(2) Single Exit - Exit Access vs. Common Path
2021 Significant Changes to the Inter...

1006.3 Egress from Occupied Roofs X

2021 CODE TEXT 1006.3 Egress from stories or occupied roofs. The means of egress system serving any story or occupied roof shall be provided with the number of separate and distinct exits or access to exits based on the aggregate occupant load served in accordance with this section. Where stairways serve more than one...

2021 Significant Changes to the International Building Code / 1006.3

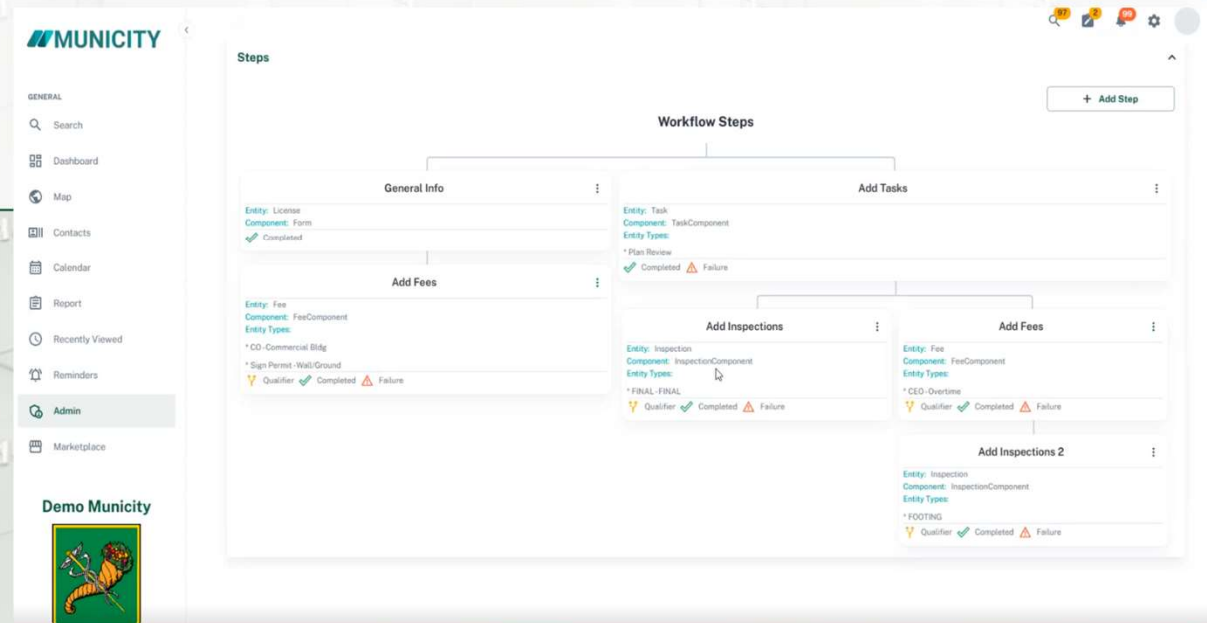
Close Jump to Section



Municipity is a cloud-based software solution built for the rapidly changing technology landscape. Access all of your Code Enforcement & Community Developmental needs from the office, field, or remote. In 2025, Municipity will launch a **platform upgrade** - offering a user-friendly experience with a selection of streamlined processes, reporting, and constituents portal access.

NextGen Features

- Intuitive Configuration Interface
- Enhanced Search Tools
- Improved Reporting Features
- Flexible Workflows



Thank You

Your Questions?





Family of Solutions

