Continuous Science Foundation

A Case Study on Building Codes

From One Big Stamp to Modular Approval Pathways

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1. Background

In the 19th and early 20th centuries, building oversight in North America and Europe was minimal and inconsistent. Many cities relied on one final inspection, often conducted after completion or after occupancy had already begun. Many inspectors would issue a single "pass/fail" stamp of approval, and enforcement focused on obvious hazards rather than systematic verification of structure, materials, or systems.

2. The Problem

If flaws were discovered, such as unsafe wiring, weak foundations, or poor fireproofing, fixes were costly or impossible, often forcing projects to restart entirely. The single, monolithic review created bottlenecks, unsafe shortcuts, and enormous risks for cities, builders, and the public.

Several high-profile, catastrophic failures such as the Great Chicago Fire of 1871 exposed the limits of end-stage inspection alone and drove the evolution of modern building oversight.

3. The Transformation

This shift was formalized over decades and consolidated with the publication of the International Building Code (IBC) in 2000, which unified staged permitting and inspection practices across jurisdictions. Modern building codes introduced distributed, modular approvals across the lifecycle of construction. Instead of waiting for one monolithic review, trust was validated incrementally.

Design Review (architects & permitting authorities) Blueprints are checked against zoning laws, accessibility requirements, and structural codes. Approval stamps on the drawings travel forward as the master reference for construction.

Foundation Inspection (municipal inspectors) Reinforcement, excavation, and concrete forms are approved before being poured. The foundation's stamp ensures downstream work rests on certified integrity.

Framing Inspection (structural inspectors) Load-bearing walls and beams are approved before being covered. That approval travels with the building record, guaranteeing the skeleton was certified before being hidden.

Plumbing, Electrical, HVAC (licensed trades + inspectors) Specialized inspectors check systems at rough-in stage. Each passes its own stamp, traveling with the project documentation.

Final Occupancy Inspection (municipality) A comprehensive review ensures all component approvals are in place. The final stamp is only possible because the smaller, modular stamps have already traveled across the project, accumulating proof of integrity.

This modular approach distributes trust signals across stages and expert groups. These records don't stay siloed, they move forward with the building's "case file." Each stamp travels to the next stage, de-risking the process and creating cumulative integrity.

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Together, these changes reshaped how trust, risk, and accountability functioned in construction.

4. The Result

Higher trust Owners and regulators gained confidence that buildings met standards and were safe.

Lower costs Problems were caught early and could be fixed before becoming catastrophic.

Shared accountability Builders, contractors, and inspectors each took responsibility for discrete components of safety and quality.

5. The Gap in Science

Scientific peer review has not undergone a comparable structural shift. Peer review today often mirrors the *old model of building inspections*—a single, high-stakes review at the end (for publication), with minimal checking of components along the way. Errors in data, methods, or analysis are often buried until it's too late. Discovered post-publication, they can be expensive, and potentially impossible to fix without starting again.

6. Key Insight

Architecture shows the power of distributed, modular approvals. Trust signals attached at each step do more than ensure compliance. They de-risk the process and enable continuous progress.

These inspections function as structured professional touch-points. Inspectors surface issues early, reference best practices, and document corrective guidance before work is concealed. They do not redesign the building, but they ensure errors are identified and corrected at one stage, before they propagate downstream.

The same principle applies in science. Identifying errors or gaps in a dataset before modeling decisions are made or a narrative is constructed serves the same risk-reducing function as an early foundation or framing inspection. Preregistration of a hypothesis is a first step towards incremental reviews.

How do we go from this review at early planning all the way through to each component of a composed research paper?

7. Inspiration for Science

A modular peer review system could:

- Validate datasets for completeness by computational peers before being shared.
- Review methods for clarity and reproducibility before results are published.
- Certify figures or analysis scripts as accurate and well-documented at submission.
- Then, like a final occupancy permit, an integrated review could certify the paper as a whole.

Instead of waiting for one monolithic stamp at the end, science could adopt the architecture model. By the time a paper is "occupied," its integrity has been built up incrementally, with each review traveling forward, visible, and trusted.