BOOK OF PROCEEDINGS

# 1st International Conference on Built Environment

# ICBE 2026

MAY 08th-09th, 2026
POLIS University, Tiranë

ISBN: 9789928347282

DOI: 10.37199/c4100031

CIP Katalogimi në botim BK Tiranë

Universiteti Polis

1st international conference on built environment (icbe) :

may 08th-09th, 2026 : book of proceedings / POLIS University,

Tirane. - Tiranë : Universiteti Polis, 2026. 1 burim në linjë (... f.)

ISBN 9789928347282

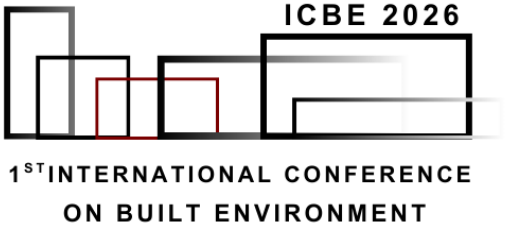
1.Arkitektura 2.Konferenca

72 (062)

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# 1st International Conference on Built Environment

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## Conference Theme and Rationale

The 1st International Conference on Built Environment (ICBE 2026) was conceived as an international and interdisciplinary forum for advancing knowledge, critical discussion, and innovation across architecture, urban planning, engineering, construction, materials, design, and the wider built environment. Organized by POLIS University in collaboration with the National Agency for Scientific Research and Innovation in Albania (AKKSHI), the Academy of Sciences of Albania and the University of Ferrara in Italy, the conference brought together academics, researchers, practitioners, students, and industry representatives to exchange research findings, professional experience, and emerging perspectives on the transformation of contemporary cities and territories.

The conference theme reflected the increasingly complex challenges shaping the built environment, with particular attention to sustainability, resilience, technological innovation, heritage preservation, and socially responsive design. Contributions addressed sustainable architecture and green building, innovative construction technologies and materials, climate-responsive and energy-efficient design, disaster risk reduction, circular approaches to construction, and the integration of renewable energy. Equal emphasis was placed on digital transformation through Building Information Modeling, Geographic Information Systems, artificial intelligence, data analytics, automated solutions, digital fabrication, and advanced manufacturing.

ICBE 2026 also recognized that the future of the built environment cannot be approached through technological innovation alone. Urban transformation, cultural heritage, adaptive reuse, inclusive design, ecological thinking, art, and interdisciplinary research were therefore integral to the conference rationale. The scientific sessions examined topics ranging from seismic resilience, geotechnical engineering, and structural safety to urban fragmentation, public space, heritage conservation, adaptive environments, and new relationships between human and non-human systems.

Through keynote lectures, scientific presentations, case studies, and interdisciplinary debate, the conference encouraged connections between research and practice while promoting approaches capable of responding to environmental, social, cultural, and technological change. The breadth of contributions demonstrated the value of bringing engineering, architecture, urbanism, design, heritage, and emerging technologies into a shared academic framework for more resilient, sustainable, adaptive, and human-centered environments.

Held on 8-9 May 2026 at POLIS University in Tirana, with in-person and online participation, ICBE 2026 welcomed guest speakers and participants from Albanian and international universities, research institutions, professional organizations, and industry. Its sessions established a platform for presenting current research, exchanging expertise, strengthening meaningful collaboration, and identifying future directions for the built environment.

## The event

The **1st International Conference on Built Environment (ICBE 2026)** is an interdisciplinary academic and professional forum dedicated to exploring contemporary challenges, emerging research, and innovative approaches shaping the future of the built environment. Bringing together researchers, academics, architects, engineers, urban planners, designers, practitioners, and industry professionals, the conference promotes the exchange of knowledge and encourages collaboration across traditionally interconnected disciplines. Its thematic scope encompasses sustainable and resilient construction, technological innovation, advanced building materials, urban transformation, cultural heritage, and interdisciplinary design approaches. Particular attention is given to the growing role of digital technologies, data-driven methodologies, intelligent design processes, and advanced analytical tools in supporting more informed and responsive approaches to architecture, engineering, and urban development. At the same time, ICBE 2026 recognizes the importance of environmental responsibility, cultural identity, social needs, and human-centered design in shaping contemporary cities and territories. Through keynote lectures, scientific sessions, case studies, and interdisciplinary exchange, the conference provides a platform for presenting current research, discussing professional experiences, and developing new perspectives capable of contributing to **safer, more sustainable, adaptive, inclusive, and resilient built environments**.

## Objectives

- Promote interdisciplinary collaboration among researchers, academics, practitioners, and professionals in architecture, engineering, urban planning, construction, design, heritage, and related fields of the built environment.
- Advance the use of digital technologies and innovative methodologies, including BIM, GIS, artificial intelligence, data analytics, digital fabrication, and parametric approaches, in research and professional practice.
- Encourage sustainable, resilient, and climate-responsive approaches to architecture, construction, and urban development through innovative materials, energy-efficient strategies, and environmentally responsible design.
- Address contemporary challenges affecting cities, buildings, and infrastructure through scientific research, applied case studies, evidence-based approaches, and innovative design solutions.
- Promote the conservation, transformation, and adaptive reuse of cultural heritage, balancing cultural identity, contemporary needs, structural safety, and responsible urban development.
- Support human-centered and socially responsive urban transformation, considering public space, mobility, ecological systems, community needs, and the wider social and economic impacts of the built environment.
- Provide a platform for knowledge exchange and emerging research, enabling scholars, young researchers, professionals, and students to present innovative ideas, strengthen international collaboration, and contribute to future directions in the built environment.

## Main Conference Themes

- Sustainable architecture and green building practices.
- Innovations in construction technologies and materials.
- Heritage preservation and adaptive reuse in the built environment.
- Digital tools and smart technologies in architecture and construction (e.g., BIM, GIS).
- Climate-responsive and energy-efficient design.
- Disaster risk reduction and resilience in the built environment.
- Circular economy approaches in construction and material usage.
- Integration of AI and data analytics in building design.
- Acoustic and thermal performance in building design.
- Renewable energy integration in building systems.
- Advanced manufacturing techniques in construction, such as 3D printing.
- Innovations in construction technologies and materials.
- Heritage preservation and adaptive reuse in the built environment.
- Disaster risk reduction and resilience in the built environment.
- Digital tools and smart technologies in architecture and construction.
- Advanced manufacturing techniques in construction.
- Geotechnical Engineering for Sustainable Development.
- Cartography and Geographic Information System.
- Computer Automated Solutions for Built Environment.
- Reliability in Civil Engineering.
- Urban planning strategies for resilient cities.
- Climate-responsive and energy-efficient design.
- Regulatory frameworks and policies impacting construction and urban development.
- Design in the Era of Anthropocene (Rethinking the Relation between Human and Non-Human Species)
- Speculative Design (with Attention to “Discursive” and “Critical” Design)
- Design and Cross-Disciplinarity (with Emphasis on Processes rather than Design Outputs)
- Inclusive Design
- Art and Urban Regeneration (Focus on Participatory, Collaborative, and Research-Based Practice)
- Relational Art and Architecture
- Monuments and ‘Anti-Monuments’ (Particular Attention to the Process of Designing and Building the City)

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The conference is structured around six thematic sessions, each addressing a specific area of research and practice within the built environment.
Each session is coordinated by experts in the relevant disciplinary field and is open to professors, researchers, PhD candidates, and other scholars and professionals contributing to the conference themes.

### SESSION I
### Urban Planning and Societal Impact

**Chair:** Dr. Gent Avdija

This session examines the relationship between urban transformation, spatial development, and their social implications within contemporary cities. Contributions address rapid urbanization, urban fragmentation, the transformation and loss of public space, informal and spontaneous development, and the challenges associated with balancing growth and modernization with human-scale urban environments. Particular attention is given to the evolving conditions of Albanian cities and to planning approaches capable of supporting more inclusive, sustainable, socially responsive, and livable urban environments.

### SESSION II
### Sustainable Materials, Resilient Construction & Smart Design

**Chair:** Dr. Endri Duro

This session explores innovative approaches to sustainable construction, resilient structural systems, and environmentally responsive design. Particular attention is given to sustainable materials, energy-efficient and climate-responsive strategies, prefabricated and lightweight construction technologies, and human-centered approaches to structural and architectural design. The session investigates how material innovation, technological development, and responsible design practices can contribute to safer, more efficient, adaptable, and environmentally sustainable built environments.

### SESSION III
### Technological Advancements and Seismic Design for Resilient Places

**Chairs:** Dr. Seyyed Behrad Emadi & Dr. Ornela Şen

This session examines the role of technological innovation and advanced engineering methodologies in developing safer, more resilient, and adaptable built environments. Contributions address seismic hazard and risk assessment, digital fabrication, parametric and computational approaches, transformations of building envelopes and prefabricated housing systems, and emerging concepts for future urban mobility. The session highlights how the integration of engineering knowledge, digital technologies, and resilience-oriented design can strengthen the capacity of buildings, infrastructure, and urban environments to respond to contemporary and future challenges.

## SESSION IV

### Cultural Heritage

**Chairs:** Dr. Nikolla Vesho & Dr. Marsela Demaj

This session addresses the preservation, interpretation, and transformation of cultural heritage within contemporary architectural and urban contexts. Contributions explore conservation strategies for historic buildings and sacred architecture, seismic assessment and strengthening of heritage structures, adaptive reuse, and the social implications of urban regeneration and heritage loss. Particular emphasis is placed on achieving a responsible balance between conservation ethics, cultural identity, structural safety, and the evolving functional requirements of historic buildings and urban environments.

## SESSION V

### Spaces of Connection: Art and Design for an Interspecies and Interdisciplinary Environment

**Chair:** Dr. Francesco Scasciamacchia

This session explores the intersections of art, architecture, design, technology, and the built environment through interdisciplinary and experimental perspectives. It investigates changing relationships between human and non-human systems, spatial perception, adaptive reuse, post-industrial landscapes, urban representation, digital heritage, and environmentally and socially engaged design practices. Through critical, speculative, participatory, and research-based approaches, the session examines how art and design can generate new forms of connection, reinterpret existing environments, and contribute to emerging cultural and spatial narratives within contemporary cities.

## SESSION VI

### Next-Generation Pioneers of the Built Environment

**Chair:** Dr. Flogerta Krosi

This session provides a dedicated platform for emerging researchers and students to present innovative, experimental, and forward-looking approaches to the built environment. Contributions span architecture, engineering, urban planning, environmental resilience, design, and related creative disciplines, reflecting the interdisciplinary character of a new generation of researchers and practitioners. Through projects addressing topics such as bioclimatic design, flood-risk management, structural technologies, architecture-inspired design, and critical interpretations of objects and social space, the session encourages critical inquiry, experimentation, and new perspectives on the future of the built environment.

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# SESSION II

## Sustainable Materials, Resilient Construction & Smart Design

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Climate-responsive and energy-efficient design: Passive design strategies / Energy efficiency / Climate adaptation / Environmental performance.

Smart construction and material innovation: Lightweight construction / Prefabricated building systems / Advanced material applications / Resource-efficient technologies.

Human-centered design: Structural design for human needs / Performance-oriented architecture / Adaptable building systems / Integration of architecture and engineering.

# Human Centered Design in Civil Engineering

**DOI:** 10.37199/c4100038

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**Abstract**

*Civil engineering has long been presented as an objective discipline governed by codes, calculations, and material laws. Yet, as structural failures, unexpected contingencies, and cultural shifts reveal, design is never isolated from human values, social practices, or temporal change. This paper adopts a conceptual and theoretical approach, drawing on interdisciplinary literature and illustrative case studies, to explore the intersection of contingency and human-centered design in civil engineering. Through examples ranging from Albania's reinforced concrete villas to monumental works like the Sagrada Familia and the Leaning Tower of Pisa, the study demonstrates that structural design emerges as both a technical and a social activity. It argues that structures should be understood not as static objects but as evolving entities shaped by users, environments, and cultural contexts. The main contribution of the paper lies in reframing contingency as a productive force in structural design and proposing a situated, participatory approach that integrates technical rigor with human experience. By placing people—their needs, perceptions, and lived experiences—at the center of design, civil engineers can create structures that are not only safe and efficient, but also resilient, adaptable, and meaningful over time.*

***Key words:*** *Contingency, Human-Centered Design, Structural Engineering, Resilience.*

## 1. INTRODUCTION

Structural design is frequently referred as a rational and objective discipline, where engineers apply codes, calculations, and material laws to produce reliable and safe structures. Yet practice reveals a more complex reality: design is contingent, shaped by uncertainties, cultural shifts, and the lived experiences of people who build and inhabit structures. From the adaptive use of reinforced concrete in Albanian villas to monumental works like the Sagrada Familia, structural engineering demonstrates that buildings are not merely technical artifacts but social products, embedded in the dynamics of time, place, and community.

The recognition of this interplay between the technical and the social has been explored by several authors. Jeremy Till (2009) in Architecture Depends argues that architecture—and by extension structural design—cannot be separated from contingency, since it is always shaped by external forces, from politics and economics to everyday human practices. Similarly, Juhani Pallasmaa (2012) emphasizes the sensory and experiential dimensions of built form, suggesting that structures shape not only space but also human perception and emotion. In the field of engineering ethics, scholars like Caroline Baillie (2006) advocate for a human-centered approach to engineering education and practice, where social responsibility and cultural awareness are as important as technical efficiency.

Human-centered design principles, originally rooted in product and interaction design (Norman, 2013), are increasingly being applied in civil engineering. Rather than focusing solely on problem-solving and optimization, this approach emphasizes the needs, behaviors, and lived experiences of users. John Forester (1999) introduces the idea of “sense-making” in planning and design, which prioritizes dialogue, negotiation, and shared meaning over purely technical solutions. In structural engineering, this suggests a reorientation: from designing idealized static objects toward designing adaptable and resilient systems that can accommodate human change, uncertainty, and participation.

Moreover, Anthony Giddens’ (1991) reflections on trust and modernity highlight the ambivalence people hold toward technical expertise: both reliant on and skeptical of it. This underscores the importance of integrating human-centered methods into engineering practice—not only to improve technical outcomes but also to build legitimacy and trust within communities. Recent scholarship in participatory design (Sanoff, 2000; Sanders & Stappers, 2008) further demonstrates that involving users in the design process generates ownership, resilience, and adaptability in built environments.

This paper situates structural design within this evolving conversation. It argues that contingency should not be dismissed as a flaw in engineering practice but embraced as an opportunity for creativity, adaptability, and social engagement. By combining human-centered design principles with the technical rigor of civil engineering, we can produce structures that are resilient in the face of uncertainty, meaningful to their communities, and responsive to cultural and temporal change. In doing so, civil engineering moves beyond problem-solving toward sense-making, integrating technical knowledge with the complex

realities of human life. This paper aims to critically examine the role of contingency in structural design and to explore how human-centered design principles can reshape civil engineering practice by i) analyzing how contingency manifests in structural design beyond purely technical parameters, ii) investigate the relationship between structural engineering and other social factors and iii) by proposing a situated and participatory approach that integrates human-centered design with engineering practice.

## 2. LITERATURE REVIEW

There are many instances of similar contingencies in the building industry, and the most successful engineers are those who, first, confront these circumstances head-on and, second, offer answers. However, contingency is a phenomenon that occurs at every level of construction. Because structural design is heavily reliant on factors outside of science and the profession, it becomes a social activity. First of all, the definition of failure genuinely varies depending on the situation. Even though a structure may need to collapse or be restored later, it can be deemed to have failed during an earthquake if everyone within and outside is unharmed. For other structures, such those of hospitals, non-failure refers to their ability to be used immediately following an earthquake; that is, they shouldn't have significant residual deflections or cease to function.

The building must be safe throughout its lifetime, which is another design requirement. The one-hoss shay in Oliver Wendell Holmes' book (Holmes, 1891) was constructed to survive 100 years, yet it fell after that number of years—neither more nor less. For structures, however, this cannot be assumed. The exact amount of time a structure will last before collapsing cannot be predicted. As a result, there are general projections that rely on the material and structural system employed in place of this. Nevertheless, these predictions are obviously highly approximative. The bearing capacity issues are also limited to statistical considerations. As a result, when we build a structure for a typical lifespan, we also have to acknowledge that there is a chance, no matter how tiny, that the structure will fail before the period assumed for its lifespan.

Additionally, there are potential hazards that are so improbable that they shouldn't be taken into account when designing. For instance, structural designers in Spain do not account for earthquakes. In a similar vein, only a small number of unique buildings—such as those used by the military, the government, and high-level institutions—are made to withstand explosions. Design does not have a final answer; there are simply better and worse options, even though an analysis may have a right conclusion.

Additional instances of contingency in design originate from design methodologies, which are regarded as undeniable and perfect. Because of its design, the dome of Saint Peter's in Rome was unable to withstand the tensile stresses pressing on its horizontal sides. Consequently, steel rings were eventually required to reinforce it. Later on, those rings were strengthened once more. The architect concealed the presence of all these reinforcements, which are not

visible. Therefore, the dome's shape actively misleads the observer by implying that it is self-supporting even though its form does not adapt to structural requirements. Michelangelo knew that this shape's structural performance was weak. However, in this instance, Eduardo Torroja states that "that does not detract from the beauty of the cupola." (Torroja, 1962) Therefore, the dome of Saint Peter is regarded as a design success, despite apparent mistakes in the application of the structural design methods of that era.

Another illustration of how design errors and contingencies have actually contributed to success is the Leaning Tower of Pisa (fig. 4). Originally intended to be a vertical tower, its foundations experienced differential displacements as a result of the base's different layered formations.



Figure 1: Tower of Pisa. Source: Alliaj, 2025

The tower moved as a result, giving it the current appearance. Initially viewed as a systemic failure, the differential displacements eventually emerged as the primary feature of this structure's identity, drawing millions of tourists annually. As was previously stated, the issues of bearing capacity and stability are poorly defined as entirely formalizable. The same is true for durability-related issues. These issues include things like steel corrosion in concrete, issues with freeze-thaw cycles, issues with wood deterioration, material fatigue, creep and shrinkage. The solutions to these problems are also based on statistical data that cannot precisely determine the lifespan of the structure against these cases because time plays a major role in this case and most of these processes require a relatively long time to cause significant damage to the structure—referring to over twenty years.

“The problem of steel corrosion has no simple solution” (Claisse, 2016), admits Peter Claisse, in his book Civil Engineering Materials. However, the idea of durability, as Kenneth Frampton

points out, is not only tied to space and form but also to place-making and the passage of time, brought to completion through the presence of light, water, wind, and weathering. “In as much as its continuity transcends mortality, building provides the basis for life and culture. In this sense, it is neither high art nor high technology” (Frampton, 1995). The structure is viewed as a time-independent object that starts when the job is finished and is meant to remain unchanged until its expiration date, which is established in a relationship based on the endurance parameters, which can be as long as 120 years. The idea that the building will stay fixed, unaffected by anything, over many years is ludicrous.

On the contrary, it interacts with living things and is changed by outside forces. When time is viewed as a dynamic agent, design is associated with ongoing paradoxes. Colonel T. E. Lawrence claimed that while the Romans attempted to construct their cities for eternity, they only succeeded in reminding the next generations of their ridiculous power, which was ephemeral and fleeting like everything in this life (Torroja, 1962).

Moreover, Eduardo Torroja challenges the wisdom of spending too much money on durability. He questions why spending money on longevity is worthwhile because it is impossible to forecast future transportation systems, industrial processes, or lifestyle choices. He notes that although many bridges are still technically good, they have been demolished since locomotive weights increased in a matter of years. Designing with a margin of reserve to account for anticipated increases in load is fair in some situations. In other cases, however, it could be more prudent to construct almost temporary buildings if they are significantly less expensive and if future functional requirements are still unknown (Torroja, 1962).

Auguste Perret, on the other hand, proposes another way of thinking by arguing that ruins are a necessary component of the process and should therefore be taken into account when designing. "Versailles is badly constructed, and when Time will have exerted its mastery over this palace, we shall not be left with a ruin, but with a mass of unidentifiable rubble," he argues in his critique of Renaissance architecture. This is not architecture; beautiful ruins are the result of architecture (Frampton, 1995).

Contingency in design appears not just as a reaction to loads but also as ornamentation in the structure's design. A structure must be ambiguous in order to be both load-bearing and beautiful; Robert Venturi refers to this as "a both-end" object (Venturi, 1966).

However, human error on the part of the designer is frequently the primary cause of a design blunder. Because design flaws can be concealed and claims made by designers as if they happened for causes outside of their control—that is, as victims of the environment or the social system—care must be taken. Based on his work experience, Torroja notes that mistakes frequently resemble what was formerly referred to as "sin." Throughout his lengthy career researching the strength of materials and structures, he looked at many accidents—many of which were fatal—and came to the conclusion that relatively few happen in a way that is morally neutral. In fact, he discovered that the great majority (nine out of ten) are the consequence of human flaws, often verging on open neglect or even wickedness, rather than hidden technological problems (Torroja, 1962).

The distinction between an error and an accident becomes hazy, though, if it is assumed that designers shouldn't be held accountable for mistakes made outside of their domain and the structural design profession is full of outside powers. Thus, the uncertain zone of contingency has become a haven for all those dishonest designers whose errors have resulted in the creation of subpar structures that have even caused human casualties.

Frank Lloyd Wright also feels this problem in the construction profession and calls for integrity as follows:

What is needed most in architecture today is the very thing that is most needed in life—Integrity. Just as it is in a human being, so integrity is the deepest quality in a building...If we succeed, we will have done a great service to our moral nature—the psyche—of our democratic society...Stand up for integrity in your building and you stand for integrity not only in the life of those who did the building but socially a reciprocal relationship is inevitable (Wright, 1954).

Regarding professional integrity, Torroja also insists that the standards of the past be challenged when the time comes (Torroja, 1962). If there is a brief period of normality, it is found in the relationship between the environment and the mind rather than in the abstract concepts of thought. This implies that if we are working with a normative, we ought to be able to challenge it at all times and take comfort in a situational approach. Above all, we have to be careful not to reverse values, which might imply, for instance, that structural performance is neglected and economic issues are given more priority. This does not imply that we should completely disregard the economic aspect and build incredibly costly structures, but it also does not indicate that we should avoid doing so in some situations. We just have to be honest, especially with those who will be impacted by our product.

Torroja then insists that society understand designers (Torroja, 1962), although this goes against even his earlier claims when he clarifies that a structure's creation need not be seen by its observers or regarded as an essential value. He asserts that no great work of art has ever been fully understood by uncultured people (Torroja, 1962). However, the reality is that urban art is not limited to museum walls. The majority, whether they be academics or common people, are nonetheless impacted by the messages that buildings carry because they reflect their authority over all of us. The structure no longer depends on the designer after the construction contract is signed. Colin Rowe reminds us that even though modernist architects constructed without a theory of architecture by rejecting the ideals of form, their structures nevertheless display some architectural values since they have the authenticity of time (Rowe, 1982). Therefore, it is a mistake to ask that society needs to attain a specific level of professionalism in order to better appreciate the merits of the structural designer profession.

The opposite, however, seems more feasible. It is this connection between form and our human consciousness that makes structural design inseparable from social aspects. Juhani Pallasmaa says: "The architecture of Michelangelo does not present symbols of melancholy; his buildings actually mourn. When experiencing a work of art, a curious exchange takes place;

the work projects its aura, and we project our own emotions and perceptions on the work" (Pallasmaa, 2005). The melancholy in Michelangelo's structures is entirely from the observer's personal experience, initiated by the authority of the work. We become part of the work. Our consciousness takes us to images of the city of another, much older time. The rooms, streets and squares are transformed and our imagination experiences life in Ancient Rome. This happens every time we encounter a structure. "We become citizens of mid-19th-century St Petersburg through the incantations of Dostoyevsky... We are in the room of Raskolnikov's shocking double murder, we are among the terrified spectators watching Mikolka and his drunken friends beat a horse to death, frustrated by our inability to prevent the insane and purposeless cruelty." (Pallasmaa, 2005), says Pallasmaa.

People are led to believe that structural design domain is also a reality by the potent metaphor of structural design as a separate field. The risk arises when structural designers themselves hold this belief. Consequently, structures themselves are dominated by structural design as a metaphor. Jeremy Till cautions, "We have already seen what happens when one starts to confuse the metaphorical for the real: the deluded belief that architecture can be autonomous," (Till, 2009) a stance that produces self-referentiality and suppresses contingency (Till, 2009).

Giddens notes that public perceptions of science and technical proficiency are characterized by ambiguity in relation to structural design's propensity to lurk within the realm of science. He contends that in situations when knowledge is insufficient, trust becomes essential, but this ignorance also permits uncertainty and careful reserve (Giddens, 1990). He contends that as a result, people negotiate with the modern spirit in terms of the trust they place in "symbolic tokens" and the human need for knowledge and assurance. However, there is a mixture of comfort and anxiety, deference and distrust, throughout the entire bargaining process.

Across the above perspectives, a common theme emerges: structural design operates within a field of uncertainty shaped by technical, social, and temporal factors. While traditional engineering emphasizes control and precision, the literature increasingly points toward adaptability, participation, and experiential meaning.

The key gap identified in this review is the lack of integration between technical rigor and human-centered approaches. Addressing this gap provides the foundation for rethinking structural design as both a scientific and a social practice.

## 3. METHODOLOGY

This study adopts a qualitative, theoretical, and interpretative methodological approach, grounded in conceptual analysis rather than empirical measurement. It draws on interdisciplinary literature from structural engineering, architecture, philosophy, and design theory to critically examine the role of contingency in structural design and to explore the

integration of human-centered principles within engineering practice.

This study begins by a narrative of giving examples of factors that dictate structural design that do not come from the domain of structural design. Then, an assessment of this field is made so as not to ignore this contingent mass, but rather to see it as an opportunity to introduce the respective field of study as an activity that deals with social values. Then, based on the studies of norms and normatives, conducted by George Canguilhem, it will be judged how it can be evaluated the norms of structural design to deal with irregularities.

## 4. CONTINGENCY IN STRUCTURAL DESIGN

Among young architects and engineers, there is a recurring joke about structural design: whenever someone asks how a difficult structure was resolved, the playful answer is, “With a spatial truss.” The humor lies in the fact that this solution is often revisited later in professional practice, where steel systems and spatial trusses indeed become reliable fallbacks for overcoming unexpected design challenges.



Figure 2: Skanderbeg Head Building, spatial truss for “Skanderbeg’s shoulder”. Source: Alliaj, 2025

The case studies demonstrate that structural design is shaped not only by technical requirements, but also by regulatory, social, cultural, and temporal contingencies. Across diverse examples—from the Sagrada Família to everyday Albanian construction practices—design solutions emerge as adaptive responses to changing and often unpredictable conditions. Collectively, they reinforce the paper’s central argument that embracing contingency through a human-centered approach leads to more resilient, meaningful, and context-responsive structures.

In many cases—both in academic exercises and real construction scenarios—complex conditions are ultimately managed through the versatility of steel construction and the adaptability of spatial truss systems. In complex architectural projects, spatial, legal, and contextual constraints often dictate structural decisions in ways that extend beyond purely

technical considerations. The project engineer noted that delays in obtaining the building permit for a specific portion of the site significantly affected the progress of a structure in Tirana that features the stylized form of Skanderbeg's head (fig. 1).



Figure 3: Sagrada Família; the old facade, the new facade, the 'yet' to be build facade, and the facade in restoration. Source: Alliaj, 2025

In this case, the unapproved area coincided with the location of Skanderbeg's "shoulder," a component of the design whose geometry could not be altered without compromising the project's conceptual integrity. As a result, conventional adjustments to the layout were not feasible. The engineering team therefore adopted a solution involving a substantial steel spatial truss projecting as a cantilever from the main structural body—an intervention that functioned almost as an autonomous, parasitic element. Despite its complexity, the approach successfully resolved the imposed constraints.

In contrast, the Sagrada Família is incomplete and unbalanced. The "under construction" designation has been in place for about 150 years, which is longer than what is often thought of as a structure's lifespan (fig.2). However, because of its ambitious design, it is regarded as a wonder of the world. The events of around 150 years of full time have unfolded there. It is sufficient to see how one area has changed and how other, more recent areas lack the aura that the passage of time provides. Paradoxically, one section is being constructed while others are being restored because they have reached the end of their useful lives.

The majority of Albanian villa buildings feature exposed rebar above the terraces with the intention of adding a second level in the future (fig. 3). In this instance, the structure may be able to sustain more floors than it actually does since the designer—whether an engineer or, as is typically the case, the villa's resident himself—was aware of this possible change and took it into consideration at the outset of construction. But it can take years for it to happen, and in many situations, the structure might live its whole existence in that form in an effort to realize its full potential.



Figure 4: Bars and unfinished structures over terraces. Source: Alliaj, 2025

The switch from masonry constructions, which were once common in Albania, to reinforced concrete frame structures for villas is another example of structural contingency. The causes are totally cultural. Since masonry is less expensive than frame structures for low-rise buildings, these are not economic justifications. Both of these systems are capable of carrying common loads in the case of villas and covering common spans in the case of houses. Additionally, the use of brick constructions is better considering constructability and construction duration. However, with the fall of the communist regime in Albania in 1990, the country's new spirit aimed to build like the developed western world. As a result, Albanians started using new materials, viewing their use as "higher quality of construction" and masonry as inferior.

Regarding construction in Albania, there are numerous instances that call for answers to land property issues, which naturally affect how buildings are constructed. It is very interesting analysing a case study of a wall in Astir, Tirana, that is composed of half reinforced concrete and half concrete blocks. Usually, the owner explains that the area with reinforced concrete should be more resistant because it is taller. Moreover, he is reluctant to disclose that he has legal issues with the use of the land and believes that the portion of the wall that will likely need to be demolished in the future should be constructed using concrete blocks in order to save money on demolition. In this instance, the wall's carrying capability is unrelated to the material selection. Simply put, because the machinery needed to cut the concrete and reinforcement is more expensive and needs skilled labor, the reinforced concrete portion in this instance is more difficult to collapse.

A dispute starts to the Green Coast development in Palasë (fig. 6). The engineers who work there defend the buildings' superior design methods and environmental certifications, yet by the public opinion it is seen a dystopian presence of authority.

This is the problem. Their claims that the building is nearly flawless in both form and technique seem reasonable, yet the overall public viewpoint is dismissed as sheer emotion. The professional claims prevail, because it is widely acknowledged in the contemporary world that reason always prevails over emotion when it comes to structural design.



Figure 5: A green coast, Palasë. Source: Alliaj, 2014



Figure 6: Green Coast Resort, Palasë. Source: Alliaj, 2025

Structural formalism may also be connected to the ridiculousness of the structural designer profession's self-referentiality, which is progressively diverting from the actual act of creating structures. According to Peter Eisenman, the rationality of the design process itself and the internal logic of form become the only justifications left when form is no longer based on elements like function, program, meaning, technology, or client requests (Eisenman, 2004). He is arguing that designers develop more logical criteria to characterize the design process because the issues of use, values, and clients differ greatly from one another and cannot all be gathered under a single regulator.

However, the values of structural design are found in the other area of design that is covered by the right side of the brain and overlaps with rational parameters. The peculiarity of structural design creativity, for example, is that it defies a thorough and accurate explanation. This mysterious quality is what makes design valuable and sets it apart from jobs that can be completed solely by computers and machines.

Situational approaches in structural design shouldn't be disregarded. As long as they serve a purpose outside of their typical self-referential domains, even traditional methods of solving forms are acceptable. Actually, what I'm arguing is that the notion that structural design is a service to humans should be at the center of its ethics. Assuming that professional behavior lacks ethical principles is one of the common mistakes. It's similar to arguing that you will guarantee ethical behavior if you strictly adhere to the design code.

During the 2019 Albanian earthquake, structural designers frequently spoke on media that soft stories were to blame for the downfall of numerous structures. However, despite being theoretically plausible, this framing only served to conceal the true causes of the devastation. The projects were never finished, occupants altered the buildings and continuously destroyed them, developers reduced expenses, and contractors performed subpar work. The building

that resulted in the greatest number of fatalities during that incident had already reached the end of its useful life and was deemed uninhabitable by experts. Their habitants were warned to exercise caution in the event of an earthquake.

However, no one asked, "Where would these residents go?" They negotiated their current lives with their future ones, and the building where they slept every day had turned into a possible coffin for them. Numerous social problems, including poverty, politics, culture, education, and awareness. In the meantime, the structural designers, who were tasked with advocating for such a crucial case and who were expected to have a deeper understanding of the reasons of destruction than others, all said, "Soft-stories." Structural designers frequently identify issues within their domain, which is why they neglect to address the primary players that cause harm. By doing this, they would gain control over the issues and appear to be the only ones who can offer solutions.

However, that is not how phenomena occur. They are situational, unclear, and beyond anyone's area of expertise. The first step to better design is realizing this. This is not to argue that structures should be constructed without taking standard design guidelines into account. But to say that a structure's geometry is the cause of its issues is not only ignorant; rather, it is a purposeful attempt to limit structural design to an area where straightforward solutions can only be found by specializing rather than by expanding. This claim is just an open invitation to increase profits from the construction market and to make a wanted product on the market.

Recent studies published in the journals of the Athens Institute for Education and Research highlight the growing emphasis on integrating structural optimization and material performance into contemporary engineering practice. Mohammad and Ahmed (2018) demonstrate how Eurocode-based optimization methodologies can significantly enhance the efficiency of reinforced concrete cantilever systems, revealing the value of computationally informed decision-making in complex structural configurations.

Similar optimization principles are advanced by Mohammad (2016), who shows that refined design strategies for reinforced concrete columns can reduce material use while preserving safety and performance. Broader investigations into wall behavior further extend this line of inquiry; Morsy and Ibrahim (2019) present a parametric analysis that underscores how geometric and reinforcement variables condition the performance of RC wall systems. Complementary research by Özbek (2016) explores strengthening techniques using solid steel plates, illustrating how adaptive retrofitting methods can address evolving structural demands—an issue closely aligned with the contingent design scenarios discussed in the present paper.

Finally, Lovasi, Msallamova, and Kouril (2019) introduce electrochemical healing as an innovative restoration method for deteriorated reinforced concrete, demonstrating how maintenance and repair practices themselves form part of a structure’s long-term adaptive trajectory. Collectively, these studies reinforce the argument that structural design is not a fixed technical exercise but an evolving process shaped by optimization, adaptation, and the

temporal behavior of materials.

We return to our human reality by embracing contingency. According to Georges Canguilhem, under some circumstances, even the pathological is normal in its own way, therefore the normal—the one recognized by the profession—should not be contrasted with the pathological—the one excluded from the profession. Stable and respected structural architecture is far more than just the standard. To put it simply, it is the sole unquestionable rule. Canguilhem then urges us to test every other instance of norms. He challenges us to examine seeming norms and consider whether it can tolerate transgressions, reconcile inconsistencies, and adjust to conflict. He contends that true normativity, or health, is found in norms that are flexible enough to change and adapt in the future. A state of normality, on the other hand, lacks true normative intent if it just aims to maintain itself, resists change, and is unable to adapt to new circumstances. Therefore, whenever we encounter something that appears typical, we need to consider if its norms represent the current cultural values or are conservative and regressive (Canguilhem, 1994).

According to Canguilhem, the term "normal" in biology does not always refer to the old, but rather to the new form—as long as it finds circumstances that enable it to become normative and replace outmoded or declining forms. He goes on to say that once the circumstances supporting a phenomena's normative status have vanished, no phenomenon classified as normal may assert the authority of the norm itself (Canguilhem, 1994). The circumstances in which they both find themselves and determine whether or not they will live in the future are what characterize normal and abnormal in nature.

He contends that nothing is fundamentally normal or abnormal. An aberration or mutation is a potential alternative standard of life rather than a pathology in and of itself. This new norm is considered pathological if it turns out to be less stable, fertile, or adaptive than previous ones. It is considered typical if it performs equally in the same setting or even better in a different environment. In this way, normativity gives rise to normality. Therefore, pathology is not the lack of a biological standard but rather another norm that life has pushed to the periphery. (Canguilhem, 1994).

Similarly, no contingency should be disregarded as unpleasant. Instead, it should be viewed as a chance. In order to develop norms that represent the values of the zeitgeist, we must always consider how the contingency will affect the normal projection.

Canguilhem insists that “No environment is normal. An environment is as it may be. No structure is normal in itself. It is the relationship between the environment and the living thing that determines what is normal in both.” (Canguilhem, 1994) According to him, a living thing is considered truly normal when it maintains itself within norms and forms that allow for flexibility and variation, allowing some forms to become more viable as circumstances change. When a species can flourish, diversify, and adjust to changes without endangering its life, the habitat is considered normal. On the other hand, disease is precisely the inability to endure change, thus when either life or the environment cannot adapt, the condition becomes pathological (Canguilhem, 1994).

In structural design, societies serve as the environment. It is evident that no society has ever been flawless. They do, however, prescribe the design requirements that must be met; otherwise, structural design will fail and cease to exist as an activity. Regarding the scientific principles of design, structural design cannot exist without a set of sound scientific principles that can satisfy all social standards. Nevertheless, Canguilhem disputes this notion, pointing out that "certainly this environment, which science defines, is made of laws, but these laws are theoretical abstractions." (Canguilhem, 1994). He contends that living things exist in connection to other living things and events that continuously alter abstract laws rather than in the domain of those laws. For instance, the branch itself is what sustains a bird and not the elasticity principle. The bird is reduced to colloidal fluids if the branch is reduced to elasticity alone. The concepts of the environment, health, and illness vanish at such an abstract level, leaving only processes of becoming and history (Canguilhem, 1994).

## 5. CONCLUSIONS

Contingency plays a fundamental role in structural design, shaping both the performance of structures and the processes through which they are conceived and adapted over time. This paper has argued that structural design should be understood not only as a technical discipline, but as a dynamic practice influenced by social, cultural, and temporal conditions.

The main contribution of this study is the reframing of contingency as a productive force, alongside the proposal of a human-centered, situated approach that integrates technical rigor with lived experience. The analysis shows that more resilient and meaningful structures emerge when uncertainty is acknowledged rather than eliminated.

Future research could focus on empirical applications of these ideas, particularly through participatory design methods, user-informed criteria, and the integration of contingency into engineering practice and education.

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