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Upcycling Architecture in Italy

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This book is the outcome of a two-year research project entitled *Upcycling Architecture in Italy. Forging and Promoting a Renewed Building Culture*, whose main objective is to analyze, articulate, and disseminate the theory and practice of upcycling – understood as a distinctive form of building material reuse – within contemporary historiography and design culture.

Funded by the European Union through the Next Generation EU program within the Italian PRIN 2022 PNRR research scheme, the project has been carried out by four research units: Politecnico di Torino, Sapienza Università di Roma, Università degli Studi di Roma Tor Vergata, and Politecnico di Milano.

More specifically, this volume examines the recent history of Italian architecture since 1945, tracing a trajectory from postwar reconstruction to contemporary design practices through the specific lens of upcycling and the related concept of Design for Disassembly (DfD). The topic and approach of this research entail a series of terminological, chronological, and methodological challenges that must be addressed at the outset in order to frame the discussion that follows.

First and foremost, the very term upcycling – which emerged in the context of post-industrial processes of the 1990s and has become

increasingly common in the fields of circular economy, systemic design, and various strands of design culture – admits multiple definitions and interpretations, particularly when applied to architectural and construction practices. From our standpoint, this flexibility – and, in a sense, its productive ambiguity – offers a remarkable semantic and operational potential. Yet such potential rests on a clear premise: the notion of upcycling as the pursuit of strategies for reusing existing matter as a critical alternative to the relentless production of the new, with the aim, in each case, of generating added value.

This conceptual framing also underpins the chronological scope and methodological approach adopted in this study. Both are closely tied to the operational evolution of industrial culture in the building sector, after the end of World War II in 1945 and throughout the second half of the twentieth century, and to the concurrent abandonment of long-standing practices of material reuse – not only in construction, but across multiple spheres of production.

The attempt to trace practices of reuse – or forms of upcycling and Design for Disassembly *ante litteram* – throughout this period has required both empirical investigation and conceptual reflection. In this process, the remnants of a vanished building culture have intersected – and, in many respects, been challenged by – the logic of industrial assembly and disassembly that, from the avant-gardes through the economic boom and into postmodernity, came to shape the very notion of modern construction.

Here lies both the challenge and the promise of the historiographical reinterpretation proposed in these pages. Situated between *bricolage* and Design for Disassembly, between postmodern *spolia* and the rethinking of industrial design – from everyday objects to the built environment – this study seeks to trace and analyze both the explicit and the latent dimensions of design culture over the past eighty years.

The aim, one might say, is to outline unconventional trajectories from which new insights for alternative historiography and contemporary practice may emerge. This is pursued with due caution toward the various forms of anachronism inevitably produced by the retroactive use of such a neologism, yet with an openness to

the productive possibilities it entails. Indeed, the very flexibility of the term – and the discrepancies between its contemporary and historical meanings – make it possible to recognize exploratory approaches in the past, as well as their resonances in the present.
Within this interpretive framework, the main but not exclusive questions guiding this volume – set against a provisional historicization and conceptual examination of upcycling in architecture – may be formulated as follows:

- While the history of twentieth-century architecture has largely been framed through a dichotomy of destruction, reconstruction, and modernity, is it possible to reinterpret it by tracing design and building practices that resonate with what we now define as upcycling and Design for Disassembly (DfD)?

- Can the early postwar period be understood as a pivotal moment of reassessment and renewal of long-standing practices of circularity – bridging the gap between premodern traditions, driven by necessity and scarcity, and the contemporary theoretical framework of reuse-based architecture within a structural condition of material surplus?

- Can we identify pioneering – albeit anachronistic – examples of upcycling within Italian modern and postmodern architecture, in which design practices generate value beyond simple reuse and promote the creation of meaning and quality within a building's circularity? Do these experiences suggest possible directions for advancing current upcycling debates through reflections on *modern spolia*, the practice of conceiving architecture through its elements, and the use of history and memory as design materials?

- Can the second half of the twentieth century – marked by the massive industrialization of the building sector – be examined as a critical juncture in which the concept of optimization first crystallized within construction processes, thereby establishing the foundations for systemic–environmental design and its gradual, if tentative, integration into architectural discourse?

- How might a critical reassessment of the ambitions and failures of building industrialization's unfulfilled potential – particularly its focus on component repertoires and on assembly as a semiotic device (the notion of architecture as opera aperta) – serve as the historical, theoretical, and methodological basis for contemporary DfD and upcycling practices?
- What future trajectories might the Italian construction industry pursue to meaningfully influence contemporary architectural production – moving beyond the mere display of bricolage-based processes and instead establishing upcycling as a systematic, industrialized, and widely adopted design and building practice, as is already occurring in other European contexts such as Denmark, Belgium, and Switzerland?
- How does upcycling relate to processes of heritage-making and preservation, particularly with regard to the controversial heritage status of late twentieth-century industrialized architecture, which is largely characterized by the assembly of building components?

By engaging with these questions, this book seeks to encourage both historiographical and theoretical renewal through a design-oriented lens, with tentative extensions into the field of experimental preservation. First, it contributes to a more nuanced understanding of architectural modernity – one that is neither wholly constructive nor entirely destructive, but inherently multifaceted and ambivalent. Second, it seeks to address a long-standing gap in the historiography of reuse and circularity by tracing their persistence and possible transformations through the years of unprecedented economic growth, mass industrialization, and the early globalization of architectural culture. In this way, the book aligns with a wider scholarly endeavor to reframe the history of the recent past from its peripheries, uncovering episodes and strategies of critique and resistance to hegemonic practices and imaginaries.

What emerges is an original narrative of Italian architecture over the past eight decades, enriched by an openness to recent best practices developed in other European contexts – one that highlights

lesser-known experiences and reconsiders familiar cases from a renewed perspective.

This alternative reading of Italian architecture in the second half of the twentieth century tentatively weaves together diverse material histories that are often examined in isolation despite their deep interconnections. These include: the industrial reuse of rubble; assembly-based design processes extended to radical ready-made concepts; the negotiation between tradition and modernity; the use of modern *spolia*; memory and the notion of reversibility in preservation; and the practice of conceiving architecture and design through their components and elements.

In doing so, this volume offers a possible interpretative framework for the current rise of cradle-to-cradle architecture, drawing upon and critically reactivating the legacy of a controversial modernity.

Structure of the Book

The book is structured in five sections. Each section comprises a thematic essay, authored by the section's coordinator, and five case-study sheets focusing on related Italian examples. These sheets have been written by members of the research team as well as by scholars with specific expertise in the selected topics. This collective structure reflects our commitment to making the project a truly collaborative endeavor.

In principle, the five sections follow a chronological order, spanning the entire timeframe of the book and revealing key theories and design practices of reuse and circularity from the mid-1940s to the present. Yet, in tracing precedents and examining their long-term legacies, the chapters often overlap chronologically and resonate thematically. Taken together, they offer multiple, parallel narratives of architectural modernity and interconnected perspectives on a continually evolving landscape.

The first section, devoted to the reuse of rubble, is curated by Alessandro Benetti. It investigates whether – and in what ways – the specific conditions of war, marked by scarcity and urgency, fostered a circular approach to construction that included the salvaging of debris.

The essay traces the trajectories of rubble, understood as displaced material, from its original pre-destruction contexts through the various stages of management to its post-reconstruction destinations.

The discussion begins by outlining the national regulatory framework and the main actors involved. It then examines the types of salvaged rubble and the logistics of its transportation, disposal, and storage. Subsequently, different practices of rubble reuse are identified and classified for both earthworks and building construction sites, ranging from recycling and repair to reuse and, potentially, upcycling. The essay concludes by proposing that World War II constitutes not an isolated phenomenon but part of a much longer history of rubble reuse following catastrophic events – such as earthquakes – a history that continues into the present.

The second section, coordinated by Ilaria Giannetti, questions the alleged novelty of Design for Disassembly (DfD) within design practice and culture. The essay argues that even a cursory examination of the full set of DfD principles – without delving deeply into the history of construction – inevitably recalls, through the rough transposition of the industrial manufacturing approach of *Design for Assembly* (DfA) to the building sector, the theoretical and methodological efforts of the late 1960s to establish a *"component-based architecture"*: the never fully realized apex of construction industrialization.

Building on these premises, the section first explores the micro-histories of building industrialization in Italy between 1945 and 1975, highlighting early approaches to DfD through an analysis of the theoretical frameworks and design experiments underpinning *"component-based architecture."* At the same time, it opens a further perspective on the process of heritage-making of industrialized buildings by proposing an experimental preservation framework grounded in the principles of DfD.

The selected case studies bear witness to the theoretical attempts to integrate industrial culture into architectural discourse between 1945 and 1975, and to the material dimensions of assembly- and disassembly-oriented architectural and technological design that have characterized industrialized construction since the postwar period.

The third section, coordinated by Gabriele Neri, investigates Italian experiences of the 1960s and 1970s that anticipated contemporary practices of architectural upcycling. This was a period marked by profound conceptual transformations and radical oppositions within the architectural field. The essay focuses on eccentric forms of design and architectural thinking that emerged during these pivotal years – situated between the mature reassessment of prewar design culture and a far-reaching critique of the entire architectural system, between the optimism of the economic boom and the social and energy crises of the 1970s.

Among the case studies, the Garelli House, a small Alpine dwelling by Carlo Mollino, is presented as an example of an unconventional negotiation between tradition and modernity – both technical and aesthetic – achieved through processes of dismantling and reinvention. The essay also examines the assemblage of ready-made components available on the market in the functionalist-oriented work of the Castiglioni brothers, within the rapidly evolving field of industrial design. Finally, the third part of the essay reveals multiple strands of thought, research, and practice of reuse that characterized the radical architectural culture of those years.

The fourth section, coordinated by Josep-Maria Garcia-Fuentes, investigates the practice of *modern spolia* and the ways of thinking architecture through its elements in twentieth-century Italy. The country functions as a privileged laboratory for reflecting on contemporary upcycling and on its strong connection to preservation. The essay analyzes the works of Piero Portaluppi, Luigi Caccia Dominioni, and Carlo Scarpa to demonstrate how *spolia* and existing buildings can be upcycled through design authorship, going beyond purely symbolic or ideological purposes. It then addresses the emergence of postmodern concerns with authenticity and historical interpretation, which further raise the question of reversibility, explored in the works of architects such as Marco Dezzi Bardeschi and Francesco Venezia. Finally, by discussing Rem Koolhaas's Biennale exhibition *Elements of Architecture* (2014) alongside his ongoing interest in heritage and preservation, the chapter broadens the connection between *spolia* and architectural

elements, and suggests ways to develop further the current design explorations on upcycling.

To conclude, the fifth and final section by Alberto Bologna reflects on the expressive codes of cradle-to-cradle architecture in contemporary practice. The essay highlights how today's prevailing patchwork aesthetic often risks compromising *firmitas* – constructive integrity – in favor of a merely ornamental *venustas*. It argues that genuine design progress requires salvaged materials to assume a renewed and durable constructive role, which in turn calls for the adoption of design protocols where the DfD approach is conceived as an integral principle. Recognizing the marginal position that Italy still occupies in this regard, the essay presents several recent buildings from Northern and Central Europe as best practices – examples that combine constructive rigor with expressive experimentation. They demonstrate how upcycling can and should evolve into a sophisticated design tool: one that moves beyond the visual idiom of *bricolage* and establishes resource circularity as an intrinsic standard of a responsible built environment, while simultaneously fostering an architecture of high expressive quality.

In line with these ambitions, the volume concludes with an afterword by Pierre Chabard – architect, critic, and historian of architecture and urbanism – who has long engaged with these issues. His contribution expands further the conceptual horizon of upcycling beyond the theoretical and historiographical reconstruction offered in the preceding chapters. By returning to *Usus/Usures* (2010) exhibition curated by Rotor's practice and to the subsequent evolution of his works, Chabard elucidates the theoretical and aesthetic stakes of material reuse as both a methodological shift and a cultural provocation. His reading demonstrates how upcycling – far from being reducible to pragmatic salvage or circular-economy compliance – articulates a profound reorientation in the understanding of architectural time, authorship, and value. In doing so, the text introduces to the Italian architectural milieu a critical and operative perspective that has played a pivotal role, on the European stage, in advancing the intellectual and practical frontiers of design with the existing.

Chabard's essay does more than conclude this book: it reopens it. It invites readers to measure the historiographical insights proposed here against the radical potential of contemporary design practice, and to recognize in upcycling not only a necessary response to planetary urgency, but also a generative aesthetic and disciplinary horizon – one capable of unsettling inherited certainties, reframing material legacies, and envisioning an architecture whose future is inseparable from its past.

Chapter 1

Reconstructing Italy Out of Its Rubble: Reuse Practices During and After WWII (1943–1947)

Alessandro Benetti
Politecnico di Torino

Despite the cultural and tangible relevance of the theme, scholarly research on the rubble left by World War II throughout Italy is surprisingly limited, particularly in the field of architectural and urban history. Existing literature primarily investigates the effects of bombing raids, quantifying and describing casualties and destruction, as well as the reconstruction efforts, focusing both on monument restoration and city planning.[1] By contrast, very little research has been conducted on a crucial intermediate moment, when the rubble of Italian cities was managed, disposed of, and more interestingly salvaged and reused. This is unlike some other European countries, such as Germany and Poland. Over the past decade, German historians, architectural and urban historians, have cast new light on the role of *Trümmerfrauen*, the women in charge of rubble removal,[2] and on the shaping of

1 See: Lorenzo De Stefani and Carlotta Coccoli, eds., *Guerra monumenti ricostruzione. Architetture e centri storici italiani nel secondo conflitto mondiale* (Venice: Marsilio, 2011); Gian Paolo Treccani, ed., *Monumenti alla guerra. Città, danni bellici e ricostruzione nel secondo dopoguerra* (Milan: Franco Angeli, 2008).

2 See: Leonie Treber, *Mythos Trümmerfrauen: von der Trümmerbeseitigung in der Kriegs- und Nachkiegszeit und der Entstehung eines deutschen Erinnerungsortes* (Essen: Klartext, 2014).

Trümmerbergen,[3] that is rubble hills, while their Polish counterparts have focused on the use of rubble for the reconstruction of Warsaw.[4]

This paper overcomes the destruction-reconstruction dichotomy widely adopted by the most established narratives, by analysing the material transformations of Italian cities during the war, and in its aftermath, through the lens of circularity.[5] The term "rubble" is used in a broad sense, as a translation of the Italian word *macerie*: accumulations of material that include both waste and potentially reusable components. Our focus is on the salvaging of the latter through a wide range of practices, from recycling, to repair and reuse, and possibly upcycling. The main research question is whether the specific context of the war, marked by scarcity and urgency, boosted a circular approach to construction. While architectural historians widely agree on wartime being an era of rapid modernization and industrialization of the construction sector, which would serve the following reconstruction phase, can we consider it also as a crucial time of reassessment and renewal of centuries-old practices of circularity – in a sense, bridging the gap between the then-declining pre-modern traditions and later experimentation in the field?

In order to address these questions, the multiple trajectories of rubble are analyzed here, tracing its movement from its original pre-destruction locations, through the various management steps, and finally to its post-reconstruction arrival points. First, the national regulatory framework for rubble management is presented, highlighting the private and public actors involved in the process and their various forms of cooperation. Second, the analysis focuses on the types of salvaged rubble and the logistics of its transportation, disposal, and storage.

3 See: *Hans-Jürgen Mielke, Wald und Politik. Die unendliche Geschichte des Berliner Teufelsberges (Berlin: Projekte-Verlag Cornelius, 2011);* Benedict Anderson, *Buried city, unearthing Teufelsberg: Berlin and its geography of forgetting* (London: Routledge, 2017).

4 See the ongoing research on the topic by Adam Przywara.

5 Amongst the most recent and comprehensive studies framing the notion of circularity, applied to the architectural scale, both from a historical and design perspective, see: IKE Institut Konstruktives Entwerfen et al., *Reuse in Construction: A Compendium of Circular Architecture* (Zurich: Park Books, 2022).

Then, various reuse practices are described, for both earthworks and building construction sites. Two additional specifications narrow the research scope: on the one hand, this paper focuses primarily on rubble lying on public ground, and therefore managed, at least in principle, by public authorities. On the other, unlike several studies in the field of architectural history and restoration, we strive to shed light on the reuse of ordinary construction materials, rather than on fragments and decorations from monuments salvaged for their artistic value.

Three cities were initially selected for this study: Genoa, Milan and Turin, the heavily bombed hubs of Italy's *triangolo industriale* – industrial triangle, the core of the country's industrial production. This paper is primarily based on original research conducted in their Municipal and State Archives. Additional archives from other cities, such as the mid-size Venetian town of Treviso, were consulted to double-check research findings in a broader geographical context. For the same reasons, we also explored the archives of the Allied Control Commission, the military and administrative body established by the Allied powers during and after World War II to oversee the occupation and governance of defeated Axis countries. They provided a comprehensive overview of the liberated parts of Italy. To conclude, archives of architects and private institutions supported the investigation of specific case studies.

Laws and Actors. Rubble Management as a Shared Concern and Opportunity

Italy followed a peculiar, inconsistent trajectory during World War II. At first, the fascist regime aligned with Nazi Germany as part of the Axis powers. However, military failures and growing domestic discontent led to dictator Benito Mussolini's removal in July 1943. Italy signed an armistice with the Allies in September, prompting German occupation in the north and the establishment of the Italian Social Republic, a Nazi puppet state. Meanwhile, the south was liberated by Allied forces, creating a divided nation. May 1945 marked the end of German occupation and Fascist rule in northern Italy and the reunification of the entire country under Allied control, while the Italian

Fig. 1
Bomb damage in Milan. August 1943. © Claudio Emmer, Civico Archivio Fotografico, Comune di Milano.

Fig. 2
Bomb damage in Turin. August 1943. Courtesy Archivio Storico della Città di Torino/Archivio Storico Vigili del Fuoco.

government regained full control of its territories only after the 1946 referendum, which abolished the monarchy and established a republic.

The geographies of bombing reflect this evolving situation and the Allies' shifting priorities. Northern Italian cities such as Genoa, Milan, and Turin were targeted first, in order to disrupt Italy's industrial base and war production. On June 11, 1940, the very first bombs fell on Turin, while raids on the three cities intensified dramatically between October 1942 and September 1943, to continue until the end of the conflict (Figs. 1, 2). Starting from the summer of 1943, bombings accompanied the path of Allied forces from the very South, where the invasion of Sicily started in July 1943, through the central regions and finally back to the North, to exhaust the remaining German and fascist forces. Unprecedented amounts of rubble were produced all through the country by wartime operations, whose management became an ever more urgent matter during the entire conflict. Scattered data exist in this regard and there is no consensus on a specific figure, either among period sources or historians. To give an example, estimates about the city of Milan, one of the most heavily bombed in the entire country, mention that 400,000 m^3 were removed by 1944, while in 1945 2.38 million m^3 still lay on private areas and 1.7 million m^3 on public areas.[6]

In order to cope with this tragic situation, between 1940 and 1945 a few national measures updated the existing legislation on rubble management, for the most part dating back to the end of the nineteenth century and to World War I. The issue of rubble was dealt with in strict connection with other urgent matters, including the reconstruction of public buildings and infrastructures, the housing for displaced people and the compensation of war damages to private parties. The first relevant law in this regard, Law No. 938 of 1940, placed the

6 Sources: "Relazione sull'opera svolta dal Comune per lo sgombero delle macerie" ("Report on the work carried out by the Municipality for the removal of debris"), November 7, 1945. Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 81/1954; Agostino Giambelli, *Milano in cinque anni. Sintesi della ricostruzione* (Milan: Massimo, 1951), 20–23.

Ministry of Public Works in charge of all reconstruction activities,[7] but a clearer task division between state and local authorities was defined only as late as 1945, through the *decreti luogotenenziali* (lieutenancy decrees) No. 4 and No. 305.

The former stated that "in each municipality where a significant number of buildings have been damaged by wartime actions, a Building Repairs Committee is established. This committee is composed of the mayor or their delegate, who serves as chair, and two members appointed by the Municipal Council."[8] The Committee "undertakes promotional activities, provides assistance to private individuals, and collaborates with government bodies."[9] Furthermore, "the Ministry of Public Works supervises the Building Repairs Committees […] through officials from the *Genio Civile*."[10] The latter decree, No. 305, promoted a further decentralization of the reconstruction activities, specifying that the Ministry of Public Works had primarily a role of coordination and budget approval, but could delegate all tasks to local authorities. The Ministry of Public Works, its local branch of the *Genio Civile*, the municipalities and their Buildings Repairs Committee – often connected to the *Ufficio Tecnico Comunale* (Municipal Technical Office) – were the main public actors involved in rubble management. Additionally, between 1943 and 1947 a key role was played by the Allied Control Commission, which supported and supervised local government activities.

7 Law No. 938, July 9, 1940, "Interventi di pronto soccorso per la riparazione di opere pubbliche danneggiate in conseguenza di azioni belliche" ("Emergency interventions for the repair of public works damaged as a result of military actions").

8 Luogotenential Legislative Decree No. 4, January 18, 1945, "Norme integrative al decreto legislativo luogotenenziale 17 novembre 1944, n. 366, per il ricovero dei rimasti senza tetto in dipendenza di azioni belliche" ("Supplementary Norms to the Luogotenential Legislative Decree No. 366 of November 17, 1944, for the shelter of those left homeless in dependence of war actions."), Article No. 2.

9 Ibid., Article No. 3.

10 Ibid., Article No. 4.

Both 1945's decrees made explicit reference to rubble removal and reuse, to which they dedicated a specific chapter.[11] Defining rubble as state property, while allowing its transfer to private parties, when necessary, was crucial in steering its trajectories throughout the reconstruction process: "Materials cleared from public areas are considered state property. These materials will be used by the *Genio Civile* for repairs carried out *ex officio*. Additionally, both the *Genio Civile* and the Building Repairs Committees may allocate them to private individuals undertaking repair work independently."[12] Furthermore, the *Genio Civile* was authorized to collect and reuse rubble from private properties, compensating for the negligence of their owners. Historians have noted that "the regulatory framework was imprecise and […] did not allow for the planning of comprehensive, large-scale interventions involving private property."[13]

Genoa, Milan and Turin, all heavily bombed, recurred to an all-in-all standardized form of cooperation between municipal offices and private contractors, framed and allowed by this national legislation. Local public authorities (be it directly the *Genio Civile*, the Building Repairs Committees or some other specifically created sections of the *Ufficio Tecnico Comunale*) outsourced to private contractors both damage assessment in bombed sites and the subsequent rubble removal. The former moment often included the identification of all reusable materials and components; the latter, as a consequence, entailed the sorting of rubble. A part of it was disposed of, in actual dumps or on public ground, as instructed by the municipality; another part, on the contrary, was stocked at municipal warehouses or, sometimes, kept by the contractor as payment for its services.

11 Ibid., chapter "Materiale di ricupero dalle macerie" ("Reuse material from rubble"), Article No. 23–24; Luogotenential Legislative Decree No. 305, June 9, 1945, Chapter VI, "Sgombero macerie ed utilizzazione dei materiali recuperati" ("Rubble removal and use of salvaged materials"), Article No. 57.

12 Ibid., Article No. 23.

13 Samanta Braga, "Lo smaltimento delle macerie nella Milano bombardata: problemi e strategie d'intervento," in *Guerra monumenti ricostruzione*, De Stefani and Coccoli, 327.

Contracts, agreements, and other correspondence between local authorities and private contractors are preserved in the Municipal Archives of both Milan and Turin, documenting the entire process and providing detailed records of quantities, schedules and fees related to rubble management. The possibility of selecting and keeping reusable material was often cited as an alternative form of compensation instead of monetary payment. For example, in Turin, the contract with the Pozzato Felice e Fortunato construction company stated that it was allowed "through its own workers, to sort the rubble to recover used bricks,"[14] and that it "may sell the recovered bricks to private individuals"[15]. Hired contractors sometimes also took in charge the repair of salvaged components, as it was the case for the Musso Francesco building company, whose receipts to Turin's *Genio Civile* also mentioned "the straightening of the metal sheets recovered from various damaged worksites and the repair of radiators, which were also recovered."[16]

In some cases, the collaboration between public and private parties led to more ambitious and coordinated actions. A case in point in this regard is the constitution of the RI-MAT Society, created in 1945 in Milan on the initiative of the *Genio Civile*, the municipal and province authorities, the trade union, the Milanese section of the anti-fascist *Comitato di Liberazione Nazionale* (National Liberation Committee), and the local *Società Umanitaria*. Founded in 1893, the latter remains to present one of the city's leading charitable institutions, aiming at

14 "Schema di convenzione con l'impresa Pozzato Felice e Fortunato per disciplinare lo scarico delle macerie provenienti da cantieri di edifici sinistrati della città di Torino" ("Draft Agreement with the company Pozzato Felice e Fortunato to regulate the disposal of debris from construction sites of damaged buildings in the city of Turin"), March 1, 1944. Archivio Storico Città di Torino, ASCT_ Affari e lavori pubblici_Cartella 875_ Fascicolo 1_1943–1944.

15 Ibid.

16 "Fattura n. 101 della Impresa costruzioni edili stradali Musso Francesco allo Spett. Corpo Reale del *Genio Civile*" ("Receipt n. 101, from the Musso Francesco buildings and roads construction company to the Spett. Corpo Reale del *Genio Civile*"), November 8, 1943. Archivio di Stato di Torino, Serie: Provveditorato alle Opere Pubbliche per il Piemonte e la Valle d'Aosta, Primo versamento, *Genio Civile*, Reparto recupero materiali, Mazzo 4380 "Sgombero di macerie e ricupero materiali."

"providing all citizens concrete assistance through study, education, and work" in order to achieve their "intellectual and moral upliftment."[17] As stated by RI-MAT Society's statute, it was open to membership to "all workers employed in the construction industry,"[18] and was structured as a *cooperativa* (cooperative), meaning that each member paid an entrance fee and purchased a certain number of shares, receiving in return the corresponding portion of the net profit, resulting from the annual balance sheet.

On the one side, the statute laid out the society's scope in clear and pragmatic terms: it was aimed at "the recovery, sorting, and testing of construction materials obtained from demolition or pre-existing rubble,"[19] as well as "the conduct of all resulting subsidiary activities."[20] On the other side, the first public announcement, circulated by the founders to advertise its founding assembly, also testified to an attempt to stir excitement about its practical goals, by framing them within a broader cultural and symbolical narrative (Fig. 3). Many passages of the text lend themselves to this dual level of interpretation:

> There can be no 'reconstruction' of our city without undertaking the systematic demolition of the thousands of remains that clutter the areas to be rebuilt, the stripping and careful sorting of the reclaimed materials, and their placing on the building market at an affordable price. The enjoyment of such reclaimed materials (*il godimento dei materiali ricuperati*) is an indispensable prerequisite to the rehabilitation of buildings still awaiting repair. [21]

17 Source: the Società Umanitaria's website: *umanitaria.it/milano*. For more information on its history, see also Massimo Della Campa, ed., *Il Modello Umanitaria* (Milan: Edizioni Raccolto-Umanitaria, 2003).

18 "Statuto della Società Anonima Cooperativa di demolizione, ricupero e distribuzione dei materiali d'opera" ("Statute of the Cooperative Joint-Stock Company for the Demolition, Recovery and Distribution of Building Materials"), August 20, 1945. ASU – Archivio Società Umanitaria, Fasc. 59/45.

19 Ibid.

20 Ibid.

21 "Prossima costituzione della 'Cooperativa demolizione, ricupero e distribuzione materiali d'opera RI-MAT'" ("Forthcoming Establishment of the 'RI-MAT Cooperative for Demolition, Recovery and Distribution of Building Materials"), August 9, 1945. ACM – Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 124/1948.

Logistics. Rubble Travels Across Italian Cities

The enthusiasm of the RI-MAT founders appears to reflect a minority perspective in Italy, where rubble was more often seen as a mere nuisance, something to be disposed of as quickly as possible. This urgency stemmed from several factors: safety, to avoid unstable piles crumbling down; public health, as decaying rubble would rapidly become insalubrious; circulation issues, to restore the normal flows of people and means of transport through the city; and even social issues, as displaced people would find refuge within ruined buildings or rubble piles. Attempts at salvaging and reusing materials happened in the hectic context of what Agostino Giambelli, Milan's Commissioner for Public Works in the immediate postwar period, described as a "rubble fever" ("*febbre delle macerie*").[22]

Giambelli recounts that in 1945

> thousands of workers are about to be mobilized in the enterprise of clearing the rubble. Work begins almost immediately […]. The available means are what they are. There is neither time nor money to impose a technically perfect equipment. Nevertheless, wonders are done. Horse-drawn carts, trucks, picks and shovels, remove and collect the smelly piles from the center to the outskirts. To speed things up, two new '*decauville*' railway are implanted […] on which hundreds of trolleys loaded with soil, crushed bricks, broken stones, shattered furniture and all sorts of objects will parade. It is the old Milan leaving in crumbs.[23]

Giambelli's attitude is boldly anti-nostalgic about rubble of the "old Milan," and goes as far as comparing it to a dirty, repulsive matter collected in "smelly piles." However, in more practical terms, his text also shows the quantity of people and the diversity of means of transport employed for these operations: wheelbarrows, horses, trucks, tramways and *Decauville* railways – narrow-gauge railways made up of prefabricated elements that can be quickly assembled and disassembled (Fig. 4). A rare map from November 1945, preserved at the *Archivio della Città di Milano* (Milan Municipal Archives), provides a comprehensive, spatialized representation of an Italian city crossed by rubble-removal

22 Agostino Giambelli, "La febbre delle macerie," in *Milano in cinque anni*, 17–32.

23 Ibid., 23.

4

Milano, 9 Agosto 1945

OGGETTO: prossima costituzione della "COOPERATIVA DEMOLIZIONE? RICUPERO E DISTRIBUZIONE MATERIALI D'OPERA RI - MAT"

Non ci può essere "ricostruzione" della nostra Città senza intraprendere la demolizione sistematica delle migliaia di ruderi che ingombrano le aree da rifabbricare, lo spoglio e la cernita accurata dei materiali di ricupero, la loro immissione nel mercato edilizio a prezzo accessibili. Il godimento dei materiali ricuperati è una premessa indispensabile al riattamento degli edifici che tuttora attendono di essere riparati, per accogliere la popolazione meno abbiente, i lavoratori, gli impiegati, i reduci dalla prigionia, i patrioti ritornati alla vita civile.

A questo immane lavoro di braccia e di menti invitiamo tutti i volonterosi, i disoccupati, i giovani senza un mestiere, i partigiani e reduci, le maestranze che dovranno - temporaneamente o definitivamente - abbandonare le industrie già al servizio della guerra.

L'edilizia, e inizialmente il ramo delle demolizioni, non conosceranno nel prossimo avvenire i tormentosi disagi della disoccupazione. Vi sarà lavoro per tutti purchè animati di buona volontà e di civica dignità.

Per iniziativa della Soc. Umanitaria si è costituito un Comitato promotore, in cui sono rappresentati la Camera del Lavoro di Milano, la categoria degli Edili, il Comune, il C.L.N. provinciale, la Fondazione Solidarietà Nazionale, che convoca per

MARTEDI' 21 Agosto 1945 - ore 20,30

nel salone sotterraneo delle assemblee, presso la Camera del Lavoro, C.so di Porta Vittoria - Milano - tutti gli interessati alla costituzione immediata di una Società cooperativa di demolizione, ricupero e distribuzione dei materiali da costruzione.

Verrà data lettura dello Statuto sociale e verrà illustrato il piano generale di lavoro della nascente Cooperativa.

Lavoratori, nel vostro stesso interesse, non mancate! Apportate all'iniziativa il frutto della vostra esperienza, partecipate in massa a questa pubblica riunione di edili e di aspiranti a diventare edili!

Ricordate che in una Cooperativa, e soltanto nella Cooperativa, l'uomo lavora democraticamente: tutti per uno e l'uno per tutti.

Vi accoglieremo con il cordiale benvenuto:

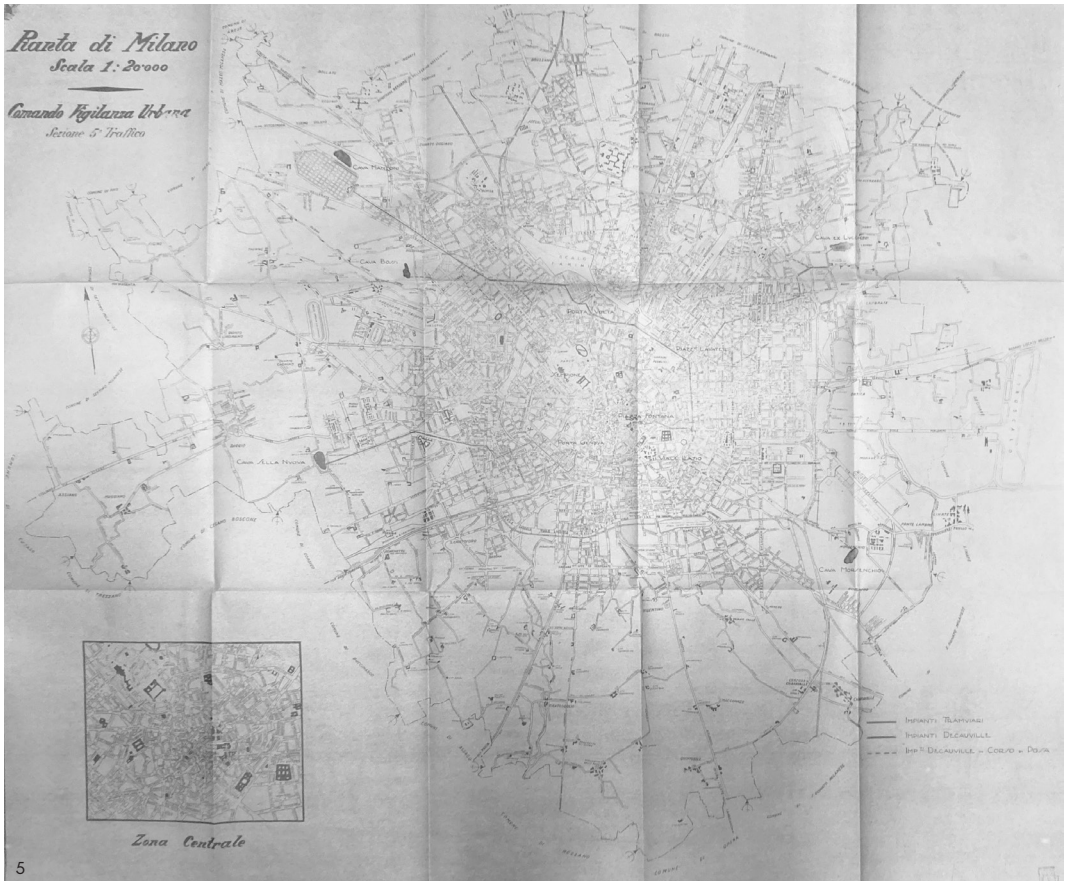
RICOSTRUIAMO MILANO !!

(Il Comitato Promotore)

3

Fig. 3
Public announcement of the founding assembly of the RI-MAT Society. August 9, 1945. Courtesy Cittadella degli Archivi del Comune di Milano, Lavori Pubblici, fasc. 124/1948

Fig. 4
A *decauville* railway in Milan. Circa 1945.



Figs. 5–6
Map of Milan indicating rubble removal infrastructures. November 1945. Full map and detail. Courtesy Cittadella degli Archivi del Comune di Milano, PR Urbanistica, fasc. 81/1954.

infrastructures (Figs. 5, 6). Green lines show temporarily reconverted tramway lines, while orange lines are *decauville* railways built specifically for this purpose. Both lead to the blue spots, disused quarries which are the final destination of disposed-of rubble. This document is a valuable source as it allows, at least in principle to track the exact trajectory of rubble coming from different neighborhoods. It is worth noting that at least one of the quarries highlighted here would become much more than a dump, as we will detail further on.

Among the cities considered here, the *Archivio di Stato di Torino* (Turin State Archives) preserves the most complete documentation for understanding the types and quantities of salvaged rubble, potentially allowing to make a global estimate for the entire Piedmont capital. Three types of standard documents are particularly useful to this aim: first, the reports filled out by private contractors in charge of

assessing what can be recovered from each demolition site; second, the invoices issued by public warehouses when receiving shipments from the same contractors; third, the receipts proving the delivery of materials or components kept in the warehouses to private parties. Pieces of furniture and technical elements were most often selected from rubble piles: bathroom fittings such as WC, sinks and bathtubs; pipes and radiators. Architectural components were also recovered, including shutters, doors and window frames, door and window stone surrounds, as are structural elements, such as wooden or steel beams and pillars.

One material, though, stands out from this diversity of salvaged rubble: the recovery of bricks became a priority for the cities of Northern Italy, similarly to other heavily damaged contexts. This is true both for Turin and for Milan. Here, a *delibera podestarile* (chief magistrate's resolution) from August 1944 aimed at boosting the activity of

brick recovery by making it independent from rubble removal.[24] The documents stated that "sorting, cleaning, transport to warehouses, and subsequent possible transport for distribution have taken on an importance for which this management needs to be separated from that of rubble clearing, of which at first brick recovery was a secondary and occasional part."[25] "For economic reasons, also in relation to the scarcity of materials on the market":[26] these are the reasons for financing bricks salvaging stated by at least one spending resolutions approved in this regard by the municipality in 1944.[27] The same year, a contract was established with the Castellano building company.[28]

Two side notes to the core of this research help understand the scale and pace of material circulation through Italian cities at the time. First, while this paper mainly focuses on publicly-owned and publicly-managed rubble, the abovementioned *Società Umanitaria* is a good case in point to cite the existence of entirely privately-managed processes of clearing, sorting and trading of rubble laying on private ground. The society's headquarters, taking up and entire large-scale block in Milan's city center, was ravaged by the August 1943's bombings. Its repair and reconstruction also entailed the selling out of rubble of different types. These included radiators, pipes and other technical components, and more interestingly the entire steel structure of its

24 *Podestà decree* August 24, 1944, "Progetto di ricupero e distribuzione di mattoni usati provenienti dalle macerie di case sinistrate" ("Project for the recovery and distribution of used bricks from the debris of damaged houses"). Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 116/1949.

25 Ibid.

26 Ibid.

27 "Approvazione spesa di 375.000 £ per il recupero di mattoni da case sinistrate" ("Approval of funding of 375,000 £ for the recovery of bricks from damaged houses"), December 22, 1944. Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 116/1949.

28 "Contratto con Castellano Stefano per ricupero e distribuzione mattoni usati provenienti dalle macerie di case sinistrate" ("Contract with Stefano Castellano for the recovery and distribution of used bricks from the debris of damaged houses"), June 26, 1944. Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 64/1949.

Art Nouveau *Teatro del popolo* (People's theatre), destroyed and never replaced.[29] Second, and on a different note, it is worth noting how, in addition to actual rubble, the construction and the dismantling of anti-aerial shelters made available other materials, which are also sometimes recovered, and possibly reused, following a similar path as rubble. These included on the one side sand and gravel from their construction sites, and on the other side the wooden or metal elements rescued at the moment of their disassembly. To cite an example, on October 8, 1945, Milan's *Vice-prefetto vicario* (Deputy Prefect) communicated to the Allied Military Government of Milan City & Province that "from the demolition of school and public shelters in its territory it is possible to recover about 9,000 m^3 of beams and 5,000 m^3 of boards, necessary for reconstruction works."[30]

Reuse Practices, Part 1. Reshaping the Urban Topography

In her seminal text about rubble removal in Milan, architect Samanta Braga points out how "the solution of a practical problem such as the clearing of bombed areas […] becomes in fact a kind of 'meta-building gesture', at the moment when the same rubble is, more or less intentionally, destined for the construction of new parts of the city."[31] In fact, rubble shaped the built landscape of reconstructed Italy in many ways, more or less visible and more or less investigated to date.

The very ground floor of the city was repaired and reshaped through rubble. On the one side, the latter was accumulated in selected locations to repair damaged artefacts, reconstructing what the war destroyed, such as river banks or railway embankments. A case in point are the bridges of Verona, all of them bombed by the Allied forces after some initial hesitation. Their rubble was in part used to repair the adjacent

29 See various documents in this regard kept at ASU – Archivio Società Umanitaria, Pratica n. 75, Anno 1945.

30 "Testing. Demolition of public and school shelters. Recovery of materials." Letter from the Vice prefetto vicario (Deputy Prefect) to the A.M.G. Milan City & Province, October 8, 1945. Archives of the ACC – Allied Control Commission, Milan Province, Public Works & Utilities 360.

31 Braga, *Lo smaltimento delle macerie*, 320.

banks of the Adige river, hit by the same bombing campaign.[32]

In other cases, rubble became the basic material for the realization of future-oriented plans and projects for the city. In Turin, for instance, contractors were instructed by public authorities about where to discharge rubble, that is in correspondence of the new streets' layout defined by the city's *piano regolatore* (masterplan). This was the case, for instance, of via Fossata, in the peripheral Barriera di Milano neighborhood. In 1944, the *Società Anonima Costruzioni Immobiliari di Torino* (Turin Anonymous Real Estate Construction Company) wrote as follows to the local *prefetto* (prefect): "Since the current level of the aforementioned stretch of road is significantly lower than the one established by the *piano regolatore*, the backfill – composed of debris materials such as brick fragments, concrete, and rubble – will provide an excellent roadbed."[33] A plan was attached to the letter, detailing the area where rubble would be discharged, upon authorization.

Rubble was distributed according to the *piano regolatore*'s directions in Milan, too, where it was used for several neighborhoods, thoroughfares and overpasses under construction in the city's outskirts: "The new Lorenteggio district, the area around the new Church of San Giuseppe in Crescenzago, as well as via Vigliani, via Scarampo, via Esquilino, and via Famagosta and the embankments of the future overpasses on via Bonfadini and viale Puglie."[34] The example of the

32 See: "Perizia dei lavori urgenti di demolizione delle strutture in cemento armato crollato in alveo del Ponte Garibaldi sul fiume Adige in Verona" ("Assessment of urgent works for the demolition of collapsed reinforced concrete structures in the riverbed of the Garibaldi Bridge over the Adige River in Verona"), July 1945. ACC – Allied Control Commission, Verona Province, Engineering, 000052/1: Perizie (1945-07), bobina 632E.

33 "Carteggio tra la SACIT – Società Anonima Costruzioni Immobiliari Torino e il Signor Commissario Prefettizio" ("Correspondence between SACIT – Società Anonima Costruzioni Immobiliari Torino and the Prefectural Commissioner"), August 30, 1944. Archivio Storico Città di Torino. ASCT – Affari e lavori pubblici, Cartella 881, fascicolo 6.

34 "Relazione sull'opera svolta dal Comune per lo sgombero delle macerie" ("Report on the work carried out by the Municipality for the removal of debris"), November 7, 1945. Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 81/1954.

thoroughfare of via Palmanova, connecting the city center to its North-Eastern outskirts, is particularly significant. In 1946, the city council defined its construction as a priority for three reasons: "In order to relieve the traffic on the congested via Padova […], to use the rubble from the damaged buildings, and finally to give profitable employment to the available workforce."[35] Via Palmanova, though of primary importance, was one of many streets planned by the same *piano regolatore*, and yet the presence of a large amount of rubble in the neighborhood accelerated its realization (Fig. 7).

Reshaping the urban ground floor through rubble was a widespread and long-lasting practice in Italy. As late as 1951, a competition launched by Saint-Gobain for the realization of a new company neighborhood in Pisa, advertised on *Domus*, encouraged participants to consider war rubble as construction material for its earthworks: "For any possible revision, whether general or partial, of the roadways or buildable areas enclosed within the boundary line of the plot […], one could, for instance, make use of the rubble still scattered throughout the city of Pisa for backfilling purposes."[36] Sometimes, the very boundaries of this ground floor were redefined, for instance in relation to water plans. The heavily bombed port of Genoa, Italy's leading hub for both freight and passenger traffic,[37] was reconstructed and extended using large amounts of the city's rubble. In Treviso, rubble was accumulated on the bed and banks of several canals crossing the city, profoundly transforming its waters' geography.[38]

35 "Ratifica della deliberazione presa in via d'urgenza dalla giunta il 14 giugno 1946 per la costruzione del nuovo viale da piazza Sire Raul a Crescenzago" ("Ratification of the resolution urgently adopted by the council on June 14, 1946, for the construction of the new avenue from Piazza Sire Raul to Crescenzago"), July 10, 1946. Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 171/1950.

36 The competition was advertised on *Domus*, no. 265 (December 1951). See "Un grande concorso per un quartiere a Pisa, per il personale della Saint-Gobain."

37 For historical figures about the port of Genoa through the twentieth century, see: Paolo Arvati, ed., *I numeri e la storia del porto di Genova* (Genoa: Comune di Genova, Unità organizzazione statistica, 2003).

38 This information, considered common knowledge among historians and even the general public, still needs to be double-checked through further research in archives and period sources.

In other cases, rubble helped modelling the reliefs of public parks, as it is the case for the Parco della Pellerina in Turin. Started in 1934, based on the indications of the 1913 *piano regolatore*, its gentle hills hide both the rubble produced by the 1930s opening of via Roma – Turin's main fascist street, cutting through its historic center – and that of World War II bombings. The largest and most well-known Italian rubble hill is certainly Milan's Monte Stella. It is the only one which can compare to its counterparts realized elsewhere in Europe, for instance in Germany, where large-scale *Trümmerbergen* rose in the outskirts of major cities such as Berlin (Teufelsberg) and Stuttgart (Birkenkopf or "Monte Scherbelino")[39] (Fig. 8).

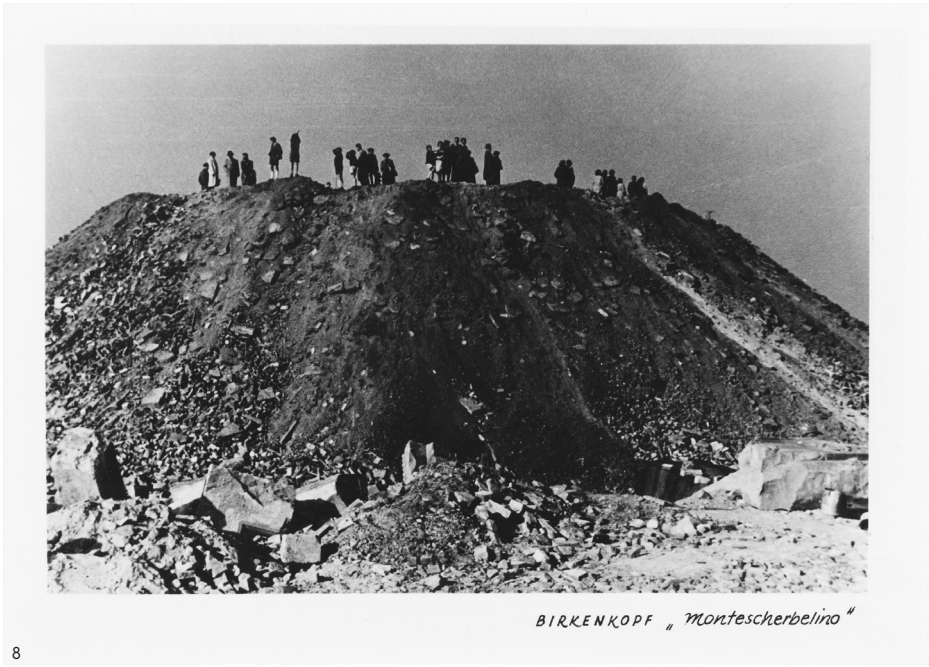
In Milan, local architect Piero Bottoni conceived Monte Stella in 1947 as part of his masterplan for the Quartiere Triennale Ottava (QT8), the low-cost and rationalist-inspired residential neighborhood promoted on the occasion of the Eighth Triennale di Milano.[40] A near-by quarry has originally been intended as the site of a small lake. Once acknowledged that it had been almost entirely filled with rubble from the bombed city center, Bottoni chose to systematize the dumping process and transform the site into an artificial hill (Fig.9). A strategic reuse of rubble not only provided the city with a new, large-scale public park, but it gifted Milanese people with the very first elevated vantage point on their otherwise entirely flat city.

Reuse Practices, Part 2. Repairing and Reconstructing Damaged Buildings

While the salvaging, sorting, and reintegration of fragments and decorations from Italian monuments have been widely discussed

39 See: Mielke, *Wald und Politik.*; Anderson, *Buried city.*

40 About the history of the QT8, see: "Monte Stella al QT8, Milano, 1953–1970 ca.," in *Piero Bottoni. Opera completa*, eds. Giancarlo Consonni, Lodovico Meneghetti and Graziella Tonon (Milan: Fabbri Editori, 1990), 373–375; Graziella Leyla Ciagà and Graziella Tonon, eds., *Le case nella Triennale. Dal parco al QT8* (Milan: Electa, 2005).



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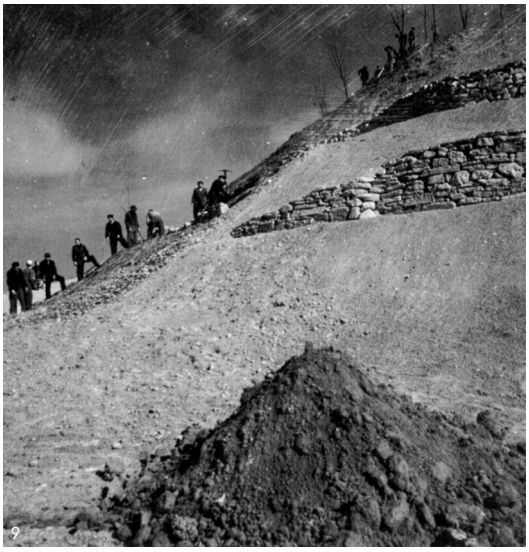

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Fig. 7
Via Palmanova, Milan. Early 1950s. From the author's personal collection.

Fig. 8
Birkenkopf, or "Monte Scherbelino," Stuttgart. Undated. Courtesy Stadtarchiv Stuttgart - 9200 - F 27826.

Fig. 9
Construction works of Monte Stella, Milan. Undated. Courtesy Archivio Piero Bottoni, DAStU, Politecnico di Milano.

within the fields of the history of restoration and architectural history,[41] more commonplace practices of rubble reuse for buildings' emergency repairs and reconstruction have gone largely unnoticed. However, archival documentation suggests that such practices existed in various forms, ranging from informal or fully illegal actions to officially regulated and documented ones.

Some private citizens spontaneously turned to rubble piles to recover useful elements for repairing their homes, stores and workshops, despite the abovementioned laws establishing the public property of rubble resting on public land. These practices, stimulated by material shortages and critical living conditions, are the hardest to map, because of their informal nature and small scale. Scattered pieces of furniture were also frequently reused within the immediate post-war emergency dwellings. In this regard, the first issue of Ernesto Nathan Rogers's *Domus*, in early 1946, featured a stunningly topical focus entitled "Pronto soccorso" ("First Aid").[42] Its opening page shows a truck crossing the bombed streets of Milan, and bringing back to the city both evacuees and their furniture (Fig. 10). The magazine commissions five architects to come up with inventive solutions to "rebuild one's home with the furniture that could be saved from the bombs, from the wear and tear of moving, from displacement […] to recreate life in a new, more essential and truer setting."[43] Rather than the design of an actual house, each architect is assigned a different case study, inspired by the diverse conditions of evacuees. They are nonetheless required to "adhere as closely as possible to reality,"[44] and provided with the following information: "type of family and number of members; type of dwelling and number of rooms; a certain number of pieces of furniture saved from destruction."[45]

41 See: Carlotta Coccoli, *Monumenti violati. Danni bellici e riparazioni in Italia nel 1943–1945. Il ruolo degli Alleati* (Florence: Nardini Editore, 2016).

42 "Pronto soccorso," *Domus*, no. 205 (January 1946), 6–22.

43 Ibid., 6.

44 Ibid.

45 Ibid.

Informality often slipped into openly illegal conduct. Building owners frequently complained about the theft of their private rubble piles, most often by contractors working on reconstruction sites. The *Archivio di Stato di Torino* preserves documents of several legal disputes in this regard. Correspondence from 1944 between Ms. Anna Barco Marocco and Turin's section of the *Genio Civile* is particularly interesting here because the owner claimed to know the exact places where the rubble, allegedly stolen from her home in corso Quintino Sella 129 by contractor Antonio Acquadro, was reused:

It is known to the undersigned that about 450 tiles were used in the covering of the roof of the Berutti house and still other tiles were used in the Molino house and the Albera house, all adjoining that of the undersigned […]; part of the iron rails (or beams as they may be) were found to be used in constructions of the Perottin house, also adjoining; part of the rails are now lying […] in a farmhouse near Villanova d'Asti.[46]

Some other reuse practices fell under the official legislative framework. As mentioned above, private citizens would turn to municipal warehouses to get specific materials needed for their repair works. On the one hand, receipts found at the *Archivio di Stato di Torino* detail the type and quantity of materials delivered to each person, often times just a few items, documenting thousands of micro-flows of rubble, for which in principle it would be possible to identify a precise final destination. On the other hand, these same receipts include a more general piece of information, namely a standard list of materials, supposedly all those available for purchase: iron railings, shutter rollers, iron rod, scrap iron and sheet metal, roof trusses, window frames, 16 cm and 18 cm steel beams, solid bricks, hollow bricks, and pipes for radiator systems.

The official books of some public buildings testify to the actual reuse of salvaged rubble by the *Genio Civile* and the municipal

46 Letter from Marocco Anna Barco to the *Genio Civile* Office, February 1, 1944. Archivio di Stato di Torino. Serie: Provveditorato alle Opere Pubbliche per il Piemonte e la Valle d'Aosta, Primo versamento, *Genio Civile*, Reparto recupero materiali, Mazzo 4392 "Accertamenti dei materiali recuperabili dalle demolizioni."

11

pronto soccorso

Quei mobili che abbiamo visto, nei giorni più tristi di questa guerra fuggire, in cataste traballanti, nelle strade ancora fumose per gli incendi, rientrano ora in città. Ricattano a ripopolare quelle case dove erano stati unici testimoni del diritto dell'abitare, la rete metallica, il tavolo, la sedia, elementi indispensabili alla funzione elementare del vivere.
Ricattano i mobili, quelli che si sono salvati, rientrano gli sfollati, quelli che hanno ancora una casa in città: noi architetti vogliamo aiutarli in questo primo atto di ricostruzione. Ricostruzione della propria casa.
Così abbiamo chiamato questa rubrica "pronto soccorso".
Tutti coloro (non riusciamo a chiamarli fortunati) che hanno potuto salvare dalla guerra un asilo hanno questo problema da risolvere: ricostruire la propria casa con i mobili che si sono potuti salvare dalle bombe, dal saccheggio dei trasferimenti, dallo sfollamento e tuttavia ricreare la vita in un clima nuovo, più essenziale, più vero.
Domus ha invitato cinque architetti per proporre loro cinque temi di pronto soccorso:
Ad ognuno di essi tre dati:
tipo della famiglia e numero dei componenti;
tipo dell'alloggio e numero dei locali;
un certo numero di mobili salvati dalla distruzione;
nello svolgimento del tema, la massima aderenza alla realtà.

5 proposte di 5 architetti

La famiglia dell'operaio L. M. rientra ora in Milano

Architetto Vittorio Gandolfi

Un giovane ingegnere con la moglie e due ragazzi ha dei mobili comperati dieci anni fa dalle ditte di arredamento

Architetto Vito Latis

I figli cresciuti hanno nuove e più vaste necessità spirituali e materiali

Architetto Carlo De Carli

Casa per la professione, il matrimonio e una zia

Architetto Mario Tevarotto

Sono tre individui che hanno perso la casa, salvato qualche masserizia, salvata una certa dose di fiducia e credono ancora nella fortuna

Architetto Renzo Mongiardino

10 Dic. 205 pronto

Fig. 10
"Pronto soccorso," in *Domus*, no. 205 (January 1946). Courtesy Archivio Domus – © Editoriale Domus S.p.A.

Fig. 11
Bomb damage at the Ca' Granda, Milan. 1943. © Claudio Emmer, Civico Archivio Fotografico, Comune di Milano.

authorities in charge of emergency repairs. The *Archivio Storico della Città di Treviso* (Treviso Historic Municipal Archive), for instance, keeps record of a number of reconstruction sites within the municipality, including the central market, the town hall and several schools.[47] Both the preliminary reports for damage assessments and the final bills of quantities make explicit reference to second-hand materials. For the town hall, both new and reused bricks were employed, as well as both new and reused wooden beams.[48] For the central market, we learn that the Gasparini Fernando ch. Giuseppe building company accomplished the following tasks, among others:

> 1. Total uncovering of the canopy in the ox market with recovery of the good eternit sheets and removal the eaves with transport on site so as not to leave them unattended; 2. Laying of the eternit sheets from the demolition […] 4. Gutters with salvaged sheet metal, shaped and repositioned in place with associated tie-rods.[49]

While the few drawings included in these folders don't show explicitly their position, they still provide a better understanding of the building's overall shape and suggest their possible distribution.

Treviso was not an isolated case: documents kept at the Allied Control Commission Archives certify that similar reuse practices were implemented in such cities as Verona (for instance for the Liceo Scientifico Fratta),[50] and Orbetello, a smaller village of Tuscany.

47 In this regard, see the following folders from the ACSD – Archivio Comunale Storico Deposito: Lavori Pubblici_51/1; 9.2.B., "Scuole urbane"; 9.2.C., "Edifici scolastici suburbani. Ripristino per danni bellici"; Danni di Guerra_9/9, 1972.

48 In this regard, see the several documents accounting for the town hall's repair works kept at Treviso's Archivio Comunale. See in particular ACSD – Archivio Comunale Storico Deposito_ Lavori Pubblici_51/1.

49 "Polizza n. 7 dei lavori eseguiti per conto dell'ufficio del *Genio Civile* di Treviso = Ripristino della tettoia del mercato suini sita al foro boario" ("Insurance Policy No. 7 for the works carried out on behalf of the *Genio Civile* Office of Treviso = Restoration of the pig market canopy located at the cattle market"). ACSD – Archivio Comunale Storico Deposito, Danni di Guerra_9/9, 1972.

50 "Fabbricato Prov. in via Fratta, sede del R. Liceo Scientifico. Preventivo di spesa per le opere di primo intervento necessarie nell'edificio danneggiato dai bombardamenti" ("Provincial Building on Via Fratta, headquarters of the Royal Scientific High School. Estimate of expenses for the first intervention works needed in the building damaged by bombing"). ACC – Allied Control

The latter is a particularly interesting case, as a rare occurrence of rubble reuse for a publicly-funded residential project. 15 homes "of average kind" were repaired using one third reused bricks and two thirds of new bricks, their floor slabs reconstructed with reused metal beams and their roofs reassembled with two thirds reused tile.[51] It is worth noting that, in all these cases, materials and components were reused in the framework of traditional, low-tech construction processes, following an *ad hoc* approach based on specific needs and on-site availability. Attempts at systematizing rubble reuse in the context of more advanced experimental approaches were extremely rare. A remarkable and little-known exception is Luigi Moretti's 1945 patent for a "Tubular house for extremely rapid and economical construction," which mentions rubble as a potential raw material for its load-bearing structure.[52]

As a coda to this chapter, the examples of some major Italian monuments show how the salvaging and repositioning of fragments and decorations with acknowledged artistic value, on the one side, and the reuse of ordinary construction materials, on the other, often coexisted in the same reconstruction sites. This is the case for the Basilica of Santa Maria dell'Impruneta, a religious complex in the surroundings of Florence dating from the 11th century, whose damaged walls were reconstructed with reused bricks. A technical report kept at the Allied Control Commission Archives states that "for the reconstruction of the damaged wall […], the demolition material may be recovered, either entirely or for the most part, thus enabling the immediate

Commission, Verona Province, Engineering. 000050/1: PERIZIE (1945-06/1945-08), bobina 1231A.

51 "Lavori di riparazione di 15 case del tipo medio facilmente riparabili nell'abitato di Orbetello," ("Repair works on 15 medium-type houses easily repairable in the town of Orbetello"). ACC – Allied Control Commission, 001042/1: 15 HOUSES AT ORBETELLO (1944-00/1945-00), GRO.71 – bobina 205E, Grosseto.

52 Luigi Moretti "Casa tubolare di rapidissima ed economica costruzione," patent n. 413222, filed in Rome on 08/11/1945, registered on 05/04/1946 (Archivio Centrale dello Stato, Fondo Ufficio Italiano Brevetti e Marchi).

Fig. 12
Alberto Burri, Cretto, Gibellina (1984-2015). © Davide di Mauro/ wikicommons

commencement of works without significant delay."[53] In Milan, a case in point is the ancient Ca' Granda, a former hospital under renovation since 1939 to host the city's *Università Statale* (State University). After their bombing, both the fifteenth-century Sforza courtyards and the seventeenth-century Richini courtyard were reconstructed, starting from 1949, using the method of anastylosis, that is reassembling original architectural fragments found on site[54] (Fig. 11).

Accomplishments and Disavowed Promises of Rubble Reuse in Italy

Rubble piles served as a significant source of construction material in Italy during and after World War II. Both formally and informally, in ordinary as well as unique ways, they were repurposed within landscapes, infrastructures, and buildings. The cases described here

53 "Perizia relativa al ripristino della Basilica di Santa Maria dell'Impruneta" ("Assessment report on the restoration of the Basilica of Santa Maria dell'Impruneta"). ACC – Allied Control Commission, 10800 / Region n° 8, Toscana, 145, "Monuments and Fine Arts (and Archives)," 66, "Superintendenza Florence, Arezzo, Pistoia."

54 See: Maria Antonietta Crippa and Emanuela Sorbo, *Liliana Grassi. Il restauro e il recupero creativo della memoria storica* (Rome: Bonsignori, 2007).

compose a vast and multifaceted mosaic of reuse practices, both rooted in long-standing traditions, and anticipating later experiments. They can be described and classified through some key notions from the contemporary discourse on these topics: they include recycling, as seen in the use of rubble for the roadbeds of Milan's and Turin's new thoroughfares and neighborhoods; the repair of salvaged components and their storage within municipal and private contractors' warehouses; the reuse of materials (bricks, in particular), along with other components and technical elements for the emergency repairs and reconstruction of public and private buildings. The Milanese rubble-made Monte Stella, which enriched the otherwise entirely flat city with its only hilly and panoramic public park may be considered an *ante-litteram* case of full-fledged upcycling, adding new value both to its material and to the city as a whole.

Far from being an isolated case, these practices form part of a broader history of rubble reuse in twentieth-century Italy, one that is only recently starting to attract the attention of architectural historians. Early examples of this include the state-coordinated repurposing of construction materials, salvaged from the fascist demolitions in Rome's ancient center, for the realisation of low-cost housing for displaced people in the *borgate* – working-class, often informal settlements in the city's outskirts.[55] In the second half of the century, a few post-earthquake reconstructions became the occasion to implement innovative strategies of rubble reuse, combining symbolical and practical instances. Alberto Burri's *Cretto* (1984–1989) in Gibellina, a village razed by the 1968 Belice Valley earthquake, is possibly the country's most impressive and well-known rubble artwork (Fig. 12). While the village was reconstructed *ex-nihilo* in a new location, its remnants were compacted *in situ* following the boundaries of its former blocks, to evoke the presence of what had been lost.[56] A few kilometers away, Alvaro Siza intervened almost simultaneously on the ruined village of Salemi's *Chiesa Madre*, main

55 See the ongoing research on the topic by Anna Mascorella.

56 See: Massimo Recalcati, *Alberto Burri: il Grande Cretto di Gibellina* (Arezzo: Magonza, 2018).

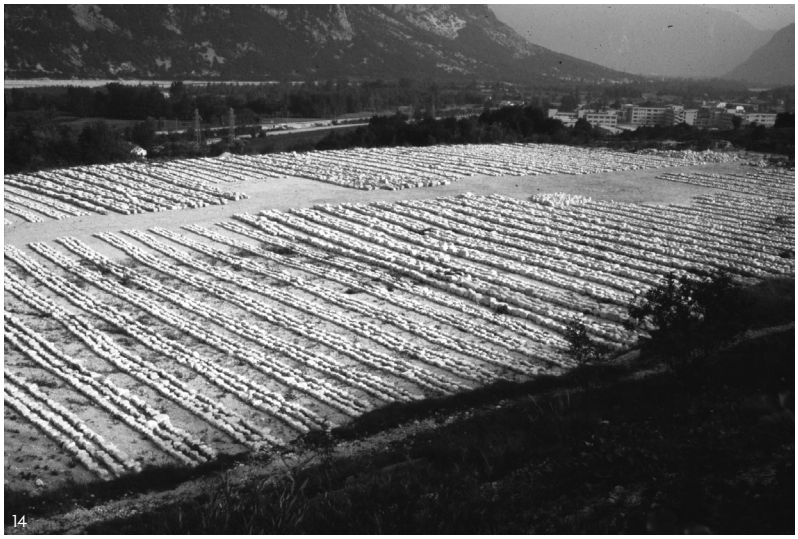


Fig. 13
Chiesa di Santo Stefano, Salemi.
© Orazio Saluci.

Fig. 14
One of the storage areas for the stones of the Duomo di Venzone, recovered after the collapse.
© Francesco Doglioni.

square and adjacent streets. He reorganised decorations and rubble creatively, in order to provide new meanings and new functions to the public spaces of a nearly lifeless place[57] (Fig. 13). In the words of Roberto Collovà, who collaborated with Siza on the project: "The notion of intervening within the area through a utilitarian and meaningful redistribution of materials is particularly compelling – envisioning a perpetual construction site where both building and dismantling are conceived as integral parts of the design process."[58] In Venzone, completely destroyed by the 1976 Friuli earthquake, Francesco Doglioni promoted an unprecedented reconstruction through anastylosis not just of the monumental Duomo, but of large parts of the historic fabric, whose stones were selected from rubble piles, stored and virtually replaced in their exact position[59] (Fig. 14). In more recent years, the reconstruction phases following the 2009 L'Aquila earthquake and the 2016–2017 Amatrice earthquakes prompted a broader, if not thriving, debate about rubble reuse, also questioning its legislative framework.[60] *Casa Futuro*, an ongoing project by Stefano Boeri Architetti for the Don Minozzi community center in Amatrice, is one of very few reconstruction sites actually making large use of rubble – almost 60% of that resulted from the pre-existing building, as declared by its architect.[61]

Amongst all these destructive events, World War II and its aftermath certainly stand out in terms of quantity of available rubble and

57 See: Alessandro Benetti, "Siza e Collovà a Salemi. La memoria di uno spazio pubblico," in eds. Bruna Di Palma and Fabrizio Toppetti, *Alvaro Siza. Premio Argan 2022* (Gubbio: ANCSA, 2023), 44–49.

58 Roberto Collovà, "Belice 1968. Un'avventura siciliana," in *Ricostruzioni. Architettura, città, paesaggio nell'epoca delle distruzioni* (Milan: La Triennale di Milano, 2019), 79.

59 See: Francesco Doglioni, "Friuli 1976. Venzone dov'era com'era," in *Ricostruzioni. Architettura, città, paesaggio*, 83–91; Corrado Azzolini and Giovanni Carbonara, eds., *Ricostruire la memoria. Il patrimonio culturale del Friuli a quarant'anni dal terremoto* (Udine: Forum Editrice, 2016).

60 See: Filippo Angelucci, Cristiana Cellucci, Michele Di Sivo and Daniele Ladiana, "Per un archivio dei materiali da demolizione nei territori della ricostruzione," *Techne – Journal of Technology for Architecture and Environment*, no. 16 (2018), 60–67.

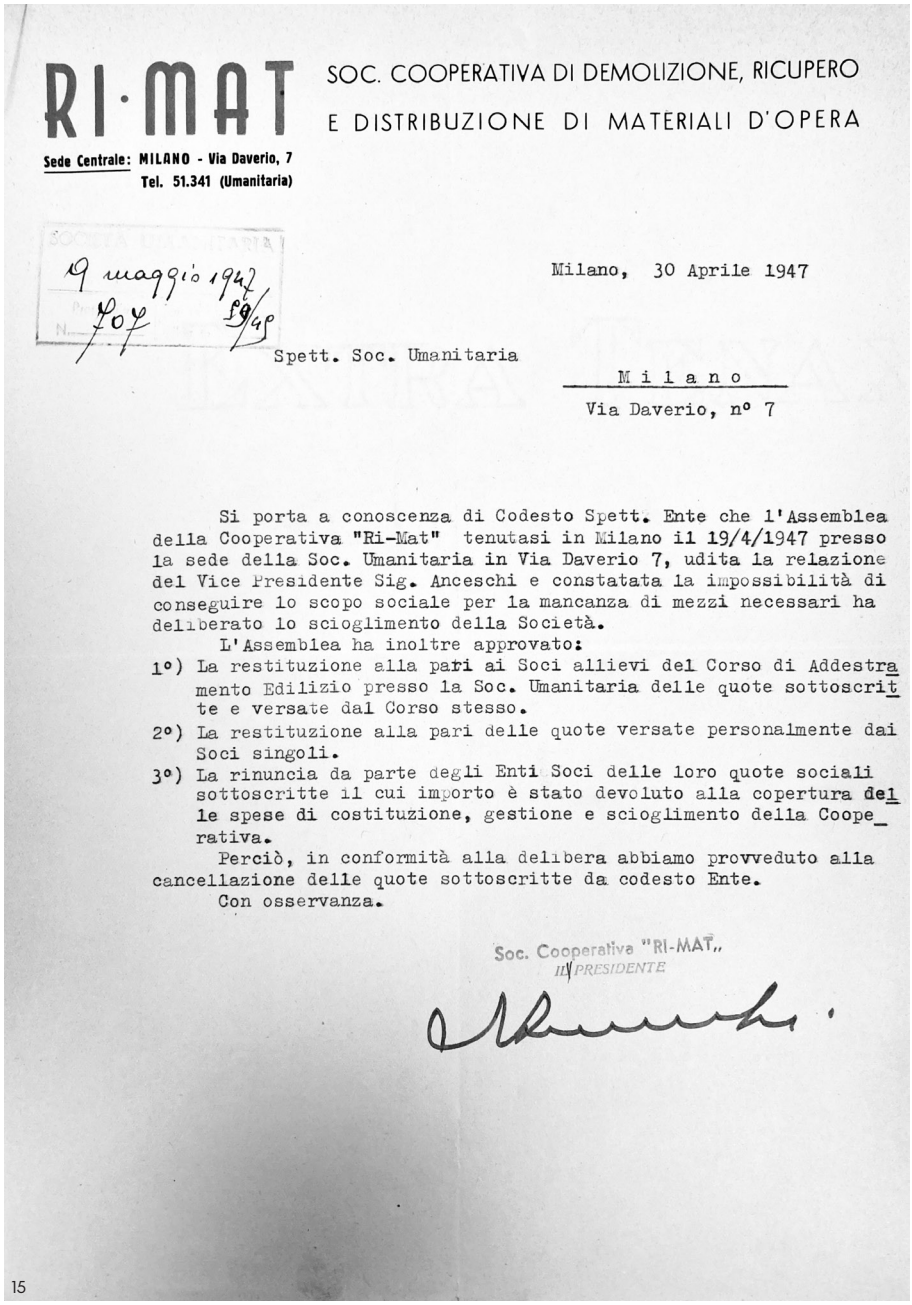
61 See the official website of Stefano Boeri Architetti: stefanoboeriarchitetti.net. https://www.stefanoboeriarchitetti.net/project/casa-del-futuro/.

of diversity of its reuse practices. This doesn't mean, though, that these practices became paramount at the time, either in practical or in cultural terms. Despite the numerous findings shown in this paper, the limited quantity and the inconsistent quality of available archival documentation reflect the absence of an organic institutional, legal and administrative framework, and the consequent lack of coordinated actions. The case of Genoa is particularly striking: the city State and Municipal Archives preserve no information regarding the use of rubble for the harbor's post war reconstruction and extension, which on the other hand, seems to be common knowledge, among historians and even the general public. The same goes for Treviso and its canals, suggesting in both cases the existence of informal processes, rather than an actual publicly-led plan. Another case in point is the abovementioned RI-MAT Society: despite its founders' initial enthusiasm, no record of its actual functioning is preserved either at the *Società Umanitaria* or at Milan Municipal Archives. Its dissolution document from April 19, 1947 confirms its lack of effectiveness, stating "the impossibility of achieving the organization's purpose due to the lack of necessary means"[62] (Fig. 15). Furthermore, the advancement report on the activity of rubble removal commissioned by the *Sezione macerie* (Rubble section) of Milan's *Ufficio Tecnico Comunale* is unequivocal in confirming that "initiatives for the actual utilization of rubble, such as the very interesting one already deployed at a central brick-forming site, have hardly developed, despite several negotiations initiated with private parties."[63]

This reality lends itself to a twofold interpretation. In practical terms, Italy's complicated political situation in the mid-1940s, with weak state authorities and unclear division of tasks, prevented the implementation of a centralized, comprehensive process. This is a key reason why, despite some early attempts, rubble reuse never turned into

62 Letter from the RI-MAT to the Società Umanitaria, April 30, 1947. ASU – Archivio Società Umanitaria, fasc. 59/45.

63 "Relazione sull'opera svolta dal Comune per lo sgombero delle macerie" ("Report on the work carried out by the Municipality for the removal of debris"), November 7, 1945. Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 81/1954.



RI·MAT

SOC. COOPERATIVA DI DEMOLIZIONE, RICUPERO
E DISTRIBUZIONE DI MATERIALI D'OPERA

Sede Centrale: MILANO - Via Daverio, 7
Tel. 51.341 (Umanitaria)

9 maggio 1947
Fol 59/48

Milano, 30 Aprile 1947

Spett. Soc. Umanitaria

Milano
Via Daverio, nº 7

Si porta a conoscenza di Codesto Spett. Ente che l'Assemblea della Cooperativa "Ri-Mat" tenutasi in Milano il 19/4/1947 presso la sede della Soc. Umanitaria in Via Daverio 7, udita la relazione del Vice Presidente Sig. Anceschi e constatata la impossibilità di conseguire lo scopo sociale per la mancanza di mezzi necessari ha deliberato lo scioglimento della Società.

L'Assemblea ha inoltre approvato:

1º) La restituzione alla pari ai Soci allievi del Corso di Addestramento Edilizio presso la Soc. Umanitaria delle quote sottoscritte e versate dal Corso stesso.

2º) La restituzione alla pari delle quote versate personalmente dai Soci singoli.

3º) La rinuncia da parte degli Enti Soci delle loro quote sociali sottoscritte il cui importo è stato devoluto alla copertura delle spese di costituzione, gestione e scioglimento della Cooperativa.

Perciò, in conformità alla delibera abbiamo provveduto alla cancellazione delle quote sottoscritte da codesto Ente.

Con osservanza.

Soc. Cooperative "RI-MAT"
IL PRESIDENTE

15

Fig. 15
Dissolution document of the RI-MAT Society. April 19, 1947. Courtesy ASU – Archivio Storico Umanitaria (Milano), busta 59/1945.

a paramount, official, publicly promoted and publicly led strategy for the reconstruction of Italian cities, but it was not the only one. The poverty of the cultural debate on these topics is striking, as it was almost entirely overlooked by the specialized and general press, academic and public conferences, and printed publications of various kinds. Just to cite a few examples, very little space was devoted to rubble management and reuse at the *Primo convegno nazionale per la ricostruzione edilizia* (First National Conference on the Reconstruction), held in Milan on December 14–16, 1945.[64] The same year, prominent Milanese engineer Pietro Giulio Bosisio published the topical essay *Ripristino delle case sinistrate* (Repair of damaged houses).[65] Bosisio very pragmatically stated that, in a condition of acute scarcity, "the materials to be used for the repairs, at least in the initial phase – which may be prolonged – should be limited to those readily available on site or in nearby areas,"[66] but he didn't cite rubble reuse as an option. The analysis of this published sources adds to the scattered archival documentation in supporting a more symbolic reading of the rapid erasure of rubble from Italy's political, economic and cultural horizon. While Germany romanticized the role of its *Trümmerfrauen* as a symbol of national reconciliation – a myth questioned by some recent studies in the field of history[67] –, Italy seems to have been more impatient to dispose of its rubble, both materially and rhetorically. Giambelli's account of the "smelly piles" filling the streets of Milan suggests a perception of rubble as dirt, rubble as "matter out of place," borrowing anthropologist Mary Douglas's definition,[68] which certainly deserves further investigation.

64 See *Rassegna del primo convegno nazionale per la ricostruzione edilizia* (Milan: Officina grafica Marinoni, 1945).

65 Ing. Pietro Giulio Bosisio, *Ripristino delle case sinistrate* (Milan: Edizioni Vesta, 1945).

66 Ibid., 7.

67 See: Treber, *Mythos Trümmerfrauen*.

68 See Mary Douglas, *Purity and Danger. An Analysis of the Concepts of Pollution and Taboo* (London–New York: Routledge, 1992, first published in 1966).

Consistent with these premises, a large part of consolidated architecture and construction histories omit any references to rubble reuse practices. Instead, they highlight the rapid transition from an emergency reconstruction phase to a new era of growth, production and consumption, leading to the country's so-called "economic boom" as soon as the late 1950s. This corresponded to two main trends in building practices: some attempts at industrialization on the one hand, though more marginal than in other countries such as France; and, on the other hand, the continuation of low-specialization, artisan construction models. This paper is a first attempt at filling this historiographic gap, accounting for the numerous, though undoubtedly minority, rubble reuse practices of 1940s Italy. It unveils some overlooked cases, but has to cope with the scarcity of both primary and secondary sources. Several documents reporting informal or illegal transfers of rubble suggest a possible way to overcome this difficulty. They encourage us to turn to the field of "architecture without architects," *à la* Bernard Rudofsky,[69] of "do-it-yourself" constructions practices, for which rubble reuse might have been crucial. A different methodology, possibly including an "archaeological" approach to the built environment, and a different set of sources would be required for what might be the next step in this study.

69 Bernard Rudofsky, *Architecture Without Architects. A Short Introduction to Non-Pedigreed Architecture* (New York: MoMA, 1964). Catalogue of the exhibition held at the MoMA, New York, 11 November 1964–7 February 1965.

A. Annoni, A. Belloni, L. Grassi, P. Portaluppi, Restoration and Conversion of the Ca' Granda into the Università degli Studi, Milan (1939–1985)

Ordinary Rubble, Invaluable Rubble

Nicole De Togni
Politecnico di Torino

During World War II, Milan's artistic and monumental heritage was severely damaged. In the post-war years, the city became a compelling laboratory for exploring the interplay between old and new, history and design – an exploration largely approached through architectural and restoration history. Within this context, the restoration and conversion of the Ca' Granda provided a key opportunity to examine the dialogue between tradition and modernity, yet its narrative from a construction history perspective remains underexplored.

The Ca' Granda was commissioned by Francesco Sforza to consolidate Milanese healthcare facilities into the new Ospedale Maggiore. Its layout, featuring two cross-shaped wings each inscribed in a square, and a central courtyard, was designed by Filarete, who later illustrated this ideal scheme in his *Trattato di Architettura* (1461–1464). Construction began in 1456 and, although it took four centuries to complete, it largely adhered to the original design. The west cross, with four loggia courtyards, was built under Guiniforte Solari and Giovanni Antonio Amadeo in the late fifteenth century. The central courtyard, terminating in the church of Annunciata, was constructed in the seventeenth century by Francesco Maria Richini based on late fifteenth-century plans, while the east transept was completed in 1804, designed by Pietro Castelli.

In 1939, after the hospital moved to new pavilions in Niguarda, architect Ambrogio Annoni was commissioned to transform the Ca' Granda – acquired by Milan's municipality the previous year – into the University of Milan's headquarters.

A thorough survey revealed that centuries of alterations and additions had significantly changed the building's structure and appearance.

The Anglo-American bombing of August 1943 heavily damaged the complex, demolishing Richini's courtyard, most monumental façades, the courtyard known as the Ghiacciaia, and the church of Annunciata, and exposing both transepts. Milan's *Sopraintendenza ai Monumenti* (Monuments Authority) and the *Genio Civile* swiftly initiated urgent provisional repairs. Restoration began in 1946 under the Public Works Department, supervised by the Municipal Technical Office.

Initial work (1946–1949), coordinated by Annoni, involved collecting and cataloguing mainly decorative fragments from the rubble, while structural materials were less documented. The fifteenth-century cross vault was reconstructed promptly, replacing the original wooden beams with reinforced concrete ones, while replicating the original design due to timber scarcity.

In 1949, the University's Technical Committee – comprising Annoni, Amerigo Belloni, Liliana Grassi, and Piero Portaluppi – developed restoration guidelines. Based on original design documents, photographs, and direct building analysis, they favored an approach that "does not generally consider it necessary to reconstruct what has been lost, except in exceptional cases, and tends to reinforce and consolidate what remains most scrupulously, integrating missing parts with architectural solutions that are not imitative but that respect the monument's uniqueness" (Grassi 1972, 37). Thus, the project engaged with existing structures in multiple ways while adapting the building's use, preserving Filarete's layout while respecting the logic of the surviving structures.

The new university headquarters was inaugurated in 1958. Work up to that point focused on the late eighteenth-century cross vault, where modern buildings were introduced freely in the most damaged areas while preserving the vault's structure, and on

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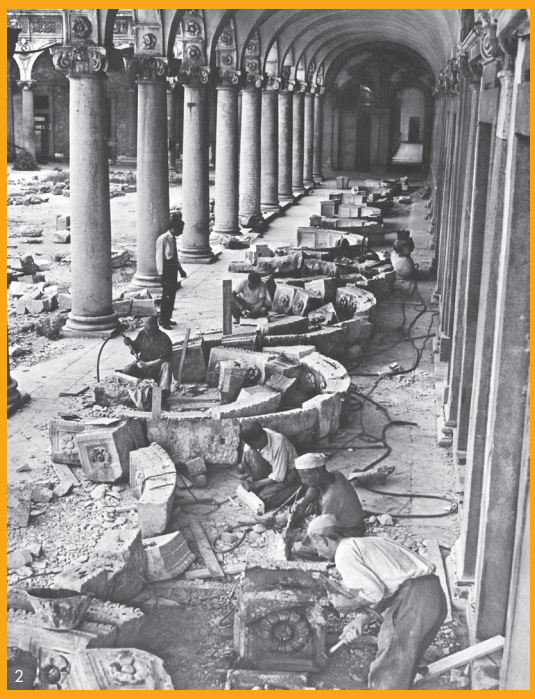

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the central courtyard. The latter was reconstructed by anastylosis, assisted by detailed pre-war photographs documenting each span: portico blocks and structural elements were recovered and tessellated, arches were raised, and bas-relief decorative motifs reassembled. Areas where original materials could not be recovered were left unfinished to avoid false restoration, and additions were limited to what was strictly necessary for stability.

Subsequently, the four courtyards and the fifteenth-century transept underwent restoration after initial stabilization of unsafe walls, removal of unnecessary additions, and coverage of the transept – work already done during the first interventions (1946–1949). Grounded in rigorous philological research and a deep reflection on the relationship between design and historical structures, these restorations concluded only in 1985. The Ghiacciaia courtyard is particularly notable, with its four sides showcasing different restoration techniques: ruin, anastylosis, historical restoration, and reconstruction, with additions and discontinuities distinguishable by contrast.

The variety of solutions resulting from the study, recovery and reuse of the rubble of the monumental building has mainly been explored in the context of restoration that developed over a rather long period of time, and in the framework of a rising debate on the role and value of modern intervention in historical contexts. The Ca' Granda's restoration and conversion into the Università degli Studi represents, in fact, a key reference in post-war restoration theory, being at the same time independent, both in terms of theoretical construction and operational practice, from Reyner Banham's 1959 critique of Italy's retreat from modern architecture.

Nevertheless, the case study offers interesting and underexplored insights from the perspective of construction history. Most decorative fragments surviving the bombing were salvaged and reassembled by anastylosis, while ordinary bricks were reused in infill walls – though this latter aspect is less studied. Scarcity and urgency also necessitated replacing irreparable structural elements with modern materials, even where a conservative approach was preferred. Attention to historical traces in rubble, original drawings, and photographic documentation, combined with reflections on "healing the

Fig. 1
The Ca' Granda following the 1943 bombing. © Claudio Emmer, Civico Archivio Fotografico, Comune di Milano.

Fig. 2
Preparatory work for the reconstruction by anastylosis of Richini's seventeenth-century courtyard. Source: AAVV, *La Ca' Granda cinque secoli di storia e d'arte dell'Ospedale Maggiore di Milano* (Milan: Electa, 1981), 279.

Fig. 3
The Ca' Granda following the 1943 bombing. Gabinetto Fotografico Nazionale. Civico Archivio Fotografico, Comune di Milano.

building's wounds" (Grassi 1958), provides a crucial interpretative framework for understanding a methodologically and technically eclectic approach that warrants further exploration.

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Headquarters of the Società Umanitaria, Milan (1940s)

Rubble for Sale

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The Società Umanitaria was founded in 1893 in Milan, thanks to the bequest of Prospero Moisé Loria, an entrepreneur and philanthropist, with the aim of providing all citizens with concrete assistance through study, education, and work. Over time, it grew to become one of the city's most prominent charitable societies, and it continues its activities to this day. Established in 1902 near the city center, its headquarters gradually expanded to occupy an entire large block, incorporating the fifteenth- and sixteenth-century cloisters of the convent of Santa Maria della Pace , as well as several early twentieth-century industrial buildings, among others. The most prominent of these was the Teatro del Popolo (People's Theatre), formerly a warehouse of the Tecnomasio Italiano Brown Boveri (TIBB) mechanical engineering company, notable for its elegant and functional Art Nouveau steel structure. Heavily damaged in the air raids of August 1943, the Società Umanitaria was reconstructed beginning in 1947, based on a design by local architect Giovanni Romano. Romano restored the ancient cloisters and added a new H-plan complex housing classrooms and workshops. This latter addition, a boldly modernist work featuring a prefabricated concrete structure and curtain-wall façades, was highly praised by critics and included in Piero Bottoni's seminal *Antologia di edifici moderni in Milano* (Anthology of Modern Buildings in Milan) in 1954. Romano's project for the Società Umanitaria was modified over time and completed only in 1956, largely due to a lack of resources. As architecture historians Maurizio Boriani, Corinna Morandi, and Augusto Rossari have observed: "Romano himself, when discussing the design process of the complex, emphasizes that the issue of available resources represented the greatest constraint on the project."[Boriani, Morandi, Rossari 2006, 200]. This statement is corroborated by a lesser-known aspect of the reconstruction: its funding through the sale of materials and components salvaged from its rubble. The society's archives preserve correspondence with various buyers, including quotations and receipts, mostly dating from 1946. That year, the Comi foundry purchased radiators amounting to 90 metric quintals, delivered in several batches between April and May; two damaged boilers were recovered by the Pietro Albera company in September; and in October, the Cooperativa Lavoranti Muratori acquired more than 10,000 kg of iron windows, frames, and parapets. These are just a few examples of a systematic sales activity, recorded in accounting sheets dedicated to each bombed building. In 1947, demolition work extended to the ruined Teatro del Popolo, which proved to be the most abundant source of reusable materials. A complete inventory compiled in June 1948 attests to their remarkable quantities: a total of 137,800 bricks, 102,976 kg of iron components, and 300 m² of cover panels. Interestingly, correspondence with various construction companies shows how coveted these materials were at the time. In October 1947, the Galletti Callisto company sent a heartfelt letter to the society's president, Riccardo Bauer, explaining how perfectly the theatre's remnants would suit one of its ongoing construction sites, and offering a generous deal to obtain them: "We are very interested in the iron frame, which would suit one of our constructions. We would be willing to offer you the sum of £2,200.00. We will also cover all the demolition expenses" [1947]. The documents preserved in the Società Umanitaria archives leave many questions open. First, further research – possibly in other archives – would be necessary to determine how and where the materials sourced from its demolition sites were reused. Second,

Figs. 1–5
The headquarters of the Società Umanitaria after the August 1943 raids. The steel structure of the *Teatro del Popolo* – one of the most heavily damaged buildings – is clearly visible. Courtesy Fototeca Società Umanitaria.

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and quite intriguingly, no evidence has been found of the on-site activity of the RI-MAT Society, "for the recovery, sorting, and testing of construction materials obtained from demolition or pre-existing rubble" [1945], which the Società Umanitaria itself co-founded in 1945. To conclude, the next step in this research could examine other large private properties – such as boarding schools, factories, and similar institutions – to assess whether this is an isolated case or part of a recurrent approach in managing the demolition and reconstruction of war-damaged structures.

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ASU – Archivio Società Umanitaria, Milan. Fasc. 42/1947.

Luigi Moretti, Tubular House for Extremely Rapid and Economical Construction (1945)

Beneath a Roof of Rubble

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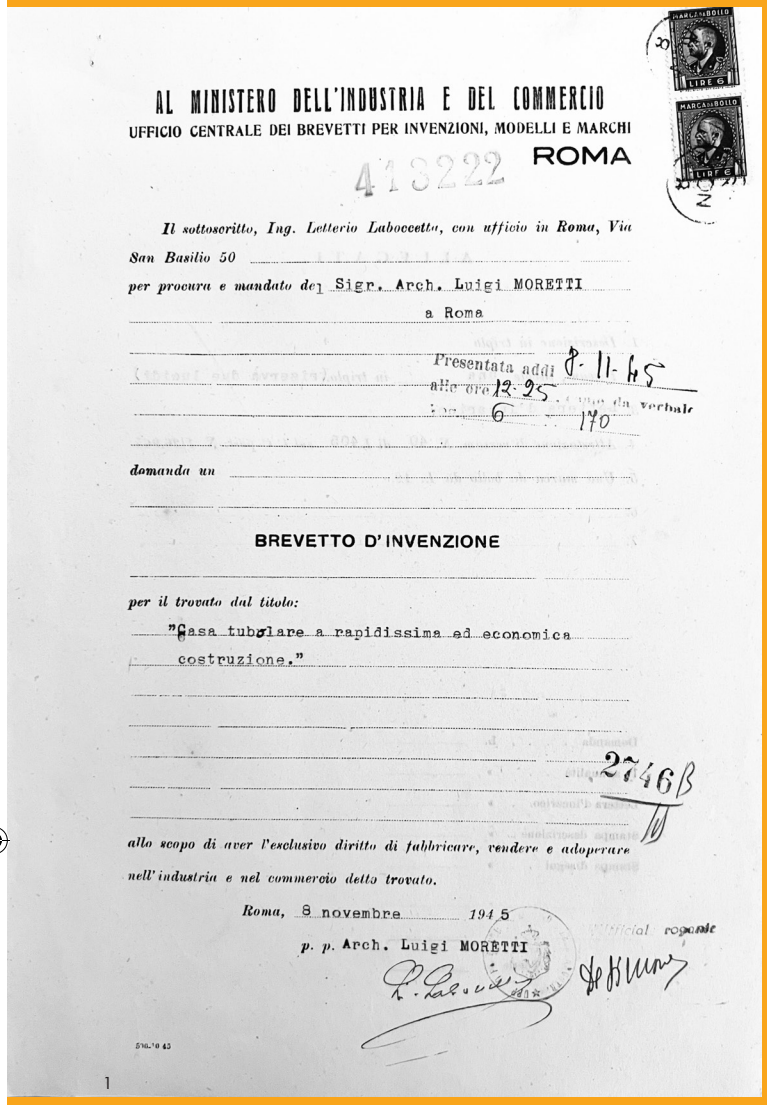
Politecnico di Torino
Roberto Germanò
Sapienza Università di Roma

It is a complex task to compile a truly exhaustive register of Luigi Moretti's works and projects. Even the curricula that the architect drafted on various occasions, over the course of more than forty years of activity, always remain partial, each time emphasizing the design directions and intentions specific to the moment in which they were written. These different moments and periods reveal the guiding lines and threads of thought of Moretti as an architect, writer, editor, builder, and man of the arts. Within this vast body of work – marked by classificatory, and thus historiographical, difficulties – many projects and ideas are only sparsely documented, in some cases mentioned merely through a few traces. Biographical notes and the historical context have nonetheless encouraged study and critical reconstruction, and in recent years – thanks also to the work carried out by the Central State Archive – they have enabled a genuine rediscovery of Moretti's *opera omnia*. Considering both his education and the circumstances – including political ones – under which he operated, a period of particular uncertainty emerges: the years of World War II. This interval, almost entirely absent from the published registers, is marked by an apparent stasis. Such a condition raises several questions and clearly defines a significant turning point in Moretti's biography, also explained by certain decisive events: a long hospitalization and a period of imprisonment. At the same time, this productive hiatus constitutes a moment of reflection, allowing Moretti to confront anew the reality of his time and the demands arising from the horrors of war.

Unpublished – or at least absent from the consulted registers – is a patent entitled "*Tubular House for Extremely Rapid and Economical Construction*," filed with the intellectual property offices of the Ministry in Rome on November 8, 1945. The invention is accompanied by a drawing that outlines a residential settlement to be built according to principles of economy and speed, in series and modules, consisting of single-story row houses. With this patent, Moretti proposes a settlement model designed to respond to situations of emergency and disaster, with particular reference to the destruction caused by bombings. The aim is to construct housing for displaced persons quickly and without relying on specialized labor – difficult to secure in wartime. Although the adjective "tubular" might suggest a system of modules and frames developed through specific construction techniques, in the patent the term instead refers to the internal spatiality generated by the roof structure and by the sectional development. Moretti envisions a sequence of tubular volumes forming a layout of row houses, repeatable in variable numbers and covered by barrel vaults. The distribution reflects the simplicity of the scheme, and the architect refers to prefabricated solutions in order to orient the project toward rapid realization. Each unit comprises a living area and a sleeping area placed at the ends of the module, with a central service core illuminated and ventilated by dormers in the roof. By breaking through passages between two contiguous volumes, larger dwellings can be obtained.

The central idea and the claim of the patent lie in the construction method of the tubular volumes and the vault, to be realized with salvaged material – taken, as Moretti himself specifies, from the rubble and debris of buildings destroyed by bombing – mixed with a concrete "of concretion in the manner of the ancient Romans." This constructive concept is entirely generated by the demands of the historical moment in which it was conceived and filed; that is, from a careful reading of the difficulties in producing



AL MINISTERO DELL'INDUSTRIA E DEL COMMERCIO

UFFICIO CENTRALE DEI BREVETTI PER INVENZIONI, MODELLI E MARCHI

ROMA

413222

Il sottoscritto, Ing. Letterio Laboccetta, con ufficio in Roma, Via San Basilio 50

per procura e mandato del Sigr. Arch. Luigi MORETTI

a Roma

Presentata addì 8-11-45

alle ore 12.25

n. 6 del verbale

domanda un

BREVETTO D'INVENZIONE

per il trovato dal titolo:

"Casa tubolare a rapidissima ed economica costruzione."

2746/B

allo scopo di aver l'esclusivo diritto di fabbricare, vendere e adoperare nell'industria e nel commercio detto trovato.

Roma, 8 novembre 1945

p. p. Arch. Luigi MORETTI

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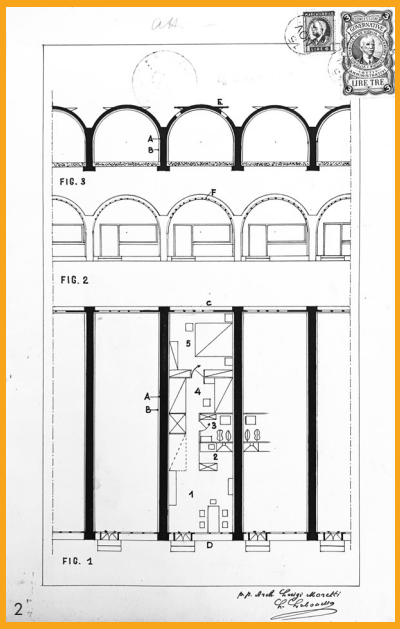

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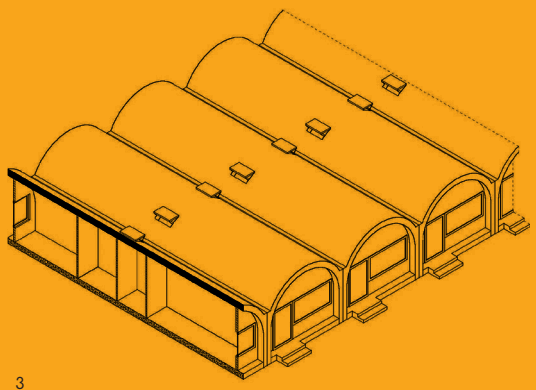
Fig. 1
Page from Luigi Moretti's patent (413222) – consulted at the Central State Archive in Rome, June 2024.

Fig. 2
Illustrative plate of the so-called tubular housing solution attached to the patent. Plan, section, and elevation – consulted at the Central State Archive in Rome, June 2024.

Figs. 3–5
Digital reconstruction of the patented housing solution. From the top: axonometric view of three modules, repeatable in multiple rows; axonometric cutaway; exploded axonometric view of the vaulted system to be built in situ using the sliding centring. Graphic elaboration by Giulia Sergi.



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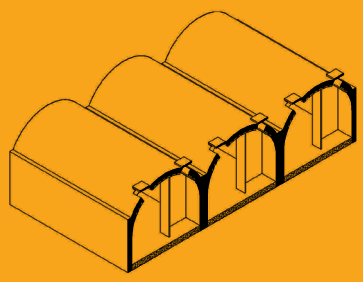

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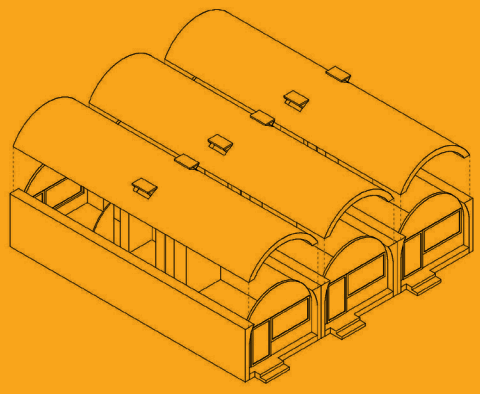

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building materials, with industries either reconverted or in crisis due to the wartime economy, and the shortage of labor, particularly specialized labor. The descriptive text of the patent also illustrates the execution procedure for the vaults, employing a sliding centering frame that moves along the axis, capable of extruding the structure in successive sections while simultaneously producing both the vertical supports and the roof. The same method, applied to the elevated floor slab, makes it possible to obtain a *cretonato* (a lightweight fill layer on a "flat vault"). The design principles of the patent are situated within the continuity of a broader season of research and experimentation, documented by numerous filings and claims, particularly intense in the first half of the 1940s. During that period, the housing problem – already critical – was exacerbated in a context of widespread emergency in Italy and Europe, where destruction was tangible. At a time marked by setbacks for architecture and by new operational complexities, technical experimentation and invention patents emerged as tools of proposal, if not of actual response. If the established registers highlight a turning point in Moretti's trajectory, the rediscovery of this patent adds an important piece: it signals the elaboration of a new design thinking, at once reactive to a context of material scarcity – hence the proposal to reuse rubble – and projected toward the demands that would engage him in the postwar landscape.

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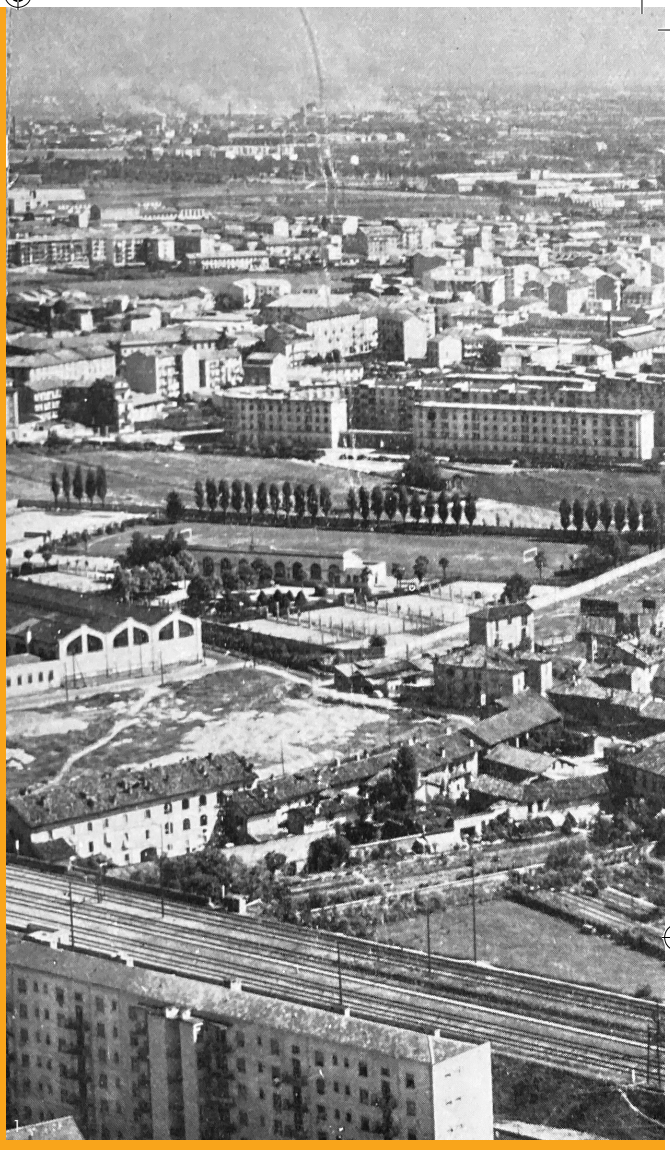
Via Palmanova, Milan (1946–early 1950s)

A Rubble Road Through the Modern City

Alessandro Benetti
Politecnico di Torino
Federico Ferrari
ENSA Paris-Malaquais



Via Palmanova, now a four-lane thoroughfare connecting Milan's city center to the outer ring road, was originally a rural path leading to the hamlets of Rottole, Cimiano, and Crescenzago, among others. Plans for its upgrade to a full-fledged vehicular roadway were already included in the city's 1934 regulatory plan. The post-war regulatory plan of 1953 confirmed its role as a fast and direct connection to the motorway system – a *strada di penetrazione* (loosely translated as "collector road") – providing an alternative to the adjacent and overcrowded Via Padova. Furthermore, it assigned to the road the function of a structural backbone for the new high-density, working-class residential neighborhoods (*zone di espansione*, or expansion areas) to be developed along both its sides. Construction of its roadbed, however, had already begun in 1946 as a matter of utmost urgency, as established by a resolution passed by the city council in a special session in June of that year. In addition to addressing circulation issues and creating employment opportunities, the resolution highlighted the abundant presence of rubble in the surrounding area. It stressed not only the need to remove this rubble, but also the opportunity to put it to productive use: "The urgency of the work is indicated by the need to use the rubble. If it is left to dissipate in the filling of the quarries, it is unlikely that in the future other equally suitable material will be found, thus leading to a much greater expense, if not to the impossibility of carrying out the works" [July 1946]. The contract signed with the Albino e Luigi Cereda building company also detailed the roadbed's stratigraphy: "The embankment will be constructed using rubble and soil deposited in neighboring areas and in the city itself, arranged in successive layers of 30–40 cm in height, properly compacted with a steam roller and thoroughly watered" [May 1946]. By 1956, *Urbanistica* 18–19 – a monographic issue of Italy's leading journal on urbanism, dedicated

to Milan's 1953 regulatory plan – featured a series of aerial views of via Palmanova, completed and open to traffic, together with its surroundings. The details of its construction history cast new light on these photographs of the booming Italian economic capital: a linear landscape made of rubble from the old city forms the first built artifact and the central spine of a new neighborhood, whose clearly modern buildings – isolated, high-rise residential blocks – were rising on either side. Here, rubble is not only the physical but also the visible foundation of reconstructed Milan. A further episode in the history of Via Palmanova reinforces the view that rubble, its production and reuse, is often integral to the process of urban growth. The road's starting point is marked by the small Church of San Carlo alle Rottole, once the center of the Rottole hamlet. Dating back to the twelfth century and listed as a heritage monument, it was illegally demolished in 1963 by the construction company of a nearby residential building. In 1966, following nationwide controversy, the Soprintendenza (heritage authority) fined the company and ordered the church's reconstruction according to an "as it was, where it was" approach. The project, directed by restoration expert Liliana Grassi, reused as much as possible of the original stones and bricks, most of which had remained on site since the unauthorized demolition.

Figs. 1–3
Three views of via Palmanova in the early 1950s, published in *Urbanistica*. The rubble-built thoroughfare served as the backbone of the modern city developing along it. Source: *Urbanistica*, no. 18–19 (March 1956): 132, 133, 135.

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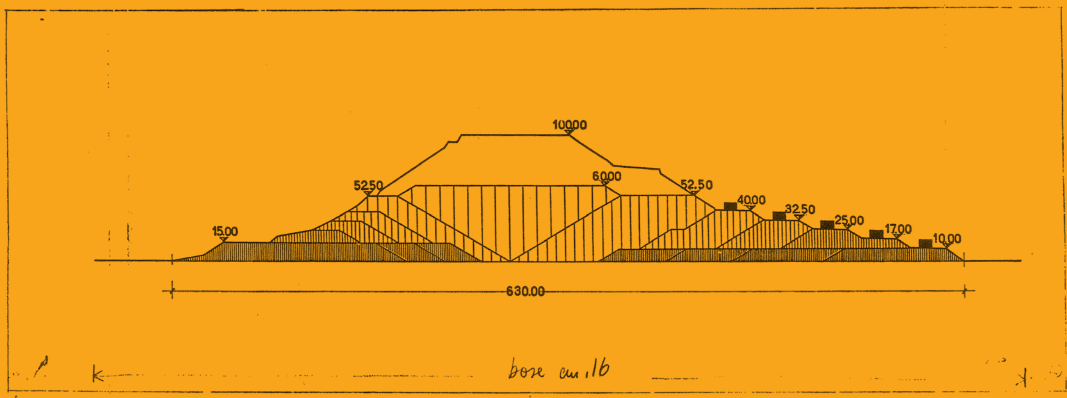
Urbanistica, no. 18–19 (March 1956): 132–137.

Piero Bottoni, Monte Stella, Milan (1946–1970)

Rising from Rubble

Federico Ferrari
ENSA Paris–Malaquais

The Quartiere Triennale Ottava (QT8) was conceived on the occasion of the eighth Triennale di Milano in 1947, by a team led by Piero Bottoni and including some of the city's most prominent architects and urbanists. It is considered a pioneering project on several fronts: for its straightforwardly modernist urban plan; for the diverse and innovative housing typologies it features; and as a rare case of large-scale prefabrication, an ambitious, though ultimately unsuccessful, attempt to update the dominant low-cost approach of the Italian post-war construction industry. The neighborhood's most popular feature, even among the general public, is its artificial hill, Monte Stella, whose silhouette stands out against the entirely flat profile of Milan's western outskirts. Conceived by Bottoni, and named after his late wife, Monte Stella is Italy's largest and best-known rubble hill – an element that arguably was never intended to exist. The neighborhood's early plans centered around an ordinary urban park, equipped with a small lake, to be developed within a disused quarry. However, during the chaotic post-war years, rubble was rapidly and disorderly transported through the city, especially from debris removed from the historic center. While the quarry was being filled by uncontrolled, illegal dumping, Bottoni ingeniously revised the project. As architects Giancarlo Consonni, Lodovico Meneghetti, and Graziella Tonon explain, "Faced with that shapeless and muddy heap of rubble, the idea of a mountain takes shape and develops" [Consonni, Meneghetti, Tonon 1990, 373]. Bottoni's drawings and contemporary photographs document the transformation of the shapeless, unstable pile into a geometric relief, complete with pedestrian paths, roadways, and panoramic viewpoints. Initially conceived to rise as high as 100 m, the hill's height was reduced to 60 m in the final 1953 project and completed in 1970 at 45 m. Interestingly, the hill's size was reduced several times as rubble was needed for numerous other construction projects, including "the embankment of new roads, some of conspicuous width, as well as for the formation of new large cemeteries" [1953]. Despite intense competition for rubble, Monte Stella was formed by the accumulation of several "generations" of debris, beginning with that of World War II. An unpublished 1967 report by Bottoni details the types of materials constituting the hill: "The foundation of the hill, from the depth of the quarries up to 8–10 m above ground level, comes almost exclusively from the deposit of war rubble (...). Among this material are buried today (...) fragments of mouldings, frames, trabeations, capitals, columns, and foundations in terracotta, stone, granite, marble, and of all kinds and historical periods" [Bottoni 1967]. The report further describes more recent layers, including rubble from later demolitions and sand sourced from the metro system's construction sites, which opened in 1957. The dumping site was officially closed in 1967, when finishing and planting works began, preceding the site's opening as a public park in the early 1970s. Covering approximately 370,000 m^2, Monte Stella provided a much-needed large-scale green space for Milan at a time of rapid and poorly regulated urban growth. It remains to this day one of Milan's most beloved parks, mainly because of its unique hilly topography, enabling unprecedented uses and activities. The series of ski competitions held there between 1982 and 1984 were a short-lived initiative – but one that launched the national spotlight on soon-to-be famous skier Alberto Tomba. Beyond these one-off events, Monte Stella allowed all Milanese to enjoy panoramic views over their city long before publicly accessible high-rise buildings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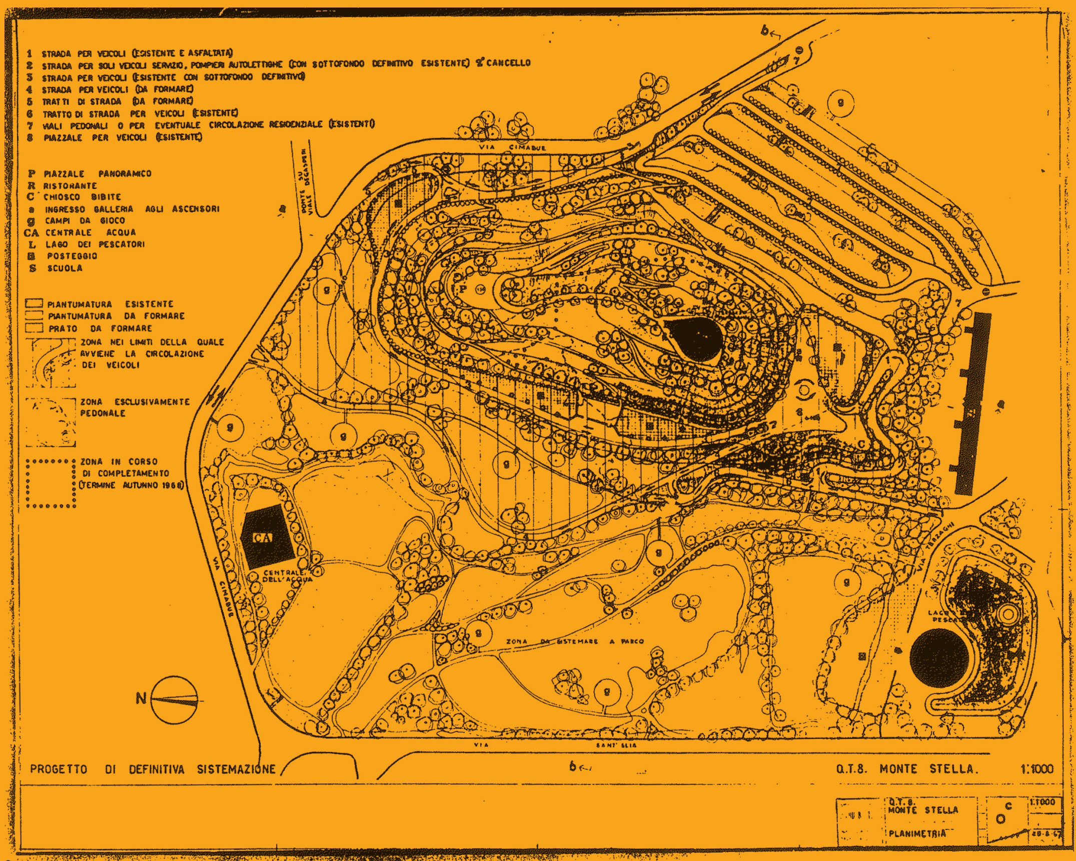
1 STRADA PER VEICOLI (ESISTENTE E ASFALTATA)
2 STRADA PER SOLI VEICOLI SERVIZIO, POMPIERI AUTOLETTIGHE (CON SOTTOFONDO DEFINITIVO ESISTENTE) 2ª CANCELLO
3 STRADA PER VEICOLI (ESISTENTE CON SOTTOFONDO DEFINITIVO)
4 STRADA PER VEICOLI (DA FORMARE)
5 TRATTI DI STRADA (DA FORMARE)
6 TRATTO DI STRADA PER VEICOLI (ESISTENTE)
7 VIALI PEDONALI O PER EVENTUALE CIRCOLAZIONE RESIDENZIALE (ESISTENTI)
8 PIAZZALE PER VEICOLI (ESISTENTE)
P PIAZZALE PANORAMICO
R RISTORANTE
C CHIOSCO BIBITE
a INGRESSO GALLERIA AGLI ASCENSORI
g CAMPI DA GIOCO
CA CENTRALE ACQUA
L LAGO DEI PESCATORI
B POSTEGGIO
S SCUOLA
PIANTUMATURA ESISTENTE
PIANTUMATURA DA FORMARE
PRATO DA FORMARE
ZONA NEI LIMITI DELLA QUALE AVVIENE LA CIRCOLAZIONE DEI VEICOLI
ZONA ESCLUSIVAMENTE PEDONALE
ZONA IN CORSO DI COMPLETAMENTO (TERMINE AUTUNNO 1968)
VIA CIMABUE
PONTE SU VIALE DEGASPERI
CA
CENTRALE DELL'ACQUA
ZONA DA SISTEMARE A PARCO
VIA SANT' ELIA
N
PROGETTO DI DEFINITIVA SISTEMAZIONE
Q.T.8. MONTE STELLA. 1:1000
Q.T.8. MONTE STELLA
PLANIMETRIA

2

Fig. 1
Diagram showing the successive phases of construction of Monte Stella. Longitudinal section, undated. Courtesy Archivio Piero Bottoni, DAStU, Politecnico di Milano.

Fig. 2
Project for the definitive layout of Monte Stella. Site plan, scale 1:1000, 1967. Courtesy Archivio Piero Bottoni, DAStU, Politecnico di Milano.

Figs. 3–4
Views of the construction works of Monte Stella. Undated. Courtesy Archivio Piero Bottoni, DAStU, Politecnico di Milano.

became common. In this sense, Monte Stella is both a pragmatic response to the need to dispose of rubble and a visionary, revolutionary urban project. In Bottoni's words: "The concavity of Lake QT8 turned into convexity (...) and it was at that moment that my distant, lifelong dream of a Milanese mountain became a reality" [Bottoni 1954].

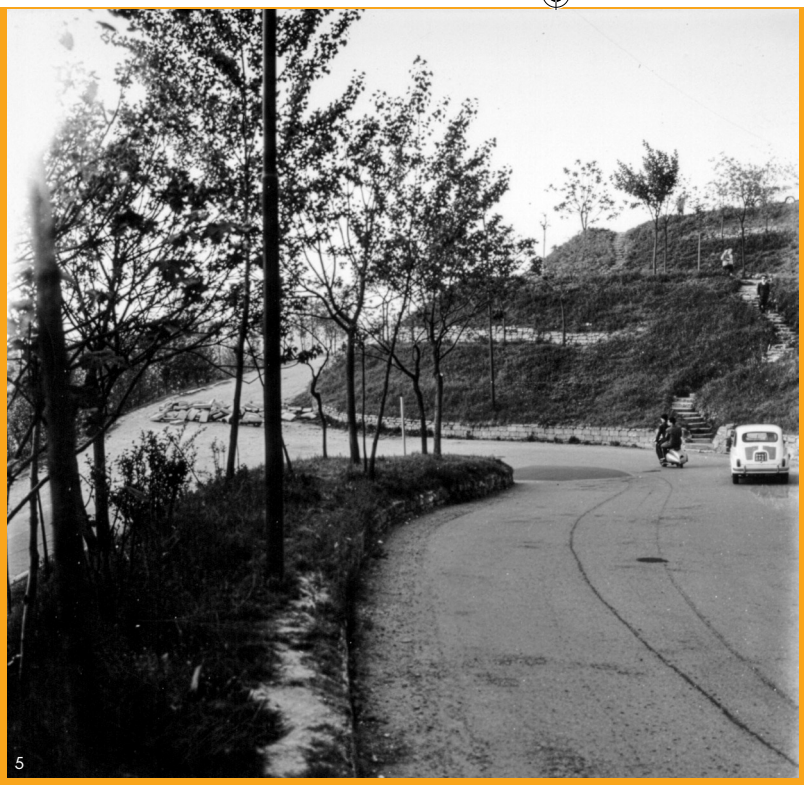

Fig. 5
Monte Stella after completion and opening to the public. Undated. Courtesy Archivio Piero Bottoni, DAStU, Politecnico di Milano.

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Chapter 2

Disjoined Joints: Traces of Design for Disassembly in Italian Industrialized Architecture Culture (1945–1975)

Ilaria Giannetti
Università degli Studi di Roma Tor Vergata

In 2016, the American architectural firm William McDonough + Partners presented in Switzerland the "ICEHOUSE™": this prototype of a small, 'ephemeral' housing unit specifically interprets, from an architectural perspective, the principles previously set out by McDonough himself, along with the chemist Michael Braungart, in their 2002 pamphlet, *Cradle to Cradle*, and the subsequent *Upcycle: Beyond Sustainability-Designing for Abundance*, published in 2011.[1] The structure, "designed for disassembly and reconstruction," allows for the reuse and recycling of its constituent building elements.[2]

In 2017, the Italian-French firm Djuric Tardio Architects designed a prototype for a fully demountable and relocatable nursery following a public competition held by the City of Paris.[3] Characterized

1 William McDonough, Michael Braungart, *The Upcycle. Beyond Sustainability – Designing for Abundance* (New York: MacMillan Publisher, 2013).

2 Source: "Innovation for the circular economy," on the official website of William McDonough + Partners, accessed July 30, 2025. https://mcdonoughpartners.com/projects/icehouse/.

3 Source: "Modular mobile nursery," on the official website of Bollinger + Grohmann, accessed July 30, 2025. https://www.bollinger-grohmann.com/en.projects.modular-mobile-nursery.html.

by a mixed steel and timber structure, the *crèche modulaire et itinérante* (modular and mobile nursery) was assembled – entirely using dry construction methods and with the aid of a robotic crane – for the first time in 2019 in the Jardin du Luxembourg, in the 6th arrondissement of Paris, in order to be dismantled just two years later and relocated to the city of Lyon in September 2025. In 2019, in Fornebu, Norway, Felleshuset, an entirely demountable architecture, was built: designed by the associated architectural firms Dyrvik Arkitekter and Transborder Studio, the structure serves as a meeting place for a local community active in urban cultivation. In 2020, the German engineers Bollinger-Grohmann, who had already engineered the structures for both the Felleshuset and the *crèche itinérante*, independently designed an experimental residential module – the Proto Habitat Pavilion – which is also completely demountable.

In 2020, a full set of design principles was summarized as a novel framework of "Design for Disassembly (and Adaptability)" within the ISO standard 20887: "Sustainability in buildings and civil engineering works – Design for disassembly and adaptability – Principles, requirements and guidance". The text of the standard – akin to a programmatic manifesto – provides a comprehensive definition of Design for Disassembly (DfD) as applied to the construction sector, a glossary, and a list of minimum principles: "versatility, convertibility, expandability, standardization, simplicity, independence, ease of access to components, and safety of disassembly."[4]

Over the last five years, as 'disassembly projects' continue to spread rapidly in the international context, DfD has also arrived in Italy, first with prototype buildings – such as the Danish pavilion designed by the Lendager studio in Milan for Design Week 2021[5] – and later taking

4 The standard contains the following definition of Design for Disassembly: "approach to the design of a product or constructed asset [...] that facilitates disassembly [...] at the end of its useful life, in such a way that enables components [...] and parts to be reused, recycled, recovered for energy or, in some other way, diverted from the waste stream." The definition is derived from a primary definition given in the standard ISO 14021:2016.

5 Source: "Lendager Group Design for Disassembly in Milan," on *Archdaily*, accessed July 30, 2025. https://www.archdaily.com/969606/lendager-group-designs-for-disassembly-in-milan.

root in the practice of national designers and construction companies.

In 2021, the company Wood Beton constructed the research laboratory buildings for the Human Technopole Foundation in Milan, leveraging the full DfD framework to create an entirely demountable steel structure.[6] In 2023, Michele De Lucchi and AMDL CIRCLE designed the Pedrali pavilion, constructed at the headquarters of this company in Mornico Al Serio as a completely demountable timber structure.[7] In the same year, the Italian architectural firm ARW designed "the factory of the future," a project guided by the possibilities of future disassembly.[8] At the time of this writing, the Italian pavilion at the Osaka international exposition has also been inaugurated: conceived by MCA - Mario Cucinella Architects and built by two Japanese companies, the structure revolves the entire design process on Design for Disassembly.[9]

Even considering only the specific case of Italy – which today lags Northern Europe in terms of resource optimization in the construction sector – is the concept of disassembly truly so new for design practice and culture?

What is certain is that, even when read without too much attention or curiosity for the history of construction, the principles set out by the current code framework – translated into practice by numerous experiments and discussed in the growing literature on the subject[10] – unmistakably evoke some of the experiences of the building

6 Source: "Nuovi laboratori di ricerca per 'Fondazione Human Technopole," on woodbeton.it, accessed July 30, 2025. https://woodbeton.it/realizzazioni/arexpo/.

7 Source: "Il nuovo Pedrali pavilion progettato da AMDL Circle e Michele De Lucchi," on area-arch.it, accessed July 30, 2025, https://www.area-arch.it/il-nuovo-pedrali-pavillion-progettato-da-amdl-circle-e-michele-de-lucchi/.

8 Source: "La fabbrica del futuro," on archello.com, accessed July 30, 2025. https://archello.com/it/project/fabbrica-del-futuro.

9 Source: "Padiglione Italia Expo 2025 Osaka," on the official website of MCA – Mario Cucinella Architects, accessed July 30, 2025. https://www.mcarchitects.it/progetti/padiglione-italia-expo-2025-osaka.

10 See: Katarzyna Ostapska, Petra Rüther, Arian Loli, Klodian Gradeci, "Design for Disassembly: A systematic scoping review and analysis of built structures Designed for Disassembly," in *Sustainable Production and Consumption*, no. 48 (2024), 377–395; *Detail*, no. 6 (2025), special issue "Circular Construction."

Fig. 1
Re-assembly of the metallic structure of the "abitazione tipica a struttura di acciaio", set up in the V Milan-Triennale in 1933, as the "Torre Novecento" in Riccione, 1934. *Quadrante*, 1934.

industry of the latter half of the twentieth century.

Delving deeper into this suggestion, we find ourselves in another context: the American manufacturing industry. It was here, in the 1990s, that the expression Design for Disassembly[11] emerged, rooted on the success – within the same industrial segment – of the much better-known Design for Assembly (DfA), which aimed at the optimization of mechanical parts to simplify the assembly process, thereby reducing production chain costs. Roughly translated to the building sector, DfA coincides with the theoretical and methodological attempts of the late 1960s at "component-based architecture" – the culmination, never fully achieved, of the industrialization of construction.

In the following pages, we will therefore project ourselves into a socio-economic and cultural paradigm that is different (if not antithetical) to the current one, in search of the principles of DfD through some micro-histories of the twentieth-century Italian industrialization in building, which we will unearth and patiently cleanse of the utopia of growth.

Emblematics of Assembly: Inventions for Systems, Elements, and Joints

In 1946, the first issue of the journal *Informatore Tecnico Cantieri* was published. Directed by Maurizio Mazzocchi, the journal served as

11 See: Pitipong Veerakamolmal, Surendra Gupta, "Design for disassembly, reuse and recycling," in Lee H. Goldberg, Wendy Middleton, eds., *Green Electronics/ Green Bottom Line* (Oxford: Butterworth-Heinemann, 2000), 69–82.

the official publication of the company *Organizzazione Cantieri per la Ricostruzione*, which he had founded in 1942 as a pioneering consulting engineering firm. The journal published 21 issues between 1946 and 1950, offering a unique testimony to the integration of industrial culture into the building sector, aiming at the renewal of methods and tools for the post-war reconstruction.

The journal therefore included, on the one hand, a theoretical and methodological reflection on the design of industrialized architecture and, on the other, provided technical documentation on prototypes of prefabricated systems, which were already available on the Italian and Northern European markets.

The theoretical essays pioneered topics related to the optimization of the building process in accordance with industrial criteria and were accompanied by a monographic section dedicated to industrial patents for invention. Within this progressive (and hoped-for) industrialization, the industrial patent – a technical and legal instrument for the protection of technological inventions for the market – becomes, in this context, the design tool of choice to support the renewed role of architects upstream of the industrial process.

Between 1946 and 1965, a crucial period for the attempted industrialization of the building sector, the inquiry into the attribution of responsibility between libertarians and planners for the failure of a specific construction industry to take off unfolded in the most established trade journals. At the same time, the Italian Patents and Trademarks Office received hundreds of applications for industrial patents for invention, utility models, and design models dedicated to industrialization processes, in terms of systems, elements, and joints.

Reinterpreted here, the sequence of inventions – reconstructed through an extended data mining process from the Italian Patents and Trademarks Office Archive[12] – constitutes a repertoire of artistic and

12 See Alberto Bologna, Josep-Maria Garcia-Fuentes, Ilaria Giannetti, Gabriele Neri, Roberto Germanò, eds., *Upcycling Architecture in Italy. Data Mining. Results* (Turin: Politecnico di Torino, to be published). The research is conducted as part of a scientific collaboration agreement between Sapienza Università di Roma, Università degli Studi di Roma Tor Vergata, and the Central State Archive.

technical solutions that are prodromal to current material approaches to Design for Disassembly. In this sense, the collection of patents, in the gap between the act of invention and the socio-economic and productive factors that determine its concrete applicability, allows for an analysis and reinterpretation of the design and technological experimentation (conducted at the scale of the building element) in terms of its 'outlines'.[13] This describes an ideal trajectory of the design research carried out in the latter half of the twentieth century on the 'tectonics of assembly' (and possible disassembly).

In 1962, the architect Leonardo Mosso, as part of a broader design research project regarding "structures as a system of transformations and possibilities,"[14] filed an industrial patent for a "Prefabricated block for forming masonry."[15] The subject of the invention is a hollow, 'universal' brick with a Z-shaped profile that allows it to be stacked (like a Tetris block) and secured to other elements solely by inserting metal rods through cylindrical holes. The design of the block – "preferably made of precast concrete" – allows to build a masonry structure that is "solid and resistant" yet also entirely demountable.[16]

In 1965, the young architect Renzo Piano, inspired instead by

13 For a definition on the use of patents as a source for socio-technological studies, see W. Beijker, *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change* (Cambridge, Massachusetts: The MIT Press, 1993); For an overview of patents in architecture, see Peter H. Christensen, *Prior Art: Patents and the Nature of Invention in Architecture* (Cambridge, Massachusetts: The MIT Press, 2024); and the ongoing research "Architecture and Patents" at ETH Zurich. Source: "International Conference Architecture & Patents," on the official website of ETH Zurch, accessed July 30, 2025. https://www.langenberg.arch.ethz.ch/discourse/architecture-patents/?lang=en.

14 Source: Leonardo Mosso "My life between Aalto, art, and experiments on joints," on *Giornale dell'Architettura*, October 22, 2018, accessed July 30, 2025. https://ilgiornaledellarchitettura.com/2018/10/22/leonardo-mosso-la-mia-vita-tra-aalto-larte-e-le-sperimentazioni-sui-giunti/.

15 Source: Leonardo Mosso, "Blocco prefabbricato per la formazione di murature," "Blocco prefabbricato per la formazione di murature," patent n. 648670, filed in Turin on 22/02/1961 (Archivio Centrale dello Stato, hereafter ACS, Fondo Ufficio Italiano Brevetti e Marchi, hereafter UIBM).

16 Ibid.

the experimentation of Jean Prouvé,[17] adapted the French demountable metal house to the industrial invention of a "Method for the construction of walls, by means of panels interlocking between uprights and walls made with this method."[18] The invention proposed a simplified system for assembling an entirely metallic structure based on dry interlocking principles, revolving around a specific assembly process of three main elements: cross-shaped uprights, T-shaped lintels, and lightweight panels.

By looking past their individual authorial styles, the two patents by Mosso and Piano concisely outline two parallel technological paths that define the broad design experimentation with prefabricated, demountable systems that arose between the 1940s and the 1960s. On one hand, there are building processes based on the dry assembly of masonry blocks – made of precast concrete or brick – that are variously reinforced and combined. On the other, there are metal structures, completed by lightweight, standard-production elements that can be assembled using only mechanical connections.

These two trajectories, supported by a series of 'anonymous' inventions, ultimately converge on the design of the joint. This building element, understood in its broad, both material and theoretical sense as a connecting device to establish a "relationship between constructive signs," represents the very heart of the assembly (and potential disassembly) project.

Among the systems based on the assembly of masonry blocks, the inventions of the Turin-based architect Olga Caminati stand out (Fig. 2). Between 1943 and 1945, through three successive patent applications, she registered a design for a "system of demountable building constructions using only four typical, entirely reusable constituent elements."[19] Caminati's method involved the assembly of hollow concrete

17 For an insight, see Lorenzo Ciccarelli, *Renzo Piano prima di Renzo Piano. Masters and beginnings* (Macerata: Quodlibet, 2017).

18 Source: Renzo Piano, "Metodo per la costruzione di pareti, per mezzo di pannelli incastrabili fra montanti e pareti realizzate con tale metodo," patent n. 751126, filed in Genoa on 22/02/1965 (ACS, UIBM).

19 Source: Olga Caminati "Sistema di costruzioni edili smontabili mediante solo quattro elementi costitutivi tipo, interamente riutilizzabili," patent n. 408609,

elements, which served as both beams and pillars. These were joined using a four-way cubic joint and completed with modular, hollow-core panels. Developed through two subsequent addenda to the original patent, focused on perfecting the individual elements and resolving corner connections, the invention materialized the idea of a rapid, temporary construction to address the urgent need for emergency housing during the war and the subsequent reconstruction period.

The masonry construction, as a specific subject of the technological and architectural design aiming support the rapid and economic building of emergency housing, was also addressed by the architect Luigi Moretti who, in 1945, filed an industrial patent for a "Tubular house of extremely rapid and economical construction."[20]

Moretti's invention voluntarily deviates from the experimentation on demountable constructions (for which "many construction methods have been devised (…) exploiting the standardization of the construction elements"[21]). Instead, it proposes the industrial exploitation of the possible reuse of "very poor" and waste material, including "rubble from collapsed houses."[22] Moretti's invention focuses on a structure with uprights and barrel vaults of significant thickness, which can be made with a "mixture of rubble debris" characterized by appropriate binders. The dwelling is therefore composed of rectangular "minimal units," featuring skylights for zenithal light and adaptable to various furnishing needs, with the furniture itself being entirely composed of demountable elements.

Alongside the more radical solutions, such as those proposed by Caminati and Moretti, numerous patents also protect more ordinary, 'industrializable' masonry systems. These systems were dedicated

filed in Turin on 19/05/1943, registered on 04/01/1945; patent n. 410221, filed in Turin on 24/07/1943, registered on 27/03/1945; patent n. 410222, filed in Turin on 27/11/1943, registered on 27/05/1945 (ACS, UIBM).

20 Source: Luigi Moretti "Casa tubolare di rapidissima ed economica costruzione," patent n. 413222, filed in Rome on 08/11/1945, registered on 05/04/1946 (ACS, UIBM).

21 Source: Ibid.

22 Source: Ibid.

to rapid reconstruction and the development of residential housing, translating the traditional reinforced concrete frame into a rapidly assemblable and demountable structure.

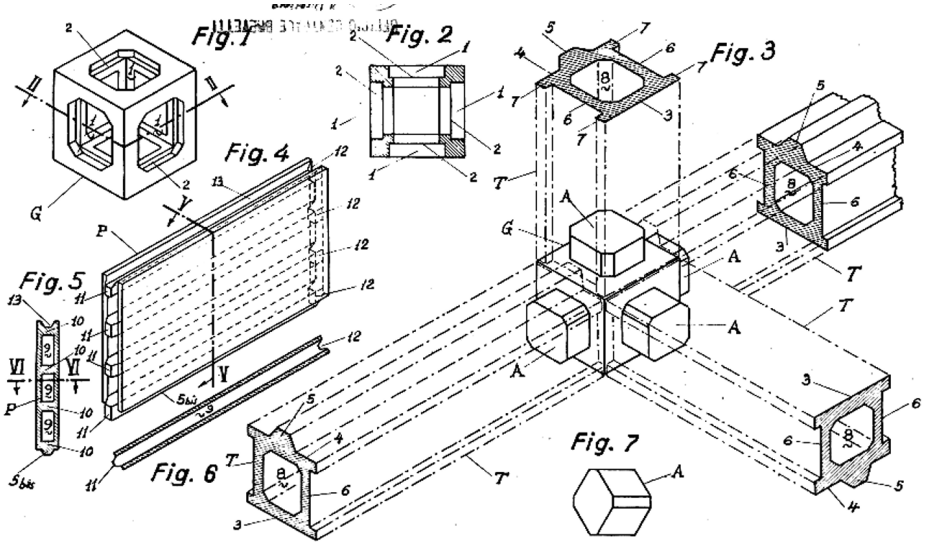
Among the most significant inventions is the "prefabricated demountable reinforced concrete structure obtained with basic elements," registered by Costantino Guala in Turin in 1946. This patent describes a three-element system – the plinth, a linear element (serving as a pillar or beam), and the capital – which are assembled using four-way joints.

During the same period, metal structure systems also rose in prominence alongside masonry ones. Following the research that began in the 1930s on the futuristic performance of metal constructions in terms of speed, efficiency, and potential for reuse – an attempt epitomized by the noteworthy *Torre* 900[23] (Fig. 1) – post-war inventions, conversely, adapted the metal structure into an efficient, demountable, and reusable load-bearing framework designed to accommodate lightweight, standard-production elements (Figs. 3, 4).

This trend revolves around the design of the joint, which develops by hybridizing the ideology of the 'universal connection' with the conception of extended repertoires of multifunctional joints – such as the joint-uprights – that integrate both a connective and a load-bearing function.[24] This latter design approach flourished in the 1960s, attracting a broader scope of architectural research. In the renewed socioeconomic and productive context marked by the hopes for industrialization brought about by the economic miracle, the design of the joint became a crucial subject. It aimed, on the one hand, to extend the combinatorial possibilities of standard components and, on the other, to produce

23 See Ferruccio Canali, "Renato Camus e l'abitazione tipica a struttura di acciaio' della V Triennale di Milano rimontata come 'Torre '900' a Riccione (1934)," *Studi Romagnoli*, LXVII (2016), 461–500.

24 Between registered patents for special joints, see: "Sistema per la costruzione rapida di case prefabbricate smontabili," filed in 1945 in Bologna by the Società Anonima L'invulnerabile, for the disassemblable combination of standard iron profile; the "Sistema di costruzione di case smontabili con elementi prefabbricati," filed in Milan in 1945 by Cesare Maranesi, for the connection of tubular metal elements using a set of snap-on coupler.



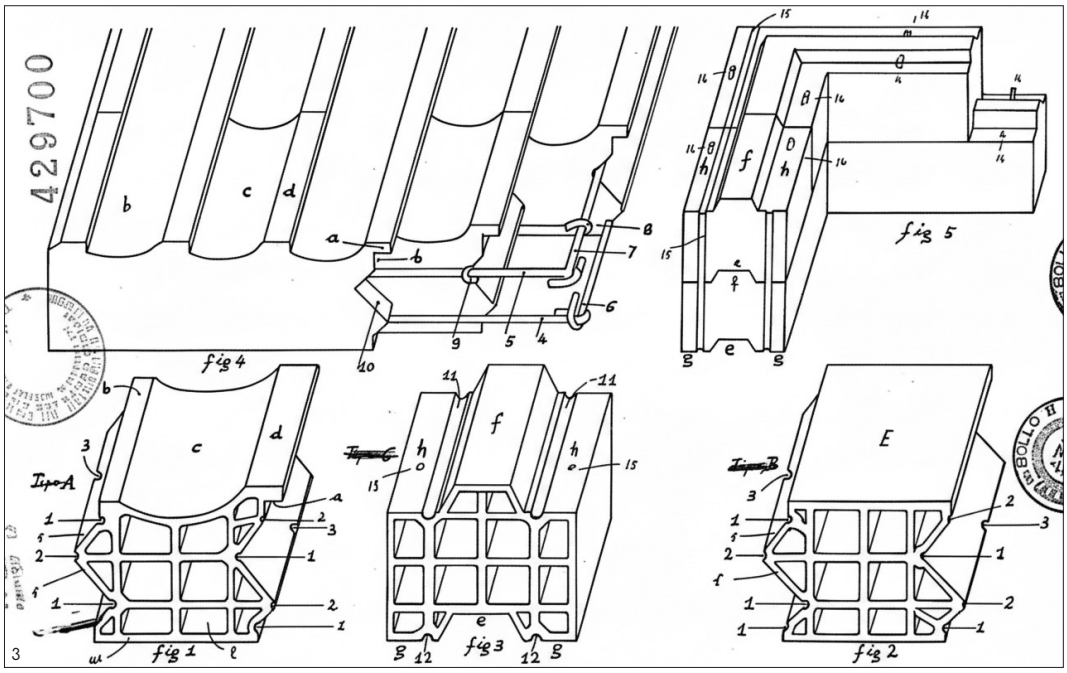
2

new systems for the integral prefabrication of buildings.

In 1962, the BBPR studio registered a patent for "a joint allowing the conjunction of two or more prefabricated panels at different angles."[25] The invention protects the design of an interior folded wall – lightweight and demountable – made of panels assembled at non-orthogonal angles using a special joint that also functions as an upright. This element, composed of a steel tube of variable diameter paired with extruded aluminum profiles, can be assembled with a snap-fit mechanism. Notably, the table of the designed aluminum profiles documented the possibility of dry-assembling standard panels of various materials at five different angles (90°, 120°, 130°, 150°, 180°), guaranteeing a wide range of geometric configurations for the wall, which could also be transformed over time (Fig. 5).

The firm BDS (Pietro Barucci, Giovanni Barucci, Beata Di Gaddo, and Ugo Sacco) also took on this theme. Engaged in experimenting with integral prefabrication systems through the

25 BBPR, "Giunto permettente la congiunzione secondo angoli diversi di due o più pannelli prefabbricati," patent n. 675627, filed in Milan on 11/09/1962 (ACS, UIBM).



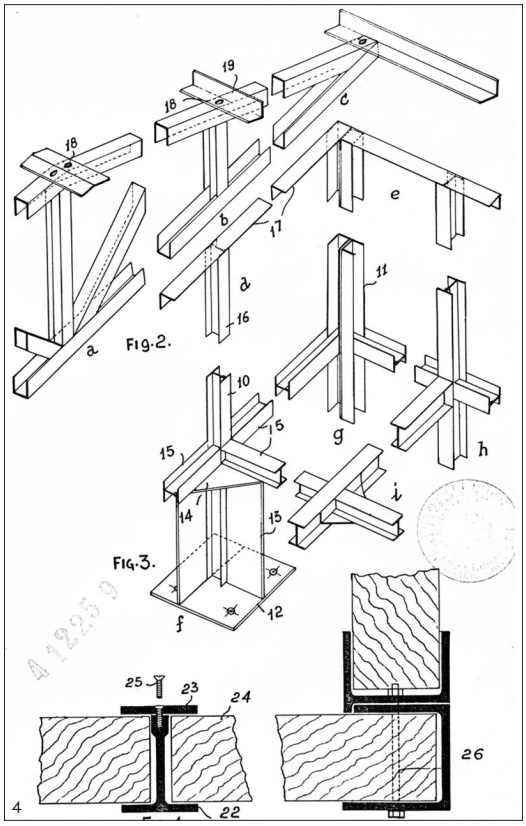
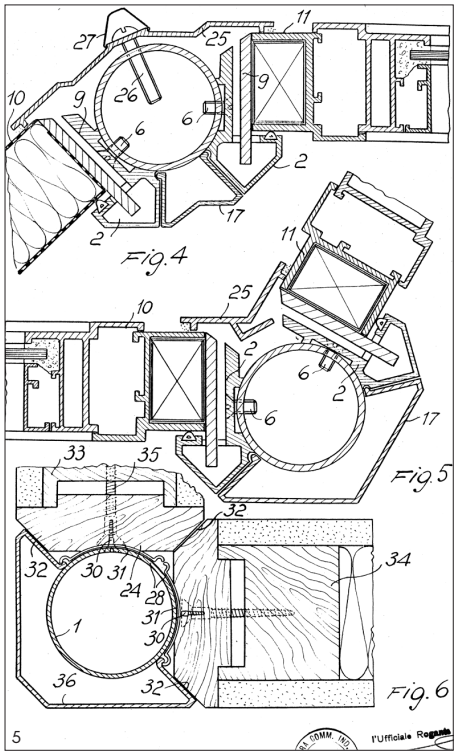
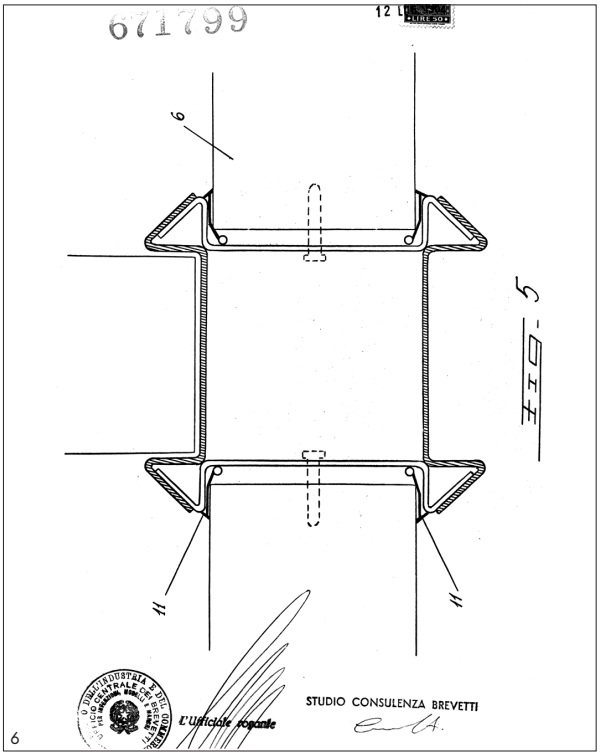


Fig. 2
Caminati Olga, "Sistema di costruzioni edili smontabili, mediante quattro soli elementi costitutivi tipo, integralmente riutilizzabili", patent n° 408609, filed in Turin on 19/05/1943. Courtesy Archivio Centrale dello Stato. Fondo Ufficio Italiano Brevetti e Marchi.

Fig. 3
Giovan Nicola Del Grosso, "Laterizi forati per la costruzione di case smontabili", patent n° 429700, filed in Rome on 31/01/1946. Courtesy Archivio Centrale dello Stato. Fondo Ufficio Italiano Brevetti e Marchi.

Fig. 4
Società Anonima L'invulnerabile, "Sistema per la costruzione rapida di case prefabbricate smontabili", patent n° 412259, filed in Bologna on 24/08/1945 a Bologna. Courtesy Archivio Centrale dello Stato. Fondo Ufficio Italiano Brevetti e Marchi.





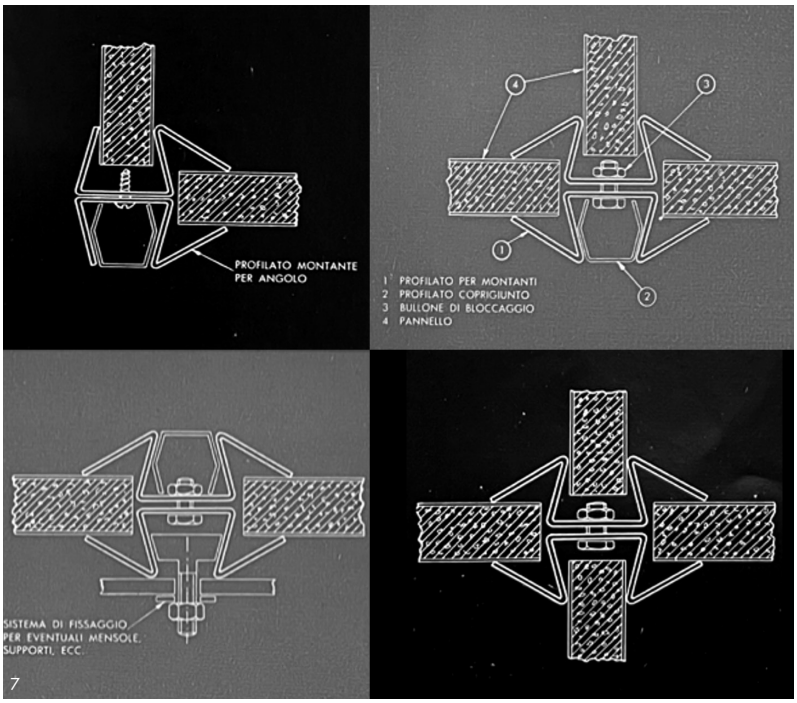


Fig. 5
BBPR, "Giunto permettente la congiunzione secondo angoli diversi di due o più pannelli prefabbricati", patent n. 675627, filed in Milan on 11/09/1962. Courtesy Archivio Centrale dello Stato. Fondo Ufficio Italiano Brevetti e Marchi.

Fig. 6
Tecnosider spa, "Elemento fondamentale per la realizzazione di costruzioni edili ad elementi prefabbricati con particolare impiego di materiale metallico", patent n. 671799, filed in Rome on 12 /07/1962. Courtesy Archivio Centrale dello Stato. Fondo Ufficio Italiano Brevetti e Marchi.

Fig. 7
Ditte Riunite Antonio Elia in Naples, assembly diagrams of dry-joints for demountable wall, prototypes, 1958. *Prefabbricare*, 1958.

entrepreneurial venture of the company Tecnosider, they registered the patent for a "Fundamental element for the construction of buildings with prefabricated elements, with a particular use of metal material" in 1962.[26]

The invention protects the design of a joint-upright made of four extruded aluminum profiles that can be dry-assembled to form a flower-shaped connection, allowing panels to be secured, using snap-fit fasteners and only two mechanical connectors (Fig. 6).

In the 1960s, the ease of assembly and reversibility of construction hybridized with the offshoots of a theoretical debate that, overshadowed by the most established architectural culture, focused on the 'scientification' of the building process by integrating industrial methods into architectural design (Fig. 7).

Towards a "Components-Based Architecture"

In 1958, the journal *Prefabbricare* was founded in Milan. As the official publication of the Italian *Associazione Italiana Prefabbricazione per l'Edilizia Industrializzata* (AIP), the periodical – in ideal continuity with the editorial line established by *Informatore Tecnico Cantieri* – aimed to document and disseminate the methods and tools of industrial culture in the building sector. It also sought to coordinate the production of prefabricated building elements already manufactured by AIP member companies.[27]

The magazine, supported by a scientific committee chaired by Piero Bottoni, collected the results of research carried out since the early post-war years by a small Milan-based technical-scientific community. This group was initially gathered around the Milan Triennale,[28] the

26 Tecnosider spa, "Elemento fondamentale per la realizzazione di costruzioni edili ad elementi prefabbricati con particolare impiego di materiale metallico," patent n. 671799, filed in Rome on 12 /07/1962, (ACS, UIBM).

27 Giovanni Saccenti, "Il Presidente e gli associati," *Prefabbricare,* no. 1 (1958), 6–7; "Lo Statuto e l'ordinamento della nostra Associazione, *Prefabbricare,* no. 1 (1958), 8–9.

28 For insight on the topic, see: Ilaria Giannetti, Stefania Mornati, "The Milan Triennale Exhibitions and the Debate on Prefabbrication in Post-War Italy," in eds. Regine Hess, Inbal Ben-Asher Gitler, Tzafrir Fainholtz, and Yael Allweil, *Between*

CNR's Centro Studi sull'Abitazione (Research Center for Housing),[29] the Istituto Autonomo Case Popolari di Milano (IACPM),[30] and the Centro Ricerca Applicata per l'Edilizia Residenziale (CRAPER),[31] and later expanded to include associations of professionals and entrepreneurs.

A collection of extracts from the journal, spanning from 1958 to 1970, thus allows the gathering of insights into the specificities of "design by assembly" as it relates to the theoretical and methodological approaches of industrial culture. In this context, the journal constitutes a fertile, intangible background – theoretical, technical, and conceptual – for the current framework of Design for Disassembly (and, more broadly, for the industrial-based concept of sustainability in the construction sector). In this sense, the collection of essays testifies to the rise of the industrial process unique to the building sector, where the very concept of optimization is defined, articulated, and specialized into an epistemological practice, culminating in the so-called "componenting" approach (for a component-based architecture).

In 1958, the criterion of optimization was discussed in relation to the economic aspects of a prefabricated building in the article *"Come ridurre i costi in edilizia?"* ("How can we reduce building costs?").[32] The article reported the results of experimental work conducted in the laboratories of the Montecatini company to quantify the net costs of a prefabricated building compared to those required for the construction of a traditional building.

Conventional and Experimental: Mass Housing and Prefabrication in Modernist Architecture. (Leuven: Leuven University Press, 2024), 209–227.

29 For insight on the topic, see: Angelo Bertolazzi, Ilaria Giannetti, *Architettura industrializzata a Milano. Prototipi e modelli per l'edilizia residenziale pubblica (1945–1965)* (Milan: Franco Angeli, 2024).

30 For insight on the topic, see Giuseppe Ciribini, *Architettura e Industria. Lineamenti di tecnica della produzione Edilizia* (Milan: Libreria Editrice Politecnica Tamburini, 1958).

31 For insight on the topic, see Bertolazzi, Giannetti, *Architettura industrializzata*.

32 Source: Enzo Ercoli, "Una importante inchiesta Come ridurre i costi in edilizia?," *Prefabbricare*, no. 2 (1958), 8–15.

The article presents an insight on the "performance efficiency" of prefabricated building elements in relation to the "assembly techniques" and the "future flexibility of the building." On a technological level, the article proposes the use of a metal load-bearing structure, based on a rigid dimensional grid, complemented by completely demountable internal infill panels. The possibility of disassembling these panels is included in the design action, which is defined here as "total," because it extends to the "future possibilities" of the building. In economic terms, the prototype demonstrates a "gain in weight [estimated between 25% and 30%], in manufacturing time (and therefore on-site time) and (…) a saving in money," mainly due to the provisions for the "future flexibility" of the building in terms of functions.[33]

The "future flexibility" as a fundamental performance parameter for optimizing prefabrication processes, is addressed with reference to the "future disassembly" of individual construction components in the article *"Elemento modulare polivalente"* ("multifunctional modular element," published in 1959[34] (Fig. 8).

The text, authored by the architect Ado Franchini, presents: a self-supporting square wall frame formed by the joining of uprights and rails made of light alloy (cold-formed or extruded profiles). This frame can accommodate various elements (an insulating panel, single or double glass, external sunshades, and parapets) and connect to the load-bearing structure of a building, which could ideally be built with different materials (steel, wood, or reinforced concrete). The "versatility" of this element is therefore expressed in terms of the possibility of "immediate transformation of a building."[35] In this sense, the prototype also explicitly refers to the potential "recovery" of the designed building element at the end of its useful life, thereby considering the possibility of its disassembly and reuse "for functions different from those initially considered."[36]

33 Ibid.

34 Source: Ado Franchini, "Un elemento funzionale polivalente," *Prefabbricare*, no. 2 (1959), 46–48.

35 Ibid.

36 Ibid.

The topics introduced in the first issues of the journal were expanded upon in a broader sense from 1967, the year the periodical, under the direction of Giuseppe Ciribini, was re-launched with the new title, *Prefabbricare. Edilizia in evoluzione*.[37] The editorial overture, signed by Ciribini, explicitly presented the cultural alignment of the journal with the most up-to-date industrial processes, "in the sense of a cyclical production-consumption system."[38]

When applied to the design of the building product, this "production-consumption" system was broken down into five phases: "in-factory transformation of intermediate goods, distribution, on-site production of final goods (by assembling prefabricated goods), consumption, and reclaim. Although not yet formalized in the current axioms of the circular economy, the five phases outlined by Ciribini introduced – as one of the foundational themes for the design of the (building) product – the prefiguration of the future of the building object, understood as an act of "control along the entire building process" (which, therefore, also includes the possibility of reclaiming).[39]

To support the evolution of the project over time, the design of the building object within the "production-consumption" system therefore requires the development of an autonomous technical and artistic reflection, specific to industrialized architecture. This theoretical approach is distinct, on the one hand, from the approaches of the manufacturing industry, and, on the other, from the processes of product design (with which it is also intimately intertwined).

In this context, supported by the theoretical convergence with contemporary research in semiotics, the design and construction of industrialized architecture acquired new interpretive and generative tools

37 The new editorial board of the magazine, whose first issue with a renewed graphic design was released in September–October 1967, is composed of: Giuseppe Ciribini (president), Gillo Dorfles, Franco Faccio (secretary), Elio Giangreco, Gino Martinoli, Salvatore Martorana, Riccardo Meregaglia, Giovanni Nassi, Cesare Pea, Virginio Pogliani, Augusto Pollice, Alberto Rosselli, Cesare Tenca, Giovanni Varlonga. Source: *Prefabbricare*, no. 9–10 (1967).

38 Source: Giuseppe Ciribini, "Nuovi contenuti per una rivista rinnovata," *Prefabbricare. Edilizia in evoluzione*, no. 5 (1967), 3–5.

39 Ibid.

– such as "meta-design" – progressively moving away from the idea of the project as a linear process. This was therefore gradually replaced by the concept of a "structurable ensemble (…) by means of defined syntactic relationships,"[40] laying the foundation for an emerging theoretical and methodological framework referable to a "component-based architecture" (as a building-related translation of DfA) (Fig. 9).

Among the specific concept of the latter approach first, there is the "catalog" understood as a collection of material entities that form the basis for a design "for assembly" to be articulated with "free and convenient choices." Next is the "componenting" in terms of a "pre-design integration, conducted in conjectural terms, of different types, based on multiple models of building components, with different production origins." Eventually, there is the "moment of the assembly" which materializes in the study of the "interactions and the coordination among the parts," to maximize the use of the inventories of building components already on the market, avoiding *a priori* outcomes (in terms of "combinations of parts according to pre-established models").[41]

Among the experiments on "assembly languages" – which the authors themselves considered "futuristic" at the time[42] – is also a radical artistic interpretation. Based on the imagination of an ideal inventory of building components this interpretation provides a tangible anticipation of research on the tectonics of assembly.

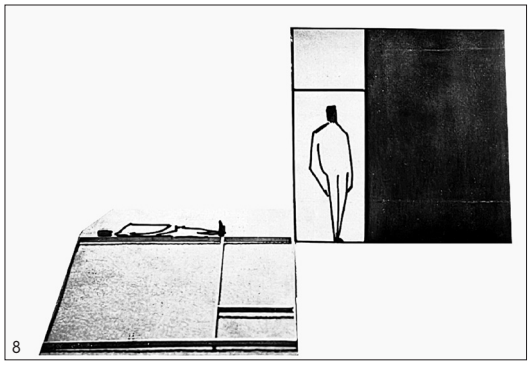
Giuseppe Raimondi, then a student at the Faculty of Architecture in Milan, dedicated his composition course project, taught by Ludovico Barbiano di Belgiojoso (with the help of Franca Helg and Alberto Seassaro), to the "assemblage" use of a "catalogue of highly characterized elements" chosen from the architectures that were most culturally significant at that time.[43]

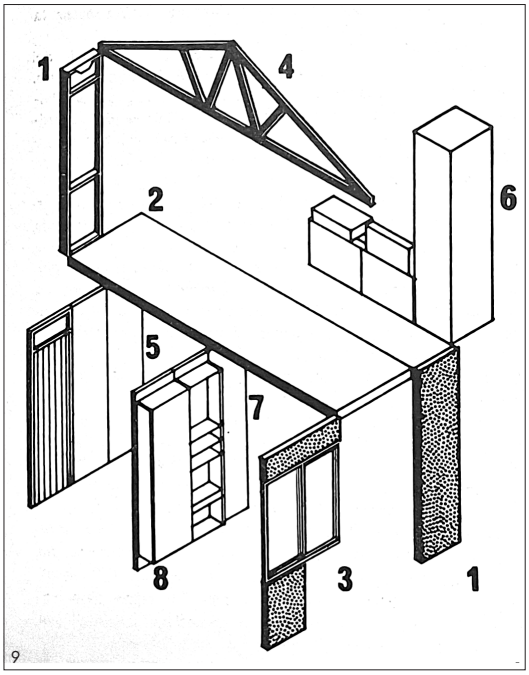
40 Source: Giuseppe Ciribini, "Coordinazione modulare come metadisegno," *Prefabbricare. Edilizia in evoluzione*, no. 1 (1968), 2.

41 Ibid.

42 Source: Alberto Seassaro, "Verso una architettura per componenti," *Prefabbricare. Edilizia in evoluzione*, no. 6 (1968), 7–26.

43 Ibid.





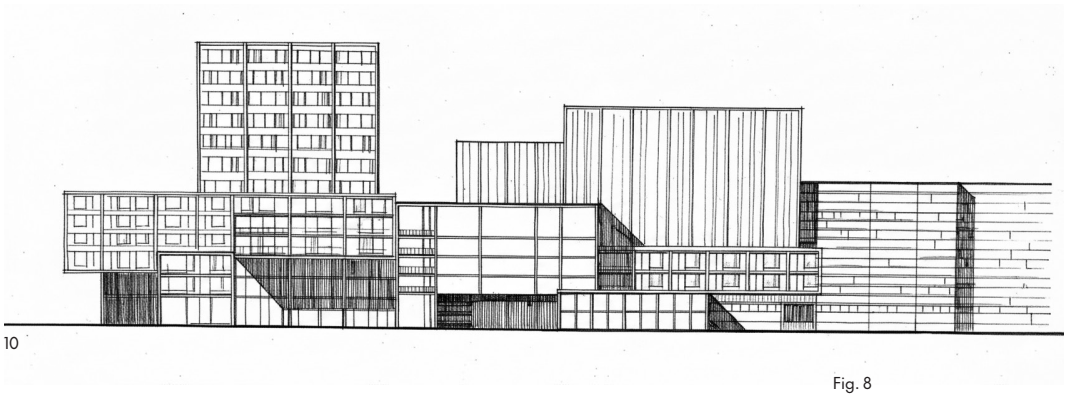


Fig. 8
Ado Franchini, Conceptual drawing of the "elemento polivalente", demountable and reusable, prototype, 1958. *Prefabbricare*, 1958.

Fig. 9
Diagram of the COSMOS system for a prefabricated component-based architecture, 1968. *Prefabbricare. Edilizia in evoluzione*, 1968.

Fig. 10
Giuseppe Raimondi, project of the Lombardy Region headquarter by the assembly of building elements conceptually extracted from existing architectures of the time, 1965. Prefabbricare. Edilizia in evoluzione, 1968.

The design project – a new building for the headquarters of the Lombardy region in Rogoredo – is thus approached as an attempt to assemble, "on a pre-ordered typological scheme (...) building artifacts [elements and pieces] taken from other projects and realizations" of the immediately preceding years. These include: the wall elements of the "house in Novara" and the "theater in Alessandria" designed by Architetti Associati, the Velasca Tower (Studio BBPR), the Rinascente building in Rome (Franco Albini, Franca Helg), the MM Depot (Studio BBPR), and the INDED elements from Moviter[44] (Fig. 10).

The composition course by Ludovico Barbiano di Belgiojoso, held since 1965, is echoed by the educational experimentation on "design by the assembly of building components" conducted within the Constructive Elements course taught by Ciribini in Turin between 1966 and 1967. Here, the thematic structure of the exercises involves the complete translation of a building's envelope design into a purely semiotic problem. The envelope is, in fact, considered a "set of possible message-systems formed with signs drawn from a lexical repertory of parts" from which the possible (material and linguistic) combinations of assembly are explored.[45]

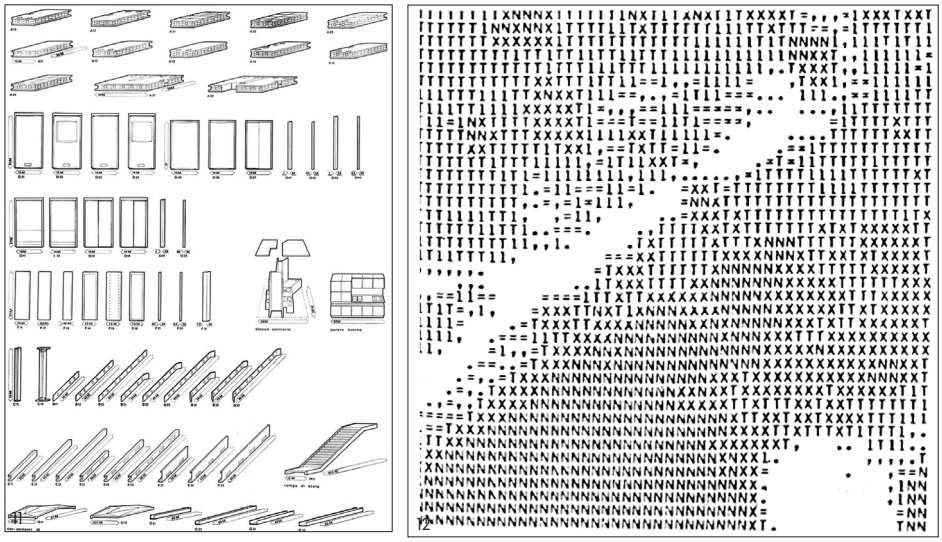
The two pedagogical experiences are substantiated by a reflection on the "aesthetic approach to the design of building components and industrialized architecture," conducted by Gillo Dorfles and summarized in the December 1968 issue of the journal *Prefabbricare*.[46] The essay by Dorfles presents the acronym of "DE,"[47] specifically dedicated to the design of building components, and discusses the two extreme positions that define the design of a single element in components-based architecture, aimed at "intentionalizing it towards assembly": embedding in the design of the single element the ideas of open and multiple configurations, or giving the element by a "morphological

44 Ibid.

45 Ibid.

46 Source: Gillo Dorfles, "Per un approccio estetico al design dei componenti edilizi ed all'architettura industrializzata," *Prefabbricare. Edilizia in evoluzione*, no. 6 (1968), 36.

47 Ibid.



neutrality" that allows for any assembly configuration. Borrowing the perceptual parameters of "facility" and "novelty" from David Hume, Dorfles defines, on one hand, the functional and fruitional effectiveness of the constructed space through the combinatorial process, and, on the other, the functional and fruitional unexpectedness of the combinatorial product, thus identifying the success of the project in the balance of the two factors (within a critical operation that involves the culture of form as a whole).

In 1968, the decision to disseminate design work on "assembly languages" – by then mature on a cultural and technological level – even within mainstream architectural culture, was a quasi-historical choice. This was formalized through a sequence of two promotional events organized, in ideal and temporal continuity, at the 4th SAIE in Bologna: the "Componenting" exhibition (Fig. 13), organized by Franco Faccio, Enzo Frateili, Pietro N. Maggi, Giuseppe Turchini, and Mario Zaffagnini with the support of the Bologna Fair Authority and the AIP,[48] and the "Environmental Design" conference, organized by the journal *Casabella*.

48 Source: *Componenting* (Bologna: Edizioni E. A. Fiere di Bologna, 1968). Catalogue of the exhibition held at IV SAIE (Salone Internazionale dell'Industrializzazione Edilizia), Bologna, October 5–13, 1968.

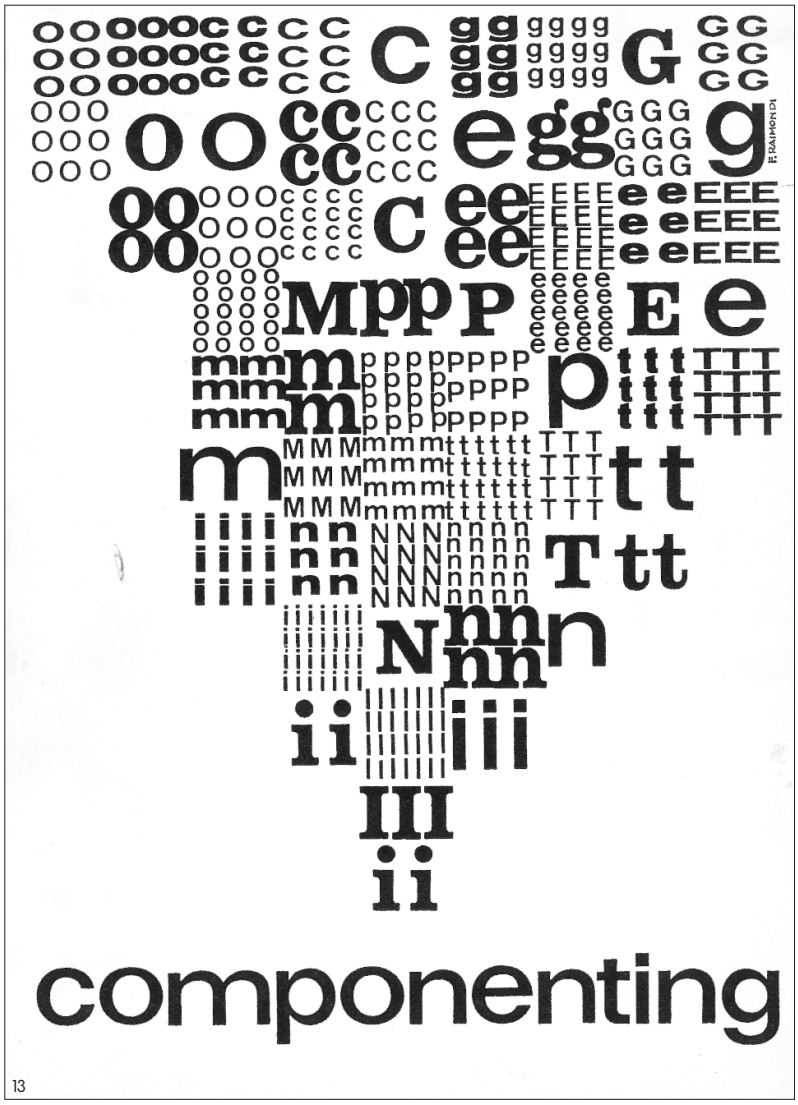


Fig. 11
The building program developed by Nizzoli and Oliveri. the inventory of the building components, 1966-67. Giuseppe Mario Oliveri, *Prefabbricazione o metaprogetto edilizio*, 1968.

Fig. 12
Alessandro Mendini, diagram accompanying the article "The problem of building metadesign" published on the journal *Casabella*, no. 2 (1969): the diagram is obtained by printing the data derived from a photoelectric scansion of the natural resources of a territory and it serves as a conceptual speculation on anomaly and repetion within an assembly process.

Fig. 13
Cover of the catalogue of the "Componenenting" exhibition at the IV SAIE in Bologna, 1968.

The exhibition focuses on the complex relationship, both semantic and material, between the autonomous architectural and technological features of the building component – as an industrial design object – and the potential "relational meanings" between components. The latter are understood as the 'vocation' of the components themselves "to be composed according to assembly objectives," thereby generating building ensembles, characterized by autonomous architectural significance. The exhibition represents the culmination of a broader design research project focused on the two concepts of the "relational aesthetic" – which refers to the prefiguration of the assembled configuration – and the "potential aesthetic" – which refers to the design of the individual element (based on its combinatory possibilities, which can be extended and expanded over time). In this sense, the exhibition revolves around the project of assembly as process that develops over time, encompassing not only the design of components but also "their articulation into catalogues (…), the dynamics of their renewal, and the control of their obsolescence in response to structural changes in the environment."

This topic merges with the nascent concept of "environmental design," where the global control of "throughput" between the project and the environment becomes the central core of theoretical and methodological reflection. The presentations by Vittorio Chiaia, Alessandro Mendini, and Pier Luigi Spadolini, coordinated by Gian Antonio Bernasconi, during the study day at SAIE organized by the journal Casabella, therefore focused on combining the concept of "open pre-fabrication" with that of "environmental structures," understood here as a "new scale of values" based on human-centered "environmental needs." Architectural conception is, thus, once again summarized in a "meta-design," indented here as a generative design tool, addressing both the semantic correlation between material instances – the repertoires of the building components – and the value system of "environmental needs." The "bureaucratic obstacle"[49] made it impossible to apply the sophisticated theories which – at the apex of their cultural and technological maturity – were thus relegated to a few pilot

49 Source: "Convegni. Fabbricazione aperta e *environmental design*," *Casabella*, no. 330 (November 1968), 59–61.

projects (Figs. 11, 12).[50] This happened while waiting for the never-realized creation of "a centralized body (...) of a national or state nature, capable of adequately and uniformly carrying out the tasks of promoting studies, coordination, research, experimentation, information, and consultancy."

In the meantime, "producing, coordinating, assembling" became central topics of the most discerning architectural culture, as evidenced by the *Casabella* column on building industrialization, edited by Giuseppe Mario Oliveri between 1968 and 1969, and its ideal "cult" extension in the column "On the Great World System and Building Methods," edited by Andrea G. Bolocan and Francesco Mendini between 1973 and 1975. This latter column published several examples – with varying degrees of success – of component-based architectures built in Italy between the mid-1960s and early 1970s. During a particularly troubled period for Italian industry, the column offered an interesting deep dive into the experimentation with new organizational methods and new formulas for productive coordination, leveraged to support assembly-driven projects.

The first edition of the column, titled "Components from the Manual: Producing as a Consortium,"[51] presents the successful experience of nurseries and kindergartens designed by the Production and Labour Consortium of the Province of Forlì. This project anachronistically mirrored the British-born CLASP model, which was entirely translated into a reinforced concrete system. The design was based on a manual published by the Study Center of the Consortium, led by the architect Stefano Piccioli. This manual served as a design tool for the prefiguration and assembly of a "flexible" building that could be constructed using

50 Among these, for example, is the opportunity offered between 1966 and 1967 by the proposal from the Nizzoli studio, under the guidance of Giuseppe Mario Oliveri. Their entry for the CECA-Finsider competition for the "Design of industrialized building elements for the free creation of housing typologies" based its metaproject on the definition of a "space-structure," which could be adapted to various housing typologies according to a rigorous "combinatory" logic. Source: Giuseppe Mario Oliveri, *Prefabbricazione o metaprogetto edilizio* (Milan: Etas Kompass, 1968).

51 Source: Andrea G. Bolocan, Francesco Mendini, "Componenti dal manuale: produrre consortilmente," *Casabella*, no. 383 (November 1973), 9–10.

standard components, joined by a dry assembly procedure. The assembly project, based on predefined functional diagrams of the buildings, utilized components already available on the construction market, extended to its potential sense, at local level, counting on the production capabilities of small workshops, organized into cooperatives.

One of the other articles that stands out is a detailed look at "Schools: Demountable and Removable."[52] Here, the flexibility of the assembly project is discussed through its explicit symmetry with the concept of disassembly, referring to a group of schools built "with requirements equal to stable buildings" and whose "demountable characteristic, instead of transformability, gives them a new concept of transferability based on the dynamics of the educational system."[53] In this sense, the article contains a forward-thinking reflection on the costs of disassembly, which include, on the one hand, the cost of designing construction details for this purpose and, on the other, a 10% margin due to a necessary "waste rate" (inevitable during disassembly and reassembly). The article – pioneering on the specific concepts of the current DfD framework – provides an insight into the design related to the reversibility and accessibility of the joints (Fig. 14). The adoption of load-bearing steel structures bolted in place must be carefully considered "from the point of view of surface finish, also in relation to their necessary independence from complementary components." In this way, "the current meaning of a dry joint" is completely re-evaluated "in its most extensive sense" by resorting to the "elimination of sealing grouts, of steel-to-steel connections by means of welding points," and "by making extensive use of contact gaskets." At the same time, the limited lifespan of the construction also becomes a significant part of the project at the scale of the individual component, by using homogeneous categories from the point of view of durability or by programming phased replacements over time, which includes the ease of accessing and moving elements on site for assembly and disassembly operations.[54]

52 Source: Andrea G. Bolocan, Francesco Mendini, "Scuole montabili e rimovibili," *Casabella*, no. 376 (April 1973), 4–5.

53 Ibid.

54 Ibid.

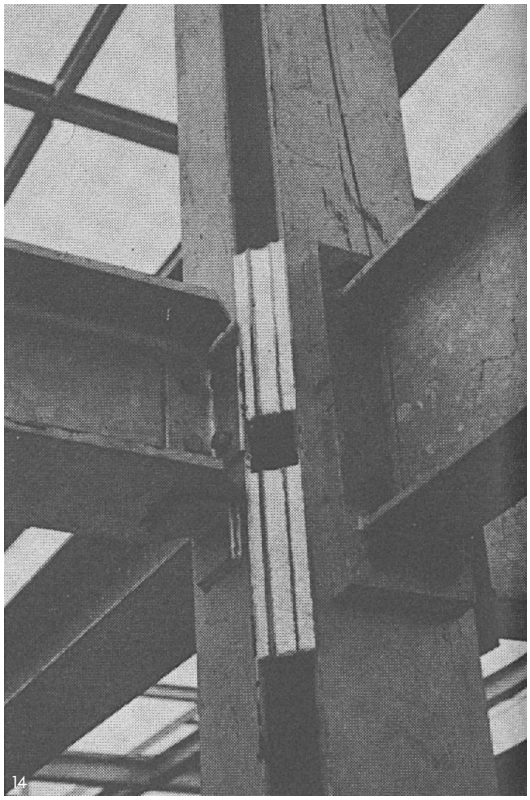
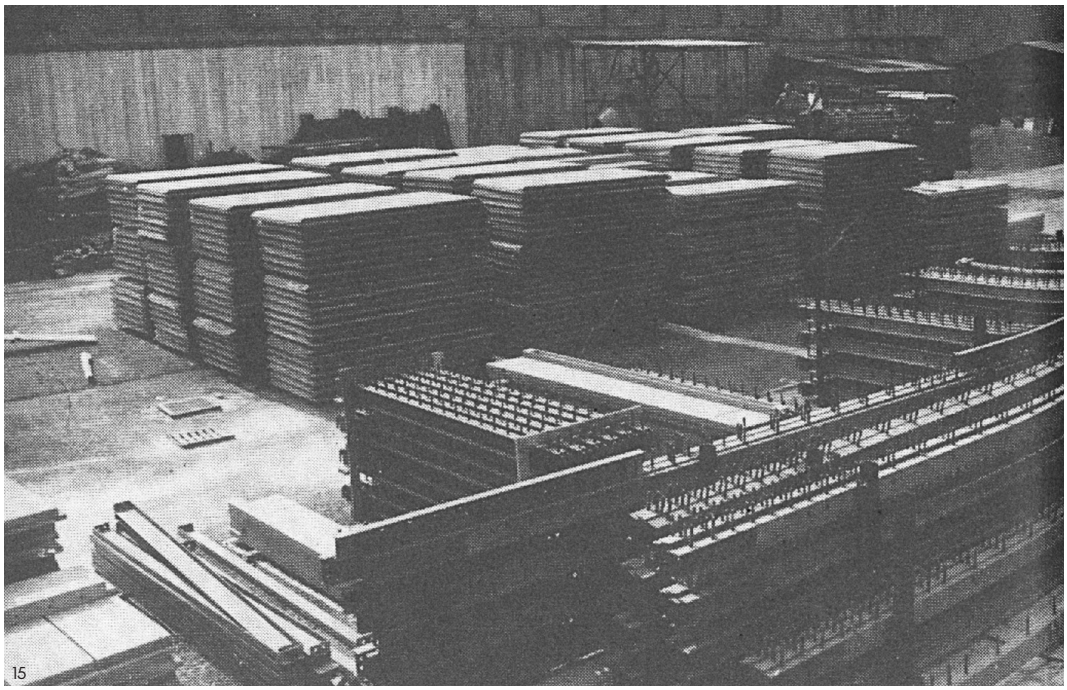


Fig. 14
Detail of the demountable joint between pillar and beam of the "IPI" system demountable schools, 1969. *Casabella*, 1973.

Fig. 15
"Housing unit commercialized by the SIR industrial group and composed of catalogue-based building elements: the construction site as a stockage area, 1968. *Casabella*, 1973.



The column extends by highlighting the material contradictions inherent in "expressing oneself through components." The article "The Industrialized Component at Grips with the Procedure"[55] reflects on the possibility of a synthesis between "an evolved professional design procedure" and "an overbearing industrial demand" (in this case, that of the SIR company's building sector) (Fig. 15).[56] A conclusive, critical praise of the "Overbearing Component" is dedicated to the presentation of the Briona 72 system (Fig. 16).[57] While the structure is resolved by forgoing the frame schema through a significant simplification of the joint – "reduced to a simple concrete-to-concrete support" – which allows for the "multi-functionalization" of the elements, its "overbearing" formal connotation contrasts with the idea of an open system, which can be combined with "components from other heterogeneous subsystems" to extend the process of assembly, disassembly, and reuse.

"On Trial": a Heritage to be Disassembled?

On a theoretical level, the laboratory of building industrialization – despite its historical failure already perceived as early as the late 1970s[58] – fully anticipated the current methodological scenarios of DfD. It provided an epistemological framework that remains valid for controlling the projects of assembly, disassembly, and upcycling. For instance, consider the definition of "system (component) design," by Ciribini,[59] and the critical approach, defined by Dorfles, which, by "globally investing the entire culture of form" enriched the then-nascent theoretical foundation of "component-based architecture" (Fig. 17).

55 Source: Andrea G. Bolocan, Francesco Mendini., "Il componente industrializzato alla prese con il procedimento," *Casabella*, no. 374 (February 1973), 8–9.

56 Ibid.

57 Source: Andrea G. Bolocan, Francesco Mendini, "Componente Prepotente," *Casabella*, no. 377 (May 1973), 9–10.

58 See: C. Testa, "L'industrializzazione non riuscita," *Domus*, no. 572 (July 1977), 1–6; "Indagine sul processo di industrializzazione dell'edilizia in Italia," special issue of *Domus* (1977).

59 Source: Giuseppe Ciribini, "La 'strategia dei componenti' e la nuova architettura," *Prefabbricare*, no. 6 (1968), 2.

Fig. 16
Assemblage of the "Briona 72" system, front cover of the journal *Domus*, no. 9 (1977).

This provided very useful conceptual and interpretive tools for current processes of reusing and upcycling building elements within a broad "component- driven" design process.

In contrast, the material legacy of component-based architecture is considerably more controversial.[60] The buildings constructed with assembly techniques – all prototypes of a large-scale production that never truly materialized – feature experimental technological and

60 See: Gianfranco Carrara, "The Great Illusion. Origins, prospects, and decline of research on building industrialization in Italy," *TEMA: Technologies Engineering Materials Architecture*, no. 1 (2025), 5–16.

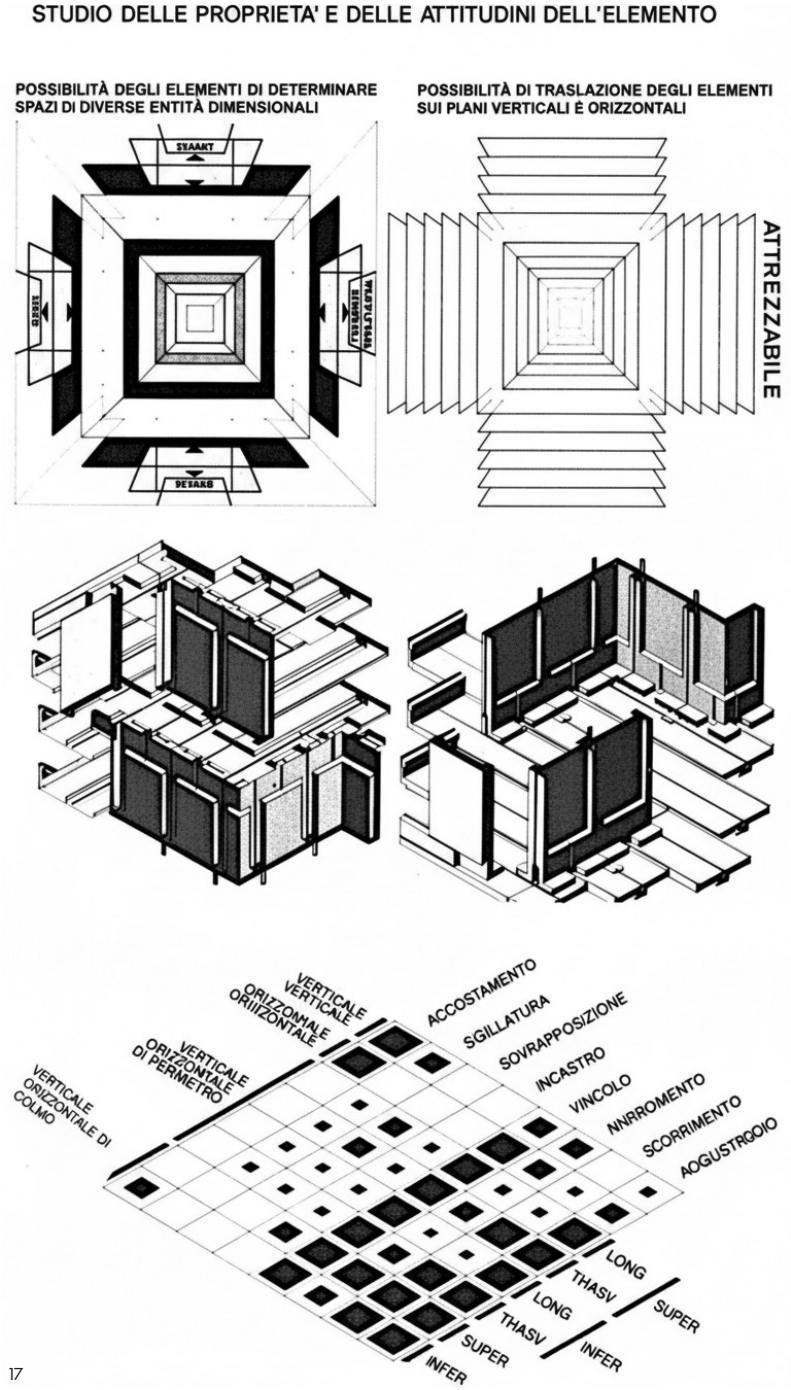


Fig. 17
Gian Paolo Valenti with Clemente Schiatti and Erberto Tealdi, Study of the "properties and attitudes" of a building element, published on the catalogue of the "Componenting" exhibition (1968).

17

material solutions, most of which are largely unresolved.[61] This represents a building heritage that has, overall, "aged poorly" due to the absence of a program for its protection and enhancement, aimed primarily at its recognition within late twentieth-century architecture.[62]

The problem is multifold and, borrowing the title of Reyner Banham's famous column on *The Architectural Review*, it urgently needs to be put "on trial." The reference is not accidental: by recalling article number 4 – "CLASP - Ill Met by Clip-Joint"[63] – dedicated to an examination of the CLASP prefabrication system after the prototype school won an award at the 1960 Milan Triennale, we can open a brief concluding reflection on the present and near future of industrialized construction, oriented toward current DfD approaches.

According to Banham, two aspects of CLASP are fundamental: the intangible value of the "process" and the "design of the joint," even in relation to the "spare parts kit." To support the first point, Banham emphasizes that "CLASP is not an individual nor a (...) but an association of various entities collaborating on the process of developing a system, for many of whom the development process is more important than the monuments it leaves behind." And, in this sense, the system conceived "under the sign of Occam's razor" is admirable for its elegant

61 On the specificities of the constructive solutions of industrialized buildings built in Italy in the second half of the twentieth century, see: Sergio Poretti, "La costruzione," in ed. Francesco Dal Co, *Storia dell'architettura italiana. Il secondo Novecento*, (Milan: Electa, 1997), 268–293; Sergio Poretti, "Un'industrializzazione sfasata," in eds. Tiziana Basiricò and Simona Bertorotta, *L'industrializzazione nei quartieri di edilizia residenziale pubblica* (Rome: Aracne editrice, 2023), 10–13.

62 See: Franz Graf, Yves Delemontey, eds., *Architecture industrialisée et préfabriquée: connaissance et sauvegarde/Understanding and Conserving Industrialised and Prefabricated Architecture* (Lausanne: Presses Polytechniques et universitaires romandes, 2012), 34–47; Angelo Bertolazzi, Ilaria Giannetti, Pedro Ignacio Alonso Zúñiga, "Afterword: matter of fact and open issues on the industrialised buildings heritage," *TEMA: Technologies Engineering Materials Architecture*, no. 1 (2025), 154–164.

63 Source: Reyner Banham, "CLASP - Ill Met by Clip-Joint," *The Architectural Review*, no. 131 (1962), 349–352; in Italian in Reyner Banham, "CLASP: brutti incontri con il giunto?," in Marco Biraghi, ed., *Architettura della seconda età della macchina* (Milan: Electa, 2004), 104–111.

"mathematical" (rather than architectural) qualities. Regarding the second point, the author focuses on the building produced by the process, and therefore able to be evaluated autonomously. In this sense, the joint is not a topological exercise but an element specifically functional to the maximum applicability of the "spare parts kit," which has always been "unusually large (...) to have been produced by a single mind."[64]

The reflection opened by Banham – together with the disassembly report of the small Triennale school – raises some crucial issues for initiating the "heritage-making" of industrialized architecture. This would place it within the established debate on the conservation of twentieth-century architecture, which began in the 1980s and is based on reconciling the concepts of transience and functionalism with a conservation approach.[65] In this sense, the conservation of industrialized buildings requires a further rethinking of some criteria traditionally associated with the "preservation" of twentieth-century architecture – durability, uniqueness and authorship. This opens the way to the use of a historical-relational framework[66] and experimental approaches, also based on the current theories of the "experimental preservation". According to Jorge Otero-Pailos, "the need to experiment is an essential factor for advancing knowledge of objects," thereby "prompting a new cultural response."[67] In the case of industrialized architecture, both the choice of which artifact to preserve and the process of preservation itself are areas of intense experimentation.

In this sense, by extending the three criteria of durability, uniqueness and authorship, the choice of what object to preserve in industrialized architecture can move beyond the building itself to include the single building component. By re-evaluating the concepts of

64 Ibid.

65 See: Maria Stella Casciato, "Patrimonio edilizio del moderno: documento da salvaguardare e monumento da restaurare," *Arte Lombarda,* no. 110/111 (1994), 138–142.

66 See: Ugo Carughi, *Maledetti Vincoli. La tutela dell'architettura contemporanea* (Turin: Allemandi, 2013).

67 See J. Otero-Pailos, Erik Fenstad Langdalen, Thordis Arrhenius, eds., *Experimental Preservation* (Zurich: Integral Lars Müller, 2016).

durability, uniqueness, and authorship we see that a building produced through assembly has different durabilities for its individual components, as well as different degrees of uniqueness and authorship.

As Banham highlighted for the CLASP system, the whole is "unusually large to have been produced by a single mind." This "multiple authorship" is an essential aspect of products from assembly-based projects. Therefore, the choice of the object can draw upon the material and cultural history of the single building component, considering its own values of authorship or uniqueness, in addition to the historical and technological meanings of the artifact as a whole.

The concept of transience already a traditional topic in the historical conservation of twentieth-century architecture, also deserves specific, deeper analysis. In architectures where the "spare parts kit" is included in the design, justifying the replacement of components that become obsolete or damaged more quickly, is it possible to extend the concept to include the replacement – understood here as the disassembly and reassembly, even in a different configuration – of the entire artifact?

In this sense, is it possible to use – based on documentary evidence – the original design syntax which is expressed through "variations in combinatorial possibilities" as a strategy for the material preservation of artifacts born from the assembly project? In other words, is it legitimate to articulate – by including, here, the "intrinsic idea of failure"[68] – the "project of disassembly" itself as a tool for experimental preservation?

A further reflection, supporting this latter position, concerns the concept of uniqueness which requires a necessary (and radical) adaptation for industrially produced architecture. If mass production shatters the relationship between the original and the copy, it is necessary to conceptually transpose this more complex relationship into the conservation process as well.

For example, considering only the patented construction solutions – like those discussed in the first part of this essay, for which the reflection is supported by clear documentary evidence – is it the

68 Ibid.

originality of the technical innovation that requires a specific preservation action? Or should the architectural design of the individual element or the construction system be valorized? Or, again, is it the technological "replica" of the same construction system, within its "technological, productive, and architectural adaptation" to local contexts or its repeated application over time, that should be valued?

The questions are manifold and require new studies to concretely validate a strategy for the experimental conservation of component-based architecture, based on the project of disassembly. At the time of writing this essay – and leveraging the affinity between the concept of monument and that of document – we are, in the meantime, committed to documenting the entire process of ideation, production, and construction that shapes the intangible identity of products from the "component approach." Remaining on the margins of the "authorized discourse" on heritage, we aim to propose new operational insights oriented toward the application of a "DfD heritage-making", intended to prompt a cultural response regarding the material legacy of industrialized architecture, as the never reached target of the utopia of growth.

Informatore Tecnico Cantieri (1946–1950)

Industrial Culture in Architecture

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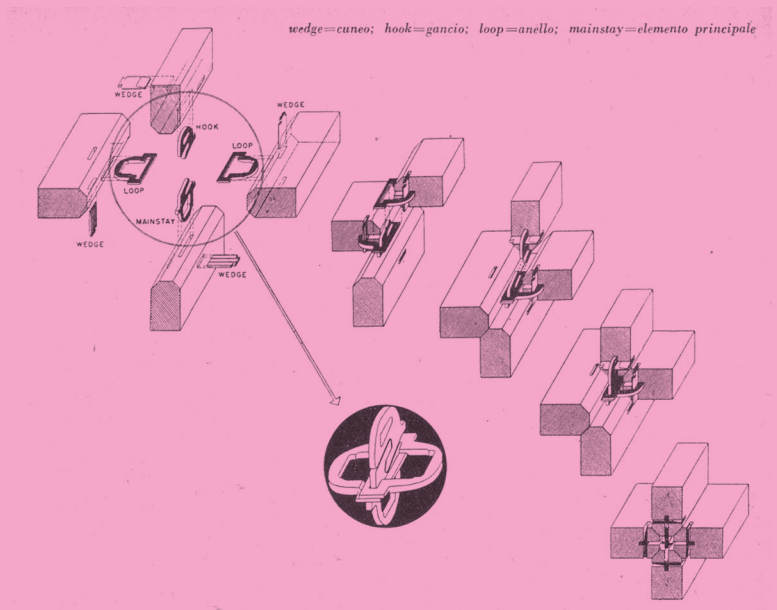
Founded in 1946 and active until 1949, *Informatore Tecnico Cantieri* emerged within the orbit of C.I.L.C.E. as an editorial platform to coordinate post-war reconstruction. Beyond mere technical updates, the journal took on a campaigning role advancing a modernist position, for which rationalization, standardization, and industrialization constituted the technical rationale of civic rebirth. From the outset, its format was explicitly operational: the recurring sections (*Documents, On Site, Standardization, Patents and Inventions, and Bulletin/News*) shaped the journal into a steadily accreting critical record.
The international shift 1948 – marked by contributions from Alvar Aalto, Marcel Lods, Sean Tschumi, and later Richard Neutra – and, in 1949, affiliation with the C.N.R.'s Research Centre on Housing, strengthened the tie between documentation and public policy.
The backdrop is the immediate post-war period: an Italy wounded, politically renewed, yet technically disorganised, where the drive to rebuild met a construction culture still anchored in craft. In this setting, Informatore serves as a guide: the editorials set out a techno-humanist outlook in which technique, directed to civic purposes, is taken as the principal means of progress. The format aims to chart and circulate a map of practical options, and to promote common platforms for testing and certification.
This is a pioneering, campaigning phase: the journal operates at the inception of Italy's techno-cultural trajectory in prefabrication, before structures, markets, or theoretical frameworks had matured.
The authorial profile makes the purpose plain: Maurizio Mazzocchi steers practice towards construction by type-elements and controlled procedures; Giuseppe Ciribini introduces a lexicon of unification, ultimately proposing performance codes for new materials and techniques. The *Unificazione* (*Standardization*) and *Brevetti (Patents)* sections translate equipment and systems into operating rules (Acrow metal formwork, concrete pumps, mould-based systems such as the Tournalayer). The *Cantieri (On-Site)* reports serve as a comparative laboratory: Carlo Perogalli uses the Airey house to clarify junctions, joints, sequences, and tolerances, shifting attention from the object to the rule; in parallel, Lods frames *"industrializzazione integrale"* (*"full industrialization"*) as a reconfiguration of the building cycle.
Within this fabric, unification is the organising principle that seeks to convert a mosaic of practices into a common language. Gaetano Ciocca formulates a basic grammar – module, multiples, and alignments – to ensure interoperability across components and sub-systems. However, even when theoretical elaboration is attempted, the prevailing aim remains the expansion of productive capacity; the modernist impulse asserts itself as a linear aeon, and the life cycle and any return of materials are not addressed systematically. Here lie the limits: the *Informatore* provides standards, tests, and unification, but not yet a comprehensive theory of architecture as an open system.
Nevertheless, the historical importance of *Informatore* is more than archival: it codifies the first conceptual tools for later theoretical advances. Reflections on modulation, dimensional coordination, and performance – from Mazzocchi's *"elementi-tipo"* (*"standard elements"*), to Ciocca's elementary rules of modulation, through to Ciribini's performance frameworks and tests – clearly inscribed within a productivist logic, lay the foundations for a broader conception of architecture as a system capable of integrating temporality, variability, and life cycles.
Hence is the modern antinomy: the drive to seriality



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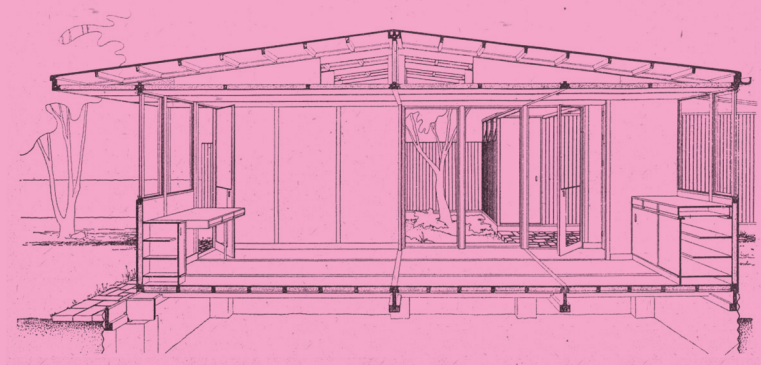

sezione prospettica di una costruzione

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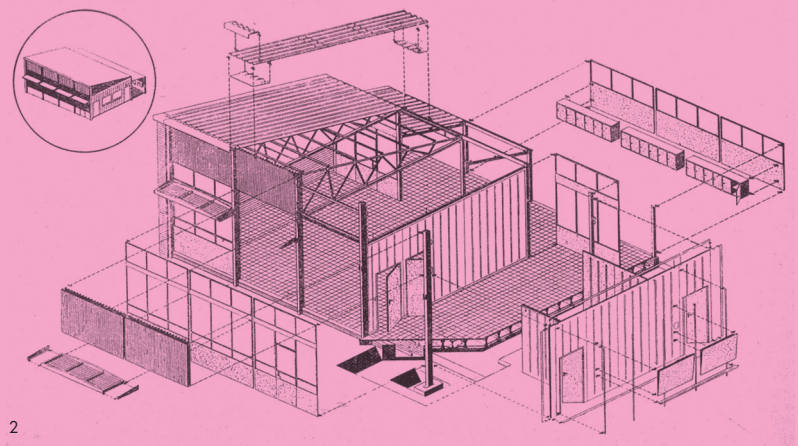

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Fig. 1
The industrialised house, U.S.A. – Wachsmann–Gropius system. *Informatore Tecnico Cantieri*, no. 9 (1947), 6–8.

Fig. 2
Arcon prefabricated system for school buildings. *Informatore Tecnico Cantieri*, no. 19 (1949), 28.

3

furnishes instruments of decomposition; rationalization prepares the conditions for recombination. Converting a straight line into a circuit is recognizing that serial construction is both a productive apparatus and a constitutive linguistic act. In this light, the journal is a technical palimpsest of post-war standardization – historically necessary, shaped by the urgency of reconstruction – now readable, for design, as temporal matter endowed with a retroactive truth. Not to negate the modern, but to lead it to its limit, to its ontological opening: *Informatore* legitimizes a lexicon and protocols that retrospectively enable the dialectical shift from assembly as a founding gesture to disassembly as a critical one. Hence, it becomes an object of critical philology: a cultural device whose interpretative reconversion can support a new design culture in which building is no longer an end but a temporary node within a network of material and cultural relations; a means, finally, to give back to matter its temporality – of passages, transformations, and returns – reconciling technique with time.

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Fig. 3
Cover of the first issue of the journal Informatore Tecnico Cantieri.

Renzo Piano, "Metodo per la costruzione di pareti" (1962) Leonardo Mosso, "Blocco prefabbricato" (1962)

Assembly and Disassembly as Industrial Inventions

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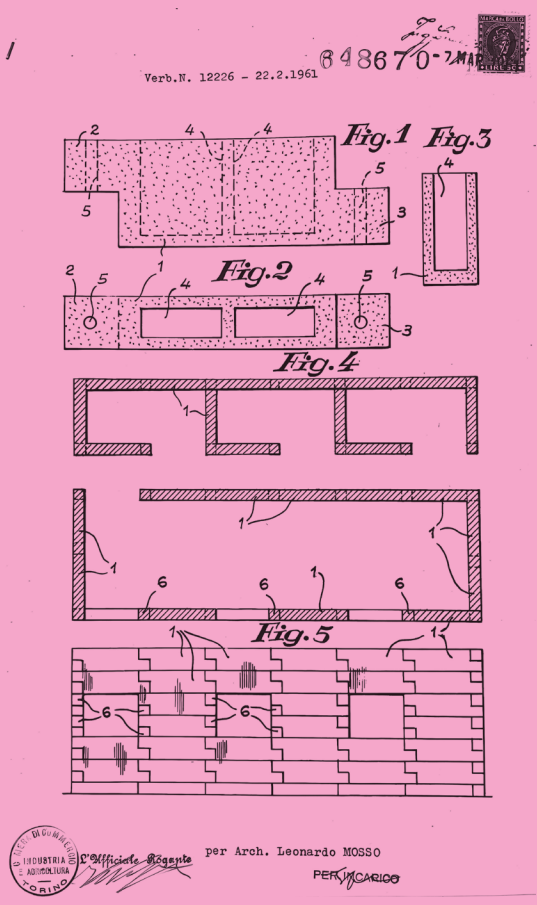
In post-war Italy, the Italian Patents and Trademarks Office received hundreds of applications for invention patents, utility models, and design models dedicated to prefabricated construction elements: the sequence of inventions constitutes a repertoire of constructive solutions for elementary components – assemblable and potentially disassemblable – shaped by the socio-economic and productive context of Italy between the reconstruction period and the economic boom.
This case study presents two authored inventions, with the aim of highlighting the distinct technological trajectories that characterized design experimentation – conducted primarily in the 1960s – on modular, assemblable, and demountable systems made up of prefabricated elements: on the one hand, processes based on the dry assembly of masonry blocks, in concrete or brick, variously reinforced and combinable; on the other, metallic structures completed with lightweight, standard production components, assembled exclusively with reversible mechanical joints.
In 1961, the Turin-based architect Leonardo Mosso, within the framework of his research on "structures as systems of transformations and possibilities," filed a patent for a "*Blocco prefabbricato per la formazione di murature*" ("Prefabricated block for forming masonry"). The invention protects the design of a parallelepiped prefabricated block, preferably made of cement concrete with the possible addition of lightweight aggregates. The distinctive feature of the block – 120–140 centimeters in length, 40 centimeters in height, and 20 centimeters in thickness – lay in the design of its heads, characterized by two superimposable projections: one placed at the upper end of one head, the other at the lower end of the opposite head: these projections had a height equal to half of the block's total height and a depth equal to its thickness, enabling easy superposition and effective interlocking of adjacent blocks, including angular connections. Each projection contained a vertical hole designed to accommodate elements for mechanical connection between the blocks – such as rebars or metal profiles – thus making it possible to obtain walls entirely dismountable and allowing the reuse of individual blocks. The central portion of the block was hollowed out with parallelepiped cavities, open at the top, serving a dual purpose: reducing the weight of both block and structure, thereby lowering production costs, and providing space for the insertion of thermal or acoustic insulating material. For the construction of openings within walls, the patent also included the design of "auxiliary blocks," with dimensions corresponding to those of the projections, necessary to fill gaps at the edges of apertures.
In 1965, architect Renzo Piano filed a patent for a "*Metodo per la costruzione di pareti, per mezzo di pannelli incastrabili fra montanti e pareti realizzate con tale metodo*" ("Method for the construction of walls by means of panels interlocked between uprights, and walls realized with this method").
The invention proposed a simplified system for assembling an entirely metallic structure, based on dry interlocking principles.
The system described in the patent revolved around three main elements: uprights, panels, and crosspieces. As illustrated in the accompanying drawings, the vertical uprights – fixed to a base with mobile devices – could slide horizontally to facilitate the panel insertion, while the crosspieces acted as the locking system. The uprights were made from cruciform metal profiles, one flange designed to fit into the groove on the edge of the subframes surrounding the panels. At the base, each upright had



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a small tube designed to slot onto pins that enabled sliding. The crosspieces used standard profiles in atypical ways so that they could fit into the groove of the subframe (an inverted T for the lower one and a regular T for the upper one) and were connected to the uprights via pins inserted into slanted notches, which acted as guides for snap-in movements and subsequent locking.

The assembly sequence consisted of preparing the frame (uprights and crosspieces), moving the uprights apart, lifting the crosspieces through the sliding of the pins within the slanted holes, and finally inserting the panel. By tightening nuts screwed onto threaded pins, the crosspieces were pushed downward, progressively bringing the uprights closer until they slotted into the grooves of the panel subframes, thus producing a firmly assembled – yet entirely demountable – structure.

The inventions of Mosso and Piano, together with a long series of anonymous patents, represent valuable traces of the material culture of assembly (and potential disassembly) design that developed through the drawing of elementary constructive elements within the broader framework of building industrialization in the second half of the twentieth century. A culture that, forcefully erased by the collapse of the growth utopia of the 1970s, now re-emerges through archival research as a repertoire of design practices highly relevant to a more conscious development of Design for Disassembly approaches.

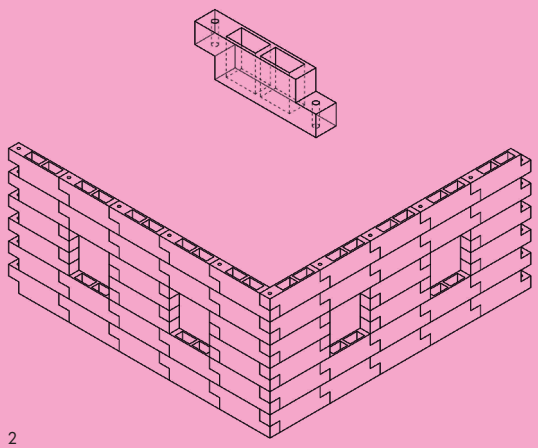

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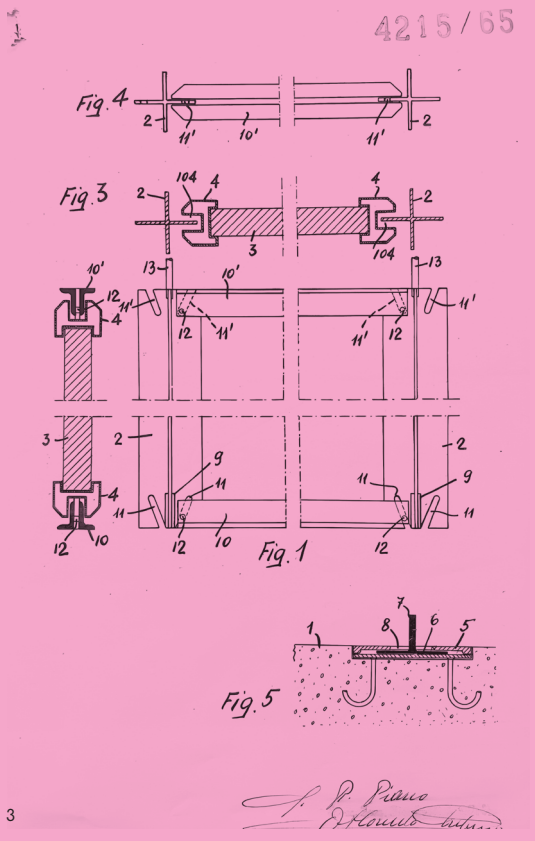
Fig. 1
Technical drawing of Leonardo Mosso's patent (n° 648670, 1961). Courtesy Archivio centrale dello Stato. Ufficio Italiano Brevetti e Marchi. Serie Invenzioni.

Fig. 2
Digital reconstruction of Leonardo Mosso's patent (n° 648670, 1961).



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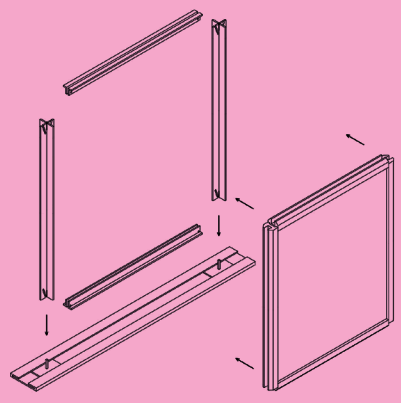

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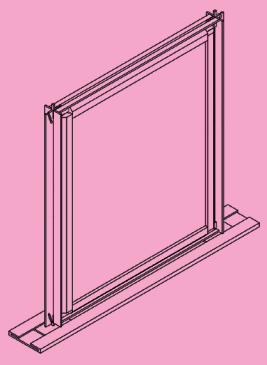

Fig. 3
Technical drawing of Renzo Piano's patent (n° 751126, 1965). Courtesy Archivio centrale dello Stato. Ufficio Italiano Brevetti e Marchi. Serie Invenzioni.

Fig. 4
Digital reconstruction of Renzo Piano's patent (n° 751126, 1965).

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Prefabbricare (1958–1979)

Architecture as System

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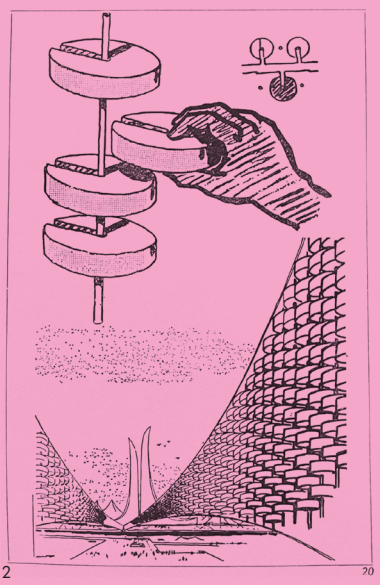
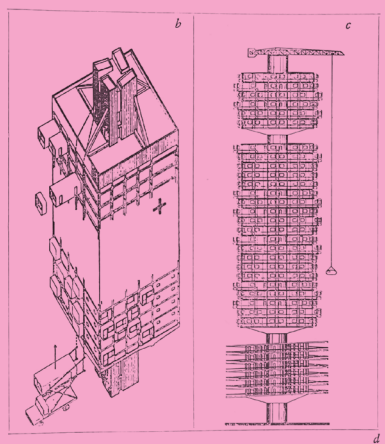
Between its founding in 1958 and the cusp of 1970, *Prefabbricare* emerged as the most cohesive, operative voice of Italian building industrialization, the direct outgrowth of the Associazione Italiana Studio Sviluppo Materiali e Sistemi di Prefabbricazione (A.I.P.). The program, stated in the early issues, sets out a project: to bridge the gap between a still largely craft-based construction tradition and a horizon of coordinated, modular, and certified production. Editorials, association proceedings, cost surveys, trade-fair reports, and technical notebooks compose an editorial structure that combines dissemination and standard-setting; the journal aims to shape processes, not merely describe them, by organizing, negotiating, and producing tangible effects within the living body of the sector.

The historical backdrop is Italy's belated economic boom and its reversals: surging housing and schools demand, a tight labor market, and pressure to compress schedules and costs. The journal both registers and helps to steer this turn through several decisive cultural orientations: institutionalizing testing and certification frameworks, promoting the agrément model and, shortly thereafter, the establishment of ICITE; widening the international horizon of reference (CSTB, CLASP, CAMUS), turning the 1962 Milan Mostra–Congresso into a vehicle for technical and cultural translation, and paving the way for the Europrefab platform; and making public demand governable through competitions, specifications, and pilot experiments.

The figures who shape its profile mediate between domains. Giovanni Saccenti, president of A.I.P., gave the journal the character of a platform for coalition-building, promoting congresses, fairs, and agreements between industry and public authorities. Ezio Ercoli energizes its operative side with surveys, productivity reports, and dossiers; his 1965 obituary for Saccenti clarifies the legacy of an "Idea-as-process," moving beyond a conception of building as mere technique. In 1967, Giuseppe Ciribini recasts the theoretical framework, redefining prefabrication as an industrial system articulated in nine phases – from motive to recovery – and adopting modular coordination, information, and cybernetics as the project's meta-languages. At this juncture, architectural voices – Gio Ponti (1964), opposing the equation prefabrication = monotony; Marco Zanuso (1967) on integrating design with the production cycle; and Gillo Dorfles (1968) on a relational aesthetics of devices – open the journal to disciplinary dialogue, while Elio Giangreco and Franco Levi strengthen the structural-engineering front (joints, rheology, dynamic actions). Accordingly, the journal's internal structure evolves. Alongside the 1950s repertoire of panels (curtain





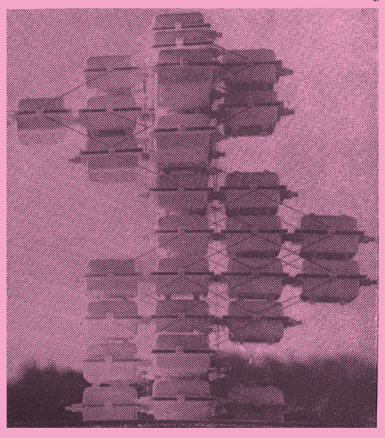


Fig. 1
"L'operazione Chaville" on-site installation of glazed panels, sliding panes and floor-indicator panels; completed window; completed façade. *Prefabbricare*, no. 1 (1961), 15.

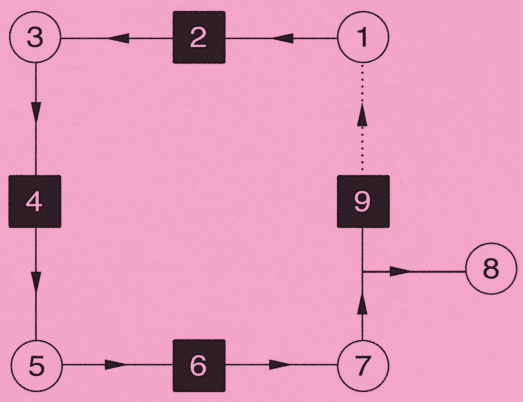
Fig. 2
"Verso una architettura per componenti" comparative montage (M. Safdie & D. Barott, "Habitat '67," Montreal, 1967; K. Kikutake/Metabolism, "Unabara" – cell, 1960; J. Andrews, "Red Coach Inn," Mandevile, 1966; W. Chalk/Archigram, "Circular Tower" with Plug-In units, 1964; W. Doring, "Kunstoffzellen," 1967). *Prefabbricare*, no. 6 (1968), 20–21.

Fig. 3
"Nuovi contenuti per una rivista rinnovata" cyclic diagram of the building process. *Prefabbricare*, no. 5 (1967), 3.

walls, sandwich panels, lightweight cladding), it introduces dossiers on standards, specifications, and certifications, culminating in the editorial turn of 1967, when it embraces the entire building life cycle, governed by interoperable rules and information, so that the building was conceived as a system rather than a mere aggregation of typified parts. The lexicon shifts to components: modular coordination as meta-design; information as operative infrastructure; and, above all, the component approach promoted by Alberto Seassaro, which relocates variety from the individual work to the repertoire – from figure to the rule-based system for combination and substitution. In this vein, Ciribini's cyclical vision – explicitly encompassing "*beni in uso*" (assets in use), "*beni consumati*" (consumable assets), "*distribuzione residua*" (residual assets), and "*recupero*" (recovered assets) – breaks with linearity. The notion of an "*componente vuoto*" (open-ended component), oriented to multiple uses and meanings, lays the groundwork for a qualified, value-enhancing form of reuse – understood as a step-change in performance rather than mere material recycling. Especially between 1967 and 1969, the journal lays down the conceptual premises for rethinking the life cycle, recasting standardization as an enabler of temporal variability.

These orientations yield lines for a contemporary reading: opening repertoires; specifying components in performance terms; emphasizing joints and maintainability; and attending to information and cybernetics as media of the process. Taken together, these constitute the instruments by which the building, as an object, ceases to be a terminal and becomes a platform, potentially enabling material flows to be recontextualized and recirculated in processes of re-signification.

The journal's historical force lies in its capacity to enable



1 - Motivazioni - risorse
2 - Produzione
3 - Beni prodotti
4 - Distribuzioni
5 - Beni in uso
6 - Consumo
7 - Beni consumati
8 - Distribuzione
9 - Recupero

3

and transmit foundational concepts for a shared paradigm among designers, industry, and institutions, shifting from the pressures of urgency – classrooms, timeframes, costs – towards a theory of architecture as an open system. Its contemporary relevance suggests a possible completion of that trajectory – from panel to component, from linear path to regenerative cycle – by translating into verifiable practices the operational potentials that it had precociously embedded in the project's founding conditions.

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CLASP School, XII Milan Triennale (1960)

Once the Exhibition was Over

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Università degli Studi dell'Aquila

The title [Neri, 2021, 2022] refers to the uncertainties that have long surrounded the destination of the CLASP school. Built by the British government for the 1960 Milan Triennale, the building was left abandoned once the event had finished.

Why not dismantle it and reassemble it in another area of Milan? Although this idea was widely approved, it was not pursued until it was actually implemented. The reasons for not reusing the prefabricated steel structure highlight the limitations of a design that, despite being based on rigorous dimensional and modular coordination, failed to meet the requirements for harmonizing the dimensions of building components. This was due to the particular production context in which the CLASP system was developed, in Great Britain rather than Italy [Lacey and Swain, 1957a, 465; Lacey and Swain, 1957b, 635]. The designers of CLASP relied on prefabrication and industrialization techniques to produce building components. They based their work on standardization and dry assembly techniques for the building parts, enabling the structure to be reused. Nevertheless, the proposed technology was British and, consequently, based on imperial units rather than the International System of Units, this was a significant factor that ultimately had a great influence on the school's destiny. Initially, however, those involved in the construction seemed to ignore this point. For example, the British government was unconcerned; it donated the building to the city of Milan, thus achieving considerable savings by avoiding the substantial cost of dismantling the structure. The Milanese administration also seemed to ignore this, planning to move the building to an area of Trotter Park alongside Via Giacosa. However, once the exhibition had finished, the plan was not implemented immediately, meaning the school remained in Triennale Park for another year. It was only later that the municipality decided to take action, entrusting a technician with assessing the feasibility of dismantling and reassembling the structure: the architect Francesco Gnecchi Ruscone was appointed to this task. As an expert on British construction systems, he was well aware of the technical problems that dismantling and reassembly operations could entail. At the time, Gnecchi Ruscone was a *trait d'union* with the British architectural scene, the "correspondent from London," as Ponti described him; he was also a consultant for Brockhouse Steel Structures, the English company that produced the steel structure for CLASP, as well as Managing Director of its Italian affiliate, Costruzioni Modulari. One of the tasks he carried out in this latter role was to develop the Italian version of the British construction system. This required adapting the system to use meters rather than inches and feet. The report he produced for the municipality is of considerable interest, as it sheds light on lesser-known aspects of the CLASP [Giannetti, 2024, 139].

Gnecchi Ruscone examined all the components of the construction system and evaluated their potential for reuse. He identified every stage of the dismantling process and the potential damage that could be caused to each building element.

The architect believed that parts such as the steel structure could be reused without any problems. However, he categorically ruled out reclaiming others, such as the perimeter concrete bases and internal partitions. As for the others, he expressed uncertainties about the feasibility of reuse. In fact, any damage during disassembly would have necessitated the replacement of building components with imported products, as similar ones could not be sourced on the national market; this was because the

original elements had been sized using imperial units of measurement.
Although significant, these uncertainties were dispelled in Gnecchi Ruscone's final assessment, in which he stated unequivocally that dismantling would not be advantageous.
He suggested that the most convenient solution would be to preserve the building in Triennale Park, completing it with the missing facilities, and to build a new CLASP school in Via Giacosa using the construction system adapted to the International System of Units, the same one proposed by Costruzioni Modulari. Ultimately, also this plan proved unsuccessful, and the Triennale school was never used again and demolished.

Fig. 1
Monti, Paolo, and Triennale di Milano. Milano. Parco Sempione. XII Triennale di Milano, 1960. Architect W.D. Lacey, English primary school: exterior, view towards the entrance. N.p., 1960. Print. Fondo Paolo Monti, © BEIC, Civico Archivio Fotografico di Milano.

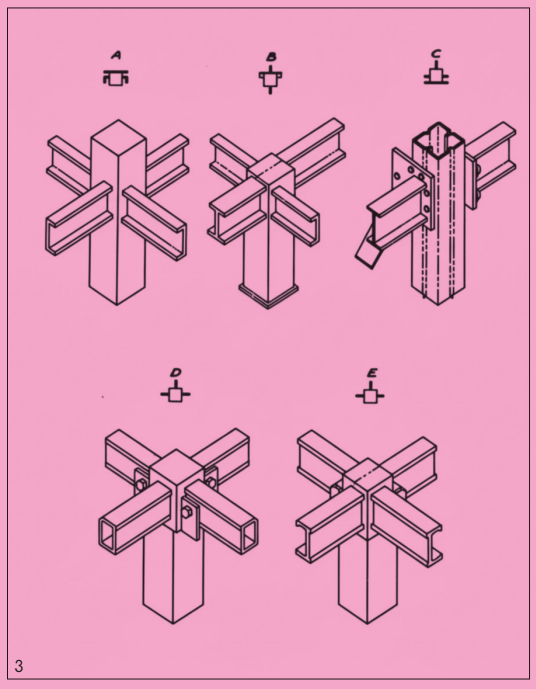

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Fig. 2
Monti, Paolo, and Triennale di Milano. Milano. Parco Sempione. XII Triennale di Milano, 1960. English primary school: view from above. N.p., 1960. Print. Fondo Paolo Monti, © BEIC, Civico Archivio Fotografico di Milano.

Fig. 3
Joints of the CLASP system ("British Prefabricated School Construction", report no. ED 001 776, 1962).

Djuric Tardio Architectes, La Crèche Itinérante (2019)

Dry-joints as a Founding Theory

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Since 2019, along Rue Guynemer in the Jardin du Luxembourg, the Italian-French firm Djuric Tardio Architectes has installed a temporary and itinerant *crèche*. Set within the park's green enclosures, the modest pavilion knowingly merges the legacy of European and Italian twentieth-century demountable constructions with the nineteenth-century tradition of garden structures while speaking an unmistakably contemporary language.

Here, construction is not a foregone conclusion but a reversible protocol: temporariness is adopted as a programme, lending the work conceptual clarity and operational agility. Prepared for disassembly, reconfiguration, and redeployment, the building treats its life in the garden as one chapter in a more extended narrative of possible futures.

Design for Disassembly is the project's ground rule. Anticipating a reversible, closely choreographed construction sequence, the building is conceived from the outset for dismantling: materials are chosen for separability, joints are specified for unbolting, and elements are dimensioned to re-enter cycles of reuse, or, if not, for responsible recycling. In this regime, the architectural language and the technical brief coincide: components carry aesthetic meaning while delivering performance, so that architecture becomes logistics conducted with precision. Every detail earns double duty as both figure and interface, binding the image of the whole. The result hovers, productively, between the experimental charge of a prototype and the lucidity of a procedure rigorously keyed to the building's life cycle.

Modularity is the project's instrument for order: it choreographs a calm progression of rooms and pedagogical settings, giving the plan a measured sense of prospect. That composure stems from the regularity of a rectangular layout, approximately 523 square metres, arranged on two storeys.

The design resolves into a compact, self-possessed volume, its identity consolidated by a quiet equilibrium between the interlocking of constructive components and a refined play of material contrast.

The project's primary conception consciously engages with an antecedent that informs the design as a contemporary reinterpretation: Jean Prouvé's axial portal frame, patented in 1939, whose discipline defines the tectonic distinction between a demountable

Fig. 1
Exterior. Within the Jardin du Luxembourg, the façade reads as a serial rhythm of opaque and glazed panels, evidencing the building's modular logic. Courtesy Djuric & Tardio Architectes.

Fig. 2
Comparative composition. Left: Djuric & Tardio's itinerant crèche; right: Jean Prouvé's Croismare School (1948). The pairing underscores the kinship of portal-frame primaries and standardised envelope panels. Courtesy Djuric & Tardio Architectes.

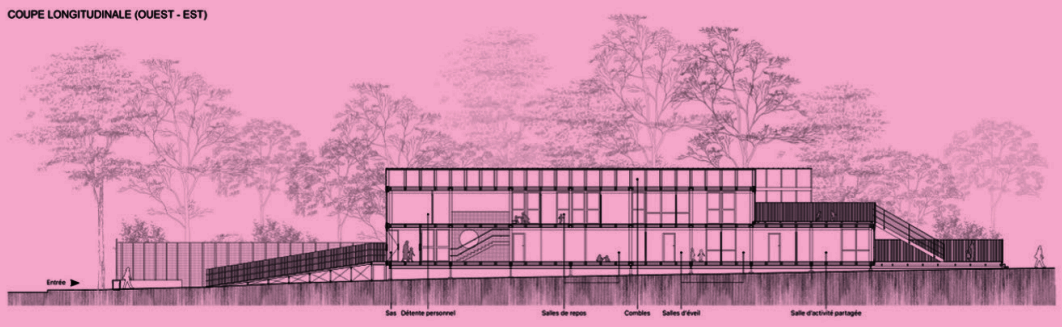
Fig. 3
Interior. Exposed timber wall panels and surface-mounted services enable easy maintenance and later reconfiguration of rooms. Courtesy Djuric & Tardio Architectes.

primary structure and non-load-bearing infill. Its structural clarity stems from a hybrid skeleton: a central sequence of steel portals onto which a family of off-site 2D timber panels is hung. Set to a 1.20-meter raster, 140 solid and glazed façade units and 176 floor cassettes are conceived as identical and interchangeable. The volumetric quality derives from the measured interplay of the structural members the prefabricated components, which, in architectural terms, operate as spatial gauges. This demountable structural spine frees the envelope, allowing it to remain standardized and reconfigurable, as in the Croismare (1948) and Bouqueval (1950) schools, the latter exhibited in the Tuileries Gardens in 2016. The result is an architecture as a platform, with a grammar of a few parts and many combinations. The system is governed by dry joints, with panel-to-panel seals closed by gaskets and wall-to-floor couplings locked with a discreet metal key, a Japanese-tinged system that secures assembly yet simplifies disassembly. Externally, the brushed stainless-steel

cladding establishes a subtle chromatic resonance with its surroundings, capturing the nuances of foliage and sky. Internally, timber linings modulate light, acoustics, and hygrometry, while exposed modular services are prepared for unplugging and re-routing. Temporariness is treated as program. The foundations are based on reversible micropiles, enabling the restoration of the host site without traces. Off-site fabrication reduces on-site operations to a matter of weeks and, more importantly, defines the building as an inventory of durable components with short coupling times. Design for Disassembly becomes a chain of consequences – mechanical fixings, accessible services, tolerant interfaces – through which the work acquires a second life by design, whether as another nursery, a cluster of classrooms, or light offices.

Although the pavilion was conceived for a brief tenure, dismantling began in September 2025 and is scheduled to take roughly three months. All components will be transported to Lyon for reassembly, reproducing the original configuration and constructive protocol; the nursery function will be retained, while the structural grid will be extended to meet new requirements. In this sense, disassembly is not an epilogue but a designed phase of life.

This modest pavilion demonstrates how modularity can sustain an ethic of measure that reconciles construction with time, reversibility, and economies demanded by contemporaneity. Its nomadic quality reflects an embrace of environmentalism, seeking to create architecture that leaves no trace on the landscape and that will be preserved and reinterpreted by future generations.



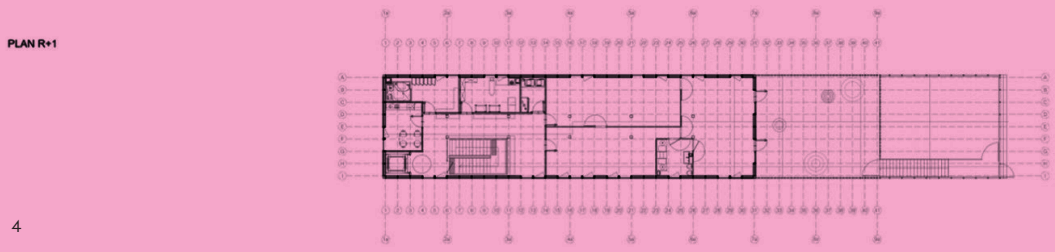


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Fig. 4
Drawings. Plans and longitudinal section reveal the regular modular grid – serial bays and repeatable panels make the structural and assembly logic legible. Courtesy Djuric & Tardio Architectes.

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Chapter 3

Before Upcycling: Unconventional Design Theories and Practices in Italy (1960s–1970s)

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Applying the concept of upcycling to architecture means rethinking how to work with materials and elements – sometimes through new strategies, sometimes by revisiting ancient ones – whether construction-related or drawn from other domains, that already exist in the world. It offers an alternative to the constant production of the new, with the aim of generating added value. Of course, each term in this formulation – especially "value" and the practical forms of reuse – could invite extensive discussion. Yet one principle seems clear: upcycling proposes a form of resistance, or more precisely an operative response, to the cradle-to-grave consumerist model that has dominated construction in the West, particularly since the postwar period.[1]

1 Among the latest references on upcycling and related categories are: Paola Altamura, *Costruire a zero rifiuti. Strategie e strumenti per la prevenzione e l'upcycling dei materiali di scarto in edilizia* (Milan: Franco Angeli, 2015); Sara Marini and Giovanni Corbellini, eds., *Recycled Theory: Dizionario Illustrato / Illustrated Dictionary* (Macerata: Quodlibet, 2016); Annette Hillebrandt, Petra Riegler-Floors, Anja Rosen, and Johanna-Katharina Seggewies, *Manual of Recycling. Buildings as Sources of Materials* (Munich: Edition Detail, 2019); Ilka Ruby and Andreas Ruby, *The Materials Book* (Berlin: Ruby Press, 2020); Daniel Stockhammer, ed., *Upcycling. Reuse and Repurposing as a Design Principle in Architecture. Wiederverwendung und Weiterverwendung als Gestaltungsprinzip in der Architektur*

On this basis, the essay develops from a guiding question: can we identify, in Italy during the 1960s and 1970s, experiences that anticipated – or even pioneered – current practices of architectural upcycling? The question is justified above all by the political, artistic, and cultural vitality of that historical moment, which was marked by conceptual transformations and radical oppositions within architecture. These years stretched between the mature reappraisal of prewar design culture and, from the mid-1960s onward, a far-reaching critique of the entire architectural system; between the promises of the economic miracle and the energy and social crises that would define the 1970s.

The premise of the following pages is self-evident: applying contemporary concepts to past phenomena entails all the risks of anachronism. At the same time, however, it is precisely the temporal and cultural distance between present-day manifestations and those of the past that can point toward alternative, unexpected genealogies – or even roots. In pursuing the forebears of today's upcyclers, we have in fact arrived not at anachronistic pioneers, but at other, eccentric forms of design and architectural conception that, in various ways, offered non-dogmatic modes of practice. In these approaches one can discern – to come to the point – some of the very principles and strategies that reappear in the contemporary landscape.

In a small Alpine building by Carlo Mollino (1905–1973), for example, we find an unconventional overcoming of the categories of tradition and modernity, both technically and aesthetically, through a process of dismantling and reinvention. Without the need for inappropriate labels, this process reveals a (de)compositional freedom grounded in the existence of a pre-existing *vibrant matter*[2] to be rese-

(Zürich: Triest, 2021); ZHAW School of Architecture, Design and Civil Engineering, Institute of Constructive Design; Baubüro in situ AG and Zirkular GmbH, eds., *Reuse in construction: a compendium of circular architecture* (Zürich: Park Books, 2022); Duncan Baker-Brown, *The re-use atlas. A designer's guide towards a circular economy* (London: RIBA Publishing, 2024); Derk Loorbach, Véronique Patteeuw, Léa-Catherine Szacka, and Peter Veenstra, *It's about time. The architecture of climate change* (Rotterdam: nai010 publishers, 2024).

2 Jane Bennet, *Vibrant Matter: A Political Ecology of Things* (Durham & London: Duke University Press, 2010).

manticized – even by fusing it with the new. A similar dynamic can be observed in the work of the Castiglioni brothers within a field that, in those years, underwent extraordinary theoretical, practical, and commercial development: industrial design. Here, however, the residue of the past is replaced by the ready-made available on the market, to be freely assembled, though always with functionality as the primary aim. The third section will instead explore a portion of the radical culture previously evoked, uncovering multiple strands of thought, research, and practice of reuse – some close, others distant from today's conventions. As will become clear, these operations of bricolage stimulated reflections on the role of technology at a time of crisis, reflections that, in their very untimeliness, acquire renewed relevance today.

The themes and lessons indicated by these paths are necessarily inconsistent and incomplete and, above all quite distant from contemporary practices. They trace a wide and often dissonant spectrum, spanning neighboring yet not always interconnected fields such as architecture, unconventional forms of restoration, self-construction, and industrial design. Nevertheless, these examples prove particularly useful for constructing – through selection, reworking, and reuse – a history and a critical theory of contemporary upcycling, understood as a conscious elaboration of the premises, expectations, methods, and also the implicit or potential contradictions of this mode of building practice.

Casa Garelli in Champoluc between Montage and Bricolage

In 1962 Mr. Felice Garelli conceived a plan that was, to say the least, unusual. He decided to take a seventeenth-century *rascard* he owned on the western slope of the Val d'Ayas – the so-called *baita Taleuc*, a block-bau timber structure – and dismantle it in order to relocate the building to the opposite side of the valley, transforming it into a house for his daughter Clotilde, newly married. Traditionally designed for the storage of grain, the building consisted of a stone base and an upper wooden body, separated from the former – so as to prevent dampness and the entry of rodents – by twelve mushroom-shaped pillars, a distinctive feature of local architecture. The whole was crowned by a double-pitched wooden roof clad in slate (Fig. 1).

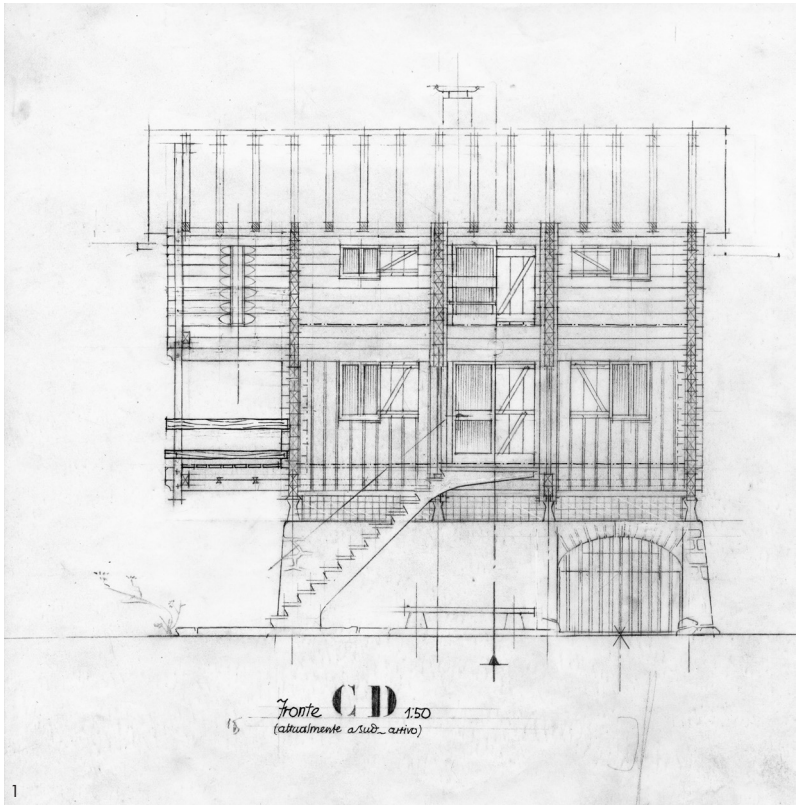

Fig. 1
Carlo Mollino, Casa Garelli, Champoluc, 1962–1965. Elevation. Courtesy of the Agenzia del Demanio, Fondo Carlo Mollino held at Politecnico di Torino, Sezione Archivi Biblioteca "Gabetti".

Carlo Mollino readily accepted. At least initially, the operation appeared limited to the patient dismantling and subsequent mirror-like of the structure, made possible by the orderly numbering of its components – a kind of game. Yet the project soon became far more subtle and complex, both because of the necessary functional adjustments and because of Mollino's distinctive ideas on Alpine architecture. Against the backdrop of a broader transformation of the mountain landscape,[3] Casa Garelli in fact belongs to the very height of the Italian economic boom, a period when building expansion and tourism were encroaching upon the Alpine panorama. This ferment gave rise to intense debates within contemporary architectural culture, especially in northern Italy, among which Mollino's position stood out – an

3 See Antonio De Rossi, *La costruzione delle Alpi. Immagini e scenari del pittoresco alpino (1773–1914)* (Rome: Donzelli, 2014).

architect long concerned with the subject,[4] as evidenced by his well-known 1954 lecture *Taboo and Tradition in Mountain Construction.*[5] Starting from a firm rejection of "mimicry with the landscape" and of romantic folklore, which he regarded as both anachronistic and counterproductive, he wrote:

> Today, to imitate the forms and evoke the structures of ancient buildings – originally born of specific material conditions and functional purposes that have now disappeared or changed – amounts to constructing the stage set of a non-existent reality: it means stepping outside, rather than inserting oneself into, tradition. New Alpine buildings must instead possess their own autonomy and authenticity, deriving their raison d'être from a comprehensive vision of the contemporary challenges of mountain construction.[6]

For Mollino, a profound connoisseur of the mountains and their architecture, respect for tradition concealed something spurious. The use of local materials, for example, he described as "in the majority of cases a luxury for obsessives,"[7] given the changes in economic, technical, and cultural conditions (including the skills of craftsmen) compared with the past. Equally mistaken, in his view, was the widespread call for mimicry (*mimetizzazione*), which he condemned as a "romantic pretense that sadly reveals both our profound mistrust of the everyday as a kind of condemnation, and at the same time our permanent desire to escape toward eras and simulacra of ways of life that we consider lost."[8] For the Turin architect, such positions entailed the impossibility of predetermining the "style" of mountain architecture on the basis of abstract theoretical reasoning.

The solution, rather, lay in seeking each time a unique, singular response capable of integrating "beautifully into the landscape" as

4 See Sergio Pace, ed., *Carlo Mollino architetto. 1905–1973. Costruire le modernità* (Milan: Electa, 2006).

5 Carlo Mollino, "Tabù e tradizione nella costruzione montana," *Atti e Rassegna Tecnica della Società degli Ingegneri e degli Architetti in Torino*, no. 4 (1954), 151–154.

6 Ibid., 151.

7 Ibid., 152.

8 Ibid., 153.

authentic architecture. To this end, new materials and new techniques – expressions of our own time rather than of another – were to be welcomed. In that capacity, they too would eventually become obsolete in the distant future, "testimonies of our time even if, as happens today, they are mistakenly held up as models. As with every history," Mollino concluded, "the history of building, too, is unrepeatable."[9]

This attitude of profound design freedom can be found throughout Mollino's built work in various Alpine locations. One example is the Ski Resort Hotel at Lago Nero (1946–47), above Sauze d'Oulx,[10] endowed with a polyvalent semantic richness generated by formal and material Alpine evocations combined with structural inventions of great plastic force – an emblem of his search for a third way between modern abstraction and romantic contextualism. In this light, Casa Garelli too must be understood: here the initial idea of a philological reconstruction quickly evolved into a truly avant-garde *montage*, producing an "uncanny object […], an early yet tragic meditation on the impossibility of re-proposing the past except in terms of fragments."[11]

Rejecting the hypothesis of reconstructing the *rascard* around a reinforced concrete frame, Mollino instead designed a new stone base and added, on one side, a strikingly new staircase: a reinforced concrete beam of variable section, resembling a springboard, with wooden treads resting on a slender metal structure, as delicate as its tubular handrail. The space originally left empty between the base and the upper body became a sort of timber ribbon window, foreshadowed, however, by ten newly crafted grey granite *boléri*. Having lost their original functional purpose, these elements turned into devices for evoking the past – "an almost apotropaic gesture, conciliatory and perhaps even ironic."[12]

9 Ibid., 154.

10 Bruno Reichlin, *Carlo Mollino. Baut in den Bergen. Katalog zur Ausstellung* (Basel: Architekturmuseum, 1991); Antonio De Rossi and Roberto Dini, *La montagna di Carlo Mollino. Architetture e progetti nelle Alpi* (Milan: Hoepli, 2023).

11 Laura Milan and Sergio Pace, *Carlo Mollino: l'arte di costruire in montagna: Casa Garelli, Champoluc* (Milan: Electa, 2018), 32.

12 Ibid., 12.

The compositional and conceptual freedom demonstrated in Casa Garelli can be linked to Mollino's particular interpretation of eclecticism. Having dismantled the progressive, linear vision of a forced reconciliation between art and technology advocated by a certain strain of orthodox functionalism, he argued that for some time now, the air we breathe has contained an eclecticism quite different from that of the late nineteenth century. He explained:

> *Eclecticism*: a problematic word, but I can think of no better. Too often it has been misapplied to describe an architecture of mere accumulation, rather than what I mean by it: a process of *synthesis* and original rethinking, which is in fact its precise etymological and philosophical sense. In this way, eclecticism stands *in contrast to* "syncretism," which more properly describes the rhetorical *mixture* typical of late nineteenth-century culturalism […]. I find it easy to predict that we are heading toward this form of total eclecticism, and that authentic works will emerge from it – works shaped by the rapid and simultaneous circulation of information across time and space, by flexibility of response, and by a non-mythical capacity to absorb both the most remote and the most contemporary cultures and sensibilities. Such works, ultimately, give form to the distinctive reality of this shared face that is our world – our taste.[13]

Many further references – or rather, parallels – can be drawn within both the Turin[14] and the international artistic context. As Sergio Pace and Laura Milan have pointed out, the operation orchestrated by Mollino in Val d'Ayas can be read as an act of "meticulous erasure," akin to what Robert Rauschenberg (1925–2008) accomplished only a few years earlier with a drawing by Willem de Kooning (1904–1997),[15] as well as to the broader universe of montage and assemblage.

As is well known, setting aside the substantial[16] nineteenth-century precedents – along with the anachronistic and rather misleading

13 Carlo Mollino, "Disegno d'una casa sull'altura," in Michela Comba, ed., *Carlo Mollino. Architettura di parole. Scritti 1933–1965* (Turin: Bollati Boringhieri, 2007), 151–152.

14 Federica Rovati, "La camera incantata. Carlo Mollino e la cultura artistica torinese 1935–41," in Pace, *Carlo Mollino Architetto*, 65–77.

15 Robert Rauschenberg, *Erased de Kooning Drawings, and Sculpture 1954–1964*, exhibition at the Whitechapel Gallery, London, 1964.

16 See William Henry Lake Price, *A Manual of Photographic Manipulation: Treating of the Practice of the Art; and Its Various Applications to Nature* (London: John Churchill, 1858).

(if intriguing) reference to Mary Shelley (1797–1851)'s *Frankenstein* (1818) – the practice of montage truly flourished from the 1910s onward, through the work of artists such as Picasso, Braque, the Futurists, and the Dada movement.[17] Their linguistic and semantic experiments sought to identify, isolate, recombine, and resemanticize heterogeneous elements of reality. From Marinetti's typographic inventions to the first photomontages of John Heartfield (1891–1968) and George Grosz (1893–1959); from Duchamp (1887–1968)'s *readymades* to Mies van der Rohe (1886–1969)'s collages; from Ejzenstejn (1898–1948)'s cinema to the collage work of Moholy-Nagy (1895–1946) and Marianne Brandt (1893–1993) – montage established itself as a technique that came to embody the symbolic form of human and urban Modernity.[18] It encompassed both the rational procedure of industrial assembly and its reversal, in order to foreground the principle of chance.

Beyond Walter Benjamin (1892–1940) – who envisioned a work composed entirely of quotations, and therefore so skillfully assembled as to be able to dispense with any accompanying text[19] – one of the most compelling readings of montage is offered by the philosopher Ernst Bloch (1885–1977). Writing in the 1930s, he interpreted montage as a dialectical procedure in which heterogeneous fragments of the past – and of the present as well – are juxtaposed in order to generate new meanings, tensions, and possibilities. Montage, understood as transporting ruins into another space that resists their customary context, made it possible to discern within the old the seed of the new. If, therefore, the parts no longer accord with the whole, they have become detachable, and can be reassembled otherwise, what becomes significant, from our perspective, is the idea of montage as a tool for deconstructing passive realism and deterministic narratives – analogous to what happens, for example, in Ejzenstejn's cinema, endowed with a political function capable of dismantling reactionary myths,

17 William C. Seitz, *The Art of Assemblage* (New York: MoMA, 1961).

18 Martino Stierli, *Montage and the Metropolis: architecture, modernity, and the representation of space* (New Haven: Yale University Press, 2018).

19 Hannah Arendt, "Walter Benjamin: l'omino gobbo e il pescatore di perle," in L. Ritter Santini, ed., *Il futuro alle spalle* (Bologna: Il Mulino, 1981), 105–170.

even by recuperating forms and symbols of the past and reorienting them toward a revolutionary meaning.[20] Bloch wrote:

> Even in the human body skin, internal organs are transplanted; but at best the transplanted organ performs in its new place only what is appropriate to that place, nothing else. In *technical* and *cultural* montage, however, the context of the old surface is decomposed, a new one is formed. It can be formed as a new one because the old context increasingly reveals itself as illusory, brittle, as one of surface.[21]

The philosopher was, of course, speaking in reference to his own time and to the avant-gardes of the day. He had in mind the "coherence" of Functionalism and the rigor of the *Neue Sachlichkeit*, to be contrasted instead with Surrealism and Joyce, for whom "montage is directly the key to all strangeness, it is the description of the confusion of experienced reality with collapsed spheres and caesuras."[22] Indeed, "the constitutive montage takes the best pieces for itself, builds other coherences out of them, and the owner of the previous coherence is pleased by the new one, if this does not remain patchwork and artistic myth, no longer."[23] In different ways, this entire artistic universe is present in Mollino's work, as is evident from his use of photomontage – together with photographer Riccardo Moncalvo (1915–2008) – during the 1930s.[24]

But there is another crucial point, concerning Mollino's command of technique. Steeped in *polytechnical* culture, thanks above all to his father Eugenio Mollino (1873–1953), the Turin architect displayed throughout his career a profound understanding of the constructive and structural issues of architecture – without which his works would not have been possible, nor could they be interpreted today. This is particularly evident in the Alpine context: well known, for instance, are

20 Antonio Somaini, *Ejzenstejn. Il cinema, le arti, il montaggio* (Turin: Einaudi, 2011).

21 Ernst Bloch, *Heritage of Our Times* (Berkeley–Los Angeles: University of California Press, 1990). First published as *Erbschaft dieser Zeit* (Frankfurt am Main: Suhrkamp, 1962), 202.

22 Bloch, *Heritage of Our Times,* 205.

23 Ibid., 207.

24 Barbara Bergaglio, ed., *Riccardo Moncalvo. Fotografie 1932–1990* (Milan: Dario Cimorelli Editore, 2025).

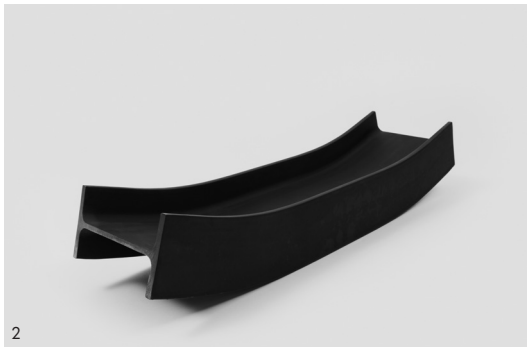

Fig. 2
Enzo Mari, *Putrella*, Danese, 1958. Courtesy Danese Milano.

Fig. 3
Cini Boeri, *mod. 602*, Arteluce, 1969. © Alberto Fioravanti.

Fig. 4
Alighiero Boetti, *Catasta*, 1966, trentaquattro elementi di Eternit, 192 × 100 × 100 cm. Courtesy Archivio Alighiero Boetti.

Mollino's early studies on the architecture of the Aosta Valley, which even earned him awards,[25] and without which an undertaking such as the *montage* of Casa Garelli would have been inconceivable.

It is precisely this technical, or polytechnical, foundation that sharply distinguishes Mollino's practice from other modes of material manipulation theorized and disseminated during the years of building in the Aosta Valley. One may think, for example, of the concept of the *bricoleur* as addressed by Claude Lévi-Strauss (1908–2009).[26] To the *pensée sauvage* he described – which, as we shall see, would attract many followers in the field of building as well – Mollino opposed a method ultimately grounded in planning and logic, so solid as to allow for "slippages into the useless" and for broad creative license.

Frankenstein, or the Other Beauty of Italian Design

In the postwar period, the world of design – whether more or less industrial – often provided Italian architects with an alternative sphere to building design,[27] one in which they could experiment with different practices and hypotheses, some of which may be cautiously brought into dialogue with our discussion of upcycling.

One of the defining strengths of Italian *Bel Design* in the postwar decades was undoubtedly its ability to resolve, on the formal level, the intrinsic contradiction between technology and aesthetics in their many facets. This reconciliatory capacity is evident in such iconic products as the Vespa, the Lettera 22 typewriter, the Fiat 500, and the *Cubo* ts522 radio by Marco Zanuso and Richard Sapper, among many others. In each of these cases, the form of the finished product

25 De Rossi and Dini, *La montagna di Carlo Mollino*.

26 Claude Lévi-Strauss, *La pensée sauvage* (Paris: Plon, 1962).

27 See Paolo Fossati, *Il design in Italia 1945–1972* (Turin: Einaudi, 1972); Vittorio Gregotti, *Il disegno del prodotto industriale. Italia 1860–1980* (Milan: Electa, 1986); Renato De Fusco, *Made in Italy. Storia del design italiano* (Rome–Bari: Laterza, 2007); Carlo Vinti, *Gli anni dello stile industriale 1948–1965. Immagine e politica culturale nella grande impresa italiana* (Venice: Marsilio-IUAV, 2007); Fiorella Bulegato and Elena Dellapiana, *Il design degli architetti italiani 1920–2000* (Milan: Electa, 2014).

managed to "domesticate" its technical content, concealing excesses while enhancing function and pleasing the eye.

Other approaches, however, can also be brought into the picture. One important strand, for instance, treated the industrial component as the perfect *ready-made* for object design. Consider the work of Enzo Mari, who in the 1950s transformed semi-finished products from the building sector into domestic objects: the 3047B for Danese (1958), a perforated sheet metal panel folded to become a fruit bowl, or the *Putrelle* (1957), steel beams reimagined as containers and centerpieces[28] (Fig. 2). A similar example can be found in the work of Cini Boeri: the *mod. 602* for Arteluce (1968) assembled ordinary industrial PVC tubes into a table lamp[29] (Fig. 3). During those years, such experiments resonated with *Arte Povera*: take, for instance, Alighiero Boetti's *Catasta* series (1966), where simple asbestos-cement (Eternit) pipes were diverted from construction to become an image of the contemporary condition[30] (Fig. 4). While not strictly a matter of *reuse*, the idea of employing what was already available on the market certainly bears a conceptual affinity to what we now call upcycling – in the sense of attributing a different and added value to what already exists in the world.

The design of Achille (1918–2002) and Pier Giacomo (1913–1968) Castiglioni also probed the potential of the *objet trouvé*, beginning as early as their university years. A curious yet telling case is Achille's irreverent model for a 1940 architectural composition course: a scheme for the headquarters of a Fascist neighborhood group, laid out with hand-drawn plans and actual pieces of cheese[31] (Fig. 5). Such irony would remain a constant in his work.

By the 1950s, in the brothers' early explorations of industrial design, their poetics of the *ready-made* went much further.

28 Hans Ulrich Obrist, ed., *Enzo Mari* (Milan: Electa, 2020).

29 Cecilia Avogadro, ed., *Cini Boeri architetto e designer* (Cinisello Balsamo: Silvana Editoriale, 2004).

30 Jean Christophe Amman, *Alighiero Boetti. Catalogo generale. Tomo I* (Milan: Electa, 2009).

31 Gabriele Neri, "Antipasto e dessert. Due modellini particolari," *Archi – rivista svizzera di architettura, ingegneria e urbanistica*, no. 4 (2021), 6.

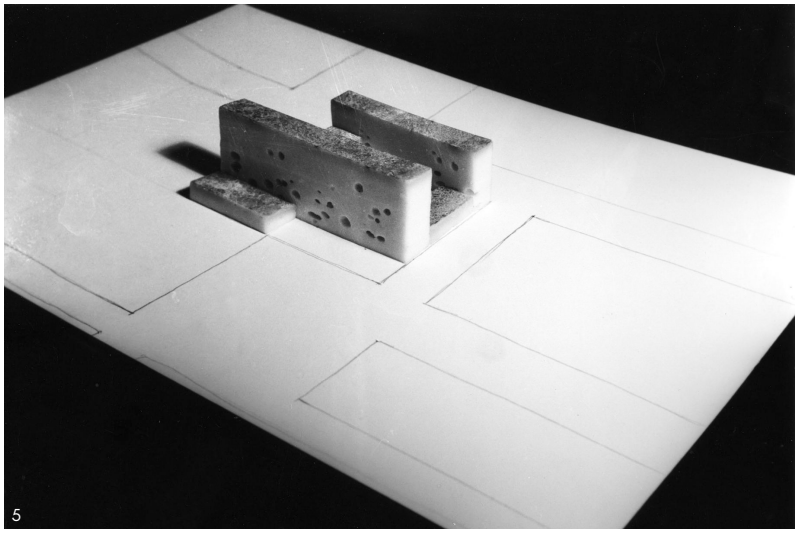

Fig. 5
Achille Castiglioni, Study model for the headquarters of a Fascist Neighborhood Group, Politecnico di Milano, 1940. Courtesy Fondazione Achille Castiglioni.

Take *Sella* (1957), a telephone stool created by combining a half-sphere cast-iron base, a height-adjustable leather bicycle saddle, and a pink-painted vertical steel tube[32] (Fig. 6). In the same year came the prototype for *Mezzadro (1957)*, another stool, almost entirely composed of pre-existing market components, decontextualized and assembled: an early-twentieth-century tractor seat; a fixing pin normally used to lock bicycle wheels; a stainless-steel spring, likewise from the tractor but inverted; and a crosspiece in natural-colored, evaporated beechwood salvaged from ships (here anticipating Marcel Raymaekers, who would later scour decommissioned shipyards for decades[33]), recalling the image of a yoke. A few years later came the floor lamp *Toio* (1962), later produced by Flos, assembled from a 300-watt automobile headlamp imported from the United States; a universal transformer, which also served as a visible counterweight; a metal frame threaded with fishing-rod guides for the external wiring; and other components[34] (Fig. 7).

32 Sergio Polano, *Achille Castiglioni. Tutte le opere* (Milan: Electa, 2018).

33 See Arne Vande Capelle, James Westcott, Stijn Colon, and Lionel Devlieger, eds., *Ad Hoc Baroque. Marcel Raymaekers' Salvage Architecture in Postwar* (Brussels: Rotor, 2024); Arne Vande Capelle, James Westcott, Stijn Colon, and Aude-Line Dulière, "Reputations. Marcel Raymaekers," *The Architectural Review*, no. 1521 (May 2025), 40–43.

34 Polano, *Achille Castiglioni*, 192–193.

Fig. 6
Achille and Pier Giacomo Castiglioni, *Sella*, 1957 (design). Courtesy Fondazione Achille Castiglioni.

Fig. 7
Achille and Pier Giacomo Castiglioni, *Toio*, Flos, 1962. Courtesy Fondazione Achille Castiglioni.

In the very years when Italian design was producing objects distinguished by extreme formal clarity and harmony among parts, these works – *Toio* in particular – boldly proclaimed a poetics of unconventional assemblage, whose origins can once again be traced back to the early twentieth-century avant-gardes. The juxtaposition of heterogeneous elements drawn from different technical and cultural realms brings us back again to the rich genealogy of montage in its various forms, from assemblage to collage, as previously described in relation to Mollino.

Yet in the shift from the work of art to the designed object, the Castiglioni brothers arrived at something quite different from the montage of the avant-gardes. Whereas early photomontages and Dada experimental poetry, for example, often renounced the final moment of synthesis, in the work of the Castiglionis synthesis is intrinsic to the disciplinary nature of industrial design, which necessarily regards function as its ultimate goal – though pursued along unorthodox and anti-mechanistic formal paths. In *Sella, Mezzadro,* and *Toio*, the two Milanese architects succeeded in resolving functional requirements through components originally conceived for entirely different tasks, while deliberately exposing rather than concealing the development of the process. The result is a poetics of assemblage that flaunts itself without filters, offering an aesthetic in which the hardness of industrial procedure is sublimated through a humor capable of turning Frankenstein into comedy.

In those same years, the Castiglioni brothers were not the only ones to flaunt the freedom of assemblage. Another example is provided by the furniture of Officina Undici (Eleven Workshop), created in the early 1960s by architect Fabio De Sanctis (b. 1931) and painter Ugo Sterpini (1927–2000) in Rome. Some of these pieces took shape precisely through the juxtaposition of dissonant elements drawn from different worlds.

The most emblematic is *Cielo-Mare-Terra*, assembled from a walnut display cabinet with internal shelves, two first-series Fiat 600 doors, and carved walnut "legs." The result, however, was very different in both spirit and outcome from the work of the Milanese designers.

As contemporary critic Enrico Crispolti (1933–2018) observed, the works of De Sanctis and Sterpini belonged to a current that aimed at a more explicit rejection of "the leveling standardization typical of industrial civilization,"[35] moving closer to what philosopher Étienne Souriau (1892–1979) had already prophesied in 1951 as the imminent rise of a "baroque industriel dont peut-être l'an 2000 verra le *plein avènement*" ("industrial baroque of which perhaps the year 2000 will see the full flowering"),[36] in contrast to, and as a countermove against, the prevailing industrial aesthetic and its attendant "classicist" ethos.

If Souriau's suggestion brings us – at first glance – closer to Mollino's surrealist universe, the difference from the Castiglioni brothers' approach (and, in truth, also from that of the Turin architect) lies precisely in the divergent relationship to industrial ideology. Whereas Achille and Pier Giacomo saw montage as a technical, expressive, and even economic strategy, one that could best interpret the principle of industrial assembly, De Sanctis and Sterpini instead used it as an unqualified exit route, producing one-off pieces aligned not with the contemporary *stile dell'industria* (style of industry) but rather with the bricolage practices of the 1960s counterculture (Fig. 8).

How, then, can these design-scale practices resonate with today's concept of upcycling? The works of the Castiglioni brothers show that the logic of twentieth-century industrial assemblage did not merely imply a formal resolution in terms of coherence, uniformity, and elegance, as much of contemporary design culture sought – and still seeks – to achieve. Rather, these objects highlight the creative, aesthetic, functional, semantic, and even economic potential of an *eclettismo industriale* (industrial eclecticism) free from any dogma – an approach that, in some ways, anticipates the "anything goes" of postmodern culture, while at the same time firmly maintaining the methodology and rationality of modern design culture.

35 Enrico Crispolti, in *Officina undici. Mobili di Fabio De Sanctis e Ugo Sterpini. Catalogo no. 1 1963–64* (Rome: Officina Undici, 1963), 7.

36 Étienne Souriau, quoted in *Officina undici*, 8.

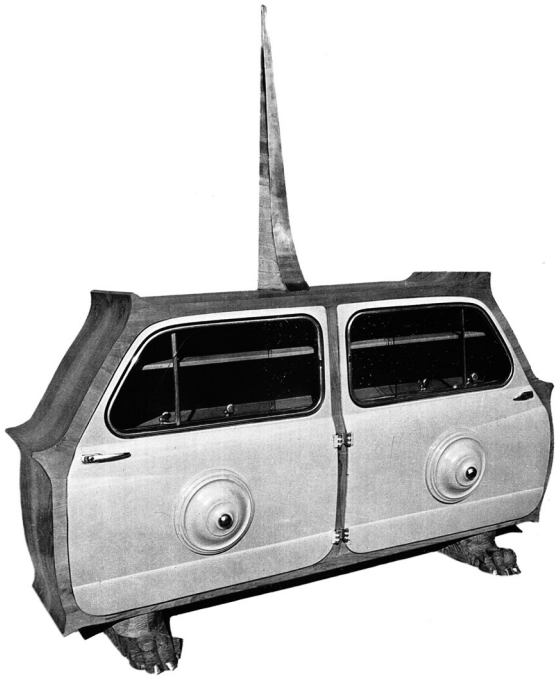

Fig. 8
Officina undici (Fabio De Sanctis e Ugo Sterpini), *Cielo-Mare-Terra Buffet*, 1964. Walnut, metal, and two Fiat doors of the 600 first series. © 1964 Fabio De Sanctis.

8

Between *tecnica povera* and Prefabrication

Leafing through the pages of *Casabella* in the early 1970s, then under the direction of Alessandro Mendini (1931–2019), one can sense how Italian design culture was undergoing a period of deep internal conflict. Its editorial content shifted back and forth – abruptly, almost neurotically – between two highly antithetical approaches, theoretical as well as operational, juxtaposed in a rather curious and forced manner.

On the one hand, in continuity with the preceding editorial season, and more generally with the "needs" of a pragmatic and orthodox professional updating – as well as with the interests of the contemporary construction industry – *Casabella* devoted extensive coverage to building industrialization. Its pages featured detailed reports on modular windows, prefabricated façades and walls, demountable schools, and the like. Among many, one might cite the feature on Angelo Mangiarotti's Armitalia plant in Cinisello Balsamo (1968–71), an apotheosis of industrial design applied to construction, where the logic of serial production and assembly was expressed with well-established

elegance.[37] Interestingly, many of the contributions on such topics were authored by Francesco Mendini (b. 1939), Alessandro's brother, which lent this bipolarity of approach an almost "family" character (Fig. 9).

On the other side, sometimes only a few lines away, stood the exact opposite: the provocation of a shift in speed, technology, economy, and sociology, carried along by the winds of systemic contestation that had been blowing through Italy since the previous decade. To Mangiarotti's *Operaio sotto scocca* (factory worker beneath the chassis) corresponded, in counterpoint, the reportage by Fernanda Pivano (1917–2009) and Gianni Pettena (b. 1940) on American communes – foremost among them the legendary Drop City, founded in May 1965 by a group of artists, writers, and designers.[38]

There, in the desolate landscapes of Colorado, the myth of the frontier took shape once again, promoting a Janus-faced technology: future-oriented yet oppositional at the same time, as exemplified by Buckminster Fuller's (1895–1983) domes. The outcome of a sophisticated and progressive engineering culture on which Fuller had been working since the 1920s, these constructions also incorporated – and in this case welcomed – the detritus of industrial society: used bottle caps, scrap metal, automobile roofs, and other refuse of postwar consumerism. In other communes, by contrast, building techniques drew inspiration from Native American traditions, such as tepees and bricks made of earth, water, and straw.[39]

But Italy was not merely watching and reporting. In the years when the ideas of Victor Papanek (1923–1998) were spreading (the first English edition of *Design for the Real World* appeared in 1971),[40] *Casabella* demonstrated that the country was not trailing behind but, on the contrary, at the forefront of seeking alternatives to the status quo of productive capitalism. Buoyed by the success achieved at

37 "Operaio sotto scocca," *Casabella*, no. 365 (February 1972), 21–27.

38 Mark Matthews, *Droppers: America's First Hippie Commune, Drop City* (Norman: University of Oklahoma Press, 2012).

39 Fernanda Pivano, "Le comuni fuori dal "sistema," *Casabella*, no. 404–405 (August–September 1975), 30–34.

40 Victor Papanek, *Design for the Real World* (New York: Pantheon, 1971).

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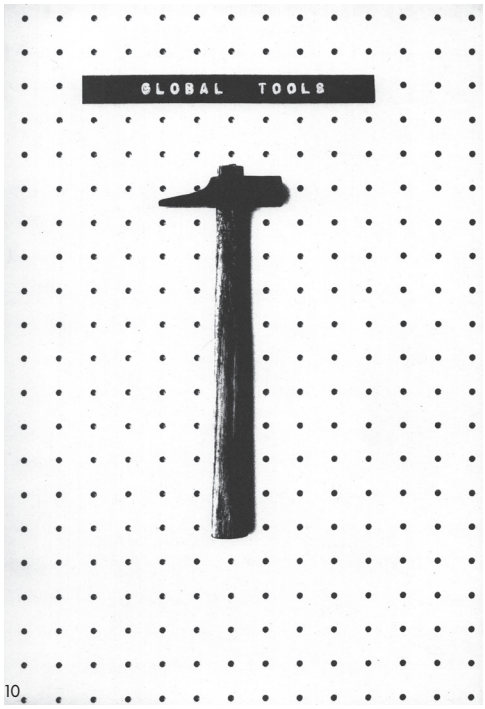

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Fig. 9
"Operaio sotto scocca," *Casabella*, no. 365 (February 1972), 21.

Fig. 10
Global Tools, Bulletin 1 (1973).

the Museum of Modern Art in New York with the celebrated 1972 exhibition – which showcased both the "apocalyptic" and the "integrated" strands of Italian design,[41] ranging from projects deliberately detached from productive reality to those that profitably (above all economically) interpreted its underlying logic – in 1973 a group of Italian radicals launched the initiative *Global Tools* (Fig. 10). This "non-school" of architecture and design was theorized,[42] not coincidentally, in parallel with the publication of Ivan Illich's (1926–2002) *Deschooling Society*.[43]

41 See Umberto Eco, *Apocalittici e integrati: Comunicazioni di massa e teorie della cultura di massa* (Milan: Bompiani, 1964); Emilio Ambasz, ed., *Italy: the New Domestic Landscape*. *Achievements and problems of Italian design* (New York: MoMA, 1972).

42 Valerio Borgonuovo and Silvia Franceschini, eds., *Global Tools. When Education Coincides with Life* (Istanbul: Nero, 2018).

43 Ivan Illich, *Deschooling Society* (New York: Harper & Row, 1972). See also Sara Catenacci and Jacopo Galimberti, *Deschooling, Manual Labour, and Emancipation: the Architecture and Design of Global Tools, 1973–75*, in eds. Meredith A. Brown and Michelle Millar Fisher, *Collaboration and its (Dis)*

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Among the many experiences promoted by *Casabella*, we may focus on those of Riccardo Dalisi (1931–2022), which were among the most concrete and intrinsically radical.[44] After a decade spent entering competitions for ambitious buildings together with colleague Massimo Pica Ciamarra (b. 1937),[45] Dalisi decided to experiment with a new type of design methodology – one that, following trends in the artistic and theatrical scenes,[46] opened itself to animation and participation (Fig. 11).

From the early 1970s, Dalisi began going regularly – and with great persistence – to the Rione Traiano, a housing settlement designed

Contents: Art, Architecture, and Photography since 1950 (London: Research Forum of The Courtauld Institute of Art, 2017), 99–121.

44 See Riccardo Dalisi, *Architettura d'animazione. Cultura di proletariato e lavoro di quartiere a Napoli* (Assisi–Rome: Carucci, 1975), 40.

45 Riccardo Dalisi and Massimo Pica Ciamarra, "Recherche d'une structure urbaine," *Le carré bleu*, no. 2 (1966), 7.

46 Sara Catenacci, "Maieutica del progetto. Riccardo Dalisi tra architettura, design e 'animazione', 1967–1974," *L'uomo nero*, no. 11–12 (May 2015), 183–201.

by the Neapolitan architect Marcello Canino (1895–1970). Born of the urban policies (and aporias) of the 1950s, the settlement soon became one of the city's most disadvantaged neighborhoods.[47] Together with his students and assistants, Dalisi decided to create workshops there which – though not without resistance – involved local residents, encouraging them to produce installations and objects using poor and discarded materials, that is, whatever could be found on site.[48] The place, which appeared desolate – as also shown in the reportage photographs of Mimmo Jodice (b. 1934)[49] – became the testing ground for this experiment.

Here, process prevailed over project, challenging the very notion of authorship. Yet this was not without the foundation of a disciplinary grammar – the so-called *geometria generativa* – far from improvised and in fact inspired by Noam Chomsky's (b. 1928) linguistics, Hans Freudenthal's (1905–1990) and D'Arcy Thompson's (1860–1948) mathematical biology, Frank Lloyd Wright's (1867–1959) organic architecture, and much more.[50] A friend of Giancarlo De Carlo (1919–2005), Dalisi often spoke in his lectures of Ivan Illich and John F. Turner (1927–2023), whose writings were later collected in the 1980 volume *Autocostruzione e tecnologie conviviali per un uso delle tecnologie alternative nel costruire-abitare* (Self-Building and Convivial Technologies for the Use of Alternative Technologies in Building–Dwelling).[51]

In the 1970s, then, the technological precision of Mangiarotti (and many other colleagues) found its counterpoint in the "poor

Fig. 11
Riccardo Dalisi, Workshops with children at Rione Traiano, Naples, 1971–74. The image shows children using an unfinished church construction site as a playground. Courtesy Archivio Riccardo Dalisi.

47 Gianluca Frediani, "Il quartiere Traiano di Marcello Canino. Distruzione di un modello," *ArQ. Architettura quaderni*, no. 2 (1989), 67–77.

48 See Riccardo Dalisi, "Pratica attiva per la cultura popolare. Il "valore d'uso" nell'architettura contro il mito della professionalità," *Casabella*, no. 404–405 (August–September 1975), 14–18.

49 Gabriele Neri, ed., *Riccardo Dalisi. La sedia del cece* (Mantova: Corraini, 2023).

50 Riccardo Dalisi, *L'architettura della imprevedibilità: glossario delle varianti* (Urbino: Argalia, 1970).

51 Giancarlo De Carlo, Ivan Illich, Franco La Cecla, and John F.C. Turner, *Autocostruzione e tecnologie conviviali per un uso delle ecologie alternative nel costruire-abitare* (Bologna: CLUEB, 1980).

technique" (or rather *minimal technology*) theorized and practiced by Dalisi, for whom the revalorization of residue, waste, and the insignificant was central (Fig. 12). As he wrote:

> "Radical" technique, or "poor" technique, aims to be such a moment of synthesis: the material value of technique, the theoretical value identified with manual skill, the "sensuality" of creative force, the communal power of creative labor. To employ a material in its elementary state – a sheet of newspaper, a discarded piece of wood – so as to assign it a new role as the body of a different object is, in a sense, to rediscover its hidden, less artificial valence. Together with new materials, through an intense process of research, this means reconnecting with the original value of matter, from which work and form, productivity and language all depart…[52]

Naturally, the term *tecnica povera* resonated in those years with Germano Celant's (1940–2020) definition of *Arte Povera*, which in turn – like Dalisi, who often collaborated with the theater director Gennaro Vitiello (1929–1985) – had borrowed the formula from Jerzy Grotowski's (1933–1999) *teatro povero*.[53] Dalisi's *tecnica povera*, however, did not mean – in the years when Lévi-Strauss was widely read – the substitution of spontaneous, "premodern" forms of bricolage for contemporary culture and technology, nor adherence to the *garbage architecture* being practiced and theorized in other contexts at the time.

Following studies such as *The Waste Makers* by Vance Packard (1960),[54] one need only think of Martin Pawley's (1938–2008) 1975 book *Garbage Housing*, whose cover featured a house made of Heineken bottles designed by John Habraken (1928–2023)[55] (Fig. 13). "*Tecnica povera*," Dalisi clarified in *Casabella*, "has no analogy with poetics that

52 Riccardo Dalisi, "Tecnica povera. La funzione del pressappoco nell'universo della precisione," *Casabella*, no. 386 (February 1974), 43.

53 Jerzy Grotowski, *Per un teatro povero* (Rome: Bulzoni, 1970).

54 Vance Packard, *The Waste Makers* (London: Longmans, 1961). In recent years, studies on the relationship between waste and architecture have multiplied, in a broad sense. See, for example: Alejandro Bahamón and Maria Camila Sanjinés, *Rematerial: From Waste to Architecture* (New York: W. W. Norton & Company, 2010); Dirk E. Hebel, Marta H. Wisniewska, and Felix Heisel, *Building from Waste: Recovered Materials in Architecture and Construction* (Basel: Birkhäuser, 2014); "Waste," monographic issue, *Architectural Review*, no. 1482 (June 2021).

55 Martin Pawley, *Garbage Housing* (New York: Halsted Press, 1975).

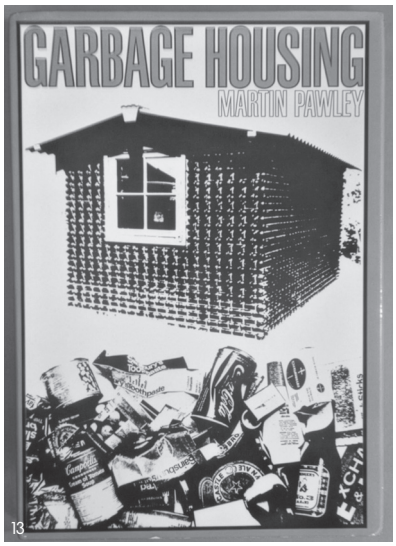

Fig. 13
Martin Pawley, *Garbage Housing* (New York: Halsted Press, 1975).

« Plain » techniques have little in common with the aesthetic schools which make use of refuse, or with pop art, or with the « protest » techniques of dwellings built with old motor-car parts or with other discarded objects; it bears little resemblance to the houses for the poor raised by hut-dwellers, the have-nots, and those resigned to their fate; it challenges the gradual and ineluctable divorce of man from active participation in the shaping, and construction of his own objects, his own space.
« Plain » technique is essentially based on two enormous storehouses of social riches: creative imagination (which everyone has, though benumbed by a vast policy of repression), and advanced science.
The technique elaborated with imagination and hard work — using makeshift material — by the students of the first-year course in the Technology of Architecture at the University of Naples during the 1970-71 academic year, bears comparison to Frei Otto's technical expertise, Aalto's intuitive power, Fuller's scientific stature, etc., at least in respect of ideational content and the students' first logical articulation of possible solutions.
« Plain » technique accepts the products and the objectives of advanced technology but its interests coincide with group industriousness and with collective work.
« Plain » technique reflects the ideology of the creative value of the collectivity.
This ideology states that technique is a specifically human dimension which in a general way coincides with the capacity to dominate the objective world, transforming « limits » into « instruments ».
The term « plain » (not « miserable ») challenges the myth that it is indispensable to have costly equipment and extensive and laboriously acquired literary knowledge.
One might say that the results of the Technology of Architecture 1 course may have derived from the particular cultural level of the students at the outset.
But there were a considerable number of students (about 300) and they came from different social levels.
To these should be added the young and older children from the Traiano quarter in Naples.
The control comes from a social level which turns out to have been completely cut off from the university.
Both experiments confirm the great fertility of technique developed with a scarcity of means (« plain » or « poor » technique) and the great educational and liberating power of such techniques.
Educational not only for the students but — also — although by completely different means — for the children of the very lowest classes.
The liveliness and complexity of the imagination shown by lower-class children is truly amazing.
Lower-class children generally draw better — more freely and with greater imagination — than many students of architecture.
All the ideas of cities, all the aspects discussed of the « urban image » and the structure of space, seem to flow naturally from the pencils of these lower-class children.
The ideas of great architects and great painters seem to have derived from a depository of collective imagination to which these children have easy access.

Riccardo Dalisi

LA TECNICA POVERA IN RIVOLTA

La cultura del sottoproletariato

La tecnica povera non ha analogie con le poetiche che utilizzano i rifiuti, con la pop art, coi modi contestativi delle abitazioni fatte con i residui di auto o col recupero degli oggetti consumati che si vedono ad Amsterdam o a Londra.
La tecnica povera non ha alcuna somiglianza coll'edilizia della miseria attuata dai baraccati, dagli esclusi, dai rassegnati.
La tecnica povera non è un revival dell'artigianato ma ne fa rinascere il senso ed il significato politico, rifiuta la raffinata sofisticazione della "alta" specializzazione, punta su due immensi depositi di ricchezza sociale: l'immaginazione creativa (che tutti posseggono e che giace sopita da un esteso esercizio della repressione [1], ed il potenziale della tecnologia e della scienza avanzata.
La tecnica povera contesta la sottrazione progressiva ed ineluttabile della partecipazione attiva dell'uomo alla modellazione, alla costruzione dei propri oggetti, del proprio spazio.
La tecnica povera vuole sfatare la suggestiva sofisticazione letteraria delle tecniche da manuale, propagandata con termini e con modi intimidatori dagli "iniziati" da laboratorio.
La tecnica povera, nel rieducare gli strumenti sensoriali e percettivi, vuole rifondare la ricerca tecnica e scientifica; presuppone un rinnovamento del senso e del ruolo della scienza. Quello che hanno immaginato e prodotto con strumenti di fortuna gli studenti del corso di Tecnologia dell'Architettura I° nell'anno 1970-71 della Facoltà di Napoli non ha nulla da invidiare all'abilità di un Frei Otto, alla forza intuitiva di un Aalto, alla dimensione scientifica di un Fuller, ecc. Ciò ovviamente al livello di spunti ideativi e di prima articolazione logica delle soluzioni. Chi di quei personaggi costruisce altari e favorisce i contenuti delle grandi opere "irraggiungibili" [2], chi fomenta i miti matematici della "controllabilità" e dell'esattezza, prepara l'ossessione repressiva di una accademia tecnologica. Contro di ciò l'idea della tecnica povera propone la forza liberatoria ed autoformativa dell'autenticità. Poiché non vi è autenticità senza esperienza diretta, l'obbiettivo centrale del metodo della tecnica povera è concentrato tutto nella esperienza diretta, sia pure, all'inizio, rudimentale e ridotta.
La tecnica povera non esclude i prodotti e gli obiettivi della tecnologia avanzata ma il suo luogo coincide col luogo della operosità di gruppo e del lavoro collettivo, laddove la tecnologia avanzata risiede sulle scrivanie dei tecnici ad alta selezione, pronta ad irradiarsi negli appositi canali del consumo.
La tecnica raffinata non rappresenta né l'unico livello degno di attenzione, né il principale argomento del dibattito sulla tecnologia. Infatti essa aderisce ad un criterio selettivo e perfezionistico della nostra società.
La tecnica povera invece, coincide coll'ideologia del valore creativo della collettività. Secondo tale ideologia la tecnica è una specifica dimensione umana e, genericamente, coincide colla capacità di dominare il mondo oggettivo, trasformando i "limiti in strumenti".
Il termine "povero" (non misero) polemizza col mito dell'assoluta necessità di costose attrezzature e di lunghe e laboriose conoscenze letterarie.
Ambedue implicano un costo sociale elevatissimo che contribuisce a seppellire le qualità creative cui si riferiva Bense.
Si potrebbe dire che i risultati del corso di Tecnologia Architettonica I° possono derivare da condizioni particolari di partenza del livello culturale degli studenti e che una rondine non fa primavera. Ma gli studenti erano moltissimi (circa 300) e di diversa provenienza. A queste rondini se ne aggiungono delle altre e sono i bambini ed i ragazzi del Rione Traiano. Forse, la primavera è più vicina di quello che non sembri. La verifica rispunta da un livello sociale che risulta totalmente tagliato fuori dagli studi universitari. Ambedue gli esperimenti confermano la grande fertilità della tecnica sviluppata con povertà di mezzi (tecnica povera) ed il grande potere educativo e liberatorio contenuto in tali tecniche. Educativo non soltanto per gli studenti ma anche e, sia pure con modi assolutamente diversi, per i ragazzi e bambini del sottoproletariato.
Ciò ovviamente implica alcune precisazioni: quando si dice proletariato, non è possibile contestare l'idea che esiste una "cultura operaia", quando si pensa al sottoproletariato nessuno sospetta che esso abbia una sua cultura. Si immaginano frange slegate e disparate di elementi di "sottocultura".
A paragone dello stato generale di incer-

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Fig. 12
Riccardo Dalisi, "La tecnica povera in rivolta," *Casabella*, no. 365 (May 1972), 28.

employ waste materials, with Pop Art, with the protest-driven dwellings made of car wreckage, or with the recovery of consumed objects as seen in Amsterdam or London. *Poor technique* bears no resemblance to the architecture of misery produced by squatters, the excluded, or the resigned."[56]

Dalisi's vision – and with it his technological conception – aimed instead at the coexistence of "precision and approximation," (*precisione e pressappoco*)[57] of design and chance, in an effort to overcome both the entropic drift of "spontaneous" design and the conceptual (and anthropological) cage of industrial modernity.[58] Poor technique, (not *miserable* technique) was based, in fact, on the cohesion of "two immense repositories of social wealth: creative imagination […] and the potential of advanced technology and science."[59]

Another noteworthy contribution from the same years, albeit of a very different tenor, is that of Ugo La Pietra (b. 1938). In the broad series of investigations he conducted between 1970 and 1975 on urban space as a physical expression of power – and, more specifically, on its *gradi di libertà* (degrees of freedom) as forms of self-management of the urban environment,[60] minimal in the city center and maximal in the periphery – the architect carried out a specific study on self-built shacks made from salvaged materials in Milan's outskirts. This research was exhibited at the Mercato del Sale in Milan in 1975 and published the following year as a small independent volume entitled *Recupero e reinvenzione (Recovery and reinvention)*[61] (Fig. 14).

56 Riccardo Dalisi, "La tecnica povera in rivolta," *Casabella*, no. 365 (May 1972), 28.

57 Riccardo Dalisi, "Tecnica povera. La funzione del pressappoco nell'universo della precisione," in AA.VV., *Contemporanea: Roma, Parcheggio di Villa Borghese, 11.1973–2.1974*, catalogue of the exhibition (Firenze: Centro Di, 1973), 323–325.

58 Riccardo Dalisi, "L'Avanguardia del Disordine," in Lara Vinca Masini, ed., *Utopia e crisi dell'antinatura. Momenti delle intenzioni architettoniche in Italia. Topologia e morfogenesi* (Venice: La Biennale di Venezia, 1978), 76.

59 Dalisi, *La tecnica povera in rivolta,* 29.

60 Ugo La Pietra, *I gradi di libertà* (Milan: Jabik & Colophon Editori, 1975).

61 Ugo La Pietra, *Recupero e reinvenzione* (Milan: Edizioni Grafica Mariano, 1976).

Fig. 14
Ugo La Pietra, *Recupero e reinvenzione* (Milan: Edizioni Grafica Mariano, 1976).

It is worth noting that this type of investigation was very much a topic of interest, especially abroad. In 1974, *Casabella* reviewed *Maisons de charpentiers amateurs américains. Vers une architecture sauvage?* (Éditions du Chêne, 1974), with texts by Art Boericke and photographs by Barry Shapiro.[62] Boericke, in particular, after working for twenty years in a cooperative of carpenters, electricians, and plumbers, decided to build his own house; he then began to seek out similar experiences, namely small self-built structures made from salvaged materials recovered from demolition sites or public dumps, or simply found on site. As *Casabella* noted: "[...] it seems evident that there is no need to explain why we recommend this book to our readers."[63]

In another issue of the magazine, a photograph was published of the so-called *House of Mirrors* built by the artist Clarence Schmidt (1897–1978) in Woodstock, NY, USA (Fig. 15). Begun in the 1940s as a simple wooden shack constructed around a large tree, it

62 Art Boericke and Barry Shapiro, *Maisons de charpentiers amateurs américains : vers une architecture sauvage?* (Paris: Chêne, 1975).

63 "Home-Made Homes," *Casabella*, no. 398 (February 1975), 53.

do it yourself

Questa costruzione adibita a serra è stata progettata e realizzata da un giardiniere a Woodstock, quartiere di New York; è il risultato dell'assemblaggio di innumerevoli intelaiature di finestre raccolte in un arco di quarant'anni. L'immagine fantastica che ne scaturisce può rientrare negli esempi di quell'architettura spontanea fiorita durante gli anni della grande crisi, come reazione all'inattività produttiva.

(«Design & Environment», fall 1971)

grew piece by piece, following the contours of the hillside, until it encompassed numerous rooms, their exteriors patched with dozens of salvaged window frames that gave the structure its "fantastic image."[64] Such an architecture would in some ways recall Lucien Kroll's (1927–2022) later work, particularly the Mémé building at Louvain-la-Neuve, with its participatory design and deliberately heterogeneous forms.[65]

Similar examples of such "spontaneous" architecture flourished across the country. Among the most famous are the *Watts Towers*, built in Los Angeles by the Italian immigrant Simon Rodia (1879–1965), and *Grandma Prisbrey's Bottle Village* in California, a compound of sculptures, walkways, and other constructions made of recycled materials and refuse from the local dump.

Back in Milan, traversing those zones still suspended between already-built peripheries and those awaiting "development," Ugo La

64 "Do It Yourself," *Casabella,* no. 362 (February 1971), 3.

65 Lucien Kroll, *Bauten und Projekte* (Stuttgart: Hatje, 1987).

Pietra reflected on the manipulation of the remnants of metropolitan consumer society. In doing so, he highlighted "the contradiction of the linear, unilateral logic of consumerist obsolescence," while instead exalting the "use of salvaged materials according to a logic freed from preestablished schemes" and the "invention of new images tied to realizations responsive to identified functional needs."[66] The categories he identified were: *recovery*, understood as conscious intention and discovery prompted by the contingencies of a specific case; *manipulation*, as the desire through manual activity to reclaim "those creative faculties atrophied by the *work-oriented society*"[67]; *appropriation of space*; *desire for possession*, defined as the "subtraction of space and the identification of a certain availability of defining it, through an individual and autonomous action, guaranteed by the expression of private property"[68]; and finally *reinvention*, as the use of salvaged materials "according to a logic freed from preestablished schemes."[69]

Fig. 15
"Do It Yourself," *Casabella*, no. 362 (February 1971), 3.

The photographs taken by La Pietra, often enriched with drawings, depict dozens of structures made of tree branches, abandoned window frames, sheets of *ondolux*, tires, shutters, panels dismantled from a trade fair stand, wooden planks – evidence of "the ability to redeem all the misery in which they struggle," by reclaiming those materials "rejected by the consumer society" in order to build "a second country house" made to their own measure, reinventing materials, objects, and refuse "according to a logic that does not belong to any bourgeois 'model' of alternative culture."[70]

La Pietra in fact asks whether these people might be the custodians of a popular culture in architecture (surely with in mind the *Architecture Without Architects* exhibition at MoMA a few years

66 Ugo La Pietra, quoted in Enrico Crispolti, "Per un comportamento creativo nei processi di riappropriazione dell'ambiente: analisi e interventi di Ugo La Pietra," in La Pietra, *Recupero e reinvenzione*, 3.

67 Ibid., 4.

68 Ibid.

69 Ibid.

70 Ibid.

earlier).[71] His answer is negative, since these "architectures" do not represent continuity with tradition but "simply demonstrate that the creative process, which has always engaged humanity in transforming the environment, has not yet entirely ceased."[72]

Further experiences could be added along these lines. For instance, one might consider the work of Superstudio, such as the large anthropological project *Culture Materiali Extraurbane*, and especially *La coscienza di Zeno*, an investigation into indigenous material culture presented at the Venice Biennale in 1978, which focused not on the protagonist of Italo Svevo's famous novel, but rather on a namesake farmer from Riparbella, a village in the Val Cecina.[73]

The attention – albeit from very different perspectives – paid by Dalisi and La Pietra to the world of *tecnica povera* and popular reinvention should be placed within a much broader critical debate on technique and technology in the contemporary world, one also addressed by a significant part of architectural culture at the time. Remaining within the radical milieu, the celebration of such practices indeed provoked reactions from several figures who perceived them as threatening in various ways.

Gillo Dorfles (1910–2018), for instance, published an article entitled *I pericoli del Do It Yourself* (The Dangers of Do It Yourself), in which he sought – though not without irony – to warn against "the illusions absorbed from Lévi-Strauss (this all-too-famous anthropologist who lived for his whole life off a few months spent in his youth in an Amazonian [sic] forest)," such as the idea of "bricolage," which "from a normal practice of 'making do,' common to the French as to every other people, has been transformed into an equivalent of art, of myth, of ritual, and even into a 'structuralist constant,' with which countless followers of the master have filled their mouths."[74]

71 Bernard Rudofsky, *Architecture without* architects: a short introduction to non-pedigreed *architecture* (New York: MoMA, 1964).

72 La Pietra, *Recupero e reinvenzione*, 4.

73 Gabriele Mastrigli, *La vita segreta del monumento continuo* (Macerata: Quodlibet, 2015).

74 Gillo Dorfles, "I pericoli del Do It Yourself," in *Progettare Inpiù*, no. 8 (1975), 36–37.

"Now," Dorfles continued, "nothing could be further from art than bricolage […]. Art is, in fact, the opposite of bricolage; because whereas bricolage makes use of makeshift elements in order to arrive at approximate results (substitutes for authentic ones), art – even when it employs fortuitous or approximate elements – always does so with precise intentionality, arriving at absolute results that cannot be obtained in any other way."[75] And further: "Today it will no longer suffice to poke fun at, or launch holy crusades against, the object of *Gute Form* […] in favor of the rediscovered 'poor object,' if all these operations are not preceded by a prior clarification of what the individual's intervention in his own environment, and in his own 'decorum,' can and should be."[76]

In a different way, Andrea Branzi (1938–2023) – a founding member of *Global Tools* – also reflected on the issues raised by Dalisi's *tecnica povera*. In a text published in *Casabella*, entitled *Tecnologia o eutanasia* (Technology or Euthanasia),[77] he questioned the steps that might follow from that discovery and reappropriation of techniques "poor and simple, yet so fascinating and endowed with their own 'richness'":

> What shall we do about the corrosive, destructive charge of so many projects and experiments, which tend to reduce to the same common denominator all forms of technology and culture? Consider it all one big holiday, or the germ of another aesthetic and another culture?[78]

Branzi even invoked the "ill-fated" example of the Bauhaus, "which recuperated, ordered, and regenerated the destructive power of the avant-garde in the form of analytical and rational energy that was destined to give industry a new dynamic dimension of the bourgeois culture, transforming what was really the undoing of culture into a "new idiom" [of that culture]."[79] In short, the idea of an alternative

75 Ibid.

76 Ibid.

77 Andrea Branzi, "Tecnologia o eutanasia," *Casabella*, no. 397 (January 1975), 1–19.

78 Ibid., 19.

79 Ibid.

technology – or of an alternative application of technology – carried with it no small number of questions, and sometimes dangers.

Upcycling as Oppositional Reconciliation

Despite the theoretical and design fervor that characterized the two decades under consideration, the experiences described above do not amount to a coherent or structured current. Rather, they emerge as a scattered and heterogeneous set of traces from which one may deduce – while tempering any initial expectations – the extreme marginality of the theme in question. The overall picture suggests, in fact, that in Italy the reuse of salvaged or discarded materials (whether from the building industry or from other productive cycles) was not, during the 1960s and 1970s, a subject of systematic exploration within architectural practice – at least not in the terms that are relevant to us today, and apart from the ongoing, never entirely absent practices of vernacular or anonymous building traditions.

Among the reasons that may account for such marginality, one of the most significant lies in the absence of an economic and productive context comparable to the present one. A theory and practice of systematic reuse – whether termed recycle, upcycle, downcycle, etc. – requires, as a precondition, not the material constraints of the pre-industrial world, but rather the opposite: an excessive surplus of production and matter. Such a surplus, despite the momentum of the postwar "economic miracle," was not yet available in Italy during the 1960s and 1970s.

On the side of industrial culture, it is not by chance that research in Italy – as elsewhere – proved far more fertile in the field of Design for Disassembly, conceived as a strategy for a near or distant future, than in the reuse of the past as a ruin to be reinvented. On the countercultural front, by contrast, the practice of reuse was associated with marginal and "poor" (or "minimal") practices, ideologically far removed from any systematic framework.

While all this confirms the impossibility of considering the examples cited as forerunners of contemporary upcycling, it must nevertheless be acknowledged that each of them contains, to varying

degrees, suggestions and elements that today are being revisited with renewed enthusiasm and curiosity by many designers.

In Mollino's curious montage of the Alps, for instance, one finds theorized the possibility of a non-ideological dialogue between tradition and modernity – an approach that today, even with regard to twentieth-century heritage, reappears in numerous attempts to reconcile cultural and material stratifications, and thus also in the assemblage of components that originate from different histories. Casa Garelli offers a demonstration of this principle not in the vague sense often relegated to words, but concretely realized at the level of constructive disassembly and re-composition. It shows that beyond cultural openness, achieving valuable results requires a deep knowledge of techniques: for Mollino, those of Alpine "tradition" as well as those of the avant-garde and industrial assemblages of the twentieth century.

From the perspective of industrial design, the Castiglioni brothers' exercises with the ready-made deepen the celebration of a certain technical and aesthetic "eclecticism," rendering more visible the overcoming of the obsession with formal and structural coherence and balance that marked much of rationalist culture in the twentieth century. Through intuition and irony, the two designers demonstrated a compositional freedom that nonetheless remained grounded in the logics of industrial production – beginning with the addition of parts through specific joints – while at the same time making a decisive leap beyond its intrinsic homogenization. In contrast to many other patchworks of the period (and of our own time), where the surrealist impulse overwhelms practical needs, in the Castiglioni's work function always comes first, though pursued along unexpected formal paths.

As for the various theories and practices of reuse and recovery promoted by the Italian radical culture – many of which have recently resurfaced within the horizons of contemporary design – what is most compelling is not only their protest against an invasive and alienating modernity. Rather, as exemplified by Dalisi's invitation "to precision and to approximation," in which the valorization of discarded material does not disregard but in fact acquires new meaning from certain methodologies of modern design culture, these experiences suggest the

possibility of coexistence between different paradigms, where one does not exclude but instead completes the other.

Perhaps, then, the most enduring lesson to be drawn from the experiences gathered here is precisely this: not the privileging of one approach over another, but the potential coexistence of different strategies – strategies that may appear dissonant, yet are capable of staging architecture as a dialogue between heterogeneous cultures, materials, and techniques. Not as a mere affectation, but as a necessary shift from entrenched practices that enforce "coherence," whether aesthetic or technological, at any cost. An oppositional act, in short, which nonetheless yields the idea of upcycling as *an architecture of reconciliation.*

Cesare Chiodi, Giulio Minoletti, Mixed-used Complex in piazza Borromeo, Milan (1951–1954)

A Staging of Fragments

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As outlined in the first chapter of this publication, practices of rubble reuse in Italy during and immediately after World War II primarily responded to conditions of urgency – rebuilding cities and structures – and of scarcity – with construction materials, infrastructures, and means of transportation were largely unavailable. In the subsequent years, rubble continued to circulate in Italian cities, though increasingly in the form of selected fragments deemed to possess real or presumed artistic value: statues, decorative moldings, balustrades, and similar elements. In most cases, their reuse was no longer dictated by necessity but rather by the interplay between the experimental approaches of certain architects – who sought to establish a dialogue between modernity and history – and the interests of clients and developers, who recognized the "presence" of historical fragments as a commercial asset, adding market value to new constructions. This was particularly evident in the redevelopment of several war-damaged noble palaces in Milan's city center, replaced by profitable high-end residential complexes targeting the urban bourgeoisie. The undisputed master of this practice of post-war *spolia* in Milan was Luigi Caccia Dominioni (1913–2016), who pioneered it in the reconstruction of his family's palace in Piazza Sant'Ambrogio (1947–1949) and later employed it in the rebuilding of the Palazzo Visconti on Via Lanzone (1957). A less well-known but in many ways more striking example – due to both its scale and specific solutions – is the mixed-use complex in Piazza Borromeo (1951–1954) by Cesare Chiodi (1885–1969) and Giulio Minoletti (1910–1981), constructed on the site of an eighteenth-century townhouse belonging to the Borromeo family.

Several of its most significant decorative elements – the two portals opening onto Via San Maurilio and Via Sant'Orsola, the twenty-four granite columns of the entrance hall, and the late-Baroque stone balustrade of the monumental staircase – had been listed by the *soprintendenza ai monumenti* (Monuments Authority) in 1940, just a few years before the Allied bombings of 1943 severely damaged the palace. Chiodi and Minoletti – particularly the latter, an eclectic and non-dogmatic Modernist – reintegrated all of these elements into their design. The resulting building represents a compromise between the constraints imposed by the *soprintendenza* – the L-shaped block, aligned to the street fronts, blends into its historical context through a regular grid of vertical windows and *ceppo* stone cladding – and the architects' rationalist orientation, more evident in the plastered tower set within the block.

Within an otherwise conventional design, the architects' most original contribution lies precisely in the staging of the listed fragments: the original portals frame the new street entrances; the exuberant balustrade is reinstalled in the courtyard, elevated as a standalone feature; and the granite columns are reassembled into a theatrical backdrop for the boundary wall. As historian Annalisa Viati Navone has noted, "These are ready-made materials that Minoletti, like a *bricoleur*, reassembles theatrically into an architecture that also becomes a 'stratigraphic palimpsest'."

In the context of Milan's frenetic reconstruction, such experiments in montage also aligned with pragmatic financial considerations on the part of the developer – in this case, the *Associazione dei Costruttori della Lombardia* (Builders' Association of Lombardy). The reused elements simultaneously testified to the prestige and elegance of the complex, enabling it to command higher market prices. Numerous similar

Figs. 1–2
The entrance hall and the monumental staircase of Palazzo Borromeo after the 1943 bombings. © SABAP-MI - All rights reserved. Courtesy Ministero della Cultura.

Figs. 3–4
The granite columns from the former entrance hall and the monumental staircase's balustrade "staged" within Chiodi and Minoletti's project. © Stefano Suriano, 2012.

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examples – by both leading architects and lesser-known practitioners – can be found throughout Milan's historic neighborhoods, underscoring the ambiguous relationship between the preservation (and display) of historical fragments, displaced from their monumental origins, and the processes of architectural and social transformation that reshaped the city center during the 1940s and 1950s.

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Carlo Mollino, Casa Garelli, Champoluc (1962–1965)

Upcycling Ante Litteram

Laura Milan
comunicArch

The Casa Garelli in Champoluc (1962–1965) represents both a concluding and paradigmatic episode in Carlo Mollino's reflection on the relationship between tradition and modernity in Alpine architecture. Commissioned by Felice Garelli for his daughter Clotilde and her family, the project stemmed from the desire to transform a seventeenth-century Walser *rascard*, the Taleuc chalet, into a holiday home. What might have taken the form of a restoration or a philological reconstruction becomes, in Mollino's hands, an experiment in radical architectural rewriting – based on a process of "additive subtraction," in which erasure and invention coexist as simultaneous gestures in the creation of the new.

The original *rascard*, dated 1664 and built with a timber *blockbau* structure, was a rare example of vernacular architecture from the Walser culture, characterized by a stone base and an upper wooden volume used as a storehouse and hayloft. Dismantled and reassembled on a new site, the building was taken by Mollino as an *objet trouvé* – the raw material for an operation of conceptual manipulation rather than restoration – supported, yet critically distanced, from his ethnographic research of the 1930s, when he had studied traditional dwellings in the Aosta Valley as models of organic unity and constructive necessity.

In the 1960s, tradition for Mollino became a field of linguistic and symbolic experimentation, a space in which to measure the tension between the permanence of form and its reinvention – here transfigured by the intentions of a client who confronted him with a wholly new and distinctly contemporary challenge: the transformation of an ancient *rascard*.

The result is a complex architectural organism – apparently unified but in fact composed of heterogeneous fragments – in which original, reconstructed, and newly invented elements coexist according to a logic of juxtaposition and transfiguration. The base, completely redesigned, constitutes the main threshold of transformation. The ground-floor walls, built in natural stone, introduce a massive and contemporary language, articulated by narrow and deep openings, square-section iron elements, and wooden doors designed in detail as mechanical components. The new external staircase, made of reinforced concrete with a variable section, wooden treads, and a tubular handrail, marks a clear rupture with the vernacular imagination, instead evoking the aerodynamic and engineering dimension typical of Mollino's vocabulary.

Between the stone base and the upper wooden structure lies the series of twelve *boléri*, reinterpreted by Mollino in grey granite and made integral with the structure below by means of a concrete beam. Once functional elements designed to protect stored goods from rodents, they here lose their original purpose to acquire a figurative and symbolic value, becoming a threshold, a sign, and an interface between two constructive systems and two temporalities. Their presence testifies to Mollino's awareness of the ritual significance of Alpine building, as well as to his intention to sublimate it into an aesthetic and conceptual vision.

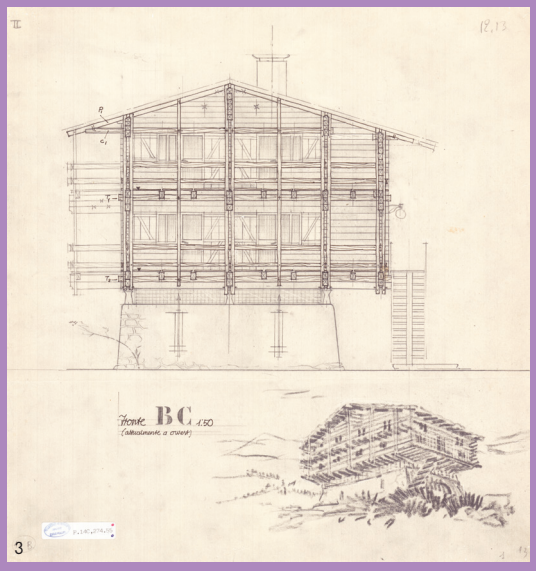
The project extends coherently to the interior, where the distribution of spaces is organized over three levels around a central service core – a true functional and technical backbone – that incorporates the staircase, the shaft, and the warm-air heating system. This device, clad in green ceramic tiles, introduces an unexpected chromatic and material note, contrasting with the wooden continuity of the living spaces.

The plan's articulation, calibrated according to the

Fig. 1
Aerial view of the original rascard, n.d. Courtesy of the Agenzia del Demanio, Fondo Carlo Mollino held at Politecnico di Torino, Sezione Archivi Biblioteca "Gabetti".

Fig. 2
View of the original rascard, n.d. Courtesy of the Agenzia del Demanio, Fondo Carlo Mollino held at Politecnico di Torino, Sezione Archivi Biblioteca "Gabetti".

grid of the new *boléri*, reveals a deliberate pursuit of geometric and constructive control that helps to define the project as a *Gesamtkunstwerk* – a total work of art in which architecture, structure, furniture, and detail contribute to a unified design of formal coherence.
From a theoretical standpoint, Casa Garelli can be interpreted as a device for reflecting on tradition and its capacity for transmission. Mollino "erases" the original *rascard* not to deny it, but to regenerate it through rewriting. The result is an architectural simulacrum that, while preserving the proportions and materiality of the Alpine archetype, reveals itself as a completely new and autonomous object.
Within Mollino's body of work, Champoluc marks a turning point. After the experiences of Cervinia, Sauze d'Oulx, and Agra – where Alpine architecture still served as a ground for functionalist and technological experimentation – in Casa Garelli Mollino, also thanks to the very particular nature of the commission, no longer seeks modernity through the overcoming of tradition, but through its reinvention. His famous definition of tradition as "a harmonious river, different in every bend, and not stagnant water or regression" finds full realization here: the history of building, he wrote, "is unrepeatable," and every new architecture must be born as a rewriting of its own past.



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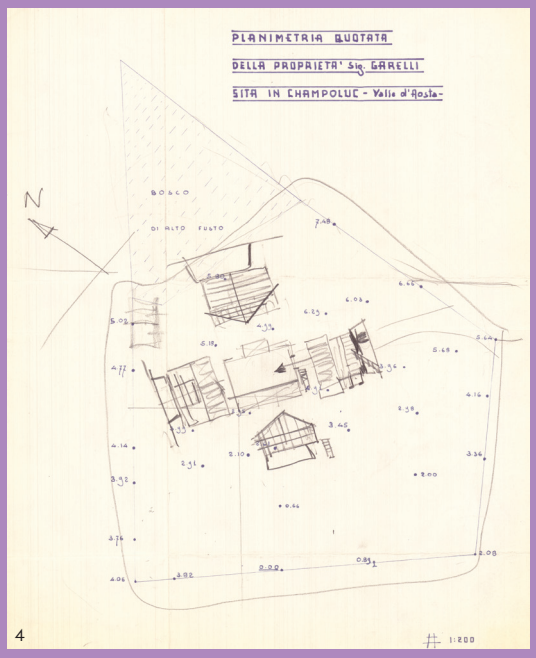

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Casa Garelli presents itself as an experiment in theoretical and poetic lucidity, but also as an example of *upcycling ante litteram* – a laboratory in which the design gesture coincides with the critical one, the project becomes an opportunity for the recovery and rethinking of tradition, and vernacular architecture becomes material for a reflection on the very meaning of historical continuity.

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Fig. 3

Casa Garelli, Champoluc. West elevation and perspective, n.d. Courtesy of the Agenzia del Demanio, Fondo Carlo Mollino held at Politecnico di Torino, Sezione Archivi Biblioteca "Gabetti".

Fig. 4

Dimensioned plan of Mr. Garelli's property in Champoluc, n.d. Courtesy of the Agenzia del Demanio, Fondo Carlo Mollino held at Politecnico di Torino, Sezione Archivi Biblioteca "Gabetti".

Achille and Pier Giacomo Castiglioni Mezzadro (1957)

Frankenstein Design

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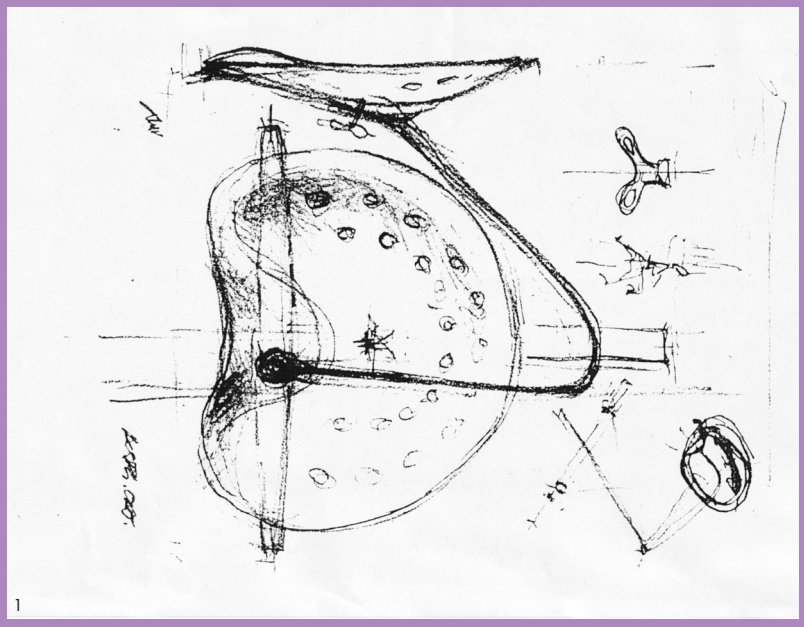
During the years of the Italian economic miracle, design played a fundamental role in redefining the domestic environment for large segments of the population, giving shape to new habits and forms of consumption. Many strategies were adopted by Italian designers, often trained as architects, who were still poised between traditional craftsmanship and the unprecedented possibilities of post-war industrial production. Among these, the approach of the Milanese brothers Achille and Pier Giacomo Castiglioni stands out for its originality and audacity: instead of the aesthetics of the "*bella forma*," they embraced the idea of assemblage – borrowed from the early twentieth-century avant-gardes – to create objects that appeared bizarre, disorienting, and aesthetically incoherent, yet were ultimately perfectly functional.

A splendid example of this is the *Mezzadro* (sharecropper) stool (1957), a collage of disparate elements drawn from equally heterogeneous worlds, capable of evoking the socio-economic and industrial transition characteristic of this period in Italian history. It consists of four components: a seat, a fixing pin, a spring, and a crossbar. The seat, made of pressed and painted sheet metal, was taken from tractors, thus evoking an agricultural world already distant from the ferment of expanding cities. The fixing pin consists of a wing nut used to secure bicycle wheels, which allows the entire structure to be tightened without the use of screwdrivers or wrenches. Like the seat, it recalls a familiar imagery, yet is used in a different context. The spring, made of stainless steel, supports the seat; it, too, comes from tractors but is mounted in the opposite direction to make the sitting more elastic. The crossbar at the base of the stool, made of solid beech wood recovered from dismantled ships, vaguely recalls the yoke used to harness oxen to a cart or plough. In this way, it establishes a symbolic connection with the seat, while performing a primarily structural role – providing the additional points of support required for the overall stability of the system.

A similar genesis characterizes the *Sella* (saddle) seat and the *Toio* lamp. The former (1957) is an unexpected object, both aesthetically and functionally. Originally conceived for leaning on during short telephone calls, it was, according to its designers, not meant to be "too comfortable" and thus represents a rare example of deliberately programmed discomfort – or of comfort limited to brief use. To achieve this, the designers invented a one-legged seat composed of a hemispherical cast-iron base, which is therefore mobile, and on which an adjustable metal tube supports a bicycle saddle in leather. The idea derived from observing the traditional wooden stool used by milkers, also equipped with a single support, complemented by the user's two legs, always ready to move from one cow to another. Thus was born *Sella*, a curious seat that embodied the arrival of the wall-mounted telephone in Italian homes, the memory of an agricultural world, the popularity of cycling in Italy, and an unconventional approach to industrial design.

When designing a new floor lamp for indirect lighting, the Castiglioni brothers instead looked to the automotive market. In 1962, a special 300-watt car headlight had been imported from the United States; however, the difference in voltage required the use of a transformer to operate it in Italy – two elements formally dissonant but indispensable to one another. Transforming these components into a lighting system required further conceptual and practical steps. The designers then looked around for other *ready-mades*, constructing a lamp as an intelligent sum of *objets trouvés*. A curved metal rod



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Figs. 1–3
Achille and Pier Giacomo Castiglioni, *Mezzadro*, 1957. Courtesy Fondazione Achille Castiglioni.

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holds and displays the headlight, emphasizing its form; a continuous hexagonal-section steel rod, from standard industrial production, serves as the vertical support; fishing-rod rings are used to contain the electrical wires; and a simple metal frame functions as a handle. The transformer, fixed at the base, also serves as a counterweight, thus performing a dual role – static and electrical. "We simply used industrial objects already in production," wrote Achille Castiglioni, "modifying their functions and seeking new applications."[1] [Achille Castiglioni, 1998].

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Ugo La Pietra, *Recupero e reinvenzione* (1976)

The Reappropriation of the City

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Between 1970 and 1975, the architect, designer, artist, and researcher Ugo La Pietra (b. 1938) focused his attention on marginalized areas at the edges of Milan's outskirts, choosing as his field of inquiry the theme of recovering and reinventing the waste products of consumer society.

La Pietra documented what was happening in those places by producing a long series of photographs – often enriched with his own drawings – that depict self-built villages made of abandoned window frames, sheets of Ondolux, tires, shutters, panels dismantled from a trade-fair stand, wooden planks, and much more. A selection of these materials was be exhibited and published in a small book titled *Recupero e reinvenzione* (Recovery and Reinvention, 1976); they would also form the basis of a half-hour film, *La réappropriation de la ville*, produced by the Centre National d'Art et de Culture Georges Pompidou in 1977.

La Pietra's analysis began with the observation that precisely on the city's margins – where the hierarchical order of power becomes weaker and less efficient – one can discern "the traces of a behavior that expresses an aspiration to reappropriate the environment, through the expression of a repressed desire for creative activity that manifests itself concretely in a certain modification of the territory" [La Pietra, 1977].

The artist identified several interpretive parameters for this phenomenon. The first is *recovery* – that is, the identification of places where consumer society accumulates its waste and residues. Here takes place the so-called "intentional recovery," linked to the discovery of ever-changing available elements that provide new stimuli. The second parameter is *manipulation*, understood as the desire to reclaim, through manual activity, the creative faculties that postwar industrial society had instead atrophied. The third parameter is the *appropriation of space*, consisting of the recovery of a temporarily available area in which one can find, in embryonic form, all the principles that characterize an individual's intervention in shaping their environment – such as the use of land, exploitation of natural resources, paths, boundaries, and so on. The fourth parameter is the *desire for possession*, often coinciding with an intensified sense of private property – legally

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non-existent in these cases, yet asserted and defined through specific constructive elements and signs. This leads to the fifth parameter, *reinvention*, understood as "the use of recovered materials according to a logic freed from preconceived schemes; the invention of new images linked to creations that respond to identified functional needs" [La Pietra, 1976]. According to La Pietra, self-building and improvisation demonstrate "the ability to redeem all the misery in which they struggle," by reclaiming those materials "rejected by consumer society" in order to build "a second country house" made to their own measure – reinventing materials, objects, and refuse "according to a logic that does not belong to any bourgeois 'model' of alternative culture" [La Pietra, 1976].

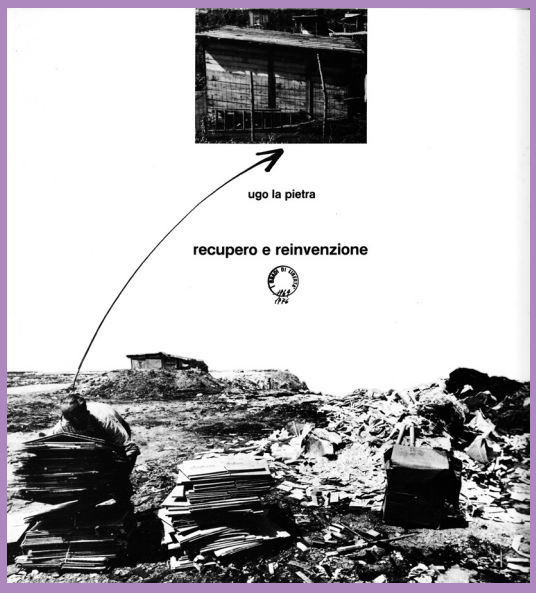
Drawing also on the exhortations of the Situationist International, La Pietra proposed opposing an increasingly totalitarian society through the "liberation of a constructive instinct currently repressed in everyone" [La Pietra, 1976].

"Today," he wrote, "one might ask whether they are the true custodians of a popular culture in architecture. In reality, spontaneous architecture created by skilled hands, not related to the evolution of bourgeois culture but arising as a response to the primary needs of individual survival in relation to the nature of the territory, no longer exists today" [La Pietra, 1976]. Consequently, the examples he described "do not represent a continuity of tradition, but simply demonstrate that the creative process – which has always engaged humankind in the transformation of the environment – has not yet completely come to a halt" [La Pietra, 1976].

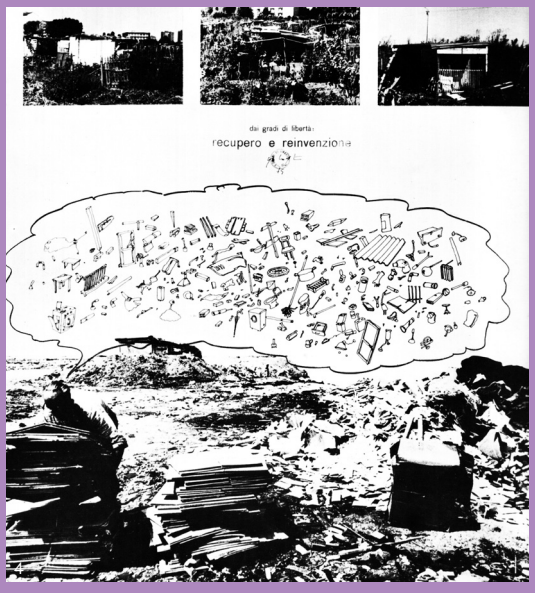
As the critic Enrico Crispolti (1933–2018) pointed out, Ugo La Pietra's work must be understood as part of a critical awakening that breaks away from the habitual mechanisms of the consumerist art circuit, moving beyond its customary elitist audience and thus developing "a new dimension of aesthetic activity, conceived in terms of *cultural cooperation*, in which the practitioner assumes the role of provocateur and stimulator" [La Pietra, 1976]. Within an inhabited space understood – recalling Foucault – as the physical description of power, Ugo La Pietra envisioned interventions and cultural operations – between art and research – capable of *unbalancing* that relationship of power.

These words, concepts, and situations may seem far removed from the concerns of the present. Yet such a reflection on the built environment continues to raise questions and offer provocations. In what ways, for instance, could the very idea of *intentional recovery* today inspire a renewed form of critical engagement in the world of construction, where the degrees of freedom seem increasingly constrained by convention and market pressures?

Fig. 1
Stills from Ugo La Pietra, "La réappropriation de la ville." Film produced by the Centre National d'Art et de Culture Georges Pompidou, Paris, 1977.



Figs. 2–5
Pages from Ugo La Pietra, *Recupero e reinvenzione* (Milan: Edizioni Grafica Mariano, 1976).



il processo creativo si interrompe! la speculazione edilizia si riappropria degli spazi cancellando ciò che di provvisorio era stato costruito.
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Riccardo Dalisi, Workshops in Naples (1970s)

Precision and Approximation

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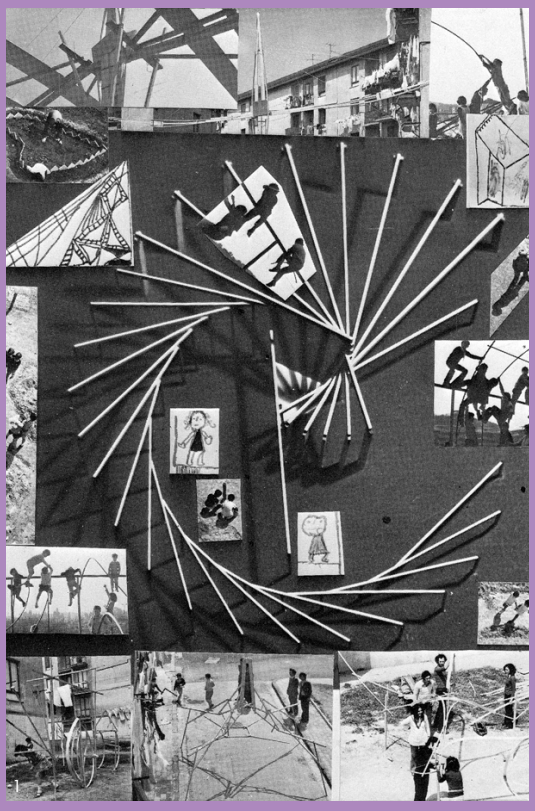
Among the Italian architects who, in the 1970s, most actively explored the semantic redefinition of existing materials, the figure of Riccardo Dalisi (1931–2022) stands out. Based in Naples, Dalisi initially enjoyed success as a "traditional" professional during the 1960s – a career phase even praised by Bruno Zevi – before taking an unexpected turn upon his arrival in Rione Traiano, a neighborhood that had become emblematic of urban decay and isolation.
For this area, in 1969–70, Dalisi designed a kindergarten conceived according to what he called *"generative geometry"*: the plan emerged from a triangle that expanded like a wave or a spiral, triggering a progressive process of spatial formation. Yet a crucial question remained: how could it actually be built? Dalisi had drawn up detailed working drawings – precise yet open to the use of salvaged materials – but everything else was uncertain. Alessandro Mendini, then editor-in-chief of *Casabella*, later recalled that moment: "Riccardo arrived [...] with major novelties: the design for a kindergarten [...] to be brought into being together with the children who would use it, without a contractor, without money, without a license, and without even the exact site where he had the right to build it. He asked me to launch a call in the magazine for building-material producers to donate their scraps – which I did" [Mendini 1975]. The kindergarten was never realized, its utopian premises irreconcilable with reality. Yet the experience became the seed of much that followed. Deeply attentive to pedagogy, Dalisi – who also taught at the university – mobilized an "army" of students and assistants, armed with paper, pens, and improvised materials, to test the power of participation and creativity, inaugurating pioneering workshops with local children. From the reuse of humble and discarded materials came a profusion of outcomes: ephemeral structures for community and religious events, art installations, sculptures, toys, embroideries, and eccentric pieces of furniture.
In doing so, Dalisi was, in a sense, echoing the exercises Johannes Itten and his colleagues assigned in the earliest years of the Bauhaus, when, in the immediate postwar context, the school lacked the means to purchase almost anything. The recovery of objects from dumps or the street was thus a common practice – one that stimulated unforeseen technical



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and creative reactions. As at the Bauhaus, what took place in Traiano was not random bricolage, but a rigorous method combining strands of participation, pedagogy, semiotics, sociology, anthropology, and much more [Neri 2023].

Dalisi called it *tecnica povera* (poor technique, or minimal technology): inspired by poor theatre yet distinct from *Arte Povera*, it championed unpredictability over the rationalist myth of precision. A story – almost a fable – captures both the method and the poetry of these experiences. One day, a little girl picked up a broken clothespin, placed a chickpea on top, and called it *"the chickpea chair."* Enchanted by this whimsical creation, Dalisi brought it to the 1978 Venice Biennale and invited everyone to make a sketch inspired by it. The resulting collection was extraordinary, including works by Superstudio, Giancarlo De Carlo, Aldo Rossi, Enzo Mari, and even Andy Warhol and Joseph Beuys. Through the creative recovery of a banal, broken object, Dalisi brought famous artists into dialogue with childlike imagination, subverting the very notions of author and artwork. Years later, he dreamed of transforming that small sculpture into a series of urban monuments – an unrealized project [Neri 2023].

Dalisi's trajectory is clearly light-years away from today's concept and application of upcycling. The reuse of waste materials was not then a programmatic principle, but rather a necessity imposed by the economic and social context. Yet this very condition – constraint turned opportunity – became a fertile stimulus for a form of design that was both intellectual and popular.

Precisely in its implicit, conditional character, Dalisi's *tecnica povera* reaffirmed lessons that resonate powerfully in many contemporary practices, including in Italy: "Refined technique does not represent the only level worthy of attention, nor the main focus of the debate on technology. It conforms to the selective and perfectionist criteria of our society. *Minimal technology*, on the other hand, corresponds to the ideology of the creative value of the community.

According to this ideology, technique is a specifically human dimension and, more generally, coincides with the ability to dominate the objective world – transforming limits into tools." [Dalisi 1972].
The most poignant and poetic image of Dalisi's experience in Traiano is that of children playing among the unfinished pillars of the local church, swinging on the exposed rebar as if they were in a playground. Once again, an act of appropriation and re-signification of an abandoned, existing reality.

Fig. 1
Riccardo Dalisi, Collage with the design for a kindergarten in the Traiano district, Naples, early 1970s. Courtesy Archivio Riccardo Dalisi, MiC – Direzione Generale Archivi – Soprintendenza archivistica e bibliografica della Campania.

Figs. 2–3
Children playing in the abandoned construction site of the church in the Traiano district, Naples. Courtesy Archivio Riccardo Dalisi, MiC – Direzione Generale Archivi – Soprintendenza Archivistica e Bibliografica della Campania.

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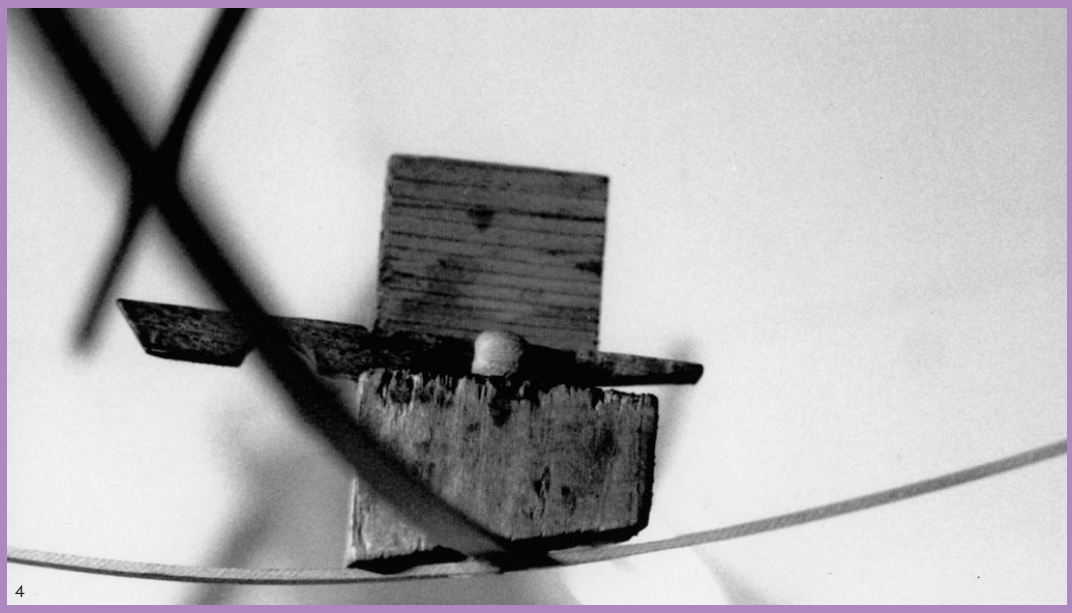

Fig. 4
Riccardo Dalisi, *Chickpea Chair*, 1978, Courtesy Archivio Riccardo Dalisi, MiC – Direzione Generale Archivi – Soprintendenza Archivistica e Bibliografica della Campania.

Fig. 5
Riccardo Dalisi, *Urban Sculpture*, 2013. Wood, plastic and acrylic, 10 × 3 × 5 cm. © Fulvio Cutolo / Courtesy Archivio Riccardo Dalisi.

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Chapter 4

Anachronistic Upcycling: Spolia, Elements of Architecture, Memory, and History as Design Materials

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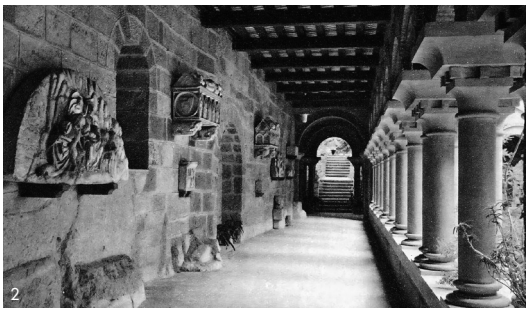
Upcycling transcends simple reuse; it involves creating added value through the act of reusing.[1] Although the concept is straightforward to articulate, its analysis proves to be complicated, and implementing it in practice is even harder. A persistent challenge in the field is the lack of a shared vocabulary to articulate the role of reuse in architectural

1 Upcycling is the process of transforming by-products, waste materials, or useless or unwanted products into new materials or products perceived to be of greater quality, such as those with artistic or environmental value. It is often known as creative reuse, and as the opposite of downcycling. The terms "upcycling" and "downcycling" were coined by Thornton Kay and Reiner Pliz in a text on fashion published in *SalvoNews*, no. 99 (October 1994). The first book to examine the idea was Gunter Pauli's *Upcycling: The Road to Zero Emissions* (Sheffield: Greenleaf Publishing, 1998). In architecture, the first book to address the topic is Daniel Stockhammer, ed., *Upcycling. Reuse and Repurposing as a Design Principle in* Architecture (Zürich: Triest, 2021). It is also worth highlighting Simone Ferracina, *Ecologies of Inception. Design Potentials on a Warming Planet* (London: Routledge, 2022); for the connection with memory: Sanem Odabaşı, *Fashion, Upcycling, and Memory. A Practice-Based Approach* (London: Routledge, 2024). On "recycling" in architectural design, see Sara Marini, Giovanni Corbellini, eds., *Recycled Theory: Dizionario Illustrato / Illustrated Dictionary* (Macerata: Quodlibet, 2016); Francesca Zanotto, *Circular Architecture. A Design Ideology*, (Siracusa: Lettera Ventidue, 2020).



design and, more broadly, within cultural history.[2] If this applies to reuse, it becomes even more challenging when dealing with upcycling.

What is needed for reuse to become upcycling? How can architects enhance value through reuse in architecture? Examining specific practices can help shed light on these questions, as well as on the persistent absence of precise terminology to frame the debate. For example, the ancient practice of spolia represents the reuse of value. It can thus be viewed as an early form of upcycling, although it is actually a prochronism since it took place before the term 'upcycling' was coined within the broader context of reuse. Spolia has been a constant throughout the history of architecture and across civilisations'. There is an anthropological impulse in the appropriation of existing material elements to produce new art and architecture. It is as if their placement in a privileged position ensured their full symbolic appropriation, extending beyond their material substance or functional value. The removal of spolia from its original setting destroys "the ancient context," so the spoliated

2 Giovanna Targia, "Reusing the Antique: Research in the 19th and 20th centuries," in eds. Salvatore Settis with Anna Anguissola, *Recycling Beauty* (Milan: Fondazione Prada, 2022), 325.

Fig. 1
The use of *spolia*, copied and cast elements, combined with innovative designs in John Soane's house in Lincoln's Inn Fields, London, during the early nineteenth century. © Josep-Maria Garcia-Fuentes.

Fig. 2
A postcard of the new cloister of Montserrat, in Spain, built by Josep Puig i Cadafalch in the 1920s, including the use of spolia grafted into the new design. © Josep-Maria Garcia-Fuentes.

Fig. 3
The Canongate Wall at the Scottish Parliament, in Edinburgh, is made up of a variety of Scottish stones that hold geological or historical significance. Some of these are inscribed with quotes chosen by the people of Scotland and grafted into the new parliament building designed by Enric Miralles and Benedetta Tagliabue, EMBT. © Scottish Parliament.

piece must find "a new meaning, a new significance in a new context."[3] For this reason, the metaphor of grafting was often used in the late nineteenth century to describe spolia, or the reuse of antiquities, in the context of debates surrounding Darwinism.[4] Grafting is the act of joining two distinct living plants, often one old and one new, so that they grow together and thrive as a single, unified organism.

Reuse and spolia as subjects sit at the intersection of disciplines. Archaeologists and art historians have led research on them. The metaphor of grafting, for example, originated in nineteenth-century art history. In this context, the German term Nachleben was related but not identical to the notions of "afterlife" and "survival," which "indicates an interpretative model founded on continuity, as opposed to a dualistic logic that emphasises discontinuity and contrasts the excellence of Antiquity against the decline of later epochs."[5] Historians such as Aby Warburg explored these ideas to develop an innovative approach to the study of art. For him, as for historians more broadly, the interest in spolia lay in the new context, and in asking "in what sense the use of spolia was actually the appropriation of Antiquity, or simple recycling, or something else altogether." [6] For the art historian and the historian, thus, spolia is a piece "received from Antiquity." For an archaeologist, by contrast, the focus is on spolia as "a piece that was removed from Antiquity"[7] (Figs. 1, 2, 3).

What is spolia for the architect? What are its particularities within architecture? How might architectural spolia be discussed today – and more specifically, as a precursor or upcycling? The connection between spolia and modernity has been largely overlooked in architectural scholarship. Although, as Arnold Esch has noted, research on

3 Arnold Esch, "On the Reuse of Antiquity: The Perspectives of the Archaeologist and of the Historian," in eds. Dale Kinney, Richard Brilliant, *Reuse Value: Spolia and Appropriation in Art and Architecture from Constantine to Sherrie Lavine* (London: Routledge, 2011), 14.

4 Targia, "Reusing the Antique", 325.

5 Ibid.

6 Ibid.

7 Esch, "On the Reuse of Antiquity", 14.

spolia began to gain momentum in the 1950s, and since the 1980s, "it has increased at an almost explosive rate."[8] This is a trajectory that aligns with the rise of ecological awareness and postmodern debates, which paved the way for defining circular construction, first as a response to overcome the limits of growth and more recently as a strategy to confront the climate emergency.

The practice of spolia can still be linked to understanding architecture through its fundamental components or elements. Spolia refers to a fragment, component, or element of a building that has been reused because of its unique value, and through this act, it has gained additional value. This establishes a meaningful connection for reflecting on contemporary upcycling, as well as in relation to broad architectural debates, treatises, and texts from various eras, civilisations, and regions of the world. Examples include, for instance, *De Architettura* (first century BCE), *The Hindu Architecture* (sixth–seventh century CE), the *Yingzao Fashi* (1103), Henry Wolton's *Elements of Architecture* (1624), or Sigfried Giedion's *Mechanisation Takes Command* (1948), among many other references, including also magazines and advertisements.[9] Ultimately, they can contribute to the study of spolia and modern upcycling practices in architecture (Figs. 4, 5, 6).

This chapter explores the practice of *spolia*, expanding it to encompass architectural thinking through its elements, and in close connection to the memory embedded in both spolia and architectural fragments, as well as to the understanding of history itself as a design material in twentieth and twenty-first-century Italian architecture. It reinterprets these practices as a *prochronism* of contemporary upcycling. Through selected works by Piero Portaluppi, Luigi Caccia Dominioni, and Carlo Scarpa, the chapter demonstrates how spolia and existing buildings can be upcycled through design authorship, beyond mere symbolic or ideological purposes. By transforming fragments into carriers of renewed meaning and cultural value, and by using history itself

8 Ibid., 13.

9 Rem Koolhaas, "library: elements in treatises," in *Fundamentals Catalogue, 14th International Architecture Exhibition* (Venice: Marsilio, La Biennale di Venezia, 2014), 198–199.

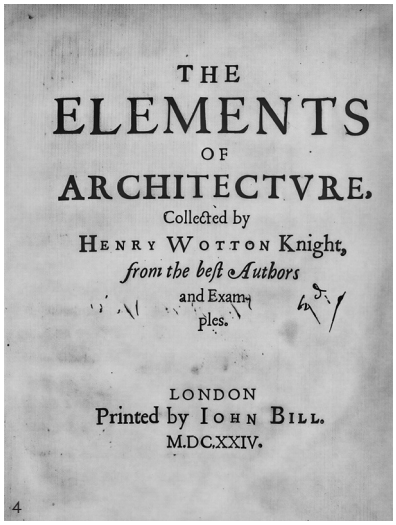
as a design material, these works anticipate postmodern debates and foreshadow ideas of building circularity and Design for Disassembly. The rise of postmodern concerns about authenticity and historical interpretation further raises questions of reversibility, explored by architects such as Marco Dezzi Bardeschi and Francesco Venezia, as well as Superstudio. Lastly, Rem Koolhaas' Biennale exhibition, *Elements of Architecture,* alongside his ongoing focus on heritage and preservation, and his Italian projects, broadens the link between spolia and architectural elements, further developing the idea of thinking of architecture as a continuous process of upcycling its constituent elements and, by extension, entire buildings.

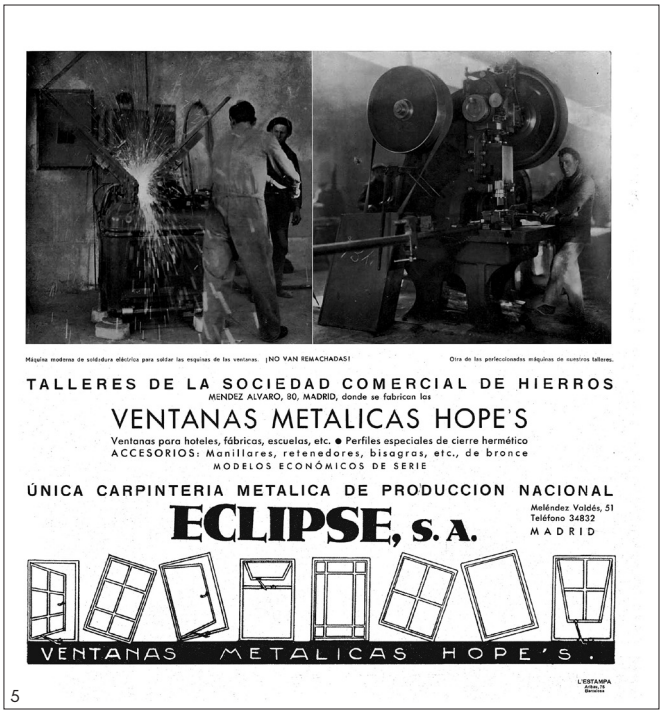
This analysis of twentieth and twenty-first-century Italian architectural experiences highlights the deep connection between spolia, the practice of thinking architecture through its elements, and upcycling, while emphasising the importance of history and memory as active design materials in relation to upcycling. Within this context, Italian modernity and postmodernism, often perceived as unusual, are instead revealed as a rich and pioneering example of anachronistic upcycling, where design practices create value beyond mere reuse and ensure building circularity and future survival.

History and Memory as Design Material

The history of twentieth-century architecture is rich with examples of spolia, although these have often been overlooked in architectural histories. In modern architectural debates, spolia has usually been dismissed as either historical forgery or as evidence of cultural stagnation, reflecting designs perceived as lacking innovation and creativity. When addressed with appreciation, modern instances of spolia are usually discussed in terms of their symbolic mobilisation within art history or their role in nationalist agendas, particularly in the context of the reconstruction or restoration of monumental buildings. Nevertheless, the use of modern spolia in twentieth-century architecture must be conceptualised as a precedent to upcycling.

Modern architects have added value to reused architectural elements, transforming these fragments from the past into treasured design





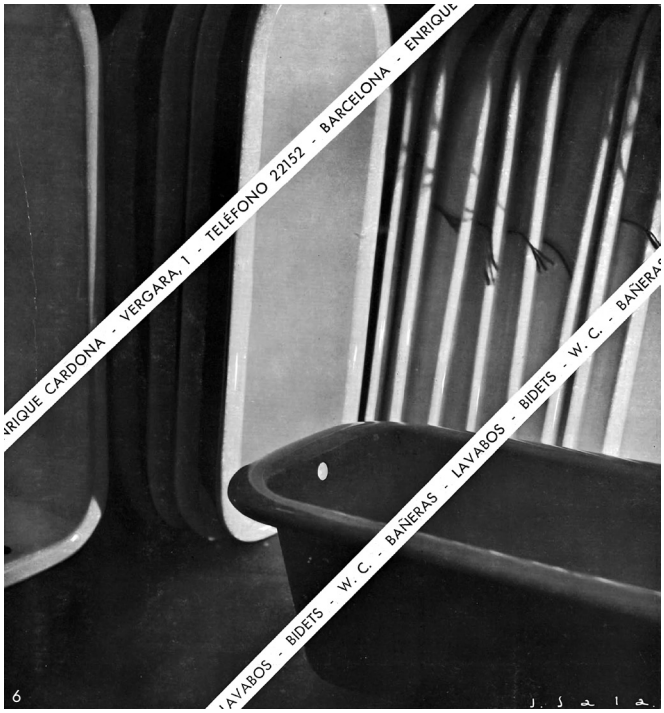


Fig. 4
Frontispiece page of Henry Wotton's *The Elements of Architecture* (London: Iohn Bill, 1624). Public Domain.

Fig. 5
Advertisement of windows featured in issue number 10 of the magazine *A.C. Documentos de Actividad Contemporánea*, published by the GATEPAC in 1933. Public Domain.

Fig. 6
Advertisement of toilet elements featured in issue number 1 of the magazine *A.C. Documentos de Actividad Contemporánea*, published by the GATEPAC in 1931. Public Domain.

materials rich with memories, whose significance is further enhanced by their design. History thus becomes a design material. The architect creatively works with history, reclaimed elements, old and new materials, existing buildings, and the memories associated with them to produce a new outcome of greater value. Italy is a privileged observatory for studying these forms of anachronistic upcycling. Its environment is filled with buildings and artworks that have been constantly expanded, transformed, demolished, and creatively curated. Elements, whether spoliated or not, have continually been given new context or significance within new structures, and materials often carry or transform memories within these works. This practice is rooted in design, craftsmanship, and resourcefulness, and has been maintained by artisans, builders, and architects throughout centuries and into the twentieth century. Piero Portaluppi provides a compelling starting point for this exploration. The design continuity between his new buildings and his interventions on old and existing ones is striking, as he "makes distinct souls coexist and blend."[10] His numerous interventions in the Casa degli Atellani, which eventually became his own home, illustrate the architect's approach to spolia and its continuity before and after World War II.

"Restorations and Minor Restorations"

Portaluppi first received the commission in 1919, when Senator Ettore Conti purchased a neglected structure to transform it into his home. The building was believed to have belonged to Giacomotto di Atella, Ludovico il Moro's squire, and was situated next to the renowned church of Santa Maria delle Grazie, which was then undergoing restoration by Portaluppi, funded by Conti. The structure, dating back to the fifteenth century, was famously described by Conti's wife as a dump, which clearly shows the low value of the historic fabric before Portaluppi's intervention. The architect himself stated in a letter to the superintendent of monuments that the building "for sure has

10 Guido Zucconi, "Stili e storia: il confronto con l'architettura del passato," in eds. Luca Molinari, Fondazione Piero Portaluppi, *Piero Portaluppi. Linea errante nell'architettura del Novecento* (Milan: Skira, 2002), 271.

no historical or archaeological value," but it has "some paintings and architectural traces" and "a non-despicable local flavour."[11]

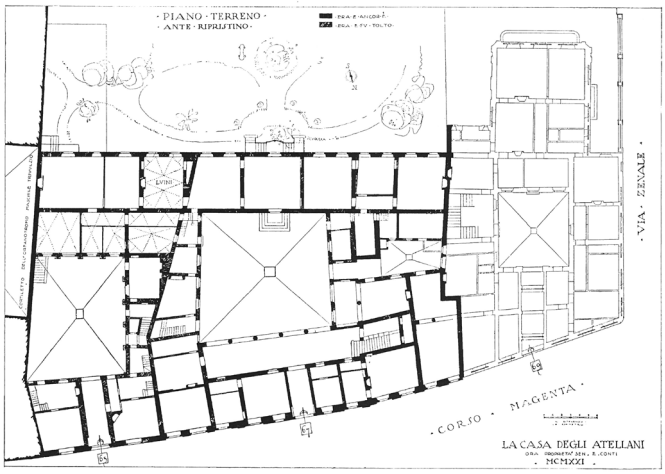
The initial intervention in 1922 had a radical impact on the entire building. Portaluppi researched and published a small book discussing the urban development of the building, its history, and its cherished elements as a preparation for the construction works.[12] These include architectural elements from the courtyards and façades that were retained as valuable, as well as the frescoes in the lunettes of an interior hall by the Renaissance painter Bernardino Luini, which were removed from the building in 1902 for conservation purposes.[13] The publication also presented Portaluppi's project for the building. The plan involved the comprehensive redesign and integration of the two courtyards, the reorganisation and transformation of the interior spaces, the creation of new designs for the front and rear façades, as well as the landscaping of a new garden (Fig. 7). To this end, historic architectural elements such as columns, stone window frames, and arcades were repurposed and repositioned, combined with newly carved stone details inspired by various historical periods and by the tastes of the new Conti owners. The works also uncovered historical features and frescoes hidden within the building's structure, greatly enriching it and significantly increasing its value, including its historical significance and depth. After World War II, the architect undertook a second intervention to rebuild the sections destroyed, which further strengthened the fabric's historical memory and value.

Portaluppi's extensive and invasive intervention significantly altered the building's structure and appearance. It is fascinating to note that it was only in the 1940s that the building was declared a national monument, "only thanks to the perseverance of the influential owner and the architect's inventive interventions" and its proximity to

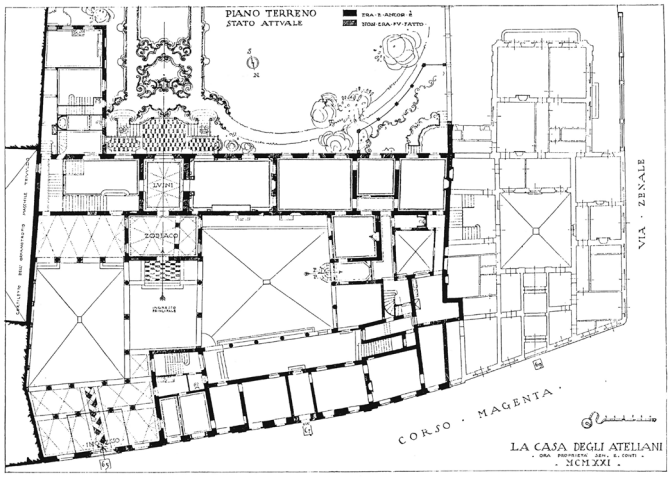
11 Letter from Portaluppi to Augusto Brusconi, Superintendent to Monuments in the Region of Lombardy, October 26, 1920, in ASBAAM-b T/7391 Letters.

12 Piero Portaluppi, *La Casa degli Atellani in Milano* (Milan: Casa Editrice Bestetti & Tumminelli, 1922).

13 The frescoes are now exhibited in the rooms of the Museum at the Castello Sforzesco.



PIANTA DELLA CASA ATELLANA PRIMA DEI RESTAURI - PIANO TERRENO.



PIANTA DELLA CASA ATELLANA DOPO I RESTAURI - PIANO TERRENO.

Fig. 7
The layout of Casa degli Ateliani before and after the initial intervention by Piero Portaluppi in the early 1920s, as published by the architect himself. The differences between the two stages are as significant and obvious as the blending of new and old architectures and elements.
© Josep-Maria Garcia-Fuentes.

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Santa Maria delle Grazie[14]. Oddly, in one of Portaluppi's letters to the Superintendency of Monuments from 1945, he states that "the Casa degli Atellani […] has been designated a national monument because of its unique Bramantesque cloister and its frescoes in the ceiling of the rooms facing the garden, which are attributed […] to Bernardino Luini."[15] These are the very courtyards that the architect extensively

14 Zucconi, "Stili e storia", 271.

15 Letter from Portaluppi to the Superintendency of Monuments in the Region of Lombardy, November 17, 1945, in ASBAAM-b T/7391 Letters.

transformed, and the same interior space he thoroughly reworked, resulting in the addition of two lunettes by Luini through his imaginative intervention. Ultimately, the building's recognition as a national monument highlights the added value brought by Portaluppi's resourceful upcycling of the existing structure.

The works by Portaluppi at the Casa degli Atellani from 1919 to 1952 cannot be considered a conservation, restoration, or reconstruction project. The idea of spolia resonates in the works but differs from its historical practice. In this context, spolia is not employed for its symbolism or ideological connotations, but rather for its age value, the idealised memories that are reshaped and associated with it, and for its aesthetic appeal. Still, it is not easy to distinguish between new elements and materials and those that are old. The works are a complex mix in which restoration becomes inseparable from new design, combining existing and new elements without scruples to transform the entire fabric completely into a higher-value architectural building. The process is possible thanks to the architect's creative work and the relaxation of heritage preservation regulations, as revealed in the correspondence with the Superintendency of Monuments at the beginning of the works. In this sense, the personal annotations by Portaluppi reveal that he invested six thousand hours of work in the designs for the Casa degli Atellani, as compared to just one thousand hours spent in the restoration of Santa Maria delle Grazie across the street.[16]

It is precisely this relaxation of heritage regulations for buildings not listed with the highest level of protection that allows Portaluppi to explore an inventive and creative transformation of the existing structure. His approach is not that of a restorer or preservationist, but one closer to the work of an architect who enjoys playing with design and the cultural continuum of a historic building playfully and imaginatively, yet with rigour. The outcome of this process raises questions about authenticity and authorship, as Portaluppi's authorship is as undeniable as that of the previous architects in the buildings' history. The architect's approach to the project is aware of this continuum in the

16 Zucconi, "Stili e storia", 271.

building and works towards increasing and interpreting its values. It is a risky process in which memory and history become a design material, and the result is something completely new and of higher value than the existing fabric. It is a true prochronism of current upcycling practices applied at the building scale.

Portaluppi's inventive approach at the Casa degli Atellani is not an exception. Blurring the boundaries between the new and the old, and entirely transforming an ancient structure through redesign, has been a constant theme throughout his work. We can see echoes and resonances of this approach in his projects for the Teatro alla Scala, the Pinacoteca di Brera, and the Ospedale Maggiore, among others.[17] Portaluppi himself classified these works under the label "restorations and minor restoration works" – *restauro e restauretti* – in his meticulously organised professional archive. The title reveals the complex approach, simultaneously serious and humorous, that he used to develop these minor restoration works. In these, he explored new and more effective ways of dealing with history, existing architectural elements and materials, and the memories associated with them.

This blurring of boundaries between restoration, preservation, and design was common among most architects working in postwar Italy, a time when the country was facing reconstruction from the abundant rubble. The architectural and cultural debate was characterised by architects discussing the role of continuity versus innovation, with Ernesto Nathan Rogers promoting the idea of "environmental pre-existences" – *preesistenze ambientali* – integrating modern design within its historical context. For Rogers, new architectural design must respond to the historical, cultural, and physical context of a place, integrating the past without imitation to ensure continuity and a sense of meaning. In this way, continuity acts as a kind of antidote to radicalism, including architectural modernism.[18] Although Portaluppi belonged to an older generation of architects, his postwar intervention

17 See for example Zucconi, "Stili e storia", 273–277.

18 Luca Molinari, "*Continuità*: a response to identity crises. Ernesto Nathan Rogers and Italian architectural culture after 1945," PhD dissertation (Delft University, 2008).

in Casa degli Atellani resonates with the spirit of this debate, while it is carried out with the freedom of someone who has reached maturity.

Luigi Caccia Dominioni, a former student of Portaluppi, graduated in architecture at the Politecnico di Milano in 1936. As a young architect, his early postwar interventions provide valuable insights into the evolving use of modern spolia and design as a form of upcycling prochronism among the new generation of architects. While Portaluppi explored the reuse of old elements, freely reassembling them within their original functions to create an entirely new building with an original layout, Caccia Dominioni pushes this approach further by actively transforming existing elements rather than merely reusing them. In his works, upcycling occurs at both the scale of individual architectural elements and the scale of the building.

In designing his new family home, facing the Basilica of Sant'Ambrogio, Caccia built an entirely new building, as nothing could be salvaged from the rubble except for four stone seating stools. He placed these on the inner sides of the new main gate, creating a subtle yet meaningful gesture that went beyond simple reuse to signal continuity with the former home and preserve its memory (Figs. 8, 9A, 9B, 9C, 9D). Around the same time, he also worked on reconstructing the nearby Palazzo Prospero Visconti. Initially built in 1589, the palazzo was destroyed during the war, with only its main iconic façade remaining standing. Using this surviving element, he designed a new residential apartment building that reinterprets the footprint, structure, and elevation of the former building. To blur the distinction between old and new, Caccia repurposed recovered old carved stone frames to create an original entrance hall featuring niches and architectural elements that had never existed before. The interplay of preservation and invention continued on the *piano nobile*, where salvaged historic doors were reinstalled, allowing the Renaissance façade to resonate within the newly defined representative spaces of the building, while creating a sense of historical depth and multiple memories embedded into the new building. The building's rear elevation is entirely new and designed in Caccia's distinctive contemporary style. Through this practice, old and reused elements increase their value.

Fig. 8
The main entrance gate of Caccia Dominioni's family home facing Sant'Ambrogio in Milan, reconstructed in the late 1940s, which features four seating threshold stones salvaged from the previous war-damaged building. © Jacopo Valentini.

Figs. 9A–9B–9C–9D
A detailed view of the four old seating stone stools positioned as threshold stones by Caccia Dominioni on the inner sides of the new main gate of the family home built in the late 1940s. This subtle gesture went beyond simple reuse, signalling continuity with the previous home and helping to preserve its memory. © Jacopo Valentini.

This prochronism of upcycling architectural elements is further developed in Caccia Dominioni's 1957 intervention at Villa San Valerio, where he redesigns interior spaces that had evolved through successive transformations from 1640 to the eighteenth century. Caccia reorganises the layout to meet postwar standards of living, subdividing frescoed rooms into smaller spaces and introducing new circulation areas and bathrooms. The project skilfully negotiates the relationship with the existing fabric, making the new additions "somewhat ambiguous" in their poetry, "not easily distinguishable from the original parts of the historic construction."[19] In fact, some architectural elements, such as the unique doors in the new spaces, are crafted from the transformations of the existing ones. Although they appear old, they have been subtly altered and adapted by the architect in ways that blur the line between preservation and invention "without a loss of continuity"[20] (Fig. 10).

Caccia Dominioni's upcycling of doors at Villa San Valerio reveals a clear departure from both the typical modern and historical approaches to spolia. The spoliated elements are not merely preserved, reused or embedded in prominent positions for their historical, artistic or memory significance. Instead, they are thoroughly modified and transformed into entirely new elements, enriched with additional layers of meaning. These reimagined elements gain further value through the act of design and the authorship imprint. Their integration within the overall building design is so seamless that it often becomes impossible to distinguish between the old and the newly created. Both the spoliated element and the new intervention are grafted onto each other. The outcome is upcycling: the metamorphosis of existing elements to enhance their multiple values.

An Innovative Restoration

This practice of modern spolia, as explored by architects such as Portaluppi and Caccia Dominioni, was far from an exception in post-war

19 Gianluca Gelmini, "Luigi Caccia Dominioni. Villa San Valerio," in *Domus*, no. 984 (October 2014), 96–98.

20 Ibid., 98.

Italy. On the contrary, it represented a widespread approach adopted and interpreted by many architects with their own distinct nuances. It stands as a defining trait of Italian modern architecture, which Cino Zucchi defines as an "anomalous modernity" characterised by "a capacity for innovation and at the same time for an interpretation of earlier states. Not a posteriori formal adaptation in respect of the existing, but instead 'grafts' able to act effectively and with sensitivity in stratified urban contexts".[21]

Although Zucchi discusses the field of architectural design broadly, his insight becomes even more compelling when explicitly applied to the practice of modern spolia. Unlike traditional spolia, Italian anomalous modern spolia evolves towards the idea of grafting. This conceptual move, as Zucchi writes for architectural design, "presupposes a wound in the host organism, but also a profound knowledge of its physiology; and of the implicit consequences of transforming an existing state, often seen in an illusory manner as being second nature."[22] In this sense, its outcome is not a nostalgic gesture but a critical and creative act that generates something entirely new. Rooted in history and the memories embedded in its materials, yet irreducible to it.

It is possible to analyse the new Italian architectural production during the second half of the twentieth century as a metamorphosis and a grafting, as Zucchi emphasises. There are numerous projects in which architects have explored the use of this anomalous Italian modern spolia, especially in their interventions in museums, as well as on other buildings, from Rogers and the BBPR at the Castello Sforzesco, including Ignazio Gardella, Franco Albini, Ludovico Quaroni, Giuseppe Samonà, and Egle Trincanato, to Carlo Scarpa and many others, such as artists like Mariano Fortuny and Henriette Negrín.[23] Each of them approaches this in their own unique way.

21 Cino Zucchi, *Innesti. Grafting. Vol. 1. Grafting. The new as metamorphosis* (Venice: La Biennale di Venezia, 14 Mostra Internazionale di Architettura, Marsilio, 2014), 35.

22 Ibid., 36.

23 Josep-Maria Garcia-Fuentes, "Back to the Future. Fortuny's search for lost time in Venice," in Fabrizia Berlingeri, ed., *Exposed Praxis. The Atelier and Other Crypto-exhibitions of Architectural Poetics and Intentions* (Milan: Mimesis, forthcoming).

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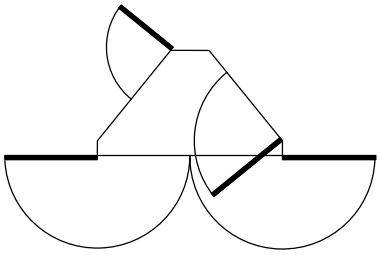

Carlo Scarpa's work is particularly relevant for further deepening this inquiry. As Manfredo Tafuri observes, there is something that "distinctly sets Scarpa's stance apart from the 'reluctant historicism' or the anguished ambiguity characteristic of Rogers, Gardella, Quaroni, or their closest disciples."[24] This distinctive quality is key to understanding how upcycling operates in architecture, as it is directly linked to the creation of value. According to Tafuri, Scarpa's uniqueness lies in the fact that "irony also extends to history, regarded as a material for design." In other words, Scarpa "weaves a private, metaphor-laden dialogue with history," fostering "a relationship with the ancient that is both playful and thoughtful."[25]

From his early works, Scarpa developed a distinctive attitude that underpins both his design philosophy and his approach to existing architectural elements and buildings. In his works, both entire buildings and individual architectural elements are reused to achieve their upcycling, as they gain additional new layers of value across different scales. On one hand, Scarpa sources materials locally, often enhancing the value of craftsmanship and artisans' work through his inventive use of materials, such as in the unique insertions of Murano glass fragments into some of his terrazzo pavements. In other cases, Scarpa

24 Manfredo Tafuri, *Storia dell'architettura italiana, 1944–1985* (Turin: Einaudi, 1982), 141.

25 Ibid.

Fig. 10
The arrangement of painted wooden doors, designed by Caccia Dominioni in the 1950s, which involves upcycling previous doors for Villa San Valerio. The image includes a photograph and a plan diagram. © Gianluca Gelmini / CN10A.

Fig. 11
Photograph captured by Paolo Monti in 1963, illustrating the recently completed garden of the Palazzo Querini Stampalia, which incorporates various ancient spolia grafted into Scarpa's design. © Paolo Monti, Creative Commons.


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reuses old materials, not only fragments traditionally associated with spolia, as seen in the garden of the Querini Stampalia, but also building materials, rubble, and other remnants, as in his interventions at Castelvecchio (Fig. 11). These are creatively grafted into new projects, reimagining their potential through precise detailing and refined construction. In doing so, Scarpa not only amplifies their material and symbolic value but also preserves the layered memories they carry.

Scarpa's interventions preserve the existing historical layers of the building while reinterpreting the entire structure, which is often repurposed for new uses and always enriched through his authorship. In doing so, as in Canova's plaster cast gallery in Possagno, the value of the building is not only retained but significantly deepened and expanded. The original construction is, in effect, grafted with Scarpa's project to become something else entirely new. The result is neither preservation, reuse, nor reconstruction, but rather a transformation or metamorphosis. An architectural reinvention that synthesises the existing and the new project. These complex design strategies are continually refined throughout Scarpa's work, from the Olivetti showroom and the Querini Stampalia Foundation in Venice to the Castelvecchio Museum in Verona. The latter was developed over an extended period, from 1956 to 1974, and illustrates Scarpa's design approach well. Originally constructed between 1354 and 1356, the building underwent numerous modifications over the centuries, including a restoration reflecting

a medieval idealisation in 1924, when it became a museum. Heavily damaged during World War II in 1945, the castle's ruins became the focus of a significant reconstruction effort beginning in 1956, when Scarpa was commissioned for the project under the supervision of Piero Gazzola, who was then acting as the monument's superintendent.

In Castelvecchio, Scarpa approaches the work as a sophisticated combination of preservation, restoration, and museum design over the course of nearly twenty years. His intervention involves the detailed study and transformation of the ruined structure, including the repositioning and reinterpretation of historical elements such as tracery windows and stone-carved doors, as well as the insertion of new elements like staircases, toilets, and modern technical systems. Through these efforts, Scarpa provides a complete revalorisation and reinterpretation of the building. The project is undertaken in close collaboration with craftsmen, site managers, and heritage and political authorities, resulting in the complete architectural reinvention and metamorphosis of the old structure into a museum of exceptional cultural and architectural value.

Throughout the design and construction process, practical needs often catalyse profound acts of transformation and reinterpretation, leading to the multiplication and enhancement of existing values. A revealing example of this approach was the decision to lift the old stone slabs of the ground-floor pavement to make room for the necessary modern installations. When Scarpa discovered the texture and qualities of the reverse side of these slabs, he chose to place them vertically along the wall beneath the sequence of arches that divided the spaces. In this way, "the floor slab is converted into a wall-facing element whose irregularly pitched surface evokes the memory of its being extracted from the quarry in Fane, Verona,"[26] thereby telling a story. "The raising of the stone is a conversion that could be seen as a metamorphic rebirth of the element, renewing our capacity to see

26 Federica Goffi, "Sited-Memory. Peripatetic Storytelling at the Castelvecchio Museum in Verona," in *Joelho – Journal of Architectural Culture*, no. 13 (2022), 91.

Fig. 12
Ground floor view of Castelvecchio's construction site in 1958, during the works by Carlo Scarpa. Archivio Carlo Scarpa, Museo di Castelvecchio, Musei Civici di Verona, CS007025. © Castelvecchio Museum. Regione Veneto.

and participate in the narration of history."[27] The new pavement in the space is sourced from the same quarry and, like the repurposed original slabs, is laid with its surface turned "upside down to reveal the side with the steel markings [from the extraction], a side that normally would be hidden."[28] The carefully designed joints between new and reused materials are defined by concrete bands inscribed with parallel lines, "inspired by the markings made by the steel thread on the prune stone."[29] These bands also serve a practical role during construction, helping to organise the labour on site. As such, one might say they "had an ethical function in setting and limiting the amount of work to be accomplished in a day"[30] (Fig. 12).

Scarpa's unique role as architect, restorer, and curator is also evident in the few references and interviews that have reached us, as he never published any texts outlining his ideas. A careful reading of these sources reveals that Scarpa was far from isolated; instead, he was deeply attuned to broader contemporary debates. The rare transcription of a lecture he delivered at the IUAV in 1964 offers insight into his sophisticated thinking, weaving together seemingly secondary topics, from

27 Ibid., 91.

28 Ibid., 94–95.

29 Ibid., 95.

30 Ibid., 95–96.

anthropological drives in architecture and furnishing, to curation, restoration, and reuse, as well as reflections on modernity, simplification in art and architecture, and the role of decoration and ornament.31 Scarpa's singular way of thinking resonates strongly with the writings of Richard Neutra, particularly his *Survival Through Design*[32], which was translated into Italian in 1956.[33]

The connection between Scarpa and Neutra is indeed significant, though it has been largely overlooked. Their first meaningful encounter occurs in 1948, when a forty-two-year-old Scarpa designs the flyer for Neutra's lecture in Venice. This is the first time he lectures in Venice, and during the visit, Neutra becomes intensely interested in Egle Trincanato's recent publication on non-monumental historical Venetian buildings. He even suggests in the opening words of his lecture that the city's old, derelict houses could become "still excellent accommodations […] if they were somewhat emptied and modernised, made efficient with modern necessities." He refers to the idea as an "innovative restoration"[34] that could serve as a powerful example to the world in facing global challenges and demonstrate "what modern design can create."[35] After the lecture, Neutra further explores the development of an actual Venetian project as an opportunity to reflect on transformation and metamorphosis not just as simple design strategies, but as vital tools for the renewal and survival of cities, existing architecture, and ultimately, humankind. His ideas were understood by only a few at the

31 Carlo Scarpa, *Prendersi cura* (Milan: Lotus, 2024).

32 Richard Neutra, *Survival Through Design* (Oxford: Oxford University Press, 1954).

33 Richard Neutra, *Progettare per sopravvivere* (Milan: Edizioni della Comunità, 1956).

34 Corrado Balistreri, "Neutra, Wright e Le Corbusier a Venezia," in ed. Emiliano Balistreri, *Le Corbusier, Neutra, Scarpa e Wright. Architetti modernisti a Venezia. Documenti, progetti, scritti, e testimonianze dall'archivio di Egle Trincanato* (Rome: Aracne, 2015), 25.

35 Richard Neutra, "Neutra e Venezia. Conferenza di Richard J. Neutra," in *Domus*, no. 233 (February 1949), 2; and Richard Neutra, "Conferenza," in ed. Emiliano Balistreri, Le Corbusier, *Neutra, Scarpa e Wright. Architetti modernisti a Venezia. Documenti, progetti, scritti, e testimonianze dall'archivio di Egle Trincanato* (Rome: Aracne, 2015), 30.

time, such as Gio Ponti, who published some of Neutra's reflections in Domus[36], and Carlo Scarpa, whose unique and boundary-pushing approach to working with existing buildings seems to echo and develop Neutra's idea of "innovative restoration"[37] in a clear expression of what might be called a prochronistic form of upcycling.

Ethics, Reversibility, and Architectural Design

Scarpa's innovative works interpret historic buildings both rigorously and playfully, focusing on the joints between old and new building elements, and engaging with anomalous modern spolia and the grafting of old buildings. It anticipates the contemporary idea of upcycling and foreshadows postmodern debates. Indeed, Scarpa's work and his collaboration with Piero Gazzola also made meaningful contributions to broader architectural and preservation discussions in postwar Italy.

Gazzola was the chairman of the 1964 Venice Charter. Alongside Roberto Pane and Cesare Brandi, he participated in discussions and in writing with an international team of contributors, advocating a shift from stylistic restoration towards conservation, emphasising authenticity, minimal intervention, and respect for the original fabric. This ethical commitment to heritage and existing buildings ultimately led him to promote a clear distinction between old and new, as well as the reversibility of restoration measures. It is worth noting that the emergence of reversibility in preservation and conservation debates paralleled the rise and development of Design for Disassembly worldwide, including in Italy. Both are generally aligned with the early and growing contemporary environmental movement that began in the early 1960s. This movement, driven by concerns about the limits of growth, the rise of circular economy principles, and the importance of sustainability in construction, reflects an increasing awareness of ecological impacts.

36 Richard Neutra, "Neutra e Venezia. Conferenza di Richard J. Neutra," in *Domus*, no. 233 (February 1949), 2.

37 Josep-Maria Garcia-Fuentes, "Sopravvivere tramite l'architettura. Lezioni veneziane alla fine della natura," in Sara Marini, ed., *Venezia. Guida alla selva* (Rome: Nero, 2024), 59–65.

Cesare Brandi champions the advocacy for reversibility in preservation in his *Teoria del Restauro* from 1963, asserting that no intervention should preclude the possibility of future ones.[38] Yet Brandi was not the first to consider this idea. Gustavo Giovannoni and Alois Riegl had anticipated aspects of it without fully elaborating on its details, and its origins can be traced even further back to the writings of John Ruskin and Camillo Boito.[39] However, during the 1970s and 1980s, Benito Paolo Torsello questioned the very idea of reversibility, highlighting the irreversible passage of time, and Giuseppe Rocchi stated that even the "most delicate" intervention inevitably involves tampering with the work.[40] Other architects, such as Paolo Marconi, later questioned the debate on reversibility, as did Paul Philippot, Bernard Feilden, and Jukka Jokilehto. They criticised reversibility as an unachievable goal in cases like structural reinforcement or material decay. Time, history, and memory are irreversible, and they cannot be erased. They are embedded within the buildings and their architectural elements, and they must be negotiated, interpreted, and mediated throughout the design process. The ethical implications of this negotiation form the core of preservation interventions, as well as the use and reuse of architectural elements within any Design for Disassembly process. It is precisely when awareness of these connections arises that upcycling takes place through such processes.

The debate on reversibility in heritage and preservation during the 1950s and 1960s laid a crucial foundation for the emergence of postmodernism, with its richer understanding of history and its interpretations. The postwar disillusionment with modernist ideals and the growing environmental movement from the mid-1960s onwards also fueled postmodernism. In Italy, the postmodern view of history

38 Cesare Brandi, *Teoria del Restauro* (Rome: Edizioni di Storia e Letterature, 1963).

39 Carmelo Majorana, Giovanna Giugni, "Riflessioni teoriche sul concetto di reversibilità," in Atti del Convegno di Studi Bressanone, 1–4 luglio 2003. La Reversibilità nel Restauro. Riflessioni, Esperienze, Percorsi di Ricerca (Venice: Edizioni Arcadia Ricerche S.r.l., 2003), 37–39.

40 Giuseppe Rocchi, *Istituzione di Restauro dei Beni Architettonici e Ambientali* (Milan: Editore Universitario Hoepli, 1985), 198.

flourishes, for example, in the works of Paolo Portoghesi in Calcata, exploring the upcycling of existing architecture at all scales, from the urban to the building detail; in the project for the Museum in Gibellina by Francesco Venezia, between 1981 and 1987, transforming some ruins salvaged after the 1968 earthquake into a new building through architectural grafting and modern spolia; as well as in the long-term interventions by Andrea Bruno at the Castello di Rivoli from 1961 to 1984, which blend preservation with creative new projects. All these projects are developed in close collaboration with the superintendency of the monuments. In many ways, thus, Scarpa's work anticipates the Italian postmodern embrace of history as a design material, combining ethical commitment to heritage with inventive transformation.

Italian postmodernism combines a refined focus on historical continuity with rigorous innovation in both building types and urban design. In contrast, postmodern practices abroad often embrace looser formal eclecticism, playful pastiche, spectacle, and irony.[41] Architects such as Paolo Portoghesi and Aldo Rossi exemplify the thorough Italian approach at both architectural and urban levels. On a more radical front, the collective Superstudio, in 1969, calls for "starting again from the art of construction, material economy, the reasons to build, and the meanings of the building."[42] For them, this is a question of "survival," though they never translated the stance into built works. The reference to Neutra's ideas on survival appears obvious. Nevertheless, their position reveals the deep ethical commitment to heritage and environmental concerns that underpinned Italian postmodernism.

This commitment is clearly reflected in contemporary Italian architectural restorations. Since the second half of the twentieth century, interventions on existing buildings, particularly those with legal heritage status, have primarily been carried out by architects with specialised education in restoration. Notable examples include the works of Franco

41 Think, for example, about Robert Venturi and Denise Scott Brown, and their publications, including the famous: Robert Venturi, *Complexity and Contradiction in Architecture* (New York: Museum of Modern Art, 1966).

42 Superstudio, "Progetti e pensieri; Ideas and projects," in *Domus*, no. 479 (October 1969), 106.

Minissi, Roberto Pane, and Marco Dezzi Bardeschi, whose controversial project for the Palazzo della Ragione in Milan serves as an illustrative example of these developments. The Palazzo was purchased by the city in 1939 but remained unused and lacked a clear purpose for decades. It was finally earmarked in the late 1960s to house the city's notarial archive for a few years. Over its long history, the building underwent numerous alterations since its original construction between 1228 and 1233, including the polemical addition of a new top floor by Francesco Croce in 1773. When, in the early 1970s, a restoration plan proposed demolishing this addition to convert the structure into an exhibition space, the architect and engineer Marco Dezzi Bardeschi opposed the scheme, advocating for the preservation of all historical layers as essential to the monument's history. As a result, in 1978, he was commissioned to design the transformation of the building, which again became a subject of controversy and the works were only completed in 2003.

The awareness that every stage in a building's history should be preserved, an idea shaped by the concern for reversibility in contemporary interventions, guides Dezzi Bardeschi's approach alongside a renewed emphasis on the relationship between preservation and architecture. His approach regards the existing building as a document of its own history, including later additions and decay, while stressing non-invasive interventions following the motto "do not subtract, but rather add, if possible, new matter to the [existing] context."[43] In his view, any interventions should incorporate bold contemporary architecture into the project, redefining how the entire building and its history are perceived and interpreted. History once again becomes design material.

For the Palazzo della Ragione, Dezzi Bardeschi proposes a design that combines conservation with a striking contemporary insertion. He deliberately exposes the building's stratifications while replacing or supplementing unfit elements with new ones, including structural reinforcements and sealing joints between the different layers of the building. He also grafts new elements, such as climate and

43 Marco Dezzi Bardeschi, *Punto e da capo. Frammenti per una (impossibile) teoria del restauro* (Milan: Franco Angeli, 1991), 93.

lighting installations integrated as furniture pieces, or the controversial new staircase necessary to meet contemporary safety standards and to enable the building's new use as an exhibition space and reception hall, which clearly captures the essence of the project. It is characterised by an "airy and immaterial presence."[44] It is a self-standing structure of steel, cables, and glass steps supported by a concrete foundation. The new staircase introduces an entirely new "itinerary rich in diversion and pauses […] with resting platforms that invite those ascending or descending to enhance the discovery of new viewpoints and things seen from close range."[45] Visitors are thus presented with the tormented façade of the building, featuring its cracks and walled-up windows. As Dezzi Bardeschi explains, the new stair "transforms its very function into a joyful metaphor, inviting those who descend and ascend to a delightful and ephemeral journey into technology and the realms of history."[46]

The new staircase functions as a graft of radical high-tech architecture into the historical fabric, transforming it into something entirely new. Yet, upon closer examination, as Federico Bucci notes, "[…] the high-tech accents recede, giving way to references drawn from Milanese, Italian, and international architectural culture."[47] For Bucci, the silhouettes of the glass steps echo Ignazio Gardella's staircase in Milan's Pavilion of Contemporary Art, the tensile structure recalls Giovanni Michelucci's metal framework in the bank at Colle Val d'Elsa, and, most revealingly, the stair's didactic function, inviting a reading of the building's historical façade stratigraphy, "evokes the high pedestal of the statue of Cangrande that Carlo Scarpa shaped in the Museum of Castelvecchio."[48] But beyond its technical ingenuity, the staircase embodies a strong conceptual stance: a Design for Disassembly that

44 Ibid., 94.

45 Ibid., 93.

46 Ibid., 94.

47 Federico Bucci, "Palazzo della Ragione, Milano: una scala di sicurezza, una piega di vetro," in *L'architettura: cronache e storia*, no. 577 (November 2003), 836–839.

48 Ibid., 837.

anticipates upcycling by allowing architecture itself to be transformed, reinterpreted, and given a new life, as it transforms and enriches the memories embodied in its material elements.

Dezzi Bardeschi's ideas and projects extend the principles of reversibility and disassembly, demonstrating a renewed ethical commitment to existing architecture, history, and the environment. In doing so, they redefine architectural attitudes towards history as a design material, emphasising the multiplicity, complexity, and contradictions inherent in buildings and their components, in line with postmodern debates. Every architectural element, whether inherited or newly introduced, contains embodied cultural, historical, and environmental memories that are irreversible; the role of the project is to mediate these memories to graft something entirely new, projected towards the future. In this sense, his work not only anticipated the contemporary notion of upcycling, treating transformation as a process of metamorphosing the existing and multiplying its values, as well as prefiguring the postmodern rethinking of architectural modernity and history.

Elements of Architecture

This investigation is not a linear account of progress but rather a thoughtful reflection on a carefully selected set of Italian post-war experimental cases that anticipate contemporary practices of architectural upcycling. Unlike science and technology, architecture does not evolve progressively. Instead, it advances through intellectual explorations linked to changing cultural, ethical, and historical attitudes, which are facilitated by scientific and technological advancements. Nevertheless, despite shifts in attitudes and concerns over time, certain aspects of the debate remain constant and central to architectural practice and discourse, such as the use of spolia, thinking about architecture through its elements and components, or the entangled relationship between architecture and preservation. The significance of these debates and the understanding they may bring may change over time, but they always remain vital in architectural discussions.

A final episode helps the exploration here. Rem Koolhaas stated in 2014 that "the old is [now] seen as more culturally relevant than

the new"[49] and that for this reason, "the total demolition of any historic building to make way for new architecture seems unthinkable, even barbaric."[50] These quotations align with Koolhaas's shift of focus towards preservation, along with his team at OMA and AMO. As he himself affirmed in 2009, "preservation is for us, a type of refuge"[51] to escape from starchitecture – a refuge in which to survive. At that time, Koolhaas was preparing for the 2014 Venice Architecture Biennale. The connection between his curatorial project for the Biennale and his growing obsession with preservation has been overlooked. However, when considered together, they offer valuable insights into the debate on upcycling – even if Koolhaas himself never explicitly mentioned it, despite the term being coined and circulating outside architecture.

Koolhaas' Biennale was organised into three sections: *Absorbing Modernity*, tracing modernisation from 1914 to 2014 across sixty-six national pavilions; *Monditalia*, highlighting other Italian sectors of the Biennale such as cinema, dance, theatre and music; and *Elements of Architecture*, in the Central Pavilion. It is the *Elements of Architecture* that is relevant here. According to Koolhaas, this central section aimed to create "an exhibition of a new body of knowledge […] exploring the often overlooked but universally familiar elements of architecture used by any architect, anywhere, anytime: the floor, the door, the wall, the ceiling, the toilet, etc. By focusing on the history of each element, architecture is revealed as an amalgamation of very ancient and some contemporary components. Their interaction is not well understood; by looking at them under a microscope, unsuspected (hi)stories and qualities emerge."[52]

49 Jorge Otero-Pailos, "Supplement to OMA's Preservation Manifesto," in Rem Koolhaas, Jorge Otero-Pailos, *Preservation is Overtaking Us* (New York: GSAPP Transcripts, Columbia University, 2014), 88.

50 Ibid.

51 Rem Koolhaas, "Recent Work," in Rem Koolhaas, Jorge Otero-Pailos, *Preservation is Overtaking Us* (New York: GSAPP Transcripts, Columbia University, 2014), 22.

52 Rem Koolhaas, "Fundamentals. Architecture Not Architects," in *Fundamentals Catalogue, 14th International Architecture Exhibition* (Venice: Marsilio, La Biennale di Venezia, 2014).

The exhibition focused on individual architectural elements, each examined in a dedicated room that traced its history and genealogy across cultures. They included the floor, wall, ceiling, roof, door, window, façade, balcony, corridor, fireplace, toilet, stair, escalator, elevator, and ramp. This list could be changed or expanded, as suggested by the suspension points in Koolhaas' introductory text to the catalogue. Each element was presented within a genealogical tree, mapping its historical development, transformations, and key moments of innovation. The display showcased how each element had propelled architectural debates, responded to shifting cultural and intellectual expectations, and reacted to the available technologies and means of production. Together, they aimed to map a kind of "super short history of architectural elements,"[53] spanning from prehistory to the present. In doing so, the exhibition revealed how architectural elements have been continuously reworked, adapted, and, in a certain sense, upcycled – grafted into new forms that transform their very nature while carrying their *story* forward. Viewed this way, the exhibition and the catalogue reveal a parallel narrative: a history of architecture as an ongoing process of upcycling its elements, in which each graft redefines its nature and multiplies its meanings (Fig. 13).

Upcycling Elements to Upcycle Architecture

As Koolhaas notes, architecture "is a strange mixture of obstinate persistence and constant flux." The continuous upcycling of architectural elements makes this essence visible. Each element "carries long strands of junk DNA that date from time immemorial," evolving through time yet always bearing traces of its past and memories. Elements change according to their own cycles and economies, sometimes independently of buildings and architectural debates, though often in dialogue with them. For Koolhaas, this means that every architectural project becomes "a complex collage of the archaic and the current, of the standard and the unique, of mechanical smoothness and bricolage […]" – a kind of postmodern anomalous grafted spolia.

53 Ibid., 193.

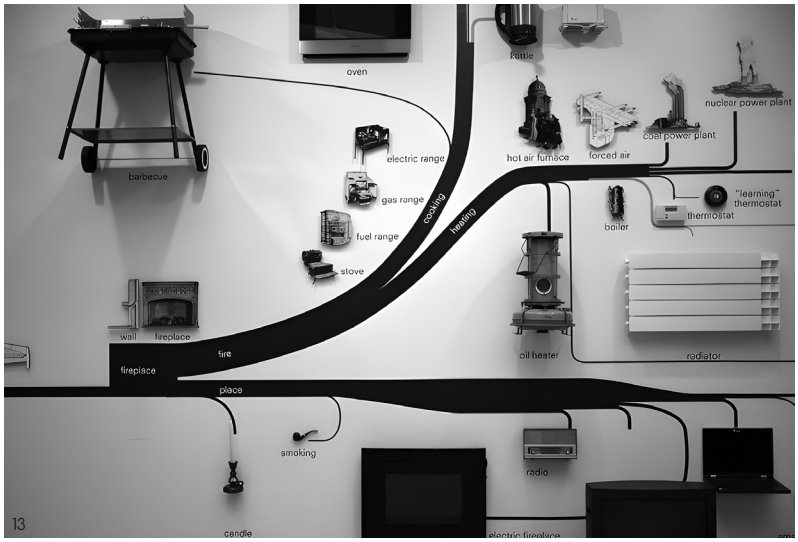

Fig. 13
A view of the display on the evolution of fireplace and gas appliances as an architectural element at the 2014 Biennale of Architecture, curated by Rem Koolhaas.

The complexity of both buildings and architectural elements is revealed only when they are examined under a microscope.[54]

This attention to architectural elements in the Biennale sheds a new light on Koolhaas's parallel concern with heritage and preservation. He himself has acknowledged on several occasions that "OMA and AMO have been obsessed, from the beginning, with the past,"[55] as he has re-examined his entire body of work to assert that preservation has always been one of his primary concerns, specifically as a distinctive approach to dealing with existing buildings. This approach, which has been analysed and discussed extensively by Jorge Otero-Pailos, positions preservation not as passive protection but as an active practice of transformation and renewal.[56] OMA's projects on existing buildings respect the integrity of the entire fabric while identifying the deficient elements that need to be addressed for the building's new program and expected function.[57] The development of the project is then clear: introducing substitutions or supplementations for the elements identified as deficient. This design process

54 Ibid.

55 *Cronocaos*, New York: New Museum, 2011. Wall text.

56 Otero-Pailos, "Supplement", 81–101.

57 Ibid., 94.

Fig. 14
A view of Fondazione Prada in Milan, showcasing elements grafted into the existing structures to create an entirely new architectural design.

is also an active reinterpretation of architecture, where obsolete elements are transformed or strategically replaced, so that the existing building is reactivated as a whole and given new cultural relevance to meet present and expected future demands. Otero-Pailos describes this approach as a "formless substitution" of elements. Through these targeted interventions, the upcycling of individual elements extends into the upcycling of the entire building, often involving a transformation or repurposing of its use. In this process, OMA's work actively aims to mediate and enrich the layered histories and memories embedded within the existing architecture. Their Italian projects, such as the Fondazione Prada in Milan and the Fondaco dei Tedeschi in Venice, demonstrate that preservation and upcycling are inseparable in their practice. For OMA, to practise architecture is to preserve and upcycle the existing through its elements (Fig. 15).

Upcycling is Taking Over

History and memory are essential design materials in upcycling. Whether through modern spolia or architectural elements, twentieth-century Italian architecture provides a privileged laboratory for reflecting on contemporary upcycling, its emergence and rise within architectural practice, and its strong connection to preservation. The works of Portaluppi, Caccia Dominioni, and Scarpa demonstrate

how the inventive use of spolia blurs the line between architecture and preservation, effectively achieving a form of upcycling. Their use of spolia was not limited to symbolic appropriation. It functioned as a graft capable of reshaping the existing fabric so that the resulting building stood as a unified and unique work of architecture. With the emergence of postmodern debates, this line of inquiry was extended by restoration architects such as Dezzi Bardeschi, who emphasised the ethical imperative to respect the multitude of memories embedded in the existing fabric and to frame new interventions as modern architectural grafts aimed at repurposing the building and enhance its value. The development of these explorations in the field of restoration introduced the complex debate on the reversibility of new grafts. Later, with Koolhaas' Biennale and his experimentation in projects, this exploration explicitly returned to the field of architecture, reinterpreting architectural elements themselves as a type of modern spolia. Throughout these shifts, the interactions and entanglements between architecture, preservation, and restoration remain vital to understanding the changing logic of upcycling.

Italian architecture throughout the twentieth century reveals a gradual shift in reuse practices that has facilitated the emergence of upcycling: transitioning from the creative appropriation of spolia to a focus on the reuse and transformation of individual architectural elements. This move also demonstrates the ability of upcycling to operate at multiple scales: from a single element, reinterpreted as a modern fragment or graft – almost like a piece of anomalous spolia used for its symbolic and magical qualities – to the level of the entire building, understood as a whole. This trajectory reflects not only practical responses to changing material or cultural conditions but also a more profound critique of modernity itself, framing history and memory as design materials and as central to architectural debate, rather than focusing solely on new buildings. In this light, Italy not only exemplifies an anomalous modernity that "[…] was once viewed by some as nostalgic or a compromise, but which today is admired […],"[58] as Cino Zucchi

58 Zucchi, *Innesti*, 35.

has noted, but it also reveals itself as a virtuous laboratory for pioneering practices of reuse and recycling that constitute a prochronism of upcycling. During a lecture in 1964, Carlo Scarpa briefly reflected on reuse and restoration within the Italian context, highlighting both the successful repurposing of ancient buildings and the frustration with the inability to afford the construction of new ones. His reflection remained inconclusive, but it emphasises the uniqueness of Italian architecture, which is built to endure, withstand the test of time, and to adapt and transform itself over time.[59]

The essence of upcycling is to promote circularity by transforming existing fragments, materials, and buildings – often of lesser worth – into new, high-value architecture that holds greater architectural, cultural, and ultimately, economic value.[60] The cases discussed here demonstrate that upcycling cannot be seen as the simple reuse of materials, buildings, or architectural components and elements. It requires, instead, an understanding of the specific qualities of the existing fabric and its elements, as well as the ability to graft new interventions – at either the scale of the individual element or that of the entire building – through design. Such grafts are not the result of a universal method but of context-specific explorations that respond to the unique conditions of each case. When memories, stories, and the magic embedded in materials, elements, and buildings are combined with new high-quality design, the resulting architecture gains multiple forms of value: functional, historical, memorial, and artistic. More importantly, the association of new high-quality design with the reuse of existing fragments enables the outcome to retain, preserve, and ultimately further develop resonance and magic, so that the resulting architecture is projected into the future as something unique and revitalised, of greater quality and value. In this regard, upcycling emerges not only as a crucial design strategy for achieving circularity but also as an essential practice for the future of architecture and the survival of humankind. Upcycling to survive.

59 Scarpa, *Prendersi cura*, 17–18.

60 On the creation of cultural capital and eventually its conversion into economic capital, see in particular Pierre Bourdieu, *The Field of Cultural Production* (New York: Columbia University Press, 1993).

Casa degli Atellani, Piero Portaluppi, Milan (1919–1952)

Memory as Design Material

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In 1919, Giannina Casati was confronted with cluttered courtyards and peeling masonry of what would eventually become the family palace. She dismissed the building as a mere hovel: "Non vorrai che noi si venga ad abitare in questa topaia [...]" ("You don't want us to move into this dump").
The judgement attributed no value to the construction, and precisely for this very reason, it makes it the most compelling prelude to the work that Piero Portaluppi would later accomplish on this building in Corso Magenta. Not a meticulous restoration, but rather a strategic transformation: replacing the obsession with permanence with a critical reinterpretation of memory, viewing history as a material for design and elevating reuse into a generative art. Through carefully selected grafts – anachronistic yet finely reconciled in effect – he created an ensemble that was not merely restored but also revitalised.
At the scale of the building, the project reads as a finely orchestrated spatial graft. Portaluppi combines two Quattrocento residences – each with its own separated internal courtyards and later added nineteenth-century structures – into a cohesive internal choreography. He sets up processional axes that extend from the entrance hall to the garden, providing the ensemble with coherence and visual depth. He composes a renewed elevation to the rear, designed as the stage background for the domestic landscape. The garden is reimagined as a visual and symbolic representation of place-memory, an erudite nod to Leonardo's historic vineyard. Contemporary critics described it as a "sapiente montaggio" ("a judicious montage"): a chronological composition of disparate epochs whose meticulously synchronised interleaving creates a work that is simultaneously new and formally cohesive. At this stage, it is difficult to distinguish the montage; it is more accurate to refer to it as a graft.
Following the devastation of 1943 and in the aftermath of the war, Portaluppi reopened the composition. He redrew the Neoclassical façade of the Aspari building on Corso Magenta, employing a more restrained architectural vocabulary and knitting the surviving fabric to discreetly modernised sections. This process of morphological clarification and disciplined integration facilitated the progressive recognition of the building as a monument: first placed on the statutory list in 1944, and subsequently, in 1954, its protected status was extended to encompass both the house and the garden – an institutional acknowledgement of its value.
However, it is within the meticulous grafting of parts and components that hybridisation becomes increasingly nuanced and diverse. The entrance arch is supported by two Serizzo columns salvaged on site. Similarly, the re-emerging frescoes and friezes, the rediscovered two-storey portico, and the fifteenth-century terracotta mouldings serve as spolia: mnemonic material reconfigured through design to function within a new architectural syntax. Portaluppi reassembles brackets and arches, and, where necessary, relocates or recomposes decorative panels, rendering the palimpsest legible without hardening into strict philological adherence. In the first court, the reinstated portico dialogues with the stripped walls. In the second, the deliberate exposure of the arcades and shield-bearing capitals reactivates an older structural logic within a modern design. It is the project's operational continuity that lends new significance to the findings.
The celebrated Zodiac Room exemplifies this method. The room was expanded in 1922, during which its lunettes increased from twelve to fourteen, and the owners' initials and the motto "*faire sans dire*"

were added to the ancient original constellations, turning the vault into a contemporary medium for an act of self-fashioning set within a Renaissance cycle. Elsewhere in the building, in other study rooms and salons, seventeenth-century boiseries, heraldic devices, fresco fragments, and household items come together as a carefully curated *Wunderkammer*. In the architect's private residence, free-standing columns arranged akin to stage flats, along with porcelain and other emblematic objects, compose a theatre of dwelling where the seamless blending of old and new becomes a poetic principle. In this context, spolia – the judicious redeployment of fragments – transcends mere quotation and becomes a metamorphosis through which the fragment gains new semantic and aesthetic values via the author's act of montage and grafting.

In truth, Portaluppi's imaginative recycling of heterogeneous elements recurs throughout his work. In his *saga* of electrical plant buildings, for example, porcelain insulators become ornamental capitals crowning entrances and strategic architectural elements; elsewhere, a train dining wagon is restaged as part of a mountain refuge. Nevertheless, at the Casa degli Atellani, this stance crystallises into a

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system of building and detail, of ethics and rhetoric. As an organic whole, the work exceeds the sum of its parts – in the Gestalt sense – because it grafts them to each other, enhances their relationships, and unites them into a single coherent composition. The description of Portaluppi's liberal modernity by Paolo Portoghesi – "l'antico nel nuovo, il nuovo nell'antico" ("the old within the new, the new within the old.") – captures the point: not palingenesis, but continuity. It is a framework attuned to the survival of forms as transformative continuity. Grafting does not diminish or threaten authorship; instead, it enhances it by adding formal and semantic layers rather than erasing them. *"Questa topaia,"* as it was named at the outset, was nothing more than a leftover. The realised work reveals architecture's capacity to transform the layering of time: guided anachronism interprets rather than distorts. And by doing so, it reveals itself as a forerunner of upcycling: increasing the value of what is recovered, bringing dormant elements to light, grafting them into a new order, and transforming the building into a living palimpsest where memory is not merely a relic but a force capable of making the past operative within the form the present demands. Is this not, essentially, upcycling?

Fig. 1
Frescoed portico in the eastern courtyard, uncovered and restored by Piero Portaluppi. Fondazione Piero Portaluppi. © Martina Sgorlon.

Figs. 2–3
Casa degli Atellani, the western courtyard before and after Portaluppi's renovation, with fifteenth-century architectural fragments grafted and reinterpreted. Fondazione Piero Portaluppi. © Antonio Paoletti.

Figs. 4–5
Casa degli Atellani, façade at 65 Corso Magenta before and after Portaluppi's intervention. Note the redesigned portal at No. 65. Fondazione Piero Portaluppi. © Antonio Paoletti.

Figs. 6–7
Casa degli Atellani, façade along Corso Magenta. On the left, the building before the 1943 bombing; on the right, the reconstruction designed by Piero Portaluppi after the second restoration, 1946–52. Fondazione Piero Portaluppi. © Antonio Paoletti.

Fig. 8
The passageway between the two courtyards designed by Piero Portaluppi, showing the entrance to the main apartment beneath the new porticoed atrium. © Chiara Rizzarda.

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Luigi Caccia Dominioni, Palazzo Prospero Visconti, Milan (1957)

Ruins and Invention: The Poetics of Fragments

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Palazzo Prospero Visconti, whose façade lines the central streets of Milan, hides a complex and layered story. Construction of the palace began slowly in 1583 and was completed in 1591. The building was commissioned by Prospero Visconti and designed by Giuseppe Meda based on initial drawings by Pellegrino Pellegrini. It established a clear standpoint distinct from the stylistic language of Milanese civic architecture, which, since the fifteenth century, had defined the city's decorative and formal vocabulary. As Gio Paolo Lomazzo wrote in 1590, the architecture of Palazzo Prospero Visconti appeared *pure and true*, conceived around an internal courtyard typical of Milanese domestic architecture.
A plan of the building drawn by Carlo Mariani and Carillo Rouger in 1831 documents the palace's original layout, allowing the study of its typological and spatial structure. On the street front, matching the present-day Via Lanzone, a single entrance led into the main courtyard. There, a sequence of paired columns articulated three bays on each side, defining the portico's quadrangular geometry. Opposite this courtyard, a secondary service court opened to the right, with access to another street. On the main street, traces of what appears to have been a second entrance remain, later walled up.

The complex developed around these two courtyards, connected by a system of staircases aligned axially with each courtyard's centre. Photographs kept in the *Civico Archivio Fotografico show that the internal façades* had two levels of windows: a *piano nobile*, with larger openings framed by mouldings and capped by flat cornices and a central window enriched with a stone balustrade. The upper storey had smaller square windows. Despite the building's typological significance, only drawings and a few photographs survive today. In 1943, the complex was almost completely destroyed in an air raid on Milan, leaving only the street-facing elevation standing.
It was on this site that Luigi Caccia Dominioni was called to intervene. In 1957, he designed a new architectural structure attached to the surviving façade, reweaving the fractured urban fabric with a residential building conceived as both reconstruction and reinterpretation. Although the new layout differs substantially from the original, replacing the dual-courtyard scheme with a linear block integrated into the urban frontage, the project is defined by a measured infill operation. Indeed, through this operation, Caccia Dominioni rebuilt the inhabited depth behind the historic façade. The new building, however, has two entrances along Via Lanzone: one corresponding to the main historical access, and a second recalling the position of the former service courtyard.
It is precisely in this threshold zone, mediating between the city and the new architecture, where Caccia Dominioni reuses several fragments of the former palace to establish a formal grammar that evokes the original decorative language of the building with a hint of the picturesque. A sequence of old stone elements articulates the walls of the entrance passage, creating a regular compositional rhythm that frames the entrance doors and walled windows, alluding to the presence of historic openings and traces of the building's former spatial organisation. Finally, a blind stone balcony reveals the upper level of the entrance's double-height space. All these features seem to evoke the sixteenth-century palace, yet they are entirely new inventions by the Milanese architect. In fact, a close examination of the original plan demonstrates that such elements did not exist in the early design. They originate from Caccia

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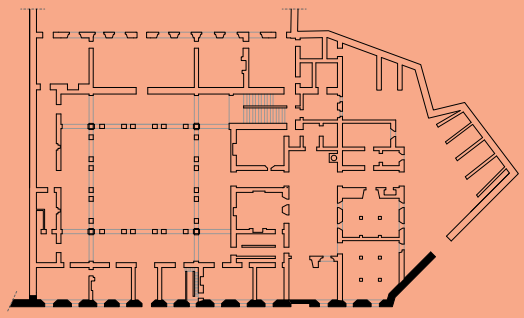

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Dominioni's process of reusing architectural fragments salvaged from the ruins. The threshold thus becomes a poetic space of mediation, not only between the urban environment and the new architectural work, but also between fragments of the past and contemporary design practice.

A broader comparison between the original layout of the Palazzo and Caccia Dominioni's design would further highlight the architect's approach. Nevertheless, all drawings or sketches for this project are missing from both the architect's personal archive and the city's official records. No original drawings by Caccia Dominioni are available for this building. This lack of documentation adds a veil of uncertainty to any interpretation of the project – an intriguing absence.

This project demonstrates an experimental approach to upcycling architectural fragments, reinterpreting the palace's history through a contemporary lens and uncovering layers of historical stratification that would otherwise have remained obscured after the war's destruction. This same sensibility to memory and material continuity appears on the piano nobile, where Caccia Dominioni reinstalls historic doors within the new domestic interiors, establishing a dialogue between the sixteenth-century façade and the newly conceived living spaces.

As Orsina Simona Pierini notes, Caccia Dominioni demonstrates his knowledge of using history as a design tool to give form to his architecture within a context that contained multiple ideas of the city. This capacity becomes clear in the new volume he designed and built behind the sixteenth-century frontage of this building, where reconstruction turns into an imaginative reworking of history. Through the reuse of salvaged fragments, Caccia Dominioni enacts an *ante litteram* upcycling, blurring the lines between preservation and invention and turning memory into a material for contemporary architectural thought.

Fig. 1
The façade of Palazzo Prospero Visconti. Like a historical backdrop, the palace's façade is characterised by its original architectural design. © Jacopo Valentini.

Fig. 2
Historic plan of Palazzo Prospero Visconti, as redrawn by Carlo Mariani and Carillo Rougier around 1831, held in the State Archives of Milan. In black, the section of the façade still standing on Via Lanzone. © Kevin Santus.

Fig. 3
The entrance hall reconstructs an internal façade, in which the stone elements compose an idealised historical reference within a sequence of frames and architectural details. © Jacopo Valentini.

Fig. 4
The staircases within Caccia Dominioni's project serve as poetic elements within the new spatial distribution. © Jacopo Valentini.

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Carlo Scarpa, Castelvecchio Museum, Verona (1956–1974)

A Roof as a Pedestal

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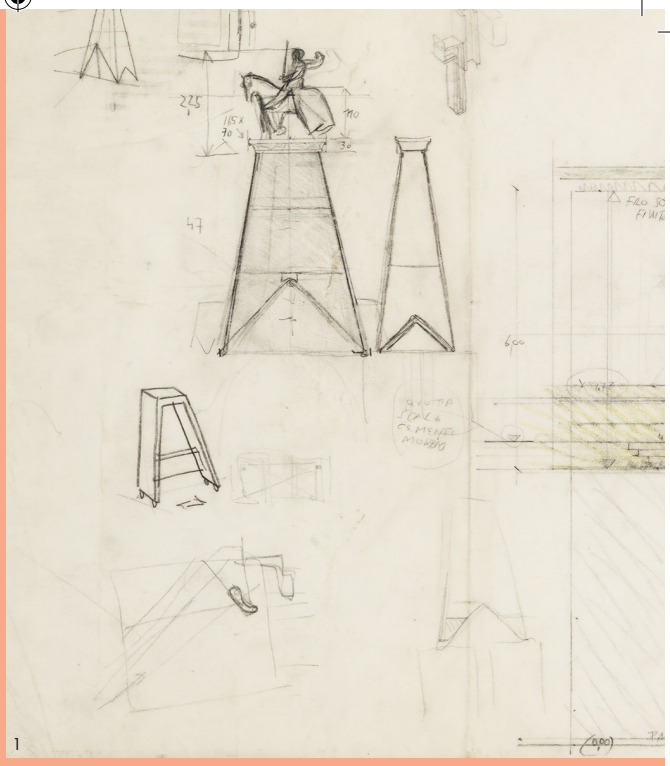

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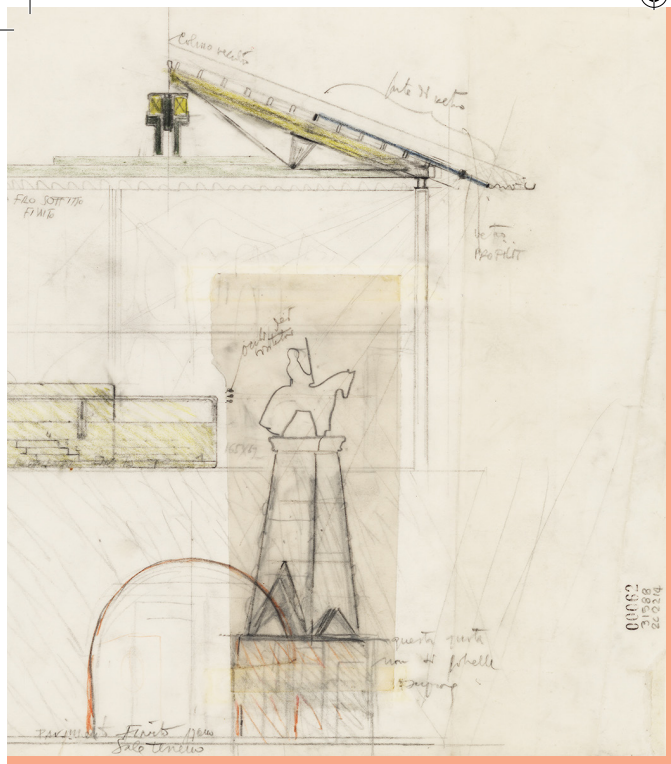
Alongside the church of Santa Maria Antica in Verona, an intricately decorated iron fence on a stone wall defines the perimeter of the five monumental tombs of the most prominent members of the della Scala family, who ruled the city from 1259 to 1387. Three of them are hosted in complex hybrid architectures, either freestanding or attached to the church. Roofs and spires suspended on slender Gothic columns protect the sarcophagi of Cangrande I, Mastino II and Cansignorio della Scala. At the summit of each structure stands an equestrian statue of the dead nobleman. These architectures serve as monumental coffin bearers and pedestals. Looking up, the dynamic tension between the three statues makes the stone knights appear eternally suspended in an aerial joust between generations of their family. Above the church portal is Cangrande's tomb: a Gothic tabernacle with a trefoiled cusped arch supporting a roof crowned by the statue of Cangrande. For preservation reasons, the statue was replaced with a copy in 1909, while the original was moved to the civic museum's collection, now displayed in Castelvecchio, the medieval fortress built under the rule of the della Scala family.

When curator Licisco Magagnato and architect Carlo Scarpa were faced with the task of reconfiguring the museum's layout in 1957, they found the statue of Cangrande in the second courtyard of the castle, in the setup realised by curator Antonio Avena and architect Ferdinando Forlati between 1923 and 1926. The statue sat atop a trapezoidal stone pedestal that referenced the roof where it originally stood.

The first problem was its location: the initial idea was to place the statue at the museum entrance, but it was later decided that Cangrande would occupy the void left by the demolition of the stairs and rooms at the end of the castle wing. In this regard, it could be argued that Scarpa's sensitivity towards certain *spolia* is counterbalanced by this deliberate demolition: it is the invention of fractures as an artistic liberty serving a spatial and narrative purpose rather than the result of a meticulous assessment of their historical value.

The second problem was the pedestal, for which Scarpa developed several solutions that have so far been mainly discussed in terms of their formal quality. Yet the problem may be more complex. Because, as Rosalind Krauss observed, ancient sculptures *"function in relation to the logic of representation and marking" and therefore, they "are normally figurative and vertical, and their pedestals are an important part of the structure since they mediate between the actual site and the representational sign."* It is no coincidence that, in Paolo Uccello's 1436 fresco of the equestrian



monument of Sir John Hawkwood in Florence's Santa Maria del Fiore, the intuitive perspective of the pedestal, which occupies half of the composition, is more prominent than that of the statue, which, paradoxically, appears less distorted to maintain its proportions. Therefore, two simultaneous perspectives coexist within the fresco.

One of Scarpa's priorities for the new layout was the opportunity to view the statue from various heights, which was not possible in the original location. His earlier thoughts for the statue included using the 1920s pedestal as a found object. This idea was partially realised during the museum's temporary opening in 1958, when the statue was moved a few meters and slightly rotated to be framed by the newly reopened Porta del Morbio, which aligns at the end of the gallery's perspective.

Scarpa used this temporal display to test the potential of using the 1920s pedestal more theatrically, either by adding a new piece to it or by altering the existing plinth and then placing it on top of another pedestal. This would have resulted in a compound pedestal made of Scarpa's concrete base, a connecting structure, and the *found pedestal*. The connection between the found pedestal and Scarpa's base support remains somewhat unclear in the sketches. At some point, a pitched roof structure

Figs. 1–2
Sketches by Carlo Scarpa for the project, kept at the archive in the Museum of Castelvecchio. © Archivio Carlo Scarpa, Museo di Castelvecchio, Musei Civici di Verona, 31588r/00062, 31642r/00113.

Fig. 3
The Cangrande statue was installed on the found pedestal from the 1920s in a temporary location in 1958. © Archivio Carlo Scarpa, Museo di Castelvecchio, Musei Civici di Verona, CS007264.

Fig. 4
The equestrian monument to Sir John Hawkwood (Giovanni Acuto) by Paolo Uccello, 1436, in Florence Cathedral. © Public Domain.

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made of IPE profiles is shown as the connecting element, evoking the silhouette of the original roof. It would have seemed as if the entire roof-sculpture system of the Scaliger Tombs had been moved to the museum and repurposed as the actual pedestal, so that Scarpa's new stairs in Castelvecchio allow visitors to reach the level of the statue, to look Cangrande in the eyes, and to stare into his charismatic and confident smile.

It is worth noting that in this proposal, Scarpa embraced and emphasized the imitative aspect of the 1920s pedestal. He nearly doubled the statue's original position while enhancing the found piece and adding theatrical value. This exploration, of course, led to several complications – both technical and museographical – that prompted him to discard the idea.

The realised support was described by Magagnato as *"una squadra semplice e secca,"* putting the ambiguity of dealing with the *found pedestal* to rest. Nevertheless, its exploration reveals Scarpa's playful approach to the past and to history as design material. A playful practice increasing the value of the past and reused elements through design, long before upcycling was invented.

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Palazzo della Ragione, Marco Dezzi Bardeschi, Milan (1978–2003)

Flights of Fancy

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The Palazzo della Ragione was built in the thirteenth century and has been adapted to changing uses over the centuries that followed. It would not have survived for so long had it not been robust and had it not been maintained. People cared about it. It is an impressive place. The ground floor is a raised open loggia with regular vaults that support a first floor. Above that there is a second floor – lit with large elliptical windows – that was added in the eighteenth century. There was no direct route from the loggia to the upper floors. They were reached by way of a bridge from another building, built in masonry with a substantial half-arch that joins the building at one corner. It is not visible from within the loggia, so the space is defined by its regular structure of vaults, without any of the special conditions that might be expected to accomodate the presence of a stair.

In the later part of the twentieth century the risks associated with fire made it imperative to introduce an escape stair at the opposite end of the building, so that the upper floors could safely be used. Bardeschi's approach was to maintain the sense of completeness of the old building by making the addition quite distinct. Instead of using masonry to produce an extension, the new stair seems more like a piece of machinery – a cherry-picker or a scaled-up bicycle – that has been parked alongside. The intervention is reversible – it could be removed without causing significant damage, as it is attached to the old building at only three points, where the stairs connect with the landings.

Compositionally the form of the stair is irregular. The top of the stair, at the floor above the vaults, is higher than might be expected, but the form makes the descent into a promenade, rather than the tightly wound configuration that is typical for fire escapes. The design embraces the condition of irregularity and develops it into a form that looks playful and whimsical. The practice of relishing the irregularity of an extension to a building goes back to the picturesque theory that developed at the end of the eighteenth century, making an aesthetic programme out of the already-evident irregularities found in ruins or in old houses where new wings had been added. The pleasing results of expedience and accident were adopted as aims. To see Bardeschi's stair in this way is to see it as having something in common with the creepers growing across a facade, using the building as a support and partially concealing it while enhancing it. But that is far from being the whole story, or the only story.

The stair in fact hardly uses the old building to support its weight. The connections prevent it from twisting, but the mass is almost entirely supported by a steel mast that is made as fine as possible by being stiffened by tension stays. It separates into three spars at the top,

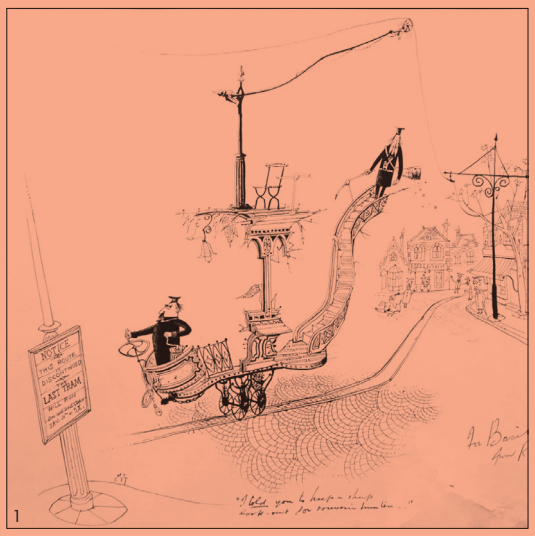

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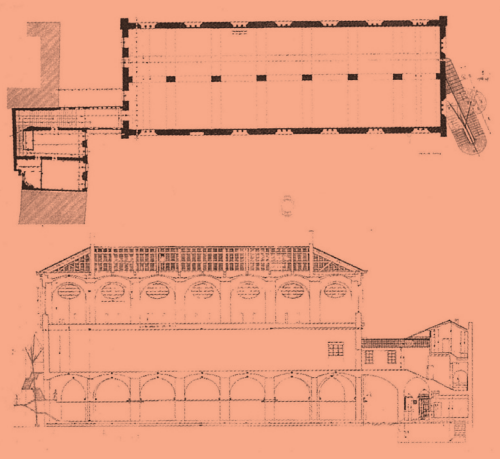
Fig. 1
The Last Tram, drawing by Rowland Emett, c. 1960. Unpublished cartoon, which would have been captioned: "I told you to keep a look-out for souvenir hunters ...". © Estate of Rowland Emett.

Fig. 2
Palazzo della Ragione, bridge giving access to the upper floors. © Andrew Ballantyne.

Fig. 3
Palazzo della Ragione, escape stair, 1978, Marco Dezzi Bardeschi, view showing relation of the stair to the interior of the loggia. © Andrew Ballantyne.

Fig. 4
Palazzo della Ragione, escape stair, 1978, Marco Dezzi Bardeschi, view showing relation of the stair to the Piazza den Mercanti. © Andrew Ballantyne.

Fig. 5
Palazzo della Ragione, Milan, 1228-33 (with later additions). Plan and section showing the old staircase (on the left in the plan, right in the section) and the new. © Estate of Marco Dezzi Bardeschi.



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from which tension cables descend either to support the stair or to reach the ground to hold everything in tension and stiffen the structure. Such arrangements are traditional in the rigging of sailing ships, which used to use ropes as the stays, but in modern sail racing, cable-stays are used so that masts can be tall and slender without buckling. In architecture they were used contemporaneously at Renzo Piano and Richard Rogers' Centre Georges Pompidou in Paris (completed 1977) – notably in the suspension of the escalatortubes on the building's principal facade – and in the poised balletic structure of the Renault Distribution Centre, designed by Norman Foster and completed in 1982. These projects however have repetitive modules and consequently an air of rationality. Bardeschi's stair design is altogether more sculptural, and calls to mind Kenneth Snelson's tensegrity sculptures of the 1970s or the animated but futile machines of Jean Tinguely, whose best-known work is a fountain, on which he collaborated with Niki de Saint Phalle, outside the Pompidou Centre. Atmospherically is it perhaps closest to the sculptures of Rowland Emett, a cartoonist and inventor in the same tradition as William Heath Robinson. Emett is best remembered for his designs for the film *Chitty Chitty Bang Bang* (1968) but his sculptures using salvaged parts of bicycles and other vehicles are more pertinent here. There is an overload of spokes and wheels, and a suggestion that the contraption might actually work, but it would do so by means that are so indirect as to seem playful. Similarly the stairs here have an intensity of redundancy. The spars and cables tether the substantial steel structure with heavy glass treads, so it seems to launch out from the building and to change its mind several times about which way to go. The handrail is supported at times on irregular cranked balustrades, which at times are substituted by glass panels. This aspect of the design seems hesitant and fussy compared with the bold sweeps of the line of the stair. One searches in vain for a rationale for the switch between the different balustrades, but the stairs themselves conform to the conventions needed to make a safe descent down them in an emergency. In pragmatic terms they are a great success. As an afterthought to the robust monumental building to which they attach, they beautifully embody *l'esprit de l'escalier.*

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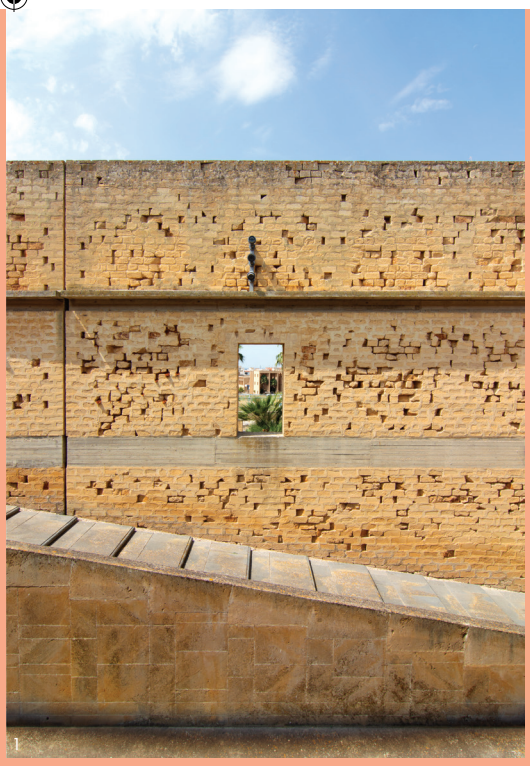
Francesco Venezia, Palazzo di Lorenzo, Gibellina (1980–1987)

Transposing a Fragment



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The 1968 earthquake in the Belice Valley wiped out the urban fabric of many inland Sicilian towns within a matter of hours, along with their historical and cultural layers. Communities and administrations faced reconstruction as a radical and urgent task. The city of Gibellina was nearly completely destroyed and rebuilt around twenty kilometres away from its original location. Its new urban plan promised greater preparedness for natural disasters but overlooked essential spatial relations. Planners widened the streets to favour emergency vehicles. In so doing, they sacrificed an urban legacy characterised by density, proportioned public squares, and a delicate interplay of shade and light shaped by geography and local dwelling customs. The reconstruction works quickly became a laboratory for experimentation, particularly in the making of the new Gibellina. The *Piano Belice '80* expanded its scope beyond housing and infrastructure, inviting architects and artists to engage with the memory of the disaster. Within this context, Francesco Venezia was commissioned to design a museum to house the only surviving fragment of the historic Palazzo di Lorenzo, which had collapsed during the earthquake.

Venezia rejected both the straightforward relocation of the ruin into a new building and a neutral musealisation through anastylosis. Instead, he regarded the surviving fragment as spolia and reassembled it within the new structure. However, the new museum did not display it as a symbolic relic but incorporated the fragment and made it the measure and creative principle of the entire project. In this way, the building became a rhapsodic composition of stone blocks. The spolia from the collapsed palace could resonate with other similar practices of reuse. As Venezia observed, particularly in Sicily, stone follows a cyclical pattern where collapse and re-erection – *katastilosis* and *anastilosis* – represent the two extreme poles of building history.

Venezia did not intend to freeze the fragment as a museum piece. Instead, he rearranged it to add a new layer of time to it and tell a new story to the mineral essence of the ruins. Rubble once again became building material, already inscribed with reliefs and mouldings that could suggest new connections with the new structure. As Venezia wrote: "A system in which the order of natural things has already been transformed into that of architecture – and in some measure has reverted to nature – comes into play in a nascent work alongside a system in which a similar transformation begins to take shape for the first time."

He also pursued another design goal. He sought to restore the lost perception of the palace façade by integrating it into the new walls. To achieve this, he adjusted the proportions and section of the new building to recall the heights and setbacks of the vanished streets of Gibellina. He staged an encounter with the old fragment at a carefully measured distance and on a scale very different from that of the town of Nuova Gibellina, The museum plan is conceived as an elongated courtyard with a 1:4 ratio, embodying the harmonious proportion of four squares, and enclosed by solid and austere walls that define an open-air room. A single, precisely positioned window in the perimeter wall acts as an optical device, directing the gaze between the landscape and the interior space.

Visitors access the museum through a sunken pathway situated alongside a lowered garden, conceived as the artificial continuation of the slope. Upon entering, the route amplifies the presence of the fragment and the courtyard. A square spiral ramp runs along the wall, extending the path and slowing the visitor's pace. It provides multiple viewpoints: sometimes close, sometimes oblique, punctuated by slits that filter light and reveal fragments of the landscape. The route culminates at two distinct spaces: the upper gallery,

Fig. 1
Francesco Venezia, Palazzo di Lorenzo, Gibellina, Italy, 1980–1987. The cordonata and the measured relationship with the exterior. © Sandro Maggi, 2019.

Fig. 2
Francesco Venezia, Palazzo di Lorenzo, Gibellina, Italy, 1980–1987. The inner courtyard and the reconstruction of elevational relationships. © Sandro Maggi, 2019.

Fig. 3
Francesco Venezia, Palazzo di Lorenzo, Gibellina, Italy, 1980–1987. Detail of the reassembled façade of Palazzo di Lorenzo. © Sandro Maggi, 2019.

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open to both the courtyard and the countryside through a series of balconies; and the *riposo*, a shaded chamber set into the northern wall, featuring a travertine seat and a fountain column, around which Pier Giulio Montano's bronze serpent coils – serving as an atmospheric space for inner contemplation.
The reconstruction of the façade required meticulous staging: workers disassembled the fragments of the old façade, numbered them, and transported the pieces to the long side of the courtyard, where they were reassembled, including their portals and balconies. The supporting wall comprised alternating courses of smooth and bush-hammered sandstone, creating a rhythmic pattern that framed the reassembled ruin, which was suspended on a concrete plinth. Sharp shadows and lateral gaps accentuated the impression of levitation of the old fragments in their new graft, as they were lifted and held in their new positions by precisely designed joints. The new courtyard walls were built from yellow tufa from Trapani, and builders reinforced them with concrete beams. These new walls secured the structural stability of the building's perimeter, while also framing and isolating the salvaged fragment as a distinct figure. Local craftsmen contributed to the construction works, reviving old building techniques that had nearly disappeared. Venezia identified three "quarries" that supplied the spolia needed for the construction of the new museum: the ruins of Palazzo di Lorenzo, the sandstone from the Caltanissetta area, and the stones gathered from nearby fields, which were the same stones that farmers used for the dry-stone walls bordering the Sicilian *trazzere* – the traditional rural paths delimiting agricultural fields. This interplay of reclaimed material sources generated a new tapestry of echoes and references through the grafting together of reused elements and materials, along with their associated histories, geographies, and techniques. Stones are reinstated as architecture after serving as ruins, cobbles, or field boundaries.
The museum of Gibellina emerges as an architectural ensemble of new and reclaimed walls, a mystical courtyard, and fragments of modern spolia, where the time of the ruin and that of the new construction interweave. In its new architecture, reuse does not merely replicate the past, but it creates a new vital tension between what survives and what is made anew, or reborn, in a different form and context. In this relationship, the reclaimed fragment does not become only a work of art; instead, it becomes the measure for construction: a device that organises the space, guides movement, and turns memory into architecture and added value. It is precisely here that reuse becomes upcycling.

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Chapter 5

Upcycling as a Design Paradigm? Expressive Codes of "Cradle to Cradle" Contemporary Architecture

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The various definitions of the concept of upcycling found in the literature, particularly when specifically related to architecture, often intertwine ambiguously with those of recycling or reuse. This conceptual overlap renders the distinction between these practices so subtle that is reduced almost to a pedantic terminological exercise – an issue that remains decidedly more pertinent within academic design theory than in actual professional practice.[1] A common premise shared by many of the upcycling definitions coined thus far lies in the attainment of an increased "value" of a given component, achieved through a process of treatment or re-signification of a construction waste material

1 For a comprehensive overview of the various definitions that explore the different facets of the concept of "recycling" in architectural design cultures, see Sara Marini, Giovanni Corbellini, eds., *Recycled Theory: Dizionario Illustrato / Illustrated Dictionary* (Macerata: Quodlibet, 2016). However, it is important to note that within this extensive volume, the entry upcycling is not included; See Ilka Ruby, Andreas Ruby, *The Materials Book* (Berlin: Ruby Press, 2020) and Paola Altamura, *Costruire a zero rifiuti. Strategie e strumenti per la prevenzione e l'upcycling dei materiali di scarto in edilizia* (Milan: Franco Angeli, 2015).

derived from the selective demolition of an existing built structure.[2] Once reinstalled or reinstated, such a component assumes, in its new form, a new life; it becomes a new resource, imparting to the new building a specific and distinctive system of values, whether pertaining to the compositional, formal, or spatial quality, or to energy efficiency or structural performance.[3]

To clarify the type of process and the potential value outcomes that characterize the concept of upcycling in architecture, it is helpful to refer to a design and construction experience unrelated to architecture itself. The only connection lies in the analogy with the tectonic process of assembling components, which first shaped the concept and later enabled its realization on a constructional level. However, it is necessary to venture not only into another field – that of music – but also into the conception and manufacture of an object now regarded as legendary.

The Red Special: a Guitar as a Manifesto of Upcycling

Harold May was an electronic engineer from Feltham, Middlesex, England. During the war, he served in the RAF, working in the field of radio and radar communications. In the early 1960s,

2 "Up|cy|cling. Describes the reuse and recycling of used building components or building materials in a way that yields something of a clearly higher quality and/or use quality," definition stated at the outset of: Daniel Stockhammer, ed., *Upcycling. Reuse and Repurposing as a Design Principle in Architecture. Wieder und Weiterver wendung als Gestaltungs prinzip in der Architektur* (Zürich: Triest, 2021). "What we need is upcycling, where old products are given more value, not less," Reiner Pilz, "Salvo in Germany," *Salvo Monthly*, no. 23 (October 1994), 11–14.

3 "Upcycling: Disposable glass bottles are transformed into drinking glasses or lampshades. Residual concrete waste is cast in moulds to create utilitarian objects. Disused freight containers are stacked together and fitted out to create a building. Downcycling: Old bricks are broken up and turned into fill material for roadbeds," definition reported at the beginning of the volume: Stockhammer, *Upcycling*. The designers of Lendager Group define upcycle as "to recover or reuse a waste material by making it a new resource. Using innovation to create a product that outperforms a benchmark in terms of quality, CO2 and aesthetics," distinguishing this practice from reuse: "to use a material or product again directly without breaking it down or changing it: by re-selling, sharing, leasing etc.," and from recycle "to recover a material while keeping its original value or purpose," Anders Lendager, Ditte Lysgaard Vind, *A changemaker's guide to the future* (Copenhagen: Lendager Group, 2018), 39.

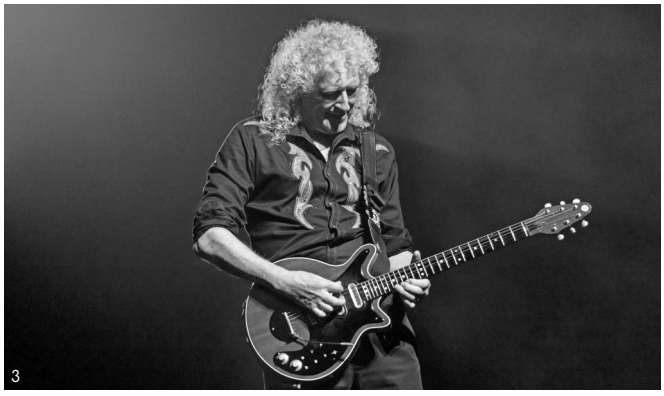
he was involved with the landing system that would later become part of Concorde. Harold could build anything: in the living room of his home, converted into a workshop, he manufactured all the household appliances, including the television, the radio, and a high-quality tape recorder. In his spare time, he strummed the banjo, a passion he passed on to his son Brian. At the end of 1962, Brian desperately wanted an electric guitar; however, his family could not afford to buy one, so Harold decided to build one himself: "we did actually sit down and design it, and I wanted it to look like an acoustic guitar that had been cut away: it's my own shape,"[4] Brian later recalled. When read in light of the nineteenth-century theories developed in the architectural field by Karl Bötticher and Gottfried Semper, it can be said that the design process followed by Harold and Brian adhered, from its inception, to the principles defined by the two Germans as tectonics. To shape the guitar, which would later be named the Red Special, father and son relied on an established construction model – namely that adopted by Fender guitars with a bolt-on neck attached to the body, the two parts of the instrument being screwed together. The body of the Red Special was fashioned from an old oak table, subsequently veneered in mahogany, while for the neck they used part of an old fireplace that was, at the time, a hundred years old; the fingerboard was made of oak, with inlays crafted from mother-of-pearl buttons. Even all the mechanical parts of the guitar were the result of the Mays' ingenuity: "The materials that went into the Red Special were, in so many cases, just made from things that happened to be lying around in my Dad's workshop–little pieces of steel, brass and aluminum, washers, nuts and bolts and screws, and occasionally less common objects,"[5] Brian recalled further. The electrical components of the instrument likewise utilized recovered or regenerated materials (Fig. 1).

The guitar, constructed over the course of approximately two years, thus presents us with certain questions when we become aware that the entire conceptual and realization process undertaken by the

4 Brian May, Simon Bradley, *Brian May's Red Special. The story of the home-made guitar that rocked Queen and the world* (London: Welbeck, 2020), 34.

5 Ibid., 60.

Fig. 1
Parts that would become the Red Special guitar, August 1963. Courtesy Sir Brian May.



Figs. 2, 3
Brian May with his Red Special guitar, photographed in May 1963 and December 2017. Courtesy Sir Brian May / © Raph_PH-Creative Commons.

Mays pertains to what, following the definition given in 1994 by mechanical engineer Reiner Pilz, we can precisely identify as the concept of upcycling.

Does the Red Special appear as an object resulting from a process of regeneration, or does it resemble a patchwork of salvaged elements? No, its constructed form exhibits, in its absolute originality, a wholly distinctive elegance, certainly no less than that of other celebrated guitars marketed by major brands (Figs. 2, 3).

Does the Red Special fall short of other guitars produced on a large scale with industrial components? Certainly not; on the contrary, history has shown it perhaps possesses something more, especially when played by Brian. Between 1970 and 1971, Brian, along with three friends, founded a band, Queen. What followed is well-known history of contemporary music, and it is with the Red Special that the iconic solos were recorded, which continue to move generations of enthusiasts to this day. The clear increase in material value inherent in the musical

instrument crafted corresponds to an immaterial value, connected to the emotional sphere, generated by the effects this instrument has had on the collective. Transposed to the field of architecture, comparing the Red Special to a building, one could say that the concept of upcycling becomes truly tangible through, for example, the perception of a spatial or environmental quality generated by a building constructed through the use of components resulting from a process of material and value re-signification.

Transposing this reasoning to an emerging theory of architectural design, which reflects on formal and linguistic expression in the era of upcycling, a clear point emerges: the design approach adopted in the construction of the Red Special represents a significant best practice. It cannot be ignored precisely because it stands in formal and expressive opposition to the communicative emphasis now typical of architecture and design based on the recovery and re-signification of components, where patchwork and bricolage instead appear to dictate the predominant aesthetic characteristics.

Beyond Patchwork and Bricolage: *Firmitas* as a Prerequisite for *Venustas*

When contemporary architectural experiences are related to the design and construction principles behind the conception of the Red Special, a clear pattern emerges. Upcycling practices still appear largely episodic and are, all too often, shaped by expressive conventions. These are influenced by an imaginary that, through the material quality of the building, primarily seeks to emphasize the principles of the now well-established *cradle to cradle* approach.[6]

Architectural academic literature produced in this field occasionally includes, sometimes with a certain degree of generalization, design experiences related to the reuse of construction elements within the scope of upcycling. This is often due to specific expressive codes and ornamental languages that characterize those works – praised

6 Michael Braungart, William McDonough, *Cradle to cradle. Remaking the Way we Make Things* (New York: North Point Press, 2002).

by critics precisely because they appear as assemblages of reclaimed components.[7]

These practices stem from a long-established culture of construction based on the reuse of components – an approach that has characterized architectural traditions for millennia, guided by the principle of conserving resources and means of production. This same ethos underpins the reuse of bricks or tiles forming the *wa-pan* masonry, which has now become the defining ornamental signature of Amateur Architecture Studio, founded by Wang Shu, in its Chinese buildings (Fig. 4). It is also evident in the more recent – and certainly less well-known – infill walls and claddings created as part of Swiss architect Enrico Sassi's recovery and enhancement project for the former brickworks of Riva San Vitale, in the Canton of Ticino, Switzerland. These were the result of assembling brick elements historically produced within the very same kilns and later recovered from the ruins of the complex (Fig. 5). Although in these cases the poetics of reuse is limited to the creation of richly ornamented, two-dimensional surfaces – without any structural role or energy-performance function – they nevertheless contribute to the definition of a strongly contemporary expressive character. Their added value lies in the deep connection they establish with the constructive history of the place.

It is noteworthy that the surface and expressive outcomes of these building practices – characterized by an approach rooted solely in the local availability of artisanal skills – are, perhaps surprisingly, closely aligned with the experimental artifacts produced by the innovative research project *Rubble Works*. The latter employs a sophisticated robotic technique for the recovery of mineral rubble, recently developed by David Chipperfield Architects Berlin (DCA) and the Institute for

7 Foundational books for a comprehensive understanding of these practices within the contemporary construction industry include: Annette Hillebrandt, Petra Riegler-Floors, Anja Rosen, Johanna-Katharina Seggewies, *Manual of Recycling. Buildings as Sources of Materials* (Munich: Edition Detail, 2019); Bill Addis, *Building with Reclaimed Components and Materials. A Design Handbook for Reuse and Recycling* (Oxon-New York: Earthscan-Routledge, 2020, first published in: 2006); Duncan Baker-Brown, *The Re-use Atlas. A Designer's Guide Towards a Circular economy* (London: RIBA Publishing, 2024).

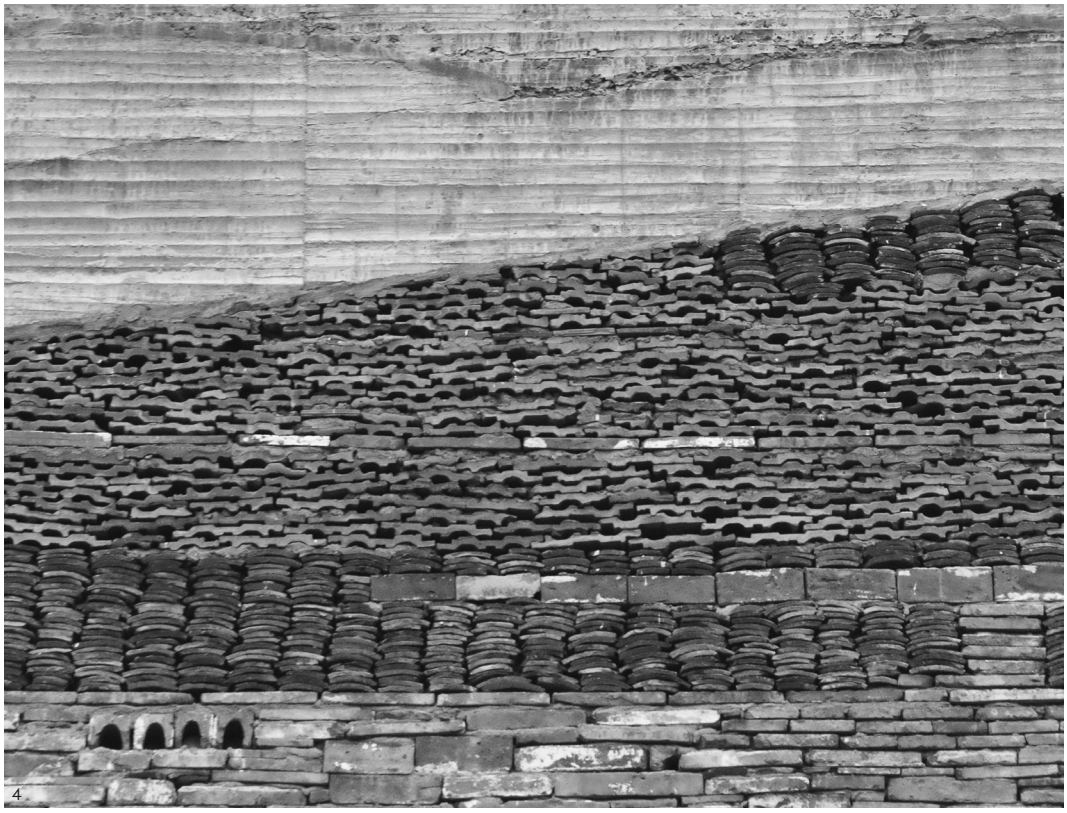
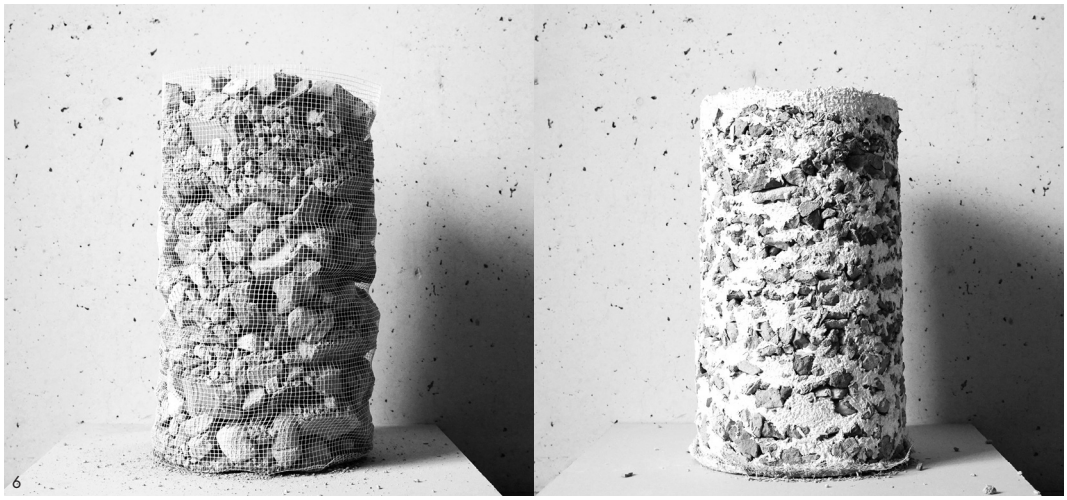


Fig. 4
Amateur Architecture Studio, Ningbo History Museum, China, 2003–2008. Details of the junction lines between concrete surfaces and *wa pan* masonry. © Alberto Bologna, 2018.

Fig. 5
Enrico Sassi Architetto sagl with engineer Giorgio Galfetti, recovery and enhancement of the former brickworks, Riva San Vitale, Canton Ticino, Switzerland, 2014–2025. Cladding in reclaimed bricks of one of the chimneys. © Alberto Bologna, 2025.



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Computational Design (ICD) at the University of Stuttgart.[8] This is an experience that, to date, has not yet found practical application in the construction of buildings or their components, but has generated interesting laboratory experiments. These tests have examined both the physical and mechanical properties of the produced material and the robotic techniques used for its deployment, as well as the distinctive surface characteristics of the material, which evoke the world of textiles (Fig. 6).

However, beyond the specific construction technique employed, it is only when the building element – used with the intention of triggering a process of its re-signification – ceases to appear merely as an *objet trouvé* and is instead valued for its genuine physical and mechanical qualities, that an architecture can emerge capable of expressing a system of values truly aligned with the expressive research demanded by our time. Such design research confers a distinctive character upon the work based on its constructive features, rather than relying solely on the explicit display of an actual or presumed poetics of recycling. Indeed, for a work to be defined as architecture, it must primarily be founded upon Vitruvius' principle of *firmitas*, rather than being reduced to outcomes that amount merely to *venustas* (whether

8 rubble-works.com, accessed August 25, 2025; Maria Wyller, Hana Svatoš-Ražnjevič, "Rubble Works! Architekturelemente aus Bauschutt. Architectural Rubble Elements," *Detail*, no. 6 (2025), 18–23.

actual or presumed), as often occurs in projects conceived with the aim of reusing building materials or components.[9]

In this regard, two architectural works stand as paradigmatic examples. Although differing in scale, program, design principles, and construction techniques, both share the common objective of recovering locally sourced building materials. Each succeeds in imparting new value to discarded stone blocks while simultaneously fostering a theoretical reflection on the expressive codes of building through the application of the upcycling principle.

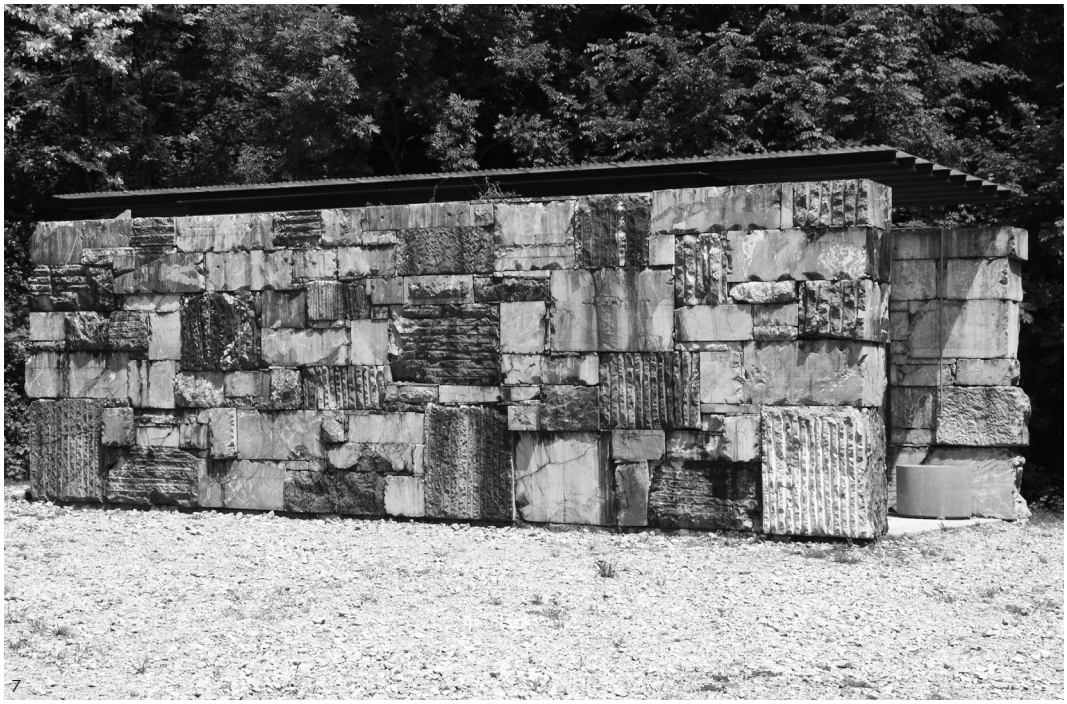
Fig. 6
Rubble works. Prototypes of gabions adapted to jammed rubble and of block casting adapted to rubble and mycelium. © David Chipperfield Architects, ICD University of Stuttgart.

It is indeed the combination of the joints, color variations, and the varied surface finishes of the cyclopean marble blocks recovered on site that amplifies the architectural quality – intimately connected to the stereotomic properties of the material itself – of the small pavilion housing the restrooms within the naturalistic trail of the disused quarries at Arzo, near Mendrisio, in Switzerland, also designed by Sassi.[10] Here, it is the assembly process that endows value to a collection of semi-finished stone blocks which, once arranged as four robust walls supporting a lightweight steel roof, elevate this construction to the status of architecture. This is due to its qualities of solidity, durability, and aesthetic and spatial character, as well as its seamless integration with the surrounding landscape context (Fig. 7). The foundation slab was likewise constructed with concrete made using aggregates derived from the crushing of local marble waste; its subsequently polished surface highlights this composition.

The massive blocks forming the load-bearing walls of the Viviendas Sociales 2104 building in Palma de Mallorca, in Spain,

9 "I think the most interesting aspect of this circular framework is the insertion of architecture in its production and disposal cycles. Like most artefacts, architecture has been traditionally related to as a finite object […] developing a design culture where the process is apparently more relevant than the final outcome. Architecture is less important than the procedures preceding and following it. Indeed, the visible outcomes of this fervor in terms of firmitas and, especially, venustas are no big deal," Francesca Zanotto, *Circular Architecture. A Design Ideology* (Siracusa: Lettera Ventidue, 2020), 80.

10 Enrico Sassi, ed., *Arzo. Il risveglio delle cave – The Awakening of the Quarries* (Pregassona–Lugano: Fontana Edizioni, 2017).



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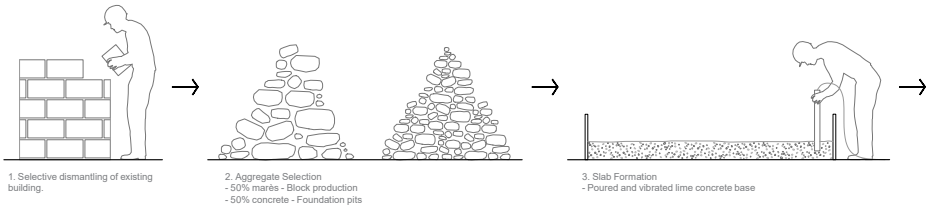

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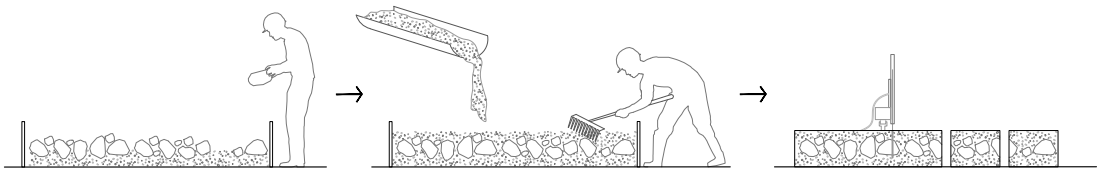
Fig. 7
Enrico Sassi Architetto sagl, pavilion housing the restrooms, disused quarries at Arzo, Canton Ticino, Switzerland, 2011–2017. © Alberto Bologna, 2025.

Figs. 8–9
HARQUITECTES, Viviendas Sociales 2104, Palma de Mallorca, Spain, 2021–2024. Block manufacturing diagram and interior view of one of the apartments. Courtesy Harquitectes / © Adrià Goula.

constructed for IBAVI – Instituto Balear de la Vivienda, designed by the Barcelona-based studio HARQUITECTES, can instead be considered fully artificial. This project originated from a competition launched in 2021, which explicitly required the reuse of construction materials resulting from the demolition of a pre-existing school on the same site. The designers reworked a construction principle previously employed for a small residential building in Ullastret, near Girona, where reclaimed stone was left exposed within reinforced concrete walls newly cast in situ.[11] The Palma de Mallorca project, however, features a load-bearing structure composed of a sequence of spine walls formed by the stacking of large cement-based blocks. These blocks were produced using reclaimed stone and through a bespoke manufacturing process. Once demolition of the existing school began, it became apparent that the structure had been built using load-bearing sandstone, locally known as *marès*. Rather than discarding this material, the stone



was carefully dismantled and broken into large fragments to be reused as oversized aggregate (Fig. 8). Instead of casting the material into traditional block molds – a process that would have concealed the *marès* fragments – the architects opted for an alternative technique. Large square panels, each measuring 4 by 4 meters, were cast and subsequently cut into smaller blocks. Once cured, the panels were cut using the same equipment typically employed on the island for shaping *marès* blocks. This approach allowed the stone pieces to remain visible within the concrete, giving the finished product a texture and appearance

11 "(1413) Casa en Ullastret. Girona, España, 2014–2017," *El Croquis,* no. 203, 194–219.

reminiscent of nougat. An inventory of over fifty different block dimensions was developed, alongside tailored cutting templates for each panel. This process ultimately yielded around 4,300 individual blocks. It is precisely the surface finish and the tactile qualities of these blocks that define the character of the building and the spatial quality of its interior environments. An almost brutalist expression, which aptly represents the era of the urban mine and the reuse of resources in construction (Fig. 9).

Both in Sassi's small pavilion and in the building designed by HARQUITECTES, the increased value attributed to the re-signified construction material is evident not only in the overall quality of the architectures to which it has contributed, but also – and above all – in their durability as built organisms intended to withstand the test of time.

Returning to the comparison with the Red Special, it is interesting to note how durability – a parameter closely linked to Vitruvian *firmitas* – was clearly one of the objectives pursued by the Mays in constructing their guitar. This is demonstrated by its long service life: it has been played for countless hours and has travelled, and continues to travel, on tours around the world. Conversely, durability does not always appear to be a priority for those architects who make the reuse of materials and resources their primary expressive hallmark.

In contrast to the still minority design approach adopted in the two buildings mentioned above – where, as with the Red Special, the presence of repurposed materials is only truly appreciated once the related construction processes have been studied and understood – many projects today are commonly classified under the upcycling umbrella. These often involve the reuse of objects of various kinds, originally not intended for construction, which are employed, for example, in the building of walls or roofs. However, it is clear that many such buildings – now frequently published on architecture websites and often presented as exemplary cases – rarely achieve genuine expressive coherence. This is often undermined by a tangible lack of constructive consistency. By contrast, such coherence is clearly evident in architectures born from rigorous design research processes, closely linked to the actual construction methods employed. The outcomes of these processes are consistently

reflected in the compositional and formal aspects of the buildings.[12]

Increasingly, however, small-scale buildings – objectively intended for short-term use, even if rarely declared as such – are celebrated as noteworthy case studies.[13] This often occurs despite their openly challenging fundamental principles of good construction and indoor environmental comfort. In these cases, reclaimed construction components that, based on their nature and condition, logically should have been destined for the waste bin or landfill are instead employed and celebrated as genuine expressive symbols of our time. This has the effect of mistakenly elevating the resulting buildings to the status of 'architecture'.

Supporting this approach, commonly adopted by mainstream criticism – which tends to ennoble constructions born from the experiences of ordinary people or, in any case, non-experts – are often cited illustrious examples from the past. One such case is the geodesic structures made from car scraps, characteristic of the 1967 Drop City project in Trinidad, Colorado. Another example is the numerous buildings constructed by assembling cans or glass bottles, starting with Tom Kelly's Bottle House of 1905 in Rhyolite, Nevada, or the peculiar small experimental building made using the special bottle-brick patented by Heineken in 1963, erected in Alfred Heineken's garden in

12 A virtuous example is the work initiated in the 1990s by Rural Studio, which created houses and community spaces for the most vulnerable populations, see Andrew Freear, Elena Barthel, *Rural Studio at Twenty: Designing and Building in Hale County, Alabama* (New York: Princeton Architectural Press, 2014).

13 "Circular thinking in architecture finds immediate application in the employment of second-hand materials, a practice prospering at the minute scale. Small buildings, nimbler in terms of regulations and certifications, are made up, in different proportions, of repurposed components and elements chosen on the basis of their affordability or availability, producing a tailored visual outcome. These experiences usually remain in the domain of the crafted prototypes, while it would be extremely interesting to observe reused materials profusely employed in a big project, taking up the challenge to handle the complexities implied in large scale architecture and to deal with forms, materials and colours originally generated within another narration," Zanotto, *Circular Architecture*, 80–81.

1965.[14] Hundreds of similar examples could be mentioned, as well as the many architectures featuring façades – now very much in vogue – composed of reclaimed window frames from other buildings. The successful mosaic of wooden frames on the Bâtiment Europe in Brussels can be viewed, all things considered, as expressive and coherent. At the same time, it serves as a sophisticated ornamental apparatus for the entire building and carries strong symbolic value. It represents the integration of elements sourced from renovations or demolitions carried out across all member states (Fig. 10). In many other cases, however, the result appears more the work of an improvised bricoleur than that of an architect fully aware of their design choices.[15]

Recently, the significant ethical value of initiatives such as *RE-WIN – Windows for Ukraine* has been rightly emphasized. This project aims to reinstall salvaged window frames, recovered in Switzerland, into buildings devastated by the war in Ukraine.[16] Clearly, these are emergency interventions where architectural quality understandably takes a back seat. Such efforts should therefore be regarded as purely technical solutions, unrelated to the theory of contemporary architectural research. This practice, however, can be seen as a continuation of what has occurred, for example, in Italy for decades, particularly since the post-war period. Indeed, speaking with any elderly construction entrepreneur reveals that, until the

14 Anja Diener, *From Waste to Architecture: The Myth of Idelaism on 20th Century Construction*, in Stockhammer, *Upcycling*, 117–129 and Véronique Patteeuw, Léa-Catherine Szacka, *Circularity, Experimentation, and the Question of Impermanence*, in Derk Loorbach, Véronique Patteeuw, Léa-Catherine Szacka, Peter Veenstra, *It's About Time. The Architecture of Climate Change* (Rotterdam: nai010 publishers, 2024), 115–133.

15 Although he has not yet produced major architectural results, it is worth highlighting the research undertaken by architect Daniel Marshall, who has devised a novel façade system for repurposing architectural glass into a low-carbon assembly named the "Shingle Façade," see "Introducing the Shingle Façade," on the Holcim Foundation's official website, accessed August 25, 2025. https://www.holcimfoundation.org/articles/2024/introducing-the-shingle-facade.

16 Other initiatives aimed at transporting reclaimed windows to Ukraine, to replace those damaged by the war, are detailed in: Adam Przywara, "Salvage for Ukraine," *The Architectural Review*, no. 1521 (May 2025), 26–29.

mid-1980s, it was quite common to find salvaged building elements for sale in material warehouses. These included window frames of various kinds, as well as sanitary fixtures, thresholds, stair components, and balustrades.

However, focusing specifically on window frame reuse, buildings whose façades are deliberately designed as a disorderly patchwork of salvaged frames – intentionally juxtaposing different shapes, colors, and materials – appear decidedly naïve. Even more naïve are the critics and journalists who find reasons to list such buildings as noteworthy examples of contemporary architecture or as forerunners tracing future design trajectories within the resource-saving era.

Besides calling into question the *firmitas* due to the inevitable proliferation of joints and connections – which, even shortly after installation, are likely to present sealing problems – it is necessary to ask, with intellectual honesty, what the *venustas* of buildings truly consists of when they appear to the world in a form that, in a single stroke, seems to erase centuries of quality architecture and theoretical reflection. These examples raise a crucial question: does it really make sense to take them as a starting point for developing a theoretical discourse on the expressive principles related to recovery practices? Or would it be more realistic to consider them simply for what they are: transient works lacking genuine architectural quality, destined to disappear over time, degraded by weathering agents, and whose elements will eventually end up in landfill – where perhaps they should have been properly disposed of and recycled years earlier?

Even on the pedagogical level in architecture, it is crucial to recognize the challenges associated with the expressive complexity that these recovery practices entail. Works such as those by Marcel Raymaekers – recently, and rightly, subject to renewed historiographical appreciation – should first be understood and critically positioned as mere exceptions, before being taken as models for a design culture founded on reuse.[17] Their elevation to a widespread practice risks

17 On the work of Raymaekers, see Marcel Raymaekers, ed., *Raymaekers Architectuur, 1972–2022* (Hasselt: Z33 House for Contemporary Art, Design & Architecture, 2022); Arne Vande Capelle, James Westcott, Stijn Colon,

equating 'Frankenstein buildings' with quality architecture, potentially leading to problematic expressive and constructive outcomes. By contrast, a design approach like that adopted by the Berlin-based firm Felgendreher Olfs Köchling for the façades of the Municipal Workshop in Schattdorf demonstrates how the use of reclaimed elements, such as guardrails sourced from cantonal and mountain roads in the Gotthard region, can be harmoniously integrated into the project without being highlighted as mere waste. In this case, the entire building – designed for the movement and storage of materials – expresses, through the conception of its façades, a balance between the conscious use of existing resources, architectural quality, and pragmatic functionality. It thus forms an ornamental apparatus that is both original and the result of an upcycling process that is as evident as it is intentional, applied to construction elements originally produced for purposes entirely unrelated to architecture (Fig. 11).

So, in construction processes of this kind, what does the increase in the "value" of a building component actually consist of? Can it be identified solely with its expressive value – as in the case of rubble transformed by Wang Shu and Enrico Sassi into ornamental apparatus – or does it rather lie in a renewed constructional role? Examples of the latter include the aforementioned guardrails, the stone debris repurposed to generate new building elements in the recent project in Palma de Mallorca, or the specially designed Heineken bottles – already conceived and industrially produced for this very purpose – used in place of bricks to build walls. This is a subtle question, and depending on one's perspective, both interpretations may well be valid.

Beyond the constructional and expressive qualities of the few exemplary cases mentioned, what remains is a design approach that, still rooted in a nineteenth-century notion of tectonics – wherein the act of assembly is deliberately exposed – too often leads to buildings with uncertain, and at times grotesque, formal results. Indeed, to the discerning

Lionel Devlieger, eds., *Ad Hoc Baroque. Marcel Raymaekers' Salvage Architecture in Postwar* (Brussels: Belgium Rotor, 2024) and Arne Vande Capelle, James Westcott, Stijn Colon, Aude-Line Dulière, "Reputations. Marcel Raymaekers," *The Architectural Review*, no. 1521 (May 2025), 40–43.

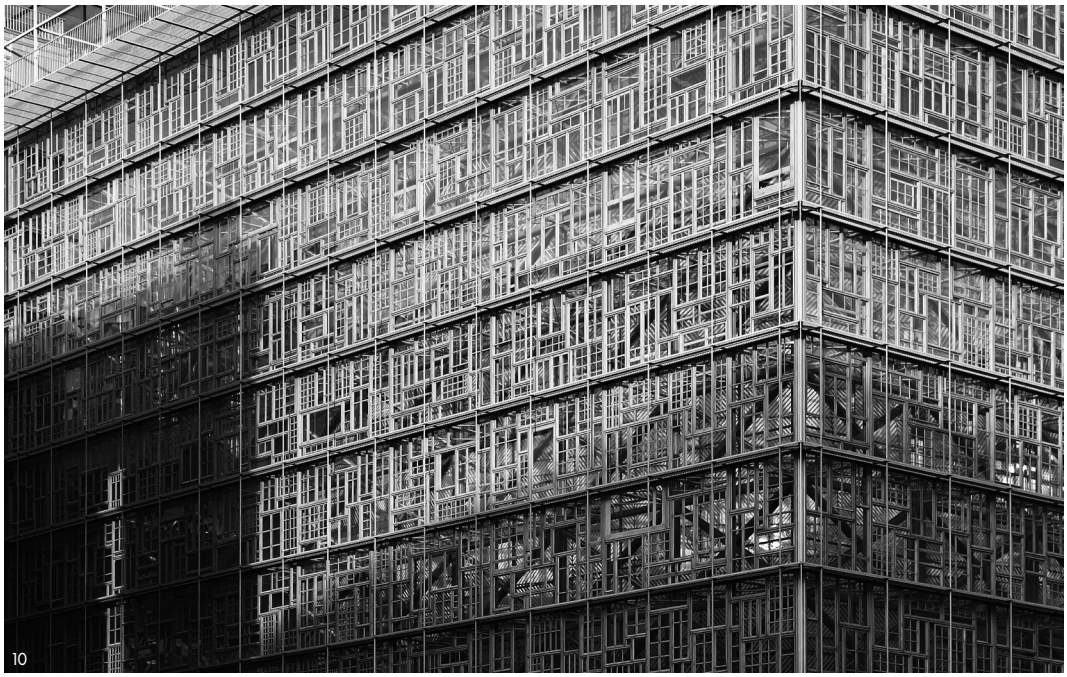


Fig. 10
Philippe Samyn and Partners architects & engineers (lead and design partner), Studio Valle Progettazioni architects, Buro Happold Limited engineers, Bâtiment Europe–New headquarters of the Council of the EU, Brussels, Belgium, 2005–2016. Detail of the façades assembled with reclaimed window frames. © Philippe Samyn and Partners architects & engineers.

Fig. 11
Felgendreher Olfs Köchling Architektur GmbH, Municipal Workshop, Schattdorf, Canton Uri, Switzerland, 2020–2024. Detail of the façade clad with reclaimed guardrails. © Karina Castro, courtesy Felgendreher Olfs Köchling Architektur GmbH.

eye, these interventions rarely appear fully controlled in their formal and expressive balance, except insofar as they serve to justify an increasingly broad – and, as a result, ill-defined – notion of *sustainability*.

A Paradigm Shift: Building Through Disassembly

As already discussed in this volume, within the Italian culture of architectural design and construction, there exists a building – considered part of Carlo Mollino's minor works – that can, in its own right, embody the same design approach to upcycling that the Mays, certainly unknowingly, codified through the making of the Red Special. It is a small mountain villa, designed for the Garelli family in Champoluc, in the Aosta Valley.[18] This holiday home also took shape during 1962. By a curious coincidence, in the same months between 1963 and 1964, during which the Mays were working on their guitar in England, Mollino in Italy was facing the challenge of designing a building from scratch – while reusing and adapting construction elements taken from a seventeenth-century ruin, originally a barn and storage space (the so-called *rascard* Taleuc), which had been deliberately dismantled.

At the time of developing the entire design process, Mollino had at his disposal an accurate survey of the existing building and a complete inventory of its components. This was the result of a dismantling, cataloguing, and numbering process carried out by a small team of workers. The architect thus designed the new building beginning precisely with the outcomes of the disassembly of the original structure, reassembling it in his own way to create an entirely new construction with a distinctive architectural character. The timber frame of the *rascard* rises above a newly built base made of natural stone, reinforced both at the bottom and the top by modern reinforced concrete beams. Access to the first-floor dwelling is provided by an external staircase. Its structure features an elegant variation on the theme of the knee beam, with a variable cross-section, made of exposed reinforced concrete. The

18 The design and construction process are retraced in: Laura Milan, Sergio Pace, *Carlo Mollino. L'arte di costruire in montagna. Casa Garelli, Champoluc* (Milan: Electa, 2018).

timber structure is dry-assembled on ten 50-centimetre-high granite posts (*boléri*), which reinterpret the shape of the traditional mushroom-shaped supports once used to keep rodents away from granaries. These are placed above the stone base of the original *rascard*. However, it is in the design and constructional treatment of the timber façades that Mollino engages in a truly tectonic process of upcycling. The components salvaged from the original structure are reused and adapted with the aim of generating an architecture deeply rooted in local tradition, yet thoroughly contemporary in its expressive and constructive unity. Here too, the value generated by the upcycling process is evident in the originality of the design achieved by Mollino, who treats the recovered timber elements on a par with the other building materials, without highlighting the process of reinterpretation they have undergone. Lastly, the salvaged components were collectively adapted to form new multilayered walls, with 15-centimetre-thick internal insulation.[19] During the disassembly and subsequent reconstruction of the *rascard*, the most deteriorated original components were replaced with similar elements sourced from other structures, while newly manufactured parts – artfully treated to appear aged – were integrated into the whole. This construction approach enabled the combination of reclaimed and new materials, giving rise to a building process in which the temporal dimension is effectively suspended (Fig. 12).

In the context of this critical analysis, it is interesting to observe how Mollino's work anticipated certain contemporary design tendencies by nearly fifty years. On the one hand, it echoes design research approaches associated with the practice of upcycling – now widespread particularly in Switzerland, Central Europe, Belgium, and Denmark – which focus on the reinterpretation of existing components for the construction of new buildings, enhancing both their expressive potential and economic efficiency. On the other hand, it prefigures Italian regulations which, beginning in 2015 with the transposition of European directives on the circular economy, gradually introduced

19 Ibid., 12; see also the drawing showing the longitudinal section of the building, in ibid., 27.

Fig. 12
Carlo Mollino, Casa Garelli, Champoluc, Ayas, Italy, 1962–1965. The south façade with the external access staircase showing the recovered Blockbau structure (in dark timber) and the perimeter wall built with new elements (in light timber). © Davide Franceschini – Altrospazio, 2018.

requirements and obligations concerning the use of reclaimed or recycled materials in the design and construction phases of buildings. These were formalized in the *Minimum Environmental Criteria* (Criteri Ambientali Minimi) issued in 2017.[20] Furthermore, it also foreshadows the practice of salvaging and reusing building components, now a hallmark of the architectural and entrepreneurial work of the Brussels-based collective Rotor – today renowned on the international stage.[21]

Moreover, the anonymous seventeenth-century builder of the *rascard* – from which the components that helped shape Casa Garelli were dismantled – unwittingly adopted design and construction standards for this small mountain building that would only be internationally

20 *Criteri ambientali minimi per l'affidamento di servizi di progettazione e lavori per la nuova costruzione, ristrutturazione e manutenzione di edifici pubblici [Minimum Environmental Criteria for the Award of Design Services and Works for the New Construction, Renovation, and Maintenance of Public Buildings]*, Gazzetta Ufficiale della Repubblica Italiana, 6 November 2017 and *Criteri ambientali minimi per l'affidamento del servizio di progettazione ed esecuzione dei lavori di interventi edilizi [Minimum Environmental Criteria for the Procurement of Design Services and Works for Building Interventions]*, Gazzetta Ufficiale della Repubblica Italiana, 6 August 2022.

21 rotordb.org/en, accessed August 25, 2025. See, in particular the special issue of the journal *A+ Architecture in Belgium*, no. 310, Vol. 51 (2024), titled *Material Flows*, co-edited by Rotor.

systematized in an ISO standard in 2020.[22] By overturning the long-established Semperian concept of tectonics, good design now begins precisely with the anticipation of the building's future disassembly, with a view to the circular reuse of each of its construction components. The building thus becomes a true "material bank,"[23] and good construction becomes the art of disassembly even before that of assembly. This practice is today universally known as Design for Disassembly, defined as an "approach to the design of a product or constructed asset that facilitate disassembly at the end of its useful life, in such a way that enables components and parts to be reused, recycled, recovered for energy or, in some other way, diverted from the waste stream."[24] Each building component must therefore be conceived with properties of recyclability[25] and remanufacturability.[26] It is precisely on these principles that the Red Special remains a paradigmatic example of design that is not only the result of assembling dismantled components or parts salvaged from other objects but is also conceived for future disassembly – just like the seventeenth-century *rascard* from which Casa Garelli took shape. This principle guarantees the regeneration of parts and the longevity of the instrument over time. This was demonstrated by the complete dismantling of the guitar in 1998, carried out for its first restoration by the Australian luthier Greg Fryer.[27]

22 International Standard ISO 20887:2020 (E) *Sustainability in Buildings and Civil Engineering Works – Design for Disassembly and Adaptability – Principles, Requirements and Guidance.*

23 *Construire une architecture bas carbone et du vivant. Nouvelles pratiques à l'ère de la RE2020* (Antony: Éditions Le Moniteur, 2023), 110–111.

24 International Standard ISO 20887:2020 (E), 3.

25 "Recyclability. Ability of component parts, materials or both to be separated and reprocessed from products and systems and subsequently used as material input for the same or different use or function," ibid., 5.

26 "Remanufacturability. Ability of a product to be disassembled and refabricated at the end of its useful life in a manner that provides restoration to a condition suitable for resale," ibid., 5.

27 May, Bradley, *Brian May's Red Special*, 76–79.

... Is It Really Necessary to Codify Upcycling in Architecture from an Expressive Standpoint?

Despite the regulatory background increasingly favoring principles of circularity and resource optimization in the construction sector, design research based on upcycling processes struggles to take off in Italy. Although initiated several years ago in a sporadic and entirely experimental manner, this approach remains firmly in an embryonic phase, having yet to yield examples of significant architectural importance. There is, indeed, a lack of emblematic cases that could be regarded as genuine best practices and hat could act as catalysts for the broader adoption of this design culture – one that fosters architecture distinguished by truly expressive and spatial qualities. Certainly, noteworthy and widely celebrated is the work of Studio Albori in Milan,[28] as well as the public installations by the Orizzontale group in Rome, which have an insightful impact on the community.[29] Of immense potential for the actual dissemination of this design culture was the project led by César Peeren of the Dutch firm Superuse Studios, involving the restoration of a listed historic villa on Lake Como in 2017-2019. This effort also led to the launch of the Italian page of the open-source platform *Harvest Map*, whose aim is to identify, map, and make available building materials sourced from demolitions, end-of-life products, unsold stock, and industrial production residues:[30] a venture that, unfortunately, has not gained much traction in Italy.[31]

Within the range of virtuous practices adopted by these designers – which vary depending on the specific context, from recycling and reuse to the up/down-cycling of building components – there remains a

28 A theoretical manifesto of Studio Albori can be considered Giacomo Borella, *Per un'architettura terrestre* (Siracusa: Lettera Ventidue, 2016).

29 On Orizzontale's work, see Alfonso Giancotti, *Autocostruzioni o degli ultimi spazi del progetto* (Rome: Prospettive Edizioni, 2012), 83–111 and Luca Reale, "The Street as a Common Space: Three Projects by Orizzontale Architects' Collective," *World Architecture/Shijie Jianzhu*, no. 372 (June 2021), 112–115.

30 Serena Baiani, Paola Altamura, "Superuse e upcycling dei materiali di scarto in architettura: progetto e sperimentazione," *TECHNE,* no. 16 (2018), 142–151.

31 oogstkaart.nl, accessed August 25, 2025.

limitation: an expressive language influenced by the desire to explicitly display a poetics of recovery. In other words, this architectural design approach tends to offer an immediately evident and readily comprehensible response on the expressive, formal, and ornamental levels to the demands for waste reduction imposed by today's environmental conditions on the construction industry. In this sense, it is a design research process within architecture that can be regarded as being at the dawn of a future era yet to be fully defined. Put differently, by moving in this direction, we find ourselves in a phase comparable to that experienced by Auguste Perret at the outset of the spread of reinforced concrete technology, when he questioned which expressive codes it should adopt. This is not an issue limited solely to the occasional examples cited above from Italy; it also – and above all – concerns international architectural production, which, having worked for several years on expressive codes related to the re/up/down-cycling of building components, presents a spectrum of constructive practices and architectural outcomes worthy of reflection.

Certainly, seminal in this field is the design research conducted alongside the constructive work by Superuse Studios. Through the reuse, adaptation, and enhancement of recovered building components, the studio has, over the years, defined its distinctive expressive language. Although still closely tied to the display of a poetics of reuse, the small Buitenplaats Brienenoord pavilion near the Brienenoord Bridge in Rotterdam is of considerable interest both expressively and spatially. Completed in January 2019, it was designed and built using construction elements salvaged from two abandoned buildings and houses a communal space. The building's peculiar roof form, created by assembling recovered structural elements (beams and trusses) of varying shapes and materials (wood and steel), generates a distinctly spatial quality, characterized by natural light entering through the glazed façades, themselves composed of reclaimed window frames (Fig. 13). Indeed, the reuse of window frames can be said to be one of the hallmarks of Superuse Studios' design research, which has, over the years, employed this constructive device in various interior fittings and building façades. Emblematic of this expressive drive, aimed at showcasing recovery, is the tectonic assembly of reused IBC (Intermediate Bulk Container) tanks

that form the Grondstoffenstation in Rotterdam, completed in 2024. In this case too, the entire structure – designed to be completely disassemblable following the principles of Design for Disassembly – is the result of the value regeneration of second-hand building components, such as the Stelcon plates (large reinforced concrete precast slabs) used for the pavilion's foundations and the load-bearing frame made from recovered steel profiles. All cladding materials also come from the disassembly of other buildings, structures, or existing pavements (Fig. 14).

These buildings, while undoubtedly milestones in the development of architectural languages born from construction processes involving upcycling, raise a pertinent question: why is there such an emphasis on openly displaying the recovery and re-signification of building materials or components sourced from disassembled structures? Without reverting once again to the now well-worn example of the Red Special, one might consider the various models of sports shoes produced today using recycled materials: their origin is not discernible from their appearance or texture, but only from a logo or slogan printed inside or beneath the sole.

Could this not also be the ultimate goal of *cradle-to-cradle* contemporary architecture? That is, for the construction industry's production chain to apply upcycling processes on such a large scale that design research carried out by architects and clients becomes freed from the constraints of an image tied to reuse and bricolage – aimed merely at demonstrating that no additional resources were consumed from the planet in the making of their building?

In this regard, numerous pragmatic experiences in recent years within structural engineering have demonstrated the effectiveness and design potential of approaching upcycling not as a "style" but as a "technique." Theoretical studies – already yielding significant impacts in practical applications – focus on the reuse of structural components extracted from the demolition of existing buildings (steel, reinforced concrete, or timber), which, once adapted to current regulations, contribute to the assembly of new load-bearing structures.[32] A precursor

32 For the reuse of portions of cast-in-place reinforced concrete structures, see Malena Bastien-Masse, Célia Küpfer, Corentin Fivet, "A concrete answer for

to this approach can be seen in Rem Koolhaas's unbuilt 1980–1981 design for an observation tower in Rotterdam, formally and structurally composed of two lattice towers, one of which was recovered from the demolition of the Willemsbrug bridge.[33] Perhaps the most striking example, however, is the large circular lattice structure crowning the Olympic Stadium, designed by Populous together with the engineering firm Buro Happold for the London 2012 Olympics. This structure was fabricated from steel pipes salvaged from old gas pipelines and adapted to be fully disassemblable.[34] In Italy, during the construction of the Juventus Stadium in Turin, inaugurated in September 2011, a reuse process was implemented using materials from the demolition of the old stadium that stood on the same site, which began in 2008: approximately 40,000 cubic meters of concrete were crushed and reused as sub-base for the new facility; in addition, around 6,000 tons of metals – including steel, aluminum, and copper – were recovered and repurposed. This approach significantly reduced environmental impact and generated estimated savings between 1 and 2.3 million euros.[35]

However, even in the field of architecture, there are already exemplary built projects that demonstrate how the construction practice of upcycling can free itself from the more immediate – and often limiting – expressive code linked to the overt display of reuse.[36] These are buildings realized through a design and construction process that is

circular construction: three prototypes reusing saw-cut elements," *The Structural Engineer*, Vol. 102, Issue 4 (April 2024), 32–37. More generally, see Patric Fischli-Boson, *Circular Load-bearing Structures*, in Eva Stricker, Guido Brandi, Andreas Sonderegger, Marc Angst, Barbara Buser, Michel Massmünster, eds., *Reuse in Construction. A Compendium of Circular Architecture*, (Zurich: Park Books, 2022), 122–127.

33 Roberto Gargiani, *Rem Koolhaas/OMA* (Rome–Bari: Laterza, 2006), 48–50.

34 Altamura, *Costruire a zero rifiuti*, 149–150.

35 Alessandra Bonoli, Sara Zanni, Francisco Serrano-Bernardo, "Sustainability in Building and Construction within the Framework of Circular Cities and European New Green Deal. The Contribution of Concrete Recycling," *Sustainability*, 13(4), 2139 (2021). https://doi.org/10.3390/su13042139.

36 For a comprehensive overview, see Serena Baiani, Paola Altamura, Gabriele Rossini, "Il riuso di componenti e materiali di scarto in architettura: strategia per la circolarità e la decarbonizzazione / Reusing Waste Elements and Materials in

certainly complex and still far from being part of professional routine or standard construction management. The definition of their architectural language is the final outcome of a transdisciplinary design effort carried out in close synergy among architects, structural engineers, specialists in building physics and materials science, as well as evaluators and certifiers.

The community center Hub67, located in the Hackney Wick district of London, was completed in 2014 and designed by the architectural practice LYN Atelier – demolished in May 2024. It was constructed using building elements salvaged from the dismantling of kiosks and other temporary structures originally assembled for the 2012 Olympic Games. Despite its formal simplicity, the building demonstrates a coherent expressive integrity. This was achieved by responding directly to the characteristics of the available construction elements, which were adapted and assembled to create an architectural expression that clearly transcends a mere poetics of reuse. The façades articulate a language derived from the tectonic assembly of prefabricated, dry-mounted components. These are enriched by an ornamental system composed of colored tiles, themselves made from reclaimed materials. As Duncan Baker-Brown notes, "LYN Atelier had to overcome an almost complete lack of information on the type of material they had to use, as well as limited information on the performance (thermal and other) of this material once it arrived on site. […] the main contractors had to assume the normal responsibilities regarding the structural integrity of the building."[37]

These are issues related to the certification of reclaimed and recontextualized components, including those combined with newly manufactured elements. Such questions were also addressed by the extensive Swiss working group coordinated by the Zurich-based architectural practice baubüro in situ, which designed and constructed the project known as K.118. This involved the vertical extension

Architecture: a Strategy for Circularity and Decarbonization," *L'industria delle costruzioni,* no. 489 (January–February 2023), 22–31.

37 Baker-Brown, *The Re-use Atlas*, 62.

Fig. 13
Superuse Studios, Buitenplaats Brienenoord, Rotterdam, the Netherlands, 2019. View of the interior space. © Riccardo De Vecchi-Superuse Studios-CC BY-NC-SA 2.0.

Fig. 14
Superuse Studios, Grondstoffenstation, Rotterdam, the Netherlands, 2022–2024. © Victor van der Ree, 2024.

Fig. 15
baubüro in situ ag, K118 – Kopfbau Halle 118, Winterthur, Switzerland, 2017–2021. External view: three new floors added above the existing building, reached via the steel exterior staircase, salvaged from the demolished Orion office building in Zurich. © Martin Zeller, courtesy Zirkular GmbH.

of an existing building within the former Sulzer industrial area in Winterthur, completed in March 2021. From an expressive perspective, the intervention can be seen as a recent interpretation of the well-known "Swiss box" character, which has characterized Swiss architecture in recent decades (Fig. 15). The new three-story atelier is the result of a complex, well-planned, and thoroughly documented process of reuse and upcycling of both structural and service components.[38] The design process was guided by the dimensions of the second-hand window frames available, as well as by the floor-to-ceiling heights of the new spaces. These were determined by the configuration of a recovered and adapted staircase. Some of the window frames were salvaged from refurbishments carried out within the same former Sulzer site. Where thermal performance was insufficient, they were doubled up to provide adequate insulation. The steel structure of the extension originated from a dismantled warehouse in Basel. The distinctive red façade was assembled from a variety of reclaimed and repurposed elements. The corrugated aluminum panels, for instance, were sourced from the envelope of a printing facility in Oberwinterthur. They are supported internally by a new timber frame that accommodates thermal insulation made of compressed straw bales. The interior finish consists of a plaster made from clay excavated from a site near the construction area.

The entire design research conducted by the Danish firm Lendager Group similarly moves towards architectural expressions that are entirely liberated from the constraints that upcycling processes involving second-hand components might seem to impose.[39] This approach is clearly evident in the Upcycle Studios, completed in 2018 in the Ørestad district of Copenhagen. A notable example is the use of a double layer of reused window frames. "We created a new window that

38 The entire design and construction process are documented in detail in: *K.118 case study*, in Stricker et al., *Reuse in Construction*, 213–263, and 289–322.

39 Still within the Danish context, in Copenhagen, it is worth noting the intervention by Pihlmann Architects, which involved the transformation of an office building into a creative workspace through the reuse of 95% of the existing materials on site. See Søren Pihlmann, Kristoffer Lindhardt Weiss, *Thoravej 29* (Copenhagen: Danish Architectural Press, 2025).

fully complies with the official requirements for energy efficiency,"[40] the designers write – omitting (perhaps because they consider it self-evident) the fact that the glazed façades are seamlessly integrated into the overall architectural design logic of the building. The interweaving of frames, in dialogue with natural light, enhances the spatial quality of the double-height interiors in each dwelling. It also echoes the imprint of the formwork left on the exposed concrete surfaces inside the building's interior space; the concrete was made using recycled aggregate from crushed demolition waste (Fig. 16).

If analyzed merely as a construction technique, the now well-known process of selective demolition followed by upcycling – which led to the creation of the celebrated façades of the Resource Rows residential complex, also in Ørestad and completed in 2019 – should give way to a more critical reading of the building. Indeed, what is increasingly relevant today is the potential for developing a theoretical framework that updates the concept of tectonics and the Semperian textile closure to the era of non-renewable resource conservation. This approach shifts the focus towards an ornamental apparatus as the result of a process of assembling components (Fig. 17). In this sense, Resource Rows may be regarded as a new icon of Scandinavian architecture. Notably, it presents itself as an explicit homage to the Muuratsalo Experimental House by Alvar and Elissa Aalto.[41] In line with this approach – though with a result that is less overtly referential – the façades of the three buildings comprising the TRÆ commercial complex, completed in 2024 in Aarhus, extend this same theory of cladding. They emphasize the tactile and material qualities of the constructive elements used in the façades, a theme that, for instance, characterized the renowned work of Herzog & de Meuron at the end of the last century. This design strategy adopts upcycling as a means of articulating expressive and formal languages rooted in contemporary architectural culture. In doing so, it assigns the material nature of a repurposed or

40 Anders Lendager, Ditte Lysgaard Vind, *A changemaker's guide to the future* (Copenhagen: Lendager Group, 2018), 67.

41 Ibid., 76.

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regenerated second-hand object purely to the constructive dimension. This approach is especially evident in the Swan Nursery in Gladsaxe, where the façades are the result of an upcycling process using materials salvaged from the demolition of an old school that once stood on the same site. One could therefore speak, almost, of a genuine 'Red Special effect' (Fig. 18).

From the perspective of applying upcycling on a global scale, and of fostering its recognition as a standard construction practice in Italy in the near future, it is encouraging to observe the approach of the young Spanish architects Carla Ferrando Costansa and Pablo Garrido Arnaiz. They belong to the generation born in the late 1980s and are principals of the PARABASE GmbH studio, founded in 2020 and based in Basel, in Switzerland. Their design research should encourage professionals to explore practices of re-signifying building components extracted from the existing building stock. At the same time, it is crucial to disseminate their approach more widely, particularly in Italy. Here, architectural design education is still perilously trapped within rigid disciplinary boundaries. These boundaries are marked above all by a lack of dialogue between architecture and engineering, and compounded by further internal divisions. As a result, the education of younger generations is still often diverted from a holistic and transdisciplinary approach to design – an approach that has now become essential for the planet's future well-being. The underlying message is clear: upcycling must now be regarded as a genuine architectural design tool, not merely at the technical level, but as a generator of an expressive vocabulary to be articulated in ever-new ways.

PARABASE gained prominence after winning a competition organized by the Canton of Basel. The brief called for the construction of a new residential complex in the Walkeweg area, in Basel. Crucially, it required the use of a catalogue of building components sourced from demolished or dismantled structures: this catalogue was specifically prepared by the company Zirkular GmbH. The PARABASE project, named ELEMENTA, was developed in collaboration with the engineer Mario Monotti and USUS Landschaftsarchitektur. It establishes a new form of brutalism, born from the valorization and re-signification

Fig. 16
Lendager Group, Upcycle Studios, Copenhagen, Ørestad, Denmark, 2016–2018. North façade detail. © Alberto Bologna, 2025.

Fig. 17
Lendager Group, Resource Rows residential complex, Copenhagen, Ørestad, Denmark, 2016–2019. Detail of the façade facing Ejler Billes Allé. © Alberto Bologna, 2025.

Fig. 18
Lendager Group, The Swan Nursery, Gladsaxe, Denmark, 2019–2022. Detail of the façade facing Tobaksvejen. © Alberto Bologna, 2025.

Fig. 19
PARABASE GmbH, with Monotti Ingegneri Consulenti SA, and USUS Landschaftsarchitektur AG, ELEMENTA- apartment buildings, migration centre, and urban green space, Areal Walkeweg Nord, Basel, Switzerland, 2023–under construction. Rendering, detailed view of the façade of Plot D. Courtesy PARABASE GmbH.

of over 2,500 second-hand building components.[42] The project's expressive power lies in the stark, unadorned ribbed prestressed concrete slabs, extracted from a dismantled multi-story car park and reassembled to form the new load-bearing façade system for the buildings in lot D. This solution offers a constructive, formal, and ornamental response to one of the most sophisticated upcycling design operations ever undertaken (Fig. 19).

This expressive gesture addresses the near future of architecture with great intensity, fully respecting the health of our planet … in short, it is fair to say that it constitutes a true architectural manifesto, comparable in boldness, conceptual coherence, and technical mastery to a solo played by Brian May on his Red Special guitar.

42 The complex is currently under construction. For a comprehensive description of the project and its design process, see Roberto Germanò, "Verso una poetica del riuso: Elementa a Basilea," *IIC – L'Industria Italiana del Cemento*, no. 861 (December 2024), 70–73.

Studio Albori. A Practice Based in Milan

Radical Reuse

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A chicken coop, an open-air classroom, several pergolas, and a guard hut with a small belvedere. Small-scale architectures, modest interventions, erected in the courtyard – transformed into a temporary vegetable garden – of the Abbey of San Giorgio Maggiore in Venice. Built on the occasion of the 18th International Architecture Exhibition, as part of the Holy See Pavilion, and composed alongside a notable exhibition of sculptures by Álvaro Siza, they were made entirely using reused components and local natural materials. Construction elements salvaged from demolitions – in Cortina, Borca di Cadore, Vittorio Veneto, Pieve di Soligo, Chioggia, Milan, Bernareggio, Cologno Monzese, San Donà di Piave, and Gambarare di Mira – migrated to the Lagoon and, once the Biennale had ended, were retrieved and reassembled elsewhere. This is one of the most recent works by Studio Albori, whose simplicity – popular and domestic in nature – condenses, in a manner that is almost illustrative, its over thirty years of practice. Studio Albori was founded in the early 1990s by architects Emanuele Almagioni, Giacomo Borella, and Francesca Riva, all trained in Milan. From their earliest works, the studio has experimented with a critical and radical approach to sustainability, grounding its design thinking in a deep sensitivity to context, social dynamics, and material resources. This attitude conceives architecture as a practical tool within broader processes of transformation and introduces a number of recurring methodological principles that can be traced across much of its architectural production.

Among these, the practice of reuse plays a central role, carrying multiple meanings. It involves both the recovery of the existing built heritage and the reuse of building materials and components. Sometimes these elements are left unchanged, transposed while preserving their original function and meaning; at other times, they are modified, transformed, and reassembled according to new construction and formal logics. An example of the first case is the *Timber and straw house* in Laveno Mombello, on Lake Maggiore, in the province of Varese. The house, located within the historic fabric of the small town, is the result of a demolition and reconstruction process that reproduces, with minimal variations, the shape of the previous building, from which a series of elements were salvaged and integrated into the new architecture. These include the roof tiles, gates, railings, stones from the small garden, and both interior and exterior window frames. Examples of the second case include the portico project at Hangar Bicocca in Milan and the renovation of a farmhouse in Montopoli di Sabina, in the Rieti countryside, where large wooden crates – originally used for transporting artworks – were reused to clad the supporting walls of a temporary roof or transformed into the interior partitions of the residence. Many more examples could be cited: from egg cartons, wine crates, and cardboard tubes used to reconfigure the small dining room of the *Pastamadre* restaurant in Milan, to stacks of firewood, branches, and black locust trunks forming the new east façade of a barn in Ispra. Alongside a consolidated practice of reuse – aimed at extending as far as possible the life cycle of architectural and building elements – the studio adopts an approach akin to a process of upcycling, where *bric-à-brac*, discarded materials, and scraps are moved from one place to another and reused in different ways, increase their value, becoming new design components.

In the Italian context, Studio Albori is undoubtedly among the first and most prominent practices to have placed reuse – in all its forms, from downcycling to upcycling – at the heart of its professional activity. This

activity, on the one hand, brings architecture closer to a form of artisanal knowledge and transforms the construction site into an open design phase, where assisted self-building operations can be tested. On the other, as it has consolidated over time, it has taken shape as a stylistic hallmark. Every intervention on existing structures, every layer, every assembly of designed and found elements, every juxtaposition of materials – both ordinary and heterogeneous – is never concealed, but rather explicitly declared, displayed, and made visible. This choice – which brings together environmental, social, economic concerns and a certain degree of irony – gives rise to strongly characterized buildings, sometimes eclectic, where reuse becomes not only an ethical matter but also an aesthetic one. The result is the codification of a posture – or rather, a language – that constantly seems to balance between the idea of an anonymous architecture and the pursuit of expressive value.

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Fig. 1
Studio Albori, Hangar / post-Hangar, Pirelli HangarBicocca, XXI Triennale di Milano, Milan, Italy, 2016. General view of the portico. © Studio Albori.

Fig. 2
Studio Albori, Vatican Pavilion, 18th International Architecture Exhibition, Venice, Italy, 2023. Small building in the temporary garden. © Studio Albori.

Fig. 3
Studio Albori, Renovation of a farmhouse, Montopoli di Sabina, Italy, 2023. Interior detail. © Studio Albori.

Fig. 4
Studio Albori, Renovation of a barn, Ispra, Italy, 2007–2010. Detail of the east façade. © Studio Albori.

Fig. 5
Studio Albori, Timber and straw house, Laveno Mombello, Italy, 2022. Southeast and Southwest façades. © Studio Albori, photo Luca Bosco.

Park Associati. A Practice Based in Milan

A Resourceful Intelligence

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On the occasion of the 19th International Architecture Exhibition – La Biennale di Venezia 2025, within the Corderie dell'Arsenale, *Resourceful Intelligence* is presented as an installation that interweaves research, experimentation, and design practice. It explores strategies and models of circularity for the construction sector. The project is developed by Park Associati in collaboration with the data-native design studio Accurat and the Department of Architecture, Built Environment and Construction Engineering at Politecnico di Milano. It investigates models of circularity for contemporary construction, linking selective deconstruction processes with digital mapping tools for urban resources available in the territory. These models rely on interpreting existing availabilities and overcoming the concept of construction waste, which is reframed as a potential resource.

Park Associati is an interdisciplinary collective founded in Milan in 2000 by Filippo Pagliani and Michele Rossi. The studio sits at the intersection of design, experimentation, and research. Its work constitutes critical moments intended to intercept and understand the challenges of contemporary building, including the questions and issues facing architecture today. Within this framework, the theme of urban mining and models of circularity play a crucial role. These are not only practices of material recovery, but also opportunities to redefine, in sustainable terms, the relationship between the built environment, historical identity, and new uses.

The exhibit at Biennale 2025 stands at the intersection of research and design. Two vertical elements rise in opposition and are presented as two "abstractions of façades." The first is a ventilated façade prototype made of regenerated glass. This glass is sourced from window frames dismantled and recovered from Palazzo Missori, a Milanese building from the 1930s. The second element is a reinterpretation of a façade composed of small clinker tiles, also reclaimed, from the selective demolition of the former Hotel Michelangelo. Together, they illustrate two case studies currently being developed: the refurbishment of Palazzo Missori and the Mi.C project for the former Hotel Michelangelo.

For the installation, part of the material recovered from the selective demolition of the two pre-existing buildings is temporarily transported to the Corderie and dry-assembled, forming not only an exhibition device but also a true construction prototype. This demonstrates how materials can be immediately reintegrated into tangible architectural components, ready to return to their respective construction sites at the end of the exhibition to continue their life cycle.

A central role in the installation is played by a video projection curated by Accurat, which displays a dynamic digital map of Milan, based on research coordinated by Professor Gabriele Masera at Politecnico di Milano. The map surveys buildings in the urban center of Milan constructed with glass façades, curtain walls, or clinker cladding, highlighting the city's potential as an "urban mine" of material resources already available. This analytical work frames the city as an archive in transformation, where buildings themselves act as temporary repositories of secondary raw materials, ready to be extracted and reused when structures reach the end of their life cycle or when recovery work is required.

The methodology finds concrete application in two projects developed by Park Associati. It enables not only significant resource savings and effective geolocation but also safeguards historical and cultural ties with sites and contexts. The same resources can

Fig. 1
Park Associati, Mi.C ex Hotel Michelangelo, Milan, Italy, ongoing. Selective demolition and floor-by-floor disassembly process. © Nicola Colella.

Fig. 2
Park Associati, Palazzo Missori, Milan, Italy, ongoing. Construction site. © Nicola Colella.

therefore be reinterpreted within the character of new buildings, ensuring continuity as well as circularity.
In the case of Mi.C, the former Hotel Michelangelo, complete demolition is replaced by a targeted process of deconstruction, carried out in sections and by floors. This process enables the identification, selection, and recovery of components, including parts of the existing concrete and clinker cladding, thereby enhancing the original material quality and allocating them for future reuse.
The project for Palazzo Missori focuses on the refurbishment of a listed 1938 building designed by Marcello Piacentini. The intervention combines a philological restoration of the façades, in compliance with heritage constraints, with a contemporary reinterpretation of the interior spaces. A key element of the project is the reuse of the original glass window frames: no longer compliant with current regulations, they are remelted in collaboration with the company 6:AM, subjected to a re-tempering process, and transformed into a new translucent skin, produced using steel molds textured on tread plate sheets. The new panels maintain a relationship with the original materiality, while reinterpreting it in a renewed technical and formal language.
This material transformation, applied both on site and within the Resourceful Intelligence installation, expresses a strategy that combines reversibility, reuse, and design innovation. It demonstrates how architectural design can, and indeed must, effectively contribute to the enhancement and responsible

Fig. 3
Exhibit realized for the 19th International Architecture Exhibition – La Biennale di Venezia 2025

Fig. 4
Park Associati with Accurat and Politecnico di Milano, "Resourceful Intelligence", Venice, Italy, 2025. Detail of the totem/facade made with components from Palazzo Missori. © Nicola Colella.

Fig. 5
Park Associati with Accurat and Politecnico di Milano, "Resourceful Intelligence", Venice, Italy, 2025. Detail of the totem/facade made with clinker tiles from the former Hotel Michelangelo. © Nicola Colella.

recovery of the built heritage, implementing concrete transformations that take into account existing opportunities and available resources, while operating in parallel on urban regeneration and on the care and reinterpretation of the historical context.

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Orizzontale. A Practice Based in Rome

Constructing Temporality

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If the difference between *upcycle* and *recycle* lies fundamentally in the re-signification of construction waste, rather than in its simple reuse, we can argue that Orizzontale's work extends this approach to public space in a kind of "urban upcycling."
Orizzontale is an architects' collective, founded in Rome fifteen years ago. It is composed of Jacopo Ammendola, Juan López Cano, Giuseppe Grant, Margherita Manfra, Nasrin Mohiti Asli, Roberto Pantaleoni and Stefano Ragazzo, all of whom graduated from Sapienza University of Rome between 2010 and 2015. Their work spans architecture, landscape, public art, and self-construction.
Orizzontale adopts a design approach that prioritizes the relationship between urban contexts, inhabitants and "latent" spaces – which their interventions activate or anticipate – with the aim of generating new connections and opportunities within the city, often operating in transitional or "meanwhile" periods; this is not just a technical phase, but the opportunity for a community-building process.
Orizzontale's interventions, almost always located in public space, thus tend to transform a place, promoting flexible ways of use and "accustoming" the city to new possibilities of using urban space: they represent, after all – going beyond episodic or "tactical" solutions – a complementary and more sustainable urban strategy than traditional, typically top-down regeneration policies. The city's neglected spaces are returned to the collectivity by "extracting" stories, communities and traces from the memory of places. Their work is therefore not a true upcycle, but rather a transformation and sometimes ephemeral re-signification of space, prior to materials. To achieve this, the architects of Orizzontale almost always assume responsibility not only for the design, but also for the realization phase of the project.
The construction period is a crucial time, because it brings designers to be fully aware of the materiality and costs of the process, triggering a dialogue with inhabitants and potential users of the works during the indispensable and sometimes prolonged stay on site. This outcome is certainly reinforced by the use of self-building – a practice that entails spending an extended period on site and being directly involved in the realization of the project – not only by the architects themselves, but also by residents, administrators, associations, and students. By activating a sense of belonging and participation, the spaces thus transformed gain added value: more alive, meaningful, and functional, they are perceived by the inhabitants as their own, fostering new relationships and a strengthened sense of community.
In this shift of attention from the object to the context, the target of their work is never exclusively aesthetic, playful or social, but always aimed at the reactivation of a passive or discarded space. The architect, they argue, is thus like a diviner – someone who must "succeed in finding resources and energy flows buried deep in the ground, invisible from above."
Among their projects, one in particular explicitly adopts an upcycle process: the *8 ½* installation, created in the summer of 2014 in the urban space in front of MAXXI in Rome. The project was the winner of YAP MAXXI, a program designed to promote and support young architecture, organized by MAXXI in collaboration with MoMA/MoMA PS1 in New York, Constructo in Santiago de Chile, Istanbul Modern in Turkey, and MMCA National Museum of Modern and Contemporary Art in Seoul, South Korea.
8 ½ is a large theatrical machine that inhabits public space. Realized over four weeks – two of which took the form of a construction workshop open to

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40 students from across Italy – it is based on an arena: a restful, shady and social space – and a wall that can be entered and climbed. Especially at night this wall interacts with the city, becoming a true landmark. Standing eight and a half meters high, the wall is constructed with modular wooden frames covered with handcrafted beer kegs, which had been recovered and stored during the previous winter. These kegs are used as light fixtures, each containing an LED to create a dynamically controlled wall.
The installation was designed specifically for the space in Piazza Boetti but could be easily dismantled, transported, reassembled in new configurations, and flexibly adapted to different sites. It is above all the lamp system that transforms the waste into something new, of greater value and interest.
Once the summer season ended, the 312 light modules – each made by reusing a transparent plastic beer keg – were disassembled, and the upcycle process continued with the creation of a design object that serves simultaneously as a seat, a lamp, and a support surface. The lamp and the anchoring systems are derived from original parts of *8 ½*, while the lamp

Fig. 1
Orizzontale, 8 ½, Yap MAXXI, 2014. Piazza Boetti with the interactive wall during the day. © Alessandro Imbriaco, 2014.

Fig. 2
Orizzontale, 8 ½, Yap MAXXI, 2014. Students during the workshop in June 2014 © Francesco Russomanno, 2014.

Fig. 3
Orizzontale, 8 ½ Lamp. © Alessandro Imbriaco.

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holder system was created by modifying the original beer keg caps and integrating the wiring.

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Césare Peeren – Superuse on Site Villa Maggiore, Como (2017–2019)

Heritage, Harvesting and Superuse

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Since the early 2000s, the Dutch group Superuse Studios has developed a methodology for scouting waste materials suitable for architecture (e.g., by-products, remnants, defective products, surplus, construction waste, etc.) within a 25 km radius of intervention sites. This enables "harvesting" waste materials to feed a Harvest Map showing available sources for *superuse*, a design approach that looks for discarded materials and reads their reuse potential, transforming their characteristics into added value for new products or buildings. *Superuse* parallels reuse, as *upcycling* does with recycling, with upcycling intended – like in *Cradle to Cradle* – as a practice of recycling materials in such a way as to maintain and/or accrue their value over time. The Harvest Map serves as a design premise and open-source resource for multiple designers, encouraging experimentation with industrial waste to develop new design approaches while enhancing local waste from the urban mine. This approach aims at reducing embodied energy in materials, raw material consumption and emissions from producing/transporting "new" materials, while activating small-scale circular economy processes. On-site material harvesting, done before design choices, strongly impacts the project ensuring efficient resource use and challenging conventional design processes, where material selection typically follows rather than informs design conception.

The Villa Maggiore project (2017-2019) on Lake Como, coordinated by architect Césare Peeren (Superuse On Site), aimed to experiment with this approach in the Italian context. The project involved renovating and re-functionalizing a 1920s heritage-listed villa into a zero-energy holiday home. A Harvest Map was developed for the Como-Milan area – including the important Brianza Furniture District – by a multidisciplinary team coordinated by Césare Peeren with Paola Altamura (researcher) and Elisa Saturno (designer) to identify waste materials from local companies suitable for the villa's renovation. The 450 square meters three-story building features load-bearing stone masonry, wooden floors, and one unfinished floor. After years of abandonment, the villa underwent renovation with minimal remodeling (e.g., transparent protective coatings on concrete and wooden surfaces, bathrooms upgrades, installation of double glazing in restored timber windows, second-floor ceiling insulation) and passive/zero-energy systems (masonry mass for cooling, central stairwell for natural ventilation, ground pipes delivering constant 14°C air, original shutters for shading, internal curtains for insulation, solar-powered air-water heat exchangers for hot water and heating), all based on superused locally harvested materials.

During the harvesting phase, preliminary geographical desk research and site visits were conducted to identify local companies holding waste resources not reintegrated into production cycles (scouting phase). A database of available materials was created (indicating nature, typology, dimensions, production frequency, price): over 130 materials/products were identified, mapped and sampled, potentially usable for furniture design and villa refurbishment, then inserted into the geo-referenced Harvest Map database to connect suppliers with potentially designers interested. The project enabled, through collaboration between Superuse Studios and Giacimenti Urbani, the opening of the Italian page of the open-source *Oogstkaart* portal, launched in March 2018 at Milan's *Fa' la cosa giusta* fair. Subsequent projects, including Williams Bar in Milan and exhibition stands, successfully used materials

Fig. 1
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of furniture in superused timber elements under construction. © Paola Altamura, 2018.

Fig. 2
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of bed in superused timber boards and shutters, hung from the existing unfinished timber floor, in the Melbourne room, immediately after completion of works, by Refunc. © Denis Guzzo, 2018.

Fig. 3
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of bed in superused metal profiles, timber shutters and laminated panels, in the Wien room, immediately after completion of works, by Superuse On Site. © Denis Guzzo, 2018.

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sourced through Villa Maggiore's workshop.
Among identified waste materials/products, 22 were *superused* at Villa Maggiore as integrative layers of the existing envelope (insulation, flooring, finishes) or as components for interior and exterior space furnishing, including: textile production waste (textile selvedges and defective silk); metal sheets derived as by-products from automotive laser cutting; leftover sandwich panels in metal and wood; a disused textile machine composed of high-resistance metal profiles; leftover pots of resin for interior surface treatment; fire extinguishers, metal trolleys, nozzles and brackets, foam panels, luminous signs. Material procurement coordination involved direct relationships with waste-producing companies to define procedural and economic supply aspects.
The villa's interior transformation occurred through two intensive two-weeks collaborative workshops, where four international teams (Superuse, Co2RO, Studio Cifra and Refunc) including fourteen designers, lived and worked on-site as designers-in-residence, producing custom-built furniture for seven bedrooms, storage spaces, lighting, dining areas and lounge facilities with *superused* materials such as: neoprene scraps as acoustic floor insulation, topped with reused exhibition flooring; leftover Malta pots (a resin-like material made from industrial waste like coal grains from filter systems, free from VOCs and CO_2 emissions) applied experimentally in bathrooms, kitchens and floor finishing using a mixed-color technique; metal sheets from automotive laser cutting processes repurposed for furniture as well as to build the garden fence and the pillars of a new pergola supporting solar panels.
The Villa Maggiore project demonstrates how circular design requires fundamental shifts in design methodology and value chain collaboration and establishes a replicable model to reduce environmental impacts and create added value from waste streams while preserving cultural heritage.

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Fig. 4
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of the ground floor living room with floor finishing in superused waste resin and Firehosescape furniture by Co2RO. © Denis Guzzo, 2018.

Fig. 5
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of one of the bathrooms with floor and walls finishing in superused waste resin. © Denis Guzzo, 2018.

Fig. 6
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of storage cupboard by Studio Cifra. © Denis Guzzo, 2018.

ARCò Architecture and Cooperation Casa Chiaravalle, Milan (2018)

Earthbags and Earthship: a Manifesto Building

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ARCò Architettura e Cooperazione is a cooperative, founded in 2012 by a group of architects and engineers based on a design approach that combines social, economic, and environmental sustainability. A specific aspect is the choice to adopt the most appropriate techniques for the site, using waste, natural and recycled materials, in order to guarantee construction processes managed directly by the communities involved. This approach has allowed the team to address and resolve the various problems posed by the humanitarian emergency in international contexts.

The "Design and Build with Ø km (local and recycled materials)" project, developed in 2018 over a four-week period as part of the sixth workshop co-funded by the European Erasmus+ LearnBIØN (Learn Building Impact Zero Network, 2015-2018), was organized at Casa Chiaravalle, in Milan's Parco Sud, a farmhouse confiscated from organized crime and managed since 2016 by five social cooperatives.

The team involved students, migrants, NEETs, unemployed individuals, architects and engineers, coordinated by ARCò, in a four-week training and application program that redeveloped an area within the complex using alternative and low-cost construction techniques to create a small multifunctional building (wooden structure with a depth of 5 meters and a height of 2.50 meters), serving as a gathering and meeting place for the local community, with bioclimatic functionality. Despite the suboptimal exposure, a transparent facade was built for winter heating; openings were placed on all facades to enable cross ventilation in summer, while thermal insulation was provided by Earthbags.

With the objective of responsible use of natural and unconventional resources, the project focused on reusing wooden window frames, bottles, plexiglass panels and pallets, combined with Earthship and Earthbags, seeking appropriate technologies with reduced processing, installation and transport times and low environmental and economic costs. The attention to "Ø km" and the use of local and recovered materials also aimed to enhance local traditions and architectural culture and to identify techniques that required low-level technological processing and minimal transport.

The development of the workshop modules, for the construction of a "manifesto building," trained the team in various construction techniques: the first, Earthbags, involved building with earthbags, a technique that uses sturdy bags filled with organic material, locally sourced earth. The system ensures

Fig. 1
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Main facade composed of reclaimed timber windows. © ARCò, 2018.

Fig. 2
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Earthbags envelope. © ARCò, 2018.

Fig. 3
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Detail of the Earthship wall incorporating reused bottles. © ARCò, 2018.

Fig. 4
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Assembly of reclaimed timber windows in the main facade, acting as a passive heat gain system. © ARCò, 2018.

structural stability by anchoring one or two strands of four-point barbed wire between each row of bags to join the bags together and prevent the walls from coming apart (resistance to fire, flooding, and earthquakes). It also promotes an optimal microclimate for the thermal inertia of the soil and offers excellent value for money (materials available locally and at affordable prices).
The soil used for the earthbags came from excavations for a new sewage drainage system at Casa Chiaravalle. During the first week of the workshop, participants learned the various stages of earthbag construction, including filling, compacting, and positioning the bags.
The second technique, Earthship, allowed the reuse of glass bottles, inserted into a support structure and fixed with mortar. The objective was to recycle over 3,000 bottles to build a separation element, facilitated by a partnership with a company for the supply and recovery of containers. The 'bottle walls' are inserted into a wooden framework, where the bottles, arranged in overlapping rows, are fixed in position with mortar prepared on-site. In these walls (used on the west side of the building), circular openings were created using plastic pipes, dismantled from the water system installation and reused as permanent formwork.
The recovery, cataloguing and adaptation of numerous discarded windows allowed the reuse of over 60 square meters of frames (*Design for Disassembly*), used to create a transparent surface (with polycarbonate panels) to close the south and east facades of the building, improving natural lighting and solar gain and establishing visual connections between interior and exterior spaces.
A key aspect of the workshop was the recovery and reuse of waste materials from the site, as well as from donations and local distribution networks. In addition to excavated soil, glass bottles and window frames, reclaimed wooden beams from demolished existing structures and closure panels not used in the renovation of Casa Chiaravalle were also used.
The workshop aimed to explore the potential of applying a "harvest map tool" and developed the principle of "secondary use," prioritizing the reuse of materials in their existing form, thus optimizing and adapting available resources rather than subjecting them to recycling, which entails material reprocessing.
The project used 70% of materials sourced on site (within 10 kilometers: plastic pipes, wooden elements, paneling, soil), 20% locally (within 75 kilometers: bottles, fixtures, polypropylene fabric tubes), and 10% recovered from beyond 75 kilometers (mortar, metal wire, screws and bolts, polycarbonate panels).
The project demonstrated the feasibility of building with "Ø km" materials, achieving minimal environmental impact while maintaining high symbolic and architectural value.

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Afterword

Architecture Without End: Aesthetical Potentials of Upcycling

Pierre Chabard
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In 2010, ROTOR curated the Belgian Pavilion at the 12th Venice Architecture Biennale. Displaying material fragments from deconstructed buildings in the manner of works of art, their exhibition, called "*Usus/Usures*," approached wear "not as a problem in itself, the result of an error of conception that must be avoided at all costs, but as an inevitable process that permits reflection on use and the practice of construction."[1]

However, beyond ROTOR's pragmatic investigation that revealed the extent of this untapped source of materials, the exhibition confronted visitors with their own aesthetic affects towards them: "The materials – after being dismantled, cleaned and cut to size – are not measured solely in terms of what can be dismantled and taken away. Like any product, they also elicit an aesthetic evaluation and, indeed, an emotional one. Traces of wear play a crucial role in this. They frequently evoke a sense of repulsion from potential buyers, but

1 See the presentation of the exhibition on ROTOR's official website, accessed October 2025. https://rotordb.org/en/projects/usususures-etat-des-lieux-how-things-stand.

occasionally evoke attraction and even fascination."[2]

Since 2010, the practice of ROTOR, centered on the circular economy of building materials, elements and components, has been considerably developed, structured and professionalized, from a technical, normative or legal point of view. My contribution aims to return to the Venetian exhibition of 2010 and to explore the aesthetic potentials it contained, which subverts certain dominant values of contemporary architecture: the smooth, the clean, the new, the finished, and the pristine.

Unexpected Beauty

At the turn of the 2010s, in response to the subprime crisis, the axiological framework of architecture underwent profound changes. "*Starchitecture*," whose spectacular forms had been widely celebrated in the architectural press before 2008, became a subject of criticism. The reasons behind this architecture, "that are not only economic but political and are sometimes based on cultural and social constructs,"[3] were studied, questioned, and strongly correlated with those of late capitalism, which, as a system of production, tends toward a flow economy, a total mobilization of bodies and minds through digital tools, but above all tends, as the French philosopher Pierre Caye analyses, "to crush the sense of time, to cultivate the *hic et nunc* and ubiquism."[4] Several theorists have highlighted the links between this political-economic ideal of immediacy and ubiquity and a conception of architecture as an autonomous, timeless, instantaneous, and event-driven phenomenon, like a gesture frozen in the seductive appearance of its novelty, available for immediate commodification.

In 2009, in his seminal essay on the contingencies of

2 ROTOR, Ariane d'Hoop, Benedikte Zitouni, "Avant-propos," in ROTOR, *Usus / Usures. État des lieux / How Things Stand,* (Bruxelles: Communauté française Wallonie-Bruxelles, 2010), 17.

3 Davide Ponzini, Michele Nastasi, *Starchitecture. Scenes, Actors and Spectacles in Contemporary Cities* (Turin: Umberto Allemandi & C., 2011), 13.

4 Pierre Caye, *Durer. Éléments pour la transformation du système productif* (Paris: Les Belles Lettres, 2020), 42.

architecture, Jeremy Till developed an in-depth reflection on this architects' problematic relationship with time. He even pointed to their "terror of time," which drives them to pursue a "quest for eternity" and produces a timeless architecture.[5] But before developing this critique of an architecture that is "out of time,"[6] trapped in an "eternal present," he offered a provocative chapter that foreshadowed, without naming them, the reuse practices that would be implemented in the following decade. At the beginning of this chapter, entitled "*Time of waste*," he quoted and emphasized a sentence by Peter Guthrie, a geotechnical engineer who in 2000 became the first professor of sustainable development at Cambridge and who very early on warned of the problem of construction and demolition waste, which is rarely recycled, as an environmental time bomb but also, if properly managed, as "mines for the future" in a time of resource depletion:

"ALL ARCHITECTURE IS BUT WASTE IN TRANSIT!!"[7]

Till likes this phrase for its iconoclastic nature, its ability to irritate architects and challenge their belief in the absolute permanence of their buildings. But above all, it fuels his thinking about architecture as a flow of matter in perpetual transformation, that "continuous flow that a building always is,"[8] as defined by Bruno Latour and Albena Yaneva in 2008. If architecture "is but waste in transit," this means that construction and deconstruction are two sides of the same coin. Building sites and demolition sites are two moments of living disorder that contrast with the idealistic vision of architecture as a pure, stable, inert, definitive, and timeless object.

This vision, which the entire book criticized, can only be maintained by erecting a mental barrier between two categories, "two states

5 Jeremy Till, *Architecture Depends* (Cambridge, Massachusetts: MIT Press, 2009), 77, 82.

6 Ibid., 82.

7 Till, *Architecture Depends*, 67.

8 Bruno Latour, Albena Yaneva, "'Give Me a Gun and I Will Make All Buildings Move': An ANT's View of Architecture," in *Explorations in Architecture: Teaching, Design, Research*, ed. Reto Geiser (Basel: Birkhäuser, 2008), 81.

Fig. 1
View of ROTOR's exhibition "*Usus/Usures*," Belgian Pavilion of the 12th Venice Architecture Biennale, summer 2010.
© Éric Mairiaux.

of matter"[9]: clean and dirty, order and disorder, waste and resource, discarded and erected. It is this mental barrier that Le Corbusier established, in *Quand les cathédrales étaient blanches*, between the slag heaps of the Borinage and the pyramids of Gizhé, between "*les amoncellements de déchets de schiste gris-noir*" ("the mounds of grey-black shale waste") and "*les monuments sublimes (…) dont la grandeur est dans l'intention*"[10] ("the sublime monuments (…) whose grandeur resides in their intention").

This mental barrier is precisely that Jeremy Till and Sarah Wigglesworth deliberately transgressed as architects when designing their home and studio at 9 Stock Orchard Street, the famous Straw Bale House, completed in 2001. Till recounted it in an autobiographical passage of the book: in the late 1990s, while working on this project, they noticed the wild piles of demolition rubble that were springing up on the outskirts of London after the introduction of a landfill tax. They had the idea of building with this rubble, and "to constrain these piles of waste in wire cages and call them walls, two states of matter divided by little more than naming."[11] He adds: "Economically this part of the building is, indeed, rubbish."[12]

9 Till, *Architecture Depends*, 70.

10 Le Corbusier, Quand les cathédrales étaient blanches. Voyage au pays des timides (Paris: Denoël/Gonthier), 1983, 33–34.

11 Till, *Architecture Depends*, 70.

12 Ibid.

This intellectual twist, which transforms rubble from waste to resource, is based on Till's reading of Michael Thompson's book *Rubbish Theory*, published in 1979. In this book, Thompson postulated that the value of objects (including buildings) is an unstable social construct. He argued that these processes of social construction and destruction of value involve interactions, transactions, but above all, power relations and social control by dominant classes.

For Thompson, there are three classes of objects: objects perceived as ephemeral or "transient," whose value decreases over time (such as a car); objects perceived as perennial or "durable," whose value increases over time (such as an antique vase). To these two classes, he adds a third: "rubbish," an intermediate and invisible category where rejected, relegated, repulsive objects end up, objects that fall outside the value system, or rather whose value is reduced to zero: "Something that becomes nothing,"[13] as Germano Celant defined it in the catalog for the ROTOR exhibition "*Ex Limbo*" at the Fondazione Prada in Milan in 2011, the year after "*Usus/Usures*". Objects belonging to the class of rubbish are not necessarily invisible, but we no longer notice them or consider them. They escape social control. "In English and Italian, a synonym for waste is refuse [*rifiuto*]. Waste material is something you refuse to deal with."[14]

For Thompson, the status of rubbish is not necessarily definitive. On the contrary, this class of objects constitutes a reservoir from which a number of social operators (flea market dealers, collectors, real estate developers, etc.) select items that can be reinserted into the value system. According to him, the only socially acceptable way for an object to evolve from transient to durable is to pass through the status of rubbish.

In the book, he gave several examples, some of which relate to architecture: the patrimonialization of Grange Park in Hampshire, a neoclassical aristocratic residence that narrowly escaped demolition in the 1960s; the gentrification of certain working-class neighborhoods

13 Germano Celant, "Against a Destiny: Rotor," in *Rotor. Ex Limbo* (Milan: Fondazione Prada, 2011), 8.

14 "Rotor Answers Germano Celant," in *Rotor. Ex Limbo*, 30.

in London, to which Thompson himself contributed in the late 1960s by working illegally as a builder to finance his doctorate, transforming Victorian houses into residences for trendy intellectuals.

He took the example of Packington Estate, a neighborhood in Islington, consisting of rows of Victorian terraced houses, which were the target of an urban renewal project involving partial demolition and the construction of large housing estate. At that time, the Victorian houses, which the poor occupants dreamed of leaving, were considered as "transient object" (their value was declining). They were the subject of devaluating arguments by the authorities (unsanitary, slums), justifying their demolition and thus their transformation into rubbish. It was precisely this status of rubbish that allowed these houses to be bought for reasonable prices by members of the middle class (such as Jeremy Till's in-laws) and, through this process, to gradually become "durable objects" whose real estate value rose again.

Following Thompson, the qualification of an object depends less on its materiality or its degree of solidity, than on its "social malleability,"[15] on the volatile representations to which it is subject and which give it its value (or lack of value). Above all, his rubbish theory helps us to take into account the contradictions inherent in the material trajectory of society, which constantly rejects the abominable things it generates within itself. As he himself wrote, "the charm of rubbish theory is that it seems always to lead straight into illogicality, anomaly, and paradox."[16] He even described this charm as "monstrous." Thompson observed and regretted that much of philosophy and social science was built on "monster exclusion." He argued for the development of a rubbish theory that includes and even conserves the monster, a theory "which would allow us to tolerate the monsters that undoubtedly exist in our world."[17] This passage from Thompson's book, which Jeremy Till strangely failed to mention in *Architecture Depends*, suggests that

15 Michael Thompson, *Rubbish Theory. The Creation and Destruction of Value* (London: Pluto Press, 2017, first published in1979), 28.

16 Ibid., 138.

17 Ibid., 139.

we should examine the links between contemporary upcycling practices, which notably affects the value (including market value) of discarded building materials, elements, and components, and the cultural and aesthetic traditions relating to the figure of the monster, a figure that is both repulsive and heterogeneous, terrifying and cathartic.

Hopeful Monsters

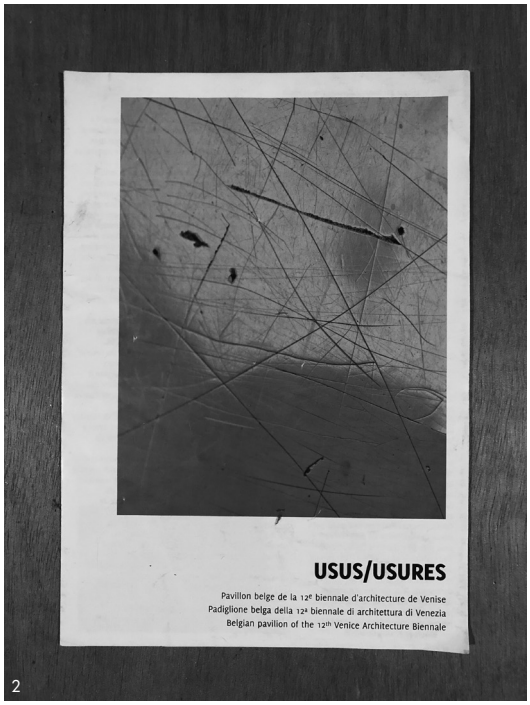
Creating architecture with elements inherited from a more or less distant past, embracing their aesthetical alterity, and negotiating with the intentions that gave rise to them and which are partly elusive, does this not require the architect to question some traditional ideals that dominate architectural design (unity, order, coherence, harmony), and to explore alternative ways of doing architecture, at the risk of incongruity, dissonance, or even monstrosity?

The figure of the monster has constantly haunted the history of architecture, either as a foil to reinforce the ideal of unity or as a weapon to challenge it. In conformity to Platonic metaphysics, which defined the monster as the opposite of beauty, order, and harmony, Renaissance theorists, for example, branded medieval architecture as monstrous because it was the antithesis of their Vitruvian vision. In other times, architectural monstrosity has been rather advocated. At the height of the deconstructivist movement, for example, it was sought after as transgressive of established values. Anthony Vidler praised the "'*grotesque*' and the 'monstrous' in Eisenman's *œuvre*" as revealing "the schizographic nature of an architecture that refuses its monumental duties by writing out its pathological condition."[18]

Between the monstrous of rejection – which is always embodied in the eyes of others – and the monstrosity[19] of rupture – which, in

18 Anthony Vidler, *The Architectural Uncanny. Essays in the Modern Unhomely* (Cambridge, Massachusetts: MIT Press, 1992), 145.

19 On the distinction between "monstrous," as a moral, juridical, and even theological category, and "monstrosity," as a simple descriptive category, notably in natural sciences, see Georges Canguilhem, "La monstruosité et le monstrueux," in *La Connaissance de la vie* (Paris: Vrin, 1992, first published in 1962), 171–184



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the case of deconstructivism, has often resulted in vain and harmless formal gesticulation – the monster always seems to arise somewhere between forms and discourse, constantly metamorphosing according to different points of view. In historiography, the liberties taken by so-called "mannerist" architects regarding the rules of classical beauty have thus been sometimes condemned as deviant, anti-classical, and unnatural aberrations, and sometimes hailed as manifestations of their powerful genius.[20]

How can we situate "*Usus/Usures*" on this map? How can we consider the monstrous coexistence of these rectangles of worn carpet, these scratched polyester seats, these wood panels discolored by sunlight, these eroded marble facade panels? The exhibition was mainly

20 See, for example, the analysis of postmodern historiography of Mannerism by Andrew Leach, "Here Be Monsters," in *Architecture and Ugliness. Anti-Aesthetics and the Ugly in Postmodern Architecture*, eds. Wouter Van Acker and Thomas Mical (London: Bloomsbury, 2020), 125–136.

conceived as an investigation into the passage of time and uses on materials, by "abrasion," "scratching," "erosion," "deposits," "stamping" and/or "fatigue."[21] And, for ROTOR, the aesthetical point of view was clearly not privileged: "Clinging to images of wear and their ranking would boil down to an arrogant and overly stylized fetishism that deliberately ignores complex stories and motivations in order to judge more easily."[22] However, displaying these worn artifacts as if they were abstract works of art, hanging them on the white walls of the Belgian Pavilion was not just an ironic nod. In the framework of the Biennale, one of the main events in the cultural industry of architecture, ROTOR's exhibition contained a latent critique of mainstream architecture, and of its energy-intensive and ecocidal predilection for smooth, continuous, perfect and pristine surfaces. But it also contributed to the social construction of the value of exhibited pieces, transforming them from rubbish to durable objects, to paraphrase Thompson.

Fig. 2
Free leaflet of the exhibition "*Usus/Usures,*" summer 2010. © Pierre Chabard.

Fig. 3
Reused architectural elements in Zinneke project, Brussels, October 2021. © Delphine Mathy.

Beyond that, it deterritorialized them and projected them into a new aesthetic field. The monstrosity that can be attributed to this disparate collision of found-objects is not the result of a negative moral judgment. Not the absolute opposite, but a possible alternative to architectural beauty, it positively paves the way for impure, hybrid, and composite assemblages. In ancient tradition, monsters were defined as chimerical creatures resulting from the deliberate, and therefore unnatural, assembly of pieces that were foreign to one another. Its fragmented, recomposed, heterogeneous body challenged the harmonious unity that Plato and Aristotle envisioned in Nature and unleashed their obsession with multiplicity in unity, their "fear of the 'many in the one'," [23] another name for chaos. As "waste in transit," architecture of reuse diametrically reverses these values, finding in the figure of the monster a desirable aesthetic horizon, intertwining the disparate things it temporarily composes, disturbing those of the

21 Ibid., 24–25.

22 ROTOR, *Usus / Usures*, 54.

23 Mark Dorrian, "On the Monstrous and Grotesque," *Word & Image*, vol. 16, no. 3 (July–September 2000), 310.

present and reactivating those of the past.

Contingent Architect

Architecture that results from the reuse of materials, elements, components or buildings, differs from them but remains attached to them because it emanates from them. It is irrevocably contingent upon them. This contingency challenges the architect's design activity. The reasons behind the form of these inherited things, as well as the circumstances by which they come to the architect, often worn, damaged and incomplete, are foreign to him and often indecipherable. They escape his will and authority. They pre-exist his intervention and, above all, his "project," imposing on him the singular data of their existence, contradicting his aspirations for perfect totality, for ideal, and therefore timeless, coherence.

Creating architectural works from inherited fragments challenges the way the architect thinks, introducing tension between formal intention and its contradiction, between anticipation and improvisation, between control and letting go.

This is another aspect of the aesthetics of monstrosity: the enigmatic complexity that surrounds its creation and threatens the laws that ancient philosophy calls the "natural" laws of procreation – the dominant model of artistic creation. Rather than being the result of reproduction, which always makes beings similar to themselves, the monster comes from a chimerical process of combining parts, limbs, and organs torn from bodies that are foreign to each other. for Aristotle, "the domain of the monstrous opens with the interruption of the father-author's reproduction of himself through the 'material' of the female. In the monster the self-display of the author in the progeny is erased, the father's mimetic making of the child in his own image undone."[24] This is the paradox of the monstrous: it challenges the all-powerful authority of the creator – lever of the modern project –, while plunging him into the intense and uncomfortable process of composing an unnatural artifice.

24 Ibid, 312.

The avant-garde movements of the early twentieth century, notably Dadaism and then Surrealism, invented all kinds of procedures for letting go – from collage to *exquisite corpse* – in order to produce unexpected, fantastical assemblages that escaped artistic control. Their goal was to bring the oneiric and monstrous power of the unconscious into reality. In upcycling architecture, the uncanny or *unheimlich* does not come from the unconscious but from the formal and aesthetic otherness of what already exists. It forces the architect to accept that not everything in their building is the product of pure creation, of a deliberate and rational project, but rather of the mobilization of contingent resources, whose availability often depends on chance.

For the architect, this openness is not synonymous with defeat or resignation. *Lâcher prise* rather than *laisser faire*, letting go rather than letting things happen, it challenges his skills, his ability not to dominate but to liberate the energy inherent in the things that come to him; to create architecture from their power of disorder, decomposition, entropy, their aspiration to ruin; to create architecture from chance, accident, uncertainty; an architecture that is no longer a barrier against the erosive and transformative forces of time and uses but welcomes their aesthetic potential. In response to environmental challenges (increasing scarcity of resources, consideration of CO2 emissions, etc.), ROTOR's commitment to reuse, as manifested in the "*Usus/Usures"* exhibition, prefigures a way of making architecture out of countless anachronistic and anastylistic fragments: an architecture capable of giving a provisional meaning to this recomposed family of old and new objects, and itself open to its subsequent transformations; an architecture that is inclusive and composite, *ad-hoc* and *non-finito*, monstrous and queer; an architecture that is constantly being done and redone.

An architecture without end.

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