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Typology in Transition: Structure, Affordance, and Umbau in Post-War Office Towers

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Abstract

The transformation of post-war office buildings in Manhattan foregrounds a broader architectural question: how can existing structures operate as frameworks for change rather than as fixed supports tied to obsolete programmes? This paper situates office-to-residential conversion within an inquiry into Umbau as a form of design intelligence grounded in material persistence and spatial reprogramming. Focusing on three modernist towers—25 Water Street and 180 Water Street in Lower Manhattan, 750 Third Avenue in Midtown—it combines urban mapping, the analysis of Department of Buildings records (DOB) and interpretative redrawing. Across the cases, structure acts as a framework that guides adaptation without determining it. Deep floor plates, regular grids and service cores afford a shared repertoire of operations: carving voids into the plan, reoccupying technical volumes and redistributing floor area through vertical accretion. Read in section, these operations show that what conversion conserves depends on what binds it. In the Water Street towers regulatory floor area is held constant while built mass grows; at 750 Third Avenue area cut from the avenue front is redeposited on the setbacks of a stepped tower, and built mass barely changes. In all three the interface between frame and addition is the critical site of transformation. Retaining structure preserves embodied carbon, yet the envelopes, slabs and transfer structures that inhabitation requires show that circularity is a condition negotiated in design rather than a property of reuse. The capacity of existing buildings to accommodate change lies in the interplay between structural persistence and spatial reprogramming.

1 Introduction

Lower Manhattan has been described as the place where the idea of architectural obsolescence was invented: a culture in which the tall building was treated as a provisional artefact, to be replaced whenever type and use fell out of step [1]. The current wave of office-to-residential conversion runs against that habit. Persistent office vacancy and a chronic housing shortage have turned conversion into a policy instrument: the Office Adaptive Reuse Task Force recommended easing the rules that govern it [2], and the City of Yes for Housing Opportunity amendment, adopted in December 2024, extended eligibility from buildings constructed before 1961, or 1977 in Lower Manhattan, to those constructed before 1991 [3]. A state tax incentive ties long-term exemptions to the provision of affordable units in converted buildings [4]. Together these measures bring the post-war office tower to the centre of the conversion market [5].

These towers were conceived as efficient and standardised environments for work. Fluorescent lighting and mechanical air conditioning freed their plans from daylight, and so from the shallow depth that daylight had imposed [6]; speculative development and zoning did the rest [7]. They combine deep floor plates, regular structural grids and centralised service cores. The buildings are not obsolete because they have deteriorated, but because their spatial and environmental logics conflict with those of dwelling [8]. In conversion the same features generate both resistance and opportunity. A dwelling needs light and air that the depth of the plan cannot provide; yet the grid, the cores and the generous volumes built for machines leave room for transformation.

The question this paper asks is architectural: how can existing structures operate as frameworks for change rather than as fixed supports tied to obsolete programmes? The literature approaches conversion from three sides that seldom meet. Analyses of feasibility read buildings in plan, measuring depth and testing layouts and returns [9–11]. Structural research has begun to quantify the reserve capacity of existing frames [12, 13] but rarely engages with building type. Typological research on *Umbau* and affordance [14, 15] rarely documents what a given structure is actually made to carry. Our own earlier work on Manhattan read conversions through plan, type and envelope [8]; what it left open is the structural and sectional logic that makes those plans possible.

We situate office-to-residential conversion within an inquiry into *Umbau* as a form of design intelligence grounded in material persistence and spatial reprogramming, and we read the transformations in section. In the conversion of Manhattan's post-war towers a recurrent sequence can be observed: voids are carved into the deep plan, volumes built for machines are reoccupied and new floors are added above. Designers and contractors describe the sequence as a transfer, in which floor area removed from the plan is relocated to the top of the building [16, 17]. The section is where this transfer becomes visible, and where structure, typology and circularity are negotiated. We examine it through the records filed with the New York City Department of Buildings (DOB).

Three questions follow, framed by the terms of this collection. *Analyzing*: which structural and typological conditions of the post-war tower afford transformation? *Activating*: through which operations are these affordances put to work, and how do the operations combine in section? *Adapting*: what does the transformation conserve and what does it add, structurally and materially? Section 2 sets out the theoretical framework and Section 3 the corpus and method. Sections 4 to 6 answer the three questions in turn, and Section 7 discusses the results. The contribution is a sectional reading of conversion. It shows where in the building floor area is taken and where it is placed, what the existing frame is asked to carry as a result, and which of two accounts, that of zoning floor area or that of built mass, each project keeps in balance.

2 Umbau, typology and affordance

2.1 Umbau as design intelligence

The German word *Umbau* designates both the transformation of an existing structure and the act of building around something that is already there. Hermann Czech gave the term its theoretical standing by arguing that all building is, in the end, conversion: a decision taken within conditions that precede it [18]. Recent research has turned it into a tool for reading the potential of existing buildings and has gathered its types in an atlas [14]. In this line of work type is not a fixed model but an epistemology, a way of reasoning about what a building can become [15, 19]. The position converges with studies of adaptive reuse as a discipline in its own right [20] and with research on the transformative potential embedded in the form of existing buildings, independent of the function they were built for [21].

Understood in this way, *Umbau* is not a marginal activity of maintenance or technical upgrading. It is a central architectural practice.

2.2 Affordance and the open script

Gibson introduced the notion of affordance to describe the possibilities for action that an environment offers to those who inhabit it [22]. In architecture the term names the possibilities for use, adaptation and interaction that a building's design supports over time [19]. An existing building offers a range of possible actions that is neither fully open nor strictly constrained. Brand's account of buildings that learn, through layers changing at different rates, gives this range a temporal dimension [23]: new uses activate some affordances and leave others dormant. We read such affordances in section, where the relations between structure, volume and use are most explicit.

2.3 Structure as a framework for change

The idea that structure frames use, rather than determining it, runs from Habraken's supports [24] to Leupen's distinction between frame and generic space [25] and to the literature on adaptable architecture [26]. Structure has been described as an organising tool for possibilities [27], and the adaptability of converted buildings has been traced as a function of their structure through the concepts of structural porosity and pockets of use [28]; in that reading the permeability of slabs contributes significantly to the usability of a building over its lifetime. We extend the reasoning along the vertical axis: porosity is read across floors, as voids cutting through the stack, and capacity is read above the roof as well as within the envelope.

Reserve capacity is the structural counterpart of affordance. Gillott, Davison and Densley Tingley modelled the sources of structural underutilisation in a large population of hypothetical steel-framed office buildings and found that a change of use from office to housing unlocks, on average, more than a fifth of the capacity of the frame, and that a variable but significant share of buildings could be extended vertically without strengthening [12]. The underutilisation of structural steel had been documented earlier [13], and practitioners point to the economic drivers and regulatory barriers of vertical extension [29, 30]. That reserve, however, is an average over many frames, whereas an addition loads particular column lines over their whole height; the interface is where the new load enters the frame, not necessarily where the frame is most stressed. The distinction returns in Section 6.

2.4 Circularity as a negotiated condition

Retaining a structure avoids the emissions of producing a new one [31, 32], and the embodied energy stored in existing buildings can itself guide decisions on what to keep [33]. A Swedish case study found that converting an office building to housing could cause about a quarter of the embodied emissions of new construction [34], and a study for New York estimated the whole-life carbon savings of extending conversion eligibility [35]. Over a long horizon, however, a comparative life-cycle assessment found that a new building could perform better overall because of its operational efficiency [36]. The environmental benefit of conversion is therefore not automatic.

Carbon re-enters a conversion at precise points. Envelopes are replaced or reworked; new slabs fill voids and plant floors; new structure is built above the roof and transfer elements are inserted into the existing frame; the slabs cut to open courts are demolished and disposed of. The New York study counts two of these items explicitly, the demolition of structure removed by carving and the production of structure added on top, and limits its assessment to structure and enclosure [35]; the life-cycle modules of EN 15978 offer a frame for a fuller inventory [37]. This paper does not perform a life-cycle assessment. It identifies, case by case, what is retained, removed and added, and where in the building those decisions are taken. In this sense circularity is a condition negotiated in design rather than a property of reuse.

3 Materials and methods

3.1 Mapping and case selection

The study builds on a mapping of post-war office towers converted to housing in Manhattan, developed by the authors through urban data analysis, fieldwork and comparative redrawing. By 2025 the mapping counted twenty-six modernist towers converted and eighteen further projects under way or planned; by 2024 about 1.2 million m² of high-rise office space built between 1960 and 1990, more than a tenth of that stock, had changed use. Lower Manhattan concentrates the completed conversions, while Midtown is where the next wave is being filed.

Two cases were selected from this mapping, and a third, slightly earlier tower in Midtown was added for contrast (Table 1). All three are speculative or corporate office towers built between 1958 and 1971, and they were chosen because each combines voids cut into the deep plan with new floors placed on roofs that the existing section makes available. All were converted, or are being converted, under the chapter of the Zoning Resolution that governs the conversion of non-residential buildings to housing [38–40]. They differ in two respects that make the comparison productive. The first is the regime under which they were built. 25 and 180 Water Street were built under the 1961 Zoning Resolution, which traded height for open space at the ground; 750 Third Avenue belongs to the last years of the 1916 Resolution and to its stepped envelopes (Section 4.3). The second is their state of completion. 180 Water Street, converted between 2015 and 2017, with zoning computations amended in 2021 [39], is among the earliest large conversions of a post-war tower in Lower Manhattan; 25 Water Street, completed in 2025 with 1,320 apartments, is among the largest conversions undertaken in the United States [41]; 750 Third Avenue was filed in 2025 [42] and has been under partial demolition since mid-2026 [43]. The corpus thus spans a decade of practice, from an early case to a project in progress.

Table 1
Cases, actors and main public records

Case	Built	Original architect	Conversion architect	Units	Main DOB records
25 Water Street (formerly 4 New York Plaza)	1969	Carson, Lundin & Shaw	CetraRuddy	1,320	Job M08013214: ZRD1 no. 72403 (2022); ZO-002.01, ZO-006.01, ZO-007.00; A-400–A-630; survey (2022)
180 Water Street (formerly 130 John Street)	1971	Emery Roth & Sons	Avinash K. Malhotra Architects; CetraRuddy (interiors)	581	Job 121192609: Z-001.04, Z-002.03, Z-003.00–01 (2021); drawings (2016); temporary certificate of occupancy (2026)
750 Third Avenue	1958	Emery Roth & Sons	Gensler	678[a]	Job M01197450-I1: zoning computations Z-003.00–Z-006.00 (2025); AI1 (2026); schedule of occupancy. Job M01197450-S7: partial-demolition drawings DM-001–DM-901 (2026)

[a] As in the submission reviewed in December 2025; the apartments along the lot line were withdrawn in April 2026, pending the recording of a zoning-lot combination [44], and the owner had announced 639 units in 2024 [45]. Sources: [38–40, 42, 43, 46–50]

3.2 Sources

The primary sources are the records filed with the DOB for each conversion: job filings, zoning determinations and computations, architectural and demolition drawings, schedules and certificates of occupancy. They are complemented by the accounts published by designers and contractors, used only for the facts they report, and by our previous study of the office buildings of Emery Roth & Sons, 180 Water Street among them [8]. For 180 Water Street the frame, and the way it is cut, are read from the architects' set of January 2016, whose detail sheets are marked as issued for coordination [47]. For 750 Third Avenue, whose architectural drawings had not been released at the time of writing, the analysis relies on the zoning computation reproduced in the plan examiner's review of December 2025, on the schedule of occupancy, on the drawings for the partial demolition and on the 1950s records of the adjoining 485 Lexington Avenue, which document the two towers together [40, 43, 50, 51]. The record is thinner than for the completed buildings, but more pertinent to the question asked here: it documents what the frame is, where it is cut and in which sequence.

3.3 Redrawing in plan and section

Redrawing is used here as a tool of inquiry rather than of illustration [21]. Each tower is redrawn in section, to its true dimensions and at a common scale, and each section is cut through the voids (Fig. 1). The geometry of the existing building and of its transformation is reconstructed by cross-reading the filed documents: heights are derived from sections and zoning computations, horizontal dimensions

from zoning sections and demolition drawings. Historical documents complement these sources in reconstructing the original layouts: the plans published when 25 Water Street was completed [52], the leasing brochure of 180 Water Street [53] and, for 750 Third Avenue, the application filed in 1955–57 [50]. The drawings follow the black–yellow–red convention, in which what exists is drawn in black, what is demolished in yellow and what is added in red [14, 54], with line types and hatching that keep the three legible without colour. Where an extent is inferred rather than read from a document, the drawing marks it.

A section shows where area is taken and where it is placed, which volumes change role and where new structure meets old. It cannot show how much. To quantify the overall balance, floor areas are compiled floor by floor from the zoning computations, in two measures that the accounts of designers and contractors seldom distinguish. Gross floor area is what the structure carries and what has to be built or demolished. Zoning floor area, the quantity regulated by the Zoning Resolution, excludes mechanical spaces, shafts and other deducted areas. The distinction proves decisive (Section 6.2).

3.4 Limits

The analysis relies on filed documents rather than on a survey of the built works: areas are those declared in zoning computations and heights those of the filed sections. 750 Third Avenue is under construction, and its drawings document the transfer as submitted in December 2025 and amended in April 2026, not as built. Structural calculations are not public, so the analysis of load transfer is limited to what the architectural, zoning and demolition drawings show: ours is a sectional reading of where structure is engaged, not a structural analysis. Press reports on structural incidents are used only for facts confirmed by public authorities or attributed to their sources. A large language model, Claude (Anthropic), was used to systematise and cross-check the information contained in the DOB records, and to support the grammar revision of the English text. The authors checked all data and take full responsibility for the content.

4 Analyzing: three towers, three frames

4.1 25 Water Street: a block for machines

25 Water Street, formerly 4 New York Plaza, was completed in 1969 as the operations centre of Manufacturers Hanover Trust, to a design by Carson, Lundin & Shaw [52, 55]. Its brick envelope, with few and unevenly distributed windows, was calibrated to machines rather than to people [52]. It is the extreme case of the deep plan: a block about 84 m long and 45 m deep, with floors of some 3,750 m² served by two façades and a service band along a blind wall [38]. The conversion drawings show a steel frame with concrete slabs on metal deck and storeys of 3.76 m [46]. Above the main roof stood generators, cooling platforms, a boiler room and a mechanical penthouse [46]: a whole landscape of plant, dimensioned for a building that processed cheques rather than housed clerks.

4.2 180 Water Street: the speculative tower

180 Water Street, completed in 1971 as 130 John Street to a design by Emery Roth & Sons [53], is the ordinary counterpart of that exception: a speculative tower of the wave that remade Lower Manhattan around 1970 [8]. Its floors, of about 1,720 m², are less than half those of 25 Water Street, but its lot is more intensively built. The floor area ratio (FAR) is 19.32, against a maximum of 10 for residential use on the same lot [39]. The architects' drawings for the conversion show the frame: forty steel columns on bays of 7.3 m by 5.6 to 8.6 m, with a deeper bay of 9.8 m along the lot-line wall for elevators and stairs; steel beams encased in concrete; concrete floor slabs [47]. Two features of its section matter for what follows: a double-height mechanical floor at mid-height, and an enclosure rising 8.8 m above the main roof to screen the rooftop plant. Both are volumes without floors, built for machines and framed by the structure.

4.3 750 Third Avenue: the stepped twin

750 Third Avenue is older and of a different kind. Built in 1957–58 for Uris Brothers to a design by Emery Roth & Sons [49], it is the eastern half of a pair. The same architects designed 485 Lexington Avenue on the western half of the block, and their calculations of 1956 treat the two buildings as one problem, down to a loading berth shared across the lot line [50]. The towers were held in common ownership for decades and, in the words of the agreement that separated them in 2004, "operated in many respects … as an integrated facility" [56].

The stepped form of 750 Third Avenue reflects the framework of the 1916 Zoning Resolution, which linked height to setbacks and allowed a tower occupying up to a quarter of the lot to rise without a height limit [6, 57]. Roth's diagram computes the area of the tower, in zoning terms, at 887.1 m² against 887.4 m² permitted [50]: the allowance is used to within a third of a square metre. The result is a base of about 3,250 m² per floor that thins through a series of setbacks into a cruciform tower of 895 m² gross, with a lower wing along 47th Street whose roofs step up towards it (Fig. 2) [40, 43]. Where the Water Street towers are extrusions, 750 Third Avenue is a stepped section.

The frame is of rolled steel on bays of 5.5 to 7.7 m, with concrete slabs reinforced with wire mesh and columns encased in concrete; the elevator banks occupy the middle of the base, beneath the tower [43]. Storeys are 3.40 m high, the lowest of the three cases and the dimension that a conversion can least alter [40]. With 64,125 m² above grade on a lot of 3,550 m², the FAR is 18.1. By 2025 the building was about four-fifths vacant [42].

4.4 What the frames afford

Read together, the three frames afford transformation in three ways (Table 2). The first is spatial. Technical volumes—penthouses, double-height plant floors, rooftop enclosures—are generous and structurally framed, and they become redundant once building services are decentralised. In the stepped tower the setbacks add a second reserve, in the form of roofs at intermediate heights. The second is structural. Residential live loads can be lower than office loads, so that a change of use may release

capacity throughout the frame [12]; and all three frames are of steel, which the records show being cut and re-edged bay by bay.

Table 2
Structural and typological parameters of the three towers

Parameter	25 Water Street	180 Water Street	750 Third Avenue
Zoning Resolution at construction	1961	1961	1916
Storeys before / after	22 / 32, plus plant levels	24 / 29	34 / 34, plus penthouse
Typical gross floor plate	3,747 m²	1,723 m²	3,251 m² in the base; 895 m² in the tower
Typical floor-to-floor height	3.76 m	3.66 m	3.40 m
Lot area	5,019 m²	2,199 m²	3,550 m²
Existing floor area	84,069 m²; FAR 16.8	42,479 m²; FAR 19.32	64,125 m²; FAR 18.1
Structural frame	Steel; concrete slabs on metal deck	Steel, encased in concrete; concrete slabs; bays of 5.6–8.6 m by 7.3 m	Rolled steel, encased in concrete; concrete slabs reinforced with wire mesh; bays of 5.5–7.7 m
Technical volumes	Rooftop plant; mechanical penthouse	Double-height plant floor; rooftop enclosure 8.8 m high	Mechanical penthouse; water tank on the wing; rooftop cooling towers and tanks
Sources: [38–40, 43, 46, 47, 50]			

The third is regulatory, and it is the least visible. At 180 Water Street the existing floor area is almost twice what the lot would allow for new housing, and the zoning computation carries this excess into the count of permitted dwellings [39]. Area removed from such a building cannot be rebuilt beyond the existing total: it can only be relocated within it. 25 Water Street is in a similar position, with a ratio of 16.8 on its present lot [46]. 750 Third Avenue exceeds the residential maximum by a similar measure, but meets the limit differently: its zoning computation counts floor area on a zoning lot that combines the two towers of the block [40], a combination still to be recorded at the time of writing [44]. The pair conceived by Uris and Roth in 1956 is called on again, seventy years later, as a regulatory resource. The frame affords transformation, but within limits that are at once physical and legal.

5 Activating: a repertoire of operations

The three conversions share a small set of operations (Fig. 3). What distinguishes them is how the operations combine in section, and which affordance of the existing building each one activates.

5.1 Carving the deep plan

The first operation answers the depth of the plan by subtraction. At 180 Water Street a single court of about 12 by 9 m runs from the 3rd floor to the roof, removing 6.5% of each floor plate and reorganising the plan into a ring of 22 apartments [39, 47, 48]. The cut is a local rewriting of the grid. The architects' plans mark the column that stood in the opening “to be removed” and a new column at its edge; where the edge follows an existing beam the encased steel is kept, and elsewhere the old steel is cut and a new beam is set beneath the slab edge; new lateral bracing runs along the northern side of the court, behind walls of light steel framing [47]. At 25 Water Street two courts are cut from the 2nd floor to the top of the existing building; together with the new shafts they remove between 8.2 and 8.5% of each plate [46]. The numbers are small. The effect is not: at 25 Water Street the two courts turn a floor with two fronts into one with ten.

Carving serves two purposes that the projects seldom separate. A light void brings daylight and air into the depth of the plan. An accounting void moves floor area from a place where it cannot be inhabited to one where it can. A neighbouring conversion, 160 Water Street, shows the second function in its pure state: three shafts cut through the middle of the building are blind, do not open to the sky and rise only to the existing roof, while their area is relocated to a five-storey addition [17, 58]. The courts of our three cases combine both functions, in different proportions.

5.2 Reoccupying technical volumes

The two Water Street conversions find their first new floors inside the technical volumes. At 180 Water Street the double-height mechanical floor receives a new slab, which becomes the 15th floor, and the 26th and 27th floors are built inside the enclosure that used to screen the rooftop plant (Fig. 1b) [39]. The new 15th floor is concrete on metal deck, 3.66 m above the 14th, and on the Water Street front the drawings show it meeting spandrel beams that already ran at that level [47]. At 25 Water Street the architect's request to the DOB states that the project "would relocate floor area of the existing floor space used for mechanical equipment to the top of the Building" and, separately, "create new interior courts" [38]. The 23rd and 24th floors take the place of the mechanical penthouse: about a third of their area already existed as floor area of the plant, and the roof of the old penthouse survives beneath the terrace of the 25th floor (Fig. 1a) [46]. In the Water Street towers the first place where space is found is thus not above the building but within it, in volumes that the frame already encloses and already carries.

5.3 Accreting above the roof

Above these volumes the addition leaves the inherited envelope. At 180 Water Street the 28th and 29th floors, set back from the street walls, raise the main roof from 96.5 m to 113.3 m [39]. At 25 Water Street a narrower amenity floor carries seven residential floors, and the roof rises from 85.3 m to 123.0 m, almost half as high again [46]. The new storeys are lower than the old, 3.35 m against 3.76 m: more floors for the same height. Read in sequence, the section shows a gradient of intervention: carving below, reoccupation at the thresholds of the old building, new construction only at the top.

5.4 750 Third Avenue: the repertoire folded into a stepped section

750 Third Avenue draws on the same repertoire for a different result: it carves and it accretes, but it reoccupies no technical volume. It also shows the operations before they are concealed by finishes. Its principal move is a court, but not an internal one: in the designers' words, portions of the podium are carved out for daylight and the area removed is relocated [59]. In front of the tower the base is cut away on the Third Avenue side, two structural bays deep and four wide, about 12 by 22 m, from the 3rd floor to the 11th; above, the cut follows the front as it steps back, and it is a single bay deep on the last three floors of the base (Fig. 2a, b) [43]. The void is neither enclosed nor blind. It opens the deep avenue block into a U, brings the face of the tower down to the 3rd floor and gives the apartments around it a front they would otherwise lack. The zoning computation records the net loss as about 7 to 8% of each typical floor [40], the same order as the internal courts of Water Street, obtained with a single cut at the edge.

Three smaller interventions complete the scheme. Along 47th Street the stepped edge of the lower wing is taken down strip by strip, slab and façade together, once new framing is in place [43]; the zoning computation records more floor area on the same floors, not less, which suggests that the edge is rebuilt further out rather than cut back [40]. A band of the 2nd-floor slab along 46th Street is taken out, after the columns beneath are reinforced, to form a double-height lobby for the apartments, separate from the office lobby that survives beside it [43, 60]. And openings are cut in the slabs around the elevator core, floor after floor [43]. The programme follows the section: shops at ground level, offices on the 2nd and part of the 3rd floor, dwellings from there to the 34th, twelve to a floor in the tower and up to thirty-eight in the base [40, 51].

What is taken from the base is given back at the flank, not at the top. The mechanical penthouse stays mechanical, and the cooling towers and tanks on the main roof are dismantled [43, 51]; the designers mention rooftop amenities, which the records examined do not yet locate [59]. The new floor area goes instead to the lower wing. The water tank that stood on its roof is dismantled, the upper floors of the wing are extended, and four new floors are built above it, beside the tower, from the 21st to the 24th (Figs. 1c and 2c) [40, 43]. The addition stops below the 25th floor, where a lounge and a terrace occupy the new roof [51], and the height of the building does not change.

The demolition drawings add something that completed buildings no longer show: the method. Slabs are saw-cut and broken out bay by bay, leaving the wire mesh to be welded back; the steel is removed once freed, and with it the columns that the cut leaves free-standing; pockets are opened in the concrete encasement of the existing steel to receive new edge framing; where a cut is deep, the frame is shored, cut and reconnected. The work proceeds from the top down, with compact and remote-controlled machines of about a tonne, in a building that remains partly occupied [43]. The drawings treat the frame of 1958 as lending itself to this surgery; that is its affordance. The filing, moreover, is not yet stable: the apartments along the western lot line depend on light and air borrowed from the neighbouring tower, and

were withdrawn from the application in April 2026 until the combination of the two zoning lots is recorded [44].

5.5 Cores and collective space

Two further moves accompany the three operations: the reworking of the core and the placing of collective space. Residential towers need fewer elevators than office towers, and conversion opens the core. At 180 Water Street eight elevator cars remain in the banks along the blind wall, between the two stairs [47]; at 25 Water Street the service band was thinned and new elevator cores were introduced closer to the centre of the plan, with extensive floor openings and structural modifications [16, 55]. The space released is partly absorbed by shared programmes, which gather at the two ends of the section. At 180 Water Street the 28th floor houses recreation rooms, an outdoor lounge and a pool [48]; at 25 Water Street the 25th floor and the cellars hold amenities that amount to about a tenth of the floor area [41, 61]; at 750 Third Avenue lounges and a screening room occupy the 3rd floor and a fitness centre the sub-cellar [51].

6 Adapting: what is conserved, what is added

6.1 The interface between frame and addition

Where the addition meets the existing frame, affordance becomes a structural question (Fig. 4). At 25 Water Street the 25th floor is designed as an interface: the architectural details show sloped structural columns and bracing rising from cast-in-place concrete pedestals [46], which take the residential floors above, wider than the amenity floor, down onto the frame of 1969. The structural engineer describes the reinforcement of the existing building, vertically and laterally, to receive the addition [62], and the contractor reports new lateral bracing in the existing floors and additional plating on some columns [16]. The amenity floor is thus also a transfer floor: the collective programme occupies the storey that the structure needs. At 180 Water Street the 26th floor is laid on the existing roof and built, with the 27th, inside the old rooftop enclosure, while the 28th and 29th rise above it, set back from the street [39]. The architects' details show the new floors as composite slabs on metal deck, carried by new steel beams with sprayed fire protection, and on the lot line new walls of reinforced blockwork, set at least 200 mm back from the property line as a seismic separation from the neighbouring tower [47]; how the new columns meet the old is a matter for the structural drawings, which we could not consult. At 750 Third Avenue the interface is lateral as well as vertical. The new floors stand on the roof of the wing and against the flank of the tower, whose façade is removed where they meet; new framing is installed before the old slab edges are cut, and at the foot of the building columns are reinforced before the lobby is opened [43].

How much capacity the change of use releases is documented only in part, and the records advise caution. The certificate of occupancy of 180 Water Street assigns 1.92 kN/m² to apartments and 4.79 kN/m² to mechanical rooms, amenity spaces and retail [48]: the collective spaces that conversions place at the top carry the highest live loads. At 750 Third Avenue the schedule of occupancy lists the same live

load, 2.39 kN/m², for the existing offices and for the proposed apartments [51]: it gives the rated load of the floors, which is unchanged, and neither claims nor excludes the reserve that the literature attributes to the change of use [12]. The application states that the structural stability of the building is not affected by the work [63]. Where floors are added, as at 25 Water Street, the published accounts describe reinforcement, not the use of an existing reserve.

6.2 Two ledgers

The DOB records qualify the common account of conversion as a transfer at constant area (Table 3). At 180 Water Street the area added above the roof is about twice the area removed by the court, and the building gains 8% in gross area. Its zoning floor area, however, is unchanged to within a tenth of one per cent [39]. The balance is reached by adding to the area of the court the deductions that housing allows for shafts and other excluded spaces, and the zoning section itself labels the new upper floors as "reconfigured floor area from court and mech. deductions" [39]. Published accounts, our own included, describe the area cut from the centre as moved to the top [8, 10]; the computation shows that what is held constant is the zoning floor area, not the gross. At 25 Water Street the pattern is the same at a larger scale: the area added at the upper levels is about two and a half times that removed from the floors below, and gross floor area above grade grows by 11%, while zoning floor area changes by less than a tenth of one per cent [46]. In both Water Street towers, then, conversion conserves regulatory floor area rather than built mass.

Table 3
Area removed and added in the three conversions

Measure	25 Water Street	180 Water Street	750 Third Avenue
Share of typical plate removed	8.2–8.5%	6.5%	7.2–7.9%
Gross area removed	6,549 m²[a]	2,453 m², plus 355 m² of mezzanine	2,909 m²[b]
Gross area added	16,180 m²[a]	4,795 m² above the roof, plus 1,331 m² on the new 15th floor	3,350 m²[b]
Area added / area removed	2.5	2.0[c]	1.2
Change in gross floor area	+ 11.3%[a]	+ 8.0%[d]	+ 0.7%[b]
Change in zoning floor area	−0.05%	−0.1%	−14.9%[e]
Height added to the main roof	37.6 m (+ 44%)	16.8 m (+ 17%)	none

[a] From the floor area schedule of the zoning calculations (sheet ZO-002.01, approved 12 February 2024): the area removed is the sum of the reductions in gross floor area on floors 2–22; the area added is the sum of the increases on floors 23–24 and of the new levels above them, mechanical levels included; the change in gross floor area is measured above grade. [b] Sums of the floor-by-floor reductions and increases above grade in the zoning computation; the summary on the same sheet gives lower totals (2,877 m² removed, 2,395 m² added), which do not reconcile with its own figures for existing and proposed area. [c] Floors above the existing roof against the court alone; with the mezzanine and the new 15th floor the ratio is 2.2. [d] From the totals of the zoning computation. [e] From the existing floor area, counted as zoning floor area under the conversion rules, to the planned zoning floor area. Sources: [16, 39, 40, 46]

At 750 Third Avenue the two ledgers diverge the other way. Gross floor area above grade grows by less than 1%, and what is added on the wing is of the same order as what is removed from the base. Zoning floor area, by contrast, falls by some 15%: the existing floor area counts in full, while the planned floor area is reduced by the deductions that housing allows, and part of the floor-area rights of the lot is left unused [40]. What conversion conserves thus depends on what binds it. In the over-built towers of Water Street the binding constraint is regulatory floor area, and that is what is conserved. At Third Avenue the floor-area account does not bind; what does is not documented in the records examined, and what stays constant is built mass and the height of the tower. The distinction matters for circularity, because structure and carbon track gross area far more closely than zoning area.

6.3 What conversion adds

If the frame persists, much else is added. At 25 Water Street new openings are cut into the brick façade and the bricks are painted white to reflect daylight along the street and into the courts; the walls of the

courts are clad in an insulated render system, a new envelope inside the old one [46, 61]. At 180 Water Street the mullions of the curtain wall are kept and new operable sashes are clipped to them, with insulation added behind the spandrels; the walls of the court are clad in aluminium panels [47]. At 750 Third Avenue the façade—partly a wall of glass and mullions, partly a masonry cavity wall—is demolished where the cuts open it and where new windows are installed [43]. New slabs fill the plant floor of 180 Water Street and extend the wing of 750 Third Avenue; new steel, transfer elements and plates are added at 25 Water Street.

The estimated job costs declared in the filings give an order of magnitude. At 25 Water Street the façade works are the largest single item, more than a third of the declared total, and the structural works for the new cores and openings account for about a sixth [64]. At 750 Third Avenue, where nothing is built above the tower, the structural application declares less than a tenth of the total filed [65]. To judge from these figures, the tension between material persistence and spatial transformation is greatest at the envelope, which residential inhabitation transforms most extensively, and next at the points where the frame is asked to carry what it was not designed for.

6.4 The limits of affordance

Three events of July 2026 are a reminder that the affordance of the frame is conditional. On 7 July two steel columns buckled on the 21st floor of 235 East 42nd Street, the former Pfizer headquarters then being converted into more than 1,600 apartments, and the floors above sagged; the building was shored and stabilised [66]. According to press reports the buckled columns stood beneath the building's vertical expansion, and the project's structural engineer stated that reinforcement specified in the approved drawings had not been installed on three floors [67]. In August, drawings obtained by The New York Times showed missing or insufficient reinforcement on eight further columns [68]. In October the DOB approved a plan to raise the sagging floors by jacking and to carry out permanent repairs, after review by its own engineers and by an independent firm; at the time of writing it had not published its findings on the cause [69, 70]. Two orders followed the failure within the month. On 24 July the DOB issued a full stop-work order at 222 Broadway, a conversion with a newly added 32nd floor, where two concrete beams on that floor had cracked and been repaired; the department alleged that the incident had not been reported immediately [71]. Five days later it issued a partial stop-work order on steel work above the eighth floor of 750 Third Avenue, after a condition on site was found to differ from the filed plans; the order was lifted the next day after re-inspection, the department having confirmed, according to the owner, that there were no structural issues [72]. After inspecting 180 sites connected to the project team of 235 East 42nd Street, the DOB reported no evidence that the failure was inherent to office-to-residential conversions [67, 73].

The first two buildings are not part of our corpus, and no causal claim is made here. Both incidents occurred, however, in buildings receiving additions. The order at 750 Third Avenue, lifted within a day, shows rather how closely such work is now watched. Affordance is a property of the frame as designed, drawn and verified; it is not a guarantee about the frame as built.

7 Discussion: the section as a site of negotiation

7.1 Umbau as vertical transfer

The three conversions do not dissolve the existing framework; they reinterpret it. Each operation activates a different affordance: depth invites carving, plant volumes invite reoccupation, roofs invite accretion. Read in section, these operations form a single movement. Floor area that the deep plan cannot make habitable is removed from the depth of the plan and deposited higher up, in the Water Street towers through the volumes that machines no longer need. *Umbau*, in these towers, operates as a vertical transfer.

In these three cases type sets the path of the transfer. In the towers of the 1961 Resolution, extruded above a plaza, the only free surface is the roof, and the transfer ends in a new crown. In the stepped tower the section itself offers landings, and the transfer stops short of the top. The older type appears, in this case, to be the more accommodating one: its setbacks, once the price paid for height, become places to build. This is what we mean by typology in transition. The type does not disappear with the office; it changes role, from a formula for rentable area to a set of instructions for its own conversion.

The transfer is negotiated on two ledgers at once, and in none of the three cases do they balance together (Section 6.2). The frame offers possible actions; regulation and economics select among them.

7.2 Where the carbon is spent

In all three cases the frame is kept. The sections show where that benefit is spent: in the slabs demolished to open voids, in the new floors and transfer structures above and, to judge from the declared costs, probably most of all in the envelopes that inhabitation requires. Even where gross area hardly changes, as at 750 Third Avenue, the slabs broken out of the avenue front and those cast on the wing are not the same material: a balanced account of floor area is not a balanced account of carbon. Nothing in the records we examined suggests that the steel and concrete removed are reused. Read against the whole-life comparisons in the literature [34, 36], the balance of a conversion is likely to be decided at specific points of the section, and could be lost at any of them.

7.3 Who occupies the top

The vertical transfer also sorts. The most valuable positions in the section are given to new collective spaces and new apartments, while the units facing the courts occupy the former depth of the plan: a vertical inversion of the building's social hierarchy. The pattern is not uniform. At 25 Water Street about a quarter of the units are designated as affordable and distributed throughout the building under the state incentive [4, 41], and 750 Third Avenue is to use the same instrument [45]; where in its section those units will sit is not documented in the records examined. A reading of conversion as circular practice cannot stop at material flows. It has to ask for whom the retained structure is made to work.

7.4 Verification and transferability

Conversions follow the pace of the real-estate cycle, while the verification of what a frame can carry depends on filings reviewed one job at a time and on the correspondence between drawings and site. After the events of 2026, engineers quoted in the press argued that independent peer review should be considered for conversions that add floors to existing buildings [67]. The sections show where the new load enters the frame; a review would follow it from there down.

The repertoire identified here also works as a design grammar: a small set of operations—carve, reoccupy, accrete—whose combinations can be read across cases and anticipated in design. Two of the three appear under both zoning regimes of the corpus, and deep floor plates recur in post-war office stocks well beyond New York. What it yields elsewhere depends on two things that the three cases help to tell apart [9, 21]. One is dimensional: the depth of the plate decides whether a void is needed and how much it takes, the storey height how many floors a given volume can hold, the grid and the technical volumes where slabs can be cut and floors inserted. The other is the urban situation: the surrounding density and the daylight that it leaves, and the rules that say whether floor area taken from the plan may be put back, and where.

8 Conclusions

This paper has read the conversion of three post-war office towers in Manhattan through their structure and in section. *Analyzing*: the post-war frame affords transformation through the volumes it built for machines, through a grid that can be cut and re-edged, and through floor-area rights that are fixed on an over-built lot or counted with a neighbour's on a combined zoning lot; a stepped tower adds to these the roofs of its own section. *Activating*: a shared repertoire of operations—carving light and accounting voids, reoccupying technical volumes, accreting on roofs and setbacks—puts these affordances to work, with demolition inside the existing envelope and new construction above or beside it. *Adapting*: the Water Street towers hold zoning floor area constant while gross area grows by 8 and 11%; 750 Third Avenue holds gross area and height while zoning floor area falls by 15%. In all three the most delicate point is the interface between existing frame and addition.

The repertoire, not the single case, is the result. Structure guides adaptation without determining it; it is a framework that has to be read, drawn and verified before it can be trusted. The capacity of existing buildings to accommodate change lies in the interplay between structural persistence and spatial reprogramming. The structural drawings of the three cases remain to be examined: a structural reading of the interface and an inventory, in terms of carbon, of what is demolished and added are the next steps.

Declarations

Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

Not applicable.

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Author Contribution

Conceptualization: Elena Guidetti; Methodology: Elena Guidetti and Caterina Barioglio; Investigation: Elena Guidetti and Caterina Barioglio; Writing – original draft: Elena Guidetti; Writing – review and editing: Elena Guidetti and Caterina Barioglio.

Data Availability

The DOB records analysed are public and can be retrieved from the BIS and DOB NOW portals using the job numbers listed in Table 1. The data compiled from them are available from the corresponding author on reasonable request.

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Footnotes

1. Records were consulted through the Department of Buildings' Building Information System (BIS) and DOB NOW portals, last accessed on 12 November 2026; job numbers are listed in Table 1. The records give lengths in feet, areas in square feet and loads in pounds per square foot. All values are converted here to SI units (1 ft = 0.3048 m; 1 sq ft = 0.092903 m²; 1 psf = 0.0479 kN/m²) and rounded. Heights are measured from the ground floor of each building.
2. The mapping cross-references the city's PLUTO and MapPLUTO datasets, DOB permit records and the housing database of the Department of City Planning. A first version was exhibited by the authors at the 14th São Paulo International Architecture Biennale in 2025, under the title “After the office: unpacking Manhattan's modernist towers in transition”.
3. The 1967 computation is based on a zoning lot of about 10,040 m², twice the present lot of 5,019 m² recorded in the 2022 survey; the plaza bonus it records, ten times the area of the plaza, is the incentive introduced by the 1961 Resolution [6].
4. As of March 2026 the building operates under a temporary certificate of occupancy, which records 29 storeys and 581 dwelling units [48].
5. Floors are numbered as in the DOB filings. The marketing numbering of 750 Third Avenue omits the 13th floor, so that DOB floors 13 to 34 are marketed as floors 14 to 35 [51].

6. The estimated job costs declared in DOB filings are figures stated for permit purposes; they are not construction costs and are not comparable with the budgets that owners announce.

Figures

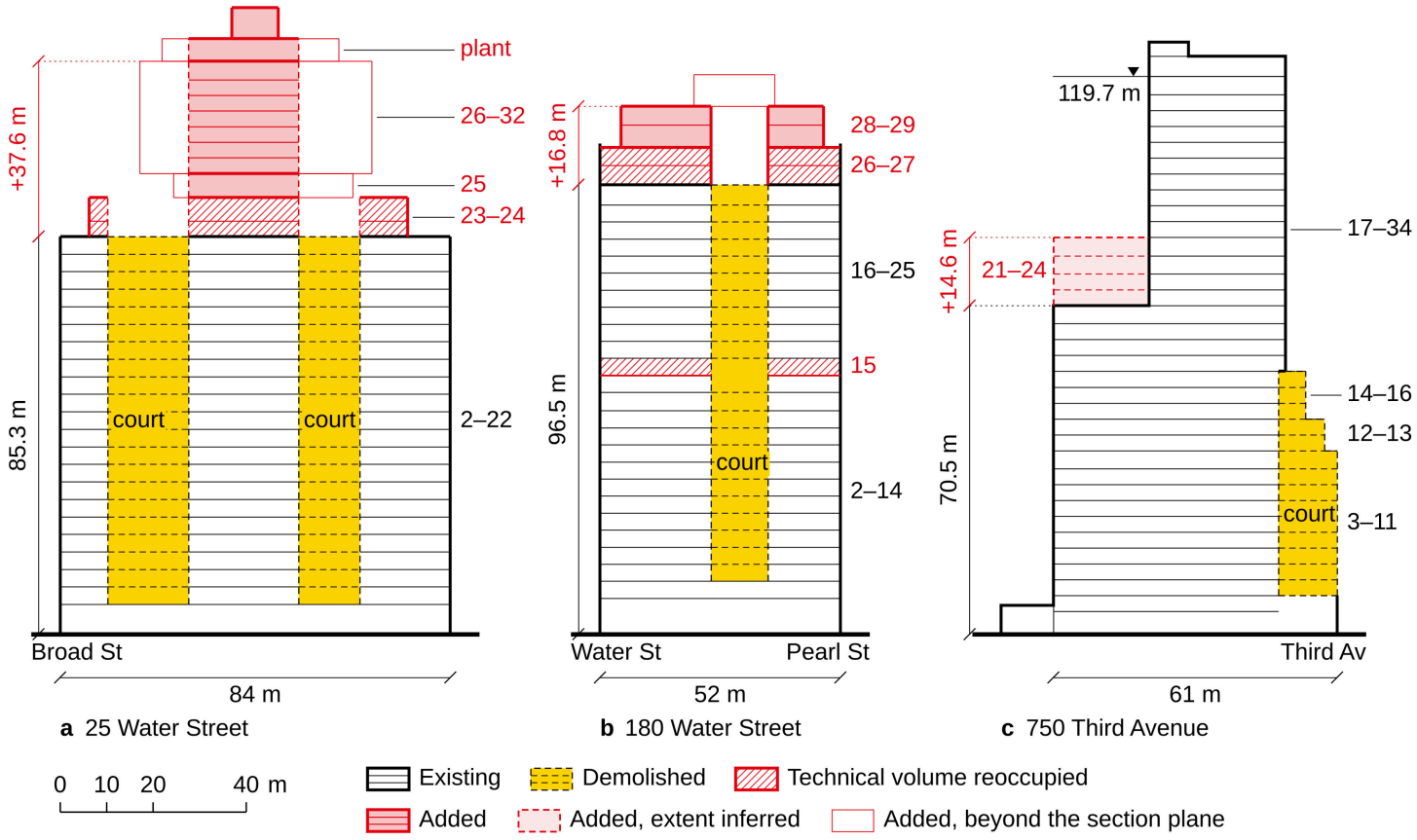


Figure 1

Diagrammatic sections of the three towers at a common scale, cut through the voids: **a**25 Water Street, east–west through the two courts; **b** 180 Water Street, through the court; **c** 750 Third Avenue, east–west through the avenue court. Existing parts are drawn in black; demolished parts are in yellow, with dashed lines; added parts are in red, in thin outline where they lie beyond the section plane; technical volumes reoccupied by new floors are hatched. The numbers beside the sections are floors, in red where they are new. Redrawn by the authors from DOB records [38–40, 43, 46]. In **a** the courts are positioned from the plans redrawn by the authors and assumed to keep the same outline above the existing roof, and the width of the upper floors is that of the zoning sections of 2022. In **b** the new 15th floor takes the upper half of the double-height plant floor. In **c** the extent of the new floors is inferred from the zoning computation and the demolition drawings; the hall behind the avenue front is double height, and the one-storey volume on the left lies west of the 61 m of the base

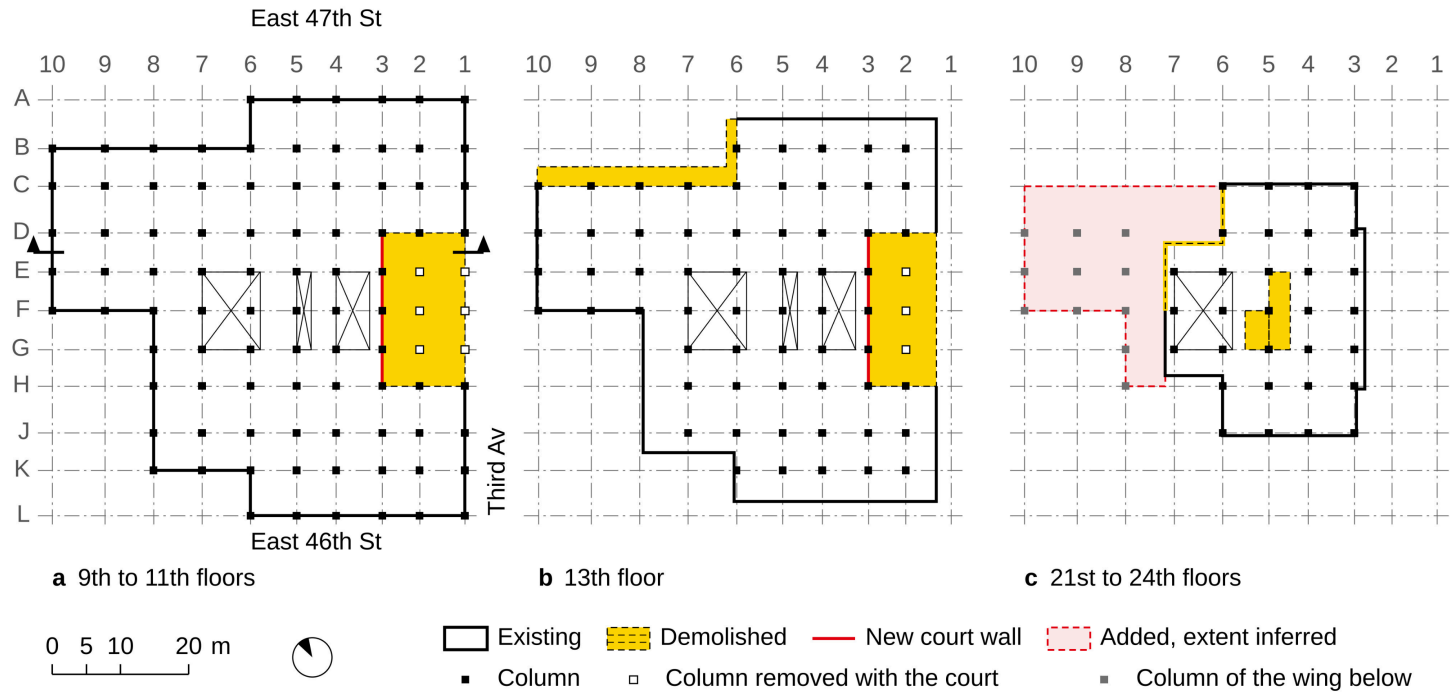


Figure 2

750 Third Avenue, floor plates redrawn on the structural grid: **a** 9th to 11th floors, with the court cut into the Third Avenue front; **b** 13th floor, where the court follows the front as it steps back and a strip is demolished along the edge of the lower wing; **c** 21st to 24th floors, with the new floors on the roof of the wing, against the tower, and the openings cut in the slabs beside the elevator core. Black squares are columns, hollow squares the columns removed with the court, grey squares the columns of the wing below the new floors; the red line is the new wall of the court; crossed rectangles mark the elevator banks, drawn schematically; the arrows beside **a** give the line of the section in Fig. 1c. Redrawn by the authors from the partial-demolition drawings and the zoning computation [40, 43]. The outline of the new floors in **c** is inferred from the area recorded in the computation and from the façades demolished at these levels

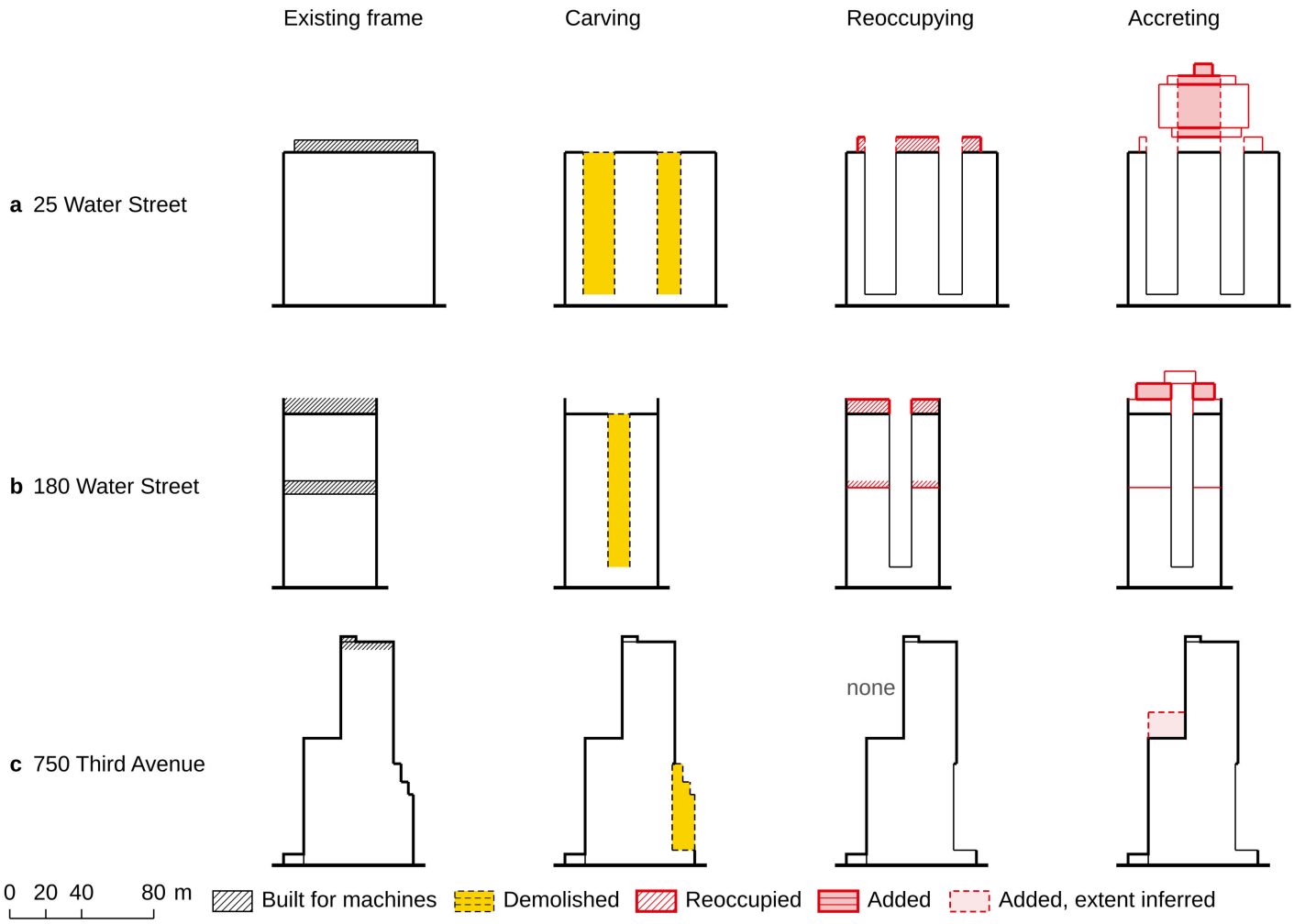


Figure 3

The repertoire of operations in the three conversions, shown one by one at a common scale: **a** 25 Water Street; **b** 180 Water Street; **c** 750 Third Avenue. From left to right: the existing frame, with the volumes built for machines hatched in black; carving; reoccupying technical volumes; accreting. Each drawing shows in colour the operation named and in thin line the others already shown; the order is that of the reading, not of the works on site. At 750 Third Avenue no technical volume is reoccupied, and the tanks and cooling towers on its roofs are not drawn. Drawn by the authors from the sources of Fig. 1

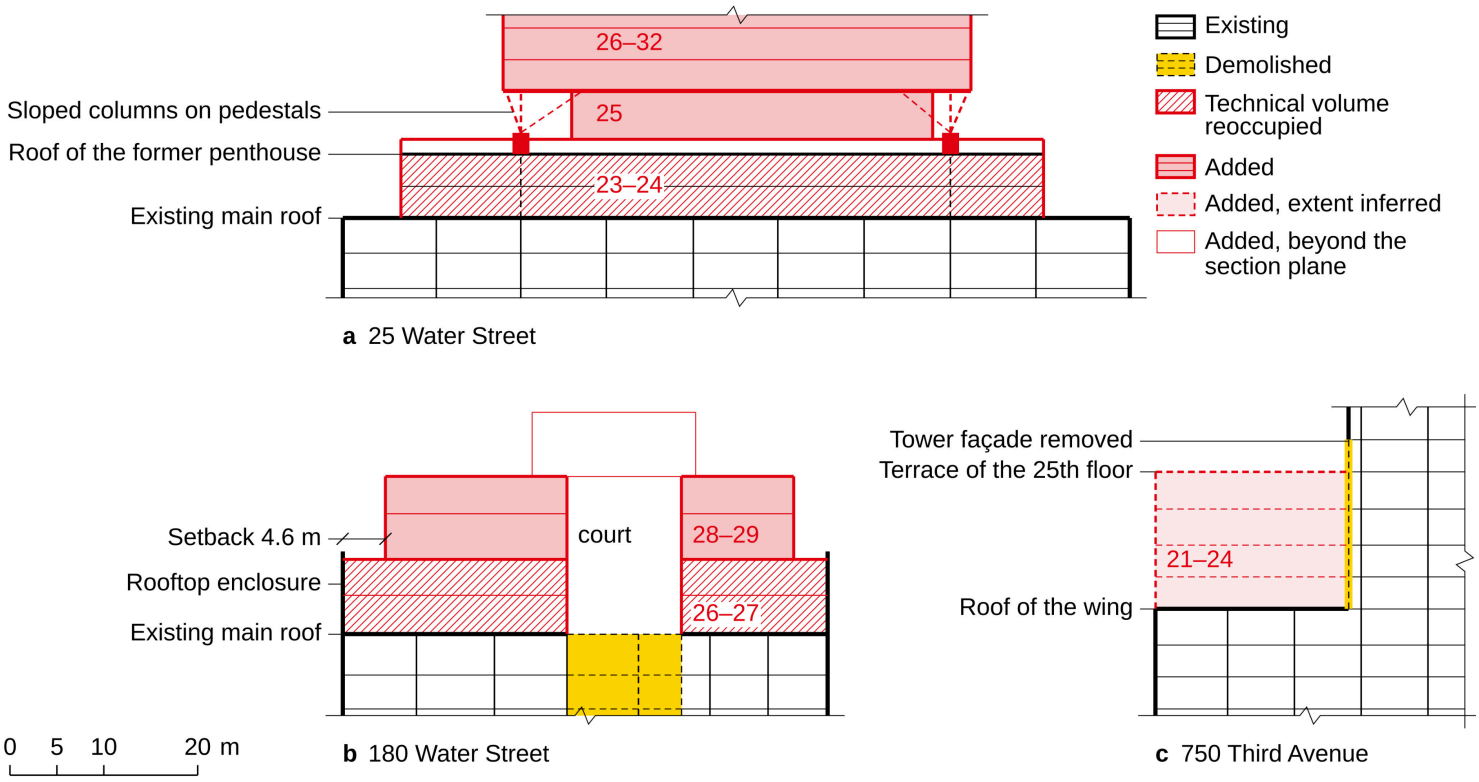


Figure 4

The interface between existing frame and addition, in partial sections at the same scale: **a** 25 Water Street, east–west section north of the courts; **b**180 Water Street, section through the court; **c** 750 Third Avenue, section through the wing and the tower, which continues to the right. Red numbers are the new floors. In **a** the 23rd and 24th floors take the place of the mechanical penthouse and extend it, and its roof survives beneath the terrace of the 25th floor; pedestals, sloped columns and bracing are dashed because their position and inclination are indicative. In **b** the 26th floor is laid on the existing roof and built, with the 27th, inside the rooftop enclosure; the dashed line in the court is the column removed with it. In **c**the water tank is removed from the roof of the wing, and the extent of the new floors is inferred. Thin vertical lines are the column lines of the existing frames, in **a** after the plans redrawn by the authors and in **b**after the architects' plans. Thin red outlines are parts beyond the section plane. Redrawn by the authors from DOB records [38–40, 43, 46, 47]