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Ghost Buildings: The Structural and Performance Impact of Gaps in Terraced Rows Specialized Masonry Restoration

A Critical Analysis for Structural Engineers

Specialized Masonry Restoration
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THE MASONRY SOCIETY

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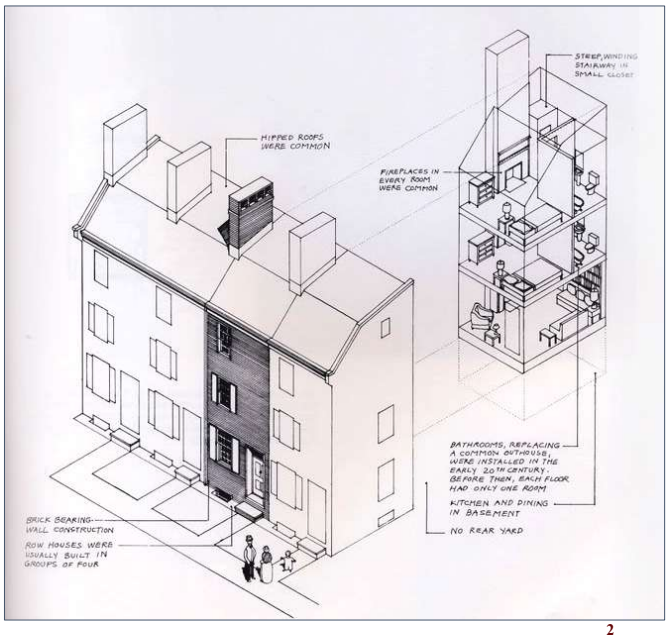
What is a "Ghost Building" Gap?

". . . the **architectural imprints** of demolished structures left **on party walls of adjacent buildings**—such as traces of former staircases, interior plaster, shelving, or fireplaces. (As cited in the recent book "Building Ghosts")

They are most visible in older **rowhouse-style** or **terraced house** neighborhoods and **Main Street squares** where shared walls remain after demolition.

- A gap in a continuous row of terraced or row houses.
- Results from complete demolition (intentional or catastrophic), fire, or extreme neglect/collapse of an intervening property.
- Exposes internal party walls of adjacent properties to external conditions.
- Creates immediate and long-term structural, weatherproofing, and thermal challenges.



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The Core Problem: Loss of Lateral Support

- Terraced houses are interdependent lateral bracing systems.
- Party walls were designed as internal, load-bearing elements, not external bracing.
- Removal of an intervening structure eliminates mutual buttressing.
- Exposed party walls become unbraced cantilevers, vulnerable to external forces.

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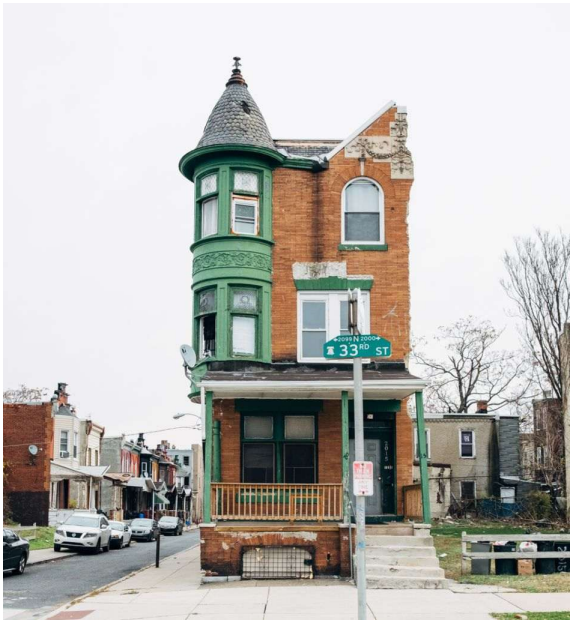
Structural Effects: Party Wall Instability

- **Slenderness Ratios:** Exposed party walls often exceed permissible slenderness ratios for unbraced walls.
- **Bowing & Out-of-Plumb:** Susceptible to bowing, particularly under wind loading or differential settlement.
- **Cracking Patterns:** Vertical or diagonal cracking, especially at junctions with internal cross walls or openings.
- **Lack of Foundation:** Original party walls may not have foundations suitable for external loading conditions.



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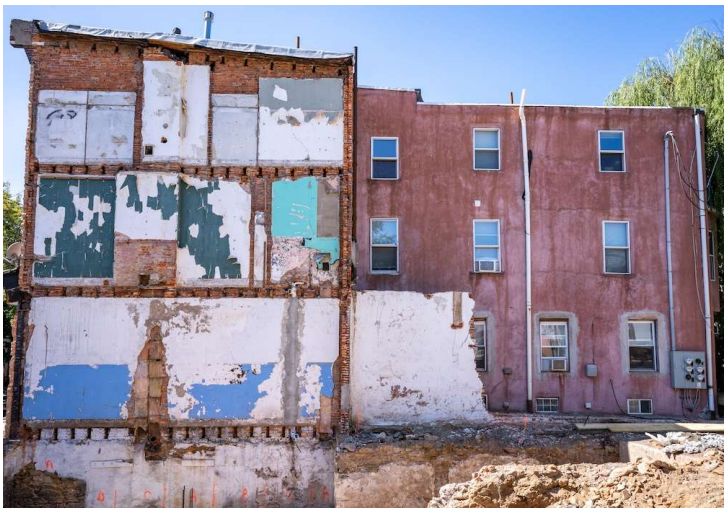
Structural Effects: Loss of Tying and Roof/Chimney Stability

- **Removed Floor/Roof Joists:** Joists from the demolished house no longer provide critical tying into the party wall.
- **Roof Spread:** Absence of roof-level restraint can lead to roof spread, particularly in traditional timber rafter roofs.
- **Shared Chimney Stacks:** Unbraced chimneys become highly unstable, especially if they were shared or partially supported by the demolished structure.
- **Progressive Collapse Risk:** Cascading failure of other elements due to loss of interconnectedness.



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And don't forget the chimneys!

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Weather and Water Penetration: The Primary Deterioration Driver

- **Porous Materials:** Internal party walls often constructed with softer, more absorbent bricks/blocks and lime mortar.
- **Rapid Water Absorption:** Exposed surfaces quickly become saturated with rain, leading to deep penetration.
- **Severe Damp & Mold:** Water ingress causes extensive internal damp, efflorescence, and black mold growth.
- **Frost Damage (Spalling):** Trapped moisture freezes in colder climates, causing brick faces to spall and mortar to degrade.

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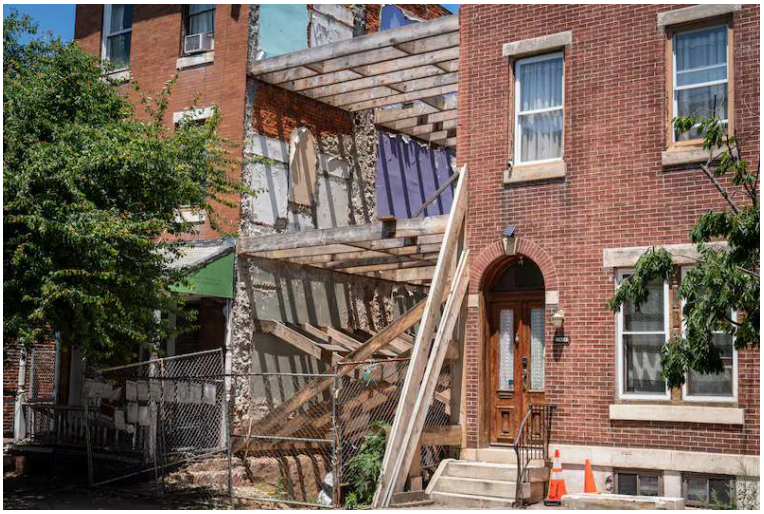
Engineering Imperative: Immediate Assessment & Temporary Works

- **Qualified Structural Engineer First:** Mandate immediate engagement of a licensed P.E.
- **Safety Perimeter:** Establish clear exclusion zones around the structure due to collapse risk.
- **Temporary Propping & Shoring:** Install temporary props and shoring to stabilize the exposed party wall and potentially the roof/chimney.
- **Weather Protection:** Implement temporary weatherproofing (e.g., heavy-duty tarpaulins, sheeting) to prevent further water ingress.



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Long-Term Remediation: Structural Solutions

- **Permanent Buttressing:** Construction of new, adequately founded buttressing piers or a new independent wall at the site of the demolished structure.
- **Steel Wind Posts/Columns:** Installation of vertical steel members tied back to the floor/roof structures for lateral support.
- **Cross Wall Ties/Anchors:** Reinforcement of existing connections between the exposed party wall and internal cross walls.
- **Roof & Chimney Support:** Comprehensive repair and reinforcement of roof structure and any unstable chimney stacks.

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Another Problem

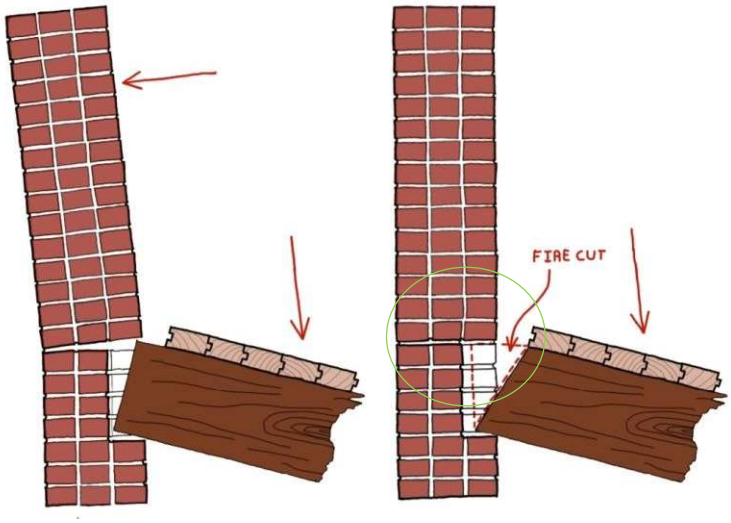

Illustration by Sandro Kenkadze, Architect

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USE OF LATERAL RESTRAINT ANCHORS FOR STABILIZATION OF MULTIWYTHE MASONRY WALLS

Alan Pettingale[1] and J. Eric Peterson[2]

Abstract

Anchor systems in masonry walls have been used for centuries, with the earliest dating back to the Romans and Greeks who used wrought iron to supplement conventional masonry. Other cultures and countries have used variations of metal anchors and straps in the construction of masonry, as well as for retrofit or repair applications to supplement and strengthen masonry systems after natural disasters such as earthquakes. There are numerous modern applications where lateral restraint anchors can be utilized to remediate masonry walls that are in service to accommodate additional applied forces or to strengthen masonry weakened by deterioration or excessive load. Often, lateral restraint anchors can utilize the existing interior framing of a building to re-establish a point of support at an intermediate height of the wall. This is accomplished through a combination of fasteners or anchors that secure straps, rods, or other tension elements to the masonry wall to resist lateral displacement. Many of these applications merge the basic premises of historic methods with techniques and modern materials of the twentieth century to provide a cost effective, aesthetically appealing, and preservation oriented method for remediating masonry. This merger of old and new techniques allows us to stabilize historic walls for modern service conditions allowing them to continue serving their intended function.

Keywords: Masonry, Repair, Restoration, Anchor, Lateral Restraint

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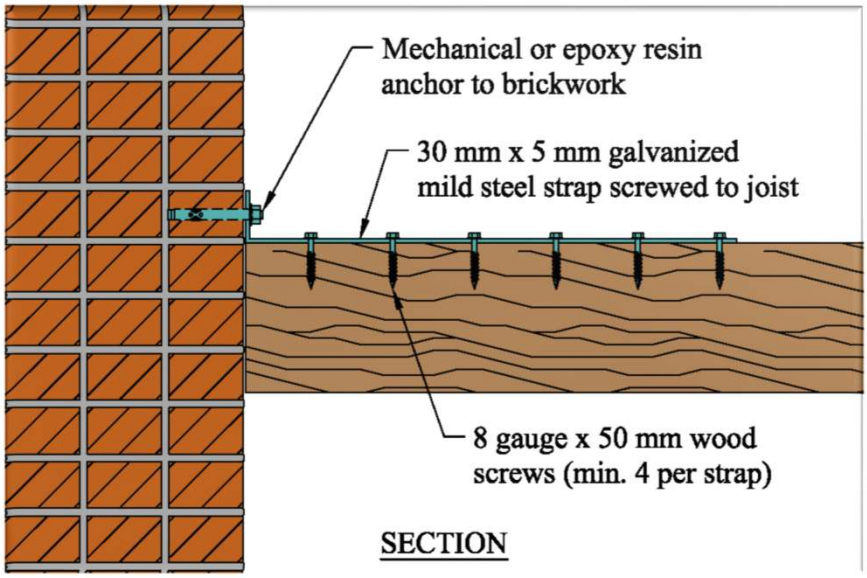

Muuranker style of retrofit wall repair utilizing straps along the top of the joist

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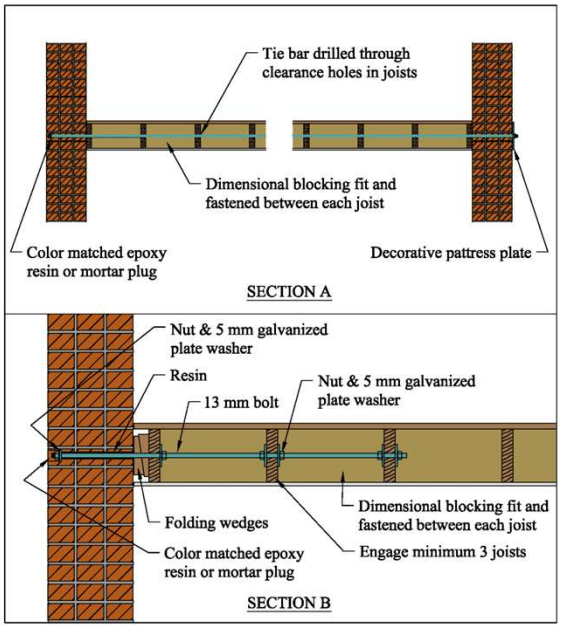
Alternatives for lateral wall ties utilizing existing transverse floor elements.



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Picture courtesy of Bryan Hindle

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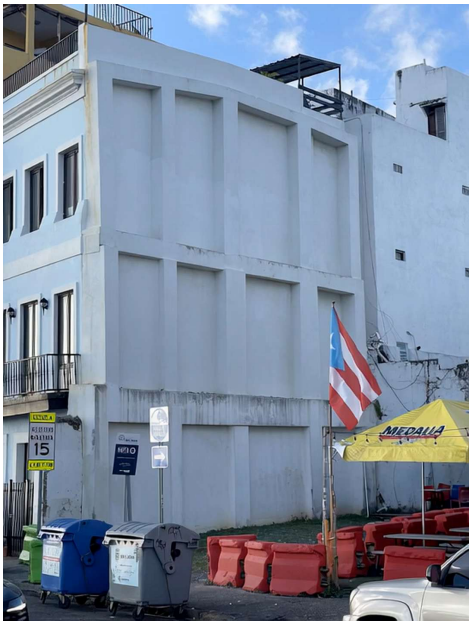
Another solution



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Long-Term Remediation: Weatherproofing & Thermal Upgrades

- **Exterior Rendering/Cladding:** Application of durable, waterproof exterior finishes (e.g., render, rainscreen cladding) over the exposed wall.
- **External Wall Insulation (EWI):** Crucial for restoring thermal performance and preventing condensation.
- **Professional Flashing & Sealing:** New, robust flashing at roof junctions and meticulous sealing of all interfaces.
- **Internal Finishes & Damp Treatment:** Repair of internal surfaces, including damp-proofing and mold remediation

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Conclusion & Key Takeaways

- **Acknowledge Interdependency:** Terraced housing is an interconnected structural system; removal of one unit has profound effects.
- **Prioritize Safety:** Immediate structural assessment and temporary works are paramount due to collapse risk.
- **Holistic Design:** Remedial solutions must address structural, weatherproofing, and thermal performance concurrently.
- **Beyond the Wall:** Consider roof, chimney, and internal timber element impacts.
- **Specialized Expertise:** This work requires deep understanding of existing masonry, structural dynamics, and building physics.

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Don’t forget the real ghosts . . .

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and the things they left behind.

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