275 W. Wisconsin Avenue, Suite 300
Milwaukee, WI 53203
414 / 259 1500
414 / 259 0037 fax
www.graef-usa.com

GRAEF

collaborāte / formulāte / innovāte

Structural Overview and Condition Assessment

Milwaukee Public Museum Complex
Prepared: November 5, 2025

---

1. Introduction

This report provides a structural overview of the Milwaukee Public Museum (MPM) complex, summarizing its construction history, current physical condition, and potential pathways for continued use, repair, or redevelopment. The complex includes the original museum building and two subsequent additions: the Discovery World building and the Dome Theater. Structural conditions were assessed through on-site, arm's-length visual observations, focusing on signs of deterioration, areas of concern, and the integrity of key framing and foundation systems.

The MPM complex is aging and observed material deterioration – including corrosion, cracking and water-related damage – pose long-term risks, if not addressed, to a structurally sound building. This is particularly important in exposed concrete elements. Addressing the material deterioration would be needed to make adaptive reuse feasible, and would likely be cost prohibitive. Targeted structural repairs and upgrades to waterproofing systems are recommended to extend service life and preserve function. These issues are particularly relevant to the original MPM building, which, due to its civic-purpose design and connection to the MacArthur Square Garage, presents unique challenges. Any full demolition of the building would require careful consideration of the structural interdependencies, particularly the re-support of connector slabs that rely on the museum building's frame. Opportunities related to partial or full demolition are identified within Appendix A which is attached and incorporated by reference.

Structural considerations for adaptive reuse differ across the three buildings but share recurring themes: floor plate adaptability, lateral system adequacy, seismic retrofit requirements triggered by occupancy changes, and the integration of modern mechanical, electrical, and plumbing (MEP) systems. Of the three, from a structural perspective, the Discovery World building offers the most straightforward reuse opportunity, due to its relatively modern construction and open, flexible layout. In contrast, the Dome Theater's specialized structure—with a spherical roof and irregular column grid—limits its adaptability. Converting this space for alternate uses would likely require significant modifications, including new infill framing and removal of specialized theater elements.

All buildings in the MPM complex are supported on deep foundation systems with large pile caps and substantial below-grade elements. These foundations are structurally robust and may include high costs to remove. Therefore, their reuse, rather than removal, may be prioritized where feasible, contingent upon compatibility with new building loads and redevelopment goals. This report aims to inform strategic planning, outlining the structural limitations and opportunities that will shape the future of the museum site, whether through preservation, adaptive reuse, or phased demolition.

2. Site Background and Structural History

2.1 Original Construction

The primary Milwaukee Public Museum (Appendix A pg. 2-9) building was constructed between 1960 and 1962. It is a 417,449-square-foot, seven-story concrete structure, with a full basement and mechanical penthouse. The floor-to-floor heights of the building range between approximately 13 feet to 20 feet. The floor plates of the mechanical penthouse through the roof are relatively uniform. The building was designed for public use, and the museum floors are designed for a live load of 150 lbs/sq. ft. while the remaining tower floors are designed for of 100 lbs/sq.ft., both of which meet or exceed code requirements for most occupancies.

The building structural systems include:

- Driven deep pile foundations
- Cast-in-place piers and concrete columns supported from concrete pile caps
- 14" thick concrete basement walls
- 7" thick concrete reinforced structural slab-on-grade
- 9” thick cast-in-place concrete two-way flat slab with dropped panels
- Between levels 3 and the roof, the northern bay of the tower includes a prestressed girder and one-way slab system at the northern bay supporting a one-way reinforced slab

2.2 Expansion and Additions

Subsequent additions to the museum complex include:

- **1965 – MacArthur Square / Wizard Wing Addition**:
  A cast-in-place concrete parking structure (Appendix A pg. 10-13) extending to the north of the primary building and connecting to the Milwaukee County Safety Building includes a multi-level pedestrian plaza and green space at the roof. MacArthur Square parking garage supports three levels of parking and spans partially over the Kilbourn Avenue and expressway tunnels. The tunnel structures were erected as part of this development project and the tunnel framing and foundation elements are integral with the MacArthur Square parking structure.

  As part of this project, a connector element was erected to connect the parking garage to the north face of the museum. This MPM wing (Wizard Wing) is partially supported by the original museum’s pile caps while structural steel angles attached to the original MPM Foundation walls support cast-in-place concrete slab edges at multiple levels. The roof and elevated slabs within this connector are continuous elements which constitute the floor of publicly accessible spaces (including the originally proposed Planetarium) and the Kilbourn Avenue tunnel ceilings – These slabs are integral to one another.

- **1994 – Discovery World Building**:
  A four-story, 44,440-square-foot vacated museum space (Appendix A pg. 14-16), originally constructed to house Discovery World. The building is composite steel construction with steel

columns supported on pile caps and deep pile foundations. Building façade is comprised of precast concrete panels.

- **1996 – Daniel M. Soref Theater (Dome Theater) and Atrium**:
  An 18,080-square-foot (Appendix A pg. 17) dome theater featuring a six-story projection screen, constructed as part of the museum's modernization efforts. The dome theater is constructed utilizing composite steel framing and its steel columns are supported on grade beams, pile caps and deep pile foundations.

---

3. Construction and Maintenance Timeline

Year	Event
1960	Construction of Primary MPM Building
1965	Construction of Wizard Wing (MacArthur Square addition)
1994	Construction of Discovery World
1994	Structural Evaluation of Wizard Wing
1996	Construction of Dome Theater and Atrium
1996	MacArthur Square Plaza Water Abatement
2011	East Parking Lot Resurfacing
2012	North Façade Repairs
2017	Waterproofing Membrane Replacement (North Plaza)
2018	Installation of Electrical Substation
2019	Demolition Study and Appraisal
2021	North Stairwell Structural Wall Repair

---

4. General Structural Condition

<u>MPM Building</u> - The structure's load-bearing systems currently function as intended, however, multiple areas of the MPM basement show signs of deterioration consistent with water infiltration in various locations – primarily at the roofs and basement.

The Wizard Wing does show signs of movement potentially associated with differential settlement between the MacArthur parking structure and the MPM tower. Structural elements which were repaired and reinforced during a 2021 repair project have shown subsequent signs of movement, with cracking evident in non-structural finishes.

Discovery World – The overall structure is in good condition showing no visible signs of maintenance or performance issues. The building is currently being used as storage and is not being maintained as it may be if used as intended.

Dome Theater – The building is in apparent good condition with no signs of significant maintenance issues. This building was inaccessible at the time of GRAEF's on site review and as such, a visual inspection of the interior was not conducted. Our understanding of the condition of this building is based on conversations with MPM staff and a thorough review of the existing documentation.

---

5. Observations and Areas of Concern

5.1 Concrete Surface Deterioration

- **Basement and Foundation Walls**: Cracking, spalling, surface scaling, and rusting were observed in cast-in-place concrete basement walls and slabs. Rust staining is prominent along the north foundation wall and at the southwest corner, suggesting moisture ingress. The north basement walls and ceiling slabs support existing parking and garage access and concrete damage at this area is indicative of water and deicing salt infiltration.
- **North Connector**: Cracks suggest shrinkage, thermal movement, or localized settlement between the MPM tower and Wizard Wing connector.

5.2 Water Infiltration

- Efflorescence and staining on interior concrete surfaces reflect prolonged water exposure, though it was not apparent at the time of review whether this water infiltration is ongoing.
- Degradation of sealants at joints between structural elements is likely to be exacerbated by water infiltration.

5.3 Structural Connections

- Mechanical fasteners and joints between precast elements may wear and potentially loosen over time.
- Misalignment may result from cumulative thermal expansion, settlement, concrete creep, or connection fatigue.

---

6. Building Envelope Assessment

6.1 Roof Membrane Deterioration Risks

Anecdotally, the existing roofing elements throughout the MPM building have shown various signs of deterioration evident in building leaks as identified via maintenance staff. While not within the scope of a typical structural assessment, these leaks are of concern due to the following implications:

- **Water Infiltration**: Enables moisture to penetrate joints and concrete, causing interior damage and promoting deterioration. Water infiltration may increase susceptibility to freeze-thaw cycles, cracking, and spalling.

- **Reinforcement Corrosion**: Accelerates oxidation of embedded steel, compromising structural performance.
- **Thermal Movement**: Water absorption results in variable expansion/contraction, increasing structural stress.
- **Service Life Reduction**: Ongoing water damage can reduce the roof system's overall lifespan and performance.

---

7. Deferred Maintenance Risks

Deferred maintenance, particularly involving damage to the building envelope, poses significant risks to the structural integrity of buildings as water infiltration and the effects of thermal movement begin to impact structural systems. Buildings constructed using mildly reinforced concrete, precast concrete, and composite steel construction are at heightened risk of damage due to these effects which escalate over time and can result in costly remediation or structural failure.

Mildly reinforced concrete relies on steel reinforcement which is subjected to corrosion when cracks in the concrete surface are not repaired. Water can infiltrate and reach the embedded steel leading to corrosion. Corroding steel expands and internal pressure within the concrete begins to expand cracks leading to spalling, loss of section, and reduced load-carrying capacity. Over time, this degradation can compromise the structural performance of slabs, beams, and columns, particularly in environments subject to freeze-thaw cycles or high humidity.

Integrity of precast concrete elements within buildings depend heavily on the condition and performance of joints, sealants, and connection hardware. Deferred maintenance of these components allows water ingress at panel interfaces and bearing points. This can lead to:

- Corrosion of embedded steel connectors and anchors
- Loss of joint integrity and differential movement between panels
- Reduced structural continuity and stiffness

These issues may manifest as façade displacement, cracking, or localized failures, especially in load-bearing wall systems or precast floor assemblies.

Composite systems combine steel framing with concrete slabs, often poured over metal decking. Water infiltration through roofing systems or façade penetrations can lead to corrosion of the steel deck and framing members. Key risks include:

- Loss of composite action due to deck deterioration
- Reduction in effective steel cross-section
- Increased deflection and potential serviceability failures due to excessive deflection

In severe cases, corrosion can compromise fireproofing materials and lead to progressive collapse under service loads. Additionally, building envelopes protect structural framing elements from movement due to thermal differences. When building envelopes are not maintained or do not meet current energy standards, the effect of thermal expansion and contraction (due to high temperature differences within conditioned spaces and exposed joints near exterior walls) creates high stresses at joints which are typically not accounted for in connections and structural framing. These high temperature differentials and seasonal changes can lead to significant damage and failure over time.

Unaddressed envelope damage and water infiltration in these structural systems can result in accelerated material degradation, loss of structural capacity, and increased safety risks, escalating repair costs. Preliminary observations suggest that concealed structural connecting elements—such as embedded anchors, welds, and bearing hardware—have likely experienced deterioration due to prolonged exposure to moisture and aging materials. However, the full extent of damage cannot be accurately assessed until selective demolition and exposure of these components are performed. Redevelopment opportunities are likely to be limited as maintenance and necessary repairs become more costly with deferral. These costs remain unknown until demolition reveals the scope and nature of necessary repairs.

---

8. Recommended Repairs and Maintenance

To preserve the museum complex and mitigate existing deterioration, the following corrective measures should be considered:

1. **Concrete Repair**: Remove deteriorated material and patch using a cementitious overlay compatible with the existing structure.
2. **Reinforcement Treatment**: Expose and clean corroded steel reinforcement. Apply corrosion inhibitors prior to concrete patching.
3. **Waterproofing and Sealant Repair**: Inject structural epoxy into cracks and reseal all failed expansion and control joints to restore watertightness.
4. **Connection Review**: Inspect mechanical connections between precast elements to ensure stability.
5. **Monitoring Program**: Implement a regular structural inspection and maintenance schedule to assess the ongoing condition and performance of repairs.

---

9. Reuse Opportunities

Because the existing Museum complex is made up of multiple buildings of varying sizes, layouts and construction types, adapting them for new use would require a specific approach for each building.

Of the three primary buildings, all are supported by pile foundations which have high load capacities. The MPM and Discovery World buildings have relatively rectilinear column layouts (~30'x30' grid) consistent with office or commercial developments. The Dome Theater building follows a more unique column grid and framing design due to the circular shape of the enclosed theater screen, limiting it's potential for reuse.

<u>MPM</u> - The building (1962) is a ±417,449-square-foot concrete structure comprised of a basement and six above-grade floors. The building is now characterized by significant deferred maintenance and physical deterioration affecting non-structural systems such as the roof, façade, glazing, and mechanical infrastructure. The primary structural elements, including the frame, floor systems, and foundations remain intact.

From a structural standpoint, the building's superstructure can accommodate interior finish demolition and reconfiguration, which would be necessary for any adaptive reuse. The likely redevelopment approach would involve a complete gutting of interior partitions and systems, while retaining the structural shell. The existing column spacing and floor loading appear sufficient to support a range of alternative occupancies, including multi-family, government or civic office, and ground-level commercial uses. However, there are structural limitations. Notably, floors 1 through 3 have deep floor plates (distance from window wall to core) with limited natural light and no windows, which constitute a form of functional obsolescence for most residential or office uses. These floors may require significant reworking, such as vertical penetrations, new light wells or atrium spaces, to accommodate modern programming and code requirements, particularly for natural ventilation and egress.

The building's ground level may be better suited to active common uses, such as amenity spaces, food service, or retail, given its access to grade and the potential for street-level activation. The upper floors (4–6) offer more flexibility due to their more compartmentalized and modular layout originally designed for office and storage functions. Structurally, these floors could be reconfigured to accommodate a range of occupancies with fewer interventions compared to the lower floors.

Extensive rehabilitation would be required to address non-structural deficiencies essential for occupancy change, including seismic code compliance, egress upgrades, and building systems modernization. Renovation for continued museum use or conversion to alternative uses would demand significant investment. Conversion to a new use would necessitate comprehensive interior demolition and structural modifications to resolve layout inefficiencies and bring the building into compliance with current codes and functional expectations.

<u>Discovery World</u> - The building (1997) totals ±44,440 square feet and is a vacant shell that remains structurally sound. Originally designed for museum occupancy, the building has been minimally maintained for the past ±18 years, resulting in an estimated effective structural age of approximately 35 years. Despite its prolonged vacancy, no significant structural deficiencies or deferred maintenance have been observed or reported in the building's primary frame, envelope, or foundational systems.

Structurally, the building could accommodate redevelopment into market uses such as office or housing. The existing superstructure includes open floor plates on the 1st, 2nd, and 4th floors, offering flexible layouts that can be readily adapted to modern programming without major structural intervention. However, the 3rd floor contains purpose-built stadium seating, which introduces a significant degree of functional limitations for most alternative uses. Repurposing this floor will likely require substantial selective demolition, including removal of the sloped slab and supporting elements, to create usable floor area compatible with alternative layouts.

Additionally, as with similar buildings originally designed for institutional or museum use, there is limited window glazing on the lower floors. This will necessitate structural modifications—such as saw-cutting of exterior walls and insertion of new openings—to improve natural light and ventilation, particularly for residential conversion. These interventions, while technically feasible, must be considered to preserve lateral load paths.

<u>Dome Theater</u> - This ±18,080-square-foot structure (1997) was purpose-built with a specialized dome geometry that defines its structural framing. The structural age of the building is approximately 25 years old and the primary structural systems are reported to be in good condition with no observed deficiencies. While the building is fairly maintained and continues to function effectively in its current form, the curvature and spatial configuration of the dome impose constraints on reprogramming. A

structural conversion to an alternative use is technically possible, but it would likely require significant structural modifications to accommodate standard floor layouts, mechanical systems, and partitioning—making such a transformation structurally complex and potentially cost-prohibitive.

Wizard Wing - A cast-in-place concrete connector element allowing access between the original MPM and MacArthur parking garage. The building shows signs of settlement with cracked finishes inside of the single egress stair tower. If demolition of the MPM building were to proceed, the Wizard Wing could be re-utilized, partially demolished, or completely demolished. Options to re-support of the southern slab edges are illustrated within Appendix A. As the MPM tower supports the southern structural slab edges, re-support of those edges would be required if the Wizard Wing structure were to remain as-is. Complete demolition of this connector would require re-building the cap of the freeway tunnels below.

9.1 Partial Demolition Option

To make-ready the site for potential redevelopment, there are two distinct options in terms of demolition. A partial demolition approach of each building would allow for various re-use potential for existing framing elements including elevated structural concrete framing, existing concrete columns and existing foundations. However, limiting demolition to allow for reuse may restrict redevelopment potential by forcing future use projects to match existing framing and foundation support conditions. As the foundation elements of the campus buildings are in good and usable condition, a hybrid approach where piles and pile-caps are left in place allowing for future use would make economic sense.

When re-using parts of existing buildings in new developments the primary issue is structural compatibility. New developments may have different column grids, core locations, or overall massing compared to the original structure, leading to load path discontinuities. Misaligned vertical elements can require the use of heavy and complex transfer systems, which may overstress the existing foundation or lead to inefficient structural framing layouts. It is likely that any new building of similar size and scale will impose greater lateral loads (driven by code) than the original foundation was designed to support.

The capacity and condition of the existing foundation system must be thoroughly reviewed early during new development projects. The older foundations may not meet current design codes, and deterioration over time—such as concrete degradation, reinforcement corrosion, or settlement—can further reduce their load-bearing capacities. Incomplete records or unknown construction details often limit confidence in the as-built foundation's performance. If deficiencies are found through demolition or construction, strengthening measures like underpinning, micropile additions, or pile jacketing may be required. From a geotechnical perspective, changes in subsurface conditions over time, such as consolidation or dewatering-related settlement will require review.

Under the International Building Code (IBC) and related standards like ASCE 7 or ASCE 41, any change in occupancy, massing, or risk category may trigger reanalysis or seismic retrofitting of the foundation system. Increased seismic base shear due to modern code requirements or changes in building importance could require strengthening or complete replacement of foundation elements, offsetting the intended benefits of reuse.

Construction coordination presents additional difficulties due to the variance of as-built conditions when compared to documentation. Geometry of existing elements can complicate the design of new structural and MEP systems. Routing utilities through or around retained foundations is also challenging, especially if penetrations through footings are needed as these may not be permissible without reinforcement.

9.2 Complete Demolition Option

Complete demolition of the existing MPM campus presents a clean path to redevelopment however, the cost and impact of deep foundation demolition require analysis of adjacent structures. Vibrations and impacts from mechanical demolition or localized overcutting can damage or compromise the foundations intended to be retained. Isolating structural elements from foundations without inducing stress or cracking requires careful sequencing and monitoring.

Demolishing a building supported by deep foundations—such as drilled piers, caissons, or driven piles—presents structural, geotechnical, and environmental challenges. These existing foundation systems are embedded many feet below grade. As a result, their removal is far more complex and labor-intensive than that of shallow spread footings. Extraction often involves extensive excavation and heavy equipment, and occasionally specialized methods like vibratory extraction or cutting below grade. These operations can generate high levels of vibration and noise, posing risks to adjacent structures by causing ground settlement, soil destabilization, or unintended movement of nearby foundations.

A significant geotechnical risk associated with deep foundation removal is soil disturbance, which can alter the stress regime in surrounding soils and undermine the stability of neighboring buildings or infrastructure. The excavation of deep elements often requires temporary shoring or slurry wall systems to retain soils and protect adjacent property. In many cases, removal is deemed impractical, and foundations are instead abandoned in place and capped, interfering with future redevelopment plans.

Additionally, deep foundations frequently interact with the groundwater table, necessitating dewatering operations that can be both expensive and environmentally sensitive. Improper handling of dewatering can lead to drawdown effects in surrounding areas, causing consolidation of fine-grained soils and even structural damage to nearby properties.

Economically, the complete demolition of deep foundations is typically cost-prohibitive compared to demolition of superstructures (partial demolition option) alone. The specialized equipment, slow production rates, and logistics involved can significantly inflate the demolition budget. For these reasons, the reuse of deep foundations, where feasible, should be considered. Existing utilities below and electrical substations located within MPM must be considered when reviewing demolition options. The site sits over an existing steam tunnel which is protected by existing structural and foundation elements. Additionally, the north foundation walls of the MPM tower gravity-support structural concrete slabs that are integral with the MacArthur Square parking structure and Kilbourn Avenue tunnels. These slabs will require complete demolition back to a suitable self-supported column line or re-support (Appendix A pg. 10-11) with new structure.

---

10. Structural Implications related to Change of Occupancy

The adaptive reuse of civic centers into residential or mixed-use developments may offer significant economic and environmental benefits, such as reduced construction waste and faster project timelines. However, fundamental differences in original design intent such as occupancy loads, code requirements, and life safety provisions limit these opportunities, and structural issues often arise when converting existing buildings to different uses. The most common structural issues encountered in such conversions include seismic and code upgrade implications triggered by changes in occupancy classification.

10.1 Floor Plate Depth

The current building features deep floor plates, leading to large interior zones with limited access to natural light and ventilation—both critical for residential use. Solutions such as introducing light wells, atriums, or cutting new courtyards often involve significant structural modifications, including new vertical openings through slabs and local reinforcement.

10.2 Floor-to-Floor Height

Mixed-Use structures typically have higher floor-to-floor heights (12–14 ft) than residential buildings (9–10 ft). While this allows for more flexibility in mechanical system routing and possible structural reinforcement, it may also create misalignments between floor levels in mixed-use configurations.

While this can be an advantage for certain occupancies, it can also complicate plumbing, HVAC routing, and floor level alignment especially if multiple uses are stacked.

10.3 Structural Grid Incompatibility

Large column spacing in office buildings (e.g., 30–40 ft) is often incompatible with efficient residential unit layouts. This can result in inefficient or awkward floor plans, and in some cases, necessitate secondary framing elements (drop beams or partial infill) or structural transfers to create usable space divisions.

10.4 Live Load and Use Compatibility

The structural design of office and mixed-use buildings generally accommodates live loads of 50 psf to 80 psf. While this is typically sufficient for residential (40 psf), any addition of assembly areas, fitness centers, retail, or rooftop amenity spaces can exceed original design assumptions. Structural analysis is required to confirm capacity, and floor strengthening (e.g., topping slabs, fiber-reinforced polymers, or steel infill framing) may be necessary. While generally, the MPM structures are designed for live loading that exceeds these occupancies, specific areas may require reinforcement.

10.5 Vertical Shaft and MEP Distribution

Residential buildings require extensive plumbing risers, HVAC ductwork, and venting, often not aligned with the existing framing layouts. This leads to the need for new vertical shafts and mechanical spaces, requiring penetrations through floors, which may impact slab strength, diaphragm continuity, or existing fire-rated assemblies. Reinforcement and firestopping must be closely coordinated.

New shafts often must be cut through the structure which might require additional framing or existing structural reinforcement.

10.6 Seismic and Code Upgrade Challenges Due to Change in Occupancy

Adding or removing walls, especially if punching new openings in lateral systems and floor slabs affects lateral stability. Various uses may have different code requirements when considering change in occupancy importance. Reutilizing the structure may require retrofit of the lateral system—e.g., adding shear walls, braces, or moment frames.

a. **Change in Risk Category**
   - Residential and mixed-use occupancies, especially those with high occupant loads, often shift the building from **Risk Category II to III**, increasing the seismic importance factor.

  - This directly raises the seismic base shear and drift limitations, potentially overloading existing lateral systems or requiring retrofits to maintain code compliance.

b. **Lateral System Deficiencies**
  - Office buildings may have minimal lateral systems designed under outdated code standards (e.g., 1997 UBC), with limited ductility or redundancy.
  - Changes to layout—such as new shafts or removal of interior walls—can introduce irregularities, break load paths, or compromise stiffness. Retrofit measures like adding braced frames or moment connections may be required.

c. **Diaphragm and Collector Upgrades**
  - Diaphragm penetrations (for stairs, shafts, or atriums) can interrupt load paths and demand new collectors or drag struts.
  - Flexible diaphragms (metal decks, wood systems) often need to be stiffened or converted to rigid diaphragms through topping slabs or structural overlays.

d. **Foundation and Anchorage Capacity**
  - Increased seismic loads from higher risk category and additional mass may overload original foundation and anchorage systems.
  - Upgrades may include adding micropiles, grade beams, foundation enlargements, or shear wall-to-foundation anchorage retrofits.

e. **Compliance Triggers Under IEBC**
  - The change in use is considered a **Level 3 Alteration** or **change in occupancy group**, triggering mandatory seismic evaluation and possible upgrade.
  - Buildings found deficient under compliance review will require proportional seismic strengthening.

f. **Nonstructural Component Anchorage**
  - Seismic bracing for ceilings, partitions, water heaters, stairs, and MEP systems, many of which may not have been adequately anchored in the office configuration.
  - These nonstructural failures are major hazards in seismic events and must be upgraded per ASCE 7-16/IBC requirements.

10.7 Egress, Fire Rating, and Compartmentation

Residential occupancies require greater egress provisions and compartmentalization. New stairwells, fire-rated corridors, and floor assemblies may be needed. Structurally, this means penetrations through floors and load-bearing walls, new shaft enclosures, and changes to the lateral system continuity might require additional stairwells, altering existing cores, or upgrading fireproofing.

10.8 Building Envelope Adaptation

Curtain walls and glazing systems on civic buildings typically do not meet modern energy codes or acoustic insulation standards required for residences. Replacing or upgrading cladding often impacts structural anchorage, introduces new wind/seismic loads, and requires coordination with the original structural system.

10.9 Elevator and Accessibility Requirements

The number, size, and placement of elevators in office towers may not satisfy the needs of a residential conversion. Additional shafts may be required, and structural modifications (including slab cutting and core wall disruption) must be evaluated for impact on strength and seismic load path.

---

11. Conclusion

The three-building campus, and the reuse potential of each building is complex and varied. Of the three buildings, Discovery World utilizes the most modern construction methods and is in adequate condition for commercial use with minimal structural modification. In contrast, the Dome Theater is a purpose-built structure with small floor plates requiring infill framing. Its unique column grid is designed to support the spherical shape of the roof and exterior walls and presents structural complexities for any change in use. The original MPM structure is the oldest, and was designed specifically for civic use, posing structural challenges to reuse.

The building supports framing that is a part of the MacArthur Square parking garage and connector on the north end. If complete demolition of this building were to occur, there would need to be partial demolition of the connector building slabs and/or re-support of these slab elements with new load-bearing and lateral structures. Each of the three buildings has deep foundation elements and pile caps which are significant in size and capacity. Complete demolition will include higher costs as opposed to retention of the foundation elements. Commonalities exist between the three buildings in floor layout compatibility, lateral system adequacy, seismic upgrade triggers, and integration of new building systems.