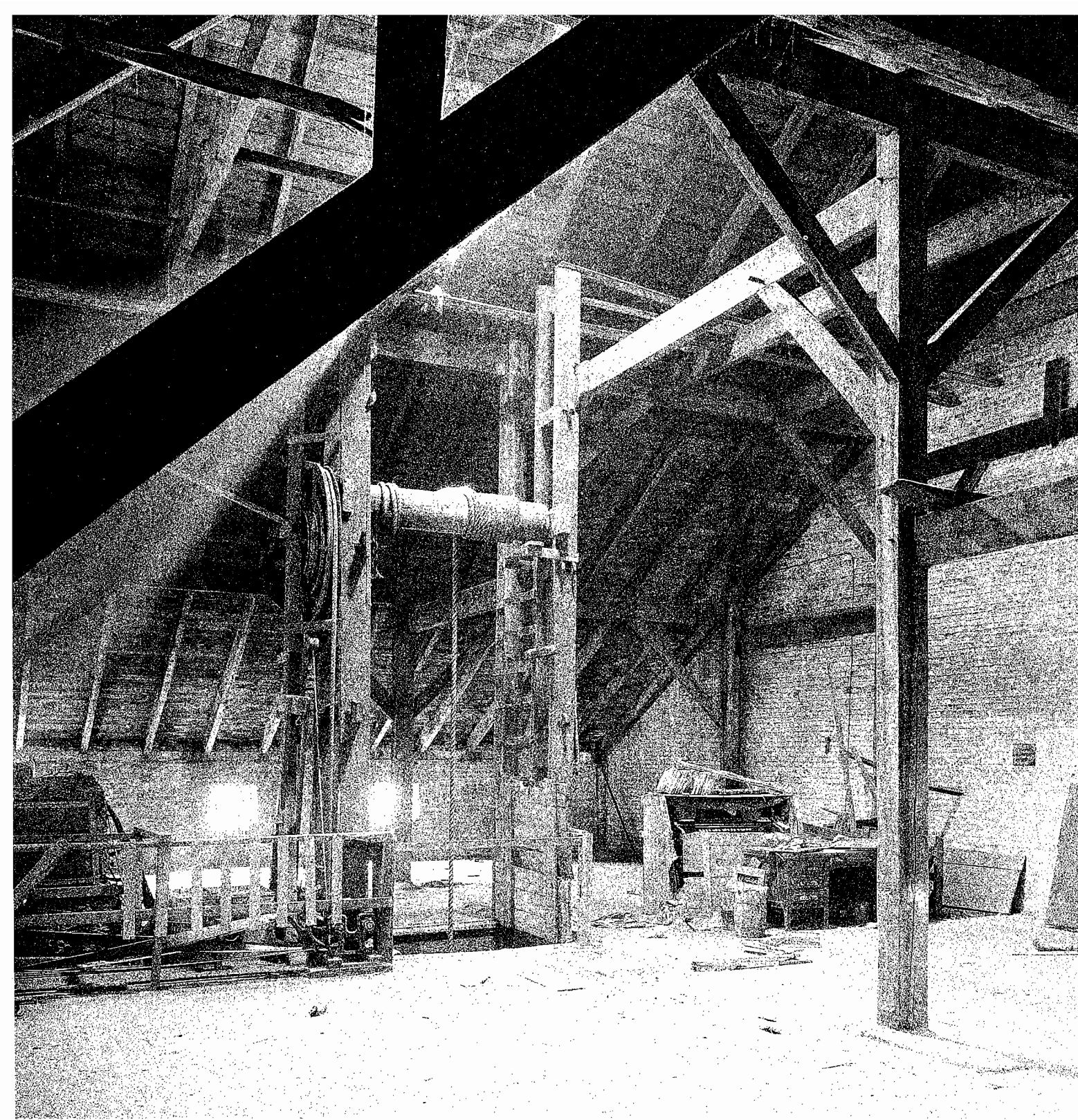


Building Interior

Structural Systems



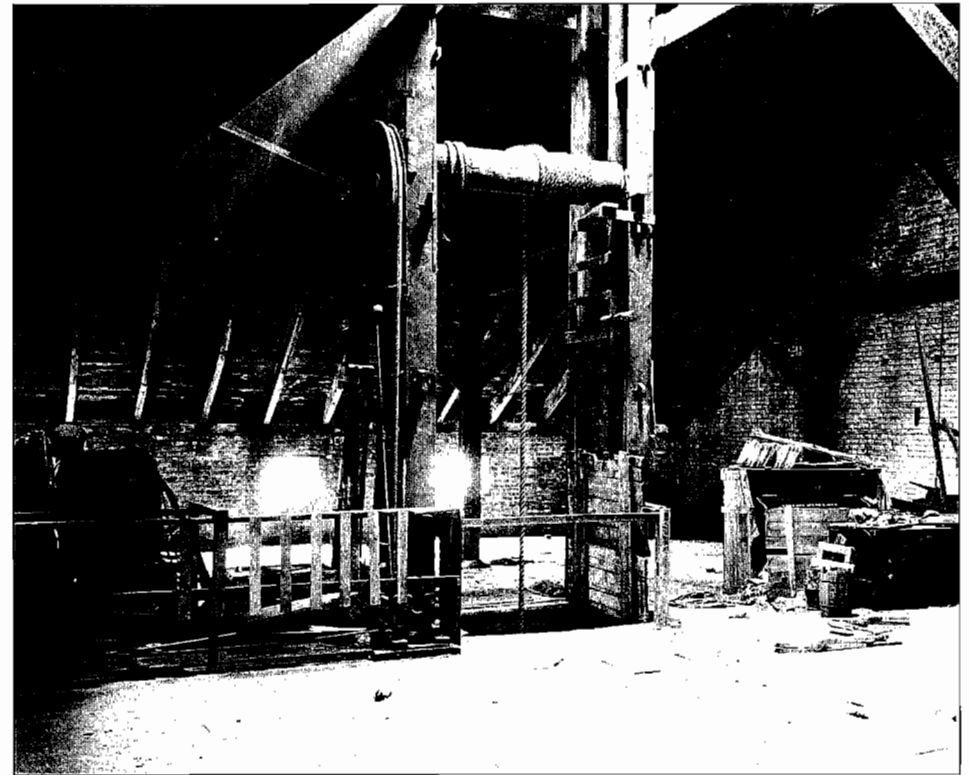
Building Interior

Structural Systems

If features of the structural system are exposed such as loadbearing brick walls, cast iron columns, roof trusses, posts and beams, vigas, or stone foundation walls, they may be important in defining the building's overall historic character. Unexposed structural features that are not character-defining or an entire structural system may nonetheless be significant in the history of building technology; therefore, the structural system should always be examined and evaluated early in the project planning stage to determine both its physical condition and its importance to the building's historic character or historical significance.

The types of structural systems found in America include, but certainly are not limited, to the

following: wooden frame construction (17th c.), balloon frame construction (19th c.), load-bearing masonry construction (18th c.), brick cavity wall construction (19th c.), heavy timber post and beam industrial construction (19th c.), fireproof iron construction (19th c.), heavy masonry and steel construction (19th c.), skeletal steel construction (19th c.), and concrete slab and post construction (20th c.).



Recommended

Identify, retain, and preserve

Identifying, retaining, and preserving structural systems—and individual features of systems—that are important in defining the overall historic character of the building, such as post and beam systems, trusses, summer beams, vigas, cast iron columns, above-grade stone foundation walls, or loadbearing brick or stone walls.



The exposed metal roof-truss system of this waiting room not only provides structural support, but is also important in defining the interior character of the train station.

Protect and maintain

Protecting and maintaining the structural system by cleaning the roof gutters and downspouts; replacing roof flashing; keeping masonry, wood, and architectural metals in a sound condition; and assuring that structural members are free from insect infestation.

Not Recommended

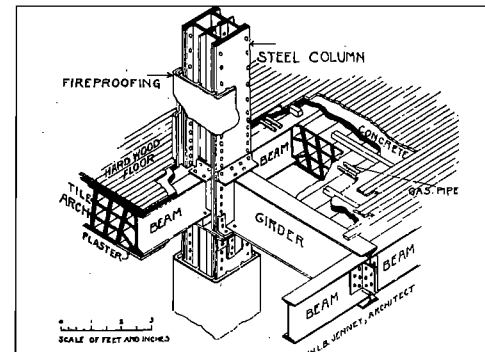
Removing, covering, or radically changing features of structural systems which are important in defining the overall historic character of the building so that, as a result, the character is diminished.

Putting a new use into the building which could overload the existing structural system; or installing equipment or mechanical systems which could damage the structure.

Demolishing a loadbearing masonry wall that could be augmented and retained, and replacing it with a new wall (i.e., brick or stone), using the historic masonry only as an exterior veneer.

Leaving known structural problems untreated such as deflection of beams, cracking and bowing of walls, or racking of structural members.

Utilizing treatments or products that accelerate the deterioration of structural material such as introducing urea-formaldehyde foam insulation into frame walls.



Detail of a column and girder connection and floor construction, The Fair Store, Chicago, Illinois, 1892 (Jenney and Mundie, architects). *This type of connection was used in many iron and steel buildings; "fireproofing" was provided by terra-cotta tile and plaster.*

Failing to provide proper building maintenance so that deterioration of the structural system results. Causes of deterioration include subsurface ground movement, vegetation growing too close to foundation walls, improper grading, fungal rot, and poor interior ventilation that results in condensation.



Photo: Irving B. Haynes and Associates

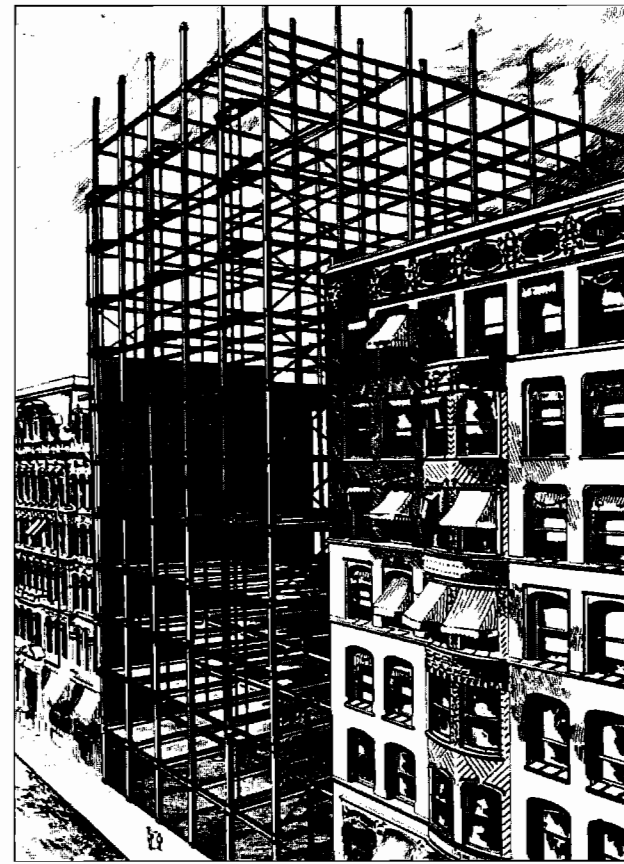
In order to preserve this historic wood-frame building, new steel framing was inserted to reinforce the wood post and beam structure. Original wood framing members were notched to accommodate the new steel frame.

Recommended

Examining and evaluating the physical condition of the structural system and its individual features using non-destructive techniques such as X-ray photography.

Repair

Repairing the structural system by augmenting or upgrading individual parts or features. For example, weakened structural members such as floor framing can be paired with a new member, braced, or otherwise supplemented and reinforced.



Iron and Steel Skeleton Frame, Unity Building, Chicago, Illinois, 1891-1892 (Clinton J. Warren, architect). *The development of the skeleton frame was pioneered by architects of the "Chicago School" in the late-19th century. With this method the weight of the building is carried on the frame, not the walls, allowing the construction of taller buildings without increasing the wall thickness.*

Not Recommended

Utilizing destructive probing techniques that will damage or destroy structural material.

Upgrading the building structurally in a manner that diminishes the historic character of the exterior, such as installing strapping channels or removing a decorative cornice; or that damages interior features or spaces.

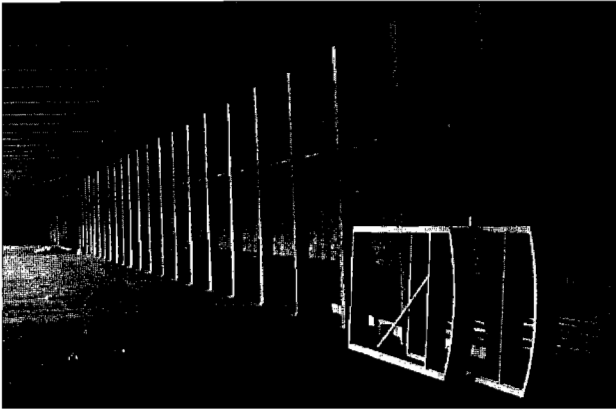
Replacing a structural member or other feature of the structural system when it could be augmented and retained.

Recommended

Replace

Replacing in kind—or with substitute material—those portions or features of the structural system that are either extensively deteriorated or are missing when there are surviving prototypes such as cast iron columns, roof rafters or trusses, or sections of loadbearing walls. Substitute material should convey the same form, design, and overall visual appearance as the historic feature; and, at a minimum, equal its loadbearing capabilities.

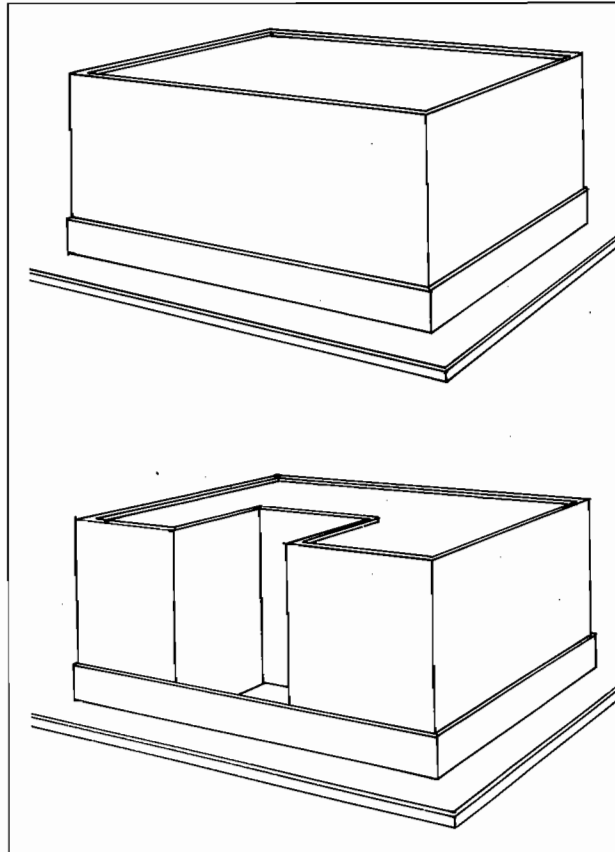
These before and after rehabilitation photographs offer a good example of a project that took into account, and respected, the unique industrial structural character of this mill building in its conversion to a shopping mall.



Not Recommended

Installing a replacement feature that does not convey the same visual appearance, e.g., replacing an exposed wood summer beam with a steel beam.

Using substitute material that does not equal the loadbearing capabilities of the historic material and design or is otherwise physically or chemically incompatible.



A rehabilitation proposal to convert a historic waterfront warehouse into a residential apartment building called for cutting out a large section of the rectangular-shaped historic building. The new "U" shape would provide more apartments with a waterfront view. This schematic drawing shows the drastic change that would result to the structure and character of the historic building if a portion had been removed as proposed (the project was denied because it did not meet the Standards).

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Recommended

Alterations/Additions for the New Use

Limiting any new excavations adjacent to historic foundations to avoid undermining the structural stability of the building or adjacent historic buildings. Studies should be done to ascertain potential damage to archeological resources.

Correcting structural deficiencies in preparation for the new use in a manner that preserves the structural system and individual character-defining features.

Designing and installing new mechanical or electrical systems when required for the new use which minimize the number of cutouts or holes in structural members.

Adding a new floor when required for the new use if such an alteration does not damage or destroy the structural system or obscure, damage, or destroy character-defining spaces, features, or finishes.

Creating an atrium or a light well to provide natural light when required for the new use in a manner that assures the preservation of the structural system as well as character-defining interior spaces, features, and finishes.

Not Recommended

Carrying out excavations or regrading adjacent to or within a historic building which could cause the historic foundation to settle, shift, or fail; could have a similar effect on adjacent historic buildings; or could destroy significant archeological resources.

Radically changing interior spaces or damaging or destroying features or finishes that are character-defining while trying to correct structural deficiencies in preparation for the new use.

Installing new mechanical and electrical systems or equipment in a manner which results in numerous cuts, splices, or alterations to the structural members.

Inserting a new floor when such a radical change damages a structural system or obscures or destroys interior spaces, features, or finishes.

Inserting new floors or furred-down ceilings which cut across the glazed areas of windows so that the exterior form and appearance of the windows are radically changed.

Damaging the structural system or individual features; or radically changing, damaging, or destroying character-defining interior spaces, features, or finishes in order to create an atrium or a light well.