

# POST-WAR MODERN / MiMo



THE CITY OF MIAMI BEACH PLANNING DEPARTMENT

## RAILINGS\*

*Miami architecture, for reasons of economy following World War II, was a generally minimalist architectural style utilizing functional exterior elements, such as railings, to bolster the architecture and provide character defining detail. Hence, railings were imaginatively created in a wide host of patterns and materials to aesthetically dramatize this minimalist style.*

During the postwar period (1945-1965), almost one thousand apartment buildings were built in Miami Beach. Most of these were one- to three-story garden apartment buildings, and the majority were designed with unit entrances via exterior corridors or private terraces. The resulting exterior stairways, corridors and balconies were primary building features. Their metal and concrete railing systems were in many cases the single most impactful exterior feature of the buildings. The railings, often quite decorative, functioned as differentiators for the vast stock of midcentury buildings.

Miami Beach's mid-century garden apartment buildings were a regional adaptation of Postwar Modern architecture popular throughout the US. This regional variant, often referred to locally as Miami Modern (or MiMo), contributes greatly to the identity of Miami Beach. In fact, Postwar Modern garden apartment building sub-number Art Deco and Mediterranean Revival buildings in the city. Further, the vast concentration of these buildings in certain neighborhoods has generated at least one new local historic district, as well as two new districts on the National Register of Historic Places.

\*For detailed railing guidelines please refer to Appendix A.

**SPACE-AGE IMAGERY** A number of MiMo landmarks capitalized on space-age imagery, such as the University of Miami's Pick Music Library, with its extending pods like those on a lunar landing module, and the Pepsi-Cola Bottling pavilion, with its spiraling floating staircases, a vision straight out of the 1953 film *The War of the Worlds*. Toward the end of the MiMo era, the television cartoon series *The Jetsons* reflected and parodied the period fascination with the future.

**SPANDRELS** Panels placed between the window head of one floor and the windowsill of the floor above. MiMo spandrels were often clad in glass mosaic tile or textured, painted stucco.

**TEXTURED STUCCO** Inexpensive stucco lent itself to the creation of textures and abstract decorative relief in the abundant Miami sunshine.

**TRAY BALCONIES** Cantilevered balconies with concrete parapets (low walls, usually formed by the projection of a wall above a flat roof) are used for their sculptural form in MiMo hotels and residences.

**WOGGLES** Biomorphic kidney shapes popular in postwar design usually appeared as ceiling coves or trays for indirect lighting.

*This Glossary is adapted, with permission from the author, from "MiMo: Miami Modern Revealed" by Nash, Eric P., and Robinson Jr., Randall. Chronicle Books, San Francisco, 2004.*



## APPENDIX A - RAILINGS

BY: SHULMAN + ASSOCIATES



STATEMENT OF PROBLEM

Remediation, restoration or replacement of the original mid-century railings has been identified as a high priority for the City of Miami Beach. Miami Beach's highly corrosive environment, along with normal wear and tear, occasional storms and infrequent maintenance, takes its toll on metal, concrete and wood railings. Many existing metal railings display high levels of rust deterioration, causing structural instability and unsightly staining of adjacent materials. This is especially evident at the base of posts where the metal comes into contact with concrete and standing water.

In addition, many postwar railing systems do not meet current ADA and Building Codes, such as height, rejection rules, railing gripability and structural tolerances. For instance, many older guardrails rise to three feet high, whereas three foot six inches is currently required. While older railing systems are often very open, contemporary building codes

require that guardrails be designed so that a four inch sphere cannot pass through any point below three feet. Contemporary codes also carefully prescribe the cross section of handrails. Existing rails may require redesign and modification or replacement during re-certifications, changes of use or substantial improvements equating more than 50% of the value of the building to bring the buildings up to code.

Finally, current fabrication methodologies and changes in manufacturing technology and methods have made pure replication of the historic railings cost prohibitive. Materials such as aluminum, more suited to this corrosive environment, have different properties from the original steel or iron railings, and so exact replication of member sizes becomes difficult.



STRUCTURAL DAMAGE



POOR REDEMPTION TECHNIQUES



LARGE OPENINGS



POOR ADAPTATION TECHNIQUES



POOR MAINTENANCE



REPAIRS USING INCORRECT MATERIALS

## RAIL TYPOLOGIES

Although the designs and styles are simply too numerous to design replacement railings for each within this document, a summary of some common groups is described here to help identify each type and provide an understanding of the design intent for each type.

A

Metal Bar with Mesh

The mesh railings are often framed much like a simple pipe rail, but are infilled with a horizontally proportioned panel of expanded metal mesh, delicately supported on fine bracing members offset from the corners of the panel.



B

Metal Bar

Historically, these designs were wrought iron which is a ductile material with a high tensile strength, and can be easily shaped when hot or cold by either hammering or rolling. It is relatively good at withstanding corrosion, however Miami Beach's harsh seaside conditions test the limits, and without suitable maintenance and repairs to portions of iron exposed to the elements, substantial damage can quickly occur. Wrought iron can be heat welded quite easily, that is, fused together by heating the ends of the iron to a high temperature and then hammering them together. It can also be drill bolted or riveted, however heat welded is by far the most typical joining technique displayed in the existing Minto railings on Miami Beach.

Vertical bars were usually square in section, or in the case of the Ribbon designs, were flat rectangular sections.

Handrail profiles were typically rectangular metal bar stock, with many of the more decorative profiles added at a later date.

C

**Ribbon.** Typically, these railings are comprised of a flat metal bar stock, folded and curved between a flat bar stock bottom rail and handrail, and presenting the narrow side to the façade. This results in an exceptionally thin visible profile. These designs are the result of a desire to create a railing that is aesthetically compliant with the 4" maximum rule, became far too dense and when viewed from even a slight angle, became too opaque. These designs would be more suitably modified using a secondary layer of mesh or glass behind to provide code compliance.



**Vertical Picket with Enhancements.** This style varies greatly, however the underlying concept exhibits a repetitive vertical picket, sometimes straight and sometimes twisted, broken up with a detailed element typically located between two pickets.

## RAIL TYPOLOGIES

- Appliqué: Appliqué railings are typically a single vertical picket with a decorative element applied directly to the front of the pickets. The location and size of the applied plate versus the picket is important to note, and are typically quite small.



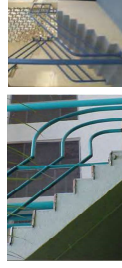
- Geometric: Many of the designs display a range of geometric patterns and gradients typically arranged in a grid. Such designs are often difficult to adapt since they typically rely on the density of the members and the profile of the stock, however the density of the members and the profile of the stock using contemporary materials can diminish the success of the final product if not carefully designed.



- Curves and Circles: Similar to the geometric, however with curves and circles. Such designs are often difficult to adapt since they typically rely on the density of the members and the profile of the stock, however the density of the members and the profile of the stock using contemporary materials can diminish the success of the final product if not carefully designed.



- Pipe: Common, but often forgotten, the simple pipe rail is typically 3 horizontal rails connected by a vertical post. Since the rail is connected to the handrail by a single post, these are difficult to adapt without completely modifying the design, since the spacing between the bars is too wide. Details must be concentrated on, since new pipe rail fittings typically have a male/female type connection, which does not match many of the historic conditions.



RAIL TYPOLOGIES

C / Precast Concrete

Less common, but appearing on many of the buildings from this period, was the use of pre-cast concrete balusters, some using smaller panels cast almost like oversized concrete masonry units (CMU) spanning between the deck and a concrete handrail. Others appear as handrails as entire baluster units, incorporating the concrete balusters, handrails, and spindles in one element approximately 6-8' long.



D / Modular Concrete Breesblock

Typically still in good condition, the concrete breezblock railings tied in to the screens, providing an abstract frieze and casting an intricate play of shadows across the facades. Many of the designs are no longer in fabrication, however most already comply with the current code and ejection rules, so are easily adaptable and fabricators are available to provide custom designs to match the existing blocks.



E / Wood

Closely related to the metal bar stock railings, these metal framed railings used redwood slats for intermediate rails, and often had wide sloping handrails.



## CRITERIA

In this document, we explore three principle approaches to working with original non-conforming railing systems: restore/adapt, replicate/adapt, and contemporary interpretation.

### 1 Restore/Adapt

Preservation may be appropriate if the original historic railings are essentially intact. Proof of the original appearance, such as photographs or drawings, is helpful in understanding the original configuration of the rails, and the extent of any changes over time. Restoration and/or adaptation is generally preferred to replacement, as it allows the original railing to remain. Any attempt to replace existing railings may attempt to be made to ensure this methodology.

Repair and minor replacement of small portions of a railing being restored should faithfully replicate the original, using exact materials, member profiles, sections, sizes and attachment details. Minor modifications may also be possible to enable restoration of the existing original handrail, such as the addition of an intermediate member or a glass panel behind, which may satisfy current code requirements.

When railings are original, less stringent standards are often applied, such as allowance for a 6" rejection rule rather than the 4" rejection applied to new railings. A full code analysis of the railing should be completed prior to determination that it warrants replacement.

### 2 Replicate/Adapt

Should a railing be unsuitable for restoration due to severe deterioration, or if the original railings have been subsequently replaced with a less historically appropriate railing, replication of the original would be preferred. Historic photos and drawings may provide a source for the design of the replicated railing, and if available, the original railing should be used as a guide. A faithful replication of the original, after restoration, faithful replication and adaptation would be the next most preferred methodology for railing replacement.

If feasible, materials matching the original should be used. However, if appropriate alternatives are able to faithfully replicate the original materials they may be considered. For example, aluminum railings are often used to replace steel railing, since the material is less prone to corrosion and requires less ongoing maintenance. However, the replicate must be able to match the original railing's appearance and function. The original railing should be described for restore/adapt, minor modifications to enable faithful replication may be possible to correct minor code non-compliance issues.

### 3 Contemporary Interpretation of the Original Railing

Should a railing be both significantly deteriorated and unsuitable for adaptation to meet current codes, a contemporary interpretation may be considered an appropriate methodology for railing replacement. Interpretation of the design of the original railing may be achieved through historic photos and drawings. A number of case studies have brought into focus various strategies for achieving the historic intent of the design without necessarily requiring a true replica of the original. Design input from the City of Miami Beach Planning Department should be sought in order to select an appropriate interpretive design solution. Note that for the purposes of receiving Historic Preservation tax credits, contemporary interpretation is not recommended.

### 4 Prevention and Maintenance

The City of Miami Beach considers original postwar railing systems a design and historic preservation resource. Building owner(s) are requested to pay attention to providing proper maintenance, timely repair and consistent care for the railing system. Historic preservation professionals should be consulted with the proper supervision, correct and thoughtful details and quality workmanship.

### 5 Understanding of the whole

Railing systems are holistic in nature, and every part contributes to the overall aesthetic and often structural integrity of the whole. A particular detail evident in many postwar railing systems illustrates the point. In many locations, the newel post of the railing extends from the deck to the underside of the eaves, providing additional structural integrity and minimizing the need to a large diameter post or additional structural bracing. Such details are important to the design of the railings, and should be retained or replicated.

## DESIGN STRATEGIES

## IGN STRATEGIES

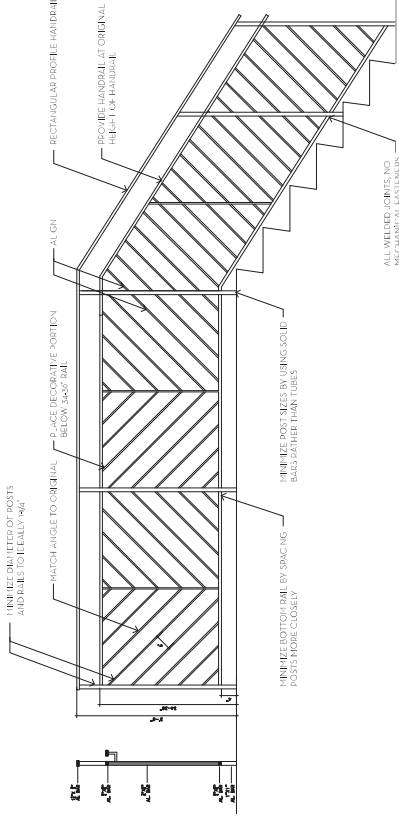
/ Metal Bar - Angle

The diagonal design is a simple adaptation of a standard picket rail design, however, it is important to note the proportions of the members, and the fact that the diagonals do not extend past the 34-56" high rail to keep the denser part of the railing at the historically lower height. All other structural members should be kept to a minimum profile, and rectangular bars used for all handrails.



**B** / Metal Bar - Angle

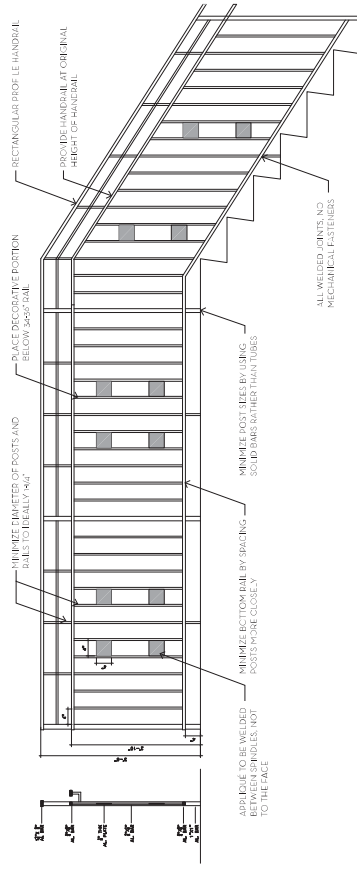
The diagonal design is a simple adaptation of a standard picket rail design, however, it is important to note the proportions of the members, and the fact that the diagonals do not extend past the 34'-6" high rail, to keep the denser part of the railing at a historically lower height. All other structural members should be kept to a minimum profile, and rectangular bars used for all handrails.



## DESIGN STRATEGIES

### B Metal Bar - Appliqué

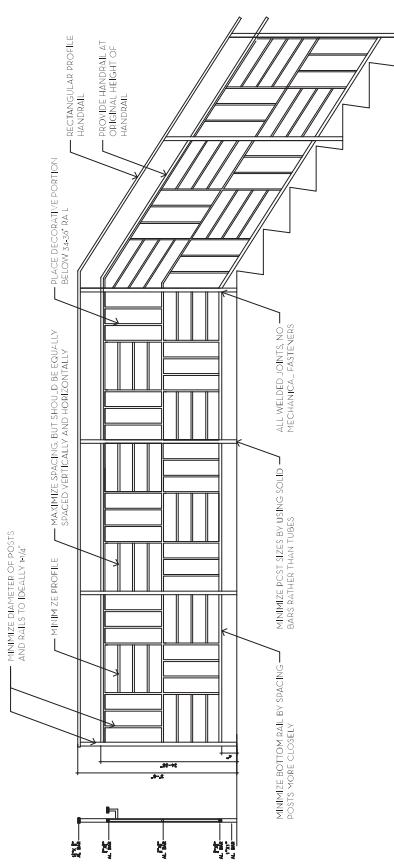
Applique designs are widely varied, however, in principle, the applique should not be so large as to dominate the open/solid proportions of the original, and the attachment method to the post should not be so large as to dominate the design of the applique in the original should be carefully noted, and the bars minimized in size as much as possible.



## DESIGN STRATEGIES

### B Metal Bar - Split

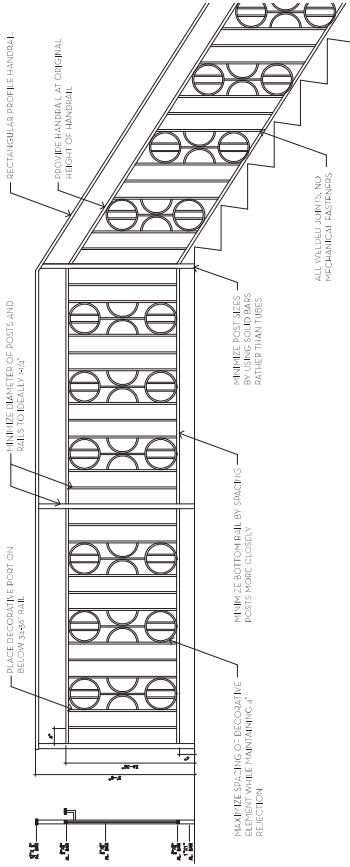
This design, while not common, was easily adapted to a number of design types, since the smaller rectangular opening allowed for the density of the original to remain while still providing for the 4" rejection as required by code.



## DESIGN STRATEGIES

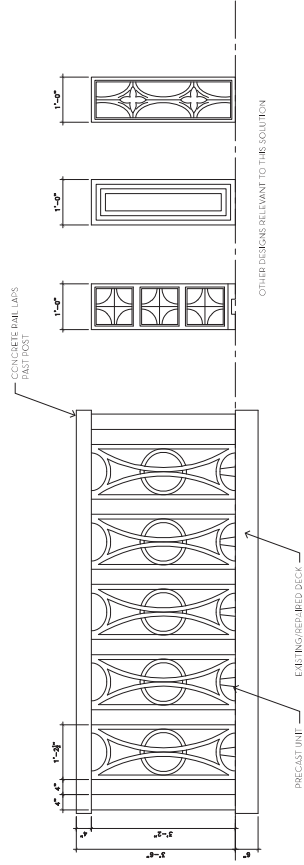
### B Metal Bar - Circles

Circles are the hardest type to adjust to meet current codes. Here, the scale of the circles was kept similar to the original by only changing the design to the 34"-36" rail height. In addition, separate intermediate bars were added to the circles.



### C Precast Concrete

Precast concrete balustrades are currently difficult to source, however since these are modular units, they can be cast similar to rebardeck to meet the current codes. Units may need to be cast in pairs to meet the 34"-36" rail height. In addition, separate intermediate bars were added to the circles. Due to increased structural standards, lightweight concrete may need to be considered.

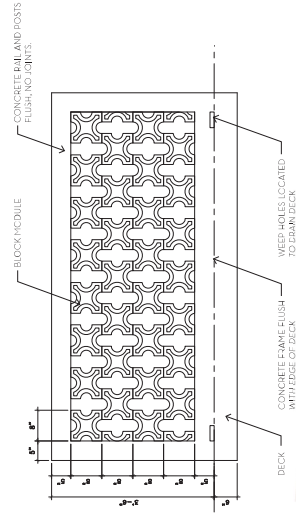


## DESIGN STRATEGIES

### D Modular Concrete Breezeblock 8" x 8" Type

One of the smaller modules, 8" x 8", formed open sided designs laid in an offset pattern. These formed different shaped openings between the blocks. In some cases, the openings are rectangular and some are triangular. Although difficult to obtain still with any other block results in a poor version of the original.

SUITABLE BLOCK TYPES  
DESIGN COURTESY OF LUP GROUP INC. H4141



## DESIGN STRATEGIES

### D Modular Concrete Breezeblock 6" x 6" Type

A more slender block type, 6" x 6", these blocks stack perfectly to achieve a 42" height rail with a large amount of opening. These design uses a frame in a regular pattern of vertical and horizontal points, creating a block that can be oriented vertically and horizontally. These details, and the original thickness of the posts and rail at the top should all be taken into consideration.

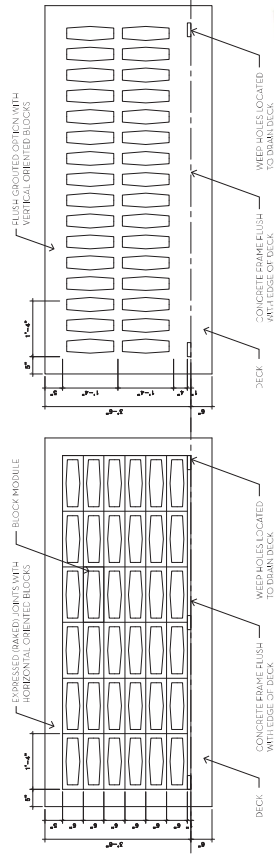
SUITABLE BLOCK TYPES  
DESIGN COURTESY OF ARIEL BUILDING SOLUTIONS AND E-ZEL LAY INFRA



HARBLEQUIN



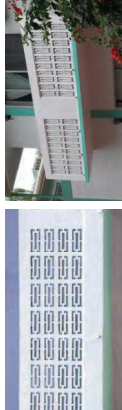
ARCADIAN



DESIGN STRATEGIES

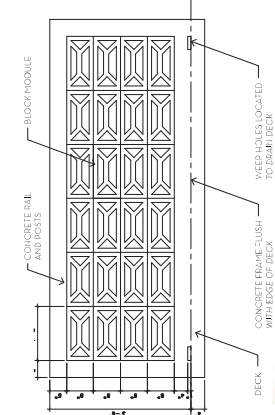
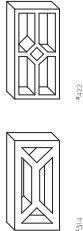
D Modular Concrete Breezeblock, 8" x 16" Type

A more typical block size, 8"x16", not all standard fabricated block patterns are suitable for use in a mid-century designed building. Particular designs have been identified that lend themselves this use, however it would be preferred that the original block design be replicated available at most block fabricating companies. Accommodating this block size for the rail.



SUITABLE BLOCK TYPES

DESIGNS COURTESY OF AIRBLOCK



DESIGN STRATEGIES

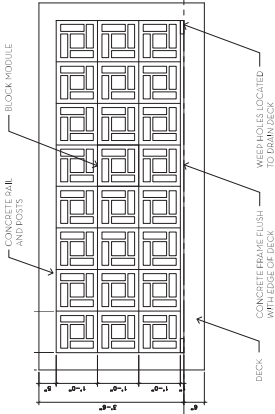
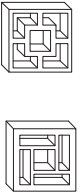
D Modular Concrete Breezeblock, 12 x 12" Type

12"x12" blocks are by far the most common mid-century block used for railings. None of the original designs are currently available by standard order, however are available as a custom purchase from most concrete block manufacturers. Ideally, the original block pattern should be utilized, but suitable substitutes are available. Designs for these block sizes are very suitable for forming a 4" high balustrade.



SUITABLE BLOCK TYPES

DESIGNS COURTESY OF AIRBLOCK

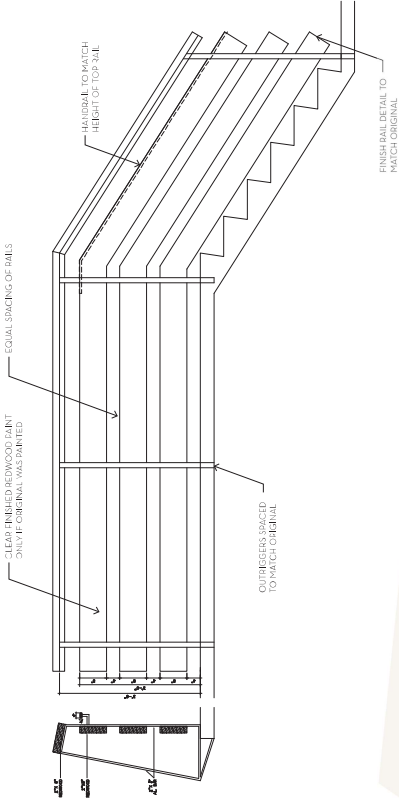


DESIGN STRATEGIES

Wood and Metal 1



This very unique design illustrates the strong relationship between the railings and the outriggers often employed to stabilize these very slender posts. While slightly more tightly spaced, the outriggers are given a lot of their original proportions while meeting current codes.

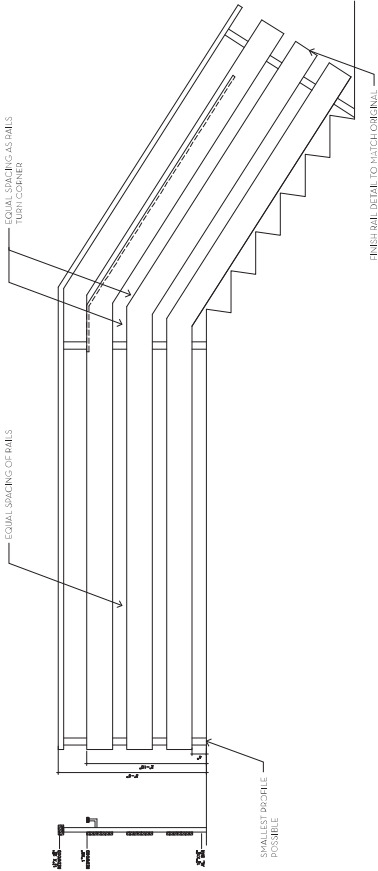


DESIGN STRATEGIES

Wood and Metal 2

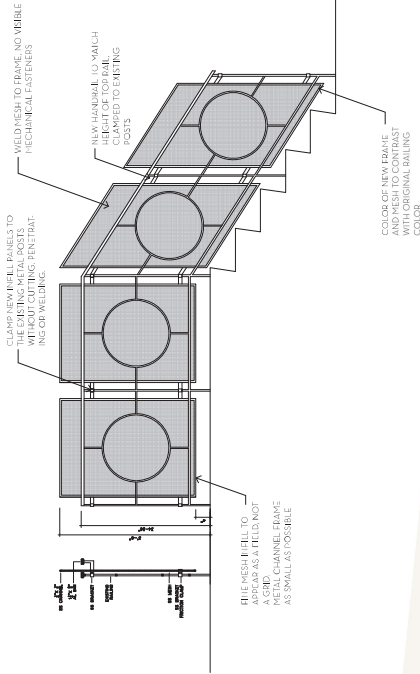
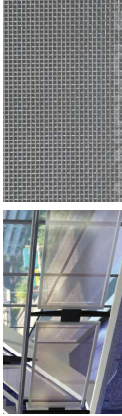


A more simple version incorporates a standard embedded post design, but illustrates some of the detail options such as the angled termination of the railings at the base of a stair. This design also incorporates a standard detail of the railing at the allowable opening between the top of the 3x5x6" rail and the top of the guardrail.



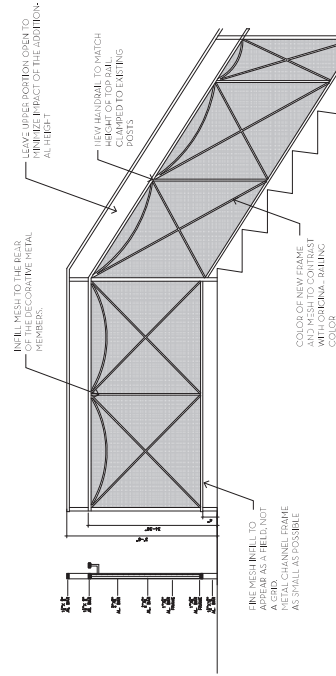
DESIGN STRATEGIES

**E** Adaptation of Original with Mesh Behind  
The priority of adapting the original design should be to retain the original design and add a mesh behind the original to achieve current code compliance. This solution proposes a transparent field of panels behind the existing, in a contrasting color, so that the original and the new can be clearly identified.



DESIGN STRATEGIES

**C** Adaptation of Original Design with Mesh Incorporated  
This example is proposed for original designs that are difficult to modify without losing the intent of the design, and where replacement is required because of deterioration or structural inadequacy. The new railing should incorporate the correct proportions for the metal members, and the 4 inch rejection requirement is achieved via a metal mesh attached discretely behind the decorative members. The mesh should be a contrasting color from the railing members.



Ironwork suffers deterioration which must be identified and treated effectively as early as possible. The most common of which are corrosion, structural damage and poor previous repairs. Corrosion is the formation of iron oxide (rust) by the reaction with oxygen and water, and begins at breaks in the surface of protective paint. Prevention of water penetration and retention is therefore a vital aspect of any preservation programme. It is important to identify where the metal is in contact with each other. If affected areas are not treated as soon as they occur then rust can move across the railing, causing damage to attachment points such as cracking, stucco and concrete, and staining adjacent materials.

II. Metal Repair

Surface preparation in order to repaint should include the following steps: removal of old paint, removal of rust, removal of loose scales, called 'mill scale' as it is like a mill scale, and removal of any other surface contaminants. Only paint that is loose, perished or flaking must be removed unless areas of existing paint are also hiding details in the metalwork, or transitions between old and new are visible after repainting. Areas of existing paint in good condition may be cleaned and repainted with two coats of paint suitable to the substrate.

The use of mechanical especially dry-high speed abrasive tools should be avoided because of the risk of inhaling lead dust contained in old paints. Paint stripping may be used, but must be removed from the surface as per local safety rules. It is recommended that old paint is removed as far as possible. Areas of corrosion should be treated with a suitable cleaning method, set up thermal stresses in the metal. A suitable cleaning method should be identified based on the type of metal being cleaned, the amount of detail and the condition of the railing.

Loose and defective mill scale can be removed by abrasive action helped if necessary by the application of heat. Removal of small areas of rust may be completed with abrasive action and treated with a chemical converter. Deeper affected areas may need repair with metal fillers after the removal of the rust, or in severe cases sections may require replacement.

Most cleaning methods are likely to cause parts to become dislodged, or other structural damage. Care should be taken to avoid such further deterioration. A thorough inspection of the cleaned ironwork should be completed prior to any preparatory coatings or paint being applied to the railing. If possible, existing railings should be galvanised for additional protection and to reduce the amount of cleaning/painting/maintenance required for their upkeep.

New paint coatings must be compatible with the existing paint. It is important to maintain a continuous paint layer, typically by applying several layers to prevent 'pin holes' or thin areas of paint coinciding in all layers. Painting must be done regularly and effectively, ideally at least annually. Painting over rust is a waste of time and money, since the corrosion continues under the surface. The above steps must be completed before continuing with the painting. It is recommended that old paint is removed and replaced.

Replication

Should replication in wrought iron be the chosen method of railing replacement, new ironwork design and fabrication details should match the original railings in every possible manner. Connection details to the walls, spacing of post to post, spacing of spindles, profiles of the handrails, connection details of the railings to the wall, and the various railing components, and component profiles should match.

New wrought iron railings can be additionally protected with galvanizing, reducing the need for the same amount of maintenance as required for an

existing wrought iron railing.

Installation

Embedment of new railings or reinstallation of repaired railings into the concrete deck should ideally be completed with attachments in the same locations as the original railing. This will require re-coring of the existing post holes. Re-core the slabs, providing a hole wide enough to accommodate the new railing without any contact between the post and the concrete. A suitable concrete repair material should be used to fill the existing re-core concrete. Installation should be performed to industry standards for concrete restoration.

The bases of the steel posts shall be galvanized and powder-coated to standards as noted earlier both inside and outside to a minimum height of 3" above the finished concrete deck.

Posts shall be set in non-shrinking grout. The grout shall be positively sloped away from the base of the post and shall be at a minimum level with the finished deck level to avoid any water ponding against the posts. The entire deck should be waterproofed in accordance with industry standards for waterproofing. If new post holes are to be cored into an existing slab care shall be taken to avoid coring through rebar.

If railing is to be attached to a newly poured concrete deck, post holes should be located and formed using a grout pocket form to avoid later coring of rebar in the deck.

Although not the preferred methodology for replacement of the railings, aluminum has proven to be a popular choice for railing replacement given its enhanced ability to withstand the salt air environment and lower maintenance requirements. It must be understood, however that aluminum railings are not designed to resist impact loading and are subject to bending and impact. For this reason a life cost analysis may prove that aluminum is not the best solution.

Aesthetically, aluminum runs the risk of not being a suitable solution for replacement railings, since typically larger profiles are required to achieve the same structural performance. Where possible, solid bar stock should be considered in order to minimize member sizes in order to more closely replicate the original designs. In addition, solid bar is more suited to curved shapes since rolling does not kink the material, often a problem for tubular members. Round profile posts and rails, a thicker wall thickness than square or rectangular profiles, will allow for more uniform expansion. Replacement railings shall be engineered to comply with all current required structural loads and shall allow for the appropriate thermal expansion. Railings shall be fabricated from all new metal free from pitting, seam marks, roller marks, stains, discoloration and other imperfections, and different metals shall be appropriately insulated from one another to prevent corrosion.

All connections must have a four sided weld, with no exposed mechanical fasteners. Concealed fasteners should only be used for interconnecting rails. The deck should be waterproofed in accordance with industry codes. If new post holes are to be bored into an existing slab, care shall be of the same material as the railing. All connections must maintain the structural integrity of the whole, and all railing ends must be closed. Weep holes should be provided when necessary to provide condensate moisture to escape.

The design should allow for the railings to be preassembled to the greatest extent possible to minimize field splicing and assembly. Field measurements should be carefully taken to eliminate the need for cutting.

welding or abrading of the railing during installation. Installation in the field should incorporate the bare minimum fully concealed fasteners, and the resulting joints should be flush, smooth, rigid and fairline joints. Aluminum railings should first be pretreated then receive a base-on primer and a clear coat finish. Painting is not recommended for welded railings due to the likelihood of discoloration.

Installation

Embedment of new aluminum railings into the concrete deck should ideally be completed with attachments in the same locations as the original railing. This will require re-coring of the existing post holes. Re-core the slab, providing a hole wide enough to accommodate the new railing without any contact between the post and the existing concrete. Should any rebar be observed, the rebar should be cut and the hole should be filled with concrete. The bases of the aluminum posts shall be powder-coated both inside and outside a to minimum height of 3" above the finished concrete deck to avoid interaction between the aluminum and concrete.

Posts shall be set in non-shrinking grout. The grout shall be positively sloped away from the base of the post and shall be at a minimum level with the finished deck level to avoid any water ponding against the aluminum. The entire deck should be waterproofed in accordance with industry codes. If new post holes are to be bored into an existing slab, care shall be taken to avoid coring through rebar.

If railing is to be attached to a newly poured concrete deck, post holes should be located and formed using a grout pocket form to avoid later coring of rebar in the deck.

Precast and breezeblock railings appear to have the best longevity of the MIMO railings, with the majority intact. However, insufficient concrete coverage of reinforcing bars has often caused spalling of the concrete railings and posts, and some blocks have received impact damage and the railings have been damaged. Cleaning and concrete repair work, both of the deck and the railings themselves should aim to remove all rusted reinforcing bars, and new reinforcing should be in and correctly covered to industry standards. All concrete elements should be kept at the same depth and width as the original, unless less than 4" in any direction, which then does not provide sufficient coverage of the rebar.

While the majority of the block and precast baluster designs are no longer in production, some local CMU fabrication companies are capable of creating a mold of the original block and casting new concrete copies. The cost of this process is high, and the block is not ideal for replication. The replication process can result in a less expensive solution if the alternative is to demolish and replace all existing blocks. New blocks can also be slightly modified where appropriate to enable compliance with current codes. If weight is an issue, lightweight concrete may be investigated as an alternative.

Replication/Replacement

Where all blocks or precast panels are to be replaced, a mold of the original should be made, or a similar code compliant block sourced. Units should be reinforced, tied or anchored as appropriate for each type of block and the size of the opening. GROUT joints should either be raked and expressed, or fully buttered and flush, to match the original design. New concrete railings and posts should match the existing in proportion and be cast in place to avoid expressed joints resulting from piecing together using precast components.

Precast balustrades consist of the baluster, post and rail. Balustrades should be appropriately attached to the deck to meet structural requirements by drilling of the deck to accommodate rebar mortared into the deck and baluster with Type S mortar or sandbed grout, depending on the type of baluster. The top of railings should be slightly pitched toward the deck to provide positive drainage to the surface and prevent ponding and water damage. Regular weep holes coordinating with the deck slope should be installed to prevent water ponding against the base of the units and rusting the rebar covealed into the baluster. All block and precast units should be painted as per the original design where applicable.

Protection and Maintenance

Railings should be regularly checked for cracks and chips to prevent water intrusion and rust developing in the rebar.

## RESTORATION/FABRICATION METHODOLOGIES

41

### WOOD

#### 1 Restoration

Most original wood railings have extensive damage and so few will be suitable for pure restoration. Original redwood slats should be stripped of all paint, while protecting the wood beneath, unless original documentation of the railings demonstrates that they were originally painted. Only those portions showing damage should be replaced, and entire pieces should be replaced, not spliced with a new board. The grade of all replacement pieces should match those adjacent, with the same species and the same amount of grain. Repair visible color and knots.

Refer to Steel section of these guidelines for restoration of the metal elements of these railings.

#### 2 Replacement

All new wood shall be in proportions to match the original. Re-housing into structure: See Aluminum or Steel sections.

#### 3 Protection and Maintenance

Regular stripping and re-coating is required to retain the original natural wood.

1 The use of new redwood is strongly discouraged to prevent the potential future loss of these ancient trees. Alternative wood types resistant to weather such as iash, mahogany or cedar should be considered.

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