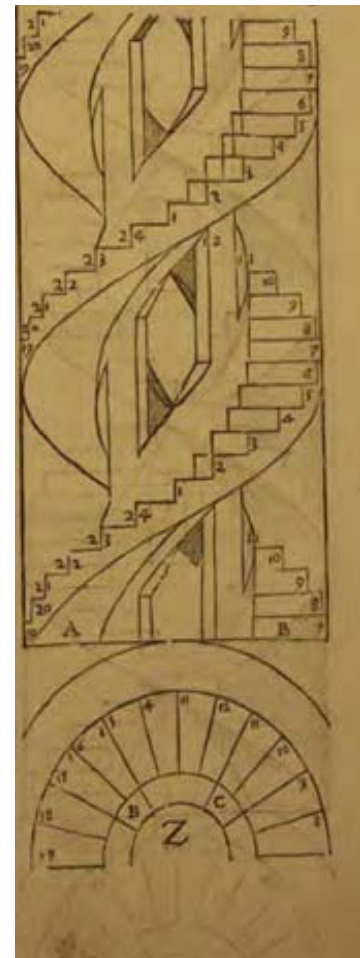
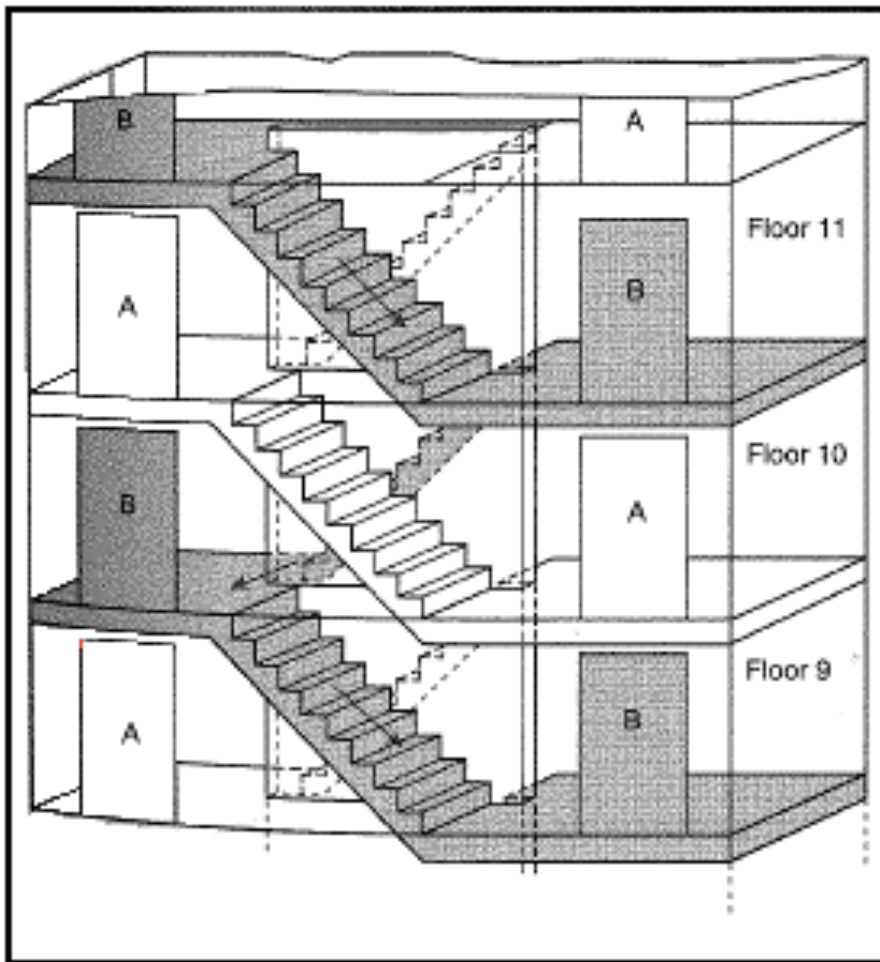


# Scissor Stairs: Origins, Development and Contemporary Use

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Scissor stairs have been shaping the skyline of British Columbia's burgeoning urban development and are now making spotted appearances along Portland's Willamette River. Heralded by architects and developers as a sleek way to maximize office and residential design, the scissor stair possesses an undeniable attraction. This unique stair design is not without its drawbacks however, and may not be the right fit for buildings with large floorplates.



The scissor stair design is commonly known as a set of two intertwined stairs located within one stairwell enclosure. Two adjacent flights connect the same floors in opposite direction, crossing each other like a scissor, hence the name. In enclosed scissor stairs it is possible for two people to climb or descend simultaneously without ever having to meet each other. A variation of the straight scissor stair has two circular stairs winding around to form a double helix. An open version of the double helix stairs is seen in the Vatican museum. This ornate set of intertwined stairs has enthralled visitors for centuries.



**A Brief History:**

Scissor stairs have a long history and many anecdotes regarding their origins and function. One of the more famous scissor stairs is actually of the double-helix style in Le Château de



Chambord, a French castle situated on the Loire River. Built in the 1500s, the Chambord castle provided the royal court with an ample staging ground for hunting within the thick forests that surrounded the site. Most associated with the castle is King Francois the 1<sup>st</sup>, who persuaded Leonardo da Vinci to travel from Italy to help him create his dream château. King Francois, a known lover of ladies, was said to have used the staircase to usher in his mistresses without alerting the Queen.

Francois must have been badly let down by one of his concubines however, as in 1545 he took a diamond ring and inscribed into his workroom window the words “*Souvent femme varie, bien fol est qui s’y fie.*” (Women are fickle; unhappy is he who puts his trust in them.)



Besides being a secluded passageway for mistresses, the scissor stair is also rumored to have kept the master of the household from having to gaze upon his servants. In 1737, the famous architect theorist Jacques Blondel published “*Maisons de Plaisance*” where he devoted much of his attention to the dwelling structure. In his manuscript, Blondel describes the scissor staircase as providing the

“serving staff with effective vertical circulation...the two flights allowed servants to go in opposite directions without running into one another.” This suggests that not only did the scissor stair’s design obscure servants from their masters; it also helped them carry out their tasks effectively and efficiently.

More recently, turn of the century designs indicate that scissor stairs were used in public schools and factories to separate the sexes. The crisscrossing parallel design was meant to be an efficient use of space while keeping the genders separate as they went to work in their different areas.

**Form and Function:**

The aspect of the scissor stair design that is irresistible to the architect and the developer is in its exceptional ability to conserve space and maximize perimeter views. This design has been made famous by the slender glass towers of Vancouver B.C. called “Point Towers”. The Seattle Daily Journal of Commerce has noted a growing level of buzz created by Vancouver B.C.’s slender point-tower design in Seattle and other northwest cities. These new tower designs would not be possible without the incorporation of a scissor stair within the building’s core.

The scissor stair condenses two paths of egress within a single stairwell and is commonly placed within the center of the building. This frees up space at the building’s corners usually reserved for traditional stairwells. The result is more leasable or saleable space per square foot as well as a sleek tower design. The versatility and aesthetic appeal is evident in its growing popularity.



The modern scissor stair is usually compact and hidden; however, in New York, Raimund Abraham took this bland, functional, building element and turned it on its head. In his Austrian Cultural Forum building, a 24-story building that is 24 feet wide and 81 feet deep, Raimund placed scissor stairs at the back of the building expressing it as a design element. His innovative use of metal clad exterior Scissor Stairs has transformed this commonly hidden functional element into a sculpture.

**Cost savings:**

In large buildings, traditional stairwells dispersed over the building’s floorplate are necessary to meet the building code requirements of travel distance or exit separation. This places a stair that is easily accessible at multiple locations, it also provides alternate paths in the event that one is compromised and allows a large number of occupants to descend quickly. Since smaller

buildings are not burdened by the long travel distances and heavy occupant loads of large high rises, they do not require multiple staircases and scissor stairs fit the bill.

Scissor stairs require less floor area, share a common wall and other components, and do not require intermediate landings. Hence, compared to traditional stairs, the scissor stair is less expensive to build. In some buildings a one-hour corridor may be needed to meet the exit separation required by the building codes, which will nullify the cost reductions gained from the compact design. However, the biggest gain is in the opening up of useable/saleable space.

Frequently in traditional buildings often there is wasted space inside the tenant area around building stairs. The scissor stair eliminates this waste by consolidating the two stairs in one location and reducing the circulation space needed outside each stair. The increase in leasable/saleable space can vary based on the building design, but is almost always a significant gain for buildings with a scissor stair.

### **Safety Concerns:**

Safety issues surrounding the favored stair design were once again brought to the forefront after the World Trade Center Building Code Task Force published its proposal to limit the use of scissor stairs to buildings with small floorplates (under 10,000 square feet). Scissor stairs are not recommended for large buildings since the design inherently requires the two stair exits to be located within close proximity of one another. If one of the scissor stairs, or its enclosure, becomes compromised, it is likely that the second stair will be compromised as well. This could trap building occupants, leaving them with no means to escape or for emergency personnel to reach them, unless the stairwell structures and fire separations are adequately designed and built to preclude such compromise.

Firefighters have also taken issue with the scissor stair design, since their unfamiliarity with them can create confusion as to which standpipe is located at which stairwell, while the crisscrossing exits can disorient rescue workers who are under high levels of stress during an emergency.

Still, the scissor stair has increased in popularity, especially within circles of architects who design residential and mixed-use developments. New technology in building safety features such as sprinklers, early smoke detection, and fireproof construction has allowed designers more flexibility while keeping building occupants safe. When placed within buildings with small floorplates, scissor stairs offer a number of attractive design characteristics that are perfectly safe.

On the West Coast, building codes have previously not allowed scissor stairs to count for more than one exit. The Uniform Building Code required that exit stairs be located in separate enclosures and the distance between the walls of these separate enclosures be a minimum of 30 feet to count as two exits. Consequently, there are very few buildings along the United States' western coast that have scissor stairs incorporated into their design.

Some buildings permitted before the adoption of UBC codes by the city or state contain scissor stairs that are designed to be an integral part of the buildings egress systems. Portland, Oregon's old TN building, (Now



Courtyard by Marriott) located in downtown at the corner of SW 6<sup>th</sup> and Oak Street is one such building. The change of occupancy from an office building to a hotel required additional review of the existing scissor stair before the proposed renovations could begin. The architect, owner and the City officials had to work together to address this unique condition. The initial hesitancy regarding this design was soon overcome and the owners were able to move forward.

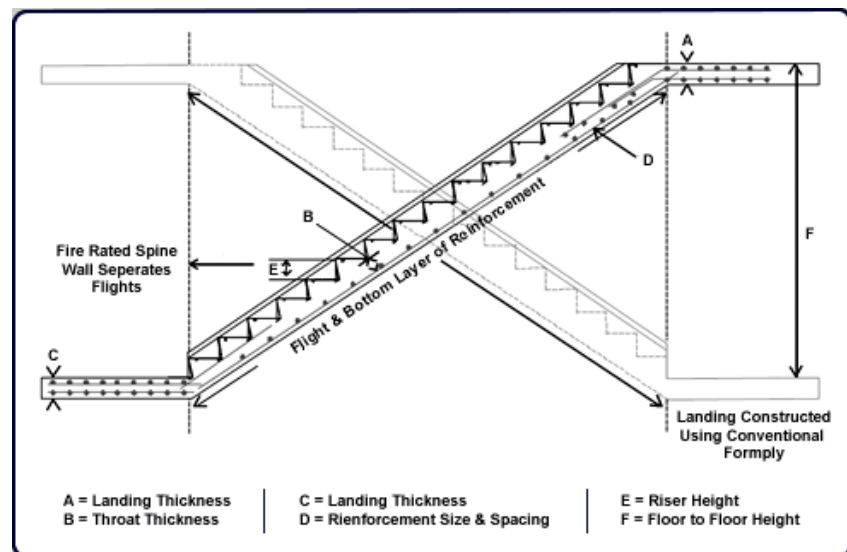
## Evolving Standards

The east, west, and southern areas of the United States were formerly governed by three different model codes. The International Building Code (IBC) combined the South's SBC, the East's NBC, and the West's UBC to form one comprehensive standard. The IBC is continuously evolving to reflect the changes in modern building construction technology and architectural innovations. Updates and modifications to code standards are submitted and reviewed by the International Code Council (ICC) every 18 months to stay current with advances made within the construction industry. If the modifications are deemed safe, they are then adopted through a consensus approval process.

During the ICC's April 2000 public hearing, David Frable of the General Services Administration submitted a minor modification to the standard that required exit enclosures to be separated by a distance of not less than 30 feet.<sup>1</sup> This modification eliminated the 30-foot separation requirement between two exit stairs but required that scissor stairs be counted as one exit. This paved the way for scissor stairs to be used as egress stairs in contemporary buildings. Frable's statement in support of this modification said:

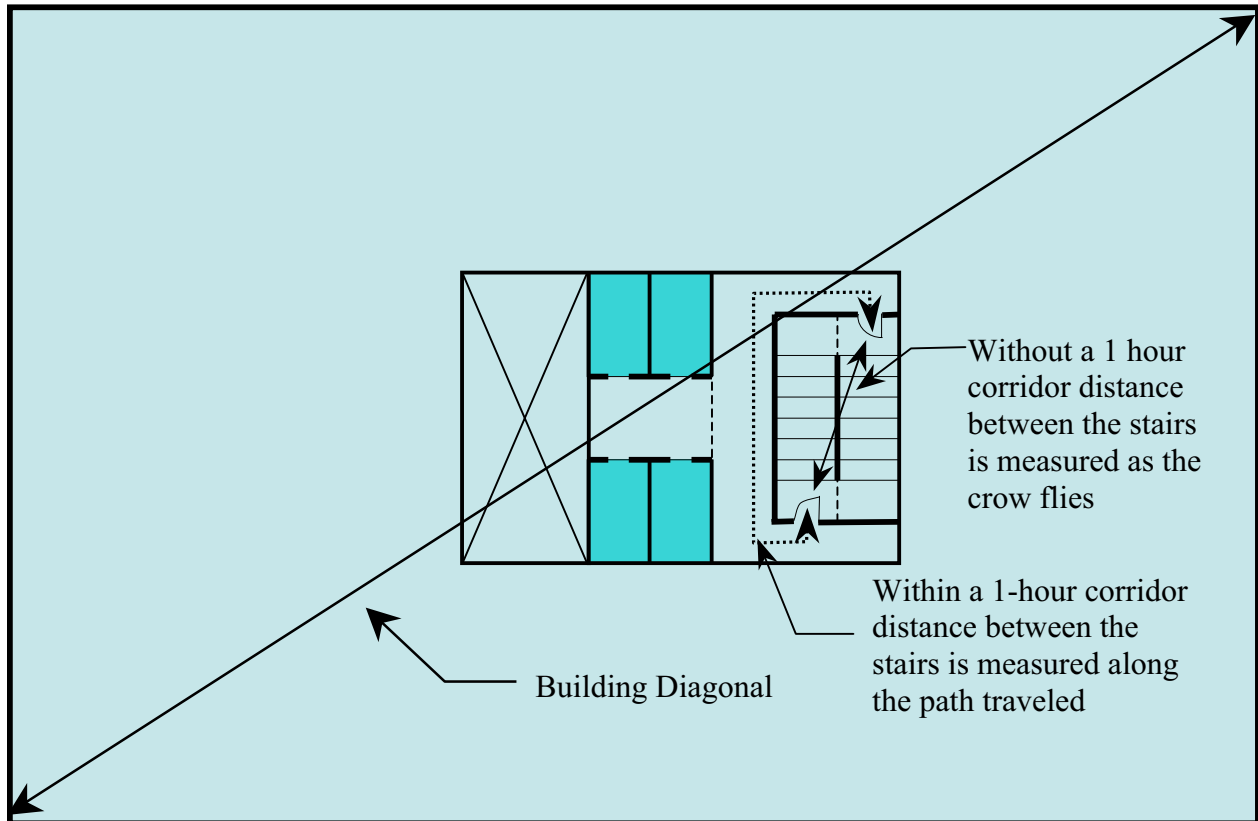
*"While much of the opponents' debate implied that the current text is only in one model code, it will impact small floor plate buildings, and the 30 feet separation distance is an arbitrary distance... The crux of this proposal is to reaffirm the belief that scissor stairs cannot be reliably built to create an absolute barrier to the passage of smoke and toxic gasses between the stairs... The proposal does not eliminate scissor stairs but only permits them to be counted as one exit enclosure... Therefore, eliminating the need for all exit enclosures to be separated a minimum of 30 feet apart at any point in a direct line of measurement"*

This code modification was formally incorporated in the 2003 edition of the International Building Code. The commentary published with the 2003 IBC discussed the concerns about smoke migration between the two stairs when they are located within a single enclosure. As the designers, developers and code officials looked at this modification within the context of existing and new buildings, further questions were raised. The 2006 IBC commentary addressed these questions by clarifying that intertwining stairs, when



<sup>1</sup> ICC Public Hearing: April 2000, Modification E44-00; 1004.2.2.1 (IFC 1004.2.2.1)

separated by construction that meets the stair enclosure requirements, [i.e. creates a barrier to the passage of toxic gas and smoke between the two stairs], are then not classified as “scissor stairs” and meet the code intent for two separate exits.<sup>2</sup>



Even though separate enclosures permit these stairs to be counted as two exits, exit separation is an additional requirement that has to be addressed in buildings with scissor stairs. Exits are required to be separated by more than third of the diagonal (distance between two diagonally opposite corners of the building) in sprinklered buildings, and more than half the diagonal in non-sprinklered buildings. In some instances the scissor stairs are too compact to meet the required separation. The solution is to connect the two entrances of the scissor stair by a one-hour fire-rated corridor. In a one-hour fire-rated corridor, the egress travel distance is measured along the path travelled. In buildings without corridors, or buildings without fire rated corridors, the distance is measured as the crow flies. Since most sprinklered buildings are allowed non-rated corridors, the addition of a one-hour corridor increases overall safety. Although, this eats up floor space which makes scissor stairs such an attractive approach in the first place, it still allows a more compact design than two separate stair towers.

The scissor stair has withstood the test of time and survived for over five centuries. It will continue to adorn new buildings, but the real and perceived safety concerns will preclude it from becoming commonplace. Many in the construction industry still fear the complexity of the intertwined stair design. The expressed concern is the potential for miscommunication between consultants, within design documents, or within the construction team, which will result in significant modifications during construction. As the pace and complexity of today’s design and construction increases, this should not be taken lightly. However, progress made in the

<sup>2</sup> 2006 International Building Code Commentary, Section 1015.2.1, Exceptions 1 & 2.

computer-aided design, especially Building Information Modeling (BIM) systems, may allay these fears. In the end the scissor staircases still remain a novelty in most areas, which is a shame because for small buildings, this is a valuable space saving solution that increases design freedom and development profitability without compromising safety.

