back-up. Accommodation of this greater relative movement requires more complex anchors.

11. Deflection, or “drift,” of the back-up structure at full design load may limit stacking heights, especially when considering corners and returns. Special joint patterns and larger joint sizes may be required.

12. Allowable stack heights may be affected by lateral seismic design loads.

13. As stone is stacked higher, the margin of tolerance for even minor errors in either design or installation drops significantly.

ILI’s general rule is to recommend the weight of the stone be carried at each floor level. Relieving angles must be adequately supported by the back-up structure, and joints must be sized to accommodate actual deflection and sealant capabilities and performance.

If there are no intervening floors and assuming that bearing is adequate, that the anchoring systems have been designed and installed properly, and that the back-up structure has been appropriately designed to permit these heights, ILI offers the following maximum wall heights between gravity supports as conservative guidelines:

- for 4 inch limestone – 25 to 30 feet
- for 3 inch limestone – 20 to 25 feet
- for 2 inch limestone – 15 to 20 feet

ILI recommends that limestone panels not be less than 2 inches thick. In all cases, regardless of how high they are to be stacked, stone panels must be sized and properly anchored to the back-up to handle wind loads, seismic loads, and other required design factors. This will sometimes require design by an experienced cladding designer. The back-up must also be properly designed to receive these loads, to permit the stacking height and for attachment of the stone anchors.

There will be instances, dictated by the situation, where stone may be safely stacked higher or should be stacked lower than indicated in these general rules. In all cases, the stone and its support and anchorage system should be properly evaluated to assure a proper and safe design.

For most installations, compressive stress or shear stress at the beds will control. But for tall stacks of thin stone, column buckling may control. Very little research or empirical data is available for this condition and ILI recommends avoiding tall stacks of thin stone.

Additional information about the use and installation of Indiana Limestone may be found in other ILI publications.

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1A relieving angle is defined here as an angle designed and installed to carry the weight of the cladding material above. It has a soft relief joint below of sufficient width to assure there is no load transfer to the cladding material below. Typically a relief joint is caulked.

**ILI Technote On Hand Rails And Posts**

The Indiana Limestone Institute believes it is generally best to avoid attaching hand-rail posts (or similar features) to stone copings, caps, steps or cornices. In part, this is because the design loads for hand rails required by most building codes mean these posts can impose very significant loads and stresses at the attachment points. Also, in some cases the method of attachment itself can cause distress in the stone.

ILI suggests that, as a general rule, hand rail posts should pass through and be isolated from the stone and be anchored directly to an adequate underlying structure. (The hand rail supplier should also be consulted for appropriate anchoring methods and other hand rail design considerations.) These pass-through joints should have adequate clearance and be properly sealed with a flexible and weather-resistant material so as to isolate the stone from any load or movement that might be transferred from the hand rail posts. One possible method for isolating the post from the stone is shown in Figure a.

Post locations should be coordinated with stone jointing whenever possible, both for appearance and ease of installation. This concept is shown in Figures b and c.

If hand rails or hand-rail posts must be attached directly to the stone, the stone and its anchors and supports must be evaluated for the proposed method of attachment and for the loads that will be applied. Note that the use of expansive grout or expansion-type or corrosive anchors will induce stress in the stone. This stress could be high enough to cause the failure of the stone, particularly if edge distances are not adequate. For this reason, ILI generally discourages the use of expansive anchors for this and other applications and advises against the use of expansive grouts for any Indiana Limestone application.

In all cases corrosion of, or run-off from, the railing system or its posts may cause staining of the stone. ILI recommends that non-corrosive or non-staining materials be used for railing systems and components located at or near Indiana Limestone.

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![Figure a](image)

**Figure a**

Limestone Cap Coping or similar

Substrate-concrete, CMU, steel or other anchoring method and configuration as recommended by hand rail manufacturer

3/8” minimum clearance all around (recommend 1/2”)

![Figure b](image)

Locate posts at joints

![Figure c](image)

Sealant all around