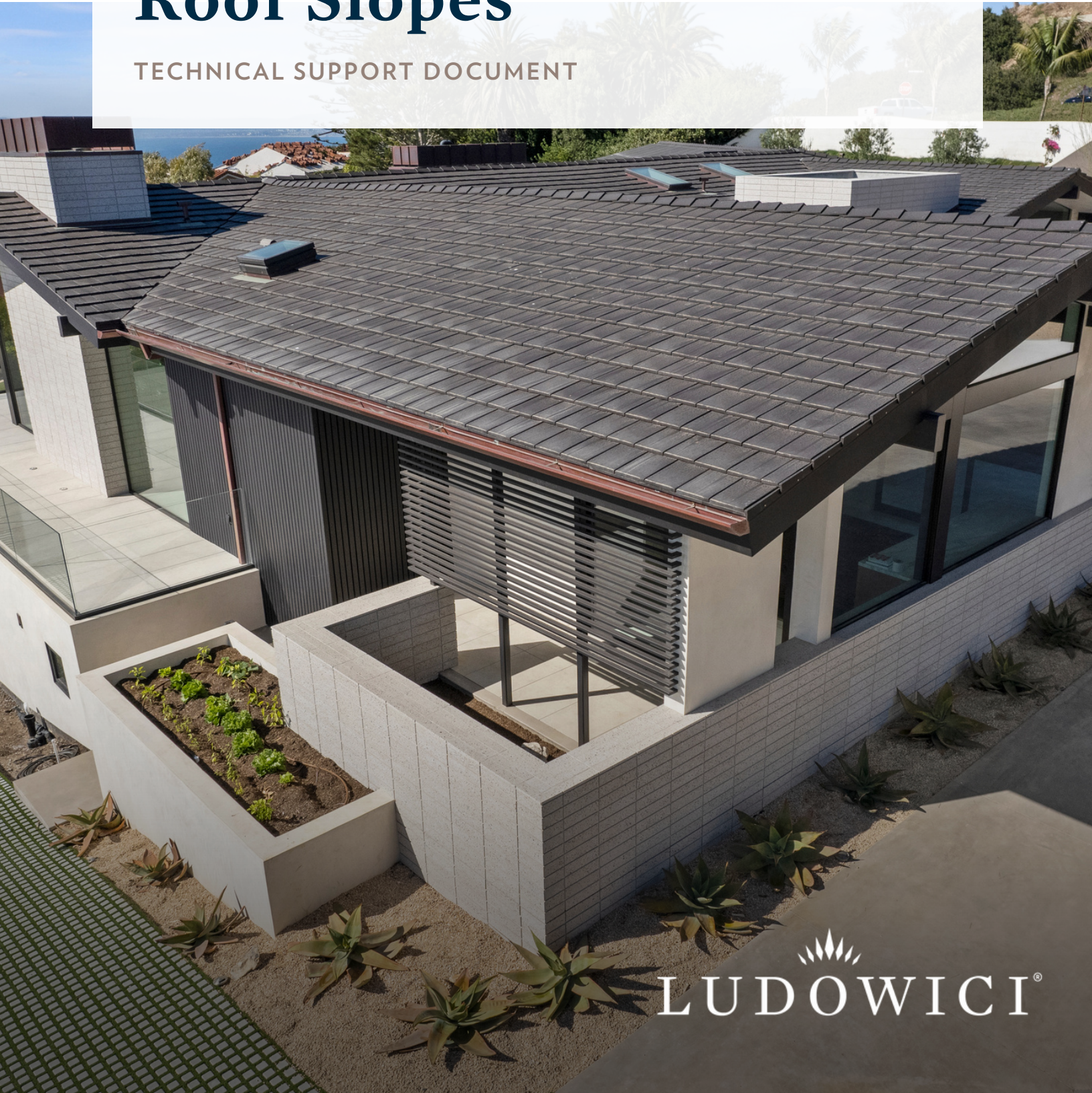




Minimum Roof Slopes

TECHNICAL SUPPORT DOCUMENT




LUDOWICI®

Minimum Roof Slopes

The performance of a roof system is critical to the longevity of a building and the safety of its occupants. In all applications, a roof should be viewed as an integrated system composed of a variety of components and materials. Structural members, decking/sheathing, insulation, underlayments, flashings, fasteners, and roof coverings all work together to provide weather protection by shedding and draining water, structurally supporting snow and ice loads in cold climates, and resisting wind forces. In addition to these functional requirements, a roof system also contributes to the architectural character and aesthetic appeal of a building or structure, providing both visual interest and beauty.

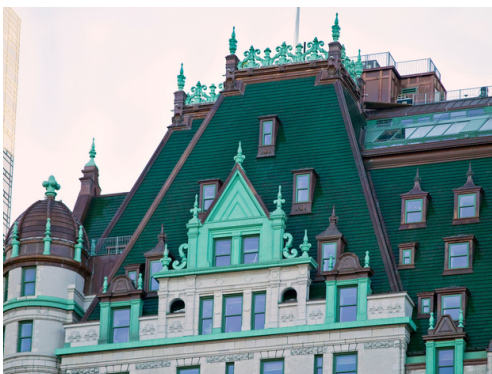
When selecting Ludowici clay tile as the water-shedding component of a roof system, one of the primary factors to consider is the roof slope because the performance, durability, and weather resistance of clay tiles depend heavily on gravity-assisted drainage. Water-shedding roof systems, like clay tile, slate, and wood shakes are designed to shed water rather than form a completely waterproof membrane by themselves; therefore, the slope of the roof directly affects how efficiently rainwater drains from the roof surface and how well the system resists water infiltration.

IMPORTANCE OF ROOF SLOPE IN CLAY TILE ROOFING

Clay tiles function by overlapping individual units in a way that channels water downward across the roof surface. Unlike continuous membranes in a watertight roofing system, clay tiles contain joints, side laps, head laps, and fastening penetrations. If the roof slope is inadequate, water may drain more slowly, increasing the risk of intrusion at joints and overlaps and placing greater reliance on the roof system's underlayment and flashing components. Lower slope roofs also allow more debris buildup.

Proper roof slope allows for gravity to quickly remove water before it can penetrate vulnerable areas. Steeper roofs drain water rapidly, reduce standing water, minimize debris accumulation, and improve resistance to leakage. Steep roofs also reduce the amount of time moisture remains on the tile surface, helping prevent mold growth, efflorescence, and freeze-thaw damage.

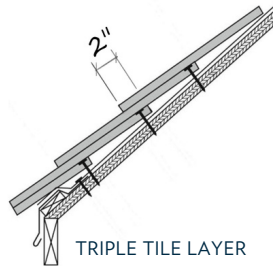
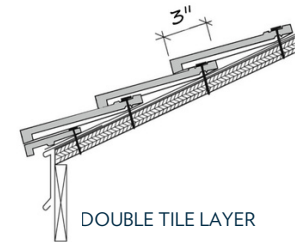
In severe weather regions, roof slope becomes even more important because wind can force rainwater beneath tiles through capillary action or hydrostatic pressure. Shallow slopes combined with high winds can significantly increase leakage risk unless additional waterproofing measures are incorporated.



LUDOWICI’S MINIMUM RECOMMEND ROOF SLOPES

Over the course of Ludowici Roof Tile’s 130+ year history a variety of recommended minimum roof slopes have been determined that maximize the water shedding benefits of the specific clay roof tile configuration.

TILE FAMILY	OVERLAP	MINIMUM RECOMMENDED SLOPE
FLAT INTERLOCKING	3" HEAD LAP (DOUBLE TILE LAYER)	3:12
SPANISH / SCANDIA (ONE-PIECE BARREL)	3" HEAD LAP (DOUBLE TILE LAYER)	4:12
MISSION (TWO-PIECE BARREL)	3" HEAD LAP (DOUBLE TILE LAYER)	5:12
FLAT SHINGLE	2" HEAD LAP (TRIPLE TILE LAYER)	5:12



In all cases Ludowici Roof Tile recommends a minimum 3:12 (14-degree) roof slope when utilizing clay tile as the water-shedding roof covering. There is no maximum roof slope recommendation. However, on extremely steep slopes (above 19:12) and vertical applications, wind current may cause the tiles to rattle. To avoid this, beads of sealant/adhesive can be used on the bottom backside of the tile, just above the bottom of the tile, in a non-visible location. Ensure the adhesive/sealant is in contact with the tile below and behind the tile its applied to.

EFFECTS OF OVERLAPPING TILE ON SLOPE

Clay tile profiles use overlaps (“head lap” and “side lap”) which have been engineered to work reliably once gravity drainage reaches a certain effectiveness. Below a 3:12 slope, those overlaps may not provide enough protection. The head lap of clay roof tiles creates a cant angle – an angle oblique to the roof deck – on the top surface of the tile. The cant angle is dependent on the length of the tile and length of the overlap.

For example, a 14” long interlocking tile with an 11” exposure on a 3:12 roof deck has an effective slope of 2.15:12 on the surface of the tile, while a 12” long shingle tile with a 5” exposure on the same 3:12 roof deck has an effective slope of 1.76:12 on the top tile surface.

The effectiveness of water-shedding roof systems depends on:

- Proper overlap between tiles
- Adequate roof pitch
- Correct underlayment installation
- Flashing details
- Ventilation and drainage pathways



OPTIONS FOR LOW SLOPE ROOFS

Roof slopes below Ludowici Roof Tile's recommended minimums may be used at the discretion of the architect, designer, engineer of record, contractor, and owner, provided the roof system is carefully designed to address water shedding. This includes consideration of underlayment materials and installation, flashing and termination details, tile installation methods, and all related roof system components. As with all clay, slate, and shake tile roofs, the roof covering itself is not fully watertight regardless of slope. For low-slope applications below Ludowici suggested minimums, enhanced waterproofing measures will be required and may include a watertight membrane, double underlayment layers, self-adhering membranes, improved flashing systems, enhanced fastening methods, and sealed battens.

For additional insight into installing clay roof tile on slopes below the recommended minimum slope, Ludowici Roof Tile refers the architect, designer, contractor, and owner to the following resources for minimum installation requirements and recommendations concerning clay tile roof systems:

- The commercial and/or residential building code governing the construction of the project
- The current edition of the Tile Roof Industry Alliance (TRIA) Installation Manual
- The current edition of the National Roofing Contractors Association (NRCA) Steep-Slope Installation Manual for Clay and Concrete Tile Roof Systems



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