

## PROVISIONAL PATENT APPLICATION

### Interlocking Building Unit with Integrated Water Management Profile

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#### SECTION 1: FIELD OF THE INVENTION

The present invention relates to building construction units—including bricks, blocks, screens, and sun-shading elements—having interlocking geometry and integrated water-shedding profile. The building units interlock on four of six faces, leaving only the interior and exterior wall surfaces free of interlocks. Applications include load-bearing walls, decorative screens (jaali), sun shading (brise-soleil), fencing, garden walls, and retaining walls. The invention is material-independent, applicable to laterite, compressed earth block (CEB), cement-stabilized earth, concrete, fired clay, polymer composite, and other curable or formable materials.

#### SECTION 2: BACKGROUND AND PROBLEM

##### ***2.1 The Skilled Mason Shortage***

In many regions, a shortage of skilled masons constrains housing construction independent of material availability or financing. Traditional mortared masonry requires extensive training and experience. Improper mortar application—wrong mix ratios, inadequate curing, inconsistent joint thickness—is a primary failure mode in low-cost construction. The skill requirement limits who can build, how fast they can build, and the quality consistency achievable.

##### ***2.2 Existing Dry-Stack Systems and Their Limitations***

Existing dry-stack interlocking block systems such as Hydraform (South Africa), EZ Stack, Allan Block, Tileco, and Haener Block address structural alignment through tongue-and-groove or similar interlocking geometry. However, these systems acknowledge ongoing water penetration problems. Published research on Hydraform blocks reports:

*"The water absorption capacity of the product was 16.45% which is greater than the standard requirements... which requires using a proper plastering to prevent the penetration of rain water."*

Current interlocking systems use tongue-and-groove geometry for **structural alignment only**—they do not address water management in the block profile itself. The exposed horizontal joints between courses remain vulnerable to direct rainfall, capillary action, and water accumulation. The industry solution is to apply cement plaster or surface bonding in high-rainfall areas, which adds cost, labor, and skill requirements—defeating the purpose of dry-stack construction.

##### ***2.3 The Mortar Assumption***

For centuries, mortar was the answer to everything: bonding, leveling, weather sealing. The entire masonry industry optimized around it. If mortar is assumed, the brick itself need not manage water—that function is outsourced to the mason and the mortar supplier. Modern building science solved water intrusion with the cavity wall (outer wythe, air gap, drainage plane, inner wythe), which works but adds complexity and cost. No mainstream system integrates water management into the mold geometry of the brick unit itself.

### **SECTION 3: SUMMARY OF THE INVENTION**

The present invention provides a building unit system that transfers alignment, structural interlock, and weather resistance functions from skilled labor to the geometry of the unit itself. The key innovation is integrating water management into the mold geometry so that the profile performs structural work AND water management simultaneously.

Each building unit interlocks on four of its six faces:

- **Top face:** Upper rail tenon (engages lower rail mortise of block above)
- **Bottom face:** Lower rail mortise (receives upper rail tenon of block below)
- **First end:** Mortise (receives tenon of adjacent block in same course)
- **Second end:** Tenon (engages mortise of adjacent block in same course)
- **Exterior face:** Concave water shedder profile (no interlock—weather-exposed)
- **Interior face:** Planar (no interlock—interior wall surface)

The concave water shedder profile on the exterior face creates a slight overhang at the bottom of each block. When blocks are stacked in courses, the course below is recessed behind this overhang, which gives water nowhere to enter. Water following the concave profile is directed outward, releases at the projecting drip edge, and falls free—it cannot reach the horizontal joint because the joint is tucked back under the overhang.

## SECTION 4: BRIEF DESCRIPTION OF DRAWINGS

**FIG 1** — Isometric view of stretcher block showing:

- 100: Mortise (end)
- 102: Upper rail tenon (top surface, runs length of block)
- 104: Concave water shedder (exterior face)
- 106: Lower rail mortise (bottom surface, runs length of block)

**FIG 2** — Bottom isometric view of stretcher block showing:

- 200: Concave water shedder (exterior face)
- 202: Upper rail tenon
- 204: Tenon (end, opposite mortise)
- 206: Lower rail mortise

**FIG 3** — Exploded view showing two stretcher blocks mating vertically:

- 300: Rail tenon (upper block)
- 302: Rail mortise (lower block)

View illustrates how upper rail tenon engages lower rail mortise when blocks stack.

**FIG 4** — Wall assembly showing multiple courses:

- 400: Drip edge created by concave water shedder profile

View illustrates the overhang where each course projects past the recessed course below.

**FIG 5a, FIG 5b** — Corner L block, two isometric views showing L-shaped configuration with interlocking features on both legs.

**FIG 6a** — Wall section with corner, showing how stretcher blocks lock to corner block.

**FIG 6b** — Corner assembly detail showing stretchers engaging corner L block with various tenons and mortises.

**FIG 7** — Corner L block with detailed callouts:

- 700: Body
- 702: Tongue (short leg, top surface)
- 704: Tongue (long leg, top surface)
- 706: Tenon (end)
- 708: Groove (bottom surface)
- 710: Tenon (end)

**FIG 8** — Corner L block, clean isometric view without callouts.

*Note: The mortise on each stretcher block is located on the end opposite the tenon. This feature is shown in FIG 1 (element 100) but is not visible in all views.*

## SECTION 5: PHYSICS OF WATER MANAGEMENT

The concave water shedder profile defeats water intrusion through three mechanisms operating together. Each mechanism is grounded in established physics and building science.

### **5.1 Mechanism A: Capillary Break**

Capillary action causes water to rise in narrow pores against gravity. The phenomenon follows Jurin's Law:

$$h = (2\gamma \cos \theta) / (\rho g r)$$

Where:  $h$  = height of capillary rise;  $\gamma$  = surface tension of water (0.0728 N/m at 20°C);  $\theta$  = contact angle between water and material;  $\rho$  = density of water (1000 kg/m<sup>3</sup>);  $g$  = gravitational acceleration (9.81 m/s<sup>2</sup>);  $r$  = radius of the pore or gap.

The critical insight: **capillary rise is inversely proportional to gap size**. For brick and masonry pores (typical radius 0.1–0.001 mm), water can rise 70mm to several meters through capillary action alone. However, when the gap exceeds approximately 3mm, capillary action breaks down—the gap becomes too wide for surface tension forces to bridge.

The shape of the brick creates a slight overhang such that the course below is recessed. This recess exceeds the capillary threshold, interrupting capillary moisture transport at each horizontal joint. This principle is identical to drip edges on roofs, air gaps behind siding, and gravel under slabs—established building science practices for stopping rising damp.

### ***5.2 Mechanism B: Surface Tension Break (Drip Edge)***

Water flowing down a surface can "wrap around" edges due to surface tension. This is why Notre-Dame Basilica required retrofit drip edges—the original horizontal bands allowed water to follow the surface around and down the wall. The solution is a drip edge that interrupts surface tension and forces water to release.

Research shows that **45mm overhangs shed significantly more water than 20mm overhangs**, and that sloped surfaces with kickouts outperform vertical surfaces. Furthermore, hemmed (rounded) drip edges on metal flashing perform worse than unhemmed because water follows the radius around and back toward the wall.

The concave water shedder profile creates a natural drip edge at every course. The projecting bottom edge of each block forces water to release and fall free. It cannot follow the surface around and into the horizontal joint because there is nowhere for it to go—the course below is recessed behind the drip edge.

### ***5.3 Mechanism C: Gravity Drainage***

The concave profile ensures water always moves outward and down, never inward. The face curves inward (away from weather), directing water toward the projecting drip edge at the bottom. The geometry functions as a gutter on every brick—water is collected, channeled outward, and released at the drip edge to fall free of the wall.

## SECTION 6: DETAILED DESCRIPTION OF EMBODIMENTS

### 6.1 Stretcher Block

The stretcher block is the primary wall-building unit (FIG 1, FIG 2). The block interlocks on four of its six faces:

**Top face — Upper rail tenon (102, 202):** A longitudinal projection running substantially the full length of the block. This tenon engages the lower rail mortise of the block above, providing vertical interlock between courses.

**Bottom face — Lower rail mortise (106, 206):** A longitudinal channel running substantially the full length of the block. This mortise receives the upper rail tenon of the block below.

**First end — Mortise (100):** A recess configured to receive the tenon of an adjacent block in the same course, providing horizontal interlock within a course.

**Second end — Tenon (204):** A projection configured to engage the mortise of an adjacent block in the same course. Located on end opposite the mortise.

**Exterior face — Concave water shedder (104, 200):** A concave profile that curves inward (away from weather exposure), with the bottom edge projecting forward to form a drip edge. This face has no interlock—it is the weather-exposed surface.

**Interior face:** Planar surface with no interlock—forms the interior wall surface or cavity construction interface.

### 6.2 Vertical Interlock Function

FIG 3 shows two stretcher blocks in exploded view, illustrating the vertical interlock. The upper rail tenon (300) of the upper block engages the lower rail mortise (302) of the lower block. This interlock provides:

- **Lateral alignment:** Blocks self-align during stacking
- **Shear resistance:** Interlocked courses resist lateral loads
- **Construction speed:** Unskilled labor can stack blocks accurately
- **Self-leveling feedback:** Misalignment prevents proper seating, alerting the builder

### 6.3 Horizontal Interlock Function

Within each course, the tenon (204) of each stretcher block engages the mortise (100) of the adjacent block. When a block is laid, the tenon must seat into the mortise of the previously laid block. If cumulative error causes misalignment, the tenon contacts the rim of the mortise rather than seating properly. The mason receives immediate tactile feedback: the block won't sit flat, indicating that correction is needed before proceeding.

### 6.4 Water Shedding Function

FIG 4 shows a wall assembly with multiple courses, illustrating the drip edge (400) created by the concave water shedder profile. The shape of each brick creates a slight overhang such that the course below is recessed, which gives the water nowhere to enter.

Water striking the wall face follows the concave profile outward, releases at the projecting drip edge, and falls free. The horizontal joint between courses is tucked back under the overhang—protected from direct rainfall and unreachable by capillary action because the recess exceeds the capillary threshold.

### 6.5 Corner L Block

The Corner L block (FIG 5a, FIG 5b, FIG 7, FIG 8) is an L-shaped unit for constructing 90-degree wall corners and structural piers. The block includes:

- **Body (700):** L-shaped solid construction
- **Tongues (702, 704):** Upper surface projections on both legs for vertical interlock
- **Groove (708):** Bottom surface channel for vertical interlock
- **Tenons (706, 710):** End projections for horizontal interlock with stretcher blocks
- **Concave water shedder:** Profile on both exterior faces of the L

FIG 6a and FIG 6b show how stretcher blocks lock to the corner L block with various tenons and mortises. The corner block receives stretchers from both wall directions, creating a unified interlocking assembly.

Corner L blocks stacked vertically with alternating orientation (rotated 90 degrees each course) form an interlocking pier. The solid construction provides structural capacity for posts, columns, and wall intersections without requiring grout-filled cores.

## SECTION 7: PRIOR ART DIFFERENTIATION

### 7.1 Relevant Prior Art

**Hydraform, EZ Stack, Allan Block, Tileco, Haener Block:** Use tongue/groove or male/female geometry for structural alignment only. Acknowledge water penetration problems. Recommend cement plaster or surface bonding in high-rainfall areas. Do not address water management through block profile itself.

**US1464423A (1923) "Clay Shingle Block":** Describes a building unit with "an inclined rain shedding and protecting face" plus interlocking. However, this design has an outward-sloping face that simulates wood shingle construction—water sheets down the face continuously. Critically, it is a **mortared system**; the patent text references "horizontal mortar course" and "vertical mortar courses." The interlocking flanges protect and conceal the mortar joints.

### 7.2 Key Differentiation

Feature	Prior Art	Present Invention
Face geometry	Flat or slopes outward	Concave (curves inward)
Water behavior	Sheets down wall or enters joint	Directed outward, drips free
Overhang/recess	None	Each course overhangs recessed course below
Construction	Mortared or requires plaster	True dry-stack, no mortar required
Interlock faces	1-2 faces (top/bottom only)	4 of 6 faces
Water absorption	16.45% (Hydraform research)	Geometry defeats penetration

The present invention integrates water management into the mold geometry. The concave profile performs structural work AND water management simultaneously—the same feature that creates the drip edge also creates the overhang that protects the recessed course below.

## SECTION 8: MATERIALS

The invention is geometry, not material. The water-shedding profile functions through geometric principles that apply regardless of material composition. Applicable materials include but are not limited to:

- Laterite (abundant in Ghana and West Africa)
- Compressed earth block (CEB)
- Cement-stabilized earth
- Concrete
- Fired clay
- Polymer composite
- Calcium silicate
- Other curable or formable materials

## SECTION 9: LEVELING SYSTEM

The interlocking geometry self-aligns blocks but does not correct for out-of-level foundation or accumulated error. In various embodiments, leveling may be accomplished by:

**Skilled mason intervention:** Periodic mortar bed joints at intervals (every nth course, at window sills, at bond beams) where a skilled mason trues the wall. Intervening courses are dry-stacked by unskilled workers.

**Shim system:** Shims of durable material (brass, bronze, stainless steel, hardwood such as teak, ipe, azobe/ekki, opepe, or iroko, stone chips, or composite/plastic) in standard thicknesses. Shims span the full depth of the bed joint to maintain continuous bearing.

**Tapered correction units:** Wedge-shaped units manufactured in the same system, with various slopes for different correction amounts.

## SECTION 10: OPTIONAL FEATURES AND APPLICATIONS

### **10.1 Drip Edge Enhancement**

In some embodiments, the drip edge incorporates a recess configured to receive a field-installed metal drip strip. Materials include brass, bronze, copper, stainless steel, aluminum, or painted steel. The strip may be decorative (stamped patterns) or functional only. Installation options:

- Basic installation: recess left empty, geometry alone provides function
- Premium installation: metal strip inserted for permanent drip edge
- Retrofit capability: strips can be added to existing walls

### **10.2 Water-Activated Bonding**

For blocks formed from compressed earth containing clay minerals, wetting the mating surfaces between courses before stacking mobilizes clay particles at the interface. As water evaporates, hydrogen bonding across clay mineral surfaces creates a light bond between courses. This is optional and does not affect structural interlock or water management, which operate through geometry alone.

### **10.3 Architectural Applications**

The recessed courses create natural shadow lines—horizontal banding across the wall that changes with sun angle. This creates architectural possibilities including but not limited to:

- **Color variation:** Alternating course colors emphasized by shadow lines
- **Texture variation:** Smooth and rough courses, the overhang highlights the difference
- **Reveal depth:** Deeper or shallower concave profiles for different shadow effects
- **Horizontal banding:** The recess reads as a deliberate architectural line
- **Mixed materials:** Concrete stretchers with fired clay corners, for example

### **10.4 Jaali (Decorative Screen)**

Pierced or perforated blocks for ventilation and light filtering. Interlocking and water-shedding features retained on solid portions. Created by cutting standard stretchers before cure or via dedicated mold.

### **10.5 Brise-Soleil (Sun Shading)**

Sun-shading screen elements oriented vertically, horizontally, or at angle. Dry-stack interlocking geometry allows demountable, reconfigurable, earthquake-tolerant installation. The drip mechanism functions regardless of orientation.

## SECTION 11: CLAIMS

1. An interlocking building unit comprising:
  - (a) a body having top, bottom, front, back, and two end faces;
  - (b) an upper rail tenon extending from the top face along substantially the full length of the body;
  - (c) a lower rail mortise in the bottom face configured to receive the upper rail tenon of an adjacent unit;
  - (d) a mortise on a first end face;
  - (e) a tenon on a second end face opposite the first end;
  - (f) a concave water shedder profile on the front face, wherein the profile curves inward and the bottom edge of the front face projects forward to form a drip edge;
  - (g) wherein the unit interlocks on four of six faces, with the front and back faces free of interlocks.

- 2.** The building unit of claim 1, wherein when units are stacked vertically in courses, the shape of each unit creates a slight overhang such that the course below is recessed, which gives water nowhere to enter.
- 3.** The building unit of claim 1, wherein the concave water shedder profile directs water outward to the drip edge, where water releases and falls free, unable to reach the horizontal joint which is recessed behind the overhang.
- 4.** The building unit of claim 1, wherein the recess created by the overhang exceeds the capillary rise threshold for the material, thereby interrupting capillary moisture transport at each horizontal joint.
- 5.** The building unit of claim 1, wherein the drip edge incorporates a recess configured to receive a field-installed metal drip strip.
- 6.** The building unit of claim 1, wherein the unit is L-shaped in plan view, forming a corner unit with concave water shedder profile on both exterior faces and interlocking features configured to receive stretcher blocks from two perpendicular wall directions.
- 7.** The building unit of claim 6, wherein the corner unit is solid and configured for vertical stacking in alternating orientations to form an interlocking pier.
- 8.** A method of constructing a wall comprising:
  - (a) providing a plurality of interlocking building units, each having upper rail tenon, lower rail mortise, end mortise, end tenon, and concave water shedder profile;
  - (b) stacking units in courses without mortar between horizontal joints;
  - (c) engaging the upper rail tenon of each unit with the lower rail mortise of the unit above;
  - (d) engaging the end tenon of each unit with the end mortise of the adjacent unit in the same course;
  - (e) orienting units such that the concave water shedder profile faces the weather-exposed exterior;
  - (f) wherein the shape of each unit creates a slight overhang such that the course below is recessed, which gives water nowhere to enter.
- 9.** The method of claim 8, further comprising wetting mating surfaces between courses before stacking, whereby clay particles at the interface are mobilized and subsequently bond across the joint as water evaporates.
- 10.** A wall assembly comprising a plurality of interlocking building units stacked in courses, each unit having:
  - (a) four-face interlock with upper rail tenon, lower rail mortise, end mortise, and end tenon;
  - (b) a concave water shedder profile on the exterior face with projecting drip edge;
  - (c) wherein each course overhangs and the course below is recessed;
  - (d) whereby water striking the wall is directed outward by the concave profile, releases at the drip edge, and falls free without entering horizontal joints which are tucked back under the overhang.

## SECTION 12: ABSTRACT

An interlocking building unit for dry-stack masonry construction incorporates integrated water management. The unit interlocks on four of six faces: upper rail tenon (top), lower rail mortise (bottom), end mortise (first end), and end tenon (second end). The exterior face features a concave water shedder profile that curves inward with a projecting drip edge at the bottom. When stacked in courses, the shape of each brick creates a slight overhang such that the course below is recessed, which gives water nowhere to enter. Water following the concave profile is directed outward, releases at the drip edge, and falls free—unable to reach the horizontal joint because it is tucked back under the overhang. Three water-defeat mechanisms operate together: capillary break (recess exceeds wicking threshold per Jurin's Law), surface tension break (drip edge forces water to release), and gravity drainage (concave curve directs water outward). Corner L blocks provide 90-degree corners and stackable piers. The geometry is material-independent, suitable for laterite, compressed earth, concrete, fired clay, or other materials. The system enables unskilled labor to construct weather-resistant walls without mortar or plaster.

## SECTION 13: DRAWINGS

*Attached separately*

FIG 1 — Stretcher block isometric (100 mortise, 102 upper rail tenon, 104 concave water shedder, 106 lower rail mortise)

FIG 2 — Stretcher block bottom view (200 concave water shedder, 202 upper rail tenon, 204 tenon, 206 lower rail mortise)

FIG 3 — Exploded view, two stretchers mating (300 rail tenon, 302 rail mortise)

FIG 4 — Wall assembly showing drip edge (400)

FIG 5a, 5b — Corner L block, two views

FIG 6a — Wall section with corner

FIG 6b — Corner assembly detail

FIG 7 — Corner L block detailed (700 body, 702/704 tongues, 706/710 tenons, 708 groove)

FIG 8 — Corner L block clean isometric

— End of Provisional Patent Application —

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