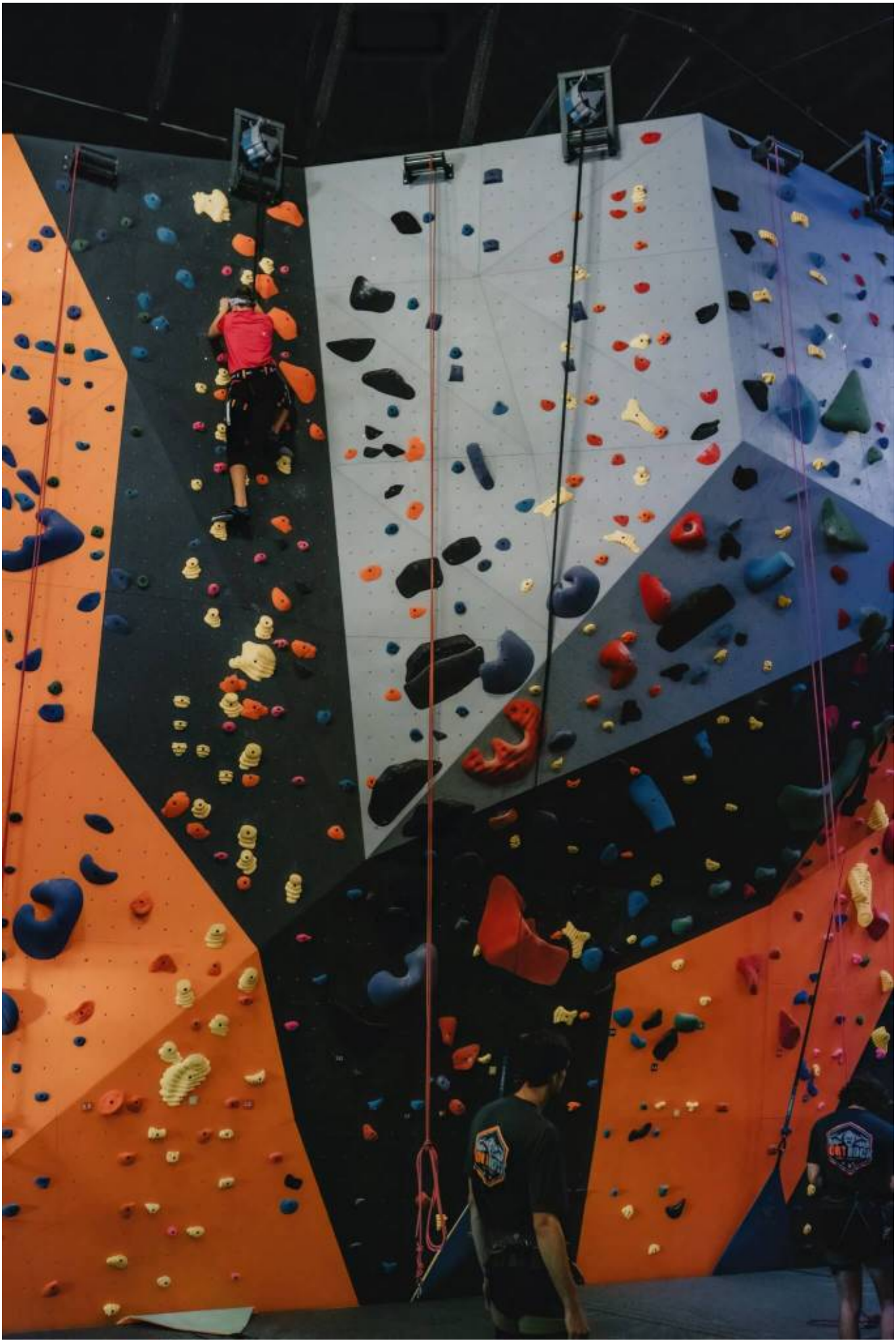
Revolutionizing Climbing Wall Design with Computational Workflows

Climbing walls have transcended their traditional role as recreational structures, emerging as fertile ground for architectural innovation driven by computational design. This transformation is the fruit of a collaborative synergy between Outdoor Escape, Protolab Architects, and a visionary Computational Designer, Mario A. Medina Vilela, who is pioneering new horizons in the field. His toolbox of choice, Rhino, and Grasshopper, forms the backbone of this venture, breathing new life into climbing wall construction.



This design journey commences with a vision, a spark of inspiration captured in a schematic model. However, the true alchemy unfolds when this vision metamorphoses into a tangible 3D reality. Geometric optimization, a process that aligns the climbing wall’s design with human movement, plays a crucial role. Standard miter angles, honed by Mario, are selected, ensuring both aesthetics and CNC milling feasibility.

Yet, the optimization journey doesn’t stop at geometry. It extends to panelization, where the climbing wall is deconstructed into manageable components, each fitting snugly within the confines of a standard 4’x8’ plywood or fiberglass sheet. This strategy isn’t solely a material efficiency exercise; it’s an architectural feat that defies the constraints of wall shape – a testament to Mario’s computational ingenuity.

Precision during installation is a nonnegotiable goal. Each panel is a piece of the climbing wall puzzle, meticulously labeled and strategically reordered based on geometry. A grid of holes and extrusions cements the pieces together with unwavering alignment, a

testament to his meticulous attention to detail.

This computational approach to climbing wall design isn’t hemmed in by the boundaries of wall size or shape. The toolkit includes Grasshopper and custom C# components, providing adaptability to diverse projects under Mario’s expert guidance. The computational prowess allows for swift adjustments.

Ensuring the correct panel orientation during CNC milling and installation ranks among the top challenges. The solution is as ingenious as the design itself: etched labels on the panel backs, guaranteeing correct installation, a detail perfected by Mario.

Comprehensive diagrams offer a visual guide for efficient CNC milling, reducing errors, and curbing waste, a testament to Mario’s problem-solving skills.

The most substantial challenge encountered is the pursuit of geometric optimization. The response is a dynamic manual-computational workflow, constantly refined to meet the unique demands of climbing wall design, a challenge that Mario has brilliantly addressed.

Lessons from this endeavor underscore the need for designers to don the mantle of “computational crafters” and become intimately acquainted with materials, a philosophy championed by Mario.

The Climbing Walls project serves as a shining testament to the profound impact of computational design. It has redefined the parameters of climbing wall construction, forging structures that are not just efficient but also stand as aesthetically enchanting architectural marvels.