For The Love of Limestone; Properties, Pitfalls and Triumphs of Texas Limestone Façades

It surrounds us, it is in the landscape and it is one of the most common forms of matter on this planet. Stone, in its variety of forms, colors and properties, has been a core element since the dawn of man. From early tools and cave dwellings to precision diamond bits, we humans have embraced this material as a key part of our lives. Ranging in composition light enough to float on water to density nearly three times that of water, in specific mass alone, there is wide variation. Most commonly, however, this substance exists in the range of 2400 to 3200 kilograms per cubic meter.\(^1\) Density, alone, however a common thread for most stone used in construction, belies the myriad of characteristics that set it apart.

Considering the factors of weight, density, hardness, porosity, chemical resistance, color, and heat conduction, as well as geographic location, compressive strength and workability, it’s most common location alone determines if and where a stone type will be used in construction. Within any geographic location, the range of stone types available are typically limited to a single type of sedimentary and metamorphic rock with an underlying or alternately exposed bed or igneous rock. Above all, sedimentary remains king and dominates the landscape 4 to 1. Approximately ten percent of sedimentary rock is limestone.\(^2\) Composed primarily of calcium carbonate, CaCO\(_3\), limestone has made its place in architectural history. It is at this point that we look more closely at this material in contemporary American architecture.

While in many forms susceptible to chemicals such as acids and acidic rains as well as chemical staining from sulfur, limestone possesses high compressive strength, is durable, workable and is most importantly, available on all continents in abundance. From the pyramids of Egypt and the Coliseum in Rome to modern architecture in the United States, abundance of limestone in these regions is reflected by its use in churches and other buildings of importance throughout history. In the United States, the demand for limestone is matched by its availability. Areas of Indiana and Texas are known for abundant deposits as well as wide variations in limestone types. In our own back yard of central Texas, we have a myriad of choices, each with variations of surface inclusions, density, and color. The variations in color result from inclusions such as iron oxide, clays, quartz, sand and organic remains while variation in texture are a facet of the mechanics of formation from rough inclusions of marine bodies and shells (often called fossilized limestone) to tighter grains formed from concentrated calcite in the form of a evaporate from streams and waterfalls which often yields Travertine.\(^3\) In final form, we are left with a broad array of color, size and surface finish.

The fascinating and readily available palette offers the Architect and builder sustainable


\(^3\) Wikkipedia, Wikimedia Foundation, Inc., Created 12 April 2011 http://en.wikipedia.org/wiki/Limestone
cladding solutions while incurring a rather small carbon footprint (both in delivery and quarry energy). Common and sustainable types of limestone in Texas include the Cordova Cream family. A mostly light colored limestone with a texture ranging from tight to one with shell inclusions, Cordova Cream, in this form, often referred to as Fossilized Limestone is usually more expensive and reflects a more civic or historic presence in architecture. Also softer and more workable, Cordova Cream offers designers and builders a low cost palette that ranges from stark white to soft yellow, and some stones containing subtle veins of chocolate and rust colors. Other common types are the Lueders limestone family, which varies from grays and browns to rich red-orange colors and named for the rock formation from which it came in the Lueders Basin near Abilene Texas. Lueders has gained popularity from architects as a limestone of choice due to its tight grain higher density and more stable natural appearance. Variety gives way to subtle strengths and weaknesses. As exhibited below, an educated selection of the best suited limestone variant will define the future performance of a building exterior.

Built in 1930, the Travis County Courthouse (Image 1) is a prime example of an early 20th century civic façade. While the entirety of the stone façade is of the fossilized Cordova Cream material the detailing of the cornice renders as less impressive than if it were made of the non-fossilized limestone [Image 2]. From a design perspective, the massing and linear design of the window bays is a fine example Art Deco. Time has also revealed the pitfall that this specific limestone type incurs. This building, likely much more striking was when new, quickly acquired darker areas attributed to common pollutants such as sulfates and sulfur dioxide gases, a common cause of discoloration of buildings in urban environments in the early and mid 20th century.

![Image 1: Travis County Courthouse in Fossilized Cordova Cream limestone.](Image 1)  
![Image 2: Detail – pollution staining at Travis County Courthouse, loss of detail with fossilized species in banding](Image 2)

Limestone buildings of Cordova Cream have also been a barometer of the performance of pollution control in urban areas. In comparison, the Travis County Courthouse likely will see a reduction of pollutant discoloration with lower emission vehicles and power plants as exhibited by the study of the Cathedral of Learning on the Central Pittsburgh University Campus. As in like buildings, over time, darker discoloration has

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actually begun to dissipate and lighten with lessening pollution.\(^6\)

In contrast to the Art Deco courthouse, the completely modernist Austin City Hall exhibits keen use of Lueders Limestone. Both in split face and full field stone, the rich yellow-brown color and ashlar appearance of the blocks perfectly suits and contrasts against the copper sheathing of the upper structures. Design of this public building was conceived by Antoine Predock of Cotera & Reed and keenly executed to create an exterior living space both addressing Lady Bird Lake directly across from the structure while slowly growing into the surrounding curtain of buildings lining the street. The use of limestone massing allows the structure to grow from the ground plane while entrances to further underscore the heft of the limestone. Creating a public space surrounded by nature and natural stone invites the community to take part. This is a true departure from civic buildings of yore. Predock’s brilliant use of stone and the complimentory copper cladding provide a park-like welcome that extends not only from the front of the building but also extends into the garage parking area via a stacked limestone boulder waterfall (Image 4). Collectively, these bold elements convey passivity in contrast to the stately intimidating structure of the County Courthouse. Penetrating the interior of the building, the exterior elements extend to the interior to address the lower floor walls further grounding the structure and reminding the occupant of the less formal nature of the atria space while honed limestone provides compliment and transition to formality. Over time, the Lueders superior grain will likely remain clean and brilliant in color as the copper begins its journey to full patina which is likely to include some dark grey-blue and grey-green hues further complimenting the hues and intensity of the stone.

While noted architects continue to embrace and evolve contemporary architecture, we see that frontrunners also include the use of sustainable natural materials. The Three Stones House designed by Austin Architect, Nick Deaver, embraces both the natural face of a brown Lueders Limestone and mates it with

\(^6\)Soiling Patterns on a Tall Limestone Building – Changes over 60 years, National Center for Preservation Technology & Training, by NCPPT, September 22, 2008
http://www.ncppt.nps.gov/2008/soiling-patterns-on-a-tall-limestone-building-changes-over-sixty-years-2000-13/
form and massing to create a façade that is both vertical and horizontal in movement while clearly presenting a solid modernist structure. The choice of a split-face texture was likely a less expensive option compared to a honed surface but the effect of the rusticated surface set against the chiseled shapes clearly defines this structure as home without being too fussy. Careful selection of mortar allows the stone to stand out as a fine fabric rather than a grid or a sheet of thin sheathing. Making use of the lot sloping upward slightly from the street, Deaver employs the use of horizontal planters and steps that provide a scaled base for the narrow coursework banding [Image 5]. The result is a home that appears as a natural geometric, almost crystalline, structure of limestone. Unlike the pragmatic use of limestone façades in monolithic homes which cry for “shrubbing-up”, the forms of the 3-Stones Home delight the eye with simple landscaping restrained use of planting. What Architect Nick Deaver has left the viewer with is a sleek structure that possesses depth and conveys warmth with intrigue through the use of layered shapes and carefully selected limestone materials.

Growing concerns for sustainable architecture, lifecycle performance, maintenance and timeless appeal will likely only increase demand for future use of local natural materials such as limestone. It is only with education, careful selection and elegant design that the future of limestone construction will be integrated in an innovative fashion. Rewards and burdens will not only be shouldered by the client but also future generations that will live in and among the decisions we make today.

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