

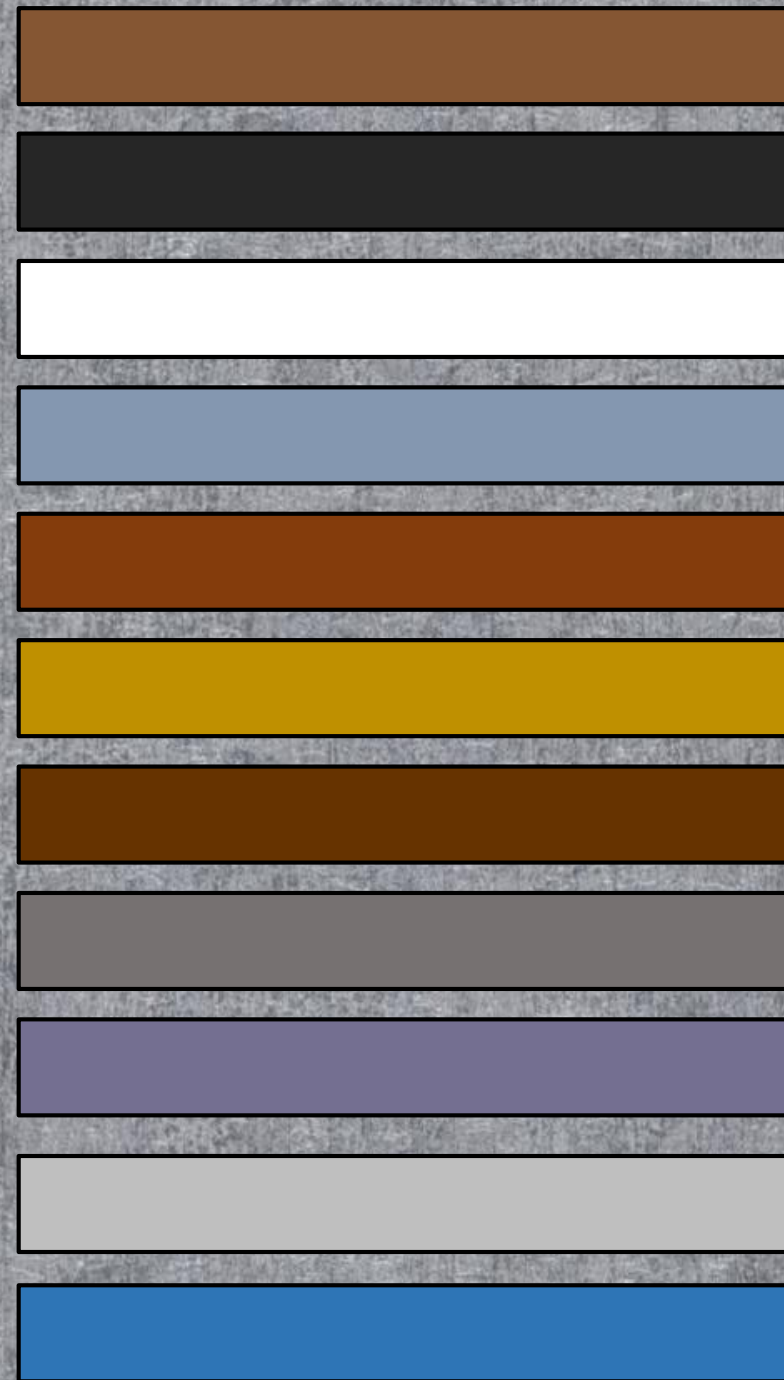
PLUMBING MATERIALS IN ARCHITECTURE

“I work a little bit like a sculptor. When I start, my first idea for a building is with the **material**. I believe architecture is about that. It's not about paper, it's not about forms. It's about space and material.” - Peter Zumthor.



LOBAS
ARCHITECTS

COPYRIGHT © 2016





DESIGN PROCESS

Instead of beginning with a formal objective, or even a programmatic one, architectural design can begin with an inquiry into the properties of materials: sculptural, textural, tactile, visceral, and tectonic.

Addressed herein, find numerous building materials traditionally found in plumbing projects and assemblies, and several others that are potentially compatible.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Clay is the most ancient piping material. Pipes and fittings made of clay were found in the excavation of the Temple of Bel at Nippur, Babylonia. The temple was built in about 4000 B.C.

Numerous clay pipes were also found in Ephesus (modern day Selcuk, Turkey), site of one of the Seven Wonders, and early Christian activity. These pipes, from 2000 B.C., carried hot and cold running water. Waste was not carried in the clay pipes, but in stone block canals, covered at top.

The Romans of course used clay pipe both within their Aqueducts, and moving from them to fountains and estates.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Vitrified clay pipe is made from a clay – shale blend that has been subjected to a high temperature. This vitrification results in a hard, firm ceramic. A salt glazing is applied to the pipe's interior and exterior surfaces.

Clay is a natural material, and its manufacturing process has been streamlined. Delivery of heavy pipes has been challenging. Until the development of rail or water transport, clay pipe plants were necessary in numerous places.

The structural building materials analogous to clay pipe are bricks and structural clay tiles.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

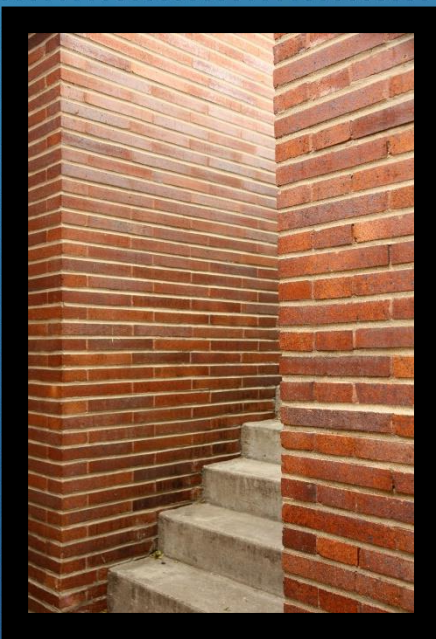
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



The Frederick C. Robie House is a U.S. National Historic Landmark, designed by Frank Lloyd Wright in 1909.

The exterior walls are constructed of Chicago common brick, double-wythe. The outside veneer is a red-orange iron-spotted Roman brick, with a long profile.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

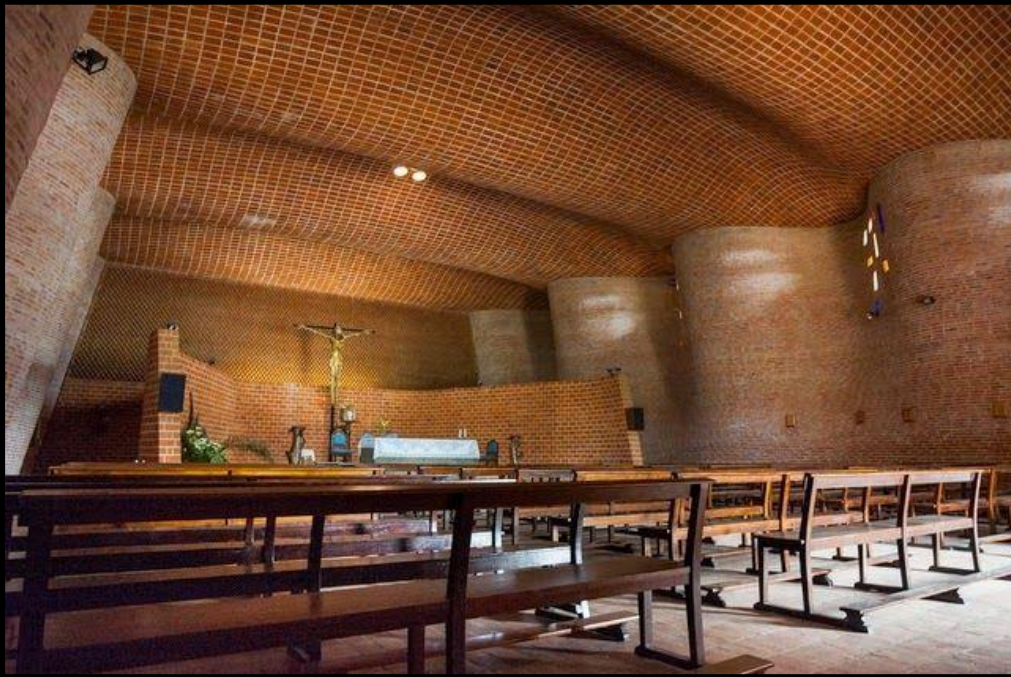
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Uruguayan Engineer and Architect Eladio Dieste was entrusted with the design of the Church of Christ the Worker on the coast of Atlantida in 1952.



He knew economic limits of construction and strove to freely experiment with brick and laminate clay materials.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

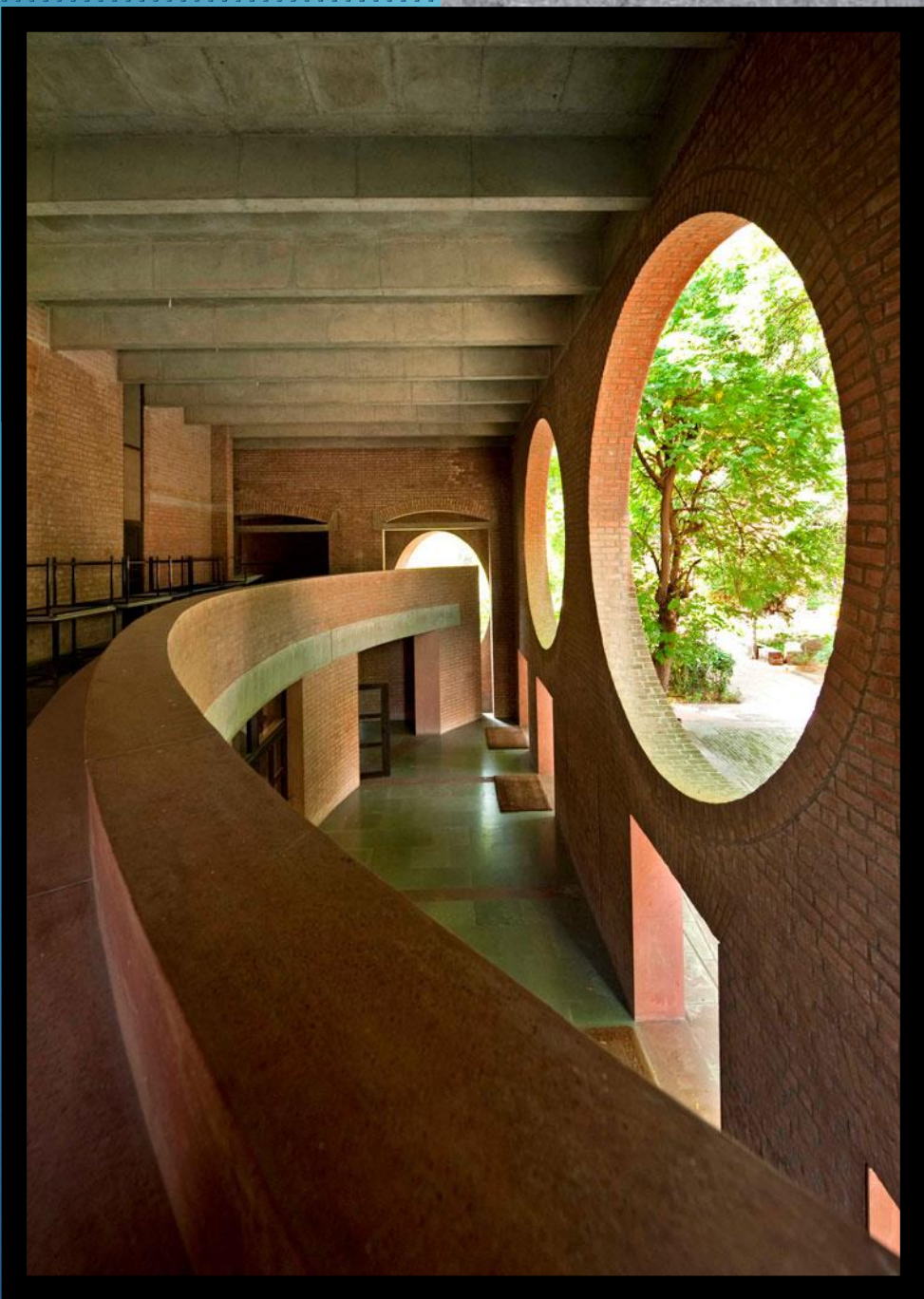
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



American Architect
Louis I. Kahn designed
the Indian Institute of
Management in
Ahmedabad, India in
1961.

In a lecture to his class
at the University of
Pennsylvania, Kahn
commented “**Even a
brick wants to be
something.**”

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Cast iron's first recorded use for piping was in the mid-15th century, in Germany, where it carried water to Dillenberg Castle. In the 17th century, cast iron pipe was installed to irrigate the gardens of the Palace of Versailles. These pipes ran over twenty miles in three-foot lengths, and were connected with flanged joints.

In modern usage, cast iron pipe was originally connected with bell and spigot joints. It was used in London in 1746, and in Philadelphia in 1804.

Ductile iron replaced cast iron, beginning in 1948. All manufacturers transitioned to the new material by the 1970s & 80s.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Calvert Vaux designed the Gothic Bridge on West 94th Street in 1864. It spans the bridle path between the northern reservoir and the tennis courts.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



London's Natural History Museum was designed by Alfred Waterhouse in 1881. The great hall shown here balances the Romanesque Revival arches and blind arcades with bold cast iron arches.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

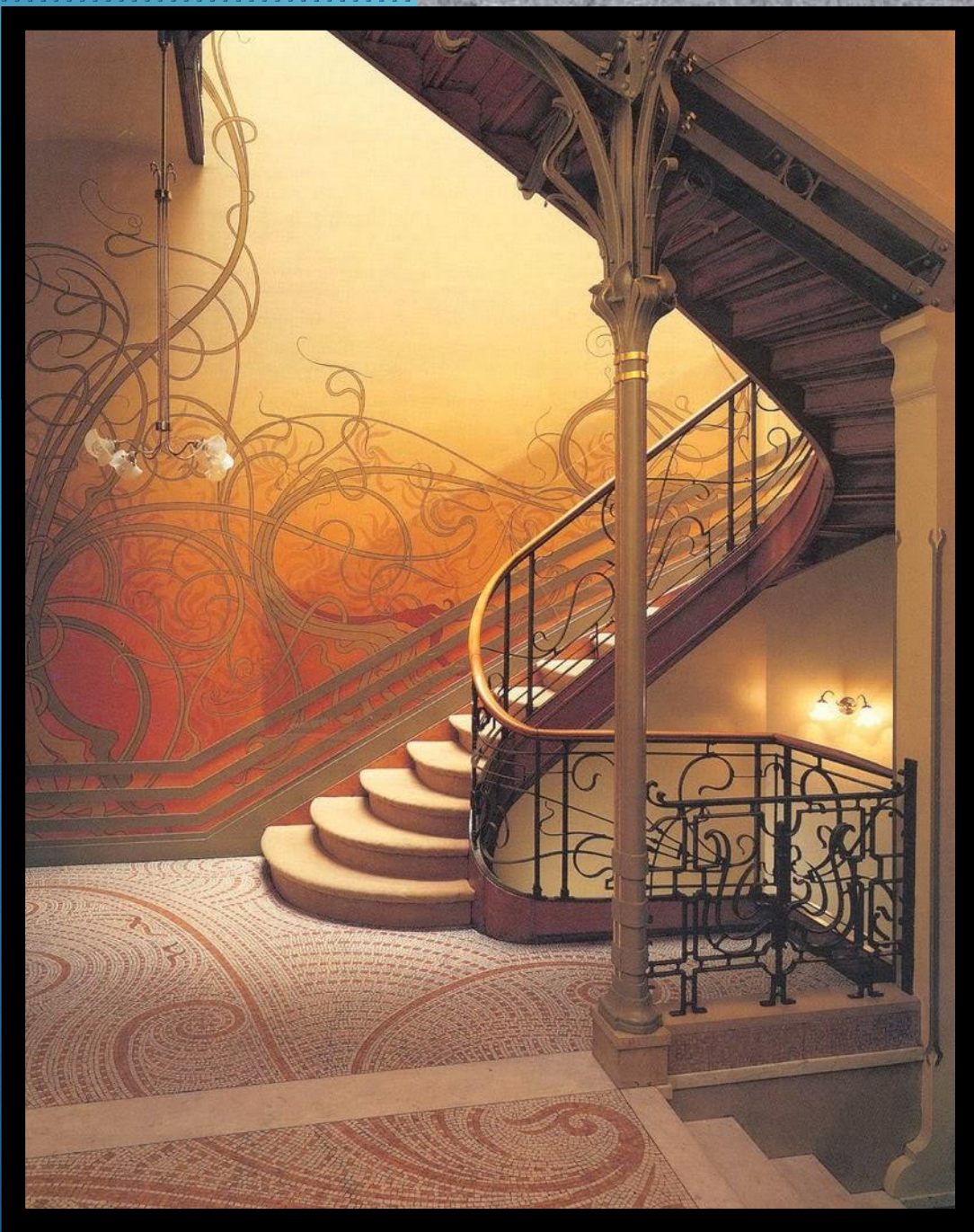
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Hôtel Tassel was designed by architect Victor Horta in 1893. It was considered the first Art Nouveau building because of its planning, materials use, and integration of the decorative arts.

With cast iron, Horta strove towards new innovations, a fluid balance of structural concerns to assure strong support, and aesthetic detailing.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



PVC was discovered accidentally twice during the 19th century as an incidental polymer emerging in flasks of Vinyl Chloride gas when exposed to sunlight. The resultant material was strong, durable, and resistant to heat.

Early applications included shoe heels, golf balls, and raincoats, but applications increased after World War II. A two-step process involving a roll-mill and extruder was initially used for pipe. This process was revised into a single-step advanced extrusion. PVC wiring insulation soon replaced rubber and by 1950, PVC piping for plumbing became widespread, for use in water distribution, waste, and gases.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



The 2012 Olympic and Paralympic games held in southeast London required numerous temporary buildings, including these two designed by Mott MacDonald of Magma Architecture for shooting. The membrane of PVC is stretched over a modular steel form. The buildings for this project were all designed to potentially be reassembled, and even recycled.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



For the same games, Wilkinson-Eyre Architects designed a Basketball Arena in North London. The PVC wraps around a modular, easy-to-assemble steel portal frame. External walls are translucent, allowing daylighting in all the support spaces. Lighting can change color and intensity, creating interesting patterns.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

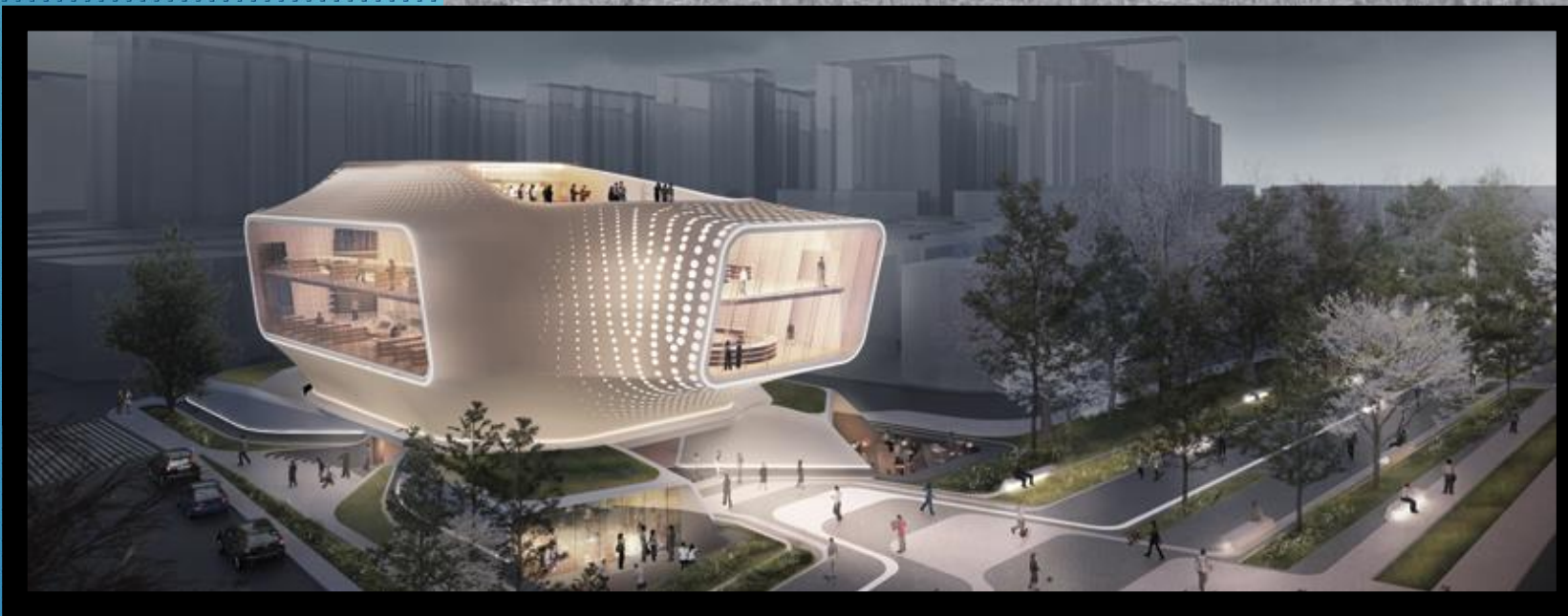
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



DIA Studio in Amsterdam produced this solution for the Daegu Gosan Public Library in South Korea, with its volume wrapped in a PVC membrane, pre-manufactured and inexpensive. The material is both frame, providing structural support, and tensile membrane, providing a building skin. The translucency of the material creates an interesting display at night.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Steel was first evidenced in Anatolia (central Turkey) nearly 4,000 years ago. A tribe (later) called the Hittites were versed in iron, and may have known how to smelt it with carbon to make steel.

Galvanized Steel was first innovated in 1742, when a Frenchman, P. J. Malouin, coated iron with molten zinc. Stanislaus T. M. Sorel advanced the method. Once chemically prepared, the zinc coating can protect steel against most corrosion, but temporarily. Rust and plaque buildup is inevitable after several decades.

Galvanized piping for water supply has been used since the early 20th century, and generally lasts 70 years or so.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

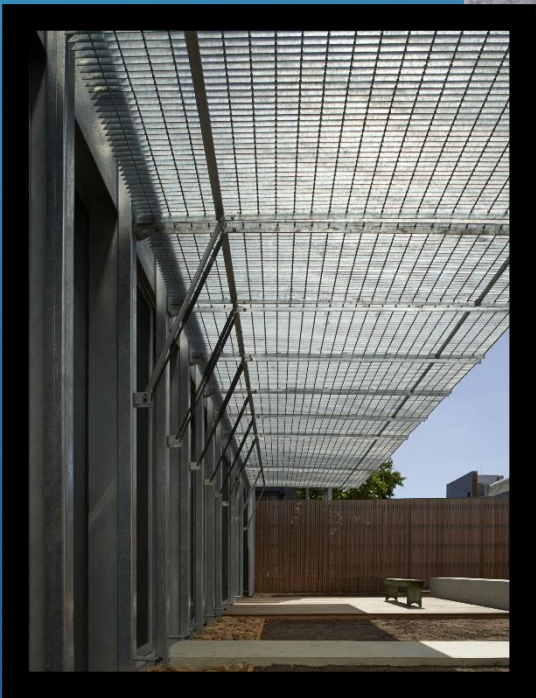
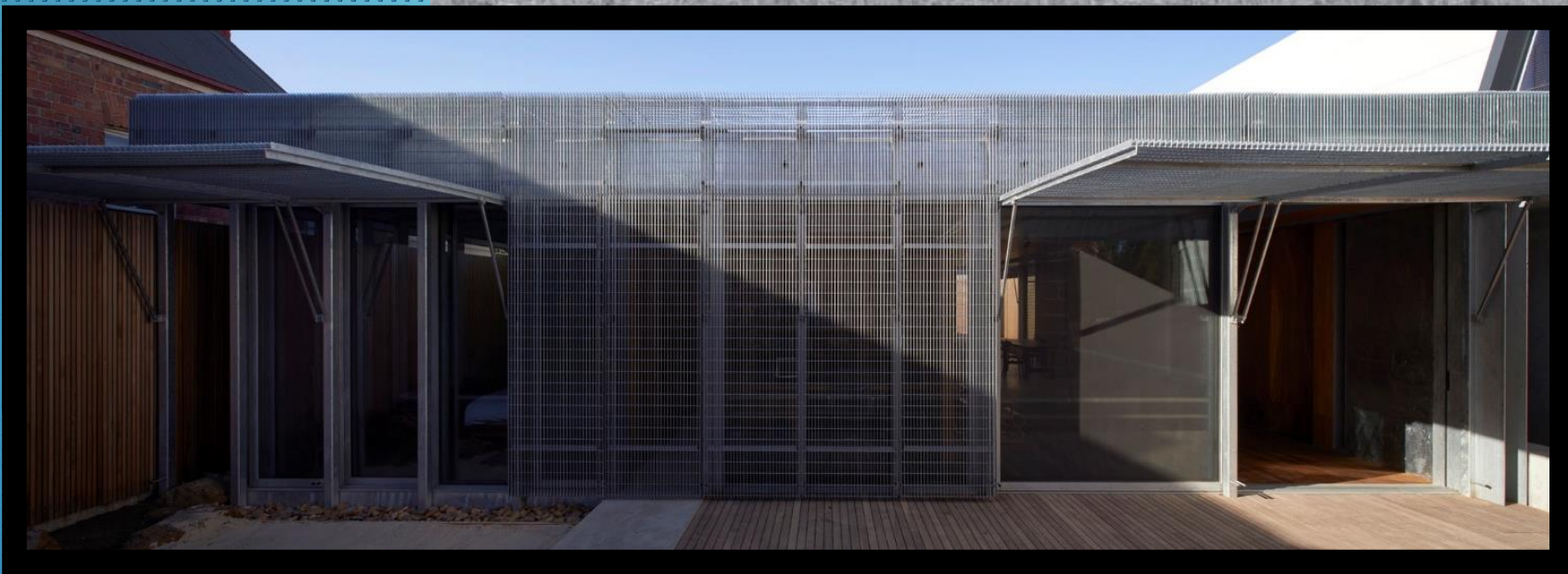
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Sean Godsell Architects designed this project in Melbourne in 2011. The Edward Street House is for a musician's family. The building is nearly entirely clad in galvanized steel grating. The grating acts as a screen wall, or can be lifted into an awning or brise-soleil.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Love Architects designed this 2012 Austrian supermarket to produce more energy than it uses. The building façade consists of panels of galvanized sheet steel, and contrasting wood. The steel composes the outer seal of a highly-insulated building envelope, containing ventilation, heat-recovery and daylight control systems.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

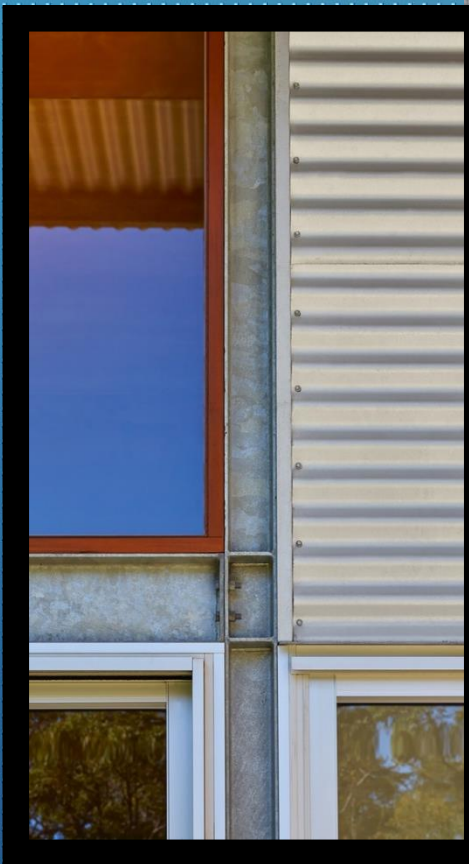
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Archterra Architects, an Australian firm, designed the Bush House, a solar-powered model of sustainability and luxury in 2016. The framing and skin is sleek, galvanized and prefabricated throughout. The metal will gain a mottled patina over time.

Green strategies here include cross-flow for ventilation, rammed earth internal wall for thermal mass, solar shading, and a natural irrigation system.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

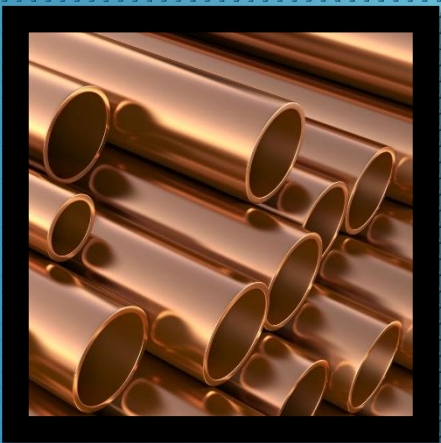
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Copper is an element, named for the Latin word *Cyprum*, “from the isle of Cyprus” (where it was heavily mined). It was first used in jewelry 11,000 years ago in what is now Iraq. Archaeologists found copper waste pipes in the Indus River Valley (India) from 5,000 to 6,000 years ago. Copper was the only metal used by Egyptians to make tools for pyramid construction 4,500 years ago. They also used it in irrigation and waste systems.

Copper only became widely used for domestic water system from the 1960s forward. Initially, soft copper with flared fittings was used, later replaced with rigid copper with soldered fittings.

See Architectural Digest Article – The World’s Best Copper Buildings: [LINK](#)

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Copper goes through stages of oxidation, each with a discernable aesthetic appeal. New, unexposed copper has a bright and reflective salmon pink color. After just a few days, it begins to gain a copper oxide conversion film, and begins browning. A statuary finish of deeper brown is gained after a few years, consisting of cupreous and cupreous sulphide conversion films. Finally, a green patina appears.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

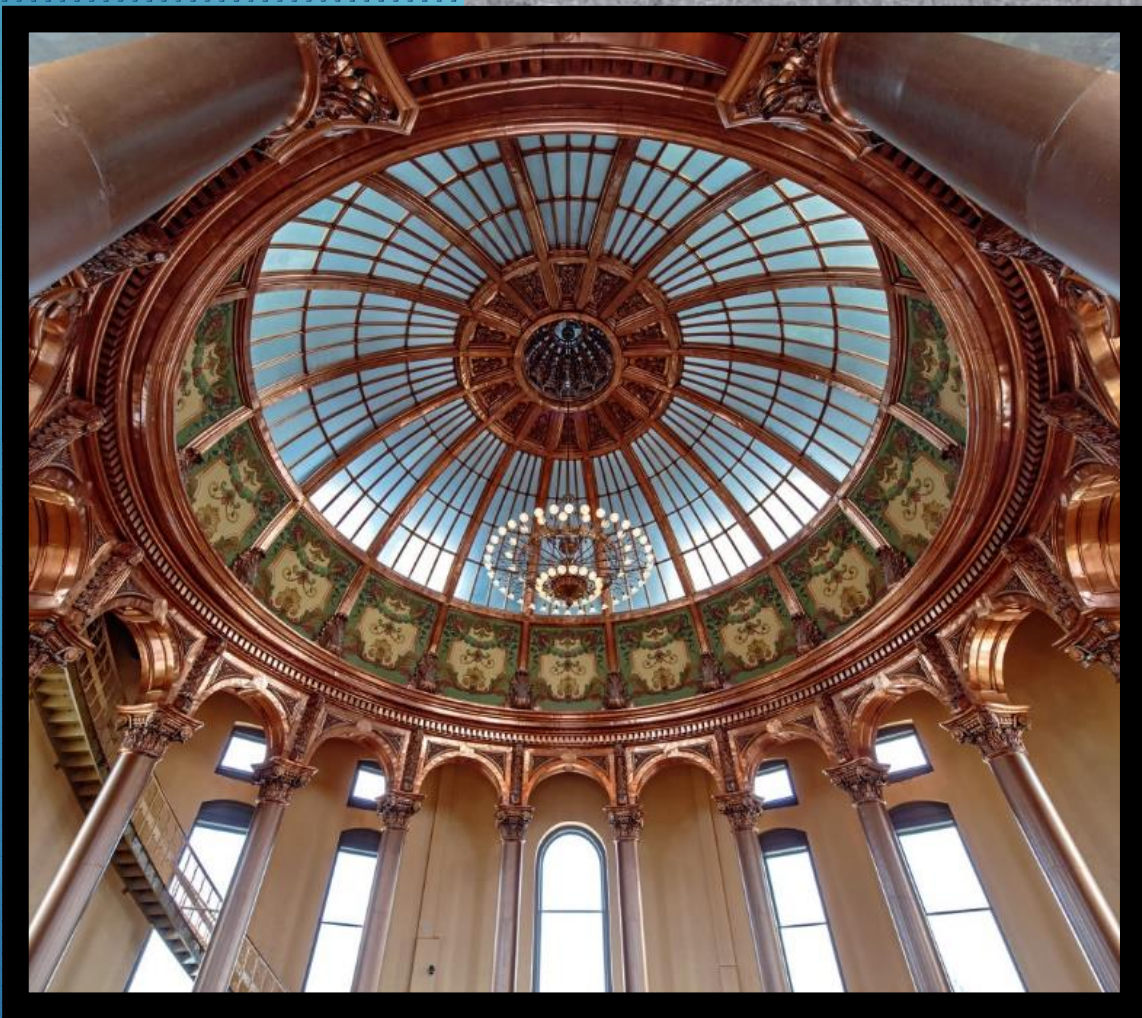
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



The Kansas State House underwent a full restoration in 2015 by the firm of Treanor Architects.

It earned the 2015 Copper in Architecture award for its work on the dome, cornice, and other decorative details.

The state capitol was originally built in 1866, designed by Edward Mix and John Haskell, and included wrought and cast iron decorative work as well as copper.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

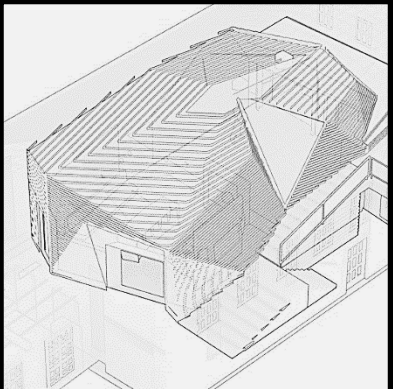
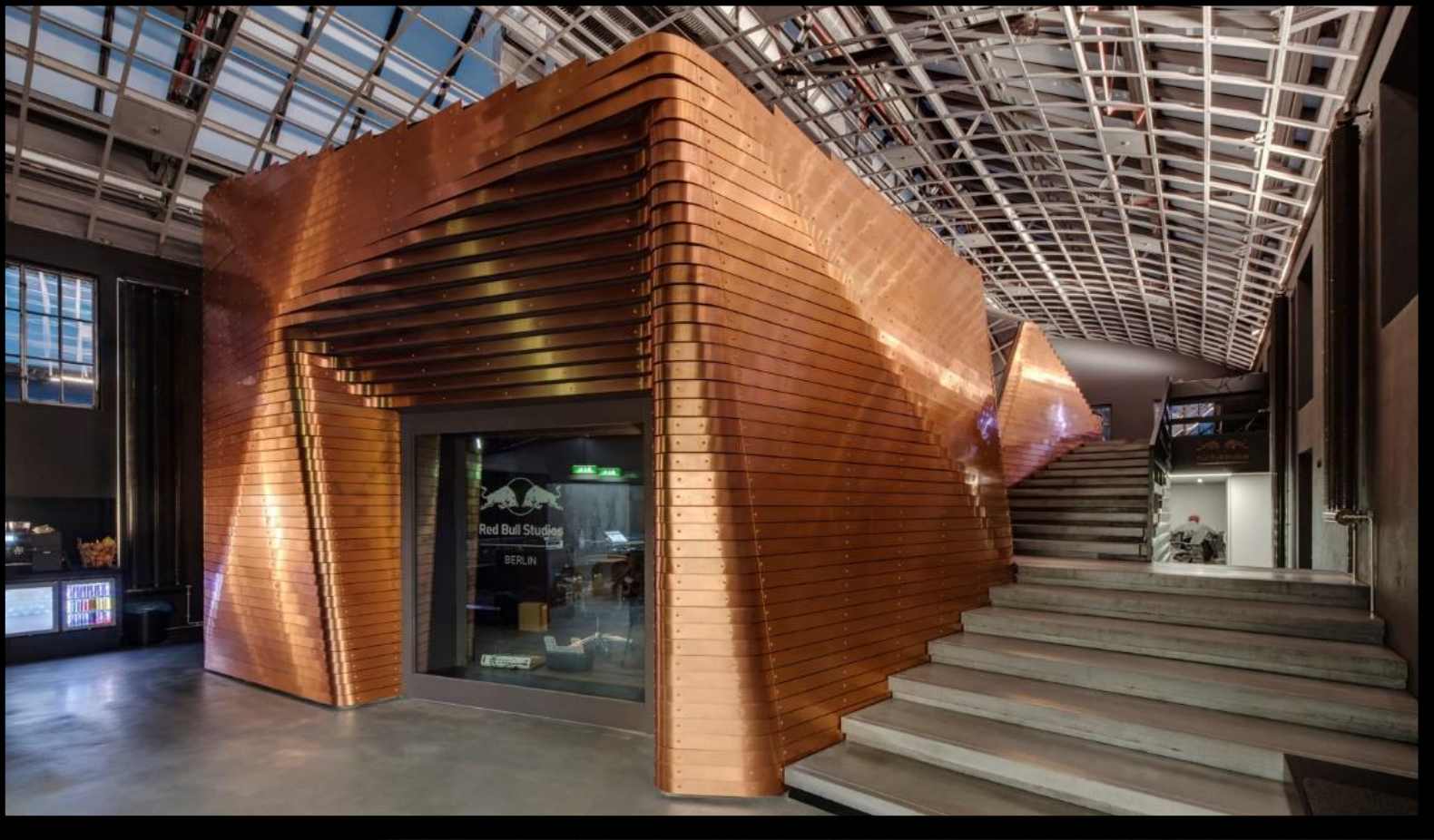
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



The L.A. firm “Optimist Design” created this Berlin copper-clad music studio in 2015 within an existing power station, wrapping the sound-proofing materials in copper bands meant to emulate musical flow.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

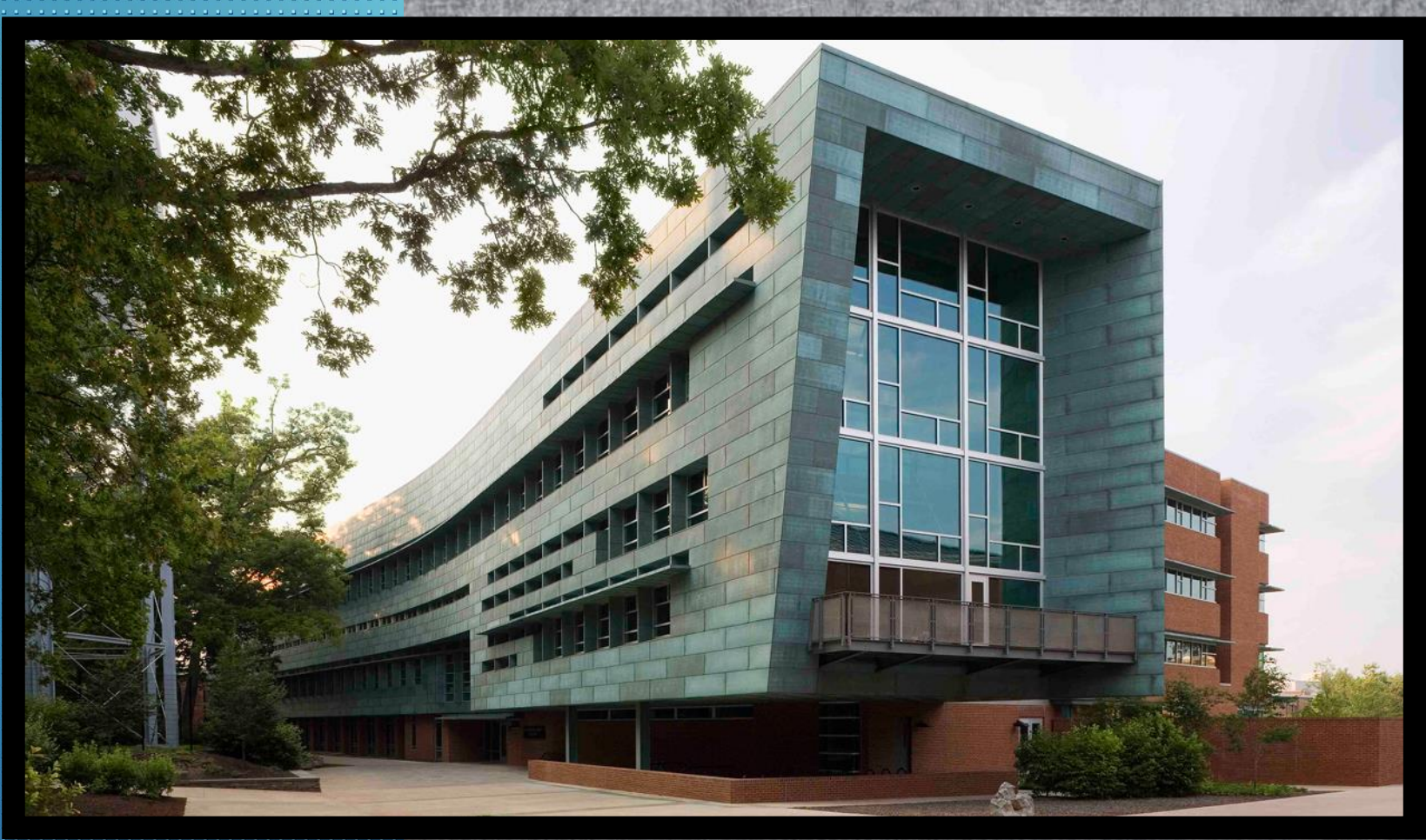
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



WTW Architects and Overland Partners created this world-award winning copper clad building for the Penn State School of Architecture with mostly construction waste materials sourced within 500 miles.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

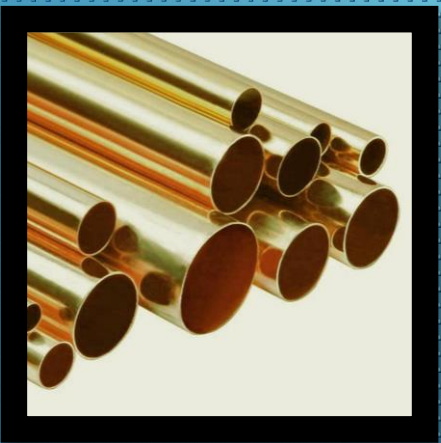
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Brass is not accounted for as an “age of man” because of the difficulty in manufacturing it. (Stone – Copper – Bronze – Iron – Space). Romans used it only for jewelry, for its decorative coloring. There was no medieval source of zinc for Brass. Before the 18th century, zinc was not accessible metal, as it melts at 420°C and boils at 950°C. A 60 / 40 brass was available, and workable, by 1832.

Brass reached its apex in plumbing around the time of the Great Depression. The Terminal Tower, Cleveland’s beaux arts classical landmark, has ample brass in its drain, waste, and vent plumbing. Due to the small, but measurable, quantities of lead in this alloy, brass is now seldom utilized.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

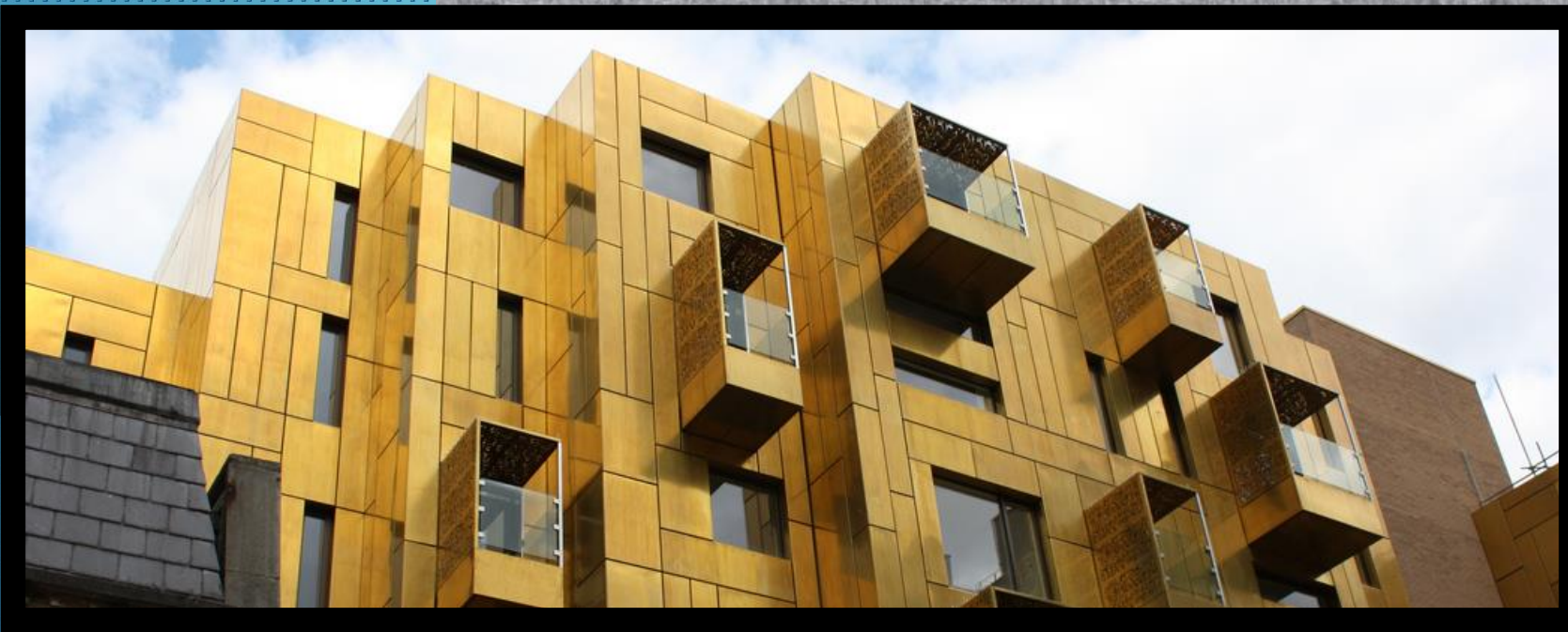
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



10 Weymouth Street, luxury apartments in the heart of London, were designed in 2009 to be stunning and rich, arising from its existing brick base with bold forms. The architect, MAKE Architects, gave nearly every apartment its own balcony.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



JSWD Architekten of Koln, Germany designed the Adaptronik Transfercenter at the Fraunhofer Institute in Darmstadt in 2012. The façade is made of sandwich plates of brass, which mechanically adapt and move, continually updating the building elevation.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Staab Architekten designed the new (2013) Ahrenshoop Museum of Art as a sculpture clad in brass. The exterior material is a specialty metal, a TECU brass manufactured with a “welltec” process allowing edges and bends configurable both in the factory and on site.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Corten (also called “weathering steel”) was developed by U.S. Steel in the 1930s. The particular advantage of the formula was its resistance to corrosion. Railway cars that carried grain or coal usually needed to be painted on a regular basis to protect against rust. Corten has a combination of alloys that develop a protective coating when it is exposed to the elements and rusts. This rusty layer actually prevents further corrosion.

Eero Saarinen, architect of the St. Louis Arch and numerous American airports, used Corten for the John Deere World Headquarters in 1964. It has had numerous bold applications since then.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

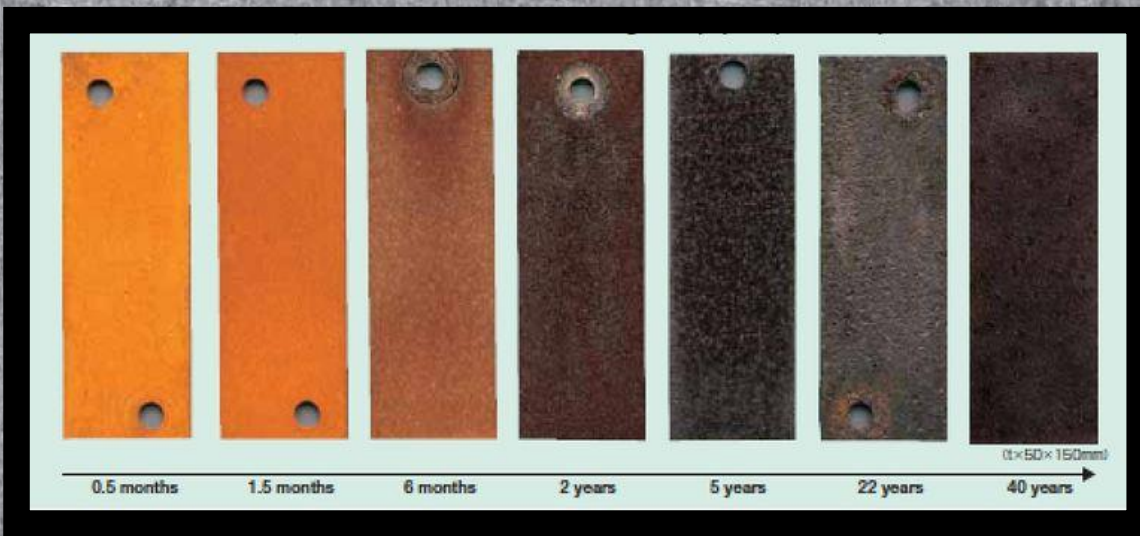
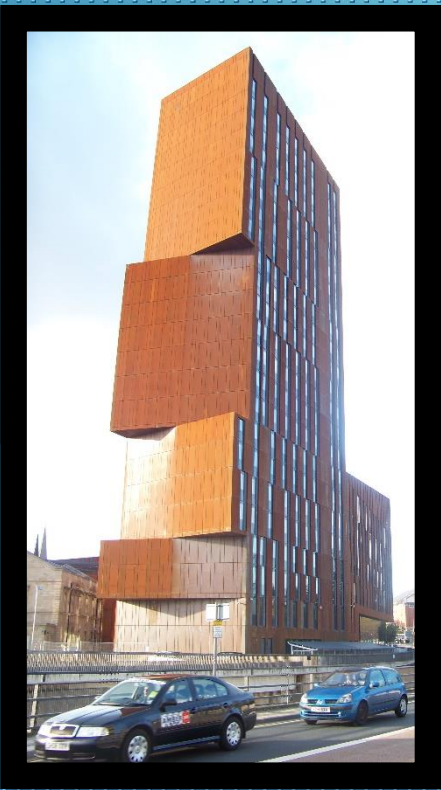
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



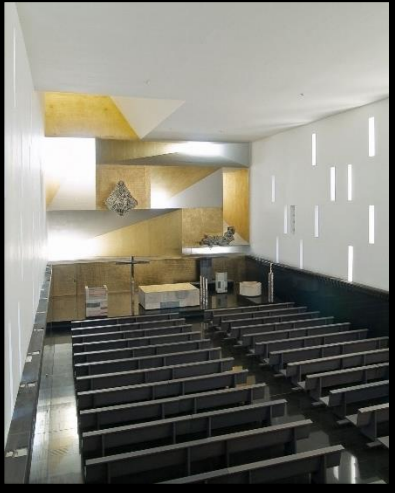
The advancement of the Corten color is contingent on numerous varying factors, including local climate, orientation to sun and wind, and also sealants.

Sealants are also necessary to prevent staining of adjacent materials by rust, and potential leaching of metals and detritus into adjacent soil or vegetation.

- VITREOUS CLAY TILE
- CAST IRON
- POLYVINYLCHLORIDE
- GALVANIZED STEEL
- COPPER
- BRASS
- CORTEN**
- LEAD-COATED COPPER
- SPECIAL METALS
- GLASS and TRANSLUCENTS
- SOLAR MATERIALS



Architects Vicens & Ramos designed this Parish Church of Santa Monica in Madrid, Spain, in 2009 for the local parish and the Diocesan Council. The building is entire clad in weathering steel, i.e., Corten.



The protuberances of abstract sculpture behind the chancel serve to allow a variety of qualities of light to enter in behind the altar during the mass. The forms have been compared to fingers of a hand reaching towards heaven.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

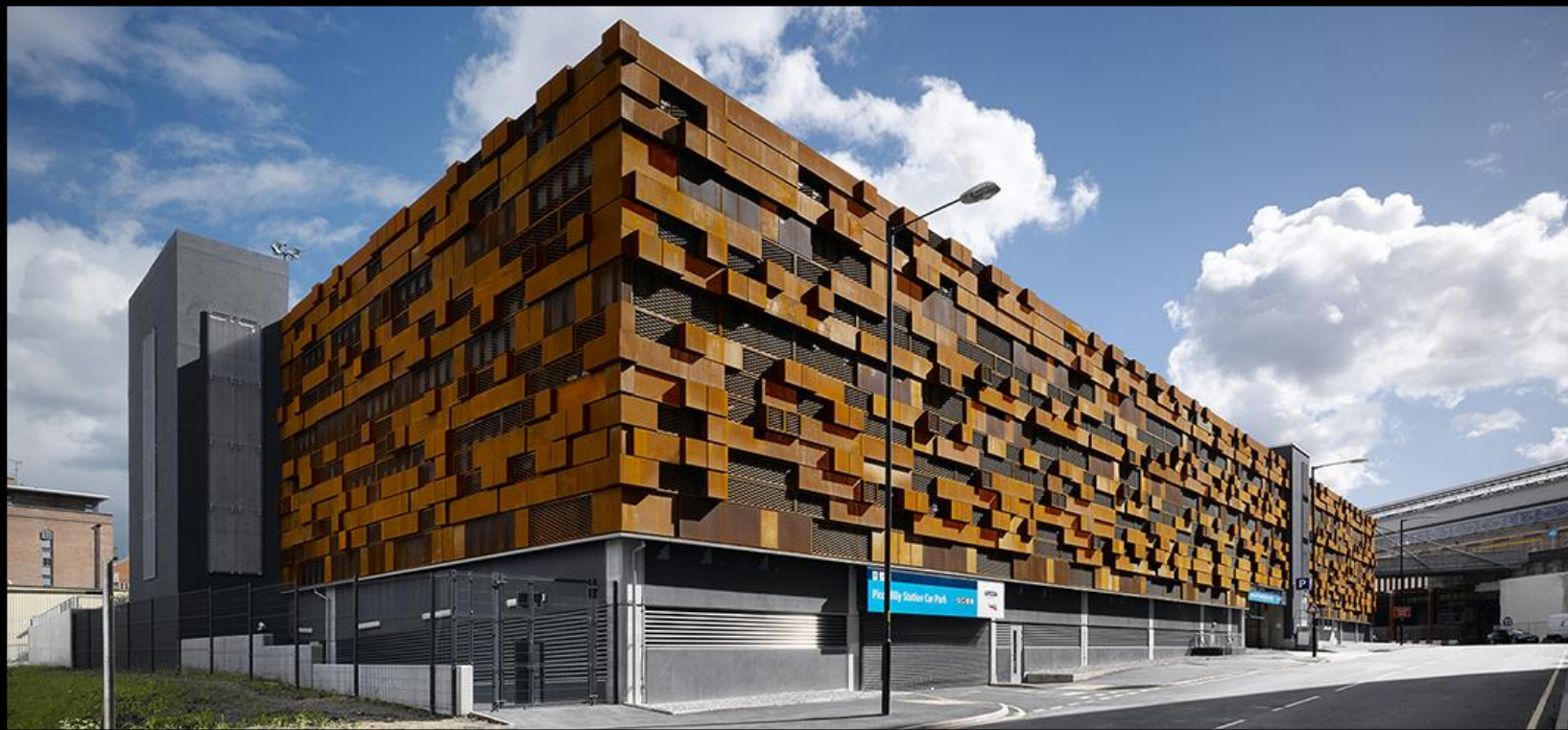
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



AHR Global firm developed the cladding concept for the Manchester Piccadilly parking garage in 2012. The Corten cladding acts first as a rainscreen, and second as artwork, to give randomness, abstraction, and thus artistic interest to the elevation.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

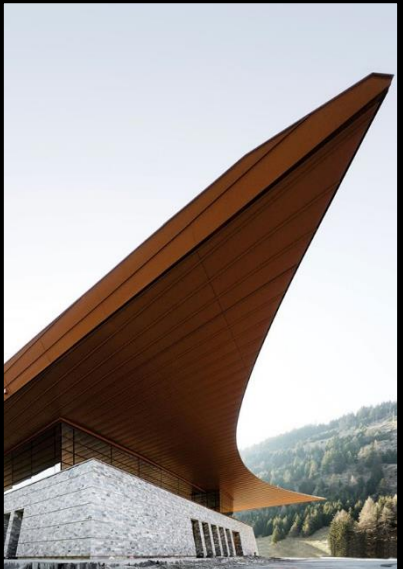
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Engineer Carlo Costa (director of the Brenner Motorway) designed the Plesi Museum in 2013 on a highway connecting Austria and Italy. The art museum presents the work of artist Fabrizio Plessi from Emilia-Romagna. It is constructed of glass and stone, beneath a vast arcing roof of wood and Corten steel.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

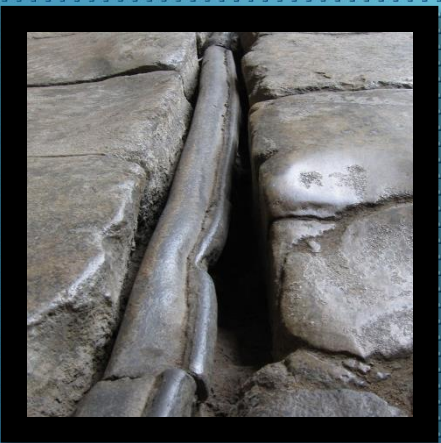
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Lead is malleable, smeltable, and workable, but is still, in most cases, is a bad idea. Found in jewelry in Mesopotamia 9,000 years old, it did not hit its stride until mined in Iberia and Greece 4,000 years ago. The Romans used ample lead (which they called “plumbium,” from which the **Pb** symbol derives) in all manner of kettles, pots, coins, cosmetics, paints, and in Roman Baths.

It is amazing how long it took to recognize the toxicity of lead (early 20th century) and how much longer it took to outlaw its use in plumbing, children’s cribs, and paints (interior paints were banned in the U.S. in 1971). It is still widely used architecturally, particularly in roofing and siding panel systems.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Architect Julian Abele designed the Duke University chapel in Collegiate Gothic style from 1930-1932. The lead-coated copper roofing panels were removed and replaced in 2015, while crews repaired joints in the limestone mortar ceiling.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



The sculptural four-story Center for the Visual Arts of the University of Toledo designed by Frank Gehry was added to the Toledo Museum of Art in 1993. The joints in the lead-coated copper panels match the proportions of the joints in the limestone of the original classical revival building.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

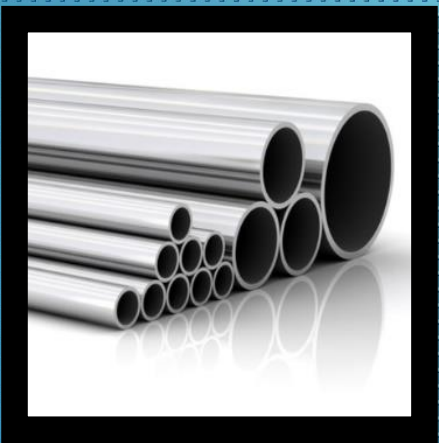
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Stainless steel was innovated by French scientists who did not initially recognize its corrosion resistance. Two Germans from Krupp Iron Works patented the first stainless steel in 1912. English metallurgist Harry Brearly perfected a martensitic chrome stainless steel in 1913. Stainless has numerous plumbing and architectural applications for its resistance to rust.

Titanium was discovered late in the game, in 1791 by English pastor William Gregor and first produced by American Matthew Hunter in 1910. Strong as steel but nearly half as light, it resists corrosion and withstands high temperature. It has numerous architectural applications, most notably in exterior panels.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Frank Gehry is well-versed in titanium, stainless steel, and numerous other modern metals. This is the pinnacle of his design oeuvre, the Guggenheim Museum Bilbao in the Basque region of Spain. The titanium panels curve and torque in all planes, and are met with glass and limestone cladding at the base. The exterior forms describe a bold, undulating, and forceful interior.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Glass was first made in the Fertile Crescent nearly 6,000 years ago, as a byproduct of metalworking and glazing. It advanced to true vessels and complex shapes in the late Bronze Age, around 3,500 years ago.

Early glass melting furnaces using indirect heat were utilized by the beginning of the Common Era. Syrians invented the blow-pipe in the 1st century BC. Glass production spread to its apex during the Roman Empire, with flat panels reaching their apex in Cathedral Windows of Gothic Churches in the 12th through the 14th Centuries. Now glass has become commonplace, a primary exterior material in the Modernist style, and is even used structurally.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Skidmore, Owings, and Merrill (SOM) Architects, a world renowned modernist firm, designed the Republic Newspaper building in Columbus, Indiana in 1971.

The light aluminum and steel frame offered wide expanses of glass to give a full view into the building. The pressroom was formerly located in the building (above) and the news room still remains, so that passersby can see the inner workings of the newspaper business.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

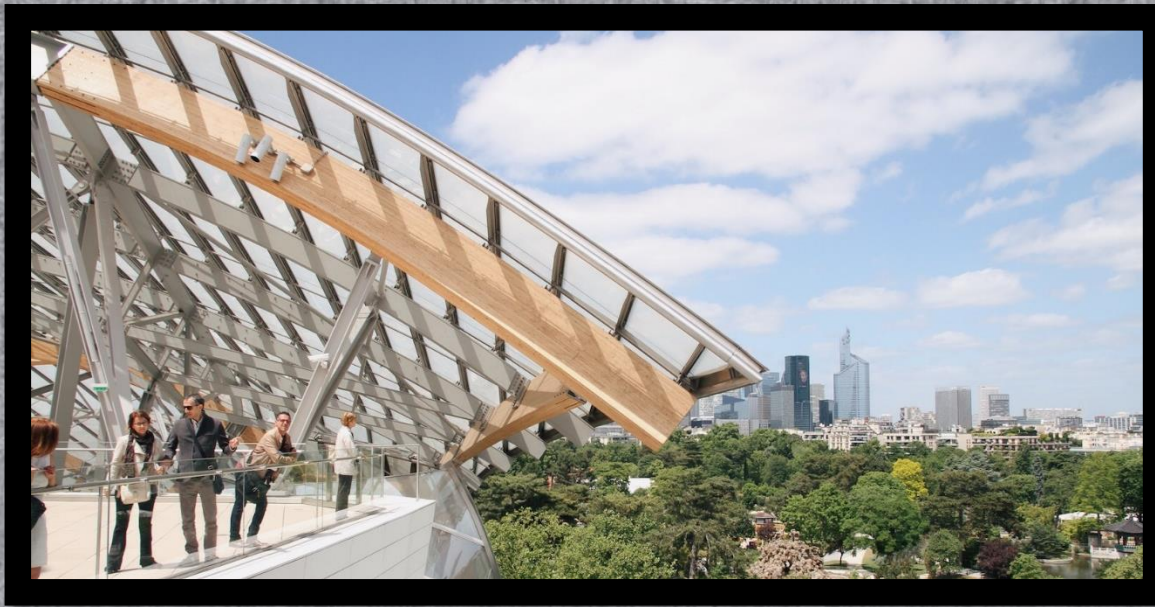
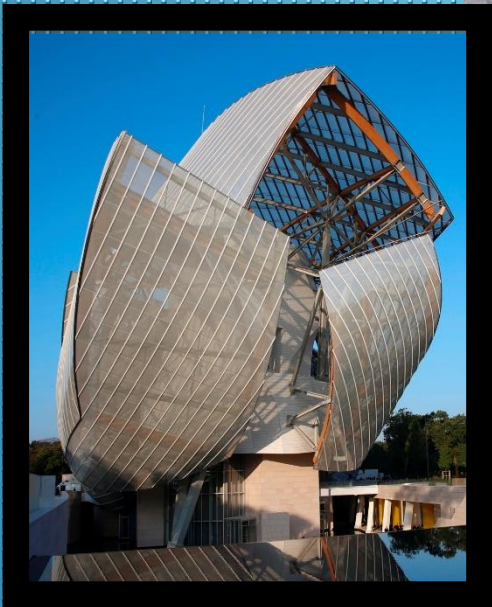
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Frank Gehry was selected to design the Fondation Louis Vuitton in Paris, and did so with master strokes of glulam timber, panels of white concrete, steel, and laminated glass. The glass envelope covers the building's various exhibition spaces and creates a stunning "iceberg" sculptural composition. Various canopies shelter excellent views of Paris. (2014)

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



ZGF Architects built the Federal center South Building in Seattle in 2014. The building is a redevelopment of an existing warehouse site, with an four story atrium that provides ample daylighting to interior spaces, a natural convection exhaust, and a pleasant work environment.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

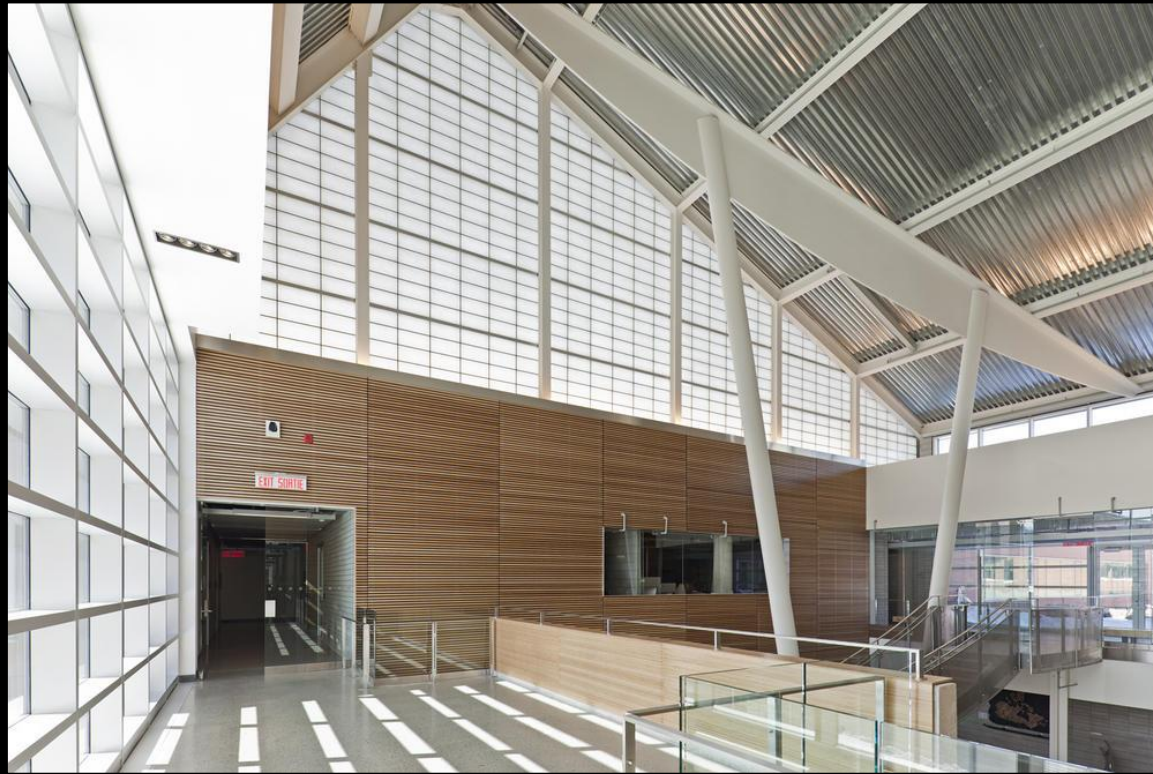
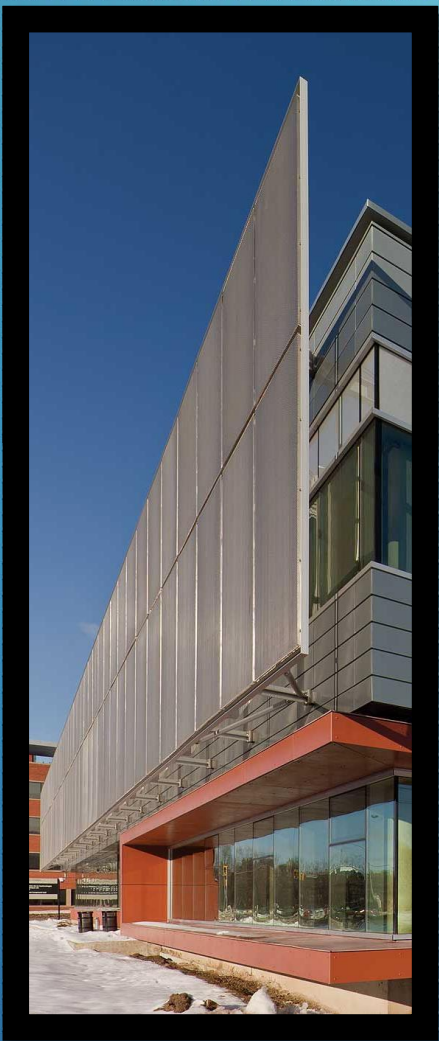
CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Canmet Material's 2015 main facility in Hamilton, Ontario by Diamond Schmitt Architects has a dual-envelope for passive solar shading. Its lightweight, insulating, structural KALWALL panels allow glare-free natural daylight, ultimately reducing energy use and thus greenhouse gas production.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Solar Materials are the result of research in chemistry, physics, optics, and materials fabrication. Of interest in this presentation are Photovoltaic Panels and Solar Thermal Panels. (Other extant devices prompt chemical processes, such as desalination or chemical conversion).

Photovoltaic Panels comprise solar cells, usually crystalline in structure, that absorb light energy, which knocks electrons loose from their atoms on the semi-conductive material. The electrons are captured on attached conductors, making electricity.

Solar thermal panels simply capture heat in copper lines, heating the water within.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Guz Architects designed the Sky-Garden House in 2010 on Sentosa Island, Singapore. The home consists of a series of roof gardens, each providing the base for the level above. The photovoltaic panels at the top provide both energy and solar shading.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Students from the University of Maryland assembled a 2011 award-winning Solar Decathlon house with passive solar orientation, photovoltaics on the butterfly-shaped roof, and solar thermal panels on the south-facing side, providing hot water.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



Building-Integrated Photovoltaics are the latest trend in alternative energy. The top two images show a home with a tin oxide film coating in lieu of separate panels. Below is an entire community in Germany that produces more energy via solar than it uses.

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS



The intent of this work is to spur forward the creative process of a complex, a series of architectural projects for industry and education originally discussed between Mr. Sam Dowdy and Mr. Christopher Lobas in the Fall and Winter of 2015.

**REPORT
MADE FOR:**



BY:



**CHRISTOPHER A. LOBAS
& ASSOCIATES, ARCHITECTS**

© 2016

VITREOUS CLAY TILE

CAST IRON

POLYVINYLCHLORIDE

GALVANIZED STEEL

COPPER

BRASS

CORTEN

LEAD-COATED COPPER

SPECIAL METALS

GLASS and TRANSLUCENTS

SOLAR MATERIALS