HONEYCOMB CONSTRUCTION: IT STARTED WITH THE PHARAOHS

It is probably futile to try and find the “inventor” of sandwich construction; he may well have lived among the artisans working at the dawn of civilization. During the time of the pharaohs, mummies were wrapped in a sandwich type material consisting of two thin layers of strong papyrus, between which was a thick papyrus core. For thousands of years, the Chinese have used a geometrically similar Honeycomb with paper facings for their large ceremonial kites. In the 17th and 18th centuries, craftsmen built light sedan chairs in which the basic panels were composed of two thin layers of strong material (veneer and resin-impregnated canvas) between which was sandwiched a thick layer of sliced corn cob discs.

The structural sandwich panel of today is a three layer bonded structure functioning as an integral unit, and composed of alternating dissimilar materials referred to as facings and cores. The facings are relatively thin, strong and dense, while the cores are relatively thick and very lightweight. TAS systems, (Thermal Acoustical Structural panels) has developed a superior building system by improving on a kraft paper Honeycomb panel first explored by the Department of Agriculture’s Forest Products Laboratory in the 1940s.

The system is composed of a sandwich construction that uses as its center a lightweight Honeycomb of kraft paper impregnated with resin and bound together permanently by a special adhesive, MOR-AD, from Morton Chemical, Chicago, IL. Honeycomb paper core panels in four foot widths and varying lengths are used as floors, walls, roof panels and internal partitions of a house or commercial structure. The panel thickness is determined by local building codes and required loads on each panel.

TAS Systems is classified as a component manufacturer, building structural wall, floor and roof panels. As such, their operations fall within one of the seven industrialized housing segments commonly referred to as prefabricated housing. As a component builder, TAS has a great deal of flexibility in construction. Practically any set of plans can be followed when constructing with component panels.

Exterior wall panels are basically fabricated by bonding American Plywood Association (APA) Rated Sheathing or 5/8” 303 Plywood Siding to the cured Honeycomb core. Cellulose fiber, foam-in-place insulation is then poured into the Honeycomb, yielding a standard four-inch exterior wall with an R-14 insulation value. Next, 1/2” or 5/8” FR gypsum wall board is laminated to the interior faces of the panels. Interior walls utilize gypsum wall board on both sides, with insulation added for acoustical purposes only. Floor or roof panels will be constructed of plywood sheathing and laminated to a 6” or 8” insulated rigid Honeycomb core.
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A stud is then attached to one edge of each panel, acting as a “tongue” to be inserted into the “groove” of the next panel. This approach cuts the number of 2x4s needed for wall construction by two-thirds, without sacrificing structural efficiency. Window and door openings are cut and framed and each panel is numbered for easy site fabrication.

Panels Are Nailed . . .

On site, panels are nailed to treated bottom plates which are fastened to a concrete floor slab. Double top plates are attached before roof trusses are installed. All members are fastened with 8d nails, using a basic six inch nailing schedule.

The Honeycomb cells provide hundreds of thousands of rigid “struts” between the two panel faces. Coupled with the structural integrity of the plywood face, the resulting panels have an extremely high strength to weight ratio. The International Conference of Building Officials (ICBO) acceptance allows an axial load of 1220 pounds per lineal foot for the panels, when used as load bearing walls. Allowable shear or racking loads are 335 pounds per lineal foot.

Construction time is significantly reduced compared with stick building techniques. According to Charlie Cellar, General Manager of TAS Systems, a home of 1400 to 1600 sq. ft. will require on site construction time of two days for walls and another day for roof construction. Rough electrical work is completed in another day, at which time roof sheathing is installed. Turnkey completion takes 25 to 30 working days. This system has equal application for small communities with low-volume housing needs as well as large tract developments with high-volume housing requirements.

Cellar points out that construction is accomplished with a four-man crew. In addition, less skilled labor is required with this modular design since connections are simple.

The key to this system, Cellar emphasizes, is the flexibility of this Honeycomb panel system. “A contractor can apply the TAS system to almost any form of construction, from residential to commercial and industrial.”

The cost savings passed on to buyers give this system an irresistible appeal. “The sales price of a TAS home in San Diego, California is approximately $32.00 per square foot in a tract environment, and in a custom building situation the price per square foot approaches $44.00. Using the local building department average of $55.00 per square foot, we achieve a $10.00 to $12.00 per square foot savings even for custom homes.” In today’s money-tight economy, those savings give contractors and developers using the Honeycomb structural panel construction an added edge.

It seems safe to say that since Honeycomb structural technology has covered and protected the pharaohs for over 2,000 years, this same technology could be used to construct and protect our homes and commercial buildings for another 2,000 years in the future.