EDUCATIONAL FOCUS: ELEVATOR CAR ENCOULSURES

DESIGNING ELEVATOR CABS

by Farid Waleh

As the focal point of buildings, elevator cabs illustrate the creativity of architects and designers. These professionals face challenges in designing cabs with respect to local code issues and material limitations. Elevator experts work with architects to find solutions to code issues. In this article, we will examine the processes of designing, manufacturing and installing a customized cab.

Design

The best-designed elevator cab is one that is appreciated by the people who use it. The architect has a dream and relies on the elevator industry to make this dream a reality. For a successful design, the following features must be met:

♦ The elevator professional must have a good understanding of the complete elevator system from the function to the size of each component. The field crew should never have to modify the cab (i.e., cut a part of the cab) to make it meet clearances or functions of the elevator system; this is the most widely recognized design flaw.

♦ Sophisticated cab manufacturers use 3-D software to exchange ideas and to illustrate the proper fit and function of elevators and cabs. The software allows finishes to be added and shows the customer what to expect so relying on samples for the complete cab is no longer necessary. These drawings can even be animated to show the car moving up and down the hoistway shaft or even show the doors of the cab opening.

♦ Detailed drawings of the elevator and cab design control the project from design to manufacturing to assembly and shipping to installation.

♦ All design issues should be addressed and resolved before manufacturing begins. Material and finishes are not as important at this point in the process.

♦ All parts should be designed so they are easily manufactured with the existing materials and technologies.

Consultation

A customized cab is expensive and requires special attention. Consultation with the cab manufacturer especially during the initial design phase is essential for project success. All code and material issues should be solved together, so there are no surprises when the completed cab and elevator are installed. Consultations with the architects, designers and the elevator cab representative helps increase creativity within the guidelines set by the code committees. Such consultations often favorably impact reductions in the approval process.

Quality

The quality of the cab must meet the customer’s expectations. A properly drawn, designed and detailed cab is easier, quicker and less expensive to manufacture and assemble. Quality is not just assembling a beautiful product in a manufacturing facility; it is manufacturing a product and installing it without any modifications. When judging an installation from a design perspective, these questions should be asked:

♦ Are all joints lined up and is there a smooth transition between different finishes?
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Does the car rattle and squeak when moving up and down the hoistway?
Are the visible parts, such as those seen in a glass elevator, meant to be seen or were they not considered during the design phase?
Were any field modifications performed to the car or to other elevator equipment?

Manufacturing
With quality design, a cab facility can manufacture and assemble a car within a relatively normal time frame.

Shipping
Another essential component to installing a customized cab is shipping. The product must be well protected and arrive to the jobsite intact. Great care should be given to the crating and shipping of elevator cabs. Size and weight considerations are the important aspects in successful shipping. Packages should never be too heavy or big for the field crew to maneuver. Special packaging is required for exotic finishes and delicate parts. Crating and the order of crating a custom cab so the field crew can have easy access in the proper order is also crucial to a successful installation.

Installation
The final test is in the installation. The emphasis is in the details of the design, manufacture and shipping of the cab. While invisible to the passenger, the hardware that holds the cab together makes the difference in the final product. The secrets to a good installation are:

- Detailed drawings for the manufacturing and installation of the cab.
- Manageable parts that can be handled by the installation crew.
- All hardware and parts are accessible and easy to get to. This is the only way to assure that all of the hardware and parts are installed.
- All parts should be properly identified and labeled prior to shipping so there is no confusion on the jobsite.
- Proper installation instructions for each part must be included with shipping of that respective part.
- Information must be provided with shipping on how to provide for parts to fit in the cab opening and how to make parts so that both the mechanic and helper can easily handle these parts.

When the field crew has all of this information, installation can be completed in mere hours. The actual work onsite becomes relatively simple for an experienced installer. The joints will fit together nicely, the panels will install exactly where they should with minimal adjustments, and the seams will join each other flawlessly. If a cab is installed properly, it will look good for years to come.

Any manufacturing facility can assemble a cab in their facility under ideal conditions. It takes a more concise design and attention to details to produce a final product that will install under the most extraordinary conditions such as an installation in a tight hoistway. A well-planned design includes attention to details from the screws that are used to installing parts in harmony with the rest of the equipment. This is especially important for custom cabs with their fragile and delicate exotic materials.
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Cost

Cost is always an issue with a custom cab. The best design is useless if the customer is not willing to pay for it. When evaluating costs, the whole process from the design to installation should be considered. If the product has to be modified in the field at the high-labor rate, a lower-priced cab may end up costing more than one that is initially priced higher. There are five issues to always consider when purchasing a custom cab:

- What is the overall value of this product?
- Will the design, manufacturing and shipping processes save time on installation?
- Will the parts fit together easily so there are no surprises during installation?
- Will all parts be accounted for so there are no wrong or missing parts?
- Can the parts be serviced easily for maintenance and upgrading?

When these processes of creating an elevator cab are considered, the best value may not be the cheapest product nor the most expensive product. The best elevator cab is one that can be designed, manufactured and installed with reasonable ease and meets the expectations of the customer in both performance and cost. And the true mark of excellence is a custom cab that installs without any difficulties.
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RESPECTING THE ELEVATOR CAB

by Louis Blaiotta, Sr.

Respect. We’ve all heard Rodney Dangerfield bemoan his perceived lack thereof. “So,” I already hear you asking, “What in the name of Elisha Graves Otis does this have to do with elevators?” To borrow a bit from Mr. Dangerfield, it has long been my view that elevator cabs and entrances do not get the respect that they deserve: from the architect, from the elevator consultant, from the general contractor and from the managers/owners of the buildings in which they’re installed.

Typically what the riding public calls an “elevator” is limited to what they actually see, the entrance and the 30-square-foot enclosure that most of the world refers to as the cabin and we in America call the “cab.” I like to refer to it as the last of the three B’s of an elevator system: Brains, Brawn and Beauty.

“Beauty” is 100% visible by all, yet constitutes only approximately 15%, on average, of the total monetary value of the elevator system. The remaining 85% – the “Brains” (the electronic/computer systems controlling elevator movement) and the “Brawn” (the traction/hydraulic form of propulsion) – are obscured from view in the basement or rooftop machine rooms, hardly as welcoming as the car enclosure and often frequented by visitors other than human. So, à la Mr. Dangerfield, the faithful elevator cab is entitled to more appreciation and understanding of its underlying issues.

Since the beginning of the modern age of vertical transportation (the end of manned “car-switch” operation and the beginning of automatic elevator operation) elevator cabs have generally fallen into two categories, commercial passenger and specialty applications. The specialty application category includes freight, limited use/limited application (LU/LA) and residential applications. The commercial passenger cab category (the subject of the balance of this article) further divides into two subcategories, wood-core and steel-shell construction types.

Commercial Passenger Cab Types

Wood-Core Enclosures

The traditional wood-core cab, while the oldest design of the modern era, still has a place in the scheme of things and clear advantages in certain situations. This
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style represents the classic, traditional aesthetic in elevator cab design, ideal in climate-controlled, new-construction environments and applications where the climate is not unduly moist/humid. Often nicknamed the “wood box,” this wall construction was traditionally composed of plywood, and, later, fire-retardant particleboard or MDF substrates. Older designs even incorporated wood core in their car-top constructions. These precision-built wood-core elevator cabs are custom fabricated and therefore need to be preassembled at the plant to assure quick and easy field installation. They may be creatively designed and assembled with an unlimited selection of plastic laminates, luxuriant hardwood veneers, metallic and applied moldings. Since the wood-core cab is comprised of fewer components (a car top, front and three large walls, etc.), its design naturally lends itself to new construction installations in which heavy lifting and lack of maneuverability are less of an issue.

In the modernization market, however (involving “rip outs” of old elevator cabs and replacement with new ones), the wood-core cab had distinct disadvantages. Unlike new construction, where the elevator is installed before the building’s sheetrock or masonry corridor walls are in place, modernization jobs mandate the installation of all cab components by bringing them into shaftways through already-existing door/entrance openings. In such situations, it is often impossible to bring a one-piece, five-foot by eight-foot wood-core wall through the typical three-foot by seven-foot door opening. The installation of the traditional wood-core cab frequently required the opening up (knocking down) of corridor walls. The advent of the steel-shell cab addressed these existing conditions.

Steel Enclosures

Steel-shell cabs were specifically designed for assembly inside the shaft by incorporating several smaller, 1.5-foot to two-foot by eight-foot steel wall sections; each very light and portable, fitting easily through typical entrance openings. Similarly, sectional car-top panels were also deployed. Like the sectional wall panels, car-top sections are lighter in weight and more maneuverable than the heavy one-piece wood ceilings found in wood-core cabs. This advancement greatly enhanced the safety of the installing field mechanic who was no longer required to erect cab walls below a precariously hanging car top that was previously hoisted and chained overhead.

While the steel-shell approach solved fundamental assembly problems, other issues emerged. Plain steel cars (industry nicknamed “tin cans”) appeared very industrial, at best like a freight car, at worst like the inside of a refrigerator, a look not at all appealing to building users, landlords and tenants alike. To present a more aesthetically pleasing car to riders, the landlord needed to spend additional time and money installing decorative panels. Solution: development of the hanging (or removable) panel cab to provide maximized options and flexibility over decades of service. The obvious drawbacks of added time and cost by hanging an interior set of panels onto the steel-shell car often makes the hanging panel cab an expensive solution. Less obvious, but of equal importance in the modernization market where replacement cabs must be within 5% of the original cab weight, the hanging panel cab design has serious weight considerations.

As the world became more time-challenged and cost-conscious, methods were sought to shorten installation times and generally make life easier for installers. Enter the invention of quick-assembly technologies, ways to instantly fasten cab components without the need for bolts. This is most often accomplished by fabricating steel wall panels with alternating male and female joints that interlock with the adjacent panel. Various methods involve sliding,
hooking, snapping or hinging joints together instantly engaging them without additional fasteners. The joints themselves secure the panels together, much faster than the traditional, century-old process of assembling a cab with bolts.

**Laminated Steel Enclosures**

The most recent development in steel-shell design has been the introduction of the laminated steel-shell car, fabricated by applying plastic laminates, wood veneers or metallic skins directly to the steel wall panels. This type of cab found its first market in the more humid or tropical coastal regions of the U.S. and Caribbean where the “look” of a wood car is preferred, but where site conditions demand the durability of a corrosion-resistant galvanized or galvanealed steel shell. (Often, by the time wood-core cabs had arrived at their sites, the particleboard or plywood...
substrate material had absorbed so much humidity from the journey – continually worsened by continued moisture-absorption in these tropical environments – that the walls would expand and disassemble.) Equally important as its ability to stand up to hostile environments, the laminated steel-shell design has found its calling in the modernization market. With its aesthetically pleasing decorative laminates applied directly to the sectional wall panels, the need for additional hanging panels has been eliminated along with their additional associated costs, installation times, and most importantly, weight.

**Marketing Elevator Cabs**

Additional to the innovative new ways that cabs are designed and manufactured, our industry is seeing similar evolution in the ways they are sold. New elevator systems are now marketed in a number of ways; the three most popular methods I will categorize here as (1) The Package System, (2) The Bid and Selection System (by far the most prevalent), and (3) The Design/Build Method (the high art of negotiation and compromise!).

**Package System**

This is a method by which a manufacturer or elevator contractor offers an owner (and/or his design professional) a completely packaged elevator system. The “package” tends to provide the purchaser the “best buy” for Brain, Brawn and Beauty. By way of caution, however, the “going in” price has limitations and restrictions that may ultimately cost more in the long run. Package systems can be proprietary and limited in accessory options – especially in the Beauty components. Beauty upgrades are often costly, since now the owner is in a captured negotiation process and often makes economic choices limiting his design scope for the project.

This is an area where design professionals could avail themselves of elevator consultants who are more inclined to assist the design professionals with generic/open systems that do not compromise the owners’ desires. Design professionals or elevator consultants with good track records – in value engineering rather than wordy specifications – are the only ones who should attempt this method of purchasing an elevator system.

**Bid and Selection Process**

This most popular American method of contract specification and qualified low-bid selection is still the best method of assuring a reasonably cost effective solution for the owner. Each of the three-B components is meticulously itemized and spelled out in performance language defining what the owners’ representatives wish to achieve with their elevator specifications. Again, I stress the importance of the language of this specification to avoid ambiguity and omissions that will almost certainly lead to expensive compromises after contract signing.

Design professionals and their specification writers often do not crosscheck to verify that the written word and what is actually represented in the architectural drawings are one and the same. Even prior to computerized word processing, “spec-writers” often cut and pasted paragraphs of previous installations to minimize the error of syntax (the written words and phrases) but often missed the entire subject matter in the process (e.g., describing counterweight components for holed low-rise hydraulic elevator systems). Today, in spite of the universal availability of sophisticated word processing and software, the bane of “cut-and-paste” errors remains, sometimes worse than before!

Another area where ambiguity can lead to unfortunate compromise is with the general contractor’s or construction manager’s goals to achieve the “best buy” for the project’s specification document. Owners have little recourse for recompense after the project is completed and running, except for litigation. Nonetheless, the elevator system and the future service contract are in place at the expense of the owners and the riding public. The design professionals and consultants can ill afford to enter into an adversarial position with the owners or the general contractor for fear of loss of future business and sheer embarrassment for their errors and omissions.

**Design/Build Method**

I refer to this route, in street-wise language, as the “Good Ol’ Boys/Handshake” method. Owners and/or their design professionals sit with a preferred elevator contractor and design an elevator system that will best serve the owner’s purpose. This method is usually chosen to expeditiously complete a project in a tight time frame – most often by design professionals with major elevator manufacturing companies. This most likely results in completion by a major corporation, rather than by an independent elevator contractor who must purchase all three-B components from several vendors in order to complete a project in a specified time. Here again, the “package” is selected as the desirable vehicle for the project, and, again, the proprietary package system is offered. The results are not always cost effective or timely delivered.

**Elevator Cab Safety**

Over the years, the elevator industry has endeavored to manufacture, install and maintain elevator equipment using the safest possible methods. Safety manuals have been diligently updated and distributed throughout the various segments of the industry including the manufacturers, installers, maintenance workers and code-enforcement officials.
ASME A17.1/B44 ("The Code") is a harmonized document and is at present the “official word” for two countries – the U.S. and Canada. The perpetual periodic revisions and interpretations of ASME A17 documents are living proof of the code makers’ intent to make elevators the safest form of mechanized transportation in the world.

The fact that elevators provide the highest level of safety per miles of travel is testimony to the industry’s commitment to safety. The dream of a safer and better product is the ultimate goal of everyone in the industry. I do not know of any other industry where competitors have worked as well together to achieve a safer environment for the installing, maintaining and riding public.

Sections of the code make specific requirements to address issues of fire resistance, structural integrity and electric shock in the elevator cab. At present, the code rules fail to mention how certification can be achieved. Perhaps in the future, the code will require independent inspection agencies to certify that all cabs are manufactured in accordance to the requirements of the code as the code presently requires for Fire Resistance Ratings of Entrances, Electrical devices (ASME A17.5) and structural integrity of safety devices and buffers.

While not required by the code, independent, third-party certification of elevator car enclosures is available to the industry on a voluntary basis. The car enclosure (cab) has been classified by the Underwriters Laboratory Inc. (UL), and a procedure has been developed for testing and in-plant inspection of these elevator cabs prior to their delivery and installation on the jobsite. The code rules have been in existence since 1984, and the UL procedure has been available to in-plant certify cabs since 1992. In the procedure, structural cab components are lab-tested and periodically inspected during the manufacturing process to assure the manufacturing process is the same as the tested assembly. The Fire Resistance Ratings of combustible components and their adhesives are also periodically tested for compliance by the certifying agency UL.

The argument of “No-need-for-additional-expense” must be moot when personal safety is in question. Furthermore, in-house quality assurance cannot replicate the outside independent inspection agency in all areas including swing and sliding (horizontal) entrances, shaft wireways and draft seals.

Besides receiving outside certification of code compliance to ensure the safety of the riding elevator public, cab manufacturers must continue to strive to consistently provide the installation mechanics with a durable, safe and easy installation of individual components. Ceiling and wall panels that can be interlocked to eliminate many nuts, bolts and fasteners help assure owners, inspectors and mechanics that all fasteners provided are actually employed and secured. Cab wall and ceiling panels that have been designed to be strong, yet light enough to be handled by individual mechanics, help to minimize product damage and personal injury, while simultaneously improving speed of installation.

Summary

Bottom line, much goes into the safety considerations, design, manufacture and effective marketing of elevator cabs that most people never take the time to consider. For the most part, that’s as it should be. The riding public should be able to press a button and step into our product without a second thought or a single doubt about getting safely and comfortably to their destinations. Building owners and elevator professionals should be able to count on the ready availability of cost-efficient, state-of-the-art cab products to achieve their objectives. However, once in awhile, some appreciation for what it takes to accomplish this would make us smile. Rodney Dangerfield just might call it “Respect.”

Louis Blaiotta, Sr., founder and chairman of the board of Columbia Elevator Products Co., Inc., is a former member of NAESA International Advisory Board. He has been an active participant in ANSI/ASME A17 activities since 1963; he served on the Main, Hoistway and Code Coordinating Committees until 1995, when he was elected to a Lifetime Honorary Membership on the A17 Main Committee. Blaiotta is a charter member of the ASME/ QEI Committee, in addition to having served as the National Association of Elevator Contractors (NAEC) Chairman of Codes and Standards for the past two decades. He is a member of the International Association of Elevator Engineers (IAEE) and a former member of the National Fire Protection Association (NFPA). In 1991, he received the prestigious NAEC Distinguished Service Award for his technical and philanthropic contributions to the elevator industry.
INTERLOCKING PANELS: ELEVATOR REMODELING MADE EASY

by Jeff Day and Glenn Bostock

In the time it takes a trained installer to install a single panel of a typical elevator cab interior, you can install an entire wall of a cab interior. The secret is the Bostock Interlocking Panel (ILP) system (patent pending) – a high-quality interior that typically installs in a single day.

The ILP system runs horizontally, the bottom layer of paneling starts at the base of the cab wall and each successive layer stacks one on top of the next. There are no clips to install. The system is remarkably versatile. ILP interiors are available in plastic laminate, bronze, stainless steel, wood, Corian solid surface, glass, granite and marble. Because the panels are installed in layers, you can mix and match materials to create the interior that meets your customer's needs. A wood interior, for example, is elegant; a plastic laminate interior is durable. The ILP system allows for designs which combine durability with elegance – building durability into the lower sections of the cab and elegance into the less damage-prone upper sections.
In addition to versatility and speed of assembly, horizontal construction has other advantages. Handrail hardware and pad hooks come pre-installed on the paneling, eliminating the need for cumbersome onsite installation. Horizontal panels attach directly to the wall, and take up very little space, maximizing the space in your cab. Panels are easily removed for repair – most damage in elevator cabs tends to occur horizontally and is usually restricted to a single lower panel per wall in an ILP cab.

The system can be used to remodel an entire elevator cab interior; new ceilings can be included as part of the package. Bostock can also advise you on how to reclad elevator doors transoms and return walls.

Installation begins with a trim piece called a reveal. The reveal is a stainless-steel corner liner that runs floor to ceiling, finishing the narrow wall spaces not covered by paneling. The reveal pieces go up quickly with a combination of double-sided tape and construction adhesive. Each wall is made up of five or six layers. The toe kick, which is the first layer of paneling, goes in after the reveals are in place. It is four inches high and runs nearly corner to corner. Most customers prefer a durable stainless-steel laminated toe kick, although toe kicks are available in a variety of materials and finishes. Vents can be placed in toe kicks as needed.

The next layer of wall paneling is taller. It slides securely into place above the toe kick, covering the screws that hold the toe kick in place. The third layer of paneling comes with optional pre-installed handrail hardware. Customers can choose from several handrail options. Standard choices include 1 1/2-inch tubular or 3/8 x 2-inch flat stainless steel with satin or satin-bronze finish. Other handrail options are available upon request.

Practically no other building space gets as much close attention from the public as the elevator does. Here are a few things to keep in mind when planning to renovate your cab interior.

Color and tone are important elements in the cab interior. A dark color below the handrail helps hide scuff marks. A light color above the handrail makes the cab feel more open. A dark tone above the handrail can give the cab a feeling of warmth or provide an elegant look. If your elevator cab is particularly small, you may want to consider placing mirrors above the handrail on the rear wall or on all three walls, to create an illusion of more space.

Stronger mar-resistant surfaces are better suited for elevators in busy public buildings. Materials such as plastic laminate, glass, Corian, granite or marble are all good choices. Granite is harder and more resistant to stain than marble; Corian is a little less costly than stone. Plastic laminate is highly durable and the least expensive of all.

Plan for your ceiling and lighting needs. The ceiling and lighting level helps to determine whether an elevator feels cozy (low ceiling and/or low light) or spacious (high ceiling and/or bright light). A mirrored or a glossy black ceiling will create the illusion of greater space. Fluorescent lighting provides maximum light at minimum cost. Halogen lights adjust to meet the needs of the clientele. A retirement home might use maximum power to create a bright interior. A restaurant or hotel might want somewhat dimmer lighting to create a relaxing or elegant atmosphere.

If the elevator does even partial duty as a freight elevator, include removable wall pads and pad buttons or hang-ers as part of the design.

When it comes to the floor of the cab, work with a flooring professional. Check with your local codes to be sure that the new floor will not create a tripping hazard. If you choose to install carpet, buy extra, make a plywood template of the cab floor, then cut and install a new piece of carpet as part of your yearly maintenance.
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Since a passenger elevator often doubles as a temporary freight elevator, customers often choose to have pad hooks pre-installed on the top panel layer. Custom-fitted vinyl elevator pads can be ordered as part of the Bostock ILP remodeling package.

Ceilings

Elevator ceilings come in three styles: Frame, Modular Downlight and Island Downlight. All ceiling types hang from solid legs that bolt to the cab ceiling. A template is provided to layout the position of the holes that you’ll need to drill in order to install the ceiling. The Frame ceiling is made from 1/8-inch T Aluminum, welded together to form one of the sturdiest ceiling frames available. The grid typically divides the ceiling into six sections; each section containing either a translucent light-diffusing panel or an aluminum egg-crate-type diffuser. You can reuse existing fluorescent lights or install new ones.

The Island Downlight ceiling is Bostock ILP’s high-end ceiling, constructed of fire-rated plywood laminated with either plastic laminate or 18-gauge stainless steel (mirror or satin finish). It typically holds six dimmable halogen downlights.

The Modular Downlight is a cross between the Frame ceiling and the Island Downlight. Halogen downlights are mounted in square panels laminated with either plastic laminate, brushed aluminum or satin bronze-tone aluminum. These panels rest in an aluminum Frame ceiling grid. The halogen downlights come with a dimmer switch attached to the transformer. All of Bostock’s ceilings allow for quick and easy access to the elevator’s escape hatch.

Jeff Day and Glenn Bostock represent Bostock Co., Inc., Elevator Cab Remodeling Products.