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Objective-Driven Apparatus Specifications

A lack of input from management and end users regarding a new apparatus' "absolutes" is a recipe for disaster.

by Greg Stone

Above: Specifications for new rigs are best developed when input from the members who operate on the vehicle is shared with the person who will write the specs.
PHOTO BY GLEN E. ELLMAN

When fire departments purchase apparatus, they must develop a specification that becomes the document that apparatus manufacturers use as a guide to price and build the rig. Some departments choose to write a specification from scratch; some departments rely on a sales representative to write the specification; and some departments use a combination of the two. Whatever method that a department chooses to prepare the specification, groundwork must be accomplished to guide the specification writer. I call this groundwork the *preparation of objectives*. In other words, what are the "absolutes" that drive

the preparation of the specification? The objectives aren't meant to be specific or detailed but to provide the specification writer with the department's desires so that person(s) can do the research to include the "absolutes" in the specification.

Who creates these objectives? The effort should be a collaboration between management and committee members who represent the end users so that the needs of the department and the needs of the end users are met. Little or no input from either management or the end users most likely results in an unsuccessful end product.

How do you start to develop these objectives? The following are eight simple questions that one can ask.



This department recognized a need for splatter shields (arrow) around the universal joints on their apparatus. An objective was written to direct the specification writer to add splatter shields around the universal joints.
PHOTO BY GREG STONE

Budget

What is the budget? Whatever that number is, when applicable, be sure that it includes the sales tax, vehicle registration fees, and any other federal, state and local fees that might be applicable. The trick here is to ensure that the proposed budget allows for the purchase of an apparatus that meets the department's needs.

Looking at recent similar purchases in your area might be a good place to start when researching the cost of a new fire apparatus. However, one must consider how long ago the contract for those purchases was signed. Delivery times have extended from 12–18 months just a few years ago to 24–30 months currently. Inflation over that period of time caused multiple price increases for most manufacturers. So, a fire apparatus that was delivered just a few months ago probably had a contract signed approximately 24 months ago, and the price of that vehicle when the contract was signed might not reflect the price increases that were imposed since then.

Sale representatives can be a good resource for this information, too. However, it must be understood that a sales representative doesn't have a detailed specification at this point. Therefore, the price must be considered as only a raw estimate.

Success and failure

What works currently and what doesn't? Evaluate the apparatus that's being replaced to consider

Are there any components that would be a benefit if they are common with the department's fleet or that have parts availability close by?

what works and what doesn't. A detailed analysis of the vehicle that's being replaced should include its mechanical workings, its functional capabilities and its equipment-carrying capabilities.

Often, the mechanical workings of the vehicle (or lack thereof) bring about a need for a solution to a problem. For example, if the vehicle that's being replaced had suspension issues that were related to lack of lubrication, an objective that requests the need for an automatic chassis lubrication system could be added. That would inform the specification writer to add a detailed section on automatic chassis lubrication to the specification.

When reviewing the functional capabilities of the current vehicle, it might be determined, for example, that it can maneuver easily around a district that has hilly streets and tight turns. An objective that requests that the maximum wheelbase and turning radius don't exceed the current vehicle's characteristics would be required.

Evaluating the current compartment layout to determine whether it's operationally functional could lead to a complete redesign of the new apparatus' compartment layout. For instance, full-depth upper compartments (rescue side compartments) might be needed to carry an ever-increasing tool load. Always remember that there's give and take when it comes to modifying compartment configurations. As an example, when adding rescue side compartments to a rig, there's a loss of approximately 12 inches on each side to the rear hosebed, which will, in turn, cause the hose load to be taller.

Future needs

What's lacking on the current apparatus that will be needed in the future? Future needs of the department might dictate the addition of specialized equipment, such as hydraulic rescue tools, in which case the person who creates the objectives should add the specifics of the new equipment.

Common components

Are there any components that would be a benefit if they are common with the department's fleet or that



have parts availability close by? This probably is more of an issue to be considered by a department that has a large fleet. However, smaller fleets also can benefit because of operator familiarity, familiarity for repair technicians, increased parts availability and potential warranty service availability. For example, a department used Brand X's fire pumps in its pumping apparatus for years. All of the operators and service technicians are familiar with them. Unless there's a justified need, moving away from Brand X pumps creates training issues for the operators and the technicians and possibly creates a need for a new parts supplier. One must carefully consider making component changes that require training and must understand that there must be a commitment to training the operators on the new components.

One large department (dozens of pumpers) decided to move to pressure governors from pressure relief valves. The department installed some governors on some current vehicles to test, with positive results. When new vehicles that had governors were delivered, the rigs were a total failure, mainly because the operators were unfamiliar with the governors and no adequate training was provided when the vehicles were put in service.

Minimum performance

What are the minimum performance requirements? If, for example, the fire district's topography is extremely hilly, the speed requirements on specific

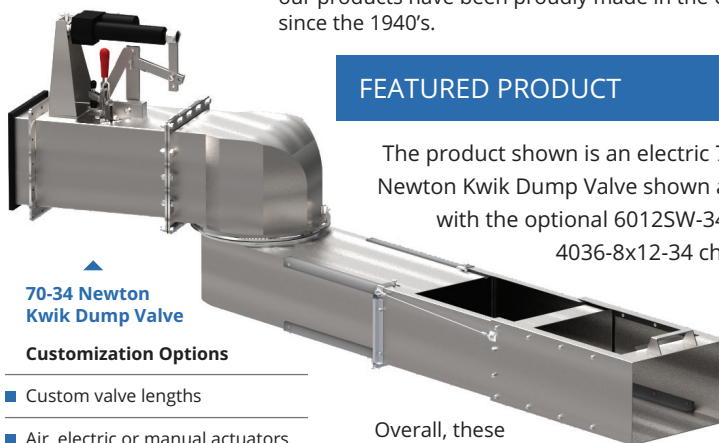
grades should be articulated, so those requirements are included in the performance standards that are in the specification. This is important, because the performance standards might dictate the engine and drive-train components that the manufacturer would include to meet this performance criteria. As well, parking on

This department observed ground clearance issues with the latest purchase (left). It asked for heavier-duty radiator protection on its new apparatus (right).



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One can visualize the effects that compartments have on hosebeds. Shown here: the conventional compartments (top), rescue compartments on one side (center) and rescue compartments on both sides (bottom).

PHOTOS BY JEFFREY D. GASKIN

a grade that's greater than 20 percent might require a front-wheel parking brake (highly recommended).

Safety features

Are there safety features that can be added to the apparatus? All manufacturers offer safety restraint systems, air bags, roll-over protection and Clean Cab options. Studies indicate that these systems provide an additional layer of protection for the occupants—at additional cost, of course.

As a precaution, be mindful of the manufacturer of the restraint system. Some of those companies offer their own proprietary systems, in which case your department might have to rely on them for repairs after the warranty period expires. Another choice would be to specify a restraint system that's manufactured by an independent company that would offer the benefits of parts availability and repairs at a potential reduced cost.

On-board tools

What equipment is to be carried? A complete list of equipment that's to be carried on the vehicle must be included with the specification. This is important to the manufacturer, because the weight of this equipment could cause the need for increased brake capability, increased axle and spring ratings, and tires that have increased load ratings. Should items be added at a later date, the load capacity of the vehicle could be exceeded, thus setting up the department for legal liability if the vehicle is involved in an accident.

Warranty

Was the warranty service on the vehicle that's being replaced adequate? All new vehicles come with a manufacturer's warranty. Warranty language that's written by the manufacturer is legal jargon that most laypeople rarely understand. Most apparatus committee members don't do enough research into the warranty language in the purchasing contract. I strongly suggest that one of the objectives that's handed to the specification writer should be to add more detail to the warranty requirements. I don't recommend that the specification writer use a manufacturer's language, because each manufacturer has slightly different warranty coverages.

For instance, some departments don't have the luxury of having a warranty service center in close proximity to their stations. What is the acceptable distance that the department is willing to travel to get a vehicle repaired? A requirement that the manufacturer is responsible for the transportation of the vehicle to the service facility could be included in the specification. That said, some manufacturers might agree to this, and some might not. However, putting it

A detailed analysis of the vehicle that's being replaced should include its mechanical workings, its functional capabilities and its equipment-carrying capabilities.

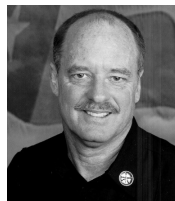
into the specification makes it clear what the department wants, and the manufacturer that bids on the project can take exception to this if it so desires, in which case the apparatus committee can evaluate the exception to see whether it wants to accept it.

Details

Once objectives are developed, they should be shared with the specification writer, so the objectives can be further detailed and articulated in the specification. The specification is where the technical details should be spelled out clearly. For example,

the objective for the use of a Brand X pump would be added to the specifications, and much more detail regarding the components of the pump, the intake and discharge ports, and all of the desired options would be included.

Preparing specifications and purchasing apparatus are major undertakings that should be done in an orderly fashion and with an educated decision-making process. Creating objectives that clearly define the needs of the department greatly assists the specification writer with the preparation of the specifications. ■



FOR MORE APPARATUS: firehouse.com/apparatus

GREG STONE is a retired 33-year veteran of the Los Angeles Fire Department. His assignments with the department included apparatus and equipment purchasing responsibilities. Additionally, Stone has 25 years of apparatus purchasing experience assisting other departments with their purchasing needs.

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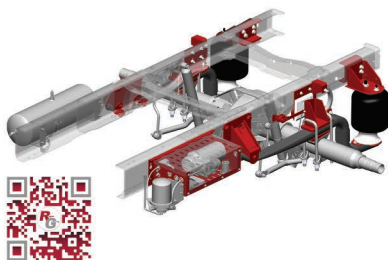


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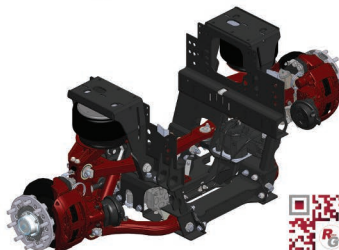
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Specifying a New Apparatus Don't Waste Money on Unnecessary Items



PHOTOS BY JEFFREY D. GASKIN

Apparatus committees for fire agencies, particularly volunteer departments, are obligated to base their specifications on response data and to scrutinize the costs of the “best” options that are available from manufacturers and suppliers.

by Jeffrey D. Gaskin

Consider this: An apparatus committee convenes for the first of what will be numerous meetings to assemble specifications for a new apparatus. It was made clear to the committee that costs for new apparatus are at an all-time high and that the committee members absolutely must keep the cost of the department's new apparatus as reasonable as possible. Historically, the volunteer side of the fire service has more flexibility when it comes to the matter of budgeting. However, with the cost for funding public safety these days, that's situation is changing. This isn't an easy directive to follow, given the complexity of today's apparatus. How does an apparatus committee accomplish this task?

Multiple considerations

It often is at least 15–20 years that passed since a piece of apparatus that's to be replaced was put into service at a department. In what ways have the various aspects of the fire protection district changed over those couple of decades?



This apparatus that has been in service for two years was upfitted with a second alternator, and its original alternator was replaced. Remember low-draw LED (light-emitting diode) lights? When a large number of such lights are combined with high-lumen-output 12-volt scene lighting, the draw on the electrical system isn't low anymore. When this apparatus sits at idle with its response lights and 12-volt scene lighting activated, it draws 341.7 amps. Members of apparatus committees must keep in mind that the best alternators that are on the market produce about 180 amps at idle. In such a case as this one, the rest of the amps come from the vehicle's batteries.

Don't downplay the importance of the answer to this question. Districts change over such a period of time, sometimes more than apparatus committee members realize.

Next, move to the apparatus that's being replaced. My recommendation is that all of the members of the committee do this on their own, because each of them will have different answers to questions.

- What on the apparatus works and what doesn't for the department's current operations?
- What functions/features/components must be carried forward to the new apparatus?
- What functions/features/components shouldn't be carried forward to the new apparatus?
- What is lacking on the current apparatus that must be incorporated into the new apparatus?

Be brutally honest going through these steps. The answers to all of these questions are going to have a big effect on developing a specification that serves the needs of the protection district today and throughout the life of the vehicle.

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There are times when it's appropriate to consider the reasons to hold on to some department traditions, but planning the functional and operational aspects of new apparatus isn't one of those times.

This lightbar that was custom-built to a large department's specifications is a popular choice for other departments only because of who it's associated with. It cost \$7,984 eight months ago. Apparatus committee members must scrutinize whether specifying a component would be money well-spent. Note the scene lights on the roof's perimeter and pay particular attention to the information that's included with the photograph of the electrical meter that's on the previous page.

Stay focused

Multiple apparatus salespeople/representatives will (or should) visit to discuss their company's products and offerings. These meetings can be a valuable source of information. Exploit that.

Two different classifications of items will become apparent quickly: needs and wants. Needs are features and components that should be included in the apparatus. Wants are things that somebody desires but have little value operationally and add to the overall cost of the vehicle. Some committee members will pitch their wants as "needs."

How do apparatus committee members navigate through this process successfully? Understand your responsibilities. From the sales side, this is a business. Make no mistake about that. Salespeople are friendly, engaging and knowledgeable about their product, as it should be. However, their responsibilities and loyalties are to their dealership, also as it should be. The members of the apparatus committee must remember that they also are in a business transaction and, therefore, must maintain a professional relationship with all of the people who are involved from the beginning of the process to its end. That said, the committee is spending taxpayer dollars and, therefore, is involved in a legal process that has protocols and procedures that are detailed in state, county and local procurement laws.

Staying on point is difficult. As they move through the specification development process, apparatus committee members can do several things to ensure that their department gets the apparatus that serves its needs and to assist in keeping costs from running away. Keep in mind that every decision that the apparatus committee makes and every line that its members put into a specification have a cost associated with them. Furthermore, every decision can create a domino effect on other factors.

Looking back on budgeting, municipalities that are served by volunteer departments tend to be more

lenient on their department than municipalities that are served by career departments are on theirs, but that creates challenges. Below are the most common ones that I encounter. Although volunteer departments certainly don't have the market cornered on these items, experience has taught me that these challenges are more prevalent with volunteer departments and can affect the cost of new apparatus significantly.

'That's what it's always been'

This viewpoint isn't limited to any one aspect of a piece of apparatus, and it's something that many apparatus committees seem to latch onto.

There are times when it's appropriate to consider the reasons to hold on to some department traditions, but planning the functional and operational aspects of new apparatus isn't one of those times.

What the department protects, how many members turn out to respond, how and on what the members train, and the amount and types of responses all change. Along with those changes are the changes in and capabilities of apparatus. Is a two-stage fire pump being specified because the department always had one? The department might not need one with today's single-stage pumps and diesel motors. Two-stage pumps are more expensive than a single-stage version. Further, two-stage pumps have more internal moving parts and require more maintenance, and pump operators need a higher level of training. So, not only does the specification of a two-stage pump cost more initially, it costs more every year that a department owns that pumper. Extrapolate that mindset over the entire vehicle.

Mutual aid

It isn't an apparatus committee's responsibility to design and equip new apparatus or to spend taxpayer dollars to protect another community. The committee's responsibility is to design and specify apparatus for its department's protection area. That said, this changes when a signed intermunicipal agreement for shared services is in place.



Apparatus and their capabilities change regularly. Those changes can be beneficial to some but not to others in the big picture. For example, does your department really need 11 discharges?

What if ...?

An apparatus committee can “what if” itself into countless situations, and this has cost many fire departments lots of money, with no real return on investment and plenty of headaches.

You must understand and accept that a department never can prepare for every incident that it will encounter.

Along those lines, if an incident is unusually large and/or complex, one piece of apparatus probably won’t make a difference operationally or in the outcome.

Say an apparatus committee insists on a Type B foam system that delivers 3 percent concentration at 1,000 gpm. Why? “We have a tire wholesaler who has a warehouse in town that’s stacked floor-to-ceiling with tires.” Getting past the fact that tires are a Class A fire, the committee offers up a second reason: “The train yard has a diesel repair shop on the property.”

OK, but does the railroad have a Type B foam on the property for the department’s use? “No, we asked them to do that, but they refused.”

The “what ifs” could go on for pages and include stories about hugely oversize electric generators that are used to power certain buildings in a power failure. There might be more foam stories and discussion about complex HRT systems on heavy rescues and items on tool lists that are questionable. All of this doesn’t address the operational challenges.

What’s more, the department relies on its county’s training center to supply the additional foam for “what if” scenarios. It takes 60–90 minutes to reach a scene, and they can make foam at maximum flow for 2 minutes and 20 seconds.

Be realistic about what’s requested on apparatus and whether it can be supported operationally. Unless all of the secondary requirements that are needed for the “what if” scenario to be successfully

Looking back on budgeting, municipalities that are served by volunteer departments tend to be more lenient on their department than municipalities that are served by career departments are on theirs, but that creates some challenges.

managed and mitigated are considered and planned, putting a “what if” into operation and supporting that operation until the completion of the incident probably won’t be possible.

Three areas of lighting

Operational lighting (headlights, turn signals, marker lights, cab interior lights and all other Department of Transportation (DOT)-required lighting) is the first area of apparatus lighting. As the purchaser, a department has options as to the make and model of different fixtures as long as they meet DOT requirements.

More time and energy is spent on the second area of apparatus lighting—emergency lights—than on any other part of the apparatus.

Is a \$ 7,000 light bar needed? Backed up by two minibars over the cab crew doors?

How many lights must be on each side of the apparatus? Is the back of the apparatus so well-lit that drivers who arrive after the new apparatus is on scene are blinded?

Educate yourself. Take the lighting supplier catalogs away from members or members who want everything that’s in the book.

The third area of apparatus lighting is scene lighting. It has improved in the past several years and took a giant leap with LED lights.

Do product research. Several lighting manufacturers make excellent products that are competitively priced and are backed by good warranty programs.

Recently, I compared two competitors’ models of a particular 12-volt scene light. There was about a 1,600-lumen difference between the two fixtures. The level of output of the fixtures was negligible. What wasn’t negligible was the \$1,800 per fixture price difference between the least expensive and most expensive

fixture. Specify two of the more expensive fixtures on each side of a vehicle and two on the back and a committee costs its department \$10,800.

Trends in apparatus

The blackout package has been one of the biggest trends over the past few years. Put another way, it’s a fad, and fads fade. In addition, like so many other decisions, specifying a blackout package might have unintended consequences. A blackout package weighs about 0.75 lbs./sq. ft. when applied at a thickness of ⅛ inch.

Bigger isn’t always better

Does the department need that 15-liter motor on the new apparatus? It might for certain applications in the fire service, but those applications are more exceptions than the rule.

That 15-liter motor weighs about 1,000 lbs. more than its 12-liter cousin. That’s a big load difference on the front axle of the apparatus.

Is the 8- or 10-man cab still being considered despite the fact that it rarely, if ever, is full?

Each of the considerations that are noted above are expensive. Furthermore, any one of them could push a specification into heavier axles, bigger brakes and bigger tires because of the weight that’s added to the vehicle. Besides adding even more to the cost of the apparatus, the additional weight can change the way that the vehicle drives.

In the know

Review the department’s responses over the past 20 years, so the types and quantities of calls are known. Specify and build to what’s needed to serve and support the department’s operations. ■



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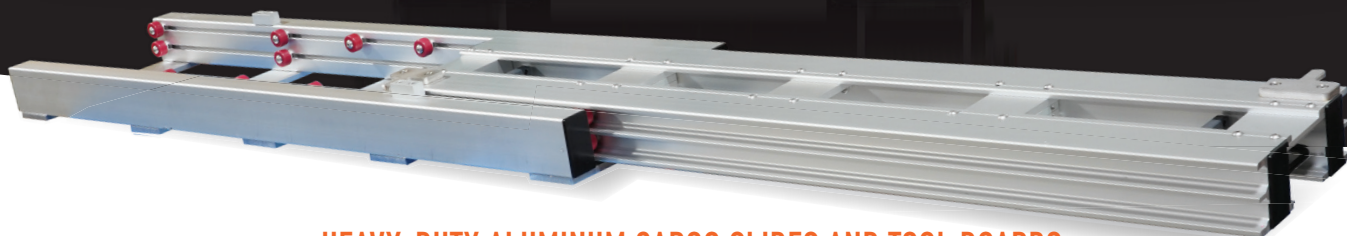
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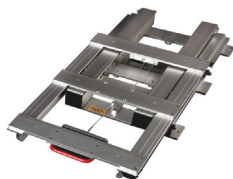
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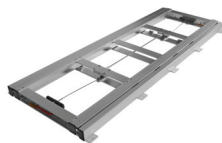
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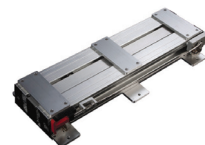
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Apparatus Cab Design and Layout

The capability of cab construction to accommodate storage for EMS equipment, rescue gear, tools, etc., and to remove obstructions to an operator's vision never has been better.

by Mark Miller

Fire department apparatus committee members and fire apparatus manufacturers alike have made great strides over recent years in taking full advantage of the space that's within the cab of custom fire apparatus. Whether an organization practices a Clean Cab concept or a "Cleaner Cab concept," there's significant space for both fire and EMS equipment that can enhance the operational effectiveness of the fire company greatly. Furthermore, interior cab specification items that the apparatus committee can identify can allow for the future addition of equipment that requires proper mounting and/or charging ports.

EMS compartments

Storage compartments for EMS equipment are, perhaps, the most common in-cab compartments that are added to fire apparatus. This simply is because most staffed fire apparatus respond to more EMS incidents than to fire incidents.

Mounting options for these compartments are on the standard rear-facing seat riser or the forward-facing rear seat riser.

The apparatus committee must determine which layout, or combination thereof, best will fit the equipment that the department plans to carry. This includes compartment dimensions, shelving requirements,

Compartments that are located in the cab extension are a good utilization of space that's otherwise unused.

PHOTOS BY MARK MILLER

12- and 120-volt power, and door type. Another question to ask: Is exterior access required for the compartment via the sidewall of the apparatus.

Most apparatus are staffed with cross-trained firefighter/paramedics. This allows for the most efficient EMS deployment model because of the strategic location of fire stations within communities. With this level of prehospital care comes an extraordinary amount of essential equipment that must not only be carried but secured. The apparatus committee must take great care to ensure that the compartment dimensions can accommodate all of the equipment that's required. Door options include netting, roll-up doors, Lexan, aluminum plate and simple straps. Security of ALS medications as well as temperature regulation must be taken into account.

Exterior door access into the EMS compartment on the rear-facing seat riser is an extremely popular option these days. It's more commonly located on the officer's side of the unit.

Compartments that are in the cab extension that transverses under the forward-facing rear seat riser also are commonplace. These compartments either can include roll-up or traditional pan doors. Either way, these doors should be lockable if a medications bag is stored within the compartment. If the apparatus is equipped with electronic door locks, doors can be programmed into the system.

Overhead compartments

Overhead storage compartments can be built into the raised roof of apparatus and can be forward- and rear-facing. These compartments are more common on heavy rescue and squad companies, but they can play a vital role in basic engine companies as well to increase valuable storage space.

Specification of overhead compartments by the apparatus committee is similar to specification of EMS compartments. However, often, the equipment that's stored in these areas is different.

We regularly see storage of ice and swift-water rescue gear in these compartments for rapid deployment at time-sensitive incidents. Meter banks for hazmat incidents usually are kept in these locations, too.

Again, electrical requirements for, in this case, charging meter banks must be taken into consideration by the apparatus committee.

Shelving and horizontal dividers also are options.

Lastly, the door options for these compartments include horizontally hinged Lexan, netting, aluminum plate and sliding Lexan doors.

If the apparatus is equipped with electronic door locks, doors can be programmed into the system.



Overhead storage compartments and EMS compartments are considered "bolt-on" options. With the price of purchasing new fire apparatus today, these items might need to be added later as additional funding becomes available. (Departments also might wish to add these compartments to older apparatus or to apparatus for which the mission of the unit changed. Most of these items can be fabricated locally and easily installed for a nominal cost.)

Tools

Interior tool mounting is another area of concern for the apparatus committee. Often, equipment that's specific to a company's seat-riding assignment is mounted. This includes hooks, irons, water cans, box lights, TICs and search ropes.

Tool mounting locations include the back of the engine house, the side of EMS compartments, doors, doorsteps and rear cab walls and in the cab extension on the exterior. Any equipment that's in the cab must be mounted with approved hardware and brackets that meet rollover requirements.

A standard size EMS compartment is mounted on the rear seat riser. The roll-up door is lockable.

With the multiplexed generation of fire apparatus, you don't want personnel getting into the chassis wiring system if at all possible.



The doors of exterior cab compartments that provide direct access to the EMS compartment on the rear seat riser in the cab should be equipped with locks if possible.

Mounting plates for engine houses are another good way to ensure that equipment is secured properly. Often, these plates are constructed out of ¼-inch aluminum plate.

Other mounting systems, such as tool boards and peg boards, also are good ways to secure equipment and to allow for future addition of equipment on vertical surfaces.

When aluminum plate is used in the engine house, it's recommended that it be mounted on a ½-inch riser, so the bottom side can be used as a wire chase. The aluminum plate is a premium location to mount map boxes, TICs, light boxes and portable batteries. Another advantage of the mounting plate: When the layout is changed over the life of a vehicle, drilling directly into the engine house isn't necessary. This can prevent costly errors down the road.

Power

In-cab electricity (12- or 120-volt) should be provided for the current and future needs of the apparatus that's being designed. Members of the apparatus

committee should specify whether outlets are "battery hot" or "ignition hot" and the location of each.

Also, if shoreline power is required, it must be identified by the committee in the written specification.

Cigarette lighter plugs and USB outlets are common locations for 12-volt outlets to be installed.

All of these outlets should be marine grade.

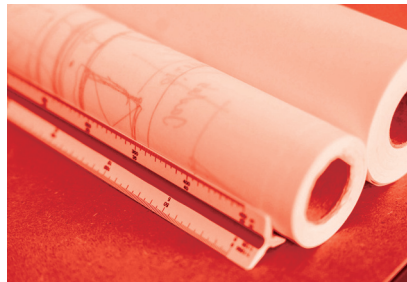
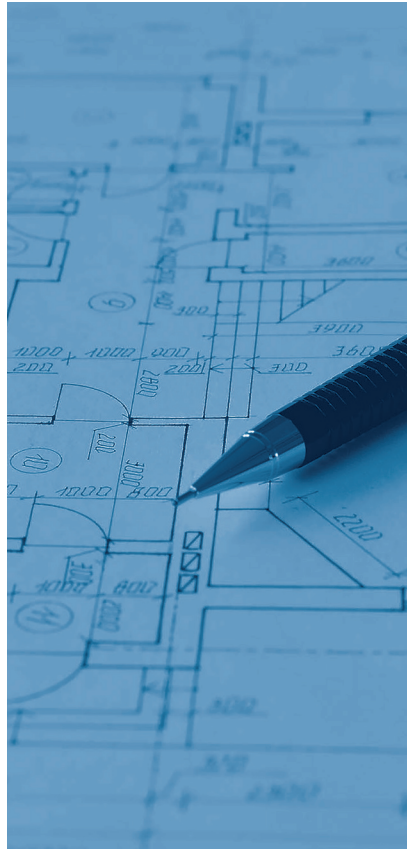
MDTs and radios

Mobile data terminals (MDT) and mobile radios are another area of concern for the apparatus committee in addressing apparatus cab design. It's important that the MDT and mobile radio(s) be mounted so as not to obstruct the operator's view of the officer's side mirror.

Putting the MDT on a slide-out tray can help to bring the unit off of the dash and closer to the officer.

Other items that can be mounted in these locations include mobile radios, arrow stick controllers, Knox Box systems, preemption systems, headset controllers and AM/FM stereos.

Power requirements also must be carefully considered for these units as well as any accessories, such



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Specification of overhead compartments by the apparatus committee is similar to specification of EMS compartments.

as GPS. Each requires its own 12-volt power supply. Note: Cowl-mounting the officer's side mirror also can help with the operator's view of the mirror.

Electrical components

I'm a proponent of allocating for future growth in apparatus design. This not only includes space but electrical components, too. With the multiplexed generation of fire apparatus, you don't want personnel getting into the chassis wiring system if at all possible. Specifying 12-volt marine-grade power panels at various locations on the apparatus can keep this from happening. This allows for future additions without getting into the main wiring of the apparatus down the road. Additional radio power

studs in the dash are another good idea and allow for future electrical growth for radio components. We often specify one being "ignition hot" and the other "battery hot" for versatility.

Vehicle lifetime

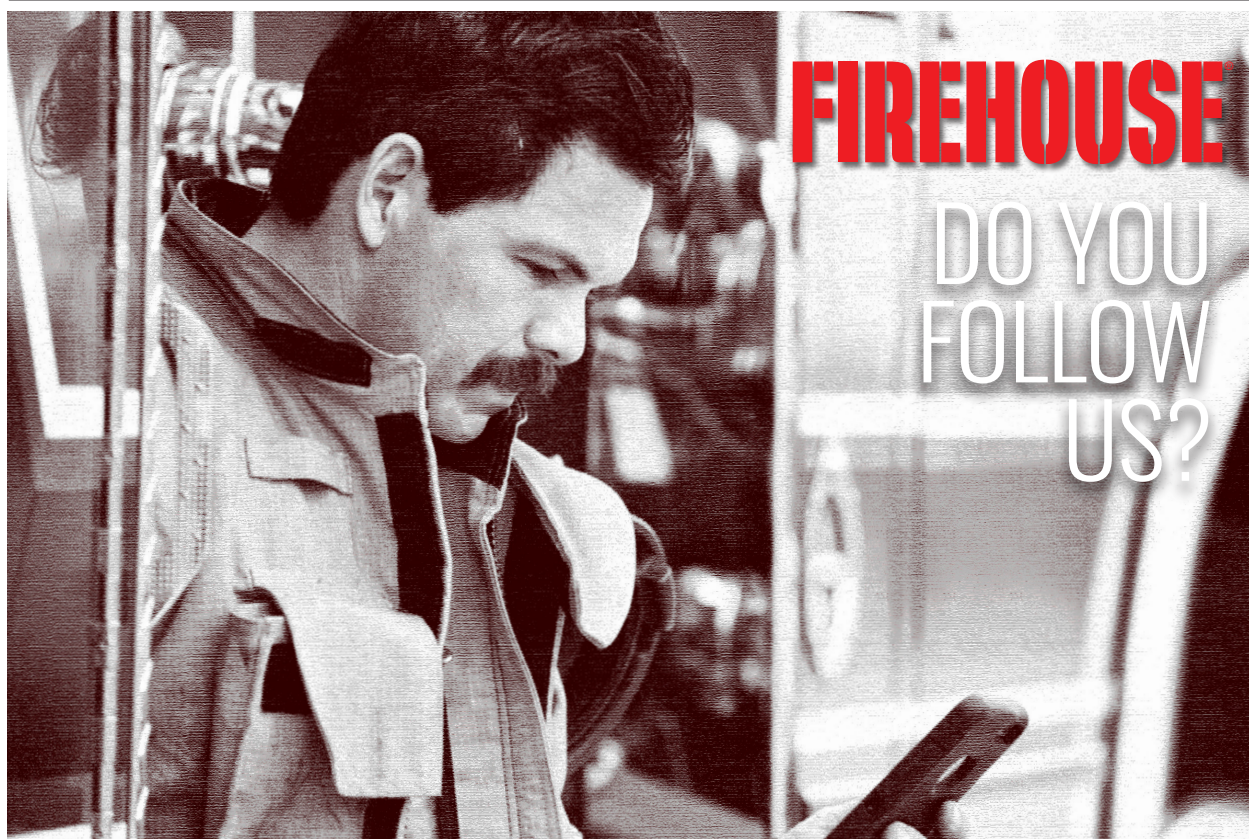
Spending time at the initial stages of the specification process by the apparatus committee can allow a significant amount of customization to the interior cab at a relatively low cost. This is the case for storage of valuable fire and EMS equipment that can be safely stored or mounted. Additionally, smart dash layouts and electrical components allow for better operator visibility and modifications over the life of the unit without getting into the onboard chassis wiring. ■



FOR MORE APPARATUS: firehouse.com/apparatus

MARK MILLER is a 26-year veteran of the fire service and currently is a deputy fire chief in Southwest Ohio. He holds a master's degree in public safety administration, the Executive Fire Officer designation from the National Fire Academy and the Chief Fire Officer designation through the Center for Public Safety Excellence. Miller routinely speaks on fire apparatus positioning on the fireground and conducting an apparatus needs analysis.

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