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YEARS

KEEPING THE ENGINES RUNNING

EXAMINING THE SPECIAL CONSIDERATIONS OF CONSTRUCTING FLEET FACILITIES

INTRODUCTION

To keep a city and county operating smoothly requires a well-maintained fleet of service vehicles. From law enforcement vehicles and fire apparatuses to work trucks and buses, the wheels of civilization are lubricated in fleet facilities by full-time mechanics and technicians. To ensure these diverse fleets can achieve their maximum utility, their fleet facilities must incorporate specialized equipment, specialized planning, and an overall commitment to building something that lasts decades under heavy use. The following paper explores these elements and how they should be approached.

BEYOND CONCRETE, STEEL, AND GLASS

In many ways, modern best practice for commercial and civic construction looks the same across any industry. For the most part, it begins with a steel reinforced concrete foundation, steel reinforced concrete load-bearing structures, glass windows to the outside world, and an assortment of plumbing and electrical lines traversing a network of concealed pathways behind drywall, plywood, or cement board. By and large, most structures look similar during construction until their finishes begin to be added. But fleet facilities deviate from this norm in myriad ways due to their highly specialized use, much of which requires dramatically different approaches to construction.

VEHICLE LIFTS

Vehicle lifts are the cornerstone of any properly outfitted mechanic bay. A lift allows a technician to access areas underneath a vehicle that would otherwise be difficult or impossible to reach. Two-post lifts are the most common in everyday auto repair shops and fleet facilities, prized for their adaptability and ease of maintenance. In addition, outside of the need for using a high-PSI concrete for the foundation, installation of these lifts is relatively simple.



Larger lifts for transit and public safety vehicles pose an altogether different set of challenges. “These aren’t your typical lifts at your mechanic shop that are wheeled into place and bolted to the floor,” says Brett Raymaker, Vice President of Willis Smith Construction, Inc.

Buses and fire apparatuses can weigh upwards of 30 tons, with wheelbases that can reach approximately 40 feet.¹ Their size and weight require the installation of not one, but two lifts. Typically, one lift is for the front axle and one is for the rear. In addition, one of the lifts is stationary while the other is adjustable depending on the desired wheelbase, meaning heavy vehicles ranging from buses to ambulances can be accommodated.

The foundation for these heavy-duty lifts is itself a delicate process that requires meticulous attention to sequencing. High pressure concrete is poured as much as 12 feet deep to support the extreme forces generated by the lifts when in use. That process includes careful coordination with on-site concrete subcontractors to ensure the foundation achieves its maximum strength once it’s cured. In addition, the inclusion of a crawlspace beneath the lift creates more convenience for technicians but requires another layer of planning, particularly in Southwest Florida where the water table can be as little as 4 feet beneath the surface depending on how close the site is to the coastline or an inland waterway.

“You spend a lot of time speaking with the ownership group about the kinds of vehicles they’ll be serving,” says Nathan Carr, Vice President of Willis Smith Construction, Inc. “And you don’t just want to know what vehicles they have now, but what they’ll be purchasing in the future.” With buses in particular, some important questions must be addressed. Are they front engine or rear engine? Will both school buses and public transit buses be serviced? Will the service bays be drive-through or one-way?

These questions helped the Manatee County Area Transit (MCAT) ownership group make decisions for their 116,000-sq-ft. facility. The MCAT system serves nearly 2 million passengers a year but was still operating out of its undersized maintenance facility built in 1961.² The new facility features five drive-through bays that allow a variety of vehicles in their bus fleet to be serviced efficiently thanks to the careful installation of the heavy-duty lifts, which are rated for 62,400 pounds.

SPECIALIZED DISPENSATION SYSTEMS

As anyone who has ever opened the hood of a vehicle knows, the average engine bay includes a maze of tubes and fittings for a variety of fluids, including refrigerant, coolant/antifreeze, steering fluid, transmission fluid, motor oil, and others. Each fluid and its accompanying pipes and fittings all have their own unique specifications for pressure, volume, temperature, and chemical composition. For a fleet maintenance facility, each of these complex systems extend beyond the engine bay and into the building itself, where various dispensation systems must be routed to different bays for easy access by mechanics and technicians.

1. Emergency Vehicle Size and Weight Guide, Fire Apparatus Manufacturers’ Association, https://www.fama.org/wp-content/uploads/2017/12/1514564588_5a466bec19c41.pdf
2. MCAT opens new facility, Your Observer, Pam Eubanks, <https://www.yourobservers.com/news/2016/dec/05/mcat-opens-new-fleet-facility/>

“The most technical and difficult aspect of installing these systems are the joints and fittings,” says Carr, “so it’s important to make sure you’re procuring exactly the right materials and getting the right subcontractor who specializes in automotive repair systems. It’s not a job for just any pipe fitter.”



Often, it even means finding different subcontractors for different dispensation systems. Is the system utilizing soft annealed seamless carbon steel hydraulic tubing? What’s the tube’s HRB rating on the Rockwell hardness scale? How long does the hose reel at the lift bay need to be? What is the maximum working pressure for the fluid being dispensed?

These technical considerations were navigated during the design and construction phases of the Sarasota County Sheriff Tom Knight Fleet Facility. Law enforcement vehicles are frequently driven to the limits of their capabilities, which sees the vehicles undergo frequent maintenance and repairs for safe operation. In addition, “fleet usage is often mission-critical and the costs of unpredictable performance associated with high-mileage vehicles” can be the difference between life and death for members of the community.³ To ensure little to no interruption in an agency’s ability to fulfill its public safety duties, these vehicles must be able to have their fluids topped off or changed more often than civilian vehicles. With the right dispensation systems in place, police cruisers can reliably get back on the road and reach their ideal lifespan.

FUELING DEPOTS

By far the most complex piece of the fleet facility puzzle is the fuel depot. For a construction firm, a fuel depot requires as much attention to the foundation as the heavy-duty lifts and as much technical knowledge as the dispensation systems. Fuel type, ingress and egress of vehicles, tank size, and fuel management systems are all variables in the complex calculus of designing and constructing fuel depots.



One of the first challenges is deciding between above ground storage tanks (AST) or underground storage tanks (UST), as each style of tank has its pros and cons.

Above ground tanks are typically less expensive to install because they do not require expensive excavation. The accessibility of above ground tanks makes them easier to assess for damage and wear, and thus easier to repair or maintain.⁴ Additionally, above ground tanks can also be moved more easily, and in some cases can have high mobility specifically incorporated into their installation. The cons of above ground tanks are mostly centered on their exposure, which makes them more susceptible to damage from storms, humidity, extreme temperature fluctuations, or, in rare cases, vandalism.

Underground tanks are typically more expensive to install due to the extensive excavation required, not to mention their more wide-ranging permitting considerations. Unlike an above ground tank, a properly

3. Replacement Mileage Creeping Up for Public Safety Agencies, Government Fleet Magazine, Mike Scott, <https://www.government-fleet.com/145550/replacement-mileage-creeping-up-for-public-safety-agencies>

4. Storing Diesel Fuel for Generators—Above Ground or Underground Tanks?, Worldwide Power Products, <https://www.wpowerproducts.com/news/above-ground-vs-underground-storage-tanks/>

installed underground tank is less likely to incur damage from weather or human intervention. Its placement underground also means that the fuel stored within it is more likely to reach its maximum shelf life, which can be dramatically shortened by exposure to water, heat, and air, especially the diesel fuels used in larger fleet vehicles such as fire apparatuses and buses. In terms of space and aesthetics, an underground tank has a smaller visual footprint than an above ground tank and also frees up space if the size of the site is limited.

Another wrinkle in the construction of fuel depots is the extensive environmental and safety regulations overseen by agencies like the Environmental Protection Agency (EPA). These regulations dictate how many tanks can be installed, how far apart they must be, and establish a high benchmark for leak and contamination prevention. “Depending on the specific project and how it is funded, an ownership group can be looking at 26 provisions for quality control on top of local or state regulations,” says Carr.

Though internal combustion technology has been around since the late 19th century, technology around fuel management has advanced such that remote sensing and automated usage tracking can now be incorporated. Identifying a fuel management system such as the FuelMaster system, for example, requires an understanding of a complex assortment of sensors and fittings that allow personnel to track how much fuel is being used, who is using the fuel, and how much fuel must be ordered for or diverted to different fleets. With this highly specified data, city and/or county operations personnel are better able to make decisions that reduce costs, reduce refueling times, and even automate certain processes.

“The newer systems are fantastic, but installing them on an entire fleet of vehicles is a logistics challenge,” says Nathan Carr, Vice President of Willis Smith Construction and the lead on their Matzke facility in Manatee County.

The sensor on the tank has a corresponding sensor on each vehicle that allows for fuel usage and flow to be measured. The vehicle sensors take approximately 90 minutes to install depending on whether or not it requires additional couplings or retrofitted parts. Installing these sensors on a bus is relatively simple to do because buses have a set operating schedule and always return to the fleet facility at the end of their shift. But for fleet vehicles that are parked away from the facility or are more frequently out in the field, installation of the sensors requires careful scheduling and communication. “You’re often coordinating dozens of vehicles from different departments and different locations,” says Carr, “but it’s important that when the system goes online, everyone is ready to use it.”





CONCLUSION

Fleet facilities are a cornerstone of a well-functioning city or county. Whether it's fire apparatuses, transit vehicles, school buses, or police cruisers, the safety, security, and comfort of a community depend upon these facilities. While they share many basic traits with other building types, the inclusion of lifts, fluid and air dispensation systems, and fuel depots makes construction of a fleet facility a much more complex project that requires expertise, collaboration, careful planning, and regulatory knowledge as city and county governments seek to keep the engines running.

ABOUT WILLIS SMITH CONSTRUCTION

Willis A. Smith Construction, Inc. is a privately held construction management firm based in Sarasota, Florida. Since 1972, we have provided expert commercial builder services in the state's Southwest region. Our full-service construction and construction management capabilities are customized to address each project's specific requirements at every stage of work, creatively overcoming barriers and always meeting deadlines. Every day, area locals and visitors likely pass a Willis A. Smith project, and we are proud of the many iconic buildings we have had the opportunity to bring to the community. The growth of the area has matched our own, and today we are the region's largest commercial construction company.