GOLF CAR STORAGE FACILITY SAFETY GUIDELINES

Introduction

The ILTVA Golf Car Storage Facility Guidelines that follow are intended only as recommendations and as a supplement to (but not a part of) ANSI/ILTVA Z130.1-2012 for Golf Car Safety and Performance Specifications.

These Guidelines are intended to assist golf course owners and management employees responsible for the maintenance of their golf car fleets to assure their golf car storage facilities are compatible with applicable safety measures. Golf course owners and managers should also consult their own legal, architectural, engineering and risk management advisors to assure identification and mitigation of safety risks are complete.

ILTVA cautions that the following recommendations may be impacted by various factors, including local conditions, federal, state, and local law, regulations, and policy. If deemed appropriate by the golf course owner or responsible manager, these Guidelines, together with other safety rules, in particular, the Golf Course Safety Guidelines (2013)\(^1\) if deemed useful by management may be adopted and published as internal policy.

Issues Not Addressed

ILTVA has endeavored to give you useful and accurate information in these Guidelines. However, applicable laws, local ordinances, regulations, procedures and their interpretation by judicial and other authorities change frequently and are subject to differing interpretations. Further, there are numerous safety issues relating to enclosed

\(^1\)Obtainable in electronic form from www.ILTVA.org.
buildings and not especially unique to golf car storage facilities. For example, OSHA regulations regarding hazardous materials communications standards, ("HAZCOM"), and the General Duty Clause, OSHA § 5(a)(1), requiring an employer to keep its workplace free from recognized serious hazards; NEC\textsuperscript{2} and state and local government building and fire code requirements, (collectively "codes"), are not discussed herein. However, they should certainly be components of designing, renovating and maintaining a golf car storage facility in a safe and legally compliant state. If you use these Guidelines, it is your responsibility to make sure that the facts and general advice contained herein are applicable to your situation. An architect, engineer or building contractor familiar with the applicable codes should be retained to ensure code compliance.

Disclaimer

ILTVA, its directors, officers, members and agents disclaim any responsibility for the completeness, relevance, timeliness, accuracy or currency of any of the information contained in these Guidelines. Users of these Guidelines are cautioned to verify on their own initiative with the assistance of their own legal, safety or risk management counsel, the appropriateness, applicability and currency of recommendations contained in the Guidelines. While ILTVA may endeavor to supplement or update these Guidelines in the future, it does not undertake any obligation to do so.

1.0 Safety Audit Committee

It is recommended you appoint a safety audit team to be responsible for periodic inspections\textsuperscript{3} of the golf car storage facility and immediately adjacent area. The audit team’s purpose is to make safety recommendations to the golf course owner or governing board. The audit team should include representatives of the owner and the management employee(s) responsible for the maintenance and repair of the golf car fleet and the security of the golf car storage facility. It is strongly recommended that the golf course owner have its legal counsel, risk management consultant and consulting architect or engineer familiar with state and local building code requirements be adjunct(s) of the team.

The safety audit team should also review each incident that resulted in or could have resulted in a personal injury or property damage within the golf car storage facility or adjacent service areas. Mitigation of safety risks can be accomplished effectively and efficiently by using an audit team of consulting experts and trained and committed

\textsuperscript{2} NFPA 70\textsuperscript{\textregistered}. National Electric Code\textsuperscript{®} 2014. This document as well as other NFPA documents referenced herein are available on line at \url{http://www.nfpa.org/catalog/}.

\textsuperscript{3} Frequency as recommended by risk consultant.
employees. Serving on the safety audit team can raise each employee’s awareness and understanding of safety policies and guidelines.

You should consider consulting with your risk management consultant and legal counsel prior to accepting or rejecting safety audit committee recommendations.

2.0 The Initial Safety Audit

The initial safety audit of the golf car storage facility and immediately adjacent area should begin with a complete tour of the exterior of the building within which the golf car storage facility is situated or proposed for use together with its support areas, e.g., golf car washing station and maintenance, repair and staging areas. The tour should provide the entire audit team with an overview and baseline orientation.

Prior to initiating the tour, each audit team member should become familiar with and study those portions of the owner’s manual furnished by the fleet golf car manufacturer dealing with golf car storage and in the case of electric powered golf cars, the materials pertaining to recharging of batteries. The major manufacturers publish golf car storage planning kits, handbooks or layout programs which may be consulted for recommended layout of golf car parking positions and spacing. These useful materials providing basic guidelines to assist in the design and operation of an efficient golf car storage facility. They are useful as an additional check list to ensure any unique features of a particular brand of golf car and its peripherals, e.g., unique battery charging components or requirements, are accounted for while conducting the safety audit.

Golf Car Storage Facilities

3.0 General Guidelines (applicable to storage of both gasoline and electric powered golf cars).

.01 Golf car storage facilities should have fire suppression systems. Fire suppression systems are important to minimize damage in the event of a fire or lightning strike. Fire suppression is especially vital if the golf car storage facility is under or connected to the clubhouse or other occupied building. Fire extinguishers should be located throughout the storage area. Periodic inspection of the extinguishers should be

4 OSHA recognizes the value of employee involvement in workplace safety and spells out specific requirements for employee involvement in the observations of employee monitoring to identify employee exposure to workplace hazards. Employee participation is a prudent practice as it enhances the probability unsafe conditions will be discovered.

made to ensure their refill currency as required or recommended by the manufacturer.

There are a variety of fire suppression systems. An engineering consultant versed in fire suppression systems and their various characteristics should be consulted to advise on the preferred system to be deployed.

.02 Smoking should be prohibited in the golf car storage facility. The presence of either gasoline or hydrogen gas both mandate rules that prohibit smoking within the golf car storage facility. Gasoline and hydrogen are both very combustible. While hydrogen dissipates rapidly in the atmosphere, it can collect in the ceiling or other areas of the building where circulation is poor. Hydrogen and gasoline fumes will travel for extended distances along the ground. Consult your risk management consultant about additional service areas that should be off limits to smoking.

.03 High-pressure water should not be used for washing golf cars. Separate washing facilities from indoor golf car storage area. Washing facilities with high-pressure risk peeling decals, paint, and even eroding composite materials used to make the golf car body. High pressure also results in water and battery acid entering golf car electrical systems.

.04 Prohibit entry into the golf car storage facility by anyone other than maintenance and supervisory personnel. Patrons and employees not involved with golf car storage and maintenance activities should not be allowed entry into the golf car storage area as a precaution against interference with recommended parking and electrical connection.

.05 Waste Water. Consult local and state regulations regarding waste water disposal.

.06 Ventilation. Maintenance and golf car storage areas shall be properly ventilated to avoid fire hazards in accordance with applicable building codes and ordinances.6

Ventilation for internal combustion engine powered golf cars shall be provided to remove flammable vapors, fumes and other flammable materials. Gasoline fumes accumulate along the floor levels. You or your consultant should consult applicable fire codes for specific ventilation requirements.

Ventilation for electric-powered golf cars shall be provided to remove the

---

accumulation of flammable hydrogen gas emitted during the battery charging process. The amount of hydrogen gas emitted depends upon a number of factors such as the condition of the batteries, the output rate of the battery charger and the amount of time the batteries are on charge. Hydrogen is lighter than air and will have a tendency to collect in ceiling areas if not adequately vented. Over four percent concentrations are considered explosive. Because of the highly volatile nature of hydrogen gas and its propensity to rise and accumulate at the ceiling in pockets, a minimum of 5 air changes per hour is recommended. The owner or responsible management shall consult applicable fire and safety codes for the specific ventilation levels required as well as the use of explosion-proof electrical apparatus.

Generally, exhaust fans should be placed at the highest point of the ceiling for an electric powered golf car fleet. However, venting the air within a building is not the total answer. Having vented ceilings or smooth ceilings, which lack nooks and crannies where the gas could concentrate, is also important.

If the building in which the golf car storage facility is located is equipped with an energy management system, ensure the ventilation fans are engineered to operate coincidentally with the operation of battery chargers.

All ventilation systems should be designed by an HVAC engineering firm and installed and periodically inspected by a licensed HVAC contractor. The type, quantity, capacity and location of ventilation fans is especially important and should be determined by a licensed civil engineer in compliance with applicable local and state codes and standards.7

Ensure the golf course owner’s records reflect the names and addresses of all engineering firms and contractors involved in the ventilation system design, repair and periodic inspection. Review existing owner warranty and service records pertaining to the ventilation system to ascertain whether service records are current and service has been affected within the preceding 12 months. Examine executory ventilation system service contracts and records to verify the service contracted for has been fulfilled.

**Ensure exhaustion fans are turned on at least four (4) hours per day.** The Failure to provide at least four (4) hours or more of exhaust fan circulation comprised of

---

the recommended minimum five changes per hour for electric powered golf car storage facilities may result in the dangerous buildup of toxic or combustible gasses.

.07 Provide sensors to detect combustible gasses (electric golf cars) and carbon monoxide exposure (gasoline golf cars). Commercially produced sensors are available not only to alert personnel of the presence of dangerous gas buildup but also to automatically start exhaust fans.

.08 There should be no standing water in the golf car storage facility. Water increases the risk of electrical shock, and greatly complicates containing spilled acid, gasoline, oil, etc. Standing water is also a slip and fall hazard.

.09 Lightning protection devices should be installed in golf car storage facilities or in the building housing the facilities. Lightning protective devices must conform to state and local building code requirements. Surge protectors should be installed at the service entrance panel that meet applicable codes and ordinances. Surge protectors should also be installed as close as practical to the equipment being protected and connected to the AC circuit at the receptacle used for battery chargers. Surge protectors should be installed by a qualified, licensed electrician.

Lightning rods or other lightning protection system should be installed on the structure housing the golf car storage facility, e.g., a roof mounted air terminal system. Ensure all workmen and supervisors have been thoroughly tested and Lightning Protection Institute, (“LPI”), certified as competent to do or oversee work required. All lightning protection equipment should meet or exceed UL96A and NFPA-780 and be manufactured by a company who is an LPI member.

An adequate ground system meeting state and local codes and ordinances is vital to protecting the owner’s equipment and personnel.

.10 Fire Detection. For the purposes of fire detection and monitoring there are basically five methods available: smoke detection; obscuration smoke detectors, scattering smoke detectors, condensation nuclei counter and ionization smoke detectors, and flame detection. The decision on which method is employed is a difficult one as all systems provide suitable detection capabilities.

8 An LPI Certified System requires a complete review of all stages of the lightning protection installation to ensure high standards of quality and safety. LPI requires factory material inspection by accredited testing laboratories (UL) to ensure that lightning protection systems are installed in accordance with national standards.

9 Confer with fire risk management consultant as to method to select.
.11 Signs. Appropriate signs placed in conspicuous locations and conforming to recognized standards\textsuperscript{10} should be located within and immediately outside the enclosed space within which the golf car storage area is situated. Signs should also be placed at the locations where battery maintenance or recharging is performed. Examples of two appropriate safety signs in the latter instance are as follows:

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid and can cause severe burns and damage to clothing. Avoid contact with skin, eyes, or clothing.

**Antidote:**

External - Flush with water.

Internal - Drink large quantities of water or milk.
Follow with Milk of Magnesia, beaten eggs or vegetable oil. Call a physician or poison control center at once!

Eyes - Flush with water for 15 minutes and get prompt medical attention.

Explosive mixtures of hydrogen gas are present within battery cells. Do not work with or charge batteries in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation wherever batteries are

being charged.

An appropriate sign to use when the golf car fleet being stored includes gasoline powered golf cars is as follows:

EXHAUST GASES CONTAIN CARBON MONOXIDE, A POISONOUS GAS THAT CAN CAUSE UNCONSCIOUSNESS AND DEATH. IT IS AN ODORLESS AND COLORLESS GAS FORMED DURING THE COMBUSTION OF HYDROCARBON FUELS.

.12 Battery acid spills or leaks should be treated with soda ash or baking soda to neutralize the electrolyte. Acid spills should not be watered down without first neutralizing the spill. An eye wash station should be located in the service area where batteries are serviced. Maintain a pail with baking soda and water handy to neutralize battery electrolyte in case of contact with your body.

Battery changing and charging facilities and procedures should be in accordance with applicable ordinances, regulations and manufacturer’s recommendations.

Change batteries only in a well-ventilated area. Wear a full face shield and rubber gloves when working with batteries. Use insulated tools when working around batteries or electrical connections. Recycle or dispose of discarded batteries in accordance with local, state, and federal regulations.

.13 Labeling of storage tanks, dispensing nozzles, abrasive chemicals and all materials listed in the OSHA hazardous materials handling regulations must be accomplished and maintained.

.14 Wear safety glasses or approved eye protection when servicing vehicles.

4.0 Electric powered golf car storage.

.01 Inspect golf car storage facility electric system annually. Inspect the system for deterioration. This inspection should be accomplished by a qualified electrician. This inspection should include, without limitation, verifying breaker function and GFI (ground fault interruption) or CCID (Charging Circuit Interrupting Device) function. The owner should maintain a record of inspections and any corrective actions or repairs.
.02 Battery chargers must be grounded to reduce risk of electrical shock. Chargers are equipped with an AC electric cord having an equipment-grounding conductor and a grounding type plug. The plug must be grounded to an appropriate dedicated receptacle that is properly installed and grounded in accordance with the NEC and all local codes. The manufacturer’s manual supplied with the charger should be consulted for specific operating instructions before using the charger.

.03 Extension cords should be avoided in connecting chargers to receptacles

.04 Appropriate signage is recommended. Examples are obtainable from the manufacturer. The following is an example:

| WARNING |
$ BE SURE ALL WIRE CONNECTIONS AT THE RECEPTACLE ARE CLEAN AND TIGHT.

$ DO NOT ROCK OR BEND THE PLUG. TO CONNECT THE CHARGER PLUG TO THE VEHICLE RECEPTACLE, GRASP THE PLUG HANDLE AND PUSH THE PLUG STRAIGHT INTO THE RECEPTACLE.

$ DO NOT PULL ON THE DC CORD. DO NOT TWIST, ROCK OR BEND THE PLUG. TO DISCONNECT THE CHARGER PLUG FROM THE VEHICLE RECEPTACLE, GRASP THE PLUG BY THE HANDLE AND PULL THE PLUG STRAIGHT OUT OF THE RECEPTACLE.

$ DO NOT CONNECT A CHARGER TO THE RECEPTACLE IF THE CHARGER CORD, PLUG, OR THE VEHICLE RECEPTACLE IS BROKEN, DAMAGED IN ANY MANNER, OR DOES NOT MAKE A GOOD ELECTRICAL CONNECTION. FIRE OR PERSONAL INJURY CAN RESULT. HAVE IT REPLACED BY A QUALIFIED SERVICE PERSON IMMEDIATELY.

$ FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN DAMAGE TO THE CHARGER CORD, THE PLUG, AND THE VEHICLE RECEPTACLE.

$ DO NOT USE A CHARGER IF:
  - THE PLUG IS TOO CLOSE OR DOES NOT MAKE A GOOD CONNECTION.
  - THE PLUG AND RECEPTACLE FEEL H HotTER THAN NORMAL DURING CHARGE.
  - THE PLUG PINS, BLADES, OR RECEPTACLE CONTACTS ARE BENT OR CORRODED.
  - THE PLUG, RECEPTACLE, OR CORDS ARE CUT, WORN, HAVE ANY EXPOSED WIRES OR ARE DAMAGED IN ANY WAY.

USING THE CHARGER WITH ANY OF THE ABOVE SYSTEMS COULD RESULT IN A FIRE, PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.

.05 Fully charged batteries are less likely to freeze. Frozen batteries should be thoroughly evaluated by a trained technician after thawing, before attempting to recharge.

.06 The charger cord, plug, and receptacle are wear items and should be inspected daily. Visually inspect them for cracks, loose connections, and frayed wiring; they must be replaced when worn or damaged. If charger plug and receptacle show signs of corrosion or are difficult to insert and remove, the receptacle contacts and plug blades/pins may be cleaned either with a good electrical contact cleaner or lubricant or both. The plug should then be inserted and removed several times to ensure ease of insertion, ease of removal, and good electrical contact.

.07 CAUTION: DO NOT CONNECT TWO CHARGERS TO ONE CIRCUIT BREAKER! Each battery charger should be on its own dedicated
circuit. This circuit must be supported by its own neutral, running back to the circuit breaker panel. Each charger circuit should be on a properly rated breaker depending upon the manufacturer’s specifications. If it is necessary to utilize both sides of a duplex receptacle, the responsible manager must still maintain an individual circuit for each charger. It is very important to properly size the main disconnect and circuit breaker panels to meet or exceed all local electrical codes and to install only top quality equipment.

.08 Electric car chargers should be connected to either GFCI or CCID20 protected circuits. Charger power circuits should be adequate to handle the amperage needed and as recommended by the golf car manufacturer. They must also protect people working in the golf car storage facility from electrical shocks which can best be provided using a CCID20 (with a current rating of 20 MIU milliamp units).

.09 Rules for charging batteries. Turn off all vehicle accessories before charging batteries. Connect the charger AC supply cord to a properly grounded, three-wire outlet of the proper voltage and frequency as shown on the charger. Do not use adapters to plug chargers with a three-prong plug into a two-prong outlet. Improper connection of the equipment-grounding conductor can result in a fire or electrical shock.

.10 Do not operate a charger if it has been dropped or otherwise damaged. Do not operate chargers near fuels, grain dust, solvents, thinners or other flammable materials or vapors. Do not expose chargers to rain, moisture or any liquid; keep chargers dry. Do not connect a stationary charger to the receptacle if the charger cord, plug, or the vehicle receptacle is broken, damaged or does not make a good electrical connection. Fire or personal injury may otherwise result. Contact a qualified technician to replace broken or damaged charger parts.

.11 Consult the manufacturer’s specifications regarding disconnecting the DC output plug from the vehicle receptacle when the charger is on. Resulting arcing and burning could damage the plug and receptacle and cause batteries to explode in some instances if the charger is not turned off before disconnecting. For those vehicles with batteries that may be disconnected from chargers while the charger is still on, the charger DC cord should be disconnected from the vehicle receptacle slowly. Jerking or pulling the DC cord out quickly could cause arcing and burning that could damage the plug and receptacle and cause batteries to explode.
.12 Do not push objects into the charger through cabinet slots as they may touch dangerous live circuits or cause an electrical short circuit that could result in fire or electrical shock. Do not block or cover slots and openings in or cover the charger cabinet. They provide ventilation and protect the charger from overheating.

.13 Provide adequate ventilation for the charger.

.14 Consult the manufacturer’s specifications to ascertain whether the charger’s DC cord may be plugged into a vehicle receptacle for more than two consecutive days. Otherwise, severe overheating and damage to the batteries may result if the charger doesn’t turn off. Some manufacturer’s chargers have a storage charge feature that automatically checks and recharges batteries as necessary and may remain plugged into the vehicle’s receptacle throughout the storage period.

.15 Electric car batteries should be watered AFTER charging to avoid overflow of electrolyte. Watering lead-acid batteries prior to charging may result in overflowing battery acid electrolyte. If batteries have not been properly maintained, water should be added to cover the top of exposed plates prior to charging. Spills should be treated promptly and the hazardous material should be legally and properly disposed.11

.16 Only trained technicians should repair or service the charger. Contact manufacturer or dealer for recommended service technicians.

.17 Stationary transformer based chargers should not be left on the floor but shall be shelf mounted. Shelf mounted chargers supported underneath from the floor and roof or ceiling joist suspended chargers should be high enough to avoid contact with the golf car. Care should be exercised if more than one charger unit is located on the same shelf, to ensure the weight bearing load of the shelf and its supports are sufficient to handle multiple chargers. The DC cord should be supported and retained to prevent damage to the plug by raising the charger plugs off the floor and prevent them from being inadvertently run over.

.18 High Frequency Chargers. High-frequency chargers have an efficiency of over 90%, which makes them very cost effective. Because a HF charger does not have a heavy transformer, its weight is generally a quarter to

---

11Refer to owner or service manuals.
one fifth of that of a similar conventional charger. This allows for wall mounting, thus increasing floor space and safety.\textsuperscript{12}

In high frequency chargers, the input mains voltage is rectified and then converted into a high operating frequency (50kHz) by a high-frequency chopping circuit. This high-frequency input is then passed through a transformer and rectified to the correct DC voltage with only a negligible ripple. Because of this high frequency, the transformation can be done with a small ferrite transformer. This makes HF chargers suitable for all types of lead acid batteries.

A battery's performance is only as good as its charger. Over fifty per cent of battery problems are caused not by the battery itself, but by wrong or insufficient charging. A proper charging regime is based on battery technology, temperature, state of charge and, equally important, the application.\textsuperscript{13} High frequency chargers in a PGE study had higher average power conversion efficiency, resulting from more efficient conversion of the AC power going into the charger to the DC power needed to charge the battery.\textsuperscript{14}

5.0 Gasoline powered golf car and petroleum storage.

.01 Fuel Storage. Gasoline or other petroleum storage tanks should comply with EPA and applicable state and local environmental requirements. Some jurisdictions require permits to not only install and maintain gasoline storage tanks but also to modify them. Annual leak tests to insure a vapor tight system and proper operation of the vapor recovery equipment could be required by the applicable jurisdiction as well as the absence of pressure-vacuum relief valves on the gasoline storage tank vent pipe and submerged fill tube. Failure to abide by applicable regulations regarding petroleum tanks could result in severe fines.\textsuperscript{15}

\textsuperscript{12} http://www.manbat.co.uk/about-chargers/
\textsuperscript{13} http://www.powerstream.com/SLA.htm; http://www.manbat.co.uk/about-chargers/
\textsuperscript{14} www.pge.com/.../fb_ib/forklift_battery_charger_fs.pdf
\textsuperscript{15} Tank owners and operators must comply with both state and federal regulations for underground storage tanks. At the state level, owners and operators must comply with applicable state law and regulation, see, e.g., Minn. Rules Chapter 7150. The federal regulations for USTs include 40 CFR Part 280-282 (the regulations can be found on the EPA web site at http://www.epa.gov/swerust1/fedlaws/cfr.htm). The California Air Resource Board developed Enhanced Vapor Recovery (EVR) standards for vapor recovery systems using Aboveground Gasoline Storage Tanks (ASTs). See http://www.arb.ca.gov/vapor/vapor.htm. ASTs of less than 250 gal. capacity may be exempt.
Other applicable regulations relate to minimum distance from other structures, surrounding containment fields and for above ground tanks, minimum ground clearance.


.03 Appropriate signage is recommended. The following is an example:

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEVER ATTEMPT TO DRAIN GASOLINE WHEN THE ENGINE IS HOT OR WHILE IT IS RUNNING. BE SURE TO CLEAN UP ANY SPILLED GASOLINE BEFORE OPERATING THE VEHICLE.</td>
</tr>
<tr>
<td>STORE GASOLINE IN AN APPROVED GASOLINE CONTAINER ONLY.</td>
</tr>
<tr>
<td>STORE IN A WELL-VENTILATED AREA AWAY FROM SPARKS, OPEN FLAMES, HEATERS, OR HEAT SOURCES.</td>
</tr>
<tr>
<td>KEEP GASOLINE OUT OF THE REACH OF CHILDREN.</td>
</tr>
<tr>
<td>DO NOT SIPHON GASOLINE FROM THE VEHICLE.</td>
</tr>
</tbody>
</table>