

A Code Review for Motorized Lawn Equipment Sheds and Similar Outbuildings

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There are several fire and building code sections aimed at mitigating the hazards associated with motorized lawn equipment. The following is a brief overview of the code sections that were created to reduce both the likelihood and danger of a fire in equipment sheds. First, sheds are required to be equipped with a fire extinguisher. Second, paths to exit doors and away from sheds must remain clear. This helps facilitate both evacuation and Boulder Fire Department access. Third, motorized vehicles should not be started indoors unless two large doors (one at/near each end of the structure) are open to provide good circulation through the garage. Fourth, plugs or covers should be placed on flammable liquids containers to minimize the flammable vapors in the air. Fifth, fuel containers should be stored in a location where they will not be susceptible to falling or spilling. They should not be located next to a doorway. Last, FLS recommends that some means, such as a flammable liquid storage cabinet with a 2 inch deep water-tight bottom, be provided to contain leaks that may occur in fuel containers. For specific requirements and implementation details, please read the following code review.

I. INTRODUCTION

The following is a summary of the fire and building code requirements for sheds used to store lawnmowers and similar fuel-powered equipment. These code requirements are based on the 2008 edition of the *Flammable and Combustible Liquids Code* (NFPA-30), the 2009 edition of the *International Fire Code* (IFC), the 2009 edition of the *International Building Code* (IBC), and the 2009 edition of the *International Mechanical Code* (IMC).

II. GENERAL

- A. Approved portable fire extinguishers need to be hung on a bracket, in a readily accessible location in the exit path. (IFC, 906.5)
- B. Required exit accesses, exits, and exit discharges need to remain clear at all times. (IFC, 1030.2)
- D. Clearly visible signs need to be installed in and near motorized equipment storage sheds strictly prohibiting smoking in the area. (IFC, 310.2 and 310.3)
- E. Please ensure that the path of fire department vehicle access to the area is not blocked by the structure. BFD requires a minimum width of 13 feet.

III. CONSTRUCTION

- A. Buildings or rooms constructed for storage of lawn-care equipment need to be built in accordance with the IBC. Section 312.1 of the IBC defines such structures as “Group U” occupancies. Table 503 states that if a lawn-care equipment shed is smaller than 5,500 square feet, it can be of Type V-B construction. The structural elements, exterior walls, and interior walls may be constructed of any materials permitted by the IBC. FLS, however, strongly recommends that non-combustible material be used in the construction of such buildings. (IBC, 312.1 and 503)
- B. Buildings or parts of buildings classified as Group U occupancies because of the use or character of the occupancy should not exceed 1,000 square feet in area or one story in height except as provided in part II.C (listed immediately below). Any building or part of a building that exceeds the limitations specified in this section should be classified in the occupancy group other than Group U that it most nearly resembles. (IBC, 406.1.1)
- C. Because lawn mowers and lawn tractors may be started inside lawn equipment sheds, ventilation in accordance with the requirements of IBC and IMC needs to be provided. FLS believes that the requirements for mechanical ventilation of combustion fumes may be eliminated if no combustion fumes are generated inside the enclosed garage. One alternative is to push the vehicles outside and start vehicles outside. Another alternative is to temporarily convert the garage to an open garage by opening two sets of doors that are on separate sides of the garage. Under this alternative, if approved by the campus mechanical engineer and the Department of Environmental Health and Safety (EH&S), leave both sets of doors open, start the vehicle, and drive it completely out in 5 seconds.

Since there is a potential for fuel spills and ignition of fuel vapors, e.g., by static electricity or other means, FLS requests that a framed openings with horizontal slats (louvers) be provided to aid in the removal of fuel vapors. Gasoline vapor is heavier than air and accumulates at low elevations within the shed. In order to reduce the concentration of gasoline vapors, vent louvers located near the floor need to be provided. FLS recommends as many vent louvers as possible but not less than one at either end. Additionally, high level vents should be provided at either end to assist in the removal of fuel vapors and to help remove some heat from the shed.
- D. The code requires a solid non-absorbent floor such as concrete, sloped back to the door. However, FLS believes that this requirement was intended for larger structures. Please note, the issue of fuel spillage and environmental contamination associated with absorbent floors needs to be approved by EH&S. (IBC, 406.1.3 and 406.2.6)
- E. Curbs and drains are not required where none of the flammable liquid storage containers exceed 38 L (10 gal). Please contact EH&S and note that environmental requirements may be more restrictive. (NFPA-30, 6.4.2.5)

IV. ADDITIONAL REQUIREMENTS FOR STORAGE OF FLAMMABLE OR COMBUSTIBLE LIQUIDS WITHIN SHEDS

Please note, the following code requirements apply to flammable and combustible liquids storage in closed containers that do not exceed 60 gallons in individual capacity and portable tanks that do not exceed 660 gallons in individual capacity.

A. Flammable Liquids Storage Site Requirements

1. Where an approved flammable liquid storage site is accessible to the general public, it needs to be protected from tampering or trespassing. (NFPA-30, 6.6.4.3)
2. Materials that will react with water or other liquids to produce a hazard may not be stored in the same room with flammable and combustible liquids. Separation of incompatible materials must comply with IFC 2703.9.8. (IFC, 3404.3.3.2)
3. A shed may not be used for the storage of wood or other combustibles if used for flammable liquid storage, unless the shed is protected by a fire suppression system and the combustibles are separated from the liquids by a minimum of 8 ft. (IFC, 3404.3.3.8)
4. Storage of any flammable or combustible liquids may not block the exit path. (IFC, 3404.3.3.3)
5. Class I liquids, such as gasoline, need to be placed so that a fire in the liquid storage area would not prevent someone from exiting from the area. (NFPA-30, 6.5.1.2)
6. Guard posts or other means of protection from vehicular damage needs to be provided. (IFC, 3404.4.5)
7. A storage shed with an area less than 500 square feet but greater than 100 square feet, must have a minimum of 5 feet of separation between individual flammable liquid storage lockers, a minimum of 20 feet of separation from the flammable liquid storage locker to the property line, and a minimum of 10 feet of separation from the flammable liquid storage locker to the nearest side of sidewalks, roads, or buildings. (NFPA-30, 6.6.4.2)
8. A storage shed with an area greater than 500 square feet must have a minimum of 5 feet of separation between individual flammable liquid storage lockers, a minimum of 30 feet of separation from the flammable liquid storage locker to the property line, and a minimum of 20 feet of separation from the flammable liquid storage locker to the nearest side of sidewalks, roads, or buildings. (NFPA-30, 6.6.4.2)
9. Flammable liquids may only be stored outside of buildings if they are stored in locked flammable liquid storage cabinets which are provided with protection from vehicular damage. Additionally, the area around the flammable liquid storage cabinet must be free of all plants, flowers, trees, dead leaves, and other combustible materials for a distance of 15 feet. (IFC, 3404.4.2.3, 3404.4.3, 3404.4.4, 3404.4.5, 3404.4.6)

B. Flammable Liquids Storage Container Requirements

1. Flammable and Combustible liquids must be stored in approved containers and tanks. (IFC, 3404.3.1.1)
2. All equipment such as tanks, machinery, and piping needs to be designed and operated to avoid ignition by static electricity. (NFPA-30, 7.9.4)
3. Empty containers previously used for the storage of flammable or combustible liquids, unless free from explosive vapors, are required to be stored as required for filled containers. Portable containers, when emptied, need to have all covers or plugs immediately replaced in openings. (IFC, 3404.3.3.4)
4. Metallic and non-metallic tanks, machinery, and piping, where an ignitable mixture may be present, need to be bonded or grounded. (NFPA-30, 7.9.4.1)
5. Flammable liquid containers cannot be stored closer than 3 feet to the nearest beam, chord, girder, or other obstruction. If there is a fire suppression system, the containers cannot be stored closer than 3 feet below the sprinkler heads (NFPA-30, 6.4.3.9)
6. Where the total amount of flammable or combustible liquids inside a building, used for maintenance and the operation of equipment, exceeds 10 gallons, flammable and combustible liquids must be stored in approved liquid storage cabinets. Quantities not exceeding 10 gallons are allowed to be stored outside of a cabinet when in approved containers. (IFC 3404.3.4.4)
7. Flammable liquid storage cabinets must be provided with a label, in red letters that states: "Flammable – Keep Fire Away". (IFC, 3404.3.2.1.2)

C. Flammable Liquids Storage Shelving Requirements

1. Shelves used for the storage of flammable liquids must be of approved construction and adequately braced and anchored. (IFC, 3404.3.3.5)
2. Wood of at least 1 in. nominal thickness is allowed to be used as shelving, racks, scuffboards and floor overlay. (IFC 3404.3.3.5.1)
3. Shelf storage of combustible liquids must be neat and orderly. (IFC, 3404.3.3.5.3)
4. Shelves must be sufficiently deep and provided with a lip or guard to prevent individual containers from falling. (IFC, 3404.3.3.5.2)

V. RECOMMENDATIONS

- A. FLS requests that in storage sheds not used for the storage of flammable or combustible liquids, the amount of combustible material be minimized to the extent that is feasible.
- B. FLS strongly recommends that all flammable liquid storage containers be provided with secondary containment, e.g., placing the containers in plastic tubs or a flammable liquid storage cabinet with a water-tight bottom to a height of 2 inches or more.

- C. FLS recommends the planning of such structures, throughout campus, be such that any leakage and any fire fighting agent run-off will not enter Boulder Creek or cause other environmental contaminations.
- D. Please note that FLS strongly recommends that these sheds have fire-rated enclosures using concrete, drywall or other non-combustible material.
- E. FLS recommends that all flammable liquid containers be inspected regularly to ensure the integrity of the containers as well as compliance with any requirements of EH&S.
- F. FLS recommends that the quantity of the stored gasoline be minimized to the degree possible.
- G. FLS recommends that such areas be provided with automatic fire sprinklers.

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