

DEPARTMENT OF INDUSTRIAL RELATIONS
Occupational Safety and Health Standards Board
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OCCUPATIONAL SAFETY AND HEALTH
STANDARDS BOARD

BOARD STAFF'S REVIEW OF
PETITION FILE No. 545

Petitioner: Ken Smith, Interim Director Environmental Health and Safety
University of California, Office of the President

Submitted by: Michael Nelmidia
Title: Senior Engineer-Standards
Date: May 13, 2015

INTRODUCTION

On December 22, 2014, the Occupational Safety and Health Standards Board (Board) received a petition dated December 17, 2014 from Mr. Ken Smith, Interim Director Environmental Health and Safety, representing University of California, Office of the President (Petitioner). The Petitioner rescinded and replaced the petition on January 8, 2015.

Labor Code Section 142.2 permits interested persons to propose new or revised regulations concerning occupational safety and health and requires the Board to consider such proposals and to render its decision no later than six months following receipt. In accordance with Board policy, the purpose of this evaluation is to provide the Board with relevant information upon which to base a reasonable decision.

The Petitioner requested that the Board amend Title 8 California Code of Regulations (CCR) Section 5538 of the General Industry Safety Orders, to “harmonize” the flammable and combustible liquid storage quantities with those in Section 5532 and applicable California building and fire code nomenclature and categories. The Petitioner also requested updates to the definitions for “Office Occupancy” and “Institutional Occupancy” and new definitions for “Laboratory” and “Educational Occupancy”.

Specifically, the Petitioner asserts:

1. *There are no applicable regulatory definitions of “Educational occupancy” or “laboratory”*
2. *The regulatory definitions of “Office Occupancy” and “Institutional Occupancy” used in the Title of the section are “obsolete” and no longer used in California building and fire codes.*
3. *Section 5538’s regulation of quantity limits should be updated and harmonized with Section 5532 and the current building and fire codes. In particular, Section 5538(a)(1) should be amended to remove the antiquated requirements and instead reference the requirements of Section 5532, Table FL-2 which was updated in May 2014.*

HISTORY

Board Staff found no relevant petition requesting or referencing clarifications of Office, Educational, and Institutional Occupancies. Board Staff also found no relevant petition for modifying the quantity limits in 5538(a)(1) however, the Division issued a Letter of Interpretation in 1995 in response to Organization Resources Counselors, Inc.’s question:

Do the regulations in Title 8 require that one properly labeled, five gallon, screw top plastic container of isopropyl alcohol be stored in a flammable [storage] cabinet?...

The Division stated that a five gallon, screw top, plastic container [of isopropyl alcohol] would be in violation of Section 5538(a)(1) on the basis of capacity and container design regardless of where the material was stored as demonstrated in the following reply:

...The size of the single five gallon container does not meet the one gallon size container or two gallon safe[ty] can criteria as specified by GISO Section 5538(a)(1)

REASON FOR THE PETITION

The Petitioner seeks definitions (and updates to existing definitions) of “Educational Occupancy”, “Office Occupancy”, “Institutional Occupancy”, and “Laboratory” within Title 8 as they relate to Article 141 Container and Portable Tank Storage. The Petitioner apparently seeks to establish a link between the occupancy categories within Title 8 and the occupancy categories within the California Fire Code/California Building Code. Ultimately, this would allow employers to determine the quantity limits/requirements within Sections 5531 through 5543 that apply to specific rooms/buildings based on their occupancy category.

Additionally, the Petitioner seeks a revision (or repeal of) Section 5538(a)(1) which states:

*(a) Storage shall be limited to that required for operation of office equipment, maintenance, demonstration, treatment, and laboratory work. **All liquids in laboratories and at other points of use shall meet the following storage provisions:***

(1) No container for Category 1, 2 or 3 flammable liquids shall exceed a capacity of one gallon except that safety cans can be of two gallons capacity. [emphasis added]

Flammable liquids are categorized by their boiling point. Category 1 liquids have their boiling points lower than that of Category 2 or 3. Category 1 liquids have a higher risk of ignition compared to their Category 2 or 3 counterparts.

The Petitioner’s proposal would allow the maximum container sizes in Section 5532, Table FL-2 to be stored outside of a flammable storage room or a flammable storage cabinet. The proposal would affect liquids in “metal containers” and “safety cans”; while glass, plastic, and metal drums would remain unaffected. The Petitioner’s stated objective is to allow flammable and combustible liquids, purchased in quantities, at their maximum container size, to be stored in laboratories, but outside of a flammable storage cabinet or flammable storage room. Flammable liquids and combustible liquids would be maintained in their original containers for dispensing to the apparatus for experiments (laboratory work).

TABLE FL-2. MAXIMUM ALLOWABLE SIZE OF CONTAINERS AND PORTABLE TANKS (Category 4, Liquids Removed)			
<i>Container Type</i>	<i>Category 1</i>	<i>Category 2</i>	<i>Category 3</i>
Glass or approved plastic	1 pt.	1 qt.	1 gal.
Metal (Other than DOT Drums)	1 gal.	5 gal.	5 gal.
Safety cans	2 gal.	5 gal.	5 gal.

NATIONAL CONSENSUS STANDARD

The National Fire Protection Association (NFPA) has standards that address use, storage, handling, and dispensing of flammable and combustible liquids. Flammable liquids are the subject of NFPA 30, which is an approved American National Standards Institute (ANSI) standard. NFPA 30 served as the basis for Title 8, Sections 5531 through 5543 and the 29 CFR 1910.106 in the Federal Standards entitled “Flammable Liquids”.

The NFPA 45 is the consensus standard for the Fire Prevention for Laboratories Using Chemicals. It describes fire prevention measures needed to protect life and property in Laboratory settings. The NFPA developed the NFPA 45 in response to fire issues in laboratories.

The NFPA 101 is the life safety code which, in relevant part, categorized rooms/buildings into occupancies. These occupancies are used as the basis for the occupancy classifications used in Title 8, Sections 5531 through 5543 and the 29 CFR 1910.106.

Not based on the NFPA, the California Fire Code is instead based on the Uniform Fire Code (International Fire Code, after 2004) which set forth the requirements for fire safety in the construction and remodeling of building or structures in California. The relevant portions are adopted into Title 24 of the California Code of Regulation.

The International Building Code, which replaced the Uniform Building Code, in relevant part, classify proposed rooms/buildings based on their proposed use. These are designated “occupancy” categories. The occupancy categories in the International Building Code (and the Uniform Building Code) are not the same as the NFPA 101 occupancy categories.

FEDERAL STANDARDS

Federal OSHA derived the 29 CFR 1910.106 regulations related to flammable and combustible liquid from the NFPA 30-1969. The Federal definitions of Institutional and Office Occupancy are identical to the definitions within the Title 8 requirements. The 29 CFR 1910.106 requirements do not define Educational Occupancy nor do they define Laboratory in that context. “Laboratory” was defined later in the “Occupational Exposure to Hazardous Chemicals in Laboratories” standard adopted under 29 CFR 1910.1450. Title 8, also utilized the same definition (within the same context).

DIVISION EVALUATION

The Division submitted to the Board, the Division’s evaluation dated March 20, 2015. The Division recommended that the Board grant the Petitioner’s request to the extent that, definitions of “educational occupancy” and “laboratory” be added to Title 8. The Division also recommended that the Board deny the Petitioner’s requests pertaining to modifying and updating the definitions of “office occupancy” and “institutional occupancy”. Additionally, the Division recommended that the Board deny the Petitioner’s request to modify or repeal the maximum container sizes for flammable and combustible liquids within Section 5538(a)(1).

BOARD STAFF EVALUATION

Board Staff held discussions with the Petitioner to determine the crux of the Petitioner's position—primarily, the 1 and 2 gallons size limits for the storage of flammable and combustible liquids in the Petitioner's laboratories. Board Staff reviewed the 1973 and 1976 editions of the California Building Code, California Fire Codes, Title 8, NFPA 30, 45, and 101 corresponding to the year when Section 5538 was promulgated. Additionally, Board Staff reviewed the 1986 editions of the same documents, because the Standards Board reviewed Section 5538 in 1986, to identify duplication and other issues between Title 8 and Title 24.

The primary document in publication today related to flammable and combustible liquids in laboratories is the NFPA 45. The NFPA 45's formation is explained in Appendix B of its first publication in 1975:

Appendix B. Laboratory Fire Experience

The need of a fire protection standard for chemistry laboratories is found, in part, in fire loss records. Three sources of laboratory loss data will serve to illustrate the laboratory fire problem: twenty years of fire records from a large university, six years of fire experience from a large industrial research laboratory, and six years of data covering medium to large fire losses from the occupancy records of the National Fire Protection Association...¹ [Emphasis Added]

It is important to understand that while Section 5538's requirements have been formed from the NFPA 30-1973, it is in fact the NFPA 45 that should serve as the basis for any future rule changes concerning flammable liquids in laboratories. The NFPA adopted the NFPA 45, specifically to address the fire hazards within laboratories. NFPA 45-2012, currently maintains the 1-gallon non-safety can and 2-gallon safety can requirements for "Educational Laboratories" and "Instructional Laboratories".

The NFPA 45-2012;

Educational Laboratory Unit. A laboratory unit that is used for educational purposes through the twelfth grade by six or more persons for four or more hours per day or more than 12 hours per week.

Instructional Laboratory Unit. A laboratory unit used for education past the 12th grade and before post-college graduate level instruction for the purposes of instruction of six or more persons for four or more hours per day or more than 12 hours per week. Experiments and tests conducted in instructional laboratory units are under the direct supervision of an instructor. Laboratory units for graduate or post-graduate research are not to be considered instructional laboratory units.

¹ NFPA 45 1973 Technical Committee Reports, Appendix B

Laboratory. A facility where the containers used for reactions, transfers, and other handling of chemicals are designated to be easily and safely manipulated by one person. A laboratory is a workplace where chemicals are used or synthesized on a nonproduction basis.

Section 5538 was written without the distinction between ‘Instructional Laboratories’ and non-instructional/non-educational laboratories. The Petitioner’s characterization that the requirements in 5538(a)(1) are “antiquated” is incorrect. The requirements still exist within the current edition of the NFPA 45.

Board Staff discussed with CAL FIRE whether there was a concern in increasing the maximum quantities of those listed in FL-2. More specifically, was there a concern in increasing the maximum container sizes from 1-gallon non-safety cans and 2-gallon safety cans to 5 gallons for both. CAL FIRE representatives did not express a concern regarding the proposed increase. However, CAL FIRE requested to be part of any discussion allowing for such a change. Board Staff would welcome CAL FIRE’s expertise in Fire Sciences to such rulemaking.

Maximum Container Sizes

The change sought by the Petitioner would not affect the quantities stored in safety storage cabinet/rooms, nor would the Petitioner’s request affect the “maximum allowable quantities” found in the California Fire Codes. The Petitioner seeks larger individual containers for flammable liquids stored in laboratory areas. The storage of these containers would be outside of a safety storage cabinet or storage room. The distinction is the safeguard normally afforded by isolation and ventilation within safety storage cabinets and storage rooms are not afforded to those containers left in the laboratory space itself.

There is a greater risk of fire when the maximum container size is increased. That risk is twofold— first, in the event of a spill or the rupture of a container, a release of up to five gallons could occur from a single container, instead of one, or two gallons from the smaller containers currently allowed.

Second, the hazard posed by increasing the container size, is the increased vapor space within the container once a portion of the liquid has been dispensed. A 1-gallon container with ½ gallon of liquid remaining in the container would contain ½-gallon volume equivalent of a ‘fuel-air’ mixture in the vapor space. A 5-gallon container with the same amount of liquid contains 4 ½ gallons equivalent of the ‘fuel-air’ mixture. The fuel-air mixture above the liquid represents the main source of danger from flammable liquids. The fuel-air mixture is susceptible to ignition by flames, sparks, and static electricity. As liquids in these containers are dispensed, the ‘vapor space’ within the container increases. Under the classic academic ‘Fire Triangle’, fuel, air, an ignition source are needed for combustion/deflagration. Since containers of flammable liquids and combustible liquids contain more air as the liquid is poured out, the fuel-air mixture within the container increases in volume. The higher the fuel-air volume within the container the greater chance of a flash and a fire. Dispensing the flammable liquid introduces the third element to the fire triangle, ignition source from static electricity or other open flames such as bunsen burners.

It is also of significance that safety cans are designed with features such as self closing lids and flame arresters to prevent ignition sources from entering the safety can. Other safeguards such as low center of gravity and pressure relief characteristics of safety cans contribute to the overall advisability of safety cans over those of their non-safety can counterparts. In contrast, Section 5523, Table FL-2's quantity limits for both non-safety can (metal containers) and safety cans are identical for both category 2 and category 3 flammable liquids.

Occupancies and Definitions

Under the current California Fire Code, quantities of flammable and combustible liquids shall not exceed those "necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment" and predefined quantity limits under the "maximum allowable quantities per control area" within the flammable liquids section of California Fire Codes. This applies to Group A, B, E, I, and F occupancies (among others) within the California Fire Codes. The Section 5538(a) requirements that apply to Office, Educational, and Institutional, match the requirements of the California Fire Code.

RECOMMENDATION

Board Staff recommends the Petitioner's request for the addition of a definition of "Educational Occupancy" to the General Industry Safety Orders be DENIED.

Board Staff recommends the Petitioner's request for updated definitions of "Institutional Occupancy" and "Office Occupancy" be DENIED.

Board Staff recommends the Petitioner's request for the addition of a definition of "laboratory" to the General Industry Safety Orders be GRANTED to the extent that the definition specifically excludes both "Educational Laboratories" and "Instructional Laboratories" as defined in NFPA 45. Board Staff recommends "Educational Laboratories" and "Instructional Laboratories" maintain the 1-gallon non-safety container and 2-gallon safety can requirements consistent with the NFPA 45 to maintain consistency with Section 5532, Table FL-2.

Board Staff recommends that an advisory committee discuss the necessity for rulemaking to 5538 to increase the maximum flammable liquid container sizes in laboratory settings *other than* Educational and Instructional Laboratories. Any consensus proposal, resulting from the advisory committee deliberations, should be brought to the Board and the public, for consideration at a future public hearing. The Petitioner should be extended an invitation to participate in the advisory committee deliberations.