Hazardous Materials & Building Codes—An update

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Objectives

- Better Understanding
- Ask Key Questions
- Properly Evaluate Answers

Who is God?

When it comes to Hazardous Materials, God is…….

YOUR LOCAL FIRE MARSHALL

Your local Fire Marshall

- Is the Authority Having Jurisdiction. ("AHJ")
- Often has a strong and unique personality.
- Is backed by codes.

Characteristics of the Fire Service

- Often has "Guardian" and "Doer" Personality Profiles
- Biased towards "the Applied"
- Based on "past Experience"

Portrait of an ESTJ - Extraverted Sensing Thinking Judging

(Extraverted Thinking with Introverted Sensing)

The Guardian

Jungian functional preference ordering:

Dominant: Extraverted Thinking

Auxiliary: Introverted Sensing

Tertiary: Extraverted Intuition

Inferior: Introverted Feeling

The Guardian---"aye, aye, Cap'n"

As an ESTJ, your primary mode of living is focused externally, where you deal with things rationally and logically. Your secondary mode is internal, where you take things in via your five senses in a literal, concrete fashion.

ESTJs live in a world of facts and concrete needs. They live in the present, with their eye constantly scanning their personal environment to make sure that everything is running smoothly and systematically. They honor traditions and laws, and have a clear set of standards and beliefs. They expect the same of others, and have no patience or understanding of individuals who do not value these systems. They value competence and efficiency, and like to see quick results for their efforts.

ESTJs are take-charge people. They have such a clear vision of the way that things should be, that they naturally step into leadership roles. They are self-confident and aggressive. They are extremely talented at devising systems and plans for action, and at being able to see what steps need to be taken to complete a specific task. They can sometimes be very demanding and critical, because they have such strongly held beliefs, and are likely to express themselves without reserve if they feel someone isn't meeting their standards. But at least their expressions can be taken at face-value, because the ESTJ is extremely straight-forward and honest.

The ESTJ is usually a model citizen, and pillar of the community. He or she takes their commitments seriously, and follows their own standards of "good citizenship" to the letter. ESTJ enjoys interacting with people, and likes to have fun. ESTJs can be very boisterous and fun at social events, especially activities which are focused on the family, community, or work.

The ESTJ needs to watch out for the tendency to be too rigid, and to become overly detail-oriented. Since they put a lot of weight in their own beliefs, it's important that they remember to value other people's input and opinions. If they neglect their Feeling side, they may have a problem with fulfilling other's needs for intimacy, and may unknowingly hurt people's feelings by applying logic and reason to situations which demand more emotional sensitivity.

The Guardian---"aye, aye, Cap'n"

When bogged down by stress, an ESTJ often feels isolated from others. They feel as if they are misunderstood and undervalued, and that their efforts are taken for granted. Although normally the ESTJ is very verbal and doesn't have any problem expressing themself, when under stress they have a hard time putting their feelings into words and communicating them to others.

ESTJs value security and social order above all else, and feel obligated to do all that they can to enhance and promote these goals. They will mow the lawn, vote, join the PTA, attend home owners association meetings, and generally do anything that they can to promote personal and social security.

The ESTJ puts forth a lot of effort in almost everything that they do. They will do everything that they think should be done in their job, marriage, and community with a good amount of energy. He or she is conscientious, practical, realistic, and dependable. While the ESTJ will dutifully do everything that is important to work towards a particular cause or goal, they might not naturally see or value the importance of goals which are outside of their practical scope. However, if the ESTJ is able to see the relevance of such goals to practical concerns, you can bet that they'll put every effort into understanding them and incorporating them into their quest for clarity and security.

Portrait of an ESTP - Extraverted Sensing Thinking Perceiving

(Extraverted Sensing with Introverted Thinking)

The Doer

Jungian functional preference ordering:

Dominant: Extraverted Sensing

Auxiliary: Introverted Thinking

Tertiary: Extraverted Feeling

Inferior: Introverted Intuition

The Doer---"get the hose, Frank"

As an ESTP, your primary mode of living is focused externally, where you take things in via your five senses in a literal, concrete fashion. Your secondary mode is internal, where you deal with things rationally and logically.

ESTPs are outgoing, straight-shooting types. Enthusiastic and excitable, ESTPs are "doers" who live in the world of action. Blunt, straight-forward risk-takers, they are willing to plunge right into things and get their hands dirty. They live in the here-and-now, and place little importance on introspection or theory. The look at the facts of a situation, quickly decide what should be done, execute the action, and move on to the next thing.

ESTPs have an uncanny ability to perceive people's attitudes and motivations. They pick up on little cues which go completely unnoticed by most other types, such as facial expressions and stance. They're typically a couple of steps ahead of the person they're interacting with. ESTPs use this ability to get what they want out of a situation. Rules and laws are seen as guidelines for behavior, rather than mandates. If the ESTP has decided that something needs to be done, then their "do it and get on with it" attitude takes precendence over the rules. However, the ESTP tends to have their own strong belief in what's right and what's wrong, and will doggedly stick to their principles. The Rules of the Establishment may hold little value to the ESTP, but their own integrity mandates that they will not under any circumstances do something which they feel to be wrong.

ESTPs have a strong flair for drama and style. They're fast-moving, fast-talking people who have an appreciation for the finer things in life. They may be gamblers or spendthrifts. They're usually very good at story telling and improvising. They typically makes things up as they go along, rather than following a plan. They love to have fun, and are fun people to be around. They can sometimes be hurtful to others without being aware of it, as they generally do not know and may not care about the effect their words have on others. It's not that they don't care about people, it's that their decision-making process does not involve taking people's feelings into account. They make decisions based on facts and logic.

The Doer---"get the hose, Frank"

ESTP's least developed area is their intuitive side. They are impatient with theory, and see little use for it in their quest to "get things done". An ESTP will occasionally have strong intuitions which are often way off-base, but sometimes very lucid and positive. The ESTP does not trust their instincts, and is suspicious of other people's intuition as well.

The ESTP often has trouble in school, especially higher education which moves into realms where theory is more important. The ESTP gets bored with classes in which they feel they gain no useful material which can be used to get things done. The ESTP may be brilliantly intelligent, but school will be a difficult chore for them.

The ESTP needs to keep moving, and so does well in careers where he or she is not restricted or confined. ESTPs make extremely good salespersons. They will become stifled and unhappy dealing with routine chores. ESTPs have a natural abundance of energy and enthusiasm, which makes them natural entrepreneurs. They get very excited about things, and have the ability to motivate others to excitement and action. The can sell anyone on any idea. They are action-oriented, and make decisions quickly. All-in-all, they have extraordinary talents for getting things started. They are not usually so good at following through, and might leave those tasks to others. Mastering the art of following through is something which ESTPs should pay special attention to.

ESTPs are practical, observant, fun-loving, spontaneous risk-takers with an excellent ability to quickly improvise an innovative solution to a problem. They're enthusiastic and fun to be with, and are great motivators. If an ESTP recognizes their real talents and operates within those realms, they can accomplish truly exciting things.

Codes

- "All Codes are Local"
- Applied Locally
- Enforced Locally
- Can be historical and static.
- May be slow to change.

Regulatory Architecture

- State Code
- County Code (Consolidation)
- City Code (Home Rule)
- Plan Review—outside engineering firm
- Creeping Federalism
  - OSHA Process Safety
  - Homeland Security
  - Chemical Safety Board
  - The Hotel and Motel Safety Act of 1990

Code Architecture

- State Basic Building Code
- Local Codes
  - NYC—High Rise
  - Cities—Smoke/CO Detectors
- Certifying Organizations
  - UL ASTM CSA SWRI
- Fire Insurance Carrier—Risk Management
  - FM/IRI

Codes then…

Regional Attributes

BOCA—Building Owners and Code Administrators
International—BOCA National Codes
Northeast States—Snow Load

ICBO--International Conference of Building Officials---International Building Codes
Western States---Earthquakes and Wild Fires

SBCC-- Southern Building Code Congress –Standard Building Codes
Southeast States---Hurricanes

Codes Now…..

INTERNATIONAL CODE COUNCIL
People Helping People Build a Safer World

Publications

The ICC has developed and made available an impressive inventory of comprehensive and coordinated International Codes, including:

- International Building Code
- International Energy Conservation Code
- International Existing Building Code
- International Fire Code
- International Fuel Gas Code
- International Green Construction Code
- International Mechanical Code
- ICC Performance Code

http://www.iccsafe.org/AboutICC/Pages/default.aspx

Code Integration

Ohio Building Code

4101:1-1-01 Administration.

Section 101

General

101.1 Title. *Chapters 4101:1-1 to 4101:1-35 of the Administrative Code shall be designated as the "Ohio Building Code" for which the designation "OBC" may be substituted. The "International Building Code 2009, first printing, Chapters 2 to 35," as published by the "International Code Council, Inc." is used as the basis of this document and is incorporated fully except as modified herein. References in these chapters to "this code" or to the "building code" in other sections of the Administrative Code shall mean the "Ohio Building Code."*

102.7 Existing structures. *The provisions of Chapter 34 shall control the alteration, repair, addition, maintenance, and change of occupancy of any existing structure.*

The occupancy of any structure currently existing on the date of adoption of this code shall be permitted to continue without change provided there are no orders of the building official pending, no evidence of fraud, or no serious safety or sanitation hazard. When requested, such approvals shall be in the form of a "Certificate of Occupancy for an Existing Building" in accordance with section 111.2.

What is the Hazard ?

Group H—High Hazard Occupancies

H-1: Detonation Hazard

H-2: Deflagration Hazard

H-3: Water Reactive

H-4: Health Hazard—Corrosive & Toxic

H-5: Semiconductor—Fabrication and Research and Development

Hazard to What ?—Adjoining Occupancies

NFPA-70 National Electrical Code (NEC)

The table below summarizes the various hazardous (classified) locations.

Summary of Class I, II, III Hazardous Locations

CLASSES	GROUPS	DIVISIONS	
		1	2
I Gases, vapors, and liquids (Art. 501)	A: Acetylene B: Hydrogen, etc. C: Ether, etc. D: Hydrocarbons, fuels, solvents, etc.	Normally explosive and hazardous	Not normally present in an explosive concentration (but may accidentally exist)
II Dusts (Art. 502)	E: Metal dusts (conductive, and explosive) F: Carbon dusts (some are conductive, and all are explosive) G: Flour, starch, grain, combustible plastic or chemical dust (explosive)	Ignitable quantities of dust normally are or may be in suspension, or conductive dust may be present	Dust not normally suspended in an ignitable concentration (but may accidentally exist). Dust layers are present.
III Fibers and flyings (Art. 503)	Textiles, wood-working, etc. (easily ignitable, but not likely to be explosive)	Handled or used in manufacturing	Stored or handled in storage (exclusive of manufacturing)

Risk Mitigation of the Hazard

- Distance→ Isolation, Access, Fire Fighting
- Construction→ Isolation, Access and Time
- Protective Systems→ Time, Firefighting, Isolation
- Systems and Procedures →Prevention and Mitigation

"The Team, the TEAM, THE TEAM"

- Architect
- Engineer—Civil/Structural, Electrical, Mechanical (HVAC)
- Building Owner/Department Supervisor
- Insurance Company Technical Representative
- Fire Marshall/Plans Reviewer/Code Administrator
- THE CHMM !!

Who is the Customer?

- Is God the Customer ?
- Do you know how God thinks?

Define the Hazard

- What Chemicals?
- Characteristics under Building Conditions?
- Physical Characteristics
- Flammable Range, Explosive Range, Flash Point, Boiling Point, Specific Gravity, Water Solubility,
- Chemical Characteristics
- pH, corrosivity, reactivity, incompatibilities with other chemicals.
- Biological Hazards----Toxicity
- Packaging and Volumes (aggregate/individual)
- Tanks, Ducts, Pipes, Totes, Drums, Carboys, Cans and Volumes of each
- Packaging Materials
- Metal, Plastic, Paper
- Storage Location
- Building location, floor, rack, ect.

Where is the high hazard occupancy in the building or facility?

- Floor ?
- Building Perimeter ?
- Core ?

What is the purpose of the High Hazard Occupancy ?

- Storage ?
- Transfer ?
- Processing ?

What is the type of high hazard occupancy?

- Liquid warehouse?
- Cutoff Room ?
- Control Area ?
- Flammable Cabinets ?
- Point of Use Container?

Advantages of a Control Area

- 4 hr walls/3 hr rated doors
  vs.
- 2 hr walls/1.5 hr rated doors with fire suppression (sprinkler) system that can have:

- less expensive construction materials
- larger floor area limitations
- longer egress paths
- fewer requirements for fire rated construction in structures protected by fire sprinklers (smoke vents, hose systems)

Purposes of Sprinkler Systems

Suppression	Control
• Prevent Flame Spread	• ESFR
• Control heat release rate to prevent structural collapse	• severe sudden reduction of the heat release rate of the fire
• Pre-wet Combustible Materials	• followed by quick extinguishment
• Manual Extinguishment by Fire Personnel	• prior to manual intervention

Types of Sprinkler Systems

- Wet—20-40 GPM (0.1-0.2 gpm/sq ft)
- Dry
- Pre-Action
- Antifreeze
- Deluge
- Foam
- Early Suppression Fast Response (ESFR) 100 GPM @ 50 psi
- Misting (droplet size <1000 um)

Design Basis for Sprinkler Systems

- The design area is a theoretical area of the building representing the worst case area where a fire could burn (1500 sq ft—typical)
- The design density is a measurement of how much water per square foot of floor area should be applied to the design area.
- Evolution is often based on the size and height of stockpiled combustible materials and the heat release rate of those materials. Greatest Concern is often high piled storage

Classifications of Sprinkler Systems

- Light hazard -- -Schools, churches, nursing homes
- ordinary hazard group 1—bakeries, electronics, laundries
- ordinary hazard group 2—chemical plants, paper mills, post offices
- extra hazard group 1 —metals, plastic processing
- extra hazard group 2 —flammable process

Classifications of Sprinkler Heads

- Standard vs. ESFR
- 1-4 minute response time vs.
- FD 15 minute response time with 250 GPM hose stream

Maximum Ceiling Temperature	Temperature Rating	Temperature Classification	Color Code (with Fusible Link)	Glass Bulb Color
100°F / 38°C	135-170°F / 57-77°C	Ordinary	Uncolored or Black	Orange (135°F) or Red (155°F)
150°F / 66°C	175-225°F / 79-107°C	Intermediate	White	Yellow (175°F) or Green (200°F)
225°F / 107°C	250-300°F / 121-149°C	High	Blue	Blue
300°F / 149°C	325-375°F / 163-191°C	Extra High	Red	Purple
375°F / 191°C	400-475°F / 204-246°C	Very Extra High	Green	Black
475°F / 246°C	500-575°F / 260-302°C	Ultra High	Orange	Black
625°F / 329°C	650°F / 343°C	Ultra High	Orange	Black

Breakdown of the Code

- Example: 2011 Ohio Building Code (ORC)
  now has a 2011 Fire Code (ORC)
  and an Administrative Section (OAC)
- Enlightenment or a sure cure for insomnia

Ohio Fire Code SECTION 2701 GENERAL (A)

(1) 2701.1 Scope.
Prevention, control and mitigation of dangerous conditions related to storage, dispensing, use and handling of hazardous materials shall be in accordance with this *rule*.

This *rule* shall apply to all hazardous materials, including those materials regulated elsewhere in this code, except that when specific requirements, *exceptions or exemptions* are provided in other *rules*, those specific requirements shall *take precedence over the similar requirements of this rule*. Where a material has multiple hazards, all hazards shall be addressed.

Exceptions:

1. The quantities of alcoholic beverages, medicines, foodstuffs, cosmetics and consumer or industrial products containing not more than 50 *per cent* by volume of water-miscible liquids and with the remainder of the solutions not being flammable, in retail or wholesale sales occupancies, are unlimited when packaged in individual containers not exceeding 1.3 gallons (5 L).

2. Application and release of pesticide and agricultural products and materials intended for use in weed abatement, erosion control, soil amendment or similar applications when applied in accordance with the manufacturers'instructions and label directions.

3. The off-site *and on-site* transportation of hazardous materials when in *compliance with and regulated by the Department of Transportation (DOTn) regulations*.

4. Building materials not otherwise regulated by this code.

5. Refrigeration systems (see *paragraph* (F)(606) *of rule 1301:7-7-06 of the Administrative Code*).

6. Stationary storage battery systems regulated by *paragraph* (H)(608) *of rule 1301:7-7-06 of the Administrative Code*.

7. The display, storage, sale or use of fireworks and explosives in accordance with *rule 1301:7-7-33 of the Administrative Code*.

8. Corrosives utilized in personal and household products in the manufacturers'original consumer packaging in Group M

8. Corrosives utilized in personal and household products in the manufacturers'original consumer packaging in Group M occupancies.

9. The storage of distilled spirits and wines in wooden barrels and casks.

10. The use of wall-mounted dispensers containing alcohol-based hand rubs classified as Class I or II liquids when in accordance with *paragraph* (E)(5)(3405.5) *of rule 1301:7-7-34 of the Administrative Code*.

(a) 2701.1.1 Waiver.
The provisions of this *rule* are waived when the fire code official determines that such enforcement is preempted by other codes, statutes or ordinances. The details of any action granting such a waiver shall be recorded and entered in the files of the code enforcement agency.

(b) *2701.1.2.*
Nothwithstanding paragraphs (B)(1)(102.1) *and* (B)(2)(102.2) *of rule 1301:7-7-01 of the Administrative Code and unless otherwise noted in this rule, the provisions of this rule relating to motor fuel-dispensing facilities and flammable and combustible liquids as otherwise regulated in rules 1301:7-7-22 and 1301:7-7-34 of the Administrative Code shall not apply to facilities, equipment, structures or installations existing or approved for construction or installation prior to the effective date of this rule, except in those cases where the fire code official demonstrates by a preponderance of the evidence that the existing facility, equipment, structure or installation creates a distinct hazard to life or adjacent property.*

(2) 2701.2 Material classification.
Hazardous materials are those chemicals or substances defined as such in this code. Definitions of hazardous materials shall apply to all hazardous materials, including those materials regulated elsewhere in this code.

(a) 2701.2.1 Mixtures.
Mixtures shall be classified in accordance with hazards of the mixture as a whole. Mixtures of hazardous materials shall be classified in accordance with nationally recognized reference standards; by an approved qualified organization, individual, or "Material Safety Data Sheet" (MSDS); or by other approved methods.

(b) 2701.2.2 Hazard categories.
Hazardous materials shall be classified according to hazard categories. The categories include materials regulated by this *rule* and materials regulated elsewhere in this code.

(i) 2701.2.2.1 Physical hazards.
The material categories listed in this *paragraph* are classified as physical hazards. A material with a primary classification as a physical hazard can also pose a health hazard.

(a) Explosives and blasting agents.

(b) Combustible liquids.

(c) Flammable solids, liquids and gases.

(d) Organic peroxide solids or liquids.

(e) Oxidizer solids or liquids.

(f) Oxidizing gases.

(g) Pyrophoric solids, liquids or gases.

(h) Unstable (reactive) solids, liquids or gases.

(i) Water-reactive materials solids or liquids.

(j) Cryogenic fluids.

(ii) 2701.2.2.2 Health hazards.
The material categories listed in this *paragraph* are classified as health hazards. A material with a primary classification as a health hazard can also pose a physical hazard.

(a) Highly toxic and toxic materials.

(b) Corrosive materials.

(3) 2701.3 Performance-based design alternative.

When approved by the fire code official, buildings and facilities where hazardous materials are stored, used or handled shall be permitted to comply with this *paragraph* as an alternative to compliance with the other requirements set forth in this rule, and *rules 1301:7-7-28 to 1301:7-7-44 of the Administrative Code*.

(a) 2701.3.1 Objective.
The objective of *paragraph* (A)(3)(2701.3) *of this rule* is to protect people and property from the consequences of unauthorized discharge, fires or explosions involving hazardous materials.

(b) 2701.3.2 Functional statements.
Performance-based design alternatives are based on the following functional statements:

(i) Provide safeguards to minimize the risk of unwanted releases, fires or explosions involving hazardous materials.

(ii) Provide safeguards to minimize the consequences of an unsafe condition involving hazardous materials during normal operations and in the event of an abnormal condition.

(c) 2701.3.3 Performance requirements.
When safeguards, systems, documentation, written plans or procedures, audits, process hazards analysis, mitigation measures, engineering controls or construction features are required
by *paragraphs* (A)(3)(c)(i)(2701.3.3.1) *to* (A)(3)(c)(xviii)(2701.3.3.18) *of this rule*, the details of the design alternative shall be subject to approval by the fire code official. The details of actions granting the use of the design alternatives shall be recorded and entered in the files of the jurisdiction.

(i) 2701.3.3.1 Properties of hazardous materials.
The physical and health-hazard properties of hazardous materials on site shall be known and shall be made readily available to employees, neighbors and the fire code official.

(ii) 2701.3.3.2 Reliability of equipment and operations.
Equipment and operations involving hazardous materials shall be designed, installed and maintained to ensure that they reliably operate as intended.

(iii) 2701.3.3.3 Prevention of unintentional reaction or release.
Safeguards shall be provided to minimize the risk of an unintentional reaction or release that could endanger people or

property.

(iv) 2701.3.3.4 Spill mitigation.
Spill containment systems or means to render a spill harmless to people or property shall be provided where a spill is determined to be a plausible event and where such an event would endanger people or property.

(v) 2701.3.3.5 Ignition hazards.
Safeguards shall be provided to minimize the risk of exposing combustible hazardous materials to unintended sources of ignition.

(vi) 2701.3.3.6 Protection of hazardous materials.
Safeguards shall be provided to minimize the risk of exposing hazardous materials to a fire or physical damage whereby such exposure could endanger or lead to the endangerment of people or property.

(vii) 2701.3.3.7 Exposure hazards.
Safeguards shall be provided to minimize the risk of and limit damage from a fire or explosion involving explosive hazardous materials whereby such fire or explosion could endanger or lead to the endangerment of people or property.

(viii) 2701.3.3.8 Detection of gas or vapor release.
Where a release of hazardous materials gas or vapor would cause immediate harm to persons or property, means of mitigating the dangerous effects of a release shall be provided.

(ix) 2701.3.3.9 Reliable power source.
Where a power supply is relied upon to prevent or control an emergency condition that could endanger people or property, the power supply shall be from a reliable source.

(x) 2701.3.3.10 Ventilation.
Where ventilation is necessary to limit the risk of creating an emergency condition resulting from normal or abnormal operations, means of ventilation shall be provided.

(xi) 2701.3.3.11 Process hazard analyses.
Process hazard analyses shall be conducted to ensure reasonably the protection of people and property from dangerous

(xii) 2701.3.3.12 Pre-startup safety review.
Written documentation of pre-startup safety review procedures shall be developed and enforced to ensure that operations are initiated in a safe manner. The process of developing and updating such procedures shall involve participation of affected employees.

(xiii) 2701.3.3.13 Operating and emergency procedures.
Written documentation of operating procedures and procedures for emergency shut down shall be developed and enforced to ensure that operations are conducted in a safe manner. The process of developing and updating such procedures shall involve participation of affected employees.

(xiv) 2701.3.3.14 Management of change.
A written plan for management of change shall be developed and enforced. The process of developing and updating the plan shall involve the participation of affected employees.

(xv) 2701.3.3.15 Emergency response plan.
A written emergency response plan shall be developed to ensure that proper actions are taken in the event of an emergency, and the plan shall be followed if an emergency condition occurs. The process of developing and updating the plan shall involve the participation of affected employees.

(xvi) 2701.3.3.16 Accident procedures.
Written procedures for investigation and documentation of accidents shall be developed, and accidents shall be investigated and documented in accordance with these procedures.

(xvii) 2701.3.3.17 Consequence analysis.
Where an accidental release of hazardous materials could endanger people or property, either on or off-site, an analysis of the expected consequences of a plausible release shall be performed and utilized in the analysis and selection of active and passive hazard mitigation controls.

(xviii) 2701.3.3.18 Safety audits.
Safety audits shall be conducted on a periodic basis to verify compliance with the requirements of this *paragraph*.

(4) 2701.4 Retail and wholesale storage and display.

Where required by the fire code official, an application for a permit shall include an "HMIS", such as "Superfund Amendments and Reauthorization Act of 1986" ("SARA") Title III, Tier II Report, or other approved statement. The "HMIS" shall include the following information:

(i) Product name.

(ii) Component.

(iii) "Chemical Abstract Service" ("CAS") number.

(iv) Location where stored or used.

(v) Container size.

(vi) Hazard classification.

(vii) Amount in storage.

(viii) Amount in use-closed systems.

(ix) Amount in use-open systems.

(6) 2701.6 Facility closure.
Facilities shall be placed out of service in accordance with *paragraphs* (A)(6)(a)(2701.6.1) *to* (A)(6)(c)(2701.6.3) *of this rule*.

(a) 2701.6.1 Temporarily out-of-service facilities.
Facilities that are temporarily out of service shall continue to be monitored and inspected *in accordance with the requirements of this code and any required permits*.

(b) 2701.6.2 Permanently out-of-service facilities.
Facilities not monitored and inspected on a regular basis *in accordance with the requirements of this code and any required permits* shall be deemed to be permanently out of service and shall be closed in an approved manner. When required by the fire code official, *the responsible person* shall apply for approval to *permanently* close storage, use or handling facilities. The fire code official is authorized to require that such application be accompanied by a facility closure plan in accordance with*paragraph* (A)(6)(c)(2701.6.3) *of this rule*.

(c) 2701.6.3 Facility closure plan.
When a facility closure plan is required in accordance with *paragraph* (A)(5)(2701.5) *of this rule* to terminate storage, dispensing, handling or use of hazardous materials, *the plan* shall be submitted to the fire code official at least 30 days prior to facility closure. The plan shall demonstrate that hazardous materials which are stored, dispensed, handled or used in the facility will be transported, disposed of or reused in a manner that eliminates the need for further maintenance and any threat to public health and safety.

SECTION 2703 GENERAL REQUIREMENTS (C)

(1) 2703.1 Scope.
The storage, use and handling of all hazardous materials shall be in accordance with this *paragraph*.

(a) 2703.1.1 Maximum allowable quantity per control area.
The maximum allowable quantity per control area shall be as specified in Tables 2703.1.1(1) *to* 2703.1.1(4) *of this rule*.

For retail and wholesale storage and display in Group M occupancies and Group S storage, see *paragraph* (C)(11)(2703.11) *of this rule*.

(b) 2703.1.2 Conversion.
Where quantities are indicated in pounds and when the weight per gallon of the liquid is not provided to the fire code official, a conversion of 10 pounds per gallon (1.2 kg/L) shall be used.

(c) 2703.1.3 Quantities not exceeding the maximum allowable quantity per control area.
The storage, use and handling of hazardous materials in quantities not exceeding the maximum allowable quantity per control area indicated in Tables 2703.1.1(1) to 2703.1.1(4) *of this rule* shall be in accordance with *paragraphs* (A)(2701) and (C)(2703) *of this rule*.

(d) 2703.1.4 Quantities exceeding the maximum allowable quantity per control area.
The storage and use of hazardous materials in quantities exceeding the maximum allowable quantity per control area indicated in Tables 2703.1.1(1) *to* 2703.1.1(4) *of this rule* shall be in accordance with this *rule*.

(2) 2703.2 Systems, equipment and processes.
Systems, equipment and processes utilized for storage, dispensing, use or handling of hazardous materials shall be in accordance with *paragraphs* (C)(2)(a)(2703.2.1) *to* (C)(2)(h)(2703.2.8) *of this rule*.

(a) 2703.2.1 Design and construction of containers, cylinders and tanks.
Containers, cylinders and tanks shall be designed and constructed in accordance with *this code and other* approved standards. Containers, cylinders, tanks and other means used for containment of hazardous materials shall be of an approved type. Pressure vessels shall comply with the ASME Boiler and Pressure Vessel Code *as listed in rule 1301:7-7-47 of the Administrative Code*.

(e) Manually activated shutdown controls required by *paragraph* (C)(1)(a)(i)(4103.1.1.1) *of rule 1301:7-7-41 of the Administrative Code* for compressed gas systems conveying pyrophoric gases.

(ii) 2703.2.9.2 Testing frequency.
The equipment, systems and devices listed in *paragraph* (C)(2)(i)(i) (2703.2.9.1) *of this rule* shall be tested at one of the frequencies listed below:

(a) Not less than annually;

(b) In accordance with the approved manufacturers' requirements;

(c) In accordance with approved recognized industry standards; or

(d) In accordance with an approved schedule.

(3) 2703.3 Release of hazardous materials.
Hazardous materials in any quantity shall not be released into a sewer, storm drain, ditch, drainage canal, creek, stream, river, lake or tidal waterway or on the ground, sidewalk, street, highway or into the atmosphere.

Exceptions:

1. The release or emission of hazardous materials is allowed when in compliance with federal, state or local governmental agencies, regulations or permits.

2. The release of pesticides is allowed when used in accordance with registered label directions.

3. The release of fertilizer and soil amendments is allowed when used in accordance with manufacturer's specifications.

(a) 2703.3.1 Unauthorized discharges.
When hazardous materials are released in quantities reportable under state, federal or local regulations, the fire code official shall be notified and the following procedures required in accordance with *paragraphs* (C)(3)(a)(i)(2703.3.1.1) *to* (C)(3)(a)(iv)(2703.3.1.4) *of this rule.*

TABLE 2703.1.1(1) MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD[a,j,m,n,p]

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE[b]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas cubic feet at NTP	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas cubic feet at NTP	Solid pounds (cubic feet)	Liquid gallons (pounds)
Combustible liquid[c,i]	II IIIA IIIB	H-2 or H-3 H-2 or H-3 Not applicable	Not applicable	120[d,e] 330[d,e] 13,200[e,f]	Not applicable	Not applicable	120[d,e] 330[d,e] 13,200[e,f]	Not applicable	Not applicable	30[d] 80[d] 3,300[f]
Combustible fiber	Loose Baled[o]	H-3	(100)(1,000)	Not applicable	Not applicable	(100)(1,000)	Not applicable	Not applicable	(20)(200)	Not applicable
Cryogenic Flammable	Not applicable	H-2	Not applicable	45[d]	Not applicable	Not applicable	45[d]	Not applicable	Not applicable	10[d]
Consumer fireworks (Class C common)	1.4G	H-3	0[q]	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Cryogenic oxidizing	Not applicable	H-3	Not applicable	45d	Not applicable	Not applicable	45[d]	Not applicable	Not applicable	10[d]
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4 Division 1.4G Division 1.5 Division 1.6	H-1 H-1 H-1 or 2 H-3 H-3 H-1 H-1	1[e,g] 1[e,g] 5[e,g] 50[e,g] 01[e,g] 1[e,g]	(1)[e,g] (1)[e,g] (5)[e,g] (50)[e,g] Not applicable (1)[e,g] Not applicable	Not applicable	0.25[g] 0.25[g] 1[g] 50[g] Not applicable 0.25[g] Not applicable	(0.25)[g] (0.25)[g] (1)[g] (50)[g] Not applicable (0.25)[g] Not applicable	Not applicable	0.25[g] 0.25[g] 1[g] 50[g] Not applicable 0.25[g] Not applicable	(0.25)[g] (0.25)[g] (1)[g] (50)[g] Not applicable (0.25)[g] Not applicable
Flammable gas	Gaseous Liquefied	H-2	Not applicable	Not applicable (150)[d,e]	1,000[d,e] Not applicable	Not applicable	Not applicable (150)[d,e]	1,000[d,e] Not applicable	Not applicable	Not applicable
Flammable liquids[c]	IA IB and IC	H-2 or H-3 Not applicable	30[d,e] 120[d,e]	Not applicable	Not applicable	30[d,e] 120[d,e]	Not applicable	Not applicable	10[d] 30[d]	
Combination flammable	Not applicable	H-2	Not applicable	120[d,e,h]	Not applicable	Not applicable	120[d,h]	Not applicable	Not applicable	30[d,h]

d. Maximum allowable quantities shall be increased 100 *per cent* in buildings equipped throughout with an automatic sprinkler system in accordance with *paragraph* (C)(3)(a)(i)(903.3.1.1) *of rule 1301:7-7-09 of the Administrative Code*. Where note e also applies, the increase for both notes shall be applied accumulatively.

e. Maximum allowable quantities shall be increased 100 *per cent* when stored in approved storage cabinets, day boxes, gas cabinets, exhausted enclosures or listed safety cans. Listed safety cans shall be in accordance with *paragraph* (C)(9)(j)(2703.9.10) *of this rule*. Where note d also applies, the increase for both notes shall be applied accumulatively.

f. Quantities shall not be limited in a building equipped throughout with an automatic sprinkler system.

TABLE 2703.1.1(2) MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A HEALTH HAZARD[a,b,c,h]

MATERIAL	STORAGE[d]			USE-CLOSED SYSTEMS[d]			USE-OPEN SYSTEMS[d]	
	Solid pounds[e,f]	Liquid gallons (pounds)[e,f]	Gas cubic feet (pounds)[e]	Solid pounds[e,f]	Liquid gallons (pounds)[e,f]	Gas cubic feet (pounds)[e]	Solid pounds[e,f]	Liquid gallons (pounds)[e,f]
Corrosives	5,000	500	Gaseous 810 Liquefied (150)	5,000	500	Gaseous 810[f] Liquefied (150)	1,000	100
Highly toxics	10	(10)	Gaseous 20 Liquefied (140)[g]	10	(10)[i]	Gaseous 20[g] Liquefied (140)[g]	3	(3)
Toxics	500	(500)	Gaseous 810[f] Liquefied (150)[f]	500	(500)[i]	Gaseous 810[f] Liquefied (150)[f]	125	(125)

TABLE 2703.1.1(4) MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD IN AN OUTDOOR CONTROL AREA[a,b,c,f]

MATERIAL	STORAGE[d]			USE-CLOSED SYSTEMS[d]			USE-OPEN SYSTEMS[d]	
	Solid pounds[e,f]	Liquid gallons (pounds)[e,f]	Gas cubic feet (pounds)[e]	Solid pounds[e,f]	Liquid gallons (pounds)[e,f]	Gas cubic feet (pounds)[e]	Solid pounds[e,f]	Liquid gallons (pounds)[e,f]
Corrosives	20,000	2,000	Gaseous 1,620 Liquefied (300)	10,000	1,000	Gaseous 810 Liquefied (150)	1,000	100
Highly toxics	20	(20)	Gaseous 40[d] Liquefied (8)[d]	10	(10)	Gaseous 20[d] Liquefied (4)[d]	3	(3)
Toxics	1,000	(1,000)[e]	Gaseous 1,620 Liquefied (300)	500	50[e]	Gaseous 810 Liquefied (150)	125	(125)[e]

(ii) 2703.8.3.2 Percentage of maximum allowable quantities.
The percentage of maximum allowable quantities of hazardous materials per control area allowed at each floor level within a building shall be in accordance with Table 2703.8.3.2 *of this rule.*

TABLE 2703.8.3.2 DESIGN AND NUMBER OF CONTROL AREAS

FLOOR LEVEL		PER CENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA[a]	NUMBER OF CONTROL AREAS PER FLOOR	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS[b]
Above grade plane	Higher than 9	5	1	2
	7-9	5	2	2
	6	12.5	2	2
	5	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below grade plane	1	75	3	1
	2	50	2	1
	Lower than 2	Not allowed	Not allowed	Not allowed

a. Percentages shall be of the maximum allowable quantity per control area as shown in Tables 2703.1.1(1) and 2703.1.1(2) *of this rule*, with all increases allowed in the footnotes of those tables.
b. Fire barriers shall include walls and floors as necessary to provide separation from other portions of the building.

TABLE 2704.2.2 REQUIRED SECONDARY CONTAINMENT-HAZARDOUS MATERIAL SOLIDS AND LIQUIDS STORAGE

MATERIAL		INDOOR STORAGE		OUTDOOR STORAGE	
		Solids	Liquids	Solids	Liquids
1. Physical-hazard materials					
Combustible liquids	Class II	Not applicable	See *rule 1301:7-7-34 of the Administrative Code*	Not applicable	See *rule 1301:7-7-34 of the Administrative Code*
	Class IIIA		See *rule 1301:7-7-34 of the Administrative Code*		See *rule 1301:7-7-34 of the Administrative Code*
	Class IIIA		See *rule 1301:7-7-34 of the Administrative Code*		See *rule 1301:7-7-34 of the Administrative Code*
Cryogenic fluids			See *rule 1301:7-7-32 of the Administrative Code*		See *rule 1301:7-7-32 of the Administrative Code*
Explosives		See *rule 1301:7-7-33 of the Administrative Code*		See *rule 1301:7-7-33 of the Administrative Code*	
Flammable liquids	Class IA	Not applicable	See *rule 1301:7-7-34 of the Administrative Code*	Not applicable	See *rule 1301:7-7-34 of the Administrative Code*
	Class IB		See *rule 1301:7-7-34 of the Administrative Code*		See *rule 1301:7-7-34 of the Administrative Code*
	Class IC		See *rule 1301:7-7-34 of the Administrative Code*		See *rule 1301:7-7-34 of the Administrative Code*
Flammable solids		Not required	Not applicable	Not required	Not applicable

(i) 2704.2.2.1 Containment and drainage methods.
The building, room or area shall contain or drain the hazardous materials and fire protection water through the use of one of the following methods:

(a) Liquid-tight sloped or recessed floors in indoor locations or similar areas in outdoor locations.

(b) Liquid-tight floors in indoor locations or similar areas in outdoor locations provided with liquid-tight raised or recessed sills or dikes.

(c) Sumps and collection systems.

(d) Drainage systems leading to an approved location.

(e) Other approved engineered systems.

(ii) 2704.2.2.2 Incompatible materials.
Incompatible materials used in open systems shall be separated from each other in the secondary containment system.

(iii) 2704.2.2.3 Indoor design.
Secondary containment for indoor storage areas shall be designed to contain a spill from the largest vessel plus the design flow volume of fire protection water calculated to discharge from the fire-extinguishing system over the minimum required system design area or area of the room or area in which the storage is located, whichever is smaller. The containment capacity shall be designed to contain the flow for a period of 20 minutes.

(iv) 2704.2.2.4 Outdoor design.
Secondary containment for outdoor storage areas shall be designed to contain a spill from the largest individual vessel. If the *secondary containment* area is open to rainfall, *the* secondary containment *area* shall be designed to include the volume of a 24-hour rainfall as determined by a 25-year storm and provisions shall be made to drain accumulations of groundwater and rainwater.

(v) 2704.2.2.5 Monitoring.
An approved monitoring method shall be provided to detect hazardous materials in the secondary containment system. The

(4) 2704.4 Separation of incompatible hazardous materials.
Incompatible materials shall be separated in accordance with *paragraph* (C)(9)(h)(2703.9.8) *of this rule.*

(5) 2704.5 Automatic sprinkler systems.
Indoor storage areas and storage buildings shall be equipped throughout with an automatic sprinkler system in accordance with *paragraph* (C)(3)(a)(i)(903.3.1.1) *of rule 1301:7-7-09 of the Administrative Code.* The design of the sprinkler system shall not be less than that required for Ordinary Hazard Group 2 with a minimum design area of 3,000 square feet (279 m^2). Where the materials or storage arrangement are required by other regulations to be provided with a higher level of sprinkler system protection, the higher level of sprinkler system protection shall be provided.

(6) 2704.6 Explosion control.
Indoor storage rooms, areas and buildings shall be provided with explosion control in accordance with *paragraph* (K)(911) *of rule 1301:7-7-09 of the Administrative Code.*

(7) 2704.7 Standby or emergency power.
Where mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be provided with an emergency or standby power system in accordance with NFPA 70 *as listed in rule 1301:7-7-47 of the Administrative Code* and *paragraph (D)(604) of rule 1301:7-7-06 of the Administrative Code.*

Exceptions:

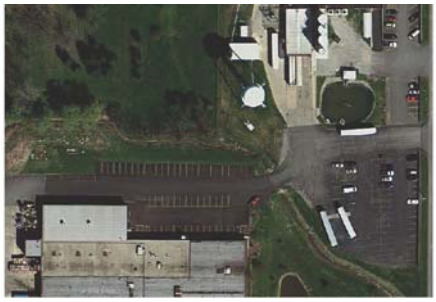
1. Mechanical ventilation for storage of Class IB and Class IC flammable and combustible liquids in closed containers not exceeding $6^1/_2$ gallons (25 L) capacity.

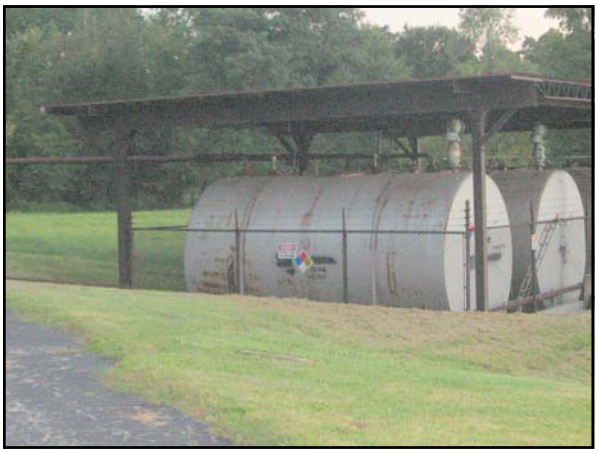
2. Storage areas for Class 1 and 2 oxidizers.

3. Storage areas for Class II, III, IV and V organic peroxides.

4. Storage areas for asphyxiant, irritant and radioactive gases.

5. For storage areas for highly toxic or toxic materials,





Summary

- The trend with Codes is to go international in scope.
- More resources can often be applied to have Codes respond to changes in technology and current practices.
- Codes with wider applicability may be more prescriptive and less flexible.
- "All codes are local."

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Questions

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