Committee Input No. 5-NFPA 704-2019 [Section No. E.3]

E.3 CHETAH.

CHETAH is a computer program that is useful for several tasks, including the following:

(1) Characterizing materials for their ability to decompose with violence

(2) Estimating heats of reaction or combustion

(3) Predicting lower flammability limits and certain other flammability parameters

(4) Predicting thermochemical properties such as standard enthalpies of formation, heat capacities, and free energies of formation

An extensive database of common chemicals, primarily organics, is included in the program, along with a procedure to predict values for additional chemicals using the Benson group additivity method of describing molecules from molecular fragments.

For hazard evaluation, CHETAH is a conservative screening tool for use during the early stages of compound synthesis or process development. Its use should be integrated within an experimental program for testing reactive chemical hazards. CHETAH was not designed to replace the physical testing of materials. Rather, CHETAH's computational results should be used to complement experimental results to help identify the need for further testing in the areas of impact sensitivity and/or flammability.

The potential hazards associated with handling new chemicals will not, in general, be known a priori. Furthermore, experimentally determined thermochemical data for new chemicals used for process design and to predict hazards will often not be available. CHETAH exists largely to allow users to build compounds using group additivity methods, to predict thermochemical properties for compounds and reactions, and to use these predicted properties for hazard evaluation. Users can then use CHETAH's predictions with results from accelerating rate calorimetry (ARC), differential scanning calorimetry (DSC), drop-weight, or other tests to prepare, use, store, or dispose of new compounds safely. Personnel committed to ensuring the safe operations at sites where research, process development, or manufacturing occur could find CHETAH useful in reactive chemicals evaluation programs.

The user might wish to examine the following list of references for examples illustrating how CHETAH can be used to evaluate instability hazards. A more extensive list of references concerning CHETAH can be found at:

www.astm.org/BOOKSTORE/PUBS/DS51F.htm. CHETAH is distributed by ASTM International Inc.

References:

Britton, L. G.; Frurip, D. J. "Further Uses of the Heat of Oxidation in Chemical Hazard Assessment, Process Safety Progress," 22 (1), 1–19, 2003.

Frurip, D., et al., "The Role of ASTM E27 Methods in Hazard Assessment: Part I. Thermal Stability, Compatibility, and Energy Release Estimation Methods, Process Safety Progress," 23(4), 266–278, 2004.

Pasturenzi, C., et al., "Thermochemical stability: A comparison between experimental and predicted data, Journal of Loss Prevention in the Process Industries," 28, 79–91, 2014.

Submitter Information Verification

Committee: CLA-AAA
Submittal Date: Thu Oct 24 15:24:24 EDT 2019

Committee Statement

Committee Statement:	The committee is planning to evaluate the new version of CHETAH, which will be released in the spring of 2020, for possible updates to Annex E material.
Response Message:	CI-5-NFPA 704-2019

Committee Input No. 6-NFPA 704-2019 [Section No. G.1]

G.1

NFPA and the Technical Committee on Classification are aware of the potential impact that the globally harmonized system (GHS) incorporation into OSHA's Hazard Communication Standard (HazCom) 2012 has on the NFPA 704 standard system and its users. Currently, NFPA 704 stands as written and there is no immediate plan to change the system. NFPA 704 is widely used and recognized by emergency responders and safety personnel for identifying the hazards of short-term/acute exposure to materials under conditions of fire, spill, or similar emergencies. The Committee will carefully consider any impact before changing a consensus standard system that has been protecting emergency responders, employees, and the public for more than 50 years.

The NFPA 704 diamond remains as a warning sign for first responders. It provides information required for the first responders to assess hazards presented by materials within an occupancy or industrial location. It provides, in a concise format, a quick presentation of all hazardous materials present. This provides critical size-up information needed to evaluate potential short-term exposure to the hazardous materials within the facility against first responder training and personal protective equipment. From this initial information, informed decisions can be made about the next steps to take to protect responders and the community and what additional resources might be needed to mitigate the event.

OSHA and NFPA are in agreement that there are differences between HazCom 2012 and NFPA 704; the two systems were developed for different purposes. There are two distinct sets of numbers used for the two systems: HazCom 2012 uses a *hazard classification system* whereas NFPA 704 uses a *hazard rating system*. The NFPA 704 label was developed to provide information to emergency personnel responding to a spill or fire. In comparison, OSHA's hazard classification system provides information for workers exposed to materials primarily under normal conditions of use. The numbers that are part of the OSHA HazCom 2012 hazard classification system are then used to obtain more detailed information for labels and safety data sheets in Appendixes A, B, and C of the OSHA standard. In contrast, the numbers in NFPA 704 are relative ratings of hazards developed for emergency response.

HazCom 2012 numbers are included in Section 2 of the new safety data sheet (SDS) format. The concern is that these numbers could be mistakenly identified as NFPA 704 ratings and be transcribed to the NFPA 704 diamond. Because the two systems have inverse number systems (e.g., 4 is the most hazardous rating in NFPA 704 but the least hazardous in OSHA's classification), a transcription error could lead to incorrect identification of the hazard in an emergency response. It should be noted that the hazard classification numbers are *not* required on HazCom 2012 labels.

Both systems have value for different purposes. The key to distinguishing the two systems is education. NFPA and OSHA developed a 'Quick Card' to explain the two systems and their differences. *(See Figure G.1.)* This card is available for download at www.nfpa.org/704 under Additional Information on the first tab, and on the OSHA website at: www.osha.gov/Publications/OSHA3678.pdf. You can also sign up for email alerts at the top of the document information page at www.nfpa.org/704 to receive an email alert when any additional NFPA 704 document-related information is posted to the page. NFPA will continue discussions with OSHA and with emergency responders to ensure that all concerns are addressed.

Figure G.1 Quick Card, Front and Reverse Sides.

NFPA® OSHA® QUICK CARD

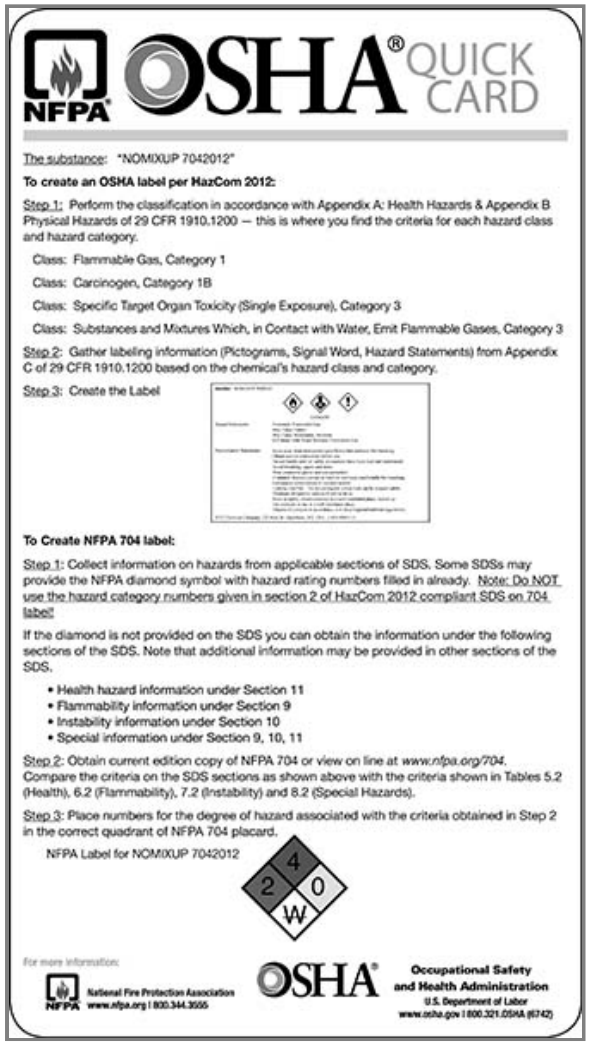
Comparison of NFPA 704 and HazCom 2012 Labels

	NFPA 704	HazCom 2012
Purpose	Provides basic information for emergency personnel responding to a fire or spill and those planning for emergency response.	Informs workers about the hazards of chemicals in workplace under normal conditions of use and foreseeable emergencies.
Number System: NFPA Rating and OSHA's Classification System	0–4 0 – least hazardous 4 – most hazardous	1–4 1 – most severe hazard 4 – least severe hazard • The Hazard category numbers are NOT required to be on labels but are required on SDSs in Section 2. • Numbers are used to CLASSIFY hazards to determine what label information is required.
Information Provided on Label	• Health – Blue • Flammability – Red • Instability – Yellow • Special Hazards* – White *OX Oxidizers W Water Reactives SA Simple Asphyxiants	• Product Identifier • Signal Word • Hazard Statement(s) • Pictogram(s) • Precautionary statement(s); and • Name, address, and phone number of responsible party.
Health Hazards on Label	Acute (short term) health hazards ONLY. Acute hazards are more typical for emergency response applications. Chronic health effects are not covered by NFPA 704.	Acute (short term) and chronic (long term) health hazards. Both acute and chronic health effects are relevant for employees working with chemicals day after day. Health hazards include acute hazards such as eye irritants, simple asphyxiants, and skin corrosives as well as chronic hazards such as carcinogens.
Flammability/ Physical Hazards on Label	NFPA divides flammability and instability hazards into two separate numbers on the label. Flammability in red section. Instability in yellow section.	A broad range of physical hazard classes are listed on the label including explosives, flammables, oxidizers, reactives, pyrophorics, combustible dusts, and corrosives
Where to get information to place on label	Rating system found in NFPA Fire Protection Guide to Hazardous Materials OR NFPA 704 Standard System for Identification of the Hazards of Materials for Emergency Response 2012 Edition. Tables 5.2, 6.2, 7.2 and Chapter 8 of NFPA 704.	OSHA Hazard Communication Standard 29 CFR 1910.1200 (2012). 1) Classify using Appendix A (Health Hazards) and Appendix B (Physical Hazards). 2) Label using Appendix C.
Other	The hazard category numbers found in section 2 of the HC2012 compliant SDSs are NOT to be used to fill in the NFPA 704 diamond.	Supplemental information may also appear on the label such as any hazards not otherwise classified, and directions for use.
website	www.nfpa.org/704	www.osha.gov OR www.osha.gov/dsg/hazcom/index.html

For more information:

National Fire Protection Association
www.nfpa.org | 800.344.3555

OSHA® Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov | 800.321.OSHA (6742)



NFPA OSHA® QUICK CARD

The substance: *NOMIXUP 7042012*

To create an OSHA label per HazCom 2012:

Step 1: Perform the classification in accordance with Appendix A: Health Hazards & Appendix B Physical Hazards of 29 CFR 1910.1200 — this is where you find the criteria for each hazard class and hazard category.

Class: Flammable Gas, Category 1

Class: Carcinogen, Category 1B

Class: Specific Target Organ Toxicity (Single Exposure), Category 3

Class: Substances and Mixtures Which, in Contact with Water, Emit Flammable Gases, Category 3

Step 2: Gather labeling information (Pictograms, Signal Word, Hazard Statements) from Appendix C of 29 CFR 1910.1200 based on the chemical's hazard class and category.

Step 3: Create the Label

To Create NFPA 704 label:

Step 1: Collect information on hazards from applicable sections of SDS. Some SDSs may provide the NFPA diamond symbol with hazard rating numbers filled in already. Note: Do NOT use the hazard category numbers given in section 2 of HazCom 2012 compliant SDS on 704 label!

If the diamond is not provided on the SDS you can obtain the information under the following sections of the SDS. Note that additional information may be provided in other sections of the SDS.

- Health hazard information under Section 11
- Flammability information under Section 9
- Instability information under Section 10
- Special information under Section 9, 10, 11

Step 2: Obtain current edition copy of NFPA 704 or view on line at *www.nfpa.org/704*. Compare the criteria on the SDS sections as shown above with the criteria shown in Tables 5.2 (Health), 6.2 (Flammability), 7.2 (Instability) and 8.2 (Special Hazards).

Step 3: Place numbers for the degree of hazard associated with the criteria obtained in Step 2 in the correct quadrant of NFPA 704 placard.

NFPA Label for NOMIXUP 7042012

For more information:

National Fire Protection Association
www.nfpa.org | 800.344.3555

OSHA Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov | 800.321.OSHA (6742)

Submitter Information Verification

Committee: CLA-AAA
Submittal Date: Thu Oct 24 15:36:36 EDT 2019

Committee Statement

Committee Statement: The committee has been informed by a committee member from OSHA that there may be some changes to HazCom 2012; therefore there may need to be some updates to Annex G material.

Response Message: CI-6-NFPA 704-2019