



Arkema Chemical Plant & the 2017 Risk Management Program Amendments

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Background on the Risk Management Program

In 2013, an ammonium nitrate explosion occurred at a fertilizer plant in West, Texas, killing 15 people and destroying or damaging half of the homes in the small town.¹ Partially in response to this incident, President Obama directed improved coordination across federal agencies and with local and state partners to make chemical facilities safer and more secure.²

In addition, the Environmental Protection Agency (EPA) proposed regulatory changes to improve the Risk Management Program (RMP) of the Clean Air Act.³ The RMP seeks to reduce accidental releases of extremely hazardous substances. Covered facilities are subject to three tiers of regulation. Program 3 facilities must meet the most stringent standards, having “a higher frequency of the most serious accidents as compared to other industry sectors.”⁴

EPA published the final rule, *Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act* (“Final Rule”), in January 2017.⁵ The original effective date was March 14, 2017, with most compliance deadlines set for March 2021.⁶ The RMP amendments enhanced accident prevention programs, emergency response requirements, and the public availability of chemical hazard information.⁷ After the change in Administration, and in response to a petition to reconsider, EPA delayed the rule’s effective date to June 19, 2019.⁸

In late August 2017, Hurricane Harvey brought an unprecedented amount of rain to the Houston area; some locations recorded more than 50 inches of rainfall.⁹ Subsequent flooding forced residents to evacuate, businesses to close, and precipitated many environmental emergencies. These emergencies included multiple chemical fires at a plant owned by Arkema, Inc. (“Arkema”) that resulted in a catastrophic emissions release. Assessing the Arkema incidents through the lens of EPA’s Final Rule reveals the importance of the RMP amendments, even though the relevant portions would not have been in place by August 2017.¹⁰

Overview of the Arkema Plant

Arkema is a specialty chemical producer headquartered in France.¹¹ It operates over thirty plants in the United States, including a liquid organic peroxide production plant in Crosby, Texas. The Crosby

plant is situated about four miles from Crosby (pop. <2,500), five miles from Barrett (pop. < 3,000), 18 miles from Bay City (pop. >30,000), and 20 miles from Houston. The plant employs 57 people.¹²

EPA has designated Arkema's Crosby plant as a Program 3 facility, because it is an organic chemical manufacturer.¹³ The facility is also located in a FEMA designated floodplain.¹⁴ As required by EPA, Arkema last submitted a Risk Management Plan in 2014.¹⁵ According to research by the Environmental Defense Fund (EDF), a 2013 hazard analysis conducted by Arkema identified potential risks flowing from equipment failure, loss of cooling, heating, electricity, floods, hurricane, and power failure or power surge.¹⁶

Previous Regulatory Inspections and Violations

The Arkema facility manufactures organic peroxides, which must be maintained at a certain temperature to prevent them from decomposing and catching fire. The 2017 chemical fires at Arkema were due to the overheating of organic peroxides after power failures cut off the cooling supply.¹⁷ This was not the first time that power outages or decomposition and overheating of these chemicals were identified as an issue at the facility.¹⁸

In 2016, OSHA investigations identified ten serious violations at the Arkema plant.¹⁹ Arkema was fined over \$100,000 and settled the claims earlier in 2017.²⁰ Seven of the violations directly related to equipment.²¹ These included: three violations relating to equipment inspections, one violation regarding equipment deficiencies, and one violation for improper electrical installations.²² There was also a violation regarding the process hazard analysis required for highly hazardous chemicals.²³ Because of the informal settlement process, additional information on the nature of the violations is not readily available.

In 2006, the plant experienced a fire due to the improper storage and eventual decomposition of organic peroxides.²⁴ Though emissions were released in this incident, the situation was quickly remedied by inundating the burning area with water.²⁵ In 2011, the facility was fined for failure to maintain proper cooling temperatures.²⁶ There was an additional incident with an opened bleed valve that led to an emissions release in 2016, but this appears unrelated to proper storage and refrigeration of the organic peroxides.²⁷ As part of the Clean Air Act's Annual Compliance Certification review, Texas Commission on Environmental Quality (TCEQ) noted deviations in Arkema's Title V reports in 2015, 2016, and 2017.²⁸ Per TCEQ, deviations are "any indication of noncompliance with a term or condition of the Title V permit..."²⁹

How the Plant Failed During Harvey

The facility shut down all production before Hurricane Harvey's landfall on August 25, 2017.³⁰ There were no electric services to the site after August 27.³¹ On August 28, a ride-out crew that had remained on site transferred the organic peroxides from cold-storage warehouses into diesel-powered refrigerated containers.³² These containers were brought onto the site prior to Harvey's landfall as backup storage in the event of a power outage.³³

On August 29, the ride-out crew was evacuated. According to Arkema, the company started communicating with emergency officials, known as “Unified Command,”³⁴ that same day.³⁴ This included sending information about the plant design and the type and quantity of each product at the plant.³⁵ A mandatory evacuation for all residents within 1.5 miles of the plant was also initiated on August 29 and remained in place into September.³⁶

The plant’s tanks overflowed on August 29 due to flooding.³⁷ The tanks’ containment dike then exceeded its capacity, which resulted in a release of storm water containing organic peroxides.³⁸ In addition, one of the refrigerated backup containers lost cooling power due to flooding.³⁹ On August 31, the trailer caught fire and burned, with the fire spreading to a few, small areas surrounding the trailer.⁴⁰ Unified Command was involved in the decision to allow the first trailer to burn completely.⁴¹

The remaining trailers lost power over the course of the next two days.⁴² By this point, the plant had lost primary power, emergency backup power, and the refrigeration backup system in many of the trailers.⁴³ The trailers were closely monitored and expected to also burn. When no fires occurred naturally, Unified Command decided to initiate a controlled burn for all six remaining containers on September 3.⁴⁴ There was no advanced notice given to locals.⁴⁵ Following the incident, Arkema deferred questions regarding the specifics of the controlled ignition to the Harris County Fire Marshal’s Office.⁴⁶

Emissions Reports and Court Challenges

At a press conference, Arkema officials informed residents that the smoke from the burning trailers was not unlike smoke that would result from a burning house.⁴⁷ According to Arkema, the smoke contained: organic peroxide product; trailer material, including plastic and rubber tires; and refrigeration insulation in the trailers. Arkema warned residents to remain inside and to call authorities to collect soot from the smoke if any landed on their property.

Following the fires, EPA and TCEQ monitored the air quality surrounding the facility.⁴⁸ EPA did not find any values that exceeded the Texas comparison values, as set by TCEQ.⁴⁹ Samples of the surface water runoff did not detect organic chemicals.⁵⁰

First responders reported not receiving accurate information about the dangers of the smoke and that many first responders required medical attention after inhaling the fumes from the fires.⁵¹ Seven first responders have filed a negligence suit against Arkema.⁵² Residents, including those beyond the 1.5-mile radius, reported finding soot and debris on their property and have filed a class action lawsuit.⁵³ There were also rumors of dead animals found on property near the plant.⁵⁴ Arkema

¹ Unified Command for Hurricane Harvey included: Harris County Fire Marshal’s Office, Harris County Sheriff, Crosby Fire Department, EPA, TCEQ, Department of Homeland Security, Security & Emergency Management, and Harris County Pollution Control Services Department.

avoided a causal connection to the dead animals in a press conference but announced it would help residents dispose of animal carcasses on their property.⁵⁵

The Harris County Pollution Control Services and Fire Marshal's Office have found that Arkema violated the Texas Clean Air Act.⁵⁶ Harris County obtained permission to file a civil suit against Arkema for creating a public nuisance and violating the Texas Clean Air Act.⁵⁷ TCEQ, EPA, and the Chemical Safety Board are all investigating the incident.⁵⁸

EPA's Delayed RMP Rule

EPA's RMP regulations and the delayed amendments seek to improve hazardous chemical plant safety and to prevent accidental releases at facilities.⁵⁹ The rule accomplishes this purpose through two primary methods: requiring proactive safety processes and reporting mechanisms at facilities, and mandating certain measures following an accidental release to ensure the cause of the accident is determined, remedied, and prevented in the future.

Provisions in the Final Rule relevant to the chemical releases at Arkema's plant during Hurricane Harvey relate to: (1) enhanced requirements for incident investigations and safer technology assessments, (2) independent compliance audits, (3) public availability of chemical hazard information, and (4) regular coordination with local emergency officials.

Program 3 Prevention Program: Root Cause Analysis and Safer Technology Analysis

The Program 3 Prevention Program under existing (pre-amendment) RMP regulations includes provisions pertaining to accident prevention, including process hazard analysis, training requirements, compliance audits, and incident investigations.⁶⁰ The Final Rule increases the information required in an incident investigation and adds a root cause analysis requirement.⁶¹ The root cause analysis enables facilities to better determine the underlying contributing factor or factors of catastrophic releases, to prevent future chemical releases.⁶² The rule also requires that root cause analyses be performed after near-misses (an incident that could have caused a catastrophic release).⁶³ Rather than focusing on the direct cause of a release, root cause analysis compels facilities to determine system-related and management-level causes that can be corrected to prevent future incidents.⁶⁴ EPA referenced a chemical plant fire as an example of an incident that would benefit from a root cause analysis, by provoking an investigation into the deeper, more indirect causes of an accident.⁶⁵

This RMP amendment is particularly relevant for Arkema, because the very same direct cause - failure to maintain consistent storage conditions for organic peroxides - caused a fire at the plant in 2006.⁶⁶ In addition, five years later, the facility was fined for failure to maintain proper cooling temperatures.⁶⁷ It is possible that a common, system-wide cause between the 2006 fire and the fires during Hurricane Harvey could have been discovered through a root cause analysis. And a direct cause analysis that focuses on the unprecedented flooding in 2017, may miss a more systematic problem - the challenge of maintaining cool temperatures onsite or the lack of blast-proof storage containers - that must be addressed to prevent future releases.

The amendments also enhance the technology analysis that certain Program 3 facilities, including chemical manufacturers, must perform as a part of a hazard analysis,⁶⁸ which is a required routine evaluation.⁶⁹ Under the new rule, the covered facilities must use Safer Technology and Alternatives Analysis (STAA).⁷⁰ This provision targets sectors with a record of accidents.⁷¹ Since the hazard analysis is required every five years, the STAA would facilitate periodic review of safer technology and designs and consideration of their use at the facility.⁷²

The STAA amendment requires the facility owner or operator to consider, in the following order, whether inherently safer technology or design [IST], passive measures (design features that “reduce either the frequency or consequence of the hazard” without energy input), active measures (controls that require energy inputs to “detect and respond to process deviations”), or procedural measures (including policies, training, and emergency responses) could help to manage risk.⁷³ The Final Rule defines each of these terms.⁷⁴

These amendments would require that Arkema regularly examine safer technologies to use on site and would incentivize the plant to adopt those technologies. The new technology requirements could be especially important regarding the storage of organic peroxides, given that multiple accidents have occurred related to improper storage of hazardous chemicals. Following the intense flooding during Hurricane Harvey, STAA and an IST analysis may also provide Arkema with alternative technology to use as backup storage containers when floods occur in the future. Absent new technologies to deploy, Arkema might consider storage design to contain blasts, relocation of organic peroxides production and storage from flood zones, or enhanced communication with first responders following an incident.

Program 3 Prevention Program: Third Party Audits

The Final Rule also requires third-party, independent compliance audits of Program 3 facilities.⁷⁵ Under the Final Rule, third-party audits are triggered by the occurrence of an accidental release from a covered process or when EPA or a delegated state agency requests it due to conditions at the facility.⁷⁶ The audits are intended to assist facilities in determining whether there is full compliance with the prevention program.⁷⁷ In the preamble of the Final Rule, EPA referenced Responsible Care, a third-party audit program that Arkema participates in through the American Chemistry Council, to demonstrate the importance of third-party audits.⁷⁸ However, the Final Rule audits go a step beyond the Responsible Care program,⁷⁹ as Responsible Care only requires that self-assessments be checked by a third party.⁸⁰

The RMP third-party audit requirement would ensure that, following the chemical release during Hurricane Harvey, the Crosby plant undergoes a comprehensive, independent audit. This audit could identify unintentional oversights in plant compliance with required procedures and recommend methods to remedy those compliance issues to prevent accidental releases in the future. If the rule had been in effect earlier, it is possible that TCEQ’s findings of report deviations during the annual compliance certification review could have triggered an independent audit and proactively addressed compliance challenges.

Availability of Information to the Public and Emergency Responders

The Final Rule also augments requirements for public disclosure of information,⁸¹ including the facility's emergency response plan, its accident history, and Safety Data Sheets, which "[explain] the hazards, precautions, and response actions for" hazardous products stored and produced onsite.⁸² The amendments require that companies clearly post on their websites or social media instructions for obtaining information and that they respond within 45 days of the request for information.⁸³

The amendments also require that the owner or operator of a facility hold a public meeting within 90 days of a chemical release.⁸⁴ The public meeting would require disclosure of the plant's five-year accident history.⁸⁵ These provisions aim to increase public safety by allowing local residents and emergency response officials to properly prepare and protect themselves in the event of an accidental release.⁸⁶

Given the public confusion and concern following the 2017 fires and evacuation, these revisions are particularly relevant. Arkema was not immediately forthcoming to the public about the chemicals at the Crosby plant, nor did it provide many details when it did publish the list of chemicals.⁸⁷ While residents and media outlets were able to obtain this information from Arkema through more challenging and time-consuming channels, with the amendments in place this information would have been more readily available. The Final Rule would also ensure that the hazardous chemical information be publicly available going forward, so that residents can better understand the risks and prepare for a possible chemical release.

A review of the Arkema Crosby website on October 17, 2017 revealed a link to the facility's safety data sheets, though it appears to be accessible only to Arkema's customers.⁸⁸ The website did not appear to provide the facility's emergency response plan or accident history, or suggest how a member of the public could request this information.

Coordination with Local Emergency Officials

Citing lack of coordination as a common obstacle to effective emergency responses, EPA updated requirements for coordination with local emergency officials.⁸⁹ Annually, a facility would have to provide emergency response officials with the facility's emergency action plan, share the plant's Safety Data Sheets, and identify how the facility fits into the local emergency response plan.⁹⁰ These provisions would guarantee that facilities are properly coordinating with local responders, to improve emergency responses to an accident.

In addition, a Program 3 facility would have to conduct "tabletop" emergency exercises with local officials every three years,⁹¹ and field emergency exercises at least once every 10 years.⁹²

It is unclear how impactful this revision would have been if it had been in place during Hurricane Harvey, as Arkema coordinated with Unified Command throughout the incident.⁹³ Arkema also hosts annual drills with the Crosby Volunteer Fire Department.⁹⁴ However, Arkema waited until after Harvey made landfall to share detailed information about the hazardous products at the plant.⁹⁵

Had the Final Rule been in place, that information would have been disclosed previously as part of the annual coordination, and acted on in tabletop and field emergency exercises. This could have improved local readiness and safety for first responders.

Conclusion

The fires and subsequent chemical releases at Arkema's plant in Crosby highlight the importance of EPA's Final Rule on accidental releases and RMPs. While the amendments discussed would not have been implemented by the time Hurricane Harvey hit, they provide a useful framework for analyzing the incident. Had safer technologies been more closely examined or a root cause analysis performed, perhaps this accidental release could have been avoided. Similarly, the sections of the Final Rule that relate to actions taken following an incident may provide guidance to decision-makers as they determine how best to investigate and respond to this incident in order to protect the plant and surrounding areas from experiencing a similar event in the future.

¹ Manny Fernandez, *Fire that Left 15 Dead at Texas Fertilizer Plant is Ruled Intentional*, THE NEW YORK TIMES (May 11, 2016), https://www.nytimes.com/2016/05/12/us/texas-fertilizer-plant-explosion.html?_r=0.

² See Exec. Order No. 13,650, 3 C.F.R. § 13650 (2014).

³ Accidental Release Prevention Requirements: Risk management Programs Under the Clean Air Act, 82 Fed. Reg. 4594 (Jan. 13, 2017) [hereinafter Final Rule] (to be codified at 40 C.F.R. pt. 68).

⁴ Final Rule, *supra* note 3, at 4600.

⁵ *Id.* at 4594.

⁶ *Id.* at 4678.

⁷ *Id.*

⁸ Delay of Effective Date, 82 Fed. Reg. 27133 (June 14, 2017).

⁹ Jason Samenow, *60 Inches of Rain Fell from Hurricane Harvey in Texas, Shattering U.S. Storm Record*, THE WASHINGTON POST (Sept. 29, 2017), https://www.washingtonpost.com/news/capital-weather-gang/wp/2017/08/29/harvey-marks-the-most-extreme-rain-event-in-u-s-history/?utm_term=.389150bfd9cf.

¹⁰ See Final Rule, *supra* note 1, at 4678 (Table 6—Final Rule Provisions and Corresponding Compliance Dates).

¹¹ *Arkema Facility Locations in the United States*, ARKEMA, <http://www.arkema-america.com/en/arkema-america/united-states/> (last visited Oct. 18, 2017).

¹² *Plant Overview*, ARKEMA, INC., 1 (2015), <http://www.arkema-america.com/export/sites/america/.content/medias/downloads/arkema-in-the-america/arkema-inc-crosby-texas-overview.pdf>.

¹³ See 40 C.F.R. § 68.10(d) (1999) (stating that processes in NAICS code 325 facilities are subject to Program 3); EPA, *TRI Explorer, Facility Profile Report*, ARKEMA INC (2016), https://iaspub.epa.gov/triexplorer/tri_release.chemical (indicating the Arkema Crosby facility is an organic chemical manufacturing facility classified by NAICS code 325199).

¹⁴ See FEMA, Flood Map Service Center, Harris County Unincorporated Areas, <https://map1.msc.fema.gov/idms/IntraView.cgi?KEY=81063550&IFIT=1> (last visited Oct. 17, 2017).

¹⁵ EPA, FRS Facility Detail Report, Arkema Crosby Plant (2015), https://iaspub.epa.gov/enviro/fii_query_dtl_disp_program_facility?p_registry_id=110000463258.

¹⁶ Elena Craft, *EPA Safeguards and the Arkema Chemical Plant Disaster - Information You Should Know*, Environmental Defense Fund: Climate 411 (Aug. 31, 2017), <http://blogs.edf.org/climate411/2017/08/31/epa-safeguards-and-the-arkema-chemical-plant-disaster-information-you-should-know/>.

¹⁷ TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 266778, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=266778>.

¹⁸ Craft, *supra* note 16.

¹⁹ OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, Inspection Detail, Inspection No. 1170128.015, (2017), https://www.osha.gov/pls/imis/establishment.inspection_detail?id=1170128.015.

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.*

²⁴ Craft, *supra* note 16.

²⁵ See TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 77401, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=77401>

²⁶ Craft, *supra* note 16.

²⁷ TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 235680, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=235680>.

²⁸ EPA, Enforcement and Compliance History Online: Detailed Facility Report, Arkema Crosby Plant, <https://echo.epa.gov/detailed-facility-report?fid=110000463258>.

²⁹ *Title V Deviation Reporting and Permit Compliance Certification*, TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, 11, (2012), https://www.tceq.texas.gov/assets/public/compliance/field_ops/guidance/Title_V_Guidance_2012_November.pdf.

³⁰ Def.'s Original Answer at 10, *Graves v. Arkema Inc.*, No. 2017-58465 (333d Judicial Dist. Ct., Harris County, Tex. Oct. 9, 2017).

³¹ *Previous Update Statements*, ARKEMA, <http://www.arkema-americas.com/en/social-responsibility/incident-page-2/previous-update-statements/> (last visited Oct. 18, 2017).

³² *Id.*

³³ See *id.*

³⁴ Def.'s Original Answer at 8, *Graves v. Arkema Inc.*, No. 2017-58465 (333d Judicial Dist. Ct., Harris County, Tex. Oct. 9, 2017).

³⁵ *Id.*

³⁶ *Previous Update Statements*, ARKEMA, <http://www.arkema-americas.com/en/social-responsibility/incident-page-2/previous-update-statements/> (last visited Oct. 18, 2017).

³⁷ See TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 267578, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=267578>

³⁸ *Id.*

³⁹ See TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 267679, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=267679>.

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² See TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 266771, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=266771>; TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 266778, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=266778>.

⁴³ TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Air Quality Emissions Events at ARKEMA CHEMICAL PLANT, No. 266778, <http://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=266778>.

⁴⁴ *Id.*

⁴⁵ Transcript of Press Conference, Arkema Inc., Arkema holds press conference, focuses on community outreach. (Sept. 4, 2017), <http://www.arkema-americas.com/export/sites/americas/.content/medias/downloads/social-responsibility/20190904-transcript-press-conference-arkema-inc-crosby.pdf>.

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ News Release, EPA, News Releases from Headquarters: EPA/TCEQ Statement on Controlled Ignition of Trailers at Arkema Facility in Crosby, Texas (Sept. 3, 2017), <https://www.epa.gov/newsreleases/epatceq-statement-controlled-ignition-trailers-arkema-facility-crosby-texas>.

⁴⁹ News Release, EPA, News Releases from Headquarters: Arkema Update (Sept. 8, 2017), <https://www.epa.gov/newsreleases/arkema-update>.

⁵⁰ *Id.*

⁵¹ Pl.'s Original Petition at 6, 7, *Graves v. Arkema Inc.*, No. 2017-58465 (333d Judicial Dist. Ct., Harris County, Tex. Oct. 9, 2017).

⁵² Pl.'s Original Petition, *Graves v. Arkema Inc.*, No. 2017-58465 (333d Judicial Dist. Ct., Harris County, Tex. Oct. 9, 2017).

⁵³ Class Action Complaint, *Wheeler v. Arkema, France S.A.*, No. 4:17-cv-2690 (S.D. Tex. Oct. 3, 2017).

⁵⁴ Transcript of Press Conference, Arkema Inc., Arkema holds press conference, focuses on community outreach. (Sept. 4, 2017), <http://www.arkema-america.com/export/sites/america/.content/medias/downloads/social-responsibility/20190904-transcript-press-conference-arkema-inc-crosby.pdf>.

⁵⁵ *Id.*

⁵⁶ Matt Dempsey, *Lawsuit: Arkema harmed residents before fires, blasts*. HOUSTON CHRONICLE (Oct. 3, 2017). <http://www.houstonchronicle.com/news/houston-texas/houston/article/Lawsuit-Arkema-harmed-residents-before-fires-12251005.php>.

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ See Final Rule, *supra* note 3, at 4594.

⁶⁰ See 40 C.F.R. § 68.65-87 (1999).

⁶¹ Final Rule, *supra* note 3, at 4701; 40 C.F.R. § 68.81.

⁶² *Id.* at 4595.

⁶³ *Id.*

⁶⁴ Final Rule, *supra* note 3, at 4696; 40 C.F.R. § 68.3 (defining “root cause”).

⁶⁵ *Id.*

⁶⁶ Craft, *supra* note 16.

⁶⁷ Craft, *supra* note 16.

⁶⁸ Final Rule, *supra* note 3, at 4595.

⁶⁹ See 40 C.F.R. § 68.67 (1999).

⁷⁰ Final Rule, *supra* note 3, at 4595.

⁷¹ See *id.*

⁷² See *id.*

⁷³ Final Rule, *supra* note 3, at 4699; 40 C.F.R. § 68.67(c)(8).

⁷⁴ *Id.* at 4696; 40 C.F.R. § 68.3.

⁷⁵ Final Rule, *supra* note 3, at 4699.

⁷⁶ *Id.*

⁷⁷ *Id.* at 4613.

⁷⁸ *Id.* at 4624.

⁷⁹ See Comment on Proposed Rule Submitted by Susan Lee-Martin, Senior, Process Safety Engineer, Arkema Inc., 81 Fed. Reg. 13637, (May 17, 2016).

⁸⁰ *Responsible Care*, ARKEMA, <http://www.arkema-america.com/en/social-responsibility/responsible-care/> (last visited Oct. 19, 2017).

⁸¹ Final Rule, *supra* note 3, at 4704.

⁸² *Hazard Communication Standard for Chemical Labels and Safety Data Sheets in GHS Format*, EPA, 1 (Dec. 2015), https://www.epa.gov/sites/production/files/2016-01/documents/hazard_communication_standard-safety_data_sheets_epa_dec_2015.pdf.

⁸³ Final Rule, *supra* note 3, at 4705.

⁸⁴ *Id.*

⁸⁵ *Id.*

⁸⁶ *Id.* at 4668.

⁸⁷ *See Products and Raw Materials on site in Crosby, Texas*, ARKEMA, <http://www.arkema-america.com/en/social-responsibility/incident-page-2/products-and-raw-materials/> (last visited Oct. 19, 2017); *See also* Ania Nussbaum, *Texas Chemical Plant Secured After Post-Hurricane Harvey Blazes*, BLOOMBERG, (Sept. 4, 2017), <https://www.bloomberg.com/news/articles/2017-09-04/texas-chemical-plant-secured-after-post-hurricane-harvey-blazes>.

⁸⁸ *See Products and Raw Materials on site in Crosby, Texas*, ARKEMA, <http://www.arkema-america.com/en/social-responsibility/incident-page-2/products-and-raw-materials/> (last visited Oct. 19, 2017).

⁸⁹ Final Rule, *supra* note 3, at 4701-02.

⁹⁰ *Id.* at 4701.

⁹¹ *Id.* at 4702; 40 C.F.R. § 68.96(b)(2).

⁹² Final rule, *supra* note 3, at 4702; 40 C.F.R. § 68.96(b)(1).

⁹³ Def.'s Original Answer at 8, *Graves v. Arkema Inc.*, No. 2017-58465 (333d Judicial Dist. Ct., Harris County, Tex. Oct. 9, 2017).

⁹⁴ *Plant Overview*, ARKEMA, INC., 1 (2015), <http://www.arkema-america.com/export/sites/america/.content/medias/downloads/arkema-in-the-america/arkema-inc-crosby-texas-overview.pdf>.

⁹⁵ Def.'s Original Answer at 8, *Graves v. Arkema Inc.*, No. 2017-58465 (333d Judicial Dist. Ct., Harris County, Tex. Oct. 9, 2017).