Hazardous Substances Emergency Events Surveillance in Michigan: 2014

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SUMMARY

This report summarizes the characteristics of hazardous substances emergency events reported to the Michigan Department of Community Health (MDCH) for 2014. The Hazardous Substances Emergency Events Surveillance system (HSEES) was established in Michigan in 2004 with funding from the Agency for Toxic Substances and Disease Registry (ATSDR). This multi-state program followed standardized protocols and definitions for collection and compilation of hazardous substances release events. In late 2009, ATSDR funded a new surveillance program for hazardous substances releases modeled on HSEES, titled the National Toxic Substance Incidents Program (NTSIP), and funded 7 states, not including Michigan. The Michigan HSEES system was continued without ATSDR support. Then in 2014, the NTSIP database for tracking releases in Michigan was unavailable and a modified database was developed to record the incidents.

Releases tracked by states in the HSEES/NTSIP system include uncontrolled or illegal acute releases of any hazardous substance (except petroleum when petroleum is the only substance released). Some substances require a threshold minimum amount released in order to be included. Information collected about these events includes the substance(s) released, number of victims, number and types of injuries, and number of evacuations. Reports of releases come from a variety of sources, primarily from the media and other state and federal agencies that are mandated to receive reports from industry and the public.

Because of resource constraints, beginning in 2010, the Michigan HSEES program limited the types of events included in its system to include for the most part only those that involved an agency response (e.g. hazmat, public health) and an injury, exposure, or evacuation.

A total of 104 reported events met MDCH criteria for inclusion in 2014. Ninety-six of the events occurred at fixed facilities and the remainder were associated with transportation. The most commonly reported substances were natural gas and black powder that was associated with fireworks, 104 (100%) of the events involved an injury, evacuation or shelter-in-place. Forty-nine of the events resulted in an injury, with burns being the most reported injury. There were 5 fatalities reported.

INTRODUCTION

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has supported and maintained a state-based surveillance system through cooperative agreements with state health departments to describe the public health consequences of releases of hazardous substances. The system was titled "Hazardous Substances Emergency Events Surveillance" or HSEES until 2009, and then ATSDR funded a new surveillance program for hazardous substances releases modeled on HSEES, titled the National Toxic Substance Incidents Program (NTSIP), which involved collection of national data and data from seven participating states.

In October, 2004 the Michigan Department of Community Health (MDCH) was funded to establish HSEES in Michigan, joining 13 other states. It was not funded for NTSIP. However, as an unfunded state, Michigan used the NTSIP database for tracking releases in Michigan, but did not follow all of the NTSIP protocols. Then in 2014, the NTSIP database for tracking releases in Michigan was unavailable and a modified database was developed to record the incidents. The name of the Michigan system did not change with the change in the national program; it is still MI-HSEES.

The purpose of the national HSEES/NTSIP system has been to describe the public health consequences of releases of hazardous substances, with the goal being to reduce injury and illness from acute hazardous substance releases by linking the data to prevention programs. The objectives of the surveillance systems in Michigan and nationally are:

- To describe the distribution of hazardous substances emergencies within the participating states, and nationally.
- To describe the types and causes of morbidity and mortality experienced by employees, responders, and the general public as a result of hazardous substances emergencies.
- To analyze and describe risk factors associated with morbidity and mortality.
- To develop strategies to reduce subsequent morbidity and mortality when comparable events occur in the future.

This report summarizes the characteristics of hazardous substance releases and their associated public health consequences of events that occurred in 2014 in Michigan. The appendices include additional details about the data, and a brief narrative of each of the events.

Annual reports for MI-HSEES starting with 2005 can be found at http://www.michigan.gov/mdch/0,1607,7-132-2945_5105-110654--,00.html (A report for 2009 was not done because of the mid-year change in funding and event definitions.)

METHODS

The general definition of a HSEES event in Michigan, which is shared with the national NTSIP program is: “An uncontrolled or illegal acute release of a toxic substance.”

Beginning in 2010, MI-HSEES altered the specific definition of a release from the definition used in the earlier MI-HSEES system and the current definition used by ATSDR funded states for NTSIP in several ways, because of resource constraints. In order to be included as an event in Michigan the released chemical must have resulted in some kind of agency response (e.g. hazmat, fire, public health). In addition, it must have resulted in a human exposure, a human injury, an evacuation or a shelter-in-place. These events are included regardless of the amount of the chemical released. Second, all carbon monoxide releases/injuries are excluded, regardless of agency response, because they are being tracked in another public health surveillance system[1]. Finally, since 2010 MI-HSEES has been collecting information about natural gas/propane releases/explosions that result in injuries and evacuations.

Various sources are used to identify and obtain information about HSEES-eligible events in Michigan. These include reports to the National Response Center (NRC)[2], the Federal Department of Transportation, the Michigan Department of Environmental Quality (DEQ), the Michigan Department of Agriculture and Rural Development, the Michigan State Police, the media, and others.

Information collected on Michigan HSEES events includes the following, when available:

- Type of event: Events are classified according to whether they occur at fixed facilities or during transportation. Fixed-facility events involve hazardous substances released at industrial sites, schools, farms, or other permanent facilities. Transportation-related events involve hazardous materials released during transport by surface, air, or water. The type of area or equipment within fixed facilities involved in the release is also recorded (e.g., piping, storage tank, and laboratory).
- Event location: The location of the event is identified by city or township and county of occurrence.
- Substance(s) released: Released substances are identified by chemical name or chemical category. Chemical constituents of brand name products are ascertained.
- Causes: A primary or root cause of the release is assigned (e.g., human error, equipment failure, bad weather).
- Victim(s): The number of individuals injured in the event is noted. Also recorded are the type(s) of injuries, and the severity of medical outcome,.
- Evacuations or sheltering-in-place are recorded

[1] http://www.oem.msu.edu/AnnualReports.aspx

[2] The NRC is the single portal for mandatory reporting of hazardous spills and releases to 16 federal agencies. See: http://www.nrc.uscg.mil/

Because of loss of funding, Michigan HSEES stopped conducting follow-up interviews to complete data fields where information was missing in the initial report.

RESULTS

For 2014, 104 hazardous substance emergency events in Michigan were included in the Michigan MI-HSEES data set. The counties with the most frequent number of events were Wayne with 12 (11.9%) events and Kent with 8 (7.7%). A complete list of counties and event frequencies can be found in Appendix 1.

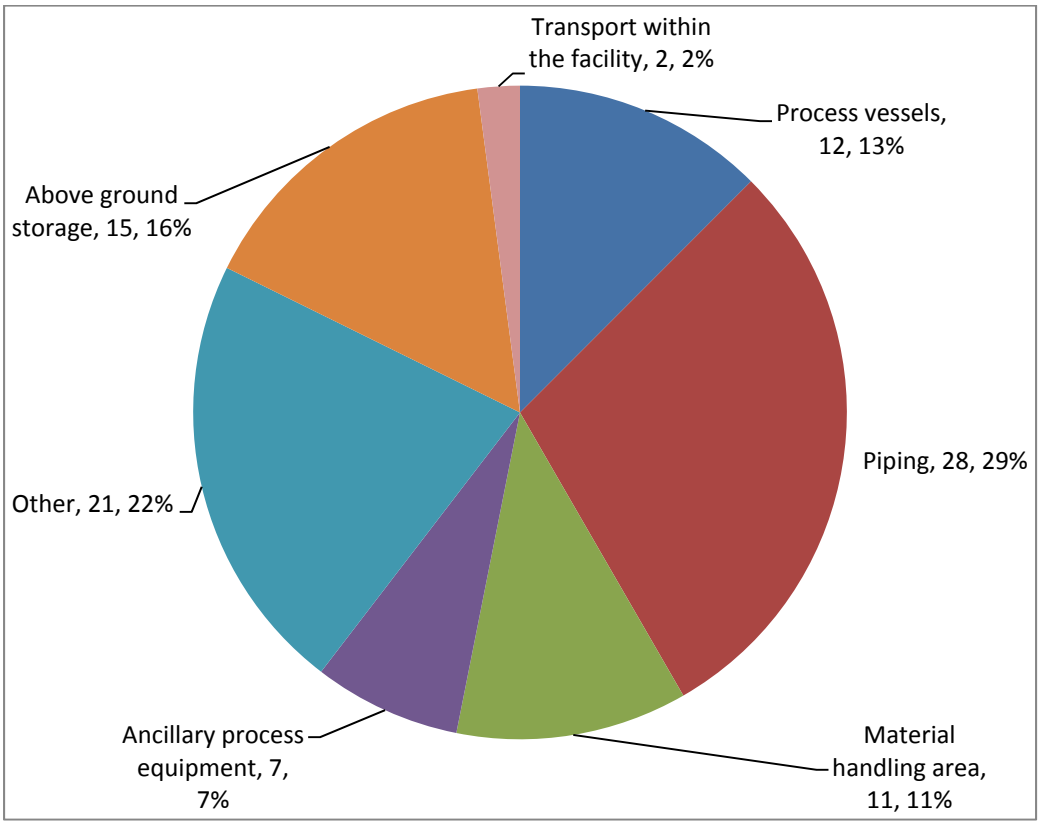
Facility type

A total of 96 (92.3%) events occurred in fixed facilities.

The locations for the 96 (92.3%)events where an area was identified included; process vessels 12 (12.5%), piping 28 (29.2%), materials handling area 11 (11.5%), ancillary process equipment 7 (7.3%), above ground storage 15 (15.6%),transport within the facility 2 (2.1%) and other 28 (29.2%). (Figure 1)

Of the 8 (7.7%) transportation events, 4 (50.0%) occurred during ground transport, and 4 (50%) by pipeline.

Figure 1 – Distribution of fixed facility related events, (N=96) - Michigan HSEES 2014.



Causes of events

Primary or root cause factors were reported in all 104 events. Of the reported primary factors, human error, 30 (28.8%), and equipment failure, 36 (34.6%) accounted for most of the factors. For transportation incidents vehicle accidents, 3 (37.5%), were responsible for the most incidents (Figure 2 and Table 1)

Figure 2 - Primary Causes of Events - Michigan HSEES 2014 (N=104).

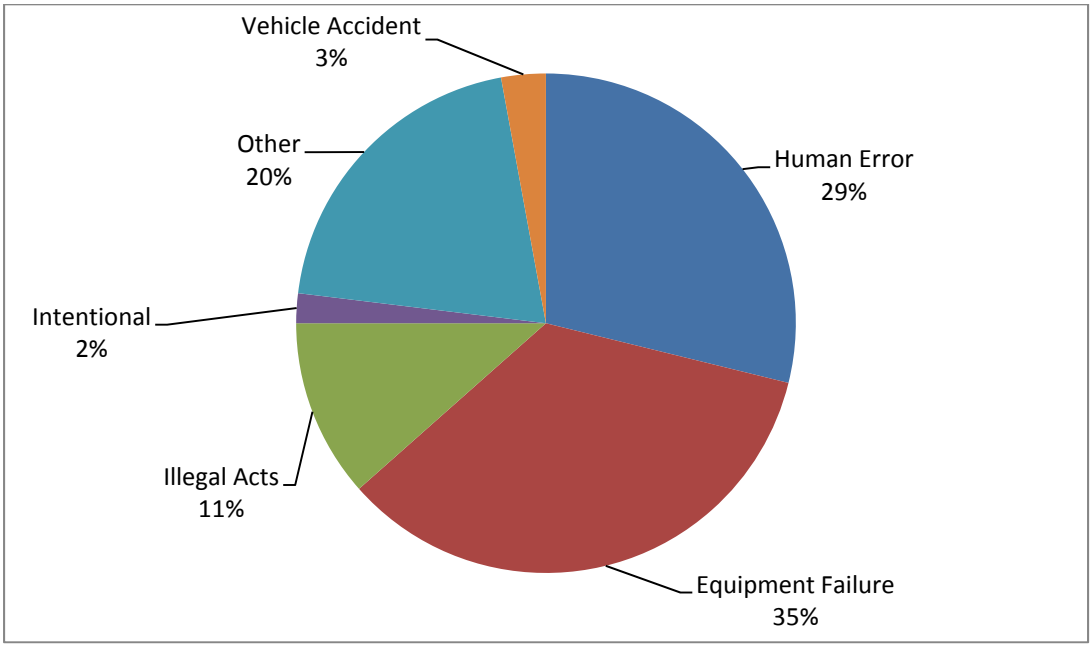


Table 1 – Primary factors associated with events by event type – Michigan HSEES 2014.

Primary Factor	Event Type					
	Fixed Facility*		Transportation		All Events	
	Number of Events	%	Number of Events	%	Number of Events	%
Human Error	28	29.2	2	25.0	30	28.8
Intentional	2	2.1	0	0	2	1.9
Equipment Failure	36	27.5	0	0	36	34.6
Illegal Act	11	11.5	1	12.5	12	11.5
Other	19	19.8	2	25.0	21	20.2
Vehicle Accidents	0	0	3	37.5	3	2.9
Total	**96**		**8**		**104**	

Substances

A total of 36 substances/mixtures were associated with the 104 events. The substances that were released in more than one event and the numbers of events for each of these are listed in Table 2. For 5 events the cause was unknown. The list of all 36 substances/mixtures released is provided in Appendix 2.

Table 2 - Substances/mixtures involved released in more than one event - Michigan HSEES 2014

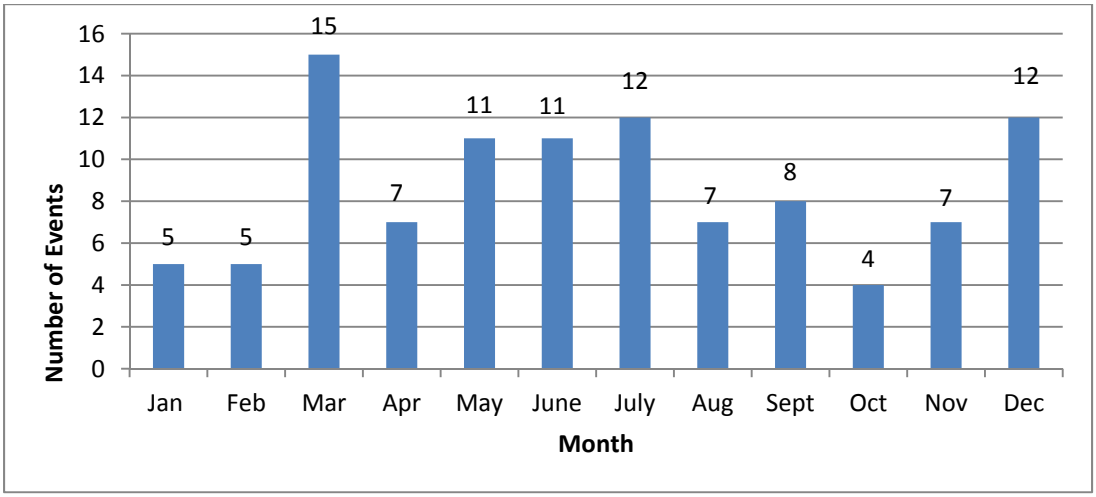
Substance	Number of times released
Natural Gas or propane	34
Black powder	8
Methamphetamine chemicals	6
Ammonia	5
Chlorine	5
Mercury	5
Gasoline	3
Butane	2
Fuel NOS*	2
Hydrochloric acid	2
Sodium Hypochlorite	2
Sulfuric Acid	2

*NOS – Not Otherwise Specified

Time of release

The number of events by month ranged from 15 (9.8%) in March to 4 (3.8%) in August. (Figure 3)

Figure 3 – Month distribution of events - Michigan HSEES 2014.



Victims

One hundred sixty-one victims were reported in 49 events (47.1% of the 104 events) (Table 3). Of the 49 events with victims, 30 (61.2%) involved only one victim, 6 (12.2%) involved two victims, 4 (8.2%) had three victims, and 9 (18.4%) had four or more victims. Of all victims, 156 (96.8%) were injured in fixed facility events (Table 3).

Table 3 - Number of victims per event, by type of events - Michigan HSEES 2014.

Number of Victims	Type of event								
	Fixed Facility			Transportation			All Events		
	No. of Events	%	Total Victims	No. of Events	%	Total Victims	No. of Events	%	Total Victims
1	27	60.0	27	3	75.0	3	30	61.2	30
2	5	11.1	10	1	25.0	2	6	12.2	12
3	4	8.9	12	0	0	0	4	8.2	12
≥4	9	20.0	107	0	0	0	9	18.4	107
Total	45		156	4		5	49		161

Fatalities

Among the 104 victims there were 5 (4.8%) fatalities. Of the fatalities 1 (20.0%) was from a natural gas explosion, 1 (20.0%) was from fireworks, 1 (20.0%) was from fuel not otherwise specified, 1 (20.0%) was from an ethanol fire and 1 (20.0%) was from steam.

Appendix 1 – Events by county – Michigan HSEES, 2014

County	Event Type				Total	
	Fixed Facility		Transportation		All Events	
	Number	%	Number	%	Number	%
Allegan	1	1.1	0	0	1	1.0
Alpena	2	2.1	0	0	2	1.9
Antrim	1	1.1	0	0	1	1.0
Bay	0	0	1	11.1	1	1.0
Berrien	2	2.1	0	0	2	1.9
Branch	1	1.1	0	0	1	1.0
Calhoun	3	3.2	0	0	3	2.9
Chippewa	1	1.1	0	0	1	1.0
Clare	1	1.1	0	0	1	1.0
Delta	1	1.1	0	0	1	1.0
Eaton	1	1.1	0	0	1	1.0
Genesee	6	6.3	1	11.1	7	6.6
Gladwin	1	1.1	0	0	1	1.0
Ingham	3	3.2	1	11.1	4	3.8
Ionia	1	1.1	0	0	1	1.0
Jackson	6	6.3	0	0	6	5.7
Kalamazoo	4	4.2	0	0	4	3.8
Kalkaska	1	1.1	0	0	1	1.0
Kent	8	8.4	0	0	8	7.6
Lapeer	1	1.1	0	0	1	1.0
Livingston	2	2.1	0	0	2	1.9
Luce	1	1.1	0	0	1	1.0
Macomb	5	5.3	1	11.1	6	5.7
Marquette	2	2.1	0	0	2	1.9
Midland	1	1.1	0	0	1	1.0
Monroe	1	1.1	0	0	1	1.0
Montcalm	0	0	1	11.1	1	1.0
Muskegon	1	1.1	0	0	1	1.0
Newago	1	1.1	0	0	1	1.0
Oakland	7	7.4	0	0	7	6.7
Ontonagon	1	1.1	0	0	1	1.0
Otsego	1	1.1	0	0	1	1.0
Ottawa	4	4.2	0	0	4	3.8
Saginaw	4	4.2	0	0	4	3.8
St. Clair	1	1.1	1	11.1	2	1.9
St. Joseph	1	1.1	0	0	1	1.0
Tuscola	0	0	1	11.1	1	1.0
Van Buren	1	1.1	0	0	1	1.0
Washtenaw	4	4.2	2	22.2	6	5.7
Wayne	12	12.6	0	0	12	11.4
Total	**95**		**9**		**104**	

Appendix 2 – Complete list of substances released and frequencies – Michigan HSEES, 2014

Chemical Name	Number of Events	Percent
Natural Gas or propane	34	32.7
Black powder	8	7.7
Methamphetamine chemicals	6	5.8
Ammonia	5	4.8
Chlorine	5	4.8
Mercury	5	4.8
Unknown	5	4.8
Gasoline	3	2.9
Butane	2	1.9
Fuel NOS*	2	1.9
Hydrochloric acid	2	1.9
Sodium Hypochlorite	2	1.9
Sulfuric Acid	2	1.9
Crude Oil	1	0.96
Diesel Fuel	1	0.96
Ethanol	1	0.96
Ethyl bromoacetate	1	0.96
Flammable NOS	1	0.96
Hash Oil	1	0.96
Hydrogen	1	0.96
Hydrogen Sulfide	1	0.96
Lead	1	0.96
Liquid Asphalt	1	0.96
Multiple Chemicals	1	0.96
Nitric acid	1	0.96
Oil	1	0.96
Paint sealer	1	0.96
Pepper spray	1	0.96
Plating chemicals	1	0.96
Pool chemicals	1	0.96
Pyrrolidine	1	0.96
Silanes	1	0.96
Sodium hydroxide	1	0.96
Sodium peroxide	1	0.96
Steam	1	0.96
White powder	1	0.96
Total	**104**	

*NOS – Not Otherwise Specified

Appendix 3- Events - Michigan HSEES, 2014

MI20140001 – A driver lost control of a tanker and the vehicle fell off an overpass and caught on fire.

MI20140002 - A fire suppression system line froze and broke damaging gas lines which leaked gas into an apartment building. The building was evacuated while the situation was stabilized.

MI20140003 - The roof of a manufacturing facility collapsed due to heavy snow. Ammonia refrigeration lines were broken releasing the contents.

MI20140004 - A regulator on a natural gas line froze due to the cold weather. The natural gas was vented to the air to keep it from entering any buildings. A road was shut down for three hours while repairs were made.

MI20140005 - A fire occurred at a household hazardous waste facility.

MI20140006 - Mercury was spilled in a home and school. Residents were checked for mercury exposure and contaminated areas were decontaminated.

MI20140007 - A pipeline cracked releasing over 500 gallons of diesel fuel.

MI2014008 - A gasket failed on a storage tank releasing sodium hypochlorite.

MI2014009 - While remodeling their home, the homeowner discovered liquid mercury spilling out of the ceiling.

MI20140010 - Two workers came into contact with drain cleaner while they were investigating a leak.

MI20140011 - A power failure caused a release of hydrochloric acid. Employees sheltered in place until the situation was cleared.

MI20140012 - A roof collapsed on a cold storage warehouse releasing ammonia from a refrigerator system. The building was not occupied at the time. Surrounding homes were evacuated or the residents told to shelter in place.

MI20140013 - A seasonal home was destroyed by a propane explosion.

MI20140014 - Two employees were splashed with sulfuric acid.

MI20140016 - A chemical reaction occurred releasing vapors. The facility's employees were evacuated while the reaction subsided.

MI20140017 - Sparks from a grinder in a pole barn lit a large collection of fireworks. The resulting explosions leveled the pole barn knocking items off of store shelves two miles away. No injuries were reported.

MI20140018 - A hot water heater exploded catching the house on fire. There were no injuries but the house was destroyed.

MI20140019 - A natural gas leak resulted in a house explosion. The resident was treated at the scene. The house was destroyed.

MI20140020 - A propane leak led to a house explosion damaging nearby properties.

MI20140021 - A gas line leaked causing a fire at a residence. Three residents were evacuated.

MI20140022 - A vacant home exploded due to leaking natural gas. Nearby houses were damaged.

MI20140023 - A water heater malfunctioned creating a natural gas leak which exploded damaging the home.

MI20140024 - A house was illegally connected to the gas service. There was an explosion injuring 4 people.

MI20140025 - A sodium hypochlorite line broke during a transfer operation spilling 400 gallons.

MI20140026 - A house exploded from a natural gas leak killing the occupant.

MI20140027 - An ethanol taker was in a one vehicle accident. The tanker caught fire and the driver died at the scene.

MI20140028 - A white powder was found in a letter to a police station. The police station was evacuated while the incident was investigated, no hazard was found.

MI20140029 - A wood boiler in an attached garage was being loaded and over pressurized. An explosion occurred killing the person fueling the boiler.

MI20140030 - Ammonia was released from a pipe which was isolated by the fire department.

MI20140031 - An ambulance crashed into a natural gas meter. The meter caught on fire damaging the building and the ambulance. The building was evacuated.

MI20140032 - A cigarette caught a deck on fire which caused a propane tank to explode. The attached house was destroyed.

MI20140033 - An unknown sheen was found in a creek. An advisory was issued to not allow animals to drink out of the creek.

MI20140034 - An explosion occurred in a city resulting in a small fire. A restaurant was evacuated and public transportation was rerouted.

MI20140035 - An asphalt tanker lost control and spilled its load on the freeway. The freeway was shut down to clean up the spill.

MI20140036 - An unusual odor caused multiple people to become ill, no hazards were found.

MI20140037 - A house exploded due to a natural gas incident, no injuries were reported.

MI20140038 - A stove was leaking gas in an apartment. The building was evacuated while repairs were made. One person was taken to the hospital for a medical evaluation.

MI20140039 - A house exploded due to illegal copper salvagers removing the pipes from a vacant property. The surrounding five to seven homes experienced damage.

MI20140040 - More than 800 gallons of motor oil and hydraulic fluid were released into the Grand River in Jackson. The source of the spill was not found. Access to the river and adjacent parks was restricted during the cleanup.

MI20140041 - A vehicle hit a natural gas pipeline. The street was closed to traffic and nearby homes were evacuated while the release was contained.

MI20140042 - A resident of a hotel was repairing his moped in his room and spilled gasoline on the carpet. He later lit a cigarette and started a fire. The hotel wiring was damaged and the hotel was evacuated.

MI20140043 - Three boys were playing with a flammable liquid. One of the boys was burned when a match was lit.

MI20140044 - A house was destroyed in a natural gas explosion.

MI20140045 - A barbeque grill caught a deck on fire. The fire spread to the garage where several propane tanks were stored and exploded. The house was severely damaged

MI20140046 - A one pot methamphetamine lab exploded in a hotel room, no one was injured.

MI20140047 - Two men were injured when their excavation work broke a natural gas line which caught on fire.

MI20140048 - A container was punctured at a metals recycler and four employees became ill.

MI20140049 - An acid bottle broke. Neutralizer was put on the spill causing a vapor cloud to form. The building was evacuated while the cloud dissipated.

MI20140050 - A chemical was spilled in a hospital and non-essential personnel were evacuated.

MI20140051 - A house exploded from a natural gas leak.

MI20140052 - A float stuck in a tanker releasing 1500 gallons of gasoline in a garage.

MI20140053 - A man was attempting to make fireworks when they exploded. He was burned and the building was severely damaged. While the firefighters were putting out the fire a meth lab was discovered.

MI20140054 - A fire at a pool company was permitted to burn due to the chlorine and bromine disinfectants on site. All employees were evacuated, smoke dissipated over a farm field.

MI20140055 - A waste drum containing lead was stored outside of a firing range and reacted causing lead dust to be released.

MI20140056 - A man was killed when an unknown type of firework struck him in the chest and exploded.

MI20140057 - A resident was attempting to make fireworks from black power when the powder ignited. The individual received burns.

MI20140058 - Three people were injured when they improperly lit a firework rocket with a short fuse.

MI20140059 - A large quantity of fireworks were being stored in a residential garage. The fireworks caught fire from an unknown cause, igniting the garage and the attached house and damaging two cars.

MI20140060 - Butane was being used to make hash oil. The butane exploded destroying a 7 unit apartment building.

MI20140061 - A large fire broke out at a metals factory. Nearby residents were evacuated.

MI20140062 - A worker was injured when a forklift punctured a tote of sulfuric acid.

MI20140063 - Pool chemicals in a water park released chlorine gas affecting 63 people.

MI20140064 - A gas leak caused an explosion in a car wash destroying the building and severely damaging nearby building and blowing out windows in the area.

MI20140065 - A man was creating methamphetamine in a storage unit when the reaction exploded. The door of the storage unit was blown out and the man was taken to the hospital for unspecified injuries.

MI20140066 - A natural gas line was compromised, two people were evacuated.

MI20140067 - A gas leak occurred outside of a hospital. The hospital was partially evacuated while the line was repaired.

MI20140068 - An explosion occurred when natural gas service was being turned off. One person was injured.

MI20140069 - Employees smelled a gas leak at a retail store and evacuated. Fire fighters entered the store and noticed evidence of an explosion and fire.

MI20140070 - A house exploded from unknown causes and caught on fire. Numerous other explosions were reported. Nearby residents were evacuated.

MI20140071 - Chlorine was released from a water treatment plant due to problems with a valve. A nearby park was evacuated.

MI20140072 - A natural gas meter was struck causing a gas leak. The road was closed while repairs were completed.

MI20140073 - A person was injured when he was welding a used 55 gallon drum. The remnants of fuel in the drum exploded.

MI20140074 - A trailer truck overturned on the freeway spilling chemicals in its load. The freeway was closed while the chemicals were removed.

MI20140075 - An individual was injured when a firework mortar exploded in his hand.

MI20140076 - A meth lab exploded in a home burning the operator and damaging nearby homes.

MI20140077 - A spill occurred at a chemical company releasing a vapor cloud which set off the fire sprinklers. The water from the sprinklers reacted with chemicals creating a vapor cloud. Nearby residents were evacuated.

MI20140078 - Chlorine was added to the wrong storage tank resulting in the generation of a vapor.

MI20140080 - Mercury was spilled in a home and was taken onto a school bus. The home was cleaned and the school bus was disposed of as scrap.

MI20140081 - Paint sealer was spilled in a basement and entered the company's waste water treatment system.

MI20140082 - An explosion occurred when an individual was lighting a stove. The individual was severely burned in the incident.

MI20140083 – After filling up with fuel a boat caught fire and exploded burning three passengers.

MI20140084 - A chemical was spilled in a college science building. Three people were exposed and taken to the hospital as a precaution.

MI20140085 - An individual was injured in a home from a propane explosion.

MI20140086 - An individual was creating hash oil when it exploded causing burns to the individual.

MI20140087 - A pepper spray canister was discharged in an apartment lobby. Twenty people were evacuated and 10 were treated for exposure.

MI20140088 - Ammonia was released from a process vessel. Twenty employees were evacuated from the facility.

MI20140089 - A leak was found on a gas line coming into a home. Twelve residents were evacuated during repairs.

MI20140090 - A worker was exposed to hydrogen sulfide.

MI20140091 - An individual was sharpening an ax when the sparks lit fireworks which caught a propane tank on fire.

MI20140092 - Four individuals were injured, one fatally, when a fuel tank exploded.

MI20140093 - A house exploded during illegal activity when a man was removing pipes from a home. The man was injured in the explosion. Five houses were destroyed and 7 additional homes damaged.

MI20140094 - A homeowner was lighting the pilot light on his water heater when there was an explosion. The homeowner was burned.

MI20140095 - A gasket on a valve failed releasing ammonia from the valve.

MI20140096 - An individual was using mercury for a metal refining process in a home. The home could not be decontaminated and was destroyed.

MI20140097 - A blood pressure cuff was broken in a home releasing mercury.

MI20140098 - An explosion occurred inside a house where firefighters found an individual who had minor smoke inhalation**.**

MI20140099 - A container of hair bleach broke open and workers experienced a burning sensation when they were cleaning the spill.

MI20140100 - Methamphetamine chemicals were dumped into a recycling bin where an individual was exposed to the vapor producing respiratory irritation.

MI20140101 - Four individuals were exposed to methamphetamine chemicals. They experienced health effects and were transported to a hospital.

MI20140102 - An overhead wire was struck by an excavator resulting in a fire of unknown chemicals.

MI20140103 - A tanker was unloading hydrogen when an explosion and fire occurred injuring the truck driver.

MI20140104 - An individual was creating methamphetamine when the reaction exploded burning the individual.

MI20140105 - A drum on a tractor trailer was punctured exposing two employees to chemicals contained in the drum.

MI20140106 - Four individuals were filling a butane tank when it caught fire. The individuals received burns.