



Emergency Response For Chemicals Spill

应急处置之化学品泄漏处置

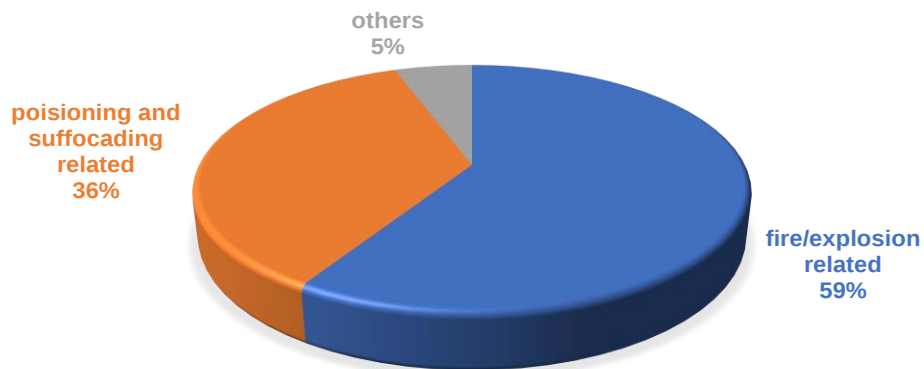
Why we are here today?

China hazardous chemical incidents



Explosion occurred in Tsinghua University when doing testing using hydrogen in 2015

2020 China chemical incident related fatalities



Fire incident occurred in Beijing Jiaotong University during a sewage treatment testing process in 2018

Topics

1. Incident Prevention
2. Emergency Preparedness
3. Emergency Response



Labs



Storage cabinets



Cylinders room



Workshops

1. Incident Prevention

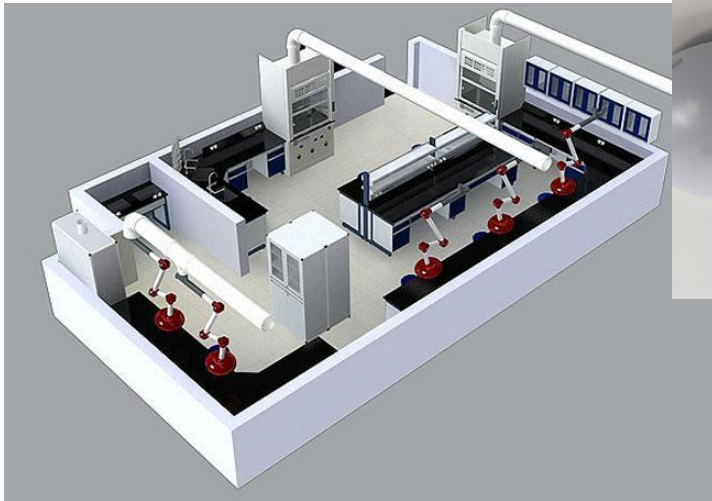
- ① The **design** of labs and chemicals warehouses must meet national safety design standards and comply with relevant regulations, e.g. National functional planning & layout.
- fire separation distance
 - emergency exit and emergency evacuation route



1. Incident Prevention

② Equipped with **necessary safety facilities** in line with chemicals' hazardous properties:

- detection
- alarm
- ventilation
- lightning protection
- anti-static facilities



1. Incident Prevention

- ③ Establish **chemicals safety management system, operational guidelines & information management system**;
 - ✓ To steward the use and disposal of any chemical

- ④ **Provide related training** for lab users, including lab management team, students and teaching staff.
 - ✓ To be aware of the potential risks in labs, the associated precautions, emergency measures and how to use safety facilities in labs etc.

2. Emergency Preparedness

① Identify and assess risks in labs and relevant areas before drawing up an emergency response plan

表 3-3 风险评级（风险矩阵）

风险等级		后果				
		影响特别重大	影响重大	影响较大	影响一般	影响很小
可能性	极有可能发生	25	20	15	10	5
	很可能发生	20	16	12	8	4
	可能发生	15	12	9	6	3
	较不可能发生	10	8	6	4	2
	基本不可能发生	5	4	3	2	1

图例：极高风险（红） 高风险（橙） 中风险（黄） 低风险（蓝）

注：评级结果为无颜色区域的风险点、危险源不列入清单管理。

风险分析、风险评级结果的表达

表 3-1 事故发生的可能性分析

级别	说明	描述
I	极有可能发生	全国范围内发生频率极高
II	很可能发生	全国范围内发生频率较高
III	可能发生	全国范围内发生过，类似区域/行业也偶有发生；评估范围未发生过，但类似区域/行业发生频率较高
IV	较不可能发生	全国范围内未发生过，类似区域/行业偶有发生
V	基本不可能发生	全国范围内未发生过，类似区域/行业也极少发生

2. Emergency Preparedness

- ① Identify and assess risks in labs and relevant areas before drawing up an emergency response plan

		Frequency per year						
		F0	F1	F2	F3	F4	F5	F6
		$F0 \leq 10^{-6}$ Extremely Unlikely 极不可能发生	$10^{-6} < F1 \leq 10^{-5}$ Very Unlikely 不可能发生的	$10^{-5} < F2 \leq 10^{-4}$ Improbable 几乎不发生的	$10^{-4} < F3 \leq 10^{-3}$ Remote 很少发生的	$10^{-3} < F4 \leq 10^{-2}$ Occasional 偶尔发生的	$10^{-2} < F5 \leq 10^{-1}$ Probable 有时发生的	$10^{-1} < F6$ Frequent 经常发生的
Consequence Severity	S5 Catastrophic	5 LA	6 MA	7 HA	8	9	10	11
	S4 Major	4	5 LA	6 MA	7 HA	8	9	10
	S3 High	3	4	5	6 LA	7 HA	8	9
	S2 Moderate	2	3	4	5	6 LA	7 HA	8
	S1 Negligible/ Slight	1	2	3	4	5	6 LA	7 HA

2. Emergency Preparedness

Risk Matrix Reference 1 - Summary of severity levels (More Detail please find the sheet of “Consequence Severity”)

SEVERITY 严重度	PEOPLE 人员	ENVIRONMENT 环境	ASSETS 资产	REPUTATION 声誉	SECURITY 安保
S5 Catastrophic	1external fatality/several fatalities on site 校外死亡/校内多人死亡	Catastrophic off Campus damage 校外灾害性破坏	>25 million € (>2500万欧元)	International media attention 国际关注	Area Attention 区域关注
S4 Major	1 fatality / several severe injuries 死亡/多人严重受伤	Off Campus release with long term clean-up 校外疏散和长期清理	<25 million € (<2500万欧元)	National media attention/ official investigation 引起国际媒体关注/当地调查	Fatal assault 致命攻击
S3 High	Severe injury 严重受伤	Off Campus release or on Campus release with long clean-up, permit violation 场外疏散或现场长期清理疏散	<5 million € (<500万欧元)	Local media attention/official investigation引起当地媒体关注、当地调查	Sabotage 蓄意破坏
S2 Moderate	Reportable injury 报告受伤	On Campus release/ Campus clean up 现场疏散/清理/违反相关许可	<1 million € (<100万欧元)	External complaint外部投诉	Burglary 盗窃
S1 Negligible/Slight	First aid 急救	Spill泄漏	<100k€ (10万欧元)	None 无	Trespass 侵入

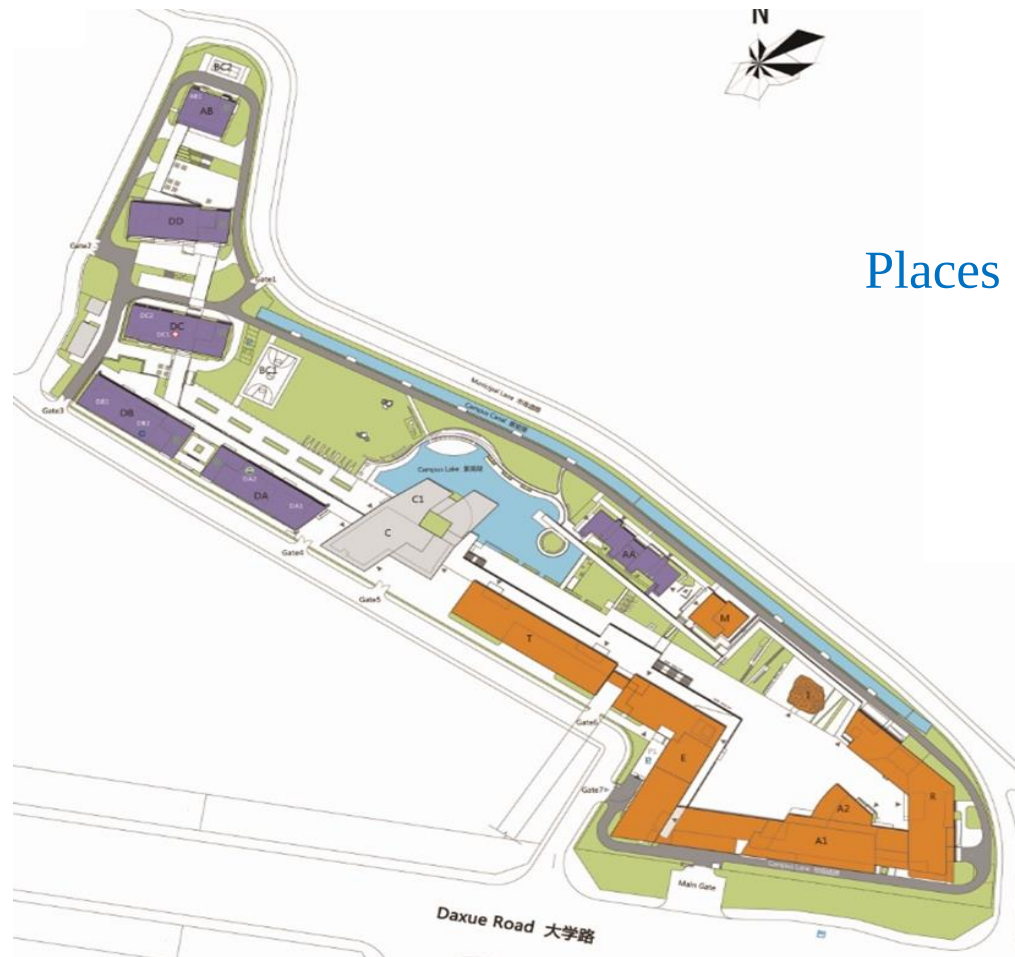
2. Emergency Preparedness

Risk Matrix Reference 2 - Summary of frequency levels

F6	经常发生 Frequent	F6 > 10年1次（在装置寿命内发生过） more than once per 10 years has occurred during lifetime of plant
F5	有时发生 Probable	每10年 < F5 ≤ 100年1次（能在装置剩余寿命内发生） between and equal to once per 10 years and once per 100 years (could occur during remaining lifetime of plant)
F4	偶尔发生 Occasional	每100年 < F4 ≤ 1000年1次（不会预料在装置剩余寿命内发生） between and equal to once per 100 years and once per 1000 years not expected to occur during remaining plant lifetime
F3	很少发生 Remote	每1000年 < F3 ≤ 10000年1次（在类似工艺生产中有个别事故发生过） between and equal to once per 1000 years and once per 10,000 years (a singular incident in industry on similar technology has occurred)
F2	几乎不发生 Improbable	每10000年 < F2 ≤ 100000年1次（可预见性发生，但前提是一个以上保护层失效） between and equal to once per 10,000 years and once per 100,000 years (foreseeable to occur, but requires the failure of more than one layer of protection)
F1	不可能发生 Very unlikely	每100000年 < F1 ≤ 1000000年1次（看似可能会发生，但前提是多个保护层失效） between and equal to once per 100,000 years and once per 1,000,000 years (credible to occur, but requires the failure of several layers of protection)
F0	极不可能发生 Extremely unlikely	F0 ≤ 1000000年1次（在低占用时期内非常不可思议的事件） less than or equal to once per 1,000,000 years very unlikely event in area with low occupancy

2. Emergency Preparedness

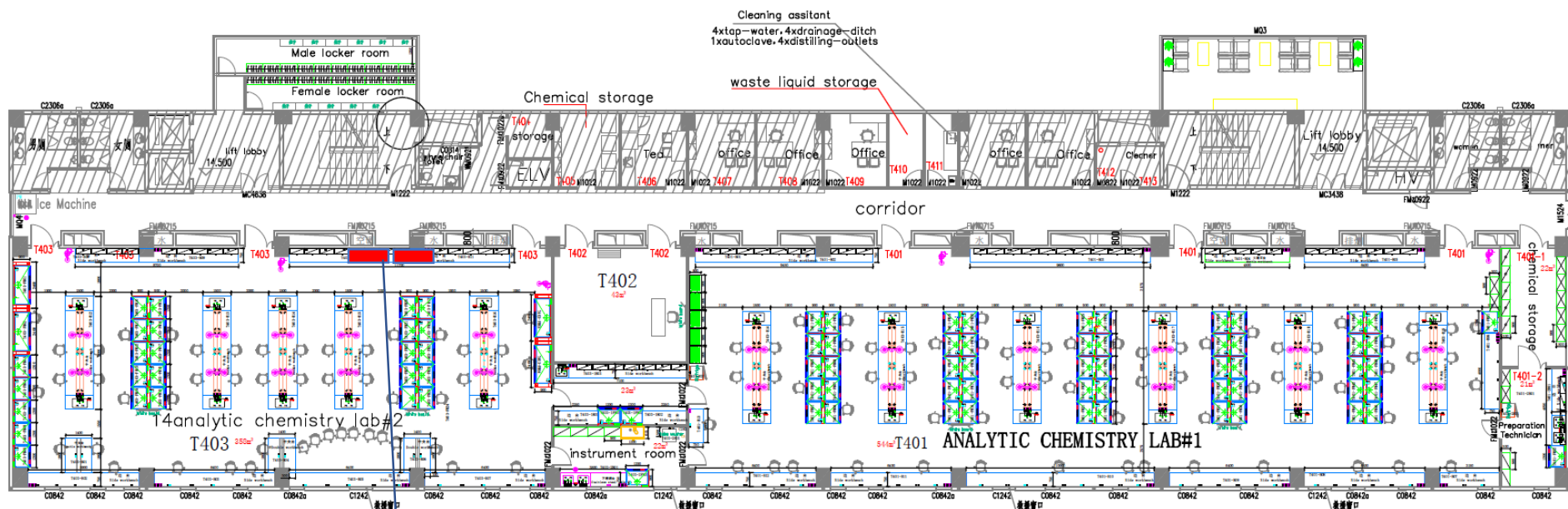
- ② Identify types of potential laboratory incidents and places based on risks identification and assessment.



Places of focus on campus

2. Emergency Preparedness

Places of focus in lab building



Hydrogen/Acetylene

2. Emergency Preparedness

③ Draw up an emergency response plan

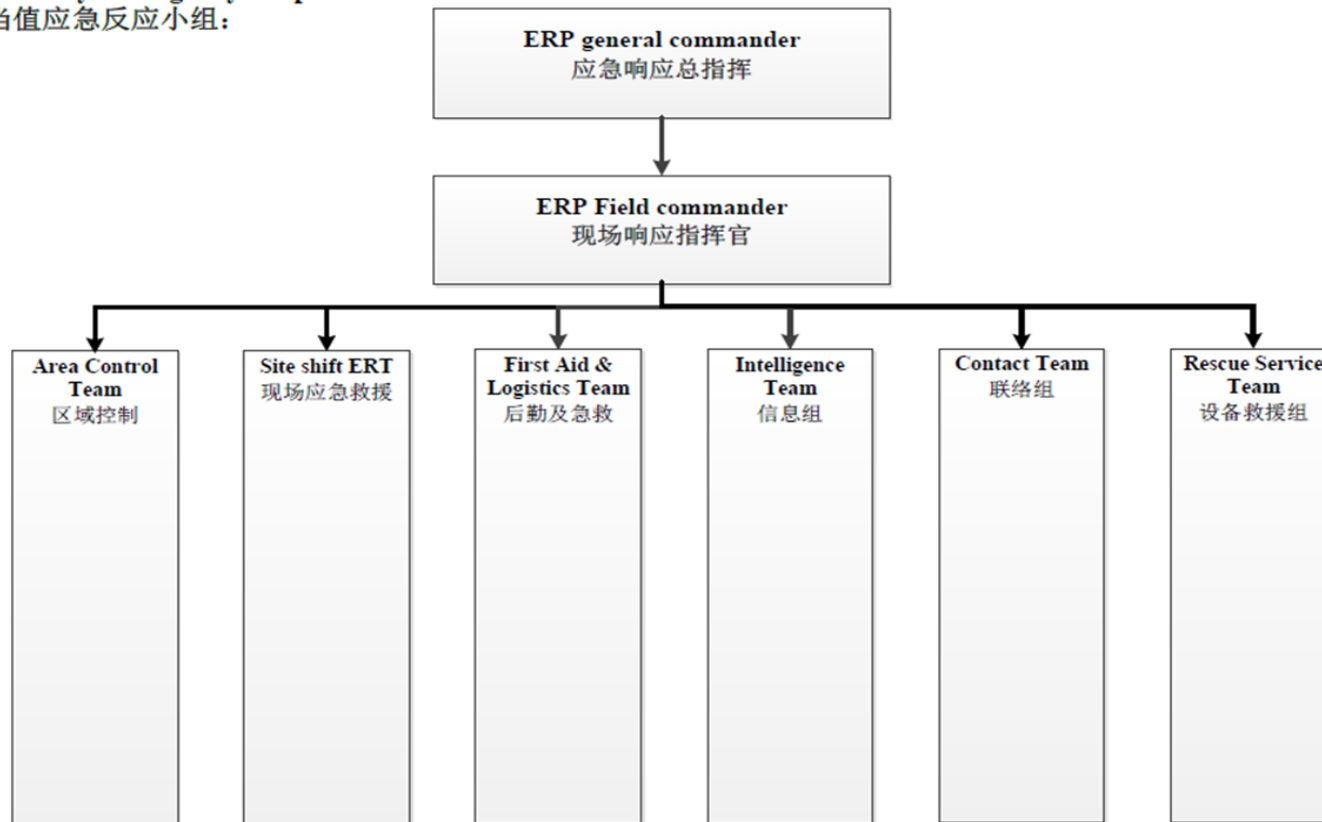
实验室危险化学品应急预案



2. Emergency Preparedness

④ Form an emergency response team

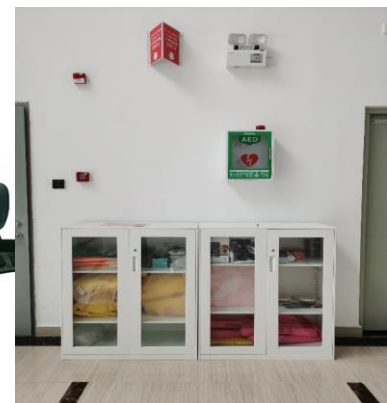
On Duty Emergency Response Team
当值应急反应小组:



2. Emergency Preparedness

⑤ Maintain the inventory of emergency equipment & PPE

No.	Equipment	Qty
1	Portable 4-in-1 gas detector + air pump + tube	1 set
2	TVOC detector + air pump + tube	1 set
3	Mercury vapor detector + air pump + tube	1 set
4	Explosion-proof air blower	1 set
5	Portable plastic chair	1 pc
6	Rubber hazardous waste barrel 20L (sealable)	4 pcs
7	Rubber hazardous waste barrel 20L	4 pcs
8	Hazardous waste bag 20L	10 pcs
9	Sorbent sock 2M	4 pcs
10	Sorbent pillow	2 pcs
11	Common absorbent material	1 box
12	Acid and alkali resistant absorbent material	1 box
13	Decontamination pool	1 pc
14	Scissors	2 pcs
15	Torch	2 pcs
16	Plastic besom	2 pcs
17	Plastic dustpan	2 pcs
18	Crucible holder / tweezers	3 pcs
19	Acid neutralizer	1 bottle
20	Alkali neutralizer	1 bottle
21	PH test paper	1 box
22	Trolley + warning tape + alert cone	1pc + 2 rolls + 4 pcs

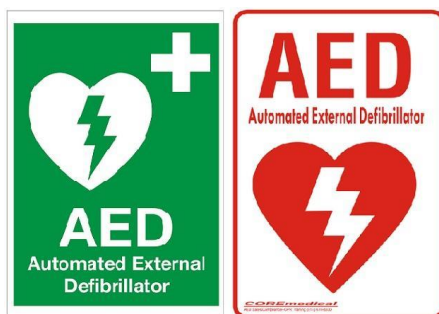


First-aid Materials

- First-aid kits must be placed in the adjacency of places where there is potential of chemicals spill
 - NO lock, easy to access
 - replenish as necessary
- Each lab must have first-aid personnel who are properly trained and receive refresher training every year.
- Take note of special medicine in emergency :
 - Hydrofluoric acid contact: Calcium gluconate gel 葡萄糖酸钙凝胶
 - Cyanide exposure: Cyanide antidote, e.g. cyanocobalamin injection or Sodium Thiosulfate inhalation 氰钴胺素注射或缓解吸入剂硫代硫酸钠



First aid kit

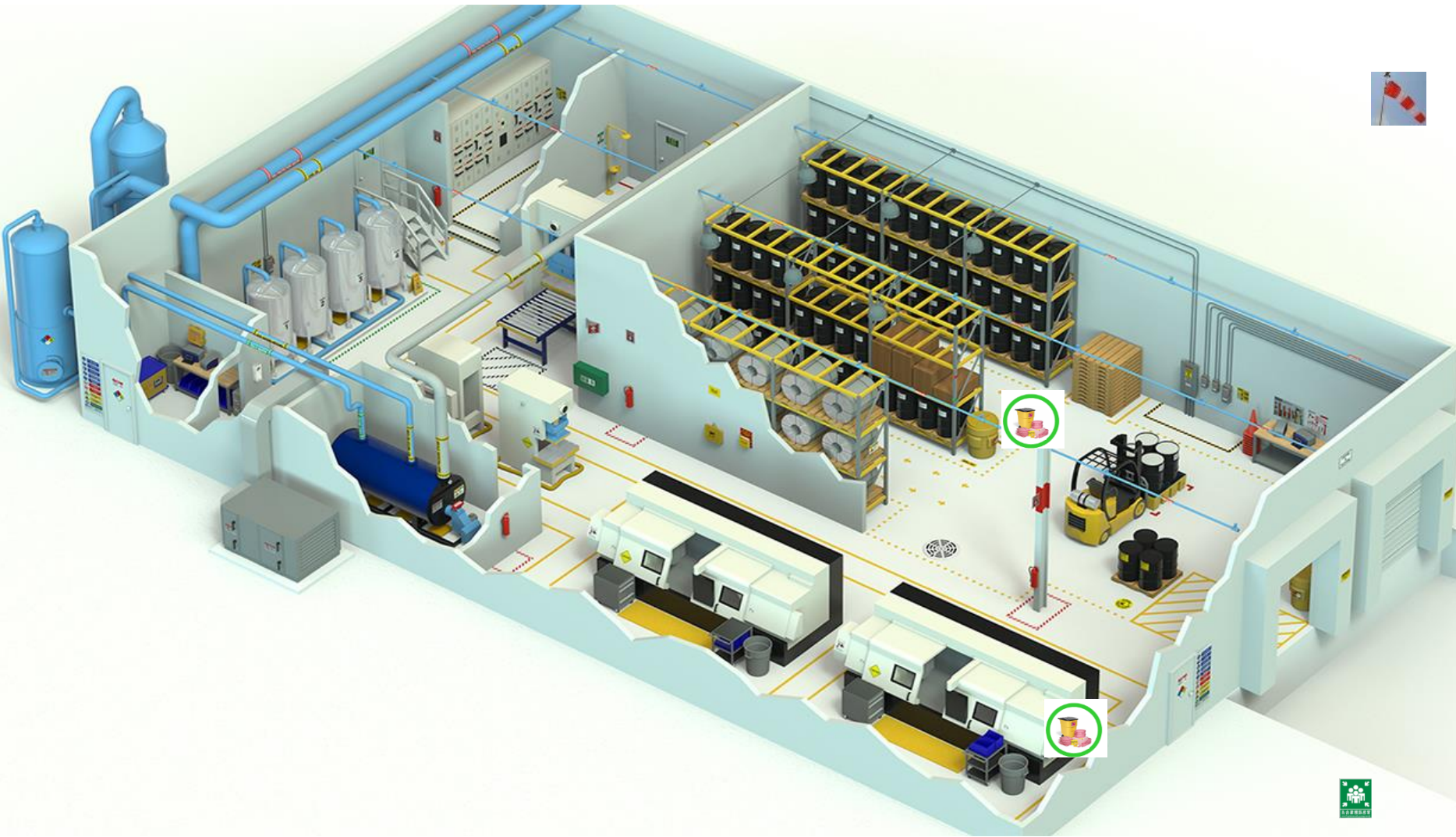
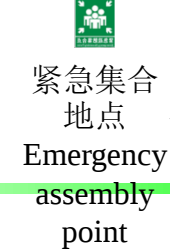


AED



Recommended for lab

Layout Plan for Emergency Response Supplies & PPE



PPE

EN 14126/EN 14605 – type 3B/EN 14605 – type 4/EN 13982-1 – type 5/EN 1149-5/EN 1073-2
EN 374

No.	PPE	Qty
1	3M silicone full facepiece+6006 cartridge+N95 filter+cartridge lid	3 sets
2	3M silicone half facepiece+6006 cartridge+N95 filter+cartridge lid	3 sets
3	Goggles	3 pairs
4	Faceshield (headgear)	3 sets
5	Disposable Nitrile gloves, size L	1 box
6	Reusable Nitrile gloves, size L	6 pairs
7	Composite membrane gloves, size L	6 pairs
8	Chemical protective coverall, B class	4 sets
9	Chemical protective coverall, C class	4 sets
10	Chemical protective boot-covers	1 box
11	Antiskid boots	3 pairs
12	Self Contained Breathing Apparatus SCBA	2 sets
13	Fabric tape	2 rolls



PPE

US EPA Integrated Protection Combining Components of PPE

	Level A	Level B	Level C	Level D
Respiratory protection	Positive pressure, SCBA	Positive pressure, SCBA	Full-face or half-mask, air-purifying respirator	Not required
Protective clothing	Fully encapsulating chemical protective suit	Chemical resistant clothing, liquid-tight	Chemical resistant clothing, liquid-tight	Coveralls or uniforms
Hand protection	Gloves, inner & outer, chemical resistant	Gloves, inner & outer, chemical resistant	Gloves, inner & outer, chemical resistant	Disposable gloves
Foot protection	Boots, chemical resistant, steel toe and shank	Boots, chemical resistant, steel toe and shank, or Boot-covers, chemical resistant	Boots, chemical resistant, steel toe and shank, or Boot-covers, chemical resistant	Safety shoes/boots or Boot-covers



Note: For any unidentified chemicals spill, use PPE for Level A, the highest level.

Protective Clothing



B class chemical protection suit

- chemical protection of type 3B (4/5) impervious to liquids
- offers protection against a wide range of chemicals
- middle finger loops prevent sleeves sliding up the arm
- self-adhesive zipper flap for optimal protection
- anti-static properties
- protection against infectious diseases

EN 13034 Typ 6



C 5/6 class chemical protection suit

- type 5/6 chemical protection, particle-tight and limited spray-tight
- extremely lightweight and breathable material guarantees an excellent combination of comfort and safety
- particle-tight and spray-tight to a limited extent
- anti-static properties
- protection against infectious diseases

Respiratory Protection



Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	(Exposures < both APF x OEL and IDLH)	Comments
Acetaldehyde 75-07-0	Acetic aldehyde, Ethanal	10000	TWA=200 (OSHA) C=25	(F)OV (F)MG	Multigas cartridge recommended for longer service life
Acetamide 60-35-5	Ethanamide		TWA=1 (inhalable fraction and vapor)	OV/N95	See comment D on page 8
Acetic acid 64-19-7	Ethanoic acid, Glacial acetic acid, Methane carboxylic acid, Vinegar acid	1000	TWA=10 STEL=15	(F)OV/AG	
Acetic anhydride 108-24-7	Acetic acid anhydride, Acetyl oxide, Ethanoic anhydride	1000	TWA=1 STEL=3	(F)OV	
Acetone 67-64-1	2-Propanone, Dimethyl ketone, Ketone propane	20000	TWA=250 STEL=500	OV	Short service life. 3M 3530 Monitor
Acetone cyanohydrin 75-86-5	2-Cyano-2-propanol, 2-Hydroxy-2-methyl propanenitrile, 2-Methylactonile, 2-Propane cyanohydrin, a-Hydroxy isobutyronitrile	22000	TWA=2 (AIHA) STEL=5 (AIHA) C=5 mg/m ³ (as CN) -skin-	OV	
Acetonitrile 75-05-8	Cyanomethane, Ethane nitrile, Ethyl nitrile, Methanecarbonitrile, Methyl cyanide	4000	TWA=20 -skin-	OV	3M 3530 Monitor

Respiratory Protection



- Self-Contained Breathing Apparatus
- Powered air-purifying respirator (PAPR)
- Full mask + filter
- Half mask + filter

Self-Contained Breathing Apparatus (SCBA)
 unknown and IDLH atmospheres Pressure demand
 SCBA.....10,000
 unknown and IDLH atmospheres

Air Purifying Respirators

- Half facepiece (filtering facepiece-disposable and reusable) 10
- Full facepiece..... 50

Powered Air Purifying Respirators

- Loose-fitting facepiece..... 25
- Half facepiece..... 50
- Full facepiece, helmet, or hood1000**

Supplied Air Respirators (airline)

- Continuous Flow
 - Loose-fitting facepiece..... 25
 - Half facepiece..... 50
 - Full facepiece, helmet, or hood1000**
- Pressure demand with full facepiece.....1000

Hazard Ratio

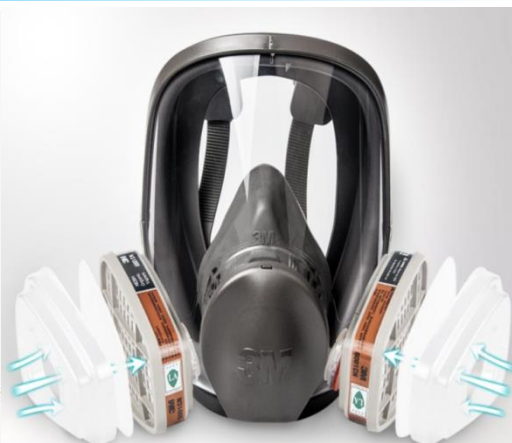
Airborne Contaminant Concentration

=

OEL

occupational exposure limit (OEL)

Respiratory Protection



Level A

Level B

Level C

Level D



Protective Gloves

EN ISO 374-1:2016/Type A



JKLMNO

EN ISO 374-1:2016/Type B



JKL

EN ISO 374-1:2016/Type C



Permeation resistance of type A:

at least 30 minutes each with at least 6 test chemicals.

Permeation resistance of type B:

at least 30 minutes each with at least 3 test chemicals.

Permeation resistance of type C:

at least 10 minutes each with at least 1 test chemical.

EN374

Mechanical protection

EN388

Working with chemicals

Cut protection

EN407

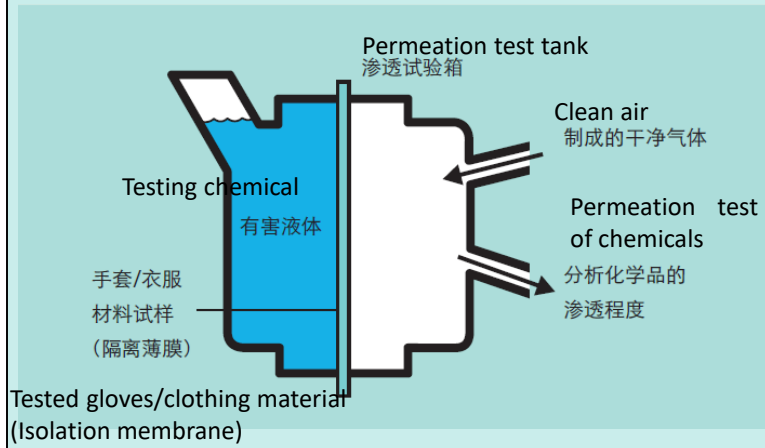
Special risks
(e.g. heat protection)



Protective Gloves

Degradation test

Tested material is made into a piece of membrane. Take the dimension and weight of the tested piece before soaking it into the solvent. Take the dimension again after 30 mins. Blow-dry the tested piece then take the weight. Mark down both variations in percentage as well as noticeable physical changes. The degradation grade is determined based on various criteria.



uvex u-chem 3000

- full chemical protection glove, certified in line with EN 374 (AJKLOT)
- good mechanical protection
- good chemical resistance
- good mechanical resistance
- long service life

Areas of application:

- repair work
- metal working
- cleaning
- chemical industry
- printing industry



uvex u-chem 3100

- the perfect combination of chemical protection and grip
- very good mechanical protection
- comfortable fit due to seamless cotton liner
- good resistance to many chemicals
- very good grip in wet and oily conditions
- highly flexible

Areas of application:

- chemical industry
- automotive industry
- metal working
- mechanical industries, sand blasting

For incidents of Level A/B/C, double-layer protective gloves must be worn,
e. g. gloves with composite membrane as inner layer and Nitrile as outer layer for Level B.

Incident sharing:

二甲基汞 Dimethylmercury / 乳胶手套 Latex Rubber Gloves



On Aug. 14th, 1996, Prof. Karen Wetterhahn was working at biological impact on heavy metals in her lab at Dartmouth college. She was transferring a highly toxic liquid compound named DIMETHYLMERCURY. She was wearing latex rubber gloves. One or two drops of the compound dripped on her left hand glove. At that time the spill was not considered significant by her. 5 months later in Jan.1997, she began to show serious neurologic symptoms. Despite of heavy mental treatments at hospital, she died in Jun. 1997.

DIMETHYLMERCURY was later tested and found to be able to seep through different types of rubber gloves and seep into skin in 15 seconds.

本表格的数据
仅适用于Ansell手套

化学物质名称	复合膜 BARRIER™			丁腈橡胶 SOL-VEX™			氯丁橡胶 无内衬 NEOPRENE™			聚乙烯醇 针织布内衬 PVATM			聚氯乙烯 (乙烯基) SNORKEL™			天然橡胶 PREMIUM PINK™			氯丁橡胶/ 天然橡胶混合物 CHEMI-PRO™		
	降解 等级	渗透 时间	渗透 率	降解 等级	渗透 时间	渗透 率	降解 等级	渗透 时间	渗透 率	降解 等级	渗透 时间	渗透 率	降解 等级	渗透 时间	渗透 率	降解 等级	渗透 时间	渗透 率	降解 等级	渗透 时间	渗透 率
56. Ethyl Alcohol 乙醇	▲	>480	E	E	240	VG	E	113	VG	NR	—	—	G	60	VG	E	37	VG	E	20	G



REPRESENTATIVE DATA FOR CHEMTE			
	DEGRADATION RATING	PERMEATION BREAKTHROUGH	PERMEATION RATE
CHEMICAL	38-428	BUTYL	
Acetic Acid	E	>480	—
Acetone	E	>480	E
Acetonitrile	E	>480	E
Ammonium Hydroxide 28%	E	>480	—
Amyl alcohol	E	>480	E
Benzene	E	20	F
Butyl Acetate	E	80	G
Butyl alcohol	E	>480	E
Butyl Cellosolve	E	>480	—
Carbon Disulfide	■	7	—
Chloroform	P	14	—
Cyclohexane	G	30	F
Cyclohexanol	E	>480	E
Cyclohexanone	E	>480	—
Diethylamine	G	18	—
Dimethylformamide	E	>480	E
Ethanol 100%	E	>480	E
Ethyl Acetate	E	147	G
Gasoline	G	20	F
Heptane	P	-	—
Hexane	P	10	F
Hydrofluoric acid 48%	E	>480	—

Foot Protection

EN_20345

- Hit resistant
- Puncture resistant
- Anti-static
- Antiskid
- Oil-proof
- Acid and alkali resistant
- PVC safety boots



Protective boot-covers may be used under the circumstance that NO massive contamination or tainting will occur.



Exercise 1: which level? what is wrong?



Exercise 2

Please select the appropriate PPE according to the following chemicals

No.	Chemicals	Spill quantity and area
1	Hydrofluoric acid	500 ml (plastic bottle)
2	Mercury	0.25Kg (glass bottle)
3	Trichloromethane	500 ml (glass bottle)
4	Dichloromethane	2.5L (glass bottle)

2. Emergency Preparedness

⑥ Conduct an emergency drill

- Scenario
- Preparation - facilities & supplies & PPE
- Personnel arrangement
- Verify / spot check on critical points e.g. the use of tools
- Familiarize trainees with emergency response plan



3. Emergency Response

Respond to an incident following the sequence of Emergency response and Rescue actions:

A. Emergency response, 5 steps:

- ① Keep a safe distance away from the site.
- ② Report the incident to lab staff on-duty immediately.
- ③ Inform emergency response team (ERT).
- ④ Isolate the affected area.
- ⑤ Identify hazardous chemicals involved.

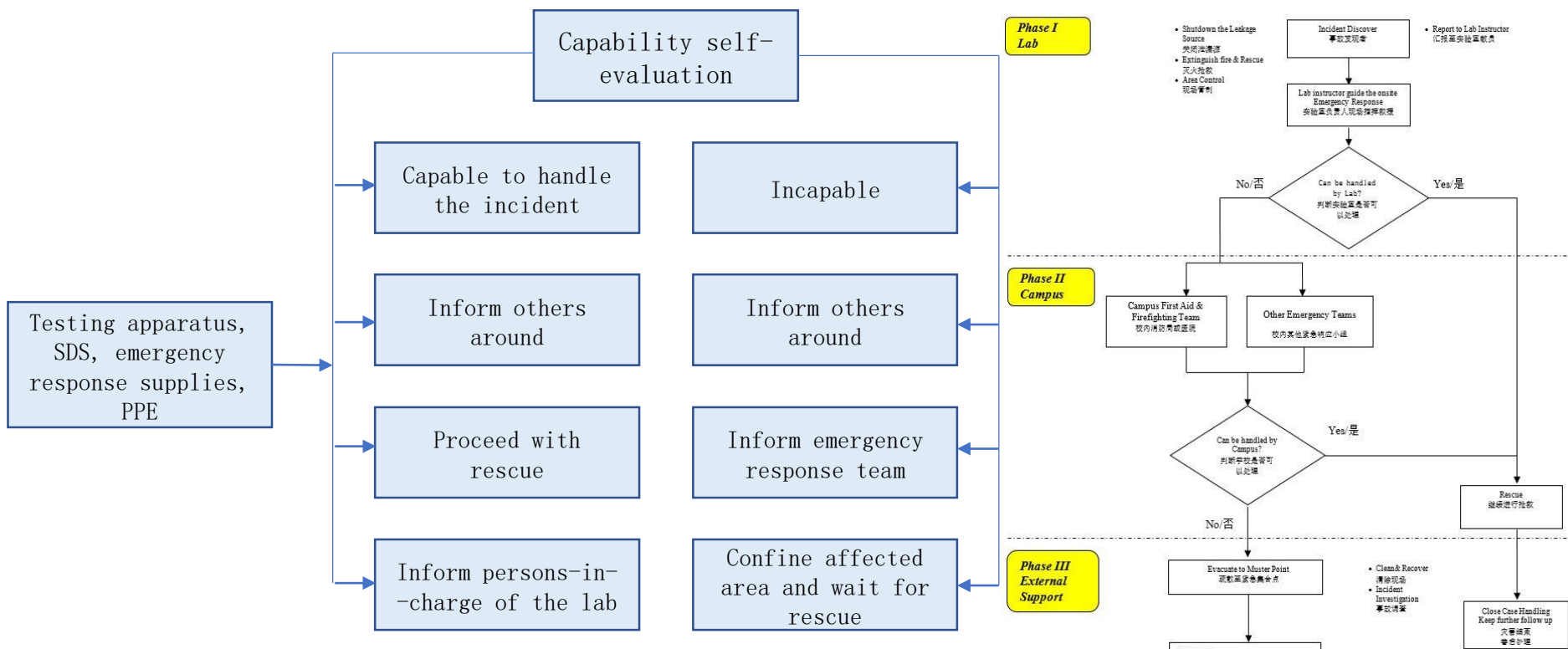
Emergency report flow chart 紧急汇报流程

Report content 报告内容包括:

- Location where and when the event happened
发生地点和时间
- Type of the event and material
事故类型/物料类型
- Situation of personnel injury
人员受伤情况
- The name of reporter and contact way
报告人的姓名和联系方式
- If the leakage is serious, the person may be affected should be informed
如是大面积泄漏, 同时通知可能受影响区域的人员;
- If fire or typhoon happen, inform all affected persons to safe place.
如发生火灾、台风等重大灾害时, 发出内部报警信号, 告知相关区域的人员疏散至安全位置。

3. Emergency Response

Principle: personnel safety first



Check the site:

The status of leaking chemicals, surrounding atmosphere, ventilation, drainage system, SDS of chemicals.

Do not take action out of haste!

When a spill strikes...

3. Emergency Response

B. Rescue actions, 7 steps:

- ① Assess the risks
- ② Select PPE & rescue tools/supplies
- ③ Stop the source
- ④ Confine the spill
- ⑤ Evaluate the risk and implement cleanup
- ⑥ Decontaminate
- ⑦ Site restoration

1

Assess the risk



From the moment a spill occurs and throughout the response, determine the risks that may affect human health, the environment and property. Always put safety FIRST. If possible, identify the spilled material and determine how much was spilled.

2

Select personal protective equipment (PPE)

Choose the appropriate PPE to safely respond to the spill. Consult Safety Data Sheets (SDS) and literature from chemical and PPE manufacturers for the best recommendations. If you are uncertain of the danger and the material is unknown, assume the worst and use the highest level of protection.



3

Confine the spill



Use PIG Socks and Booms to stop the flow of the liquid before it contaminates a water source. Use nonabsorbent barriers like the SpillBlocker Dike and DrainBlocker Drain Cover to confine and direct liquids, minimize the spill area and protect drains.

4

Stop the source

After liquid is confined, stop the source of the spill. This may simply involve turning a container upright or plugging a damaged drum or container. PIG Repair Putty, barrel patches and cone plugs are effective at stopping leaks. Transfer liquids from the damaged container to a new one.



5

Evaluate the incident and implement cleanup



When the spill is confined and the leak has been stopped, reassess the incident and begin the cleanup. Place PIG Pillows and PIG Mat Pads throughout the spill area to absorb the remainder of the spill. Unused absorbents are not hazardous, but absorbents that are saturated with oils, solvents, etc., may be considered hazardous waste and should be disposed of properly.



6

Decontaminate

Effective decontamination ensures the health and safety of emergency responders. You may also need to decontaminate the site and equipment by removing or neutralizing hazardous materials or dispose of media, such as soil, that was exposed during the spill incident.



7

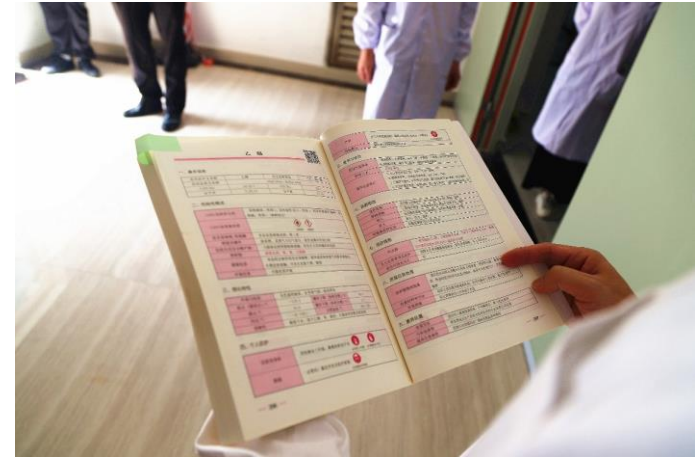
Complete required reports

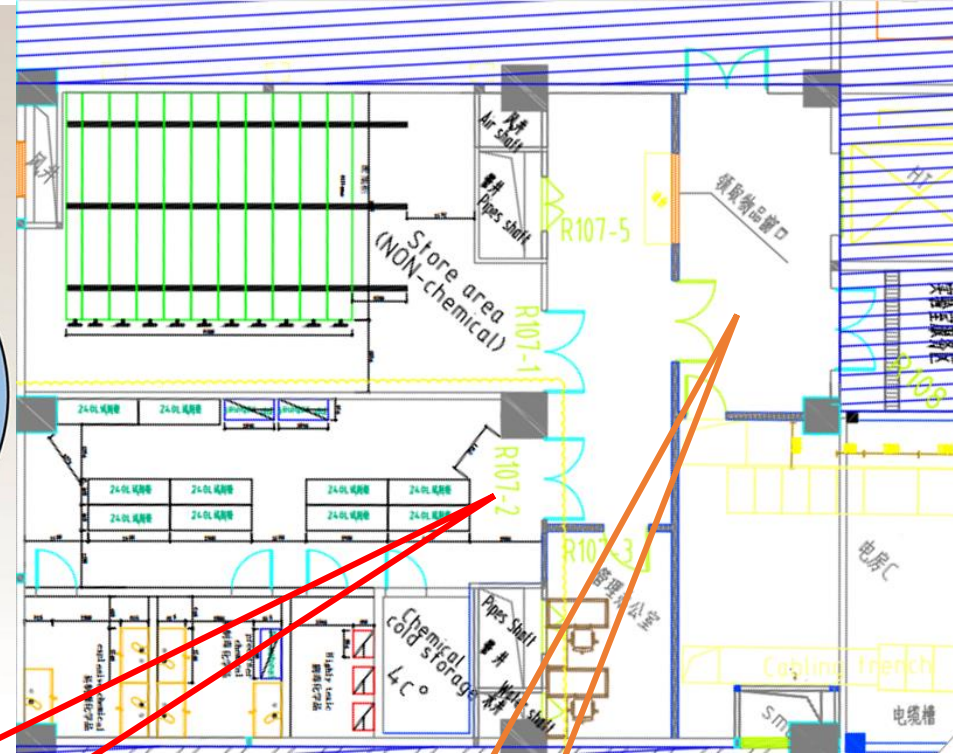
Failure to complete all notifications and paperwork required for reporting spill incidents can result in severe penalties. Make sure you document the incident properly to make the final paperwork easier.



① Assess the Risks

- a. Note the physiochemical features of the chemicals (corrosive, toxic, flammable, explosive & SDS)
- b. Select appropriate types of container for spilled chemicals (glass, rubber and/or iron)
- c. Identify location of spill and surrounding conditions (indoor: ventilation, outdoor: soil, water supply, atmosphere, drainage, vent, etc.), note if surroundings are toxic, flammable or explosive.
- d. Assess if first-aid kit, PPE and other supplies are sufficient for the rescue.







SIGMA-ALDRICH

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化学品安全技术说明书

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1. 化学品及企业标识

1.1 产品标识符

产品名称 : 亚磷酸

产品编号 : 215112

品牌 : Sigma-Aldrich

1.2 鉴别的其他方法

Phosphonic acid

1.3 有关的确定了物质或混合物的用途和建议不适合的用途

仅供科研用途，不作为药物、家庭备用药或其它用途。

1.4 安全技术说明书提供者的详情

公司名称 : Sigma-Aldrich (Shanghai) Trading Co., Ltd
 41F K. Wah Centre
 1010 Huai Hai Zhong Road
 200031 SHANGHAI
 CHINA

西格玛奥德里奇(上海)贸易有限公司

中国上海市淮海中路1010号

嘉华中心41层

邮政编码: 200031

电话号码 : +86 21-61415566

传真 : +86 21-61415567

电子邮件地址 : china@sial.com

1.5 应急电话

紧急联系电话 : +8621-61415560

2. 危险性概述

2.1 GHS分类

急性毒性, 经口 (类别4)

皮肤腐蚀 (类别1A)

2. Hazard description

2.1 GHS classification

2.2 GHS pictogram and precautions

4. First-aid measures

5. Fire fighting measures

6. Spill emergency response

7. Disposal and storage

8. Exposure control and PPE

Hazard Notification Card

Suggest the “Hazard Notification Card” of critical chemicals in place

危 害 告 知 卡		
有毒物品，对人体有害，注意防护		
氢氟酸 HF (Hydrofluoric acid) CAS No. : 7664-39-3 Chemical Characters 主要化学特性 Toxic, Corrosive 有毒，强腐蚀  	健康危害 急性毒性： 经口：LD50 < 25mg/Kg，摄入1.5g可致立即死亡 呼吸道：接触其蒸气，可致气管炎、肺炎等 皮肤：对皮肤有强烈的腐蚀作用	理化性质 闪点：112.2℃ 引燃温度： 爆炸极限（v/v）： 溶解性：易溶于水
	应急处理 1. 急救措施 燃爆危险：本品不燃，具强腐蚀性、强刺激性，可致人体严重灼伤。 皮肤接触：立即脱去污染衣物，用大量流动清水缓缓清洗至少15分钟，并立即就医。 眼睛接触：立即提起眼睑，用大量流动清水或生理盐水彻底冲洗至少15分钟。立即就医。 吸入：迅速脱离现场至空气新鲜处。保持呼吸道通畅。呼吸困难时给输氧，严禁进行人工呼吸，可致进行人工呼吸者本人吸入氟化氢气体。给予2-4%碳酸氢钠溶液雾化吸入，并立即就医。 食入：用水漱口，给饮牛奶或蛋清，并立即就医。 2. 消防措施 危险特性：本品不燃，但能与大多数金属反应，生成氢气而引起爆炸。遇H发泡剂立即燃烧。腐蚀性极强。有害燃烧产物：氟化氢。 灭火方法：灭火剂：雾状水、泡沫。 3. 泄漏处理措施 小量泄漏：用砂土、干燥石灰或苏打灰混合。也可以用大量水冲洗，地面清洗废水水稀释后可排入废水系统。 大量泄漏：构筑围堤或挖坑收容。用泵转移至专用收集器内，回收或运至废物处理场所处置。	
	防护措施  必须戴防护眼镜  必须戴防毒面具  必须戴防护手套  必须穿防护服  必须穿防护鞋	
急救电话： 职业卫生咨询电话：		

② Select PPE & Rescue Tools/Supplies

- Select appropriate PPE and clean-up tools based on evaluation results.
- Select first and subsequent batches of supplies to be taken to site.
- Select PPE for assisting personnel

Level A

Level B

Level C

Level D



ERT leading handling



Decontaminated by each other



Decontaminated by assistant

③ Stop The Source

- **Determine/trouble-shoot** critical points of further spreading (indoor: ventilation, outdoor: soil, water supply, atmosphere, drainage, vent etc.)
- **Determine types of container for spilled chemicals**
 - Bottle
 - Can
 - Barrel
- **Determine the volume of spill**
- **Determine the material of spilled chemical**
- **Determine the location of spill**



On-site Emergency Response (if possible)

Note the ventilation before actions:

- Shut off ventilation in the case of biological leakage incidents to prevent further diffusion;
- For toxic, hazardous, flammable or explosive chemicals spill, prior to turning on ventilation to reduce concentration of hazardous chemicals, make sure ventilation and reducing the concentration will NOT cause fire or explosion. Note the UEL and LEL.



③ Stop The Source (if possible)

- **Methods to stop the source:**

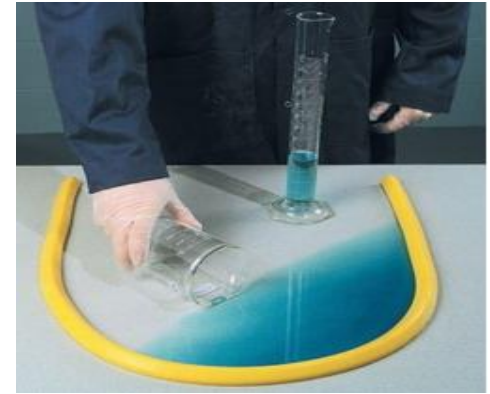
- Turn off the valve
- Block up broken or leaking containers
- Hold the container up (transfer into another container, use bigger container to hold smaller one)



④ Confine the Spill – Prevent from Further Diffusion/Spreading



Drain blocker
承重型排水井保护垫



Cofferdam 围堰

What's wrong in this below picture?



If possible, never try to
step into the spill area

Clean-up tools:

- If spilled chemicals are found to be flammable or explosive and easy to create an atmosphere that is flammable or explosive, use spark-proof tools.
- Tools: copper shovels, bamboo besoms, anti-static cloth, and appropriate fire extinguishers.



Drainage System Connecting Outbound – (if connect to the spill) Waste Water Collection Pool and Sewage System



1. Shut down valves connecting waste water collection and sewage system.
2. Collect contaminated water/ liquid.
3. Treat the waste water to meet discharge standards before discharge, otherwise the waste water must be handled by qualified waste disposal company.

⑤ Evaluate the incident and Implement Cleanup

For spilled chemicals:

Control/contain/absorb/collect

After absorption, verify if spilled chemical need to be neutralized.

Neutralizer for mercury spill:

Price of neutralizer for mercury is high. It is recommendable to absorb the spilled mercury then determine whether to use neutralizer.



IF SAFE TO DO SO

STOP > CONTAIN > NOTIFY > CLEAN-UP

STOP

- Stop work immediately
- Stop the leak or eliminate the source of the spill
- Eliminate ignition sources and provide natural ventilation

CONTAIN

- Use pollution control equipment (e.g. spill kits, drip trays, bunds of earth and sand) to contain the spill
- Check the spill has not reached any drains, water courses or other sensitive areas
- Cover all drains / manholes to prevent the spill from entering the drainage system

NOTIFY

- Once the spill has been contained notify your emergency contact. Details at the bottom of the page.

CLEAN-UP

- Attempt to soak up the spill using absorbent material
- Always follow your Duty of Care for waste when disposing of contaminated materials including spill kit/equipment.

⑤ Evaluate the incident and Implement Cleanup

💣 Used absorbent material is contaminated with spilled chemicals.

They are hazardous waste!



⑥ Decontaminate

- Decontamination of PPE and personnel

Decontaminate
contaminated personnel



Decontaminate
rescue personnel

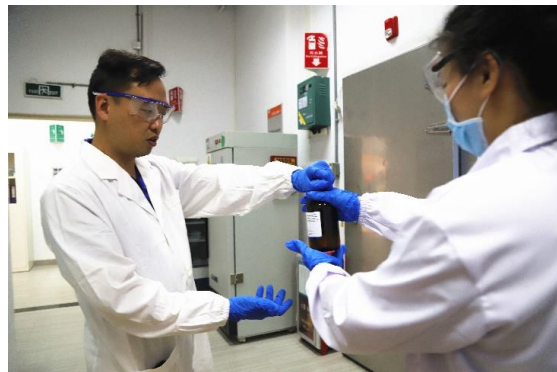


Drill Exercise 20210527

化学品仓库R107化学品泄漏演习



Enter the precursor chemical WH



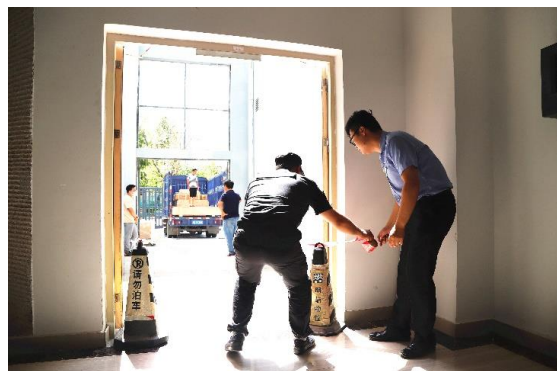
Take chemical from WH



Broke the glasses bottle



Clean the contaminated



Area Control



Confirm the MSDS and handle measures

Drill Exercise 20210527

化学品仓库R107化学品泄漏演习



ERT PPE Wearing



Spill control



Absorbing the spill material



Waste collection



Decontamination



Drill Summary & ideas Exchanging

⑦ Site Restoration

- Verify the site if there is still residue. Determine if the area is fit for service or takes time to recover.
- Continue with ventilation for 30 min (as necessary).
- Re-verify the site.



*“Nothing we do is worth
getting hurt for !”*

没什么是值得以牺牲安全作为代价！