

Insurance View/Concern about High-Tech Industry Risk Management

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Risk Engineering
Where standard solutions are the exception

FIRES BY PROPERTY TYPE

- > **Assemblies** eating and drinking establishments; religious and funeral properties
- > **Business and mercantile** Service stations; office properties; stores
- > **Educational properties** fires in educational properties; largest loss in educational structures; schools with 10 or more deaths
- > **Health care facilities** Includes nursing homes; hospitals or hospices; mental health facilities; and clinics or doctors' offices
- > **High-rise building fires** Analysis and discussion on the fire experience and risk in high-rise vs. other properties
- > **Industrial and manufacturing facilities**
- > **Prisons and jails** Fires in prisons and jails; deadliest prison fires in the U.S.
- > **Residential** Homes; manufactured homes; hotels; dorms, and more.
- > **Storage** Barns; warehouses; LP-gas bulk storage; liquid tank storage
- > **Vacant buildings** Fires in vacant buildings

2013 FIRES IN THE U.S.

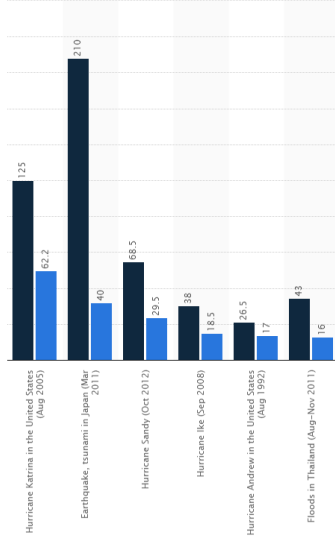
In 2013, there were 1,240,000 fires reported in the United States. These fires caused 3,240 civilian deaths, 15,925 civilian injuries, and \$11.5 billion in property damage.

- > 487,500 were structure fires, causing 2,855 civilian deaths, 14,075 civilian injuries, and \$9.5 billion in property damage.
- > 188,000 were vehicle fires, causing 320 civilian fire deaths, 1050 civilian fire injuries, and \$1.3 billion in property damage.
- > 564,500 were outside and other fires, causing 65 civilian fire deaths, 800 civilian fire injuries, and \$607 million in property damage.

FIRE CAUSES

- > **Appliances & equipment** Cooking; heating; washing machines & dryers; air conditioners and fans; and more.
- > **Arson and juvenile firesetting** Children playing with fire and intentional fires.
- > **Candles** Causes and trends in home fires involving candles; candle fire frequency in other occupancies, and selected published incident descriptions
- > **Chemical and gases** Natural gas and LP-gas home and non-home fires; spontaneous combustion.
- > **Electrical** Includes home structure fires involving electrical distribution or lighting equipment
- > **Fireworks** Includes injury patterns and trends, including shares by type of fireworks, based on reports to hospital emergency rooms
- > **Holiday** Christmas trees; holiday lights and decorations.
- > **Household products** Mattresses; bedding and upholstered furniture
- > **Lighting Fires and Lightning Strikes** Information on incident type, and when and where the incidents occurred.
- > **Smoking materials** Fires involving smoking materials (i.e., tobacco products), including data from other countries, and what materials are most often ignited

Most expensive natural disasters for the insurance industry worldwide from 1980 to 2013 (in billion U.S. dollars)



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Fire Loss in the High-Rise Building

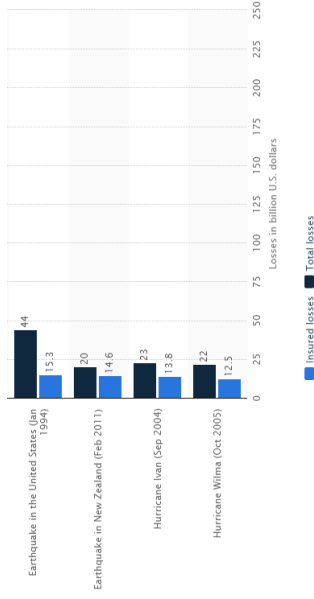


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Most expensive natural disasters for the insurance industry worldwide from 1980 to 2013 (in billion U.S. dollars)



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Fire Loss in Semiconductor in 2003



- Fire start in the ventilation filter next to horizontal furnace at 09:30 Friday and put out at 11:00 by 80 firemen
- Almost total loss. Cause at least 300 staffs unemployed.
- Loss amount estimated USD430 millions.



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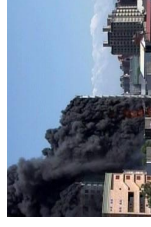
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Fire Loss in TFT-LCD in 2004



Fire Loss in IC Assembly and Testing in 2005



- The fire broke out at the plant at 2pm, following what the company believes was a boiler explosion. The fire was contained within two hours.
- The losses from the fire are expected to be enormous, including rebuilding costs and NT\$600 million (US\$19 million) per month in lost capacity.
- In all, the damages are expected to reach NT\$10 billion (US\$320 million). This plant provides services for some very big and important companies, such as ATI, NVIDIA, Intel, Motorola, Infineon, and VIA, among others.

Fire Loss in Semiconductor Plant in 2013



- This fire occurred on 4th September 2013. This fire, which is thought to have started in a chemical vapor deposition (CVD) tool, quickly spread to involve the waste exhaust ductwork and the associated scrubbers located on the roof. The losses from the fire are expected to be enormous, including rebuilding and repair and replacement of production tools.
- In all, the damages are expected to reach NT\$ 31 - 37 billion (US\$ 1.0 – 1.2 billion) for property damage and business interruption. This plant provides services for some very big and important customers as it is a foundry plant.

Large Losses in the High-Tech Industry

Oct. 1996	Conflagration	Hsinchu	Taiwan	US\$ 180 m
Oct. 1997	Conflagration	Hsinchu	Taiwan	US\$ 350 m
Aug. 1999	Earthquake	Various	Taiwan	US\$ 300 m
Aug. 2000	Conflagration	Albuquerque	USA	US\$ 200 m
Jan. 2000	Leak and Contamination	Orlando	USA	US\$ 40 m
Jan. 2000	Leak and Contamination	Temecula	USA	US\$ 45 m
Dec. 2003	Conflagration	Caen	France	US\$ 430 m
Apr. 2005	Conflagration	Chungli	Taiwan	US\$250 m
Sep. 2013	Conflagration	Wuxi	China	US\$ 1.0 – 1.2 B

Fabrication Plant Accident Statistics Greatest Dollar Losses

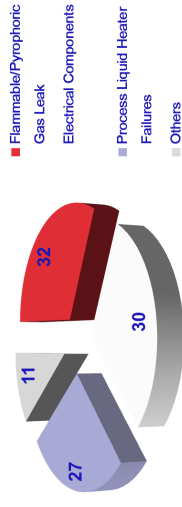


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Leading Cause of Semiconductor Facility Fire Incidents



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Building Layout

- Building Construction
 - Roof
 - Floor
 - Walls
 - Basements
 - Seismic Design
- Building Separation & Fire Cut-offs
 - Fire Stopping
 - Fire resistance coating

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Management Issues

- Business Contingency Plan
- Infra Red Thermal Scanning Programs
- Fire protection facility maintenance Procedures
- Hazardous chemicals/gases handling and controls
- Housekeeping
- Process Technology

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Fire Protection Systems



- Automatic Sprinkler
- Fire Pump Installations
- VESDA
- Smoke Exhaust Systems
- Foam Water Spray Systems
- Gas Extinguishing Systems
- Fire Fighting Water Tanks



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Fume Exhaust Systems



- Flammable exhaust ducts
- Corrosive exhaust ducts
- Ammonia exhaust ducts
- General Exhaust ducts
- Silane exhaust ducts



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Production Tools



- Wet Stations or Wet benches
- Vacuum pumps
- Mini Environment Enclosures
- Cooling Towers, Scrubbers, VOC
- Stockers
- Cleanroom chemical dispensing units – coaters
- Gas and chemicals dispensing units



Fig. 10: Cleanroom enclosure

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Utilities



- Emergency Power Supply
 - DUPS
 - Power Generators
 - Main Transformers
- Process Water Supply
- Cooling Water
- CDA Supply

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Intrinsically Safe Construction Materials

- Building Constructions
 - Roofs
 - Floors
 - Walls
 - Partitions
 - Interconnections and interchanges
- Tool Constructions
 - Wet Benches
 - Parts Cleaning Stations
 - Chemical Dispensing Units
 - SMIF Enclosure Materials
- Exhaust Systems Constructions

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Production Processes

- Specific Process or New Technology
 - Standalone
 - Redundancy / Backup
 - Upstream and Downstream Relations
- Tools
 - Specific Machines / Lead-time
 - Redundancy / Backup
 - Spare Parts Preparations
- Supply Chains
 - Raw Materials
 - Semi-finished Products
 - Upstream and Downstream Relations

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Utility Supplies

- Power
 - Main Transformer Installations / Redundancy
 - Emergency Power Supply
 - Primary & Secondary Power Distributions / Redundancy
- Gaseous / Chemicals
 - Bulk Gaseous / Redundancy
 - Gas / Chemical Supply / Redundancy
- Cooling Water
 - Raw water Supply
 - Water treatment Facility and Capability / Redundancy
 - Cooling Towers / Chilled Pumps / Redundancy
 - AHU / Make-up Air / Redundancy

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General – Insurance View

- The Largest Monetary Loss 最大金錢損失
- PD + BI (if covered) 財產險加營業中斷
- Conservative Assumption 保守之假設
- NFPA Standards Shall Apply 須使用美國防火協會之標準

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EML / PML / NLE 產生之主要原因



- 最佳的承保能力 (Optimization of Capacity)
- 本身的自留 (Own Retention)
- 再保安排 (Reinsurance)
- 指出災損之嚴重性 (以最壞的情況) Indicates Severity of Exposure (in the worst case)

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EML & PML - 最大可能損失的定義

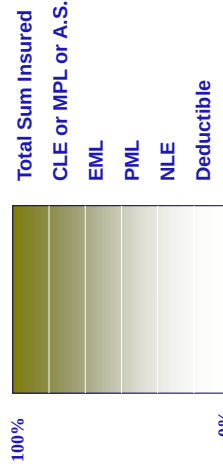


- Insured Perils 須考慮事故
- Fire Protection and Separation 防火區隔及消防系統之考慮
- Standards 何種規範
- How Conservative 保守程度

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Total Sum Insured vs. Maximum Loss



Remark:

NLE: Normal Loss Estimates
 CLE: Catastrophic Loss Estimates
 MPL: Maximum Possible Loss or Catastrophic Loss Potential
 A.S.: Amount Subject

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Insured Perils 承保事故



- Fire 火災 (Arson 縱火)
- Explosion 爆炸 (VCE, BLEVE)
- Vehicle Impact 車輛碰撞
- Aircraft Impact 航空器墜落
- Typhoon 颱風
- Earthquake 地震
- Flood 洪水
- Others 其它

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防火區隔與最大可能損失之關係



- Fire Resistance Rating 防火牆，門之耐火程度
- Separation Distance 間隔距離
- Design and Installation Standard 設計之設置規範
- Maintenance, Inspection and Testing 維護情形
- Impairment or Unimpairment 堪用狀態

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消防系統與最大可能損失之關係



- Automatic Fire Extinguishing 自動滅火系統
- Manual Fire Fighting Equipment 室內外消防栓
- Fire Alarm 火警警報系統
- Public and Private Fire Brigade 公私設消防隊

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消防系統與最大可能損失之關係



- Design and Installation Standard 設計及設置規範
- Maintenance, Inspection and Testing 維護情形
- Impairment or Unimpairment 堪用狀態
- Water Supply (Adequacy and Reliability) 供水能力
(適當性及可靠度)
- Timing of Manual Fire Fighting and Access 人為救火時效及通道之適當性

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EML and PML Concerns



- Fire Separations /Cut-off
- Building Layout
- Fire Protection Adequacy and Reliability
- Emergency Response
- Internal/External Exposure
- BI (Business Interruption) and CBI (Contingency Business Interruption) Exposure and Concerns

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Thank You

Q & A