

Risk Engineering Report



Prepared for:

TECHNISCHE UNIVERSITEIT EINDHOVEN

Site Name: TUE

Date of Survey: December 2, 2022

Report Date: March 3, 2023

Survey Type: Site Summary Review

TIV (EUR): 1,249,296,900

Site Address: De Wielen 6, EINDHOVEN, 5612 AV, Netherlands

Latitude: 51.446127

Longitude: 5.487879

RFS ID: RFS-147162

SIC Code: 8221-01-Colleges and Universities, NEC, State owned

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Survey Contacts

E.W.T. (Edwin) Spanjaards

Head Facility Support/Quality
manager Real Estate

TUE

T: +31(0)6 515 00 045

E.W.T.Spanjaards@tue.nl

Marc Snoeijen

Regional Account Manager
Raetsheren

T: +31 (0)6 412 34 715

marc.snoeijen@raetsheren.nl

Hans E. Sikkema

Risk Engineer
Raetsheren

T: +31 (0)6 21 544 321

hans.sikkema@raetsheren.nl

AIG Contacts

Joep Huppertz

Account Risk Engineer

T: +31 (0)6 226 88 312

Joep.huppertz@aig.com

Nandha Kumar Swaminathan

Field Risk Engineer

T: +31 (0)6 821 86 014

Nandha.kumar@aig.com

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- A Fire Protection Impairment Program that includes insights into Managing Fire Protection System Impairments, a notification form, and downloadable or pre-printed tags. Available in multiple languages.
- A series of Property Risk Engineering Insights that include current and emerging risk topics.
- Tips sheets that offer guidance and checklists to use before, during and after extreme weather events

Customer web page access: www.aig.com/riskengineering

Questions or special requests: Email: globalproperty.impairment@aig.com

Fire Protection Impairment Hotline for reporting fire protection system outages:

- 1-877-705-7287 (US & Canada) or 1-817-490-3255 (Global)
- Email: globalproperty.impairment@aig.com or reach out to your dedicated account risk engineer

Purpose of Visit

This facility was visited to undertake a risk assessment of the fire and associated perils for insurance purposes. The purpose of the assessment was to assist in the identification and mitigation of hazards and exposures that could lead to the loss or damage to assets or business interruption.

Site Overview

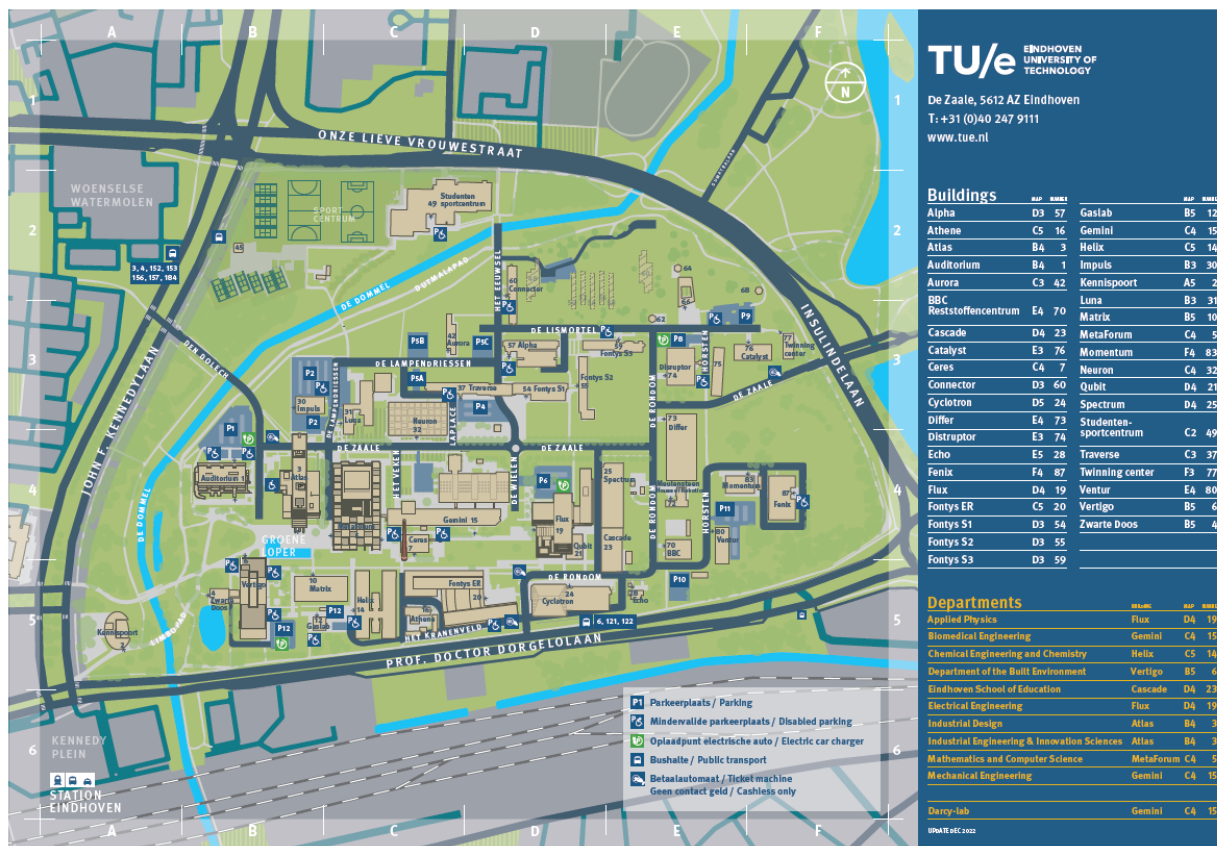
The Eindhoven University of Technology(TU/e), is a public technical university in the Netherlands, located in the city of Eindhoven.

The campus is 1 km² in size and is situated northeast of the city centre of Eindhoven, with the Insulindelaan, Prof. Dr. Dorgelolaan, Onze Lieve Vrouwestraat, and John F. Kennedylaan as its borders. The campus is open, large, and unfenced. The campus grounds are comprised of number of buildings.

The campus also consists of the TNO and Fontys buildings.

The predominant construction is of reinforced concrete, most of the buildings date back to 1960s but have been renovated and restored over the years and were found to be in good condition during the visit. Only three buildings on campus have sprinkler protection. The rest of the campus relies on detection and manual fire fighting. The fire station is located on campus which houses both the private and public fire brigades which are both full-time paid and well equipped,the ERT comprises of the private fire brigade and the evacuation wardens.

Campus Grounds:



Site Loss History

There have been two major losses in recent years:

- An explosion in the Spectrum building.
- There is currently a damage to a device in building Gemini

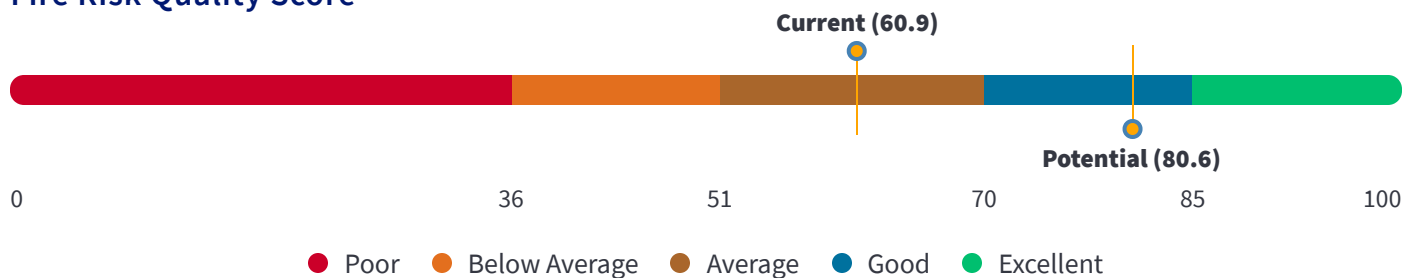
New Projects, Significant Changes and Observations

It is important to involve your insurer in new projects, such as refitting, refurbishment, extension work, new builds or relocating to a new site. Failure to do so could result in using non-approved construction materials (even though they meet local Building Codes and Fire Regulations) or inadequately protected facilities which could lead to expensive retrospective additions or rework. The Loss Prevention Engineering team at AIG can assist you with this by providing you with engineering support both before and during your project. Please contact us before you commence your project to ensure that we can arrange a consultation with one of our engineers.

Risk Summary

Open RI by Classification	5	Open RI by Age	5	Open RI by Type	5
Critical	0	New	5	Management Programs	5
Important	5	Outstanding	0		
Advisory	0	Completed RI	0		

Fire Risk Quality Score



Ratings

	Current rating	Potential rating
Hazards	Low	No Deficiencies
Water Supply	Adequate	Adequate
Protection	Inadequate	Adequate
Management Programs	Nearly Adequate	Adequate
Supervision	Adequate	Adequate
Exposures	Negligible	Negligible

Risk Improvements

Risk Improvements - Open

Number	Name	Classification	LE Before (EUR)	LE After (EUR)
22-12-01	Housekeeping- Remove combustibles from the basement areas	Important	--	--
22-12-02	Hot Work Program- Improve	Important	--	--
22-12-03	Impairment Program- Develop	Important	--	--
22-12-04	Scope-12 Inspection for PV (Photo-Voltaic) solar panels	Important	--	--
22-12-05	New Wafer Fab Project	Important	--	--

Note: Risk Improvements associated with management programs will not have an associated Loss Estimate before or after implementation

Open Risk Improvements : Important

Number/Type	Name	LE Before (EUR)	LE After (EUR)
22-12-01 Management Programs	Housekeeping- Remove combustibles from the basement areas		

Summary

Remove the combustible materials from the basement and technical areas.

Details

A fire involving the combustible materials may contribute to the smoke contamination of the equipment within the room.

During the visit we noticed that the basement areas of building Vertigo was being used for storage.

Client Exit Conference Comments

Will look into the issue.

Images



Basement area-1



Basement area-2



Staircase



Technical rooms

Number/Type	Name	LE Before (EUR)	LE After (EUR)
22-12-02 Management Programs	Hot Work Program- Improve		

Summary

Improve the existing hot work permit by:By ensuring that the permit is completed and signed off accordingly after the completion of work.Extending the fire watch and monitoring period to a 1 hour continuous fire watch after hot work has been completed and a 3 hour intermittent fire watch thereafter(after the 1 hour fire watch, the remaining 3 hour fire watch can be substituted by smoke detection as long as the staff monitoring the smoke detection are aware of all hot work areas and will treat a smoke alarm in a hot work area with additional suspicion.).Extending the clearance area around the hot work area to 35 ft (10m)Including a check to ensure detection is reinstated after hot work operations.Including an audit system to assess precautions and the permit for active hot work operations during large maintenance periods.

Details

Improper cutting and welding is a leading cause of fire. Loss history shows that some hot work fires can start some

distance away from where the work is taking place, sometimes well after the work has been completed. A hot work permit system ensures that proper precautions are in place prior, during and after this work is completed. All hot work operations taking place outside designated workshop areas should be performed under this program, including work by contractors.

Client Exit Conference Comments

Document to be reviewed by AIG.

Number/Type	Name	LE Before (EUR)	LE After (EUR)
22-12-03 Management Programs	Impairment Program- Develop		

Summary

Develop and implement a written program to manage impairments to fire protection systems and equipment. The program should establish actions necessary for impairment identification, tracking, reporting and restoration, and hazard evaluation and mitigation. Impairments should be tagged for visual indication and tracked using a computerized or paper log system. AIG should be notified of all impairments that will exceed 8 hours in duration.

Details

Impaired fire protection can result in a large loss if not properly managed. If an impairment occurs, appropriate precautions should be taken as necessary to minimize the hazard including:

- Notification of appropriate department heads in the affected areas
- Shutdown of hazardous processes
- Prohibit hot work
- Prohibit smoking
- Notification of the central station\alarm receiving center
- Notification of the public fire department
- Supplemental manual firefighting equipment such as extra fire extinguishers.
- Establish temporary connections to hydrants or adjoining sprinkler systems
- Expediting completion of repair work

AIG recommends that all impairments lasting longer than 1-shift or 8 hours be reported to the impairment desk. This will allow AIG to monitor the impairment and provide guidance regarding precautions that should be taken while the impairment exists. Impairments can be reported by calling 877-705-7287 or emailing GlobalProperty.Impairment@aig.com.

Note: The fire pump in Building Atlas was replaced without the knowledge of the TUE, since the maintenance contractor is contractually obliged to keep the sprinkler protection per the design specification of the UPD (UitgangsPunten Document).

Number/Type	Name	LE Before (EUR)	LE After (EUR)
22-12-04 Management Programs	Scope-12 Inspection for PV (Photo-Voltaic) solar panels		

Summary

The roof of the Spectrum building has PV solar panels installed. The panels need to be inspected and certified based on the local standards.

Details

The Scope-12 inspection for the PV solar panels installations in the Spectrum building needs to be completed to understand if there are any potential risk to the building from the installations.

Images



PV solar panels :Spectrum

Number/Type	Name	LE Before (EUR)	LE After (EUR)
22-12-05 Management Programs	New Wafer Fab Project		

Summary

The planned new wafer fab should be designed in accordance with NFPA code 318 or FM datasheet 7-7.

Details

The existing wafer fab in Building Spectrum was designed based on the Dutch building code which has no provisions for the specific hazards associated with a wafer fab (e.g. hazardous gases dispensed from cylinders).

Due to the high risk involved a wafer fab which does not comply with the requirements of NFPA code 318 or FM datasheet 7-7 should be considered a serious risk for the site.

According to the site contact, Mr Spanjaards, a plan exists to construct a new wafer fab within the next couple of years, since the existing wafer fab no longer has sufficient capacity or capabilities.

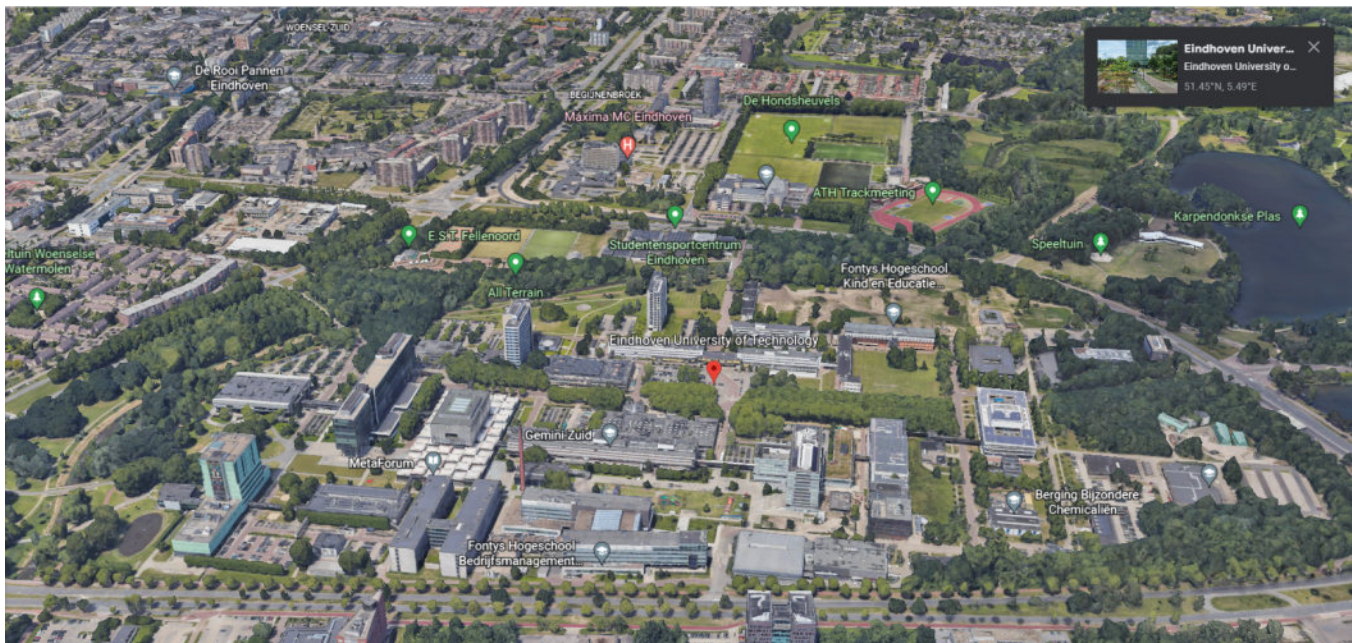
Client Exit Conference Comments

Mr Spanjaards, agreed to discuss the requirements of the NFPA code 318 or FM datasheet 7-7 during the conceptual design phase of the new wafer fab.

Occupancy & Process Overview

The campus is 1 km² in size and is situated northeast of the city centre of Eindhoven, with the Insulindelaan, Prof. Dr. Dorgelolaan, Onze Lieve Vrouwestraat, and John F. Kennedylaan as its borders. The campus is open, large, and unfenced. The campus grounds are comprised of number of buildings.

The campus also consists of the TNO and Fontys buildings. The distance from the central station in Eindhoven to the south is adequate.



Helix :

Department of Chemical Engineering and Chemistry is housed here. There are a total of 600 fume cupboards in the various laboratories. This building is not equipped with a fire extinguishing system , The complex is equipped with an automatic fire alarm system in accordance with NEN2535 with full surveillance.

Flux:

New faculty building for Applied Physics and Electrical Engineering. The building contains several labs, including one equipped with a Faraday cage. The complex is equipped with sprinkler protection, with the exception of a few specific labs on the ground floor (area 3). It concerns a partial automatic sprinkler system installed in accordance with NFPA 13 (2010) with a water supply as per EN 12845. The installation does not meet the derived objectives and is therefore not certified. The deviations are obstruction due to light fixtures, a cable duct and ventilation ducts and various storage that is not sufficient

Spectrum:

The department of Applied Physics is housed in this building. This building is not equipped with a fire extinguishing system. This building also houses a mini wafer fab and that, during the 2012 AIG visit, only the gas vaults were visited and that the mini wafer fab does not comply with NFPA code 318 or FM datasheet 7-7. It is unknown which type of research (e.g. process or product and lithography, epitaxy, etc.) is conducted.

Atlas:

The main Atlas building of TU/e is equipped to deliver education in a variety of formats and also houses office functions. In addition to lecture halls and other similar spaces, there are also options for independent study as well as more practical aspects of education. The latter may contain spaces set aside for creating maquettes or scale models. Although the building has no link to its surroundings, there are footbridges on the first floor level that connect it to the Auditorium and the Metaforum.

The building is mostly used during the daytime hours of working days. On weekends and in the nights, certain areas of the building may be occupied.

Gemini zuid:

The Faculty of Biomedical Engineering is located in this building, the building is connected to Gemini Noord by three footbridges.

Gemini Noord:

The Department of Biomedical Engineering is located in this building.

Vertigo:

This building houses the Faculty of Architecture.

Metaforum:

The Faculty of Mathematics and Computer Science (W&I) is housed here. The building also houses a library, a lunch café, offices, and study spaces.

Auditorium:

The Auditorium features a number of rooms, including 16 different-sized lecture halls. Here, in addition to lectures, a variety of meetings, including conferences, symposia, study days, and events, are hosted.

Cyclotron:

The cyclotron was created in the early 1970s through an alliance between TU/e and the business community for the production of isotopes for medical purposes. The particle accelerator has put Eindhoven on the map. With the old cyclotron, TU/e has built up a name in the international accelerator world with ion optics and accelerator technology. The cyclotron is operated by GE Healthcare for the manufacture of medical isotopes which are shipped throughout north-west Europe and that the original cyclotron has been replaced by a cyclotron made by IBA of Louvain-La-Neuve (Belgium).

Matrix:

The Matrix building started out in 1965 as accommodation for the department of Chemical Engineering and Chemistry (CE&C). Today it is being used by the Equipment & Prototype Center (EPC), TU/e innovation Space (iSP) and a section of the department of CE&C.

Occupancy Details

Building	SIC Code	Description	Operating Days/yr	Operating Hrs/Day	Other Tenants
Helix	822101	Colleges and Universities, NEC, State owned	365	24	No
Flux	822101	Colleges and Universities, NEC, State owned	365	24	No
Spectrum	367401	Manufacture of Semiconductors and Related Devices: Manufacture/Assembly without Wet Bench	365	24	No
Atlas	822101	Colleges and Universities, NEC, State owned	365	24	No
Gemini zuid	822101	Colleges and Universities, NEC, State owned	365	24	No
Vertigo	822101	Colleges and Universities, NEC, State owned	365	24	No
Metaforum	822101	Colleges and Universities, NEC, State owned	365	24	No
Gemini Noord	822101	Colleges and Universities, NEC, State owned	365	24	No
Auditorium	822101	Colleges and Universities, NEC, State owned	365	24	No
Cascade	822101	Colleges and Universities, NEC, State owned	365	24	No
Cyclotron	281904	Manufacture of Very High Hazard Inorganic Chemicals	365	24	No

Risk Engineering Report

TECHNISCHE UNIVERSITEIT EINDHOVEN



Building	SIC Code	Description	Operating Days/yr	Operating Hrs/Day	Other Tenants
Matrix	822101	Colleges and Universities, NEC, State owned	365	24	No

Hazards

Hazard Category	Type	Current Rating	Potential Rating	RI's
Electrical	Common	No Deficiencies	No Deficiencies	0
Storage	Common	Moderate	No Deficiencies	0
Heating, Ventilation, Air Cond & Refrigeration	Common	No Deficiencies	No Deficiencies	0
Flammable Liquids - Storage, Transfer, Use	Common	No Deficiencies	No Deficiencies	0
Electrical	Process	Low	No Deficiencies	0
Storage/Archives	Storage	Moderate	No Deficiencies	0
High Valued Equipment	Process	Moderate	No Deficiencies	0
Commercial Cooking	Process	Slight	No Deficiencies	0
Silane and other Pyrophoric Gases	Process	Moderate	No Deficiencies	0
Flammable Liquids - Storage, Transfer, Use	Storage	Moderate	No Deficiencies	0

Non-Process HVAC Equipment

Heat/cold storage is used in the subsurface and groundwater to a depth of 80m for additional space heating in the Helix, Gemini-zuid, Auditorium, Spectrum, Cyclotron and Metaforum buildings.

Pyrophoric Gases

The Spectrum building hosts the Department of Applied Physics, part of the building is converted into nano labs for production of WaferFabs.

The mini-wafer fab has a gas vault which houses 3 pyrophoric gases AsH_3 , PH_3 and SiH_4 . The pyrophoric gas cylinders are provided with ACVs (Automatic Cylinder Valve) interlocked to elctro-chemical gas detectors.

Note:The helium recovery system is located in Building Cascade.

Cyclotron -IBA

The Cyclotron Building hosts the IBA machine in collaboration with GE to experiment and manufacture samples of isotopes of different elements.

Library

Commodity Types

Not Applicable

Sprinklers

Area Protected	System	Design Existing	Design Required	Existing BOR Flow (Lpm)	Adjusted BOR Pressure (bar)	Temp & K-Factor	Hose (Lpm)	Adequacy
Metaforum: Library ,basement ,ground floor and 1st to 3rd floor	Wet	6.1mm/min over 139m2	6.1mm/min over 139m2					Adequate

PV-Panels

Images



PV -Panles : Spectrum

Flammable liquid and Gas storage

Images



Flammable gas storage

Commercial cooking

Hoods/Duct Cleaning Frequency	Ceiling Sprinklers present ?	Portable Extinguishers Acceptable
Annually	No	Yes

The campus houses a number of small cafes to restaurants in different buildings around the campus.

In general the kitchen in most of the restaurants were found to be in good condition.

Construction

Category	Current Rating	Potential Rating	RI's
Construction	ISO 6 / Class AA - Fire Resistive	ISO 6 / Class AA - Fire Resistive	0

Building	Year Built	# Stories	Height (m.)	Total Area (sq. m.)
Helix	1997	6	30	29,920
Flux	2013	11	66	29,630
Spectrum	2002	4	20	7,624
Atlas	1963	14	60	304,152
Gemini zuid	1974	7	35	20,533
Vertigo	1965	11	40	26,194
Metaforum	2012	8	35	28,525
Gemini Noord	1974	3	15	13,749
Auditorium	1966	5	25	16,760
Cascade	1957	5	25	100
Cyclotron	1968	4	20	20,000
Matrix	1957	2	15	0

Area (1,000 sq. m.)

Building	ISO1/D	ISO2/C	ISO3/C	ISO3/B	ISO4/C	ISO4/B	ISO5/A	ISO6/AA
Helix	--	--	--	--	5.5 (18.24%)	--	--	24.5 (81.76%)
Flux	--	--	--	--	4.5 (15.07%)	--	--	25.2 (84.93%)
Spectrum	--	--	--	--	2.0 (26.23%)	--	--	5.6 (73.77%)

Building	ISO1/D	ISO2/C	ISO3/C	ISO3/B	ISO4/C	ISO4/B	ISO5/A	ISO6/AA
Atlas	--	--	--	--	--	--	--	304.2 (100.00%)
Gemini zuid	--	--	4.7 (22.65%)	--	--	--	--	15.9 (77.35%)
Vertigo	--	--	--	--	3.9 (14.71%)	--	--	22.3 (85.29%)
Metaforum	--	--	--	--	6.5 (22.79%)	22.0 (77.21%)	--	--
Gemini Noord	--	--	5.4 (39.60%)	--	--	--	--	8.3 (60.40%)
Auditorium	--	--	--	--	--	--	--	16.8 (100.00%)
Cascade	--	--	--	--	--	--	--	0.1 (100.00%)
Cyclotron	--	--	--	--	--	--	--	20.0 (100.00%)
Matrix	--	--	--	--	--	--	--	--
Total	0.0 (0.00%)	0.0 (0.00%)	10.1 (2.03%)	0.0 (0.00%)	22.3 (4.48%)	22.0 (4.43%)	0.0 (0.00%)	442.8 (89.06%)

Definitions: ISO1=wood frame walls roof, ISO2=masonry walls wood roof, ISO3=light non-combustible walls roof, ISO3 (CMD)=ISO3 with combustible metal deck, ISO4=non-combustible metal deck and masonry walls, ISO4 (CMD)=ISO4 with combustible metal deck, ISO5=modified fire resistive walls roof, ISO6=fire resistive walls roof.

Comments

Auditorium:

This building (built in 1966, and renovated in 1994 after fire damage) has five floors with a built-up area of 3,364 m2, with a total Gross Floor Area (GFA) of 16,760 m2. The building has a load-bearing construction of concrete, with concrete floors and roof. The facades are partly made of concrete, partly of masonry, partly of steel sandwich panels and partly of glass (non-woven construction). The concrete roof is fitted with flammable insulation. Technical rooms have a WDBDO of 60 minutes.

Metaforum:

This building (built in 2012) has nine floors including the basement with a built-up area (including the roof) of approximately 6,500 m² and a gross floor area (GFA) of 28,525 m².

The building has a load-bearing construction of concrete and steel, with concrete floors and a roof of steel and partly Durasol Mevriet. The roof is fitted with flammable insulation. The facades are made of steel sandwich panels with PS insulation core, and partly glass (fleece construction). The low-rise building (roof), consisting of different roof surfaces that are mutually staggered in height, is fitted with flammable insulation. Technical rooms have a WBDBO of 60 minutes.

Vertigo:

This building (built in 1965, renovated in 2002) has thirteen floors including two basements and can be divided into a high-rise and a low-rise section. The built area is 3,852 m², with a total GFA of 26,194 m². The building has a load-bearing construction of concrete, with concrete floors and roof. The facades consist of concrete, steel facade plates and glass fronts (fleece construction). The concrete roof is partly fitted with rock wool and partly polystyrene insulation. The building is connected by a covered connection with a length of approx. 100m with the Matrix building (building 53). The technical areas have a WBDBO of 60 minutes.

Helix:

This building (built in 1997) has seven floors including basement with a built-up area of 5,457 m², with a total GFA of 29,920 m². The building has a load-bearing construction of concrete with concrete floors. The facades are made of concrete, steel and partly a lot of glass (fleece construction). The steel roof is equipped with Pur insulation. The technical areas have a WBDBO of 60 minutes.

Flux:

This detached building (built in 2013-2014) has twelve floors including a basement. The building has a built-up area of 4,464 m², with a total GFA of 29,630 m². The building has a load-bearing construction of concrete, with concrete floors and a concrete and partly glass roof. The facades consist of glass (fleece construction), steel sandwich panels and wood. The concrete roof is fitted with flammable insulation. The technical areas have a WBDBO of 60 minutes.

Spectrum:

This building (built in 2002) has four floors, with a built-up area of 3,299 m², and a total GFA of 7,624 m². The building has a load-bearing construction of concrete, with concrete floors and roof. The facades are made of masonry, concrete and partly glass (fleece construction). The concrete roof is fitted with flammable insulation. The technical areas have a WBDBO of 60 minutes. The Spectrum building and the Cascade building form one whole.

Gemini Zuid:

This building (built in 1974) has eight floors including basement with a built-up area of approximately 4,650 m², and the total GFA is 20,533 m². The building has a load-bearing concrete structure. With concrete floors. The facades are partly

made of concrete and masonry, and mostly of glass (fleece construction). The steel roof is fitted with flammable insulation. The technical areas have a WBDBO of 60 minutes.

Gemini Noord:

This building (built in 1974) has four floors including basement with a built-up area of approximately 5,445 m², and the total GFA is 13,749 m². The building has a load-bearing concrete structure. With concrete floors. The facades are partly made of concrete and masonry, and mostly of glass (fleece construction). The steel roof is fitted with flammable insulation. The technical areas have a WBDBO of 60 minutes.

Note: The construction details for some of the buildings were unavailable at the time of writing the report.

Water Supply & Fire Pumps

Category	Current Rating	Potential Rating	RI's
Water Supply	Adequate	Adequate	0

Comments

Sufficient underground and above ground hydrants are available on and around the campus grounds.

Flux:

The water supply consists of an electrically driven pump with a capacity of 150 m³/h @ 6.3 bar connected to the water supply network.

Metaforum:

The water supply installed in accordance with EN-12845. The water supply consists of an electrically driven pump with a capacity of 81 m³/h @ 5 bar connected to the water supply network.

Vertigo:

The water supply consists of an electrically driven pump with a capacity of 162 m³/h @ 8.2 bar connected to the water supply network.

Protection

Category	Current Rating	Potential Rating	RI's
Sprinklers	Inadequate	Adequate	0
Special Extinguishing Systems	Adequate	Adequate	0
Fire Extinguishing Equipment	Good	Good	0
Public Fire Department	Excellent	Excellent	0

Sprinklers

Building	AS (%)	ASA (%)	ASN (%)	Fire Detection (%)
Helix	0.00	0.00	100.00	100.00
Flux	80.00	40.00	0.00	100.00
Spectrum	0.00	0.00	100.00	100.00
Atlas	0.00	0.00	100.00	100.00
Gemini zuid	0.00	0.00	100.00	100.00
Vertigo	100.00	100.00	0.00	100.00
Metaforum	40.00	40.00	60.00	100.00
Gemini Noord	0.00	0.00	100.00	100.00
Auditorium	0.00	0.00	100.00	100.00
Cascade	0.00	0.00	100.00	100.00
Cyclotron	0.00	0.00	100.00	100.00
Matrix	0.00	0.00	100.00	100.00
Total	12.33	9.95	86.48	100.00

Definitions: AS (%) =sprinklers provided, ASA (%) =adequate sprinklers provided, ASN (%) =sprinklers improvements needed, Detection=Smoke or other Fire Detection excluding sprinkler waterflow

Area protected	System	Existing Design	Required Design	Adjusted BOR (bar)	Existing Flow (Lpm)	Hose (Lpm)	Adequacy
Metaforum: Library ,basement ,ground floor and 1st to 3rd floor	Wet	6.1mm/min over 139m2	6.1mm/min over 139m2				Adequate
Vertigo	Wet	5.5 mm/min over 216 m2	5.5 mm/min over 216 m2				Adequate
Flux: lower levels (exception of a few specific labs)	Wet	4.1mm/min over 139m2	4.1mm/min over 139m2				Inadequate
Flux: high building levels	Wet	8.1mm/min over 139m2	8.1mm/min over 139m2				Inadequate

Definitions: Adequate = 100% of required sprinkler design hose. Nearly Adequate = 90% of required sprinkler design and no hose. Inadequate = less than 90% of required sprinkler design and no hose. Duration requirements must be met or rating is inadequate. For ESFR nearly adequate is defined as full sprinkler design with NO HOSE.

Comments

Not all buildings on campus are protected with automated sprinkler systems. Only the following three buildings are provided with sprinkler protection.

Vertigo:

The complex is equipped with automatic sprinkler protection. The sprinkler regulation is VAS'96. Conventional system with 5.5 mm/min over 216 m2 (N3).

Metaforum:

The complex is partly equipped with sprinkler protection; Library (basement and ground floor) and the 1st to 3rd floors are sprinklered. The sprinkler code is NFPA13:2013. It is a conventional system with 6.1mm/min over 139m2 (OH1).

Flux:

The complex is equipped with sprinkler protection, with the exception of a few specific labs on the ground floor. The sprinkler code is NFPA13, supplemented by FM datasheet 3-26 for spaces greater than 50 feet (15.2 m).

The installation was carried out with 4.1mm/min over 139m² (OH2) for traffic areas, offices, the seating area of the restaurant and the like, (the high building part according to FM maximum 6 sprinklers, K360), with 8.1mm/min over 139m² (OH2) for storage areas, practice rooms, laboratories and the like. A dry system has been installed in the antenna measuring cage on the 8th floor.

The installation does not meet the derived objectives and is therefore not certified. The deviations are obstruction due to light fixtures, a cable duct and ventilation ducts and various storage that is not sufficient.

Fire Extinguishing Equipment

Water Supply & Inspection

Frequency

- Meets NFPA requirements

FEA/Hose Reel Details

- Equipment is properly maintained
- Inspections are properly documented with records maintained and readily available
- Plant personnel properly trained

Recommendations

None

Public Fire Department

Fire Department Type

- Full Time

Fire Department Features

- Fully trained and funded (adequate for the risk if special hazards exist)
- Fully equipped with required modern pumping appliances, ladders, aerial equipment, BA equipment
- Equipment regularly tested and maintained
- Full time emergency communications center to dispatch FD
- Closest FD participates w/ other local full-time FD's w/in a "mutual aide" concept
- Response time is less than 20 minutes

Fire Department Distances (kilometers)

Station #1

Station #2

1.00

2.00

Comments

A fully equipped, professional company fire brigade is present on campus during office hours. Outside office hours, the municipal fire service is on duty.

The fire station located on campus which houses both the private and public fire brigades which are both full-time paid and well equipped. The private fire brigade operates during week days from 8 AM to 5 PM and the public fire brigade operates 24/7. The nearest fire station beyond the campus is in the city centre at 4 km over unobstructed roads.

Supervision

Category	Current Rating	Potential Rating	RI's
Automatic Fire Detection	Good	Good	0
Security	Adequate	Adequate	0

Automatic Fire Detection

Signaling Systems Local Alarm	Monitored Line Yes	Fire Detection Coverage (Including Sprinklers) at least 80%	Smoke Detection Monitored Yes
Other Alarms Yes	Maintenance, Testing and Inspection per NFPA 25 Satisfactory		

Security

Security & Watch Service (24/7) Other	Round Frequency Other	Security Rounds Unrecorded	Coverage 100%
Security Alarms - Breaking Glass Detection - CCTV	Intrusion Alarm Monitoring Constantly attended location	Site Fencing and Barriers None	Burglar and Theft Exposure Yes
Vandalism / Malicious Mischief Exposure Yes	Sabotage and Terrorism Exposure Yes		

Comments

The campus grounds are not fenced, but are equipped with outdoor lighting. Almost all buildings are equipped with electronic burglary alarms, consisting of motion detectors and magnetic contacts on the outside doors. A burglary alarm is reported to the permanently occupied control room (main building). During the day 9-12 guards are present, at night 2 to 3 guards are present. Alarm follow-up is provided by a professional security service that is permanently present on campus. The campus grounds are equipped with approximately 240 digital (dome) cameras, placed at strategic locations. The images are read in the security box.

Management Programs

Category	Current Rating	Potential Rating	RI's
Emergency Organization & Planning	Excellent	Excellent	0
Self-Inspection Program	Excellent	Excellent	1
Fire System Impairment Procedures	Inadequate	Adequate	1
Contractor Management	Adequate	Good	0
Hot Work Permit	Inadequate	Good	1
Smoking	Adequate	Adequate	0
Housekeeping	Nearly Adequate	Good	1
Planned Preventative Maintenance	Excellent	Excellent	0
Management Interest	Adequate	Adequate	1
Site Level Business Continuity Planning	Adequate	Adequate	0

Management Programs

Emergency Organization & Planning

Written Emergency Action Plan

Precise instructions of emergency procedures, allocation of roles and responsibilities

Drills/practices conducted

periodically
Yes

Fully Updated

Yes

Comments

The emergency response plan is developed for each building. There are 2 fully equipped emergency rooms. A central emergency plan is in place.

Self-Inspection Program

Self-Inspection Program

- Yes

Documentation

- Formal, documented checklist

Frequencies

- Minimum weekly or commensurate with the occupancy

Root cause & training

- Program includes items such as inspector training, root cause analysis, management

of change, auditing,
etc.

Risk Improvements

- None

Comments

For the buildings there is an extensive NEN 3140 program that is implemented by the company Strukton; Assessment by the Management and Maintenance (B&O) department.

Risk Improvements

Name	Classification
Scope-12 Inspection for PV (Photo-Voltaic) solar panels 22-12-04	Important

Fire System Impairment Procedures

Written and documented procedure

- No

Risk Improvements

Name	Classification
Impairment Program- Develop 22-12-03	Important

Contractor Management

Contractor Training Program

- Yes

Management Program Features

- Required for all contractors and sub-contractors
- Strongly supported by management with zero tolerance for misconduct
- Contractors follow all plant policies including but not limited to hot work, impairment,

Records

- Maintained electronically

Risk Improvements

- None

housekeeping, and
smoking

Comments

Yet to be reviewed.

Hot Work Permit

Hot Work Program in Place

- Yes – Does not conform to AIG

Communication

- Communicated to personnel with mgmt. responsibilities assigned

Logging

- Paper logging system

Is there Hot Work Occurring

- Yes – with any of the following conditions;
No sprinkler protection or inadequate sprinkler protection with combustible loading, EH occupancy, Combustible Storage in excess of 12 feet, or Presence of EPS Panels

Comments

Yet to be reviewed.

Risk Improvements

Name	Classification
Hot Work Program- Improve 22-12-02	Important

Smoking

Policy

- No smoking allowed within the perimeter of the site

Appropriate Receptacles

- Yes

Inspections

- None

Material Disposal

- Adequate

Risk Improvements

- None

Comments

There are some smoking areas, otherwise smoking is prohibited in the buildings.

Housekeeping

Quality

- Commensurate with exposure

Inspections

- Regular inspections w/ management support; well-documented

Risk Improvements

- Important

Comments

In general the housekeeping on campus is considered good with exceptions to some basement and technical areas. during the visit we noticed some of the basement areas were used to store supplies and boxes.

Risk Improvements

Name	Classification
Housekeeping- Remove combustibles from the basement areas 22-12-01	Important

Planned Preventative Maintenance

PM Program in place

- Yes – includes all equipment including work performed by outside contractors

PM System

- Fully computerized and automated work order generation

Overdue Assignments

- None

PM of Critical Components/Equipment

- Conforms to manufacturer's minimum requirements

Risk Improvements

- None

Management Interest

Management Interest

- Proactive

Field Safety and Risk Management

- Important

Risk Improvements

Name	Classification
New Wafer Fab Project 22-12-05	Important

Site Level Business Continuity Planning

Business Continuity Plan (BCP)

- No BCP or DCP in place

Exposures

Category	Current Rating	Potential Rating	RI's
Exposure	Negligible	Negligible	0

Internal Exposure

The campus also houses buildings for other institutes.

External Exposure

None

Yard Storage

None

Water Intrusion Exposure

No

Aircraft Exposure

No

Structural Collapse Exposure

No

BI Exposures

General BI

BI is not insured as part of the program.

NATCAT Exposure Summary

	Flood	Wind	Earthquake	Hail	Collapse	Other
Zone/Exposure	>500-year Flood Zone	40 m/s	MR Zone 1:MMVI	MRe Zone 2	No	No

Flood

Site Property Flood Zone

>500-year Flood Zone

Building	Flood Zone	Flood Source	FFE (m)	100 Yr Flood Elv. (m)	500 Yr Flood Elv. (m)
Helix	>500-year Flood Zone	River	--	--	--
Flux	>500-year Flood Zone	River	--	--	--
Spectrum	>500-year Flood Zone	River	--	--	--
Atlas	>500-year Flood Zone	River	--	--	--
Gemini zuid	>500-year Flood Zone	River	--	--	--
Vertigo	>500-year Flood Zone	River	--	--	--
Metaforum	>500-year Flood Zone	River	--	--	--
Gemini Noord	>500-year Flood Zone	River	--	--	--
Auditorium	>500-year Flood Zone	River	--	--	--

Building	Flood Zone	Flood Source	FFE (m)	100 Yr Flood Elv. (m)	500 Yr Flood Elv. (m)
Cascade	>500-year Flood Zone	River	--	--	--
Cyclotron	>500-year Flood Zone	River	--	--	--
Matrix	>500-year Flood Zone	River	--	--	--

Wind

Wind Speed (m/s)

40

Building	Distance to Coast
Helix	10 and greater miles
Flux	10 and greater miles
Spectrum	10 and greater miles
Atlas	10 and greater miles
Gemini zuid	10 and greater miles
Vertigo	10 and greater miles
Metaforum	10 and greater miles
Gemini Noord	10 and greater miles
Auditorium	10 and greater miles
Cascade	10 and greater miles
Cyclotron	10 and greater miles
Matrix	10 and greater miles

Earthquake

EQ Zone

MR Zone 1:MMVI

Peak Ground Acceleration (%g)

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Fire Loss Estimates

All loss estimates developed as a result of our property surveys are for the sole use of AIG underwriters. Engineering loss estimates are based on the professional judgement of our engineer / consultants. There is detailed guidance and methodologies that are reference and used in the calculate of our Loss Estimates. Using our Loss Estimates without an understanding of the underlying guidance and methodologies is not recommended. AIG assumes no responsibility for use or reliance upon the loss estimates presented below.

	PD (M EUR)	PD%	BI (M EUR)	BI%	IBI (M EUR)	TOTAL (M EUR)
MAS	361.22	28.9		0.0		361.22
MFL	165.52	13.3		0.0		165.52
NLE	81.69	6.5		0.0		81.69

Reported Values

Property Damage

Building (EUR)	Contents (EUR)	M&E (EUR)	Stock/Inventory (EUR)	Other PD (EUR)
679,633,200	0	0	569,663,700	0

Business Interruption

Indemnity Period	BI/Gross Revenues (EUR)	Rental Income (EUR)	Payroll (EUR)
12 Months	0	0	0

Totals	EUR
Total Property Damage Value	1,249,296,900
Total BI Value	0
Total Insured Value	1,249,296,900

Maximum Foreseeable Loss (MFL)

Total LE (EUR): 165,515,160

PD Loss Estimate

Building	Bldg (EUR)	M&E (EUR)	Content (EUR)	Stock (EUR)	Other (EUR)	Total (EUR)
Flux	31,793,755 (35.00%)	0 (45.00%)	0 (45.00%)	29,501,505 (45.00%)	0 (0.00%)	61,295,260 (39.19%)
Spectrum	26,808,705 (55.00%)	0 (55.00%)	0 (55.00%)	49,830,165 (55.00%)	0 (0.00%)	76,638,870 (55.00%)
Cascade	6,591,410 (35.00%)	0 (45.00%)	0 (45.00%)	20,989,620 (45.00%)	0 (0.00%)	27,581,030 (42.12%)
Total	65,193,870 (9.59%)	-- (--%)	-- (--%)	100,321,290 (17.61%)	-- (--%)	

Total Property Damage Loss Estimate (EUR): **165,515,160 (13.25%)**

TE Loss Estimate

Building	BI (EUR)	Payroll (EUR)	Rent (EUR)	Downtime (Months)	Total(EUR)
Flux	-- (--%)	-- (--%)	-- (--%)	--	--%
Spectrum	-- (--%)	-- (--%)	-- (--%)	--	--%
Cascade	-- (--%)	-- (--%)	-- (--%)	--	--%
Total	-- (--%)	-- (--%)	-- (--%)	--	

Total TE Loss Estimate (EUR): **-- (0.00%)**

Loss Estimate Comments

Flux-Spectrum-Cascade :

The Flux building is a detached building (built in 2013-2014) has twelve floors including a basement. The building has a load-bearing construction of concrete, with concrete floors and a concrete and partly glass roof. The facades consist of glass (fleece construction), steel sandwich panels and wood. The concrete roof is fitted with flammable insulation.

Spectrum has a load-bearing construction of concrete, with concrete floors and roof. The facades are made of masonry, concrete and partly glass. The concrete roof is fitted with flammable insulation. The Spectrum building and the Cascade building form one single fire compartment.

The Flux building is connected to the Spectrum building via a sky bridge 13 meters long, the sky walk is made of non combustible elements. However the space separation do not meet AIG criteria for clear space separation.

A fire in one of the labs in Spectrum building during Idle hours could result in a fire that can travel through the roof and to the Cascade and Flux building.

The resulting damage from the fire is estimated to 165.5 Million based on AIG guidelines.

MFL Area:



Normal Loss Expectancy (NLE)

Total LE (EUR): 81,691,295

PD Loss Estimate

Building	Bldg (EUR)	M&E (EUR)	Content (EUR)	Stock (EUR)	Other (EUR)	Total (EUR)
Helix	25,590,110 (35.00%)	0 (45.00%)	0 (45.00%)	56,101,185 (45.00%)	0 (0.00%)	81,691,295 (41.30%)
Total	25,590,110 (3.77%)	-- (--%)	-- (--%)	56,101,185 (9.85%)	-- (--%)	

Total Property Damage Loss Estimate (EUR): **81,691,295 (6.54%)**

TE Loss Estimate

Building	BI (EUR)	Payroll (EUR)	Rent (EUR)	Downtime (Months)	Total(EUR)
Helix	-- (--%)	-- (--%)	-- (--%)	--	--%
Total	-- (--%)	-- (--%)	-- (--%)	--	

Total TE Loss Estimate (EUR): **-- (0.00%)**

Loss Estimate Comments

Building Helix represents the highest value on campus.

Department of Chemical Engineering and Chemistry is housed here. There are a total of 600 fume cupboards in the various laboratories. This building is not equipped with a fire extinguishing system , The complex is equipped with an automatic fire alarm system in accordance with NEN2535 with full surveillance.

The building has a load-bearing construction of concrete with concrete floors. The facades are made of concrete, steel and partly a lot of glass (fleece construction). The steel roof is equipped with PUR insulation.

A fire in one of the labs during idle hours will be detected by the system, the fire station is located on campus which houses both the private and public fire brigades which are both full-time paid and well equipped.

However, if the fire reaches the combustible roof section, we could expect the fire to spread to the enter building.Based on AIG guidelines, the damage from the fire is estimated to be:

35% for building and 45% for the content

The overall NLE damage is estimated to be 81.69 Million Euro.

Note:

No recommendation has been made to provide/ expand the sprinkler protection to the entire campus, since the expected cost of completion is approximately EUR 9 million to reduce the NLE to EUR 10 million (approximate

estimate).

Maximum Amount Subject (MAS)

Total LE (EUR): 361,217,800

PD Loss Estimate

Building	Bldg (EUR)	M&E (EUR)	Content (EUR)	Stock (EUR)	Other (EUR)	Total (EUR)
Flux	90,839,300 (100.00%)	0 (100.00%)	0 (100.00%)	65,558,900 (100.00%)	0 (100.00%)	156,398,200 (100.00%)
Spectrum	48,743,100 (100.00%)	0 (100.00%)	0 (100.00%)	90,600,300 (100.00%)	0 (100.00%)	139,343,400 (100.00%)
Cascade	18,832,600 (100.00%)	0 (100.00%)	0 (100.00%)	46,643,600 (100.00%)	0 (100.00%)	65,476,200 (100.00%)
Total	158,415,000 (23.31%)	-- (--%)	-- (--%)	202,802,800 (35.60%)	-- (--%)	

Total Property Damage Loss Estimate (EUR): **361,217,800 (28.91%)**

TE Loss Estimate

Building	BI (EUR)	Payroll (EUR)	Rent (EUR)	Downtime (Months)	Total(EUR)
Flux	-- (--%)	-- (--%)	-- (--%)	--	--%
Spectrum	-- (--%)	-- (--%)	-- (--%)	--	--%
Cascade	-- (--%)	-- (--%)	-- (--%)	--	--%
Total	-- (--%)	-- (--%)	-- (--%)	--	

Total TE Loss Estimate (EUR): **-- (0.00%)**

Loss Estimate Comments

Flux-Spectrum-Cascade :

The Flux building is a detached building (built in 2013-2014) has twelve floors including a basement. The building has a load-bearing construction of concrete, with concrete floors and a concrete and partly glass roof. The facades consist of glass (fleece construction), steel sandwich panels and wood. The concrete roof is fitted with flammable insulation.

Spectrum has a load-bearing construction of concrete, with concrete floors and roof. The facades are made of masonry, concrete and partly glass. The concrete roof is fitted with flammable insulation. The Spectrum building and the Cascade building form one single fire compartment.

The Flux building is connected to the Spectrum building via a sky bridge 13 meters long, the sky walk is made of non combustible elements. However the space separation do not meet AIG criteria for clear space separation.

A fire in one of the labs in Spectrum building during Idle hours could result in a fire that can travel through the roof and to the Cascade and Flux building.

The resulting damage from the fire is estimated to 361,217,800 Euro based on AIG guidelines.

Risk Improvement Classification

Critical

Critical recommendations represent conditions or work practices that create an imminent or severe loss-producing situation. This means that there must be a readily available ignition source or the potential for a severe loss event.

Important

Important recommendations represent conditions or work practices that could result in a loss-producing situation, but for which immediate action is not necessary. These are recommendations to correct uncontrolled exposures or to achieve and maintain a reasonable level of property protection. These recommendations require commitment on the part of the insured to change or modify conditions or work practices in order to reduce the potential for serious loss, resulting from either frequency or severity events.

Advisory

Advisory recommendations represent conditions or work practices that do not directly pose a risk for severe loss or injury, but could contribute to a loss situation. These are recommendations that are considered best practices to enhance the level of property protection. Compliance with these recommendations improves the risk and reduces the likelihood of a loss occurring from the recognized hazard or situation.

Risk Improvement Types

Physical Protection:

A Physical Protection Risk Improvement is associated with provision of physical plant and equipment; typically there could be a capital expenditure associated with these improvements.

Management Programs

A Management Programs Risk Improvement typically relates to procedures and management programs and will not normally involve, or will have limited, capital expenditure.

NATCAT:

NATCAT Risk Improvement is either a physical improvement or the addition/enhancement of management procedures to reduce the risk associated with natural catastrophe events.

B&M Management Programs

A B&M Management Programs Risk Improvement relates to procedures and management programs, such as inspection, testing and maintenance, which will not normally involve, or have limited capital expenditure. Such a risk improvement is directed at reducing the probability of the identified risk exposure.

Loss Estimate Definitions

Maximum Amount Subject (MAS)

The **Maximum Amount Subject (MAS)** is defined as the area of the largest insured value (PD and BI) that is subject to a single fire or explosion. The amount Subject area will only be limited by clear space separation that is sufficient to restrict the spread of fire, as defined in the Space Separation Table which is found in the AIG Commercial Property Field Engineering Manual, MFL section. MAS considers complete failure of all active protection including automatic sprinkler systems, all water supplies, automatic extinguishing systems, alarm supervision, public and private water supplies, no firefighting effort and offers no credit for MFL or fire walls, fire proofing or other passive barriers. In circumstances where the location consists of only one building, the Amount Subject will normally be equal to the full TSI for that building. Calculate of MAS will include PD, BI, BI interdependencies, contingent BI and any other time element values such as Extra Expense, Extended Period of indemnity, Rents, etc.

Maximum Foreseeable Loss (MFL)

MFL is defined as the largest amount of loss that can be anticipated (including PD, BI, BI interdependencies, contingent BI and any other time element values such as extra expense, extended period of indemnity, rents, etc. due to a fire and/or explosion event with all fire protection systems and equipment out of service and with no fire-fighting effort, either public or private. The loss would be that which occurs if the fire were allowed to “burn freely” until it burns itself out. The MFL area is the maximum plant area that could be affected by a single fire or explosion, occurring in the more vulnerable area of the facility (i.e. that with the largest total PD and BI potential). The only acceptable ways to reduce the MFL estimate are:

- Adequate clear space separation between buildings
- Lack of continuity of combustibles
- Effective horizontal cut-offs with MFL walls
- Effective vertical cut-offs
- Expectable salvage values
- Reliable make-up capacity

Airports, High Rise Buildings, Hospitals and Universities are treated as unique and may have a MFL calculation that differs from the above providing certain favorable factors exist.

Normal Loss Estimate (NLE)

The Normal Loss Estimate (NLE) is defined as the largest loss anticipated for a location under existing conditions. The NLE for a protected (sprinklered) facility assumes that the existing automatic and manual protection functions as designed and for intended and in its existing condition, whether it is adequate for the occupancy or not. This can include both public and private protection, including fixed automatic protection (such as sprinkler systems with reliable water supplies), other fixed automatic protection (such as special extinguishing systems or fire alarms with off-site signaling), and proximity of the public fire department and availability of public and private water supplies for firefighting purposes. In addition, construction characteristics are considered that include firewalls, draft curtains, roof

parapets, fire doors, etc., as these factors relate to the hazard and combustibility of the occupancy. Fire department response is anticipated.

Factors that could influence the NLE include:

- Construction classification and characteristics including fire walls, fire doors, etc.
- Occupancy and contents susceptibility to damage (smoke or water damage)
- Continuity of combustibles and combustible loading (light, moderate, heavy)
- Sprinkler protection/water supply adequacy
- Special hazard conditions, protection and controls
- Public Fire Department
- Fire alarms and Central Station monitoring

Deficiencies, minor in nature that are not expected to contribute significantly to a loss but do represent or could contribute to unsafe conditions or unsafe acts. These are recommendations that are considered best practices to enhance the level of property protection. Although compliance with these recommendations improves the risk and reduces the likelihood of a loss occurring from the recognized hazard or situation, they are considered desirable and not mandatory in nature.