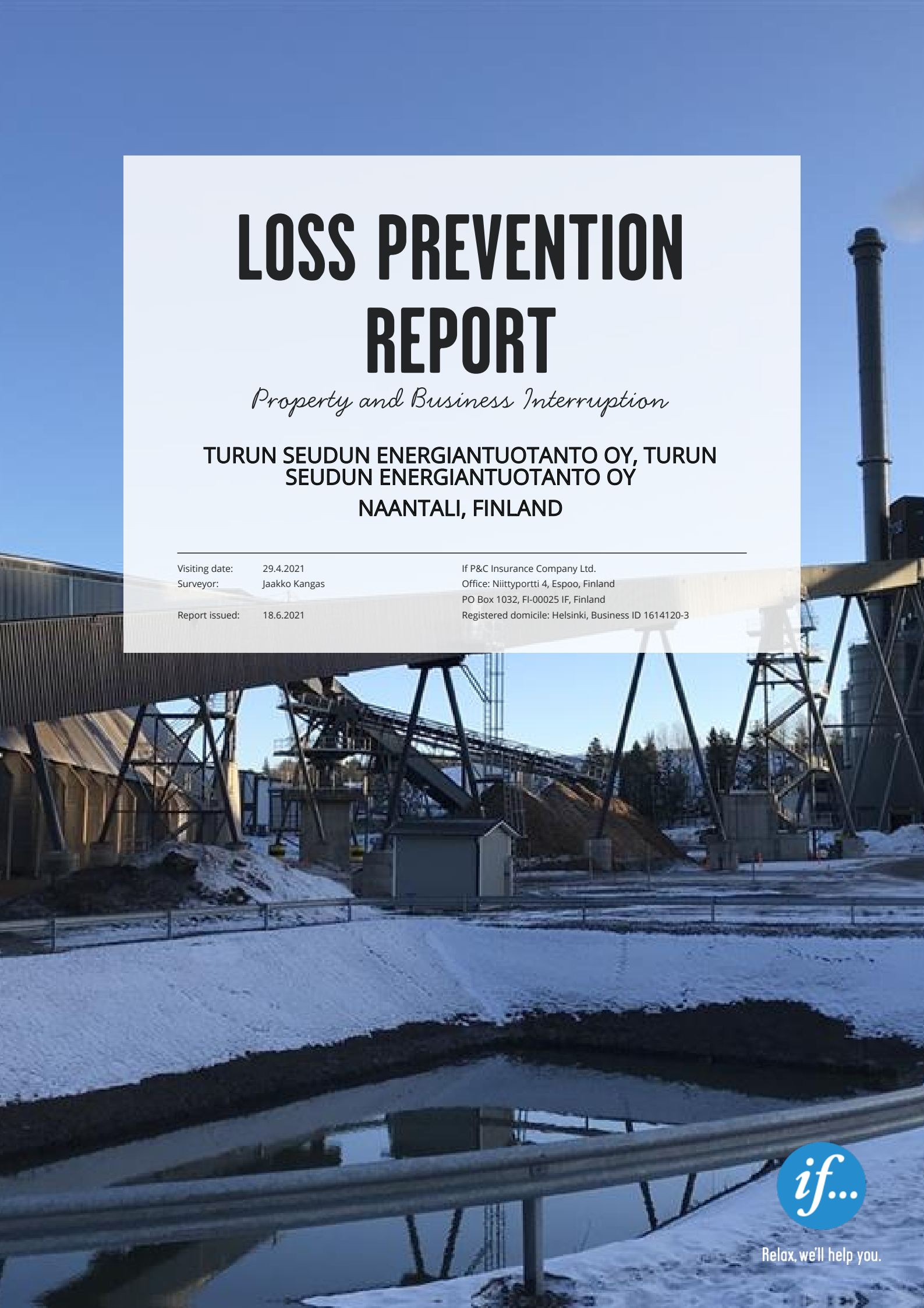


LOSS PREVENTION REPORT

Property and Business Interruption

TURUN SEUDUN ENERGIANTUOTANTO OY, TURUN SEUDUN ENERGIANTUOTANTO OY

NAANTALI, FINLAND

Visiting date:	29.4.2021	If P&C Insurance Company Ltd.
Surveyor:	Jaakko Kangas	Office: Niittyportti 4, Espoo, Finland
		PO Box 1032, FI-00025 IF, Finland
Report issued:	18.6.2021	Registered domicile: Helsinki, Business ID 1614120-3

Relax, we'll help you.

Contents

Appendix

1 Purpose of the Visit

Purpose	This was a remote risk survey intended for updating the risk information to take into account major changes and progress in loss prevention recommendations implementation since the initial visit done in 2019.

2 General Information

Group	Turun Seudun Energiantuotanto Oy
Company/Plant	Turun Seudun Energiantuotanto Oy
Location, address	Satamatie 16 21100 Naantali Finland
Location coordinates	60° 27' 34,5" N, 22° 3' 8,1" E
Plant manager	Maija Henell, CEO, TSE
Local contact person(s)	Sakari Mikkola, CFO, TSE
Participant(s)	• Maija Henell, TSE • Juho Perkonoja, Turkuenergia • Veli-Pekka Kervinen, Turkuenergia • Matti Akkanen, Turkuenergia • Kalle Karjala, Turkuenergia • Ville Pääkkönen, Turkuenergia • Jari Kouki, Turkuenergia • Sakari Mikkola, TSE • Teemu Paavonen, Broker, WillisTowersWatson • Jussi Tunturi, TSE • Jaakko Kangas, Risk-engineer, If • Piiamari Poikonen, Property Underwriter, If
Surveyor(s)	Jaakko Kangas Risk Engineer If P&C Insurance Ltd. Phone +358105145507 Mobile +358503170706 E-mail jaakko.kangas@if.fi
Distributed to	• Maija Henell, TSE • Teemu Paavonen, Willis Tower Watson • If P&C Insurance Property UW and RM
Type of activity	Thermal power plant producing district heat, electricity and process steam.
Significant changes since last /previous report	• Na1 and Na2 units have been decommissioned permanently • Flue gas condencer installed to NA4 CHP 01/2019 • Asphaltene fuel receiving and feeding system installed to NA4 CHP 11/2019

- Fuel feeding hopper from yard to storage < 1 MEUR
- Neste has closed operations at the nearby refinery. Due to this the process steam demand has reduced about 50 % and the use of refinery gas as fuel has ended.

Future plans and projects

- NA4 SRF-project; SRF receiving-, handling and fuel feeding systems including automation and integration to the existing DCS. The project value is an estimated million 17,4 EUR and the system is scheduled to be taken into use during 2021.
- Na4 unit waste heat recovery pump to recover 10 MW of heat from internal cooling circulations and steam venting and during summer time from sea water. The heat pump will be installed on the dismantled Na2 generator concrete. The project value is approximately million 7 EUR and is scheduled to be taken into use during spring 2022.
- No descisions have been made regarding Na3 and this unit will remain in use during peak DH demand periods for the time being. The dismantle of Na1 and Na2 is awaiting descisions concerning Na3.
- The use of coal as a supplementary fuel is scheduled to end and be replaced by alphaltene latest by 2025 when all use of coal in Naantali is planned to end. The use of wood bricket fuel is planned to start during next winter.

3 Opinion of the Risk

Information on Navigator tool

If P&C Insurance evaluates the risks and loss prevention level of the site using a benchmarking tool, called Property Navigator. This is a systematic way to evaluate 10 areas, which If has, based on its experience, found to be the most important issues when assessing property damage and business interruption risks. The result of each evaluation area is presented according to four-level scale: “Excellent” (green), “Good” (blue), “Fair” (yellow), “Poor” (red).

“Industry Risk Standard” is based on If’s loss prevention standard for the line of business at the site and consists of the most relevant loss prevention measures including automatic sprinkler systems.

Navigator Result

Property Navigator	**2021**
Management	Good
Human Element	Good
Security	Good
Construction	Good
Compartmentation	Fair
Active Protection	Good
Machinery Breakdown	Good
Utilities	Good
Natural Hazards	Excellent
Industry Risk Standard	Good
Total	**Good**

Summary and Opinion of the Risk

Turun Seudun Energiantuotanto (TSE) was founded in it's current form in 2012. TSE owns the base energy production power plants at Naantali, Oriketo bio boiler plant and the Kakola heat pumps. TSE optimizes the regional district heat production taking into account electricity production gross profit. TSE is owned by Fortum Power and Heat Oy (53,5 %), Turku Energia (43,5 %) and the City of Naantali (3,0 %). TSE sells the produced district heat, electricity and steam to its owners.

- Production costs and are being allocated to electricity, district heat and steam based on agreed principles
- Distribution & sales of district heat are organized by Turku Energia Oy
- O&M services are provided by Turku Energia Oy

Naantali power plant consist of two power blocks with individual boilers and power trains. The boiler blocks are named NA3 and NA4 CHP. The already decommissioned units NA1 and NA2 still remain at the site. The blocks are not cross connected except for process steam production.

NA3 is equipped with coal fired Sulzer boilers and AEG & KVU steam

turbine and matching generator. The NA3 boiler is equipped with flue gas desulphurization (FGD) plant and Low-NOx conversion has been installed to the boiler. NA3 is designed originally as a condensing power plant but turbine has later been equipped with DH extraction. Naantali power plant environmental permits allow continuous use for NA3.

NA4 CHP is a multi-fuel combined heat and power (CHP) plant that is constructed in separate buildings next to older power blocks. NA4 CHP is dimensioned to be capable or producing the entire heat demand. It replaced the NA1 and Na2 units and reduces the operating of NA3 only to peak district heat consumption periods. The NA4 CHP is equipped with Valmet CYMIC CFB boiler and Siemens extraction back-pressure turbine with reheating and Siemens generator. Main fuels used currently are biomass and coal. The use of coal and peat are planned to be phased out latest by 2025 replaced mainly by asphaltene.

In addition, the plant has four electric back-up boilers owned by Turku Energia.

Naantali power plant units and main equipment:

NA3 (Commissioned 1972)

- Sulzer boiler 315 MW
  Pulverized coal
- KVU steam turbine
  123 MW condensing
  95 MW back pressure
- KVU generator
  125 MVA
  Hydrogen cooled

NA4 CHP (Commissioned in 2017)

- Valmet CYMIC CFB boiler 430 MW
  Biomass, Coal, Peat, SRF, Asphaltene
- Siemens steam turbine, 167 MW
  123 MW SST-800
  44 MW SST-500
- Siemens generator
  179 MVA SGen5-100A-2P

The risk is considered as GOOD, but with high priority recommendations.

Recommendation summary

No	Recommendation	Priority	Status
2019-01	NA4 CHP turbine maintenance program	High	Implemented
2019-02	NA4 CHP turbine contol system Siemens T3000	High	In Progress
2019-03	NA4 CHP Defective fire protection installation in turbine lubrication oil bunker	High	Implemented
2019-04	Auxiliary power feed to NA4 CHP		In Progress
2019-05	NA4 CHP Fire protection for auxilliary generator		Implemented
2019-06	NA4 CHP Fire protection for start-up burners		Implemented

No	Recommendation	Priority	Status
2019-07	Repair fire doors		Implemented
2019-08	Flange guard installation for oil lines		In Progress
2019-09	High dust load in biofuel handling areas		In Progress
2019-10	NA1, NA2, NA3 transformer fire protection		Rejected
2019-11	NA4 CHP electric room cable penetration sealings		Implemented
2019-12	Replace unreadable warning signs		Implemented
2021-01	Consider alternatives to fluorine containing firefighting foams		Issued

4 Risk Improvement Recommendations

Active Recommendations

2019-02 **NA4 CHP turbine contol system Siemens T3000**

The ingration level and between turbine control unit Siemens T3000 and main plant automation Valmet DCS was unclear.

The operators have good knowledge on Valmet DCS, but there has been no T3000 related training. Therefore, the general knowledge related to T3000 was not on sufficient level.

It is recommended that the integration of T3000 to Valmet DNA is at good level and operators cn easily use the system

It is recommended that all operators receive in-depth training related to T3000.

Status 04/2021
Sealing steam operating point displays taken to DNA.
There is money budgeted for continuing with integration of T3000 and DNA DCS with operating displays and sequense descritions scheduled to be built in to the DCS.

2019-04 **Auxiliary power feed to NA4 CHP**

The current auxiliary power feed to NA4 CHP has been routed using excisting NA3 power feed. The NA3 auxiliary power feed has not enough capacity NA4 CHP boiler operation in case of failure in NA4 CHP HV equipment.

In order to ensure the DH production in failure event, it is recommended to stengthen the auxiliary power feed.

Status 04/2021
An own 10 kV feed to Na4 is planned to be built during this year in conjuction with the waste heat recovery pump investment.

2019-08 **Flange guard installation for oil lines**

Lubrication oil lines should use "guarded" pipe construction with the pressure feed line located inside the return line. Where guarded pipe construction is not used, piping sleeves and flange guards should be used to reduce the possibility of oil atomization and resulting fire. The sleeves and flange guards prevent the spread of oil into the surrounding increasing the fire load.

All mechanical connections should be guarded.

Status 04/2021
Na4 turbine flanges have been protected with flange guards. No flange guard suitable for protecting the control oil cone joints were found and the risk of leaks was assessed to be small from here.

2019-09 **High dust load in biofuel handling areas**

High dust load in several locations in biofuel handling areas. Biofuel dust concentrations creates optimal atmosphere for dust explosion.

It is recommended that housekeeping in biofuel areas should be improved to elminate dust load cumulation.

Status 04/2021
Cleaning interval increased, all problematic locations are being vacuumed at least weekly. Dust removal systems installed with hose filters taht tend to get plugged due to moist dust. No well working solution has been found so far regardless of active testing of several alternatives. Dust binding with a mointurizing system has beentested in fuel receptions, however the experiences have not been particularly good. Work to find good solutions continues.

2019-10 **NA1, NA2, NA3 transformer fire protection**

AIG Reference REC # 16/04/02

Main transformers are located outdoors and are separated from each other by concrete walls.

Automatic water spray system is recommended to prevent downtime in case of fire.

Status 04/2020
A descision has been taken not to implment due to uncertainties related to the detection of a fire and potential for unneccessary sprinkler release.
The recommendations is kept active and recommended to study alternatives such as pre-action sprinklers using for example heat and flame detection to prevent false sprinkler release.
The location and the fire separation of the transformers to other important structures or equipment is to be sturdied in more detail during next on-site visit.

2021-01 **Consider alternatives to fluorine containing firefighting foams**

Fluorine containing chemicals used as active ingredients in firefighting foams such as AFFF are well known to be harmful for environment and human health. There is already a ban in effect on the use of PFOA, present often in older AFFF firefighting foams. And that there is a real possibility that the use of PFOA in general to is to be limited and/or banned in the foreseeable future, affecting then naturally the possibilities of use of fluorine containing firefighting foams.

It is recommended to consider fluorine free alternatives in protection systems being built related to new investments.

Avoid using fluorine containing foams in trainings or tests unless

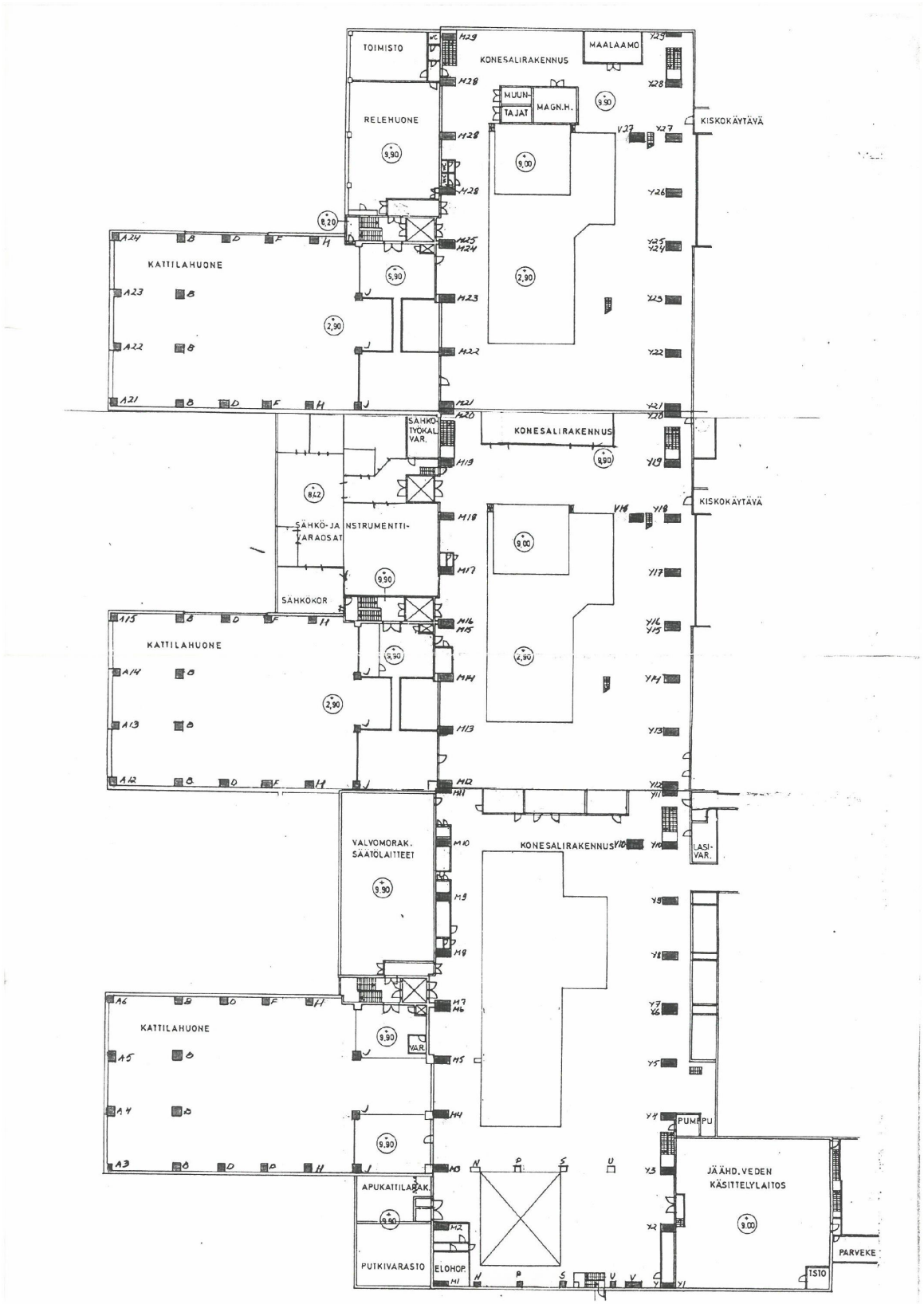
the collection and disposal of the foam can be properly arranged.

In case older systems are are changed to use fluorine free alternatives, the system needs to go throung a comprehensive management of change procedure revising the design basis including the adequacy of system dimensioning for the hazard, application method and the hardware's suitability for the new foam type etc. by a specialized contractor.

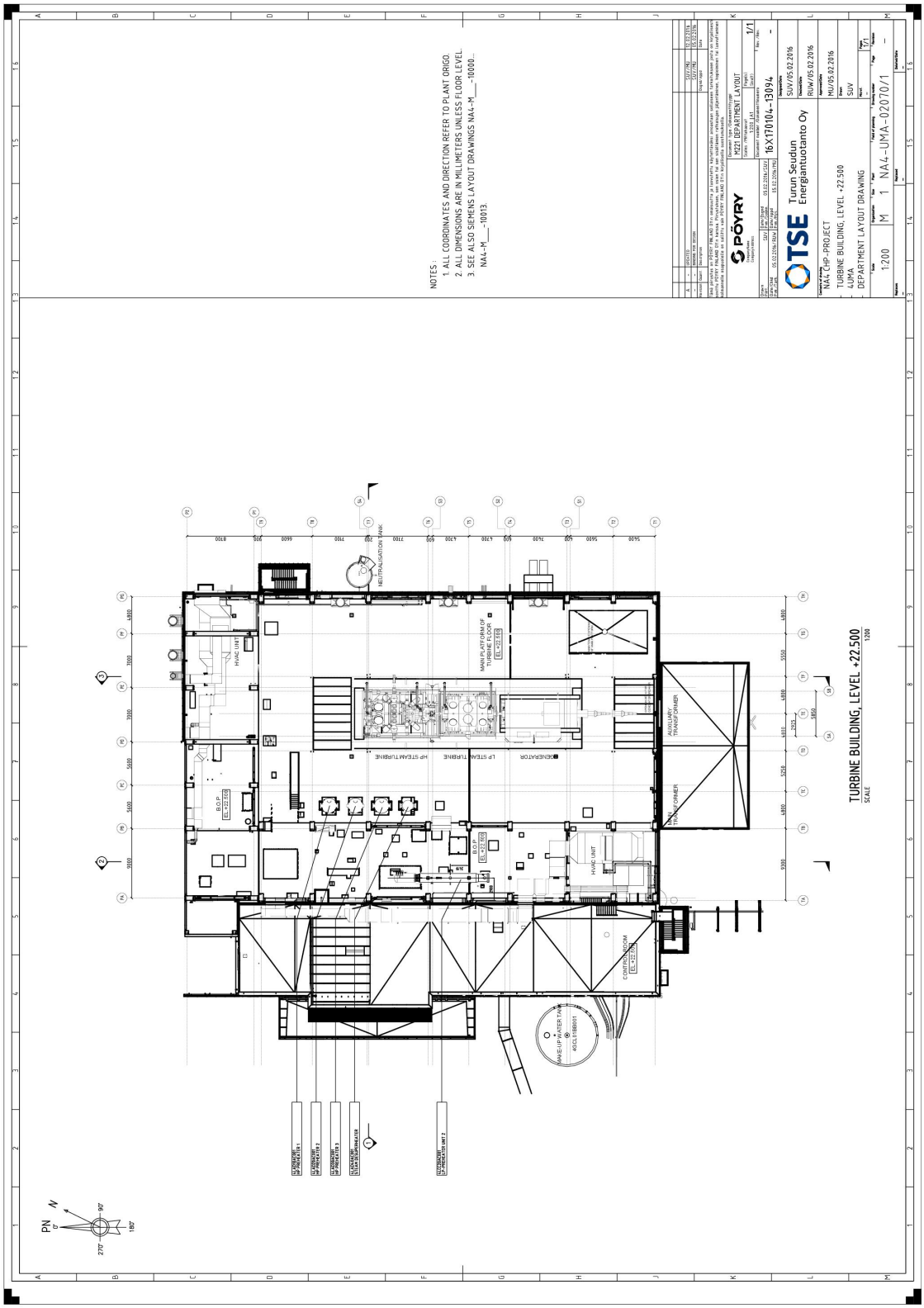
Completed Recommendations

2019-01	**NA4 CHP turbine maintenance program**
2019-03	**NA4 CHP Defective fire protection installation in turbine lubrication oil bunker**
2019-05	**NA4 CHP Fire protection for auxilliary generator**
2019-06	**NA4 CHP Fire protection for start-up burners**
2019-07	**Repair fire doors**
2019-11	**NA4 CHP electric room cable penetration sealings**
2019-12	**Replace unreadable warning signs**

Site plan **Appendix 1**



NA1 - NA 3 turbine hall.



NA4 turbine hall