Fire that resulted in the deaths of four people in a flat in Vuosaari, Helsinki on 9 December 2016

Y2016-05

PREFACE

Under Section 2 of the Safety Investigation Act (525/2011), the Safety Investigation Authority of Finland decided to initiate an investigation into the fire that occurred in a flat in Vuosaari, Helsinki on 9 December 2016 and led to the death of three minors and one adult. The purpose of the safety investigation is to promote general safety, prevent further accidents and incidents, and prevent losses caused by the accidents. Safety investigations are not conducted to allocate legal liability.

Senior Fire Inspector Knut Lehtinen was appointed as the Head of the Investigation Team, and retired Executive Fire Officer Reijo Salminen and Licentiate in Philosophy Jukka Seppänen as members. Chief Safety Investigator Kai Valonen served as the Investigator-in-Charge. Site investigations were performed in cooperation with the police and Helsinki Rescue Services. The sauna stove was inspected by the forensic laboratory of the National Bureau of Investigation. The report on the building's ventilation system was prepared at the Safety Investigation Authority of Finland's request by Stravent Oy, a supplier of ventilation systems that operates in Finland, Sweden and Estonia. The report was drawn up by Sales Manager Peter Biström from the company.

The safety investigation examines the course of events, its causes and consequences, and the search and rescue actions as well as any actions taken by the authorities. The investigation specifically examines whether safety had adequately been taken into consideration in the activity leading up to the accident and in the planning, manufacture, construction and use of the equipment and structures that caused the accident or incident or at which the accident or incident was directed. The investigation also examines whether the management, supervision and inspection activity had been appropriately arranged and managed. If necessary, the investigation also examines possible defects in the provisions and orders regarding safety and the authorities.

The investigation report includes an account of the course of events of the accident, the factors leading to the accident and its consequences. It also includes safety recommendations addressed to the appropriate authorities and other instances regarding measures that are necessary in the interests of the promotion of general safety, the prevention further accidents and incidents, the prevention of loss and the improvement of the effectiveness of the operations of search and rescue and other authorities.

The parties involved in the accident and the authorities responsible for supervision within the field of the investigated accident have been provided with the opportunity to provide a statement on the draft investigation report. The statements were taken into account when the report was finalised. A summary of the statements is at the end of the investigation report. Pursuant to the Safety Investigation Act, statements from private individuals are not published.

The investigation report has been translated into English by Semantix Finland Oy.

The investigation report, summary and appendices have been published on the Safety Investigation Authority of Finland's website at *www.turvallisuustutkinta.fi*.

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1 THE INCIDENT

1.1 General description, site of the accident and weather conditions

A fire broke out inside a flat on the top floor of a six-storey building at Vuotie 59 A, Vuosaari, Helsinki in the early hours of Friday, 9 December 2016. Four people died in the fire: an adult and children aged 2, 6 and 7 who were inside the flat. Even though the fire did not spread to the other flats in the building, significant amounts of smoke spread into the other flats through the ventilation.

The weather during the fire was fair and a low pressure was present in the area. Temperature was around +2°C and there was no snow on the ground. Relative air humidity was over 90% and there was weak or moderate wind from the west.

1.2 Course of events

A family of five was living in the flat affected by the accident. According to the father, the youngest child had had a stuffy nose for several days. On Thursday evening, the mother had suggested that she could go to the sauna with the children after the father leaves for his night shift in order to make breathing easier for the child. However, the father had told his wife not to do this, since according to him, the wife could not operate the sauna stove. At the same time, he had stated that going to the sauna will be postponed until the weekend.

According to his account of the events, the father took his working shoes from the sauna and looked for his bag before leaving for work at around half past eight. At the same time, the mother was starting to get the children ready for bed and took the youngest child to the shower instead of the sauna. No exact information is available on what was done or what happened in the flat after this. During the evening, the spouses did not call or send messages to each other.

At around 02:46, several neighbours woke to different sounds and the smell of smoke. The next-door neighbour woke up after hearing a loud bang and screams, and noticed that smoke is entering their kitchen through the ventilation. The neighbour living on the same floor opposite the flat woke up to a banging that, to them, sounded like the door was being pounded on, and indefinable screams of terror. The neighbour on the floor below explained they woke up to a woman yelling and screaming and a clatter that sounded like items falling on the floor. In addition to the next-door neighbour, many other neighbours observed smoke or the smell of smoke in their flats. Some neighbours heard the alarm of a fire detector. Even though the flat affected by the accident had no fire detector, the detectors in the staircase and in one other flat reacted to the fire.

After the fire, it could be clearly seen that the fire had started near the sauna stove and that children's clothes had been left to dry near the stove. According to the father, there were no cloths near the sauna stove when he left for work, but this was the case after the fire. Apparently, the mother had rearranged the other items in the sauna, since the father said that they were in a different order after the fire than they were before.

The sauna stove has likely been accidentally or purposefully activated already in the evening by turning the control knob to the timer preselection area. This means that the sauna stove has started heating only after the time set on the timer has elapsed; on the basis of the electricity consumption, this has been around 01:40. The cloths near the sauna stove ignited after reaching ignition temperature, and the burning cloths ignited the wooden floor panels. The

fire developed inside the sauna and formed combustible flue gases in the sauna and washroom. At this point, the washroom door was closed. A hot water pipe on the washroom ceiling broke, and the water discharged from it limited the fire.

After slightly more than one hour had passed since the activation of the stove, the washroom door was opened or it opened by itself; this resulted in the flue gases igniting suddenly and creating a powerful fire. After the fire, the traces of the flash-over and flames could be clearly seen in the ceiling and walls of the hallway and living room. At the same time, a strong positive pressure formed in the flat and pushed the smoke into the ventilation channel. The powerful fire quickly consumed the oxygen inside the flat and the fire died down.

Kuva 1. There were clothes drying on the railings of the sauna stove and items were stored on the seats. The wall and ceiling panels in the sauna were charred during the fire and they partially burned through. (Photo: SIA)

1.3 Rescue operations

1.3.1 Alarms and reports

Five emergency calls were made to the emergency response centre following the observations of sound and smoke. All the callers were neighbours whose flats where in the same staircase. The first call was picked up at the Kerava emergency response centre at 02:47:40. During the call, the caller explained that a fire detector is going off upstairs, smoke or fog is entering their flat, a loud “pfum” that they described as a thump has been heard in the building and that

there is noise, rattle and a horrible screaming coming from somewhere. The caller estimated that the fire is on the fifth floor above their flat.

During the call, the duty officer determined the assignment type as *402B building fire: medium severity* and started the alarm 46 seconds after the call had started, stating the address Vuotie 59 A. In the first alarm, a total of seven rescue services units (command unit, three rescue units, tank unit, heavy rescue unit and lifting platform unit) and one emergency medical care unit, in this case a paramedic-level ambulance unit, left for the scene. At the first stage, three police patrols left for the scene. The emergency response centre did not provide the rescue units with the additional information (thump, rattle and loud screaming) that was recorded in the emergency response centre data system after the alarm was issued.

The second call was picked up at the emergency response centre at 02:50:00. Since a couple of minutes had passed since the last call, the duty officer immediately observed that this was a duplicate notification concerning the same address. During the second emergency call, the caller explained that the visiting address for Vuotie 59 A is Maustetehtaankatu 10, the turnaround at the end of the street, and asked to relay this information to the fire brigade in order for the units to arrive without delay. The emergency response centre did not relay this information to the units. The third and fourth emergency calls were both answered two minutes after the second call and the fifth was answered at 02:55:00. The later calls included no essential additional information.

The sixth emergency call was made a little more than an hour later, after the caller had observed the firefighters and the smell of smoke. Following this, the emergency response centre recorded one more call related to the assignment; it was a contact request from the police related to the investigation.

When it was discovered that people were found inside the flat, the assignment was switched to class A, an emergency medical care assignment with the highest risk. As a result, on the orders of the fire chief on duty, three emergency medical care units and a doctor unit were alerted at 03:14, and the field commander for emergency medical care also joined the assignment at the request of the emergency medical care doctor.

The rescue department's damage limitation unit was alerted at 03:35, and shortly after this at 03:48 the fire chief on duty commanded the alerting of the agreement fire brigades of Oulunkylä and Tammisalo. Instead of Oulunkylä, the emergency response centre alerted the volunteer fire service of Laajasalo for some reason. After it arrived at the scene, the fire chief on duty again requested alerting the volunteer fire service of Oulunkylä, which specialises in damage limitation; it received the alert at 04:34. A total of 11 rescue services units and six emergency medical care units participated in the assignment.

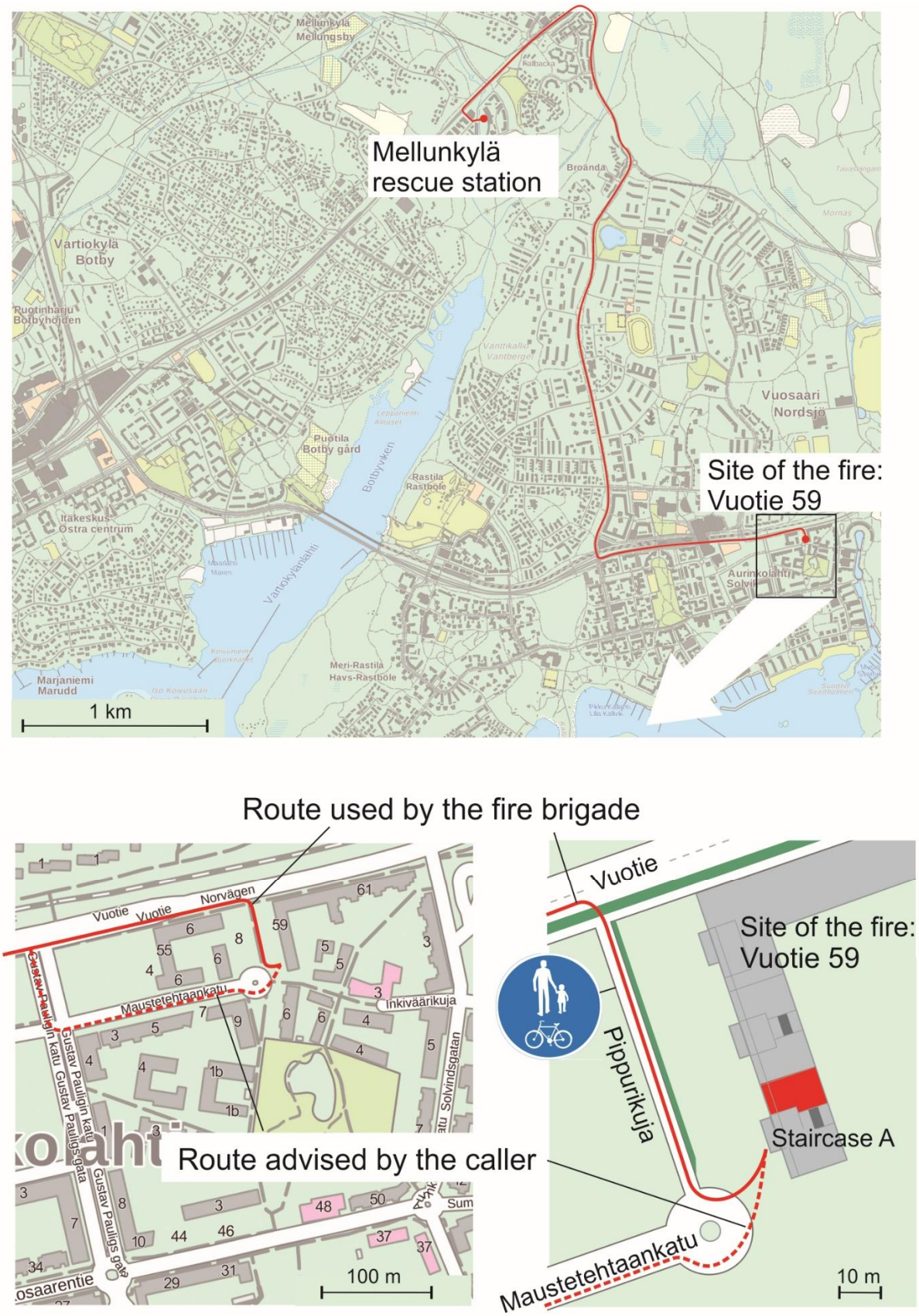
1.3.2 Actions at the site of the accident

Of the rescue services units, the first to arrive at the scene was the rescue unit from Mellunkylä station (staffed 1+5) at 02:58, ten minutes from the alarm. The units parked in a line on Vuotie, after which it was observed that the address Vuotie 59 A can only be reached via Maustetehtaankatu.

The neighbour who made the second emergency call was observing the situation from their balcony and tried to draw the attention of the rescue units by blinking a flashlight. The unit foreman stepped out to investigate the site of the fire, and a four-wheel-drive rescue unit drove across a green strip and along a cycleway to the front of staircase A where it started the

basic survey[1]. The residents outside could not explain in detail which flat the fire was in. However, they indicated suspicions that the fire could be in the flat of an elderly person living on the fifth floor. The foreman observed a smoke boundary at the fifth floor level and the unit members started preparations for opening the door. The foreman continued the investigation. On the sixth floor, the foreman noticed that the outer door to one flat is slightly ajar. The closed, white interior door showed black soot and smoke trails at the top which indicated that a strong fire had occurred inside.

[1] The different surveys refer to the first actions of a rescue unit; they are fairly similar for most fires. The basic survey is the most common type of survey that is used for minor and normal fires and whenever a fire has already developed to be stronger than normal.



Kuva 2. A map of the fire brigade's driving route. In order to reach the site, the first rescue unit first crossed a lawn and continued along Pippurikuja, which is a combined cycleway and walkway. (Pictures: SIA, includes material from the National Land Survey of Finland's Background Map series 04/2017 and 05/2017)

The rescue and tank units from Herttoniemi station and the lifting platform unit from Mellunkylä station were at the site almost at the same time as the first rescue unit. The fire chief on duty was at the site at 03:00, the rescue unit from Malmi station was there at 03:02 and the heavy rescue unit from the central station was there at 03:03. When investigating the scene, the fire chief on duty noticed smoke on the outside of the other side of the building, near the roof cornice on the sixth floor level.

The rescue unit from Herttoniemi was tasked with receiving the patients since, taking into account the time of day and the smoke formation, it was likely that patients could be found. The unit from Malmi was tasked with inspecting the neighbouring flats, and the heavy rescue unit was to prepare for smoke ventilation.

The first smoke diver team from the Mellunkylä unit tried to start a chainsaw in order to create a smoke trap on the flat's outer door. However, the chainsaw did not start. Since the door was open, the foreman and their partner decided to attack with a pressurised hose. At the same time, the foreman from the Herttoniemi rescue unit continued starting the saw; once it started, they sawed the flat's outer door in two halves, so that the upper part of the door could be closed in order to limit smoke entry into the staircase. When entering the flat, the smoke divers observed that there was a large amount of smoke inside and hot water was on the floor. The situation caused their masks and the thermal imaging camera to fog up quickly. With low visibility, the smoke divers had to feel their way around. Once the balcony door and windows were opened, the smoke and steam from the flat cleared enough so that the victims who were on the floor and close to each other could be observed. The rescuers first brought down the three children in the same lift, and finally the mother. While the mother was being moved, the rescue department allowed the next-door neighbour, who had been suffering due to the smoke, to leave their flat by using the stairs. The flat affected by the accident was checked again thoroughly in order to ensure that there are no more victims inside.

It appears that the door between the washroom and hallway in the flat was half open when the smoke divers entered. The smoke divers did not find the fire immediately, since there were no large flames in the direction of the sauna. The fire had already died down and only a small simmer was found next to the sauna stove. After checking the rest of the flat, the smoke divers proceeded into the sauna and found small fire pockets on the panel wall behind the sauna stove and the burning and simmering clothes on the floor of the sauna. Only a small amount of water was required for the extinguishing. The window of the sauna was opened for ventilation, and at this time, it was observed that the inner glass pane was broken due to the heat. There were several pieces of clothing, shoes and nappies on the benches. The wooden parts of the sauna's inside walls were badly charred due to the powerful fire.

The suspended panel ceiling in the washroom was leaking water at high temperature, since the heat had burst open the hot water pipe. The floor drain was clogged by the crushed glass and fire residue, which caused water to flow over the washroom threshold and into the rest of the flat; there was 2–3 cm of water on the floor. The glass door between the sauna and washroom had broken into small pieces and all plastic parts in the washroom had melted and deformed. The water leak could not be stopped inside the flat; a serviceman was called and he used water shut-off valves located elsewhere. No fire detector was found inside the flat.

A positive pressure fan was used for the smoke ventilation. A discharge route for the smoke was created by opening the flat's windows and using the button next to the lower door to trigger the staircase's smoke ventilation hatch. The forced ventilation in the building was not stopped, even though there was a button for this near the lower door. The smoke ventilation was managed by the heavy rescue unit, which also started damage limitation; it was resumed

by the rescue department's damage limitation unit and the agreement fire brigades of Oulunkylä and Tammisalo.

The fire chief on duty acted as the general manager of the situation for the entire time. A second fire chief on duty working at the Central Rescue Station supported them for external communication. After the acute rescue operations were complete, the fire chief on duty commanded the foreman of the heavy rescue unit, who had received supervisor training, to lead the damage limitation activities.

During the accident, the arrival time for the first unit (from the alarm by the emergency response centre to the arrival at the site) was 9 minutes 37 seconds. The exceeding of the target time was partially explained by the fact that, initially, the units arrived on the Vuotie side from where the correct staircase could not be properly accessed. Furthermore, the location of the nearest fire station was such that the route to Vuosaari could not be completely direct. However, the arrival time for the rescue team, i.e. the time from the alarm to the arrival at the site, was clearly below the target time. The time to receive assistance, i.e. the time for starting effective rescue or firefighting activities in the target flat could not be established, since the internal radio traffic of the rescue department was not recorded due to a technical problem.

Out of the emergency medical care units, the first one to arrive at the site was an ambulance from Mellunkylä rescue station at 02:56. The treatment of the patients was started immediately after the people in the flat had been evacuated and brought down. The estimated patient encounter times, based on the starting times for the defibrillators, were as follows: The 2-year-old at 03:13, the 6-year-old at 03:14, the 7-year-old at 03:15 and the mother of the children at 03:19. In addition to the paramedics, members of the Malmi rescue unit and the Central Station's heavy rescue unit were ordered to participate in the resuscitation of the patients immediately after the patients were found.

Simultaneously with the start of the resuscitation, the emergency response centre alerted additional emergency medical care units from 03:14 onward. The assignment type used for emergency medical care was *702A unconsciousness*. The first additional unit, which was a basic-level ambulance from Mellunkylä station, was at the scene at 03:23; the second additional unit, a basic-level ambulance from Käpylä station, arrived at 03:26. The doctor unit arrived at 03:28, the emergency medical care field commander arrived at 03:31 and the third additional unit, a paramedic-level ambulance from Malmi, arrived at 03:47.

All the patients were lifeless when resuscitation was started and they had no electrical or mechanical heart activity (asystole). Despite the effective resuscitation efforts, there was no response, and the emergency medical care doctor pronounced the patients dead soon after arriving at the scene. According to the assessment of the emergency medical care doctor, none of the victims had substantial burns; they had all succumbed to the toxic combustion gases. This was later confirmed by the medicolegal investigation.

Since several emergency medical care units were committed to the assignment, the rescue department set up a temporary emergency medical care unit in order to maintain preparedness.

Psychosocial support started quickly after the accident. The City of Helsinki's social and crisis emergency services were informed of the accident immediately after the first alarm, since sending an information message is connected in the emergency response centre's responses to the building fire assignment type that was now in use. The social and crisis emergency services received the assignment proper from the emergency response centre at 03:25. The fire chief on duty contacted social and crisis emergency services at 03:40 and requested workers at the site to assess the need for temporary housing and psychosocial support. Two crisis

counsellors and two employees from social and crisis emergency services left for the assignment and arrived at 04:15. The fire chief on duty announced that staircase A cannot be entered since there is a lot of water inside the building. An evacuation site was set up in another staircase, and instead of the crisis counsellors, the personnel from the rescue department were surveying the need for crisis assistance among the residents of staircase A.

After operating at the site for a while, the crisis counsellors left to meet the family's father at Pasila police station, at the request of the police. They arrived at 05:55 and met with the father, who at that time was sitting alone on a bench in the lobby. The father had been told that the family had died, but he did not have exact information on what had happened. At the request of the crisis counsellors, the police officers spoke with the father and told him more about the events of the night. After this, the police handed over the responsibility to the crisis counsellors who took care of the father and helped him find temporary housing, among other things.

Following the first encounter, several meetings were arranged for the father and contact was maintained over the telephone. The father was also strongly supported by the City of Helsinki's Eastern Psychiatry Clinic, the social services in the area, the father's home parish and the community of Ghanaians living in Finland, since the family originally came from Ghana. The family's next of kin living in Helsinki also received assistance from the city's social and crisis emergency services.

A defusing session was arranged for the rescue department's personnel the same morning. However, since activities were still ongoing at the site, not everyone could participate in the event.

The incident was shocking to many of the residents in the housing cooperative and the nearby areas. Social and crisis emergency services published a bulletin on the house bulletin board on the same day. It explained the basic facts of the situation, the typical reactions from adults and children and the opportunities for receiving help. The brochure regarding 24-hour crisis service was also distributed in the lobbies of the housing cooperative.

Vuosaari parish also reacted to the accident. The same day, Marielund chapel and the Columbus street chapel were open for prayer, and Marielund chapel had employees from the parish. A mourning service in memory of the victims was arranged in the evening at the church of Vuosaari.

The Evangelical Lutheran Church's assistance channels, i.e. the telephone service (in Finnish and Swedish) and chat line were opened in the morning after the fire.

Kuva 3. The accident widely affected the residents of the area. (Photo: SIA)

The school of the eldest child, who was 7 years old, contacted the crisis team for the City of Helsinki's basic education student welfare service. The team offered support for the pupils at the school, and crisis support was offered for the adults through occupational healthcare.

The two younger children, aged 6 and 2, went to the same day nursery. The employees at the day nursery discussed the matter with the children and the employees received support through occupational healthcare.

A debriefing event called by the housing cooperative and intended for the residents of the building was held on Monday 12 December 2016. In addition to a representative from the housing cooperative, the event was attended by employees from the rescue department, emergency medical care, social and crisis emergency services and Vuosaari parish. Some 20 residents attended the event and they were told about the accident, rescue operations and damage to different flats, for example. The crisis work section talked about common reactions and how to best discuss the events with children. Brochures for the on-call crisis service were handed out and the participants were offered the opportunity to reserve personal appointments for the employees of the crisis service and the parish.

1.4 Police operations

The first police patrol was at the site at 02:57, immediately after the first ambulance. Two other patrols arrived approximately one minute later, at the same time with the first rescue units.

After the first patrol arrived at the site, they could clearly smell smoke in front of staircase A. The second patrol observed smoke coming out of a window on the top floor at the rear of the building. The first caller to report the emergency was downstairs to meet the patrols and repeated the observations they had made during the call.

During the firefighting, the police was maintaining general order at the site. Police investigation concerning the fire, i.e. the determination of the cause of the fire, started immediately after the firefighting had ended. The police relayed the message concerning the fatalities to the family's father, who was at work, and transported him to Pasila police station. The police also spoke to all tenants of staircase A who were at the site and surveyed the status of fire detectors in their flat. Later, the police interviewed a few neighbours as witnesses.

The sauna stove that was damaged in the fire was investigated at the National Bureau of Investigation's forensic laboratory. The police was also responsible for determining the cause of death. Burns were discovered on the mother's other shoulder and hand during the medicolegal examination. There have been no indications that the fire was started wilfully.

1.5 Damage caused by the accident

1.5.1 Injuries / fatalities

The fire claimed the lives of everyone inside the flat, that is, the mother and her three children. The mother was born in 1976 and the children were born in 2009, 2010 and 2014.

People in other flats were not injured, but they suffered somewhat from the smoke that spread through the ventilation.

The situation was psychologically traumatising for the family's father. Many other residents in the housing cooperative also required psychosocial support. The residents of Vuosaari were deeply touched by the event, and it stirred emotions everywhere in Finland.

1.5.2 Damage to property

The sauna and washroom in the flat where the accident occurred were completely destroyed in the fire, and other parts of the flat suffered severe smoke and water damage. The surface structures of the flat had to be torn down completely and rebuilt. Two other flats suffered large-scale water damage and their residents had to move out for the renovation. Milder smoke damage was managed through ionisation in some flats.

1.5.3 Environmental damage

Since the firefighting and pipe damage occurred indoors, water did not spread into the environment outside the building. Hazardous substances may have been dispersed into the atmosphere as a result of smoke formation.

1.6 Communication

Helsinki City Rescue Department held a media briefing at 06:00 on the morning of the accident in the large lecture hall of the Central Rescue Station in Kallio. Representatives from rescue services, emergency medical care and the Safety Investigation Authority of Finland were present. The rescue department had also invited a representative from on-call crisis service, but due to the priority of customer work they had no resources to participate in the briefing. The media briefing explained basic information about the accident and the rescue activities, such as the fatalities, the times of the emergency call and arrival at the site, the number of units in the first response and the overall number of responding units and the emergency medical care activities.

The Rescue Department used its Twitter account (@brankkarit), among other things, to communicate on the media briefing and published its condolences to the next of kin of the victims who perished in the accident. During the following few days, the account linked to the rescue

department's own safety communications material, such as the brochures *Turvallisuus tehdään yhdessä* (Safety is created together), *Palovaroitin - tärkein herätyskellosi* (Fire detector – your most important alarm clock) and *Lisäturvaa palovaroitinjärjestelmällä* (Added safety with a fire detection system).

The police published a total of three information bulletins; two on Friday and one the next Monday. The first information bulletin stated the years of birth of the victims who died in the fire. It also mentioned that a severe fire had broken out in a flat on the sixth floor and that the largest damage was in the sauna. The second information bulletin explained that the victims had succumbed to the combustion gases, that there was no fire detector in the flat and that the police is resuming technical and tactical investigation.

The fire received widespread national attention and it was mentioned in nearly all forms of media, from TV news to online media and printed newspapers to radio news. Prime Minister Juha Sipilä expressed his condolences to the victims.

Ilta-Sanomat wrote about the father's state of health and the social and healthcare services or psychosocial services provided to him. The news article published on the newspaper's website on Friday afternoon was based on an interview with the manager of the City of Helsinki's social and crisis emergency services, who explained that the events had been a major shock to the family's father. In the interview, the manager explained in great detail the reactions of the father and his children from an earlier marriage, the crisis counselling provided to the father and the state of the building's residents.

Stories or fact sheets related to fire prevention and the need for fire detectors were published in several media. During the weekend, stories concerning the accident and fire safety used information from the police and fire safety statistics from SPEK, among others.

The third information bulletin from the police, published on Monday 12 December 2016, explained that the sauna had been rarely used for bathing, it had been used for storing clothes and shoes, and that traces of burnt fabric had been found in the sauna stove. This was seen as a sign that material had been stored too close to the sauna stove and it had most likely caused the fire when melting in the heat.

On the same day, several news articles were published in the media based on the information bulletins from the Safety Investigation Authority of Finland and Helsinki Police Department. Some stories also went back to earlier severe fires and discussed Finnish fire safety in general.

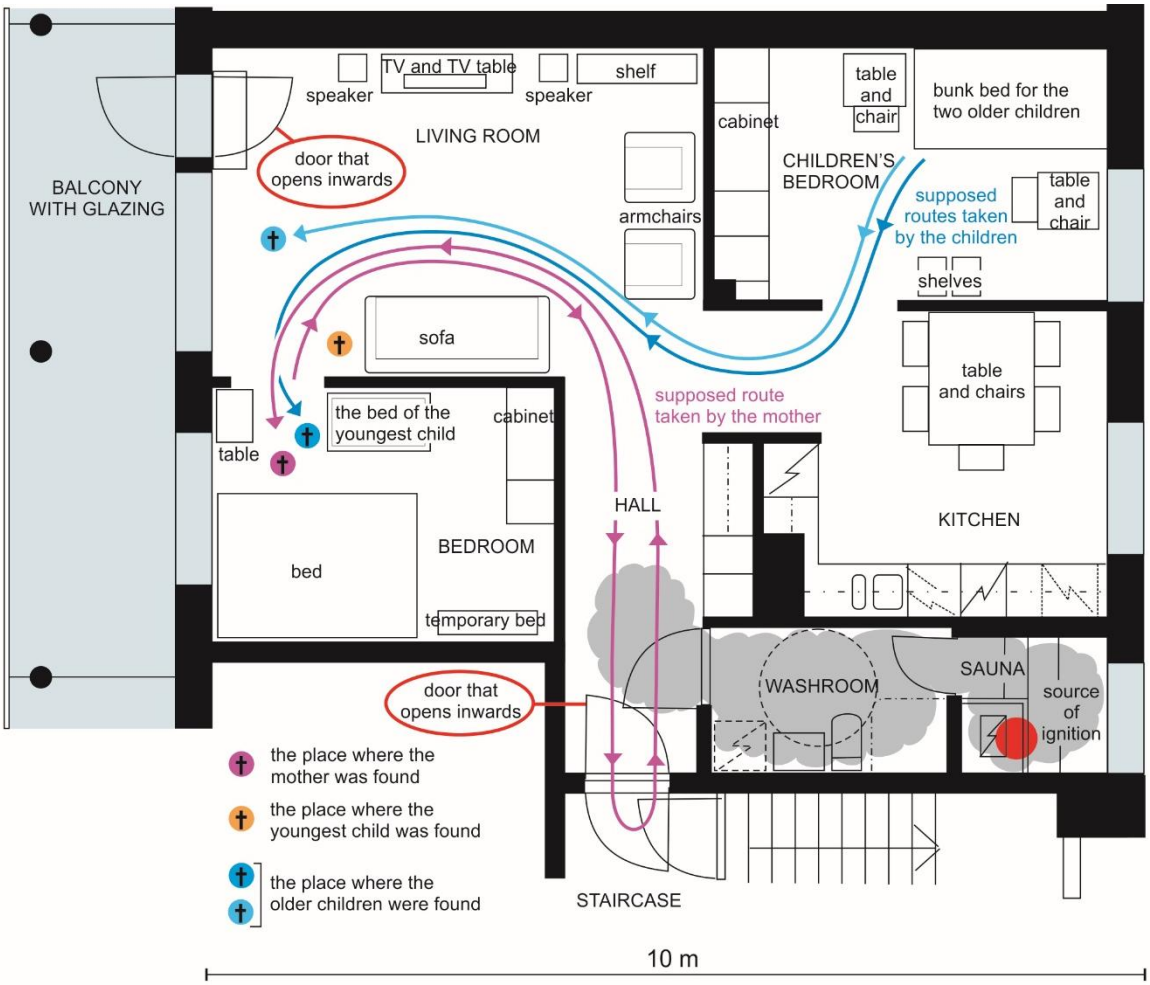
A few media outlets discussed the skills of immigrants and Finnish housing culture in general. For example, Helsingin Uutiset published a story on 12 December 2016 on its "Puheenaihe" column where it interviewed the managing director of the owner of the building at Vuotie 59. In the interview, the managing director explained that residents with an immigrant background receive no more initiation into Finnish housing culture than people of Finnish origin. New residents receive an information package with details about the flat. After that, it is largely up to the residents themselves to familiarise themselves with their new home and ask questions if any practical matters are unclear. User instructions are provided for sauna stoves and very few flats owned by the leasing company have saunas. According to the managing director, the tenement company has no resources to provide more detailed guidance, since over 300 flats get new residents each year in the Vuosaari area alone. However, the company does arrange safety briefings for its tenants.

2 BACKGROUND INFORMATION

2.1 The building, the flat where the fire started, sauna and fire detectors

The accident occurred in a housing block that was completed in 2007 and has a total of 93 flats. The flat where the accident occurred was on the top floor or sixth floor of staircase A and had an area of 74 m². It consisted of three rooms, a kitchen, a sauna and a balcony.

The housing cooperative's staircases had fire detectors connected to the electrical network on the third and sixth floors. Upon completion of the building, the tenement company had installed one battery-operated fire detector in each flat.[2] After the fire, a piece of the plastic bottom plate of the fire detector of the flat where the accident occurred was found in a central location on the ceiling between the living room and hallway, but the detector was not there. According to the information provided by the family's father during the hearing, there has not been a fire detector in the flat during the time that the family has lived there.



Kuva 4. Layout of the flat. Both doors leading out of the flat open inward. The supposed routes taken by those inside the flat are also marked in the image. (Photo: SIA)

[2] According to the Ministry of the Interior guideline A:59 "Palovaroittimen tekniset ominaisuudet ja sijoitus" (Technical characteristics and placement of fire detector, SM-1999-00256/Tu-33) that was in force when the building was constructed, each floor in the building had to be equipped with at least one fire detector. The required number of additional fire detectors depended on the area of the flat, its shape, and any functions causing a special ignition hazard. The requirements concerning the number of fire detectors have since become stricter, and this also applies to older buildings. The occupier of a flat must ensure that there is a sufficient number of fire detectors available.

There were two exit routes from the flat: one into the staircase and another into the balcony. Both exit routes had two doors, the inner ones of which opened inward. The fire classification for the outer door leading into the staircase was EI15. According to the father, the outer door had been found open on at least one occasion when he had returned from work.

The door leading to the washroom and sauna was immediately next to the staircase door. The sauna had an area of approx. 3 m^2 and wood panelling on the walls and ceiling. The sauna stove was a Harvia KIP60 electric model, made in Finland, with a nominal output of 6.0 kW. A similar new sauna stove was tested during the investigation and it was found that the control knobs turned easily and lightly. The control knobs were on the bottom of the sauna stove. The knob on the left side was the thermostat and the knob on the right was the timer. The timer had an eight-hour preselection time and a four-hour operation time.

Kuva 5. Control knobs on a new sauna stove of the same make. The control knobs were in reverse order in the sauna stove of the flat where the accident occurred. The small hole on the left hand side of the photo is the reset button for the overheating protection. (Photo: SIA)

The sauna stove was equipped with overheating protection, i.e. a temperature limiter that disconnects the stove when it overheats. The overheating protection had been triggered during the accident. According to the operating instructions, the highest allowed temperature on the wall and ceiling surfaces of the sauna is +140°C.

According to the instructions from the sauna stove manufacturer, the top and vicinity of the stove should be checked for items before the stove is switched on. Due to the risk of fire, the instructions prohibit using the sauna as a drying room for clothes or laundry. The instructions also state that once the sauna stove has been installed, the instructions must be handed over to the owner of the sauna or the person responsible for its maintenance.

The investigations performed on the sauna stove after the accident did not indicate a technical problem that could have caused the fire to ignite. There were traces of a foreign substance that had melted, burned and partially ran along the side of the sauna stove. Furthermore, a 15

square centimetre piece of charred, multi-layered and thin fabric was found inside the sauna stove.

The connecting wire for the sauna stove and the electrical connections at both ends were intact, as were all of the resistors inside the sauna stove. The thermostat had been set at around 70% of the adjustment range, which corresponds to the normal operating temperature. The control knob had stopped at around the three-hour mark, which means that the stove had been warming for approximately one hour.

The police survey on the existence and operability of fire detectors reviewed 18 flats out of the 20 in staircase A, including the flat where the accident occurred. Out of these, two had two fire detectors and fifteen had one. The only flat that had no fire detectors at all was the one where the accident occurred. Most of the detectors were original, installed by the housing cooperative. Only three flats had detectors that were installed by the residents.

Out of the 93 flats in the tenement, some 50, or slightly more than half, and exactly half of those in staircase A have an area above 60 m^2; therefore, according to the decree on the placement and maintenance of fire detectors,[3] they should have at least two detectors. In the survey, however, only one in ten (11%) of the flats had two fire detectors. None of the flats surveyed had more than two fire detectors.

The survey also reviewed the operability of the fire detectors. Nine flats (=50% of those surveyed) had at least one operable detector, in six flats (=33%) the detector was not operable because the battery had run out or was missing. This information was not available for two flats.

With the exception of one, the fire detectors in the flats did not react to the smoke spreading from the fire being investigated here. Nobody was home in the flat on the fifth floor, immediately below the one affected by the accident, but upon returning home, the resident found that the second fire detector in their flat had been placed in the sink in the bathroom and its battery and wires had been removed.

In addition to the flat-specific fire detectors, the staircases in the building had fire detectors connected to the electrical grid; in staircase A, they were installed on the third and sixth floors. After the fire, a serviceman inspected the detectors in the staircase and determined that they are operable.

The building's ventilation had been designed and installed in compliance with part E7 of the National Building Code of Finland. The ventilation used a centralised system, i.e. the air supply units were common to all the flats in the staircase. The air terminal units or inlet and exhaust valves in the flats were chokes that allow air and smoke to pass through into the ducts. These are also compliant with the current building regulations.

Smoke spread into the other flats via the ventilation ducts, since the fire created high positive pressure in the flat. The positive pressure in the flat where the accident occurred also prevented the opening of the inner doors leading to the staircase and balcony, if an attempt to open them was made at that time. The positive pressure was so high that it may have caused the outer door on the staircase side to open if the door has not been closed properly due to the malfunction of a lock or another reason. The positive pressure has pushed the smoke into the ventilation ducts through the chokes and caused the smoke to spread into the other flats. Smoke was also pushed into the staircase through the gap in the inside door.

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[3] 239/2009

Since the exhaust air unit was running and the exhaust air ducts were at negative pressure, most of the smoke that ended up there has likely left the building through the ducts.[4] The larger amount of smoke has spread into the other flats through the inlet air ducts. Since the positive pressure was higher than the pressure in the inlet air ducts, a large amount of smoke spread into the inlet air system. There, the inlet air pressure and positive pressure spread the smoke forward. The positive pressure would have caused this even if the air supply unit had been shut down.

The flats where the largest amount of smoke occurred were connected to the same ventilation shaft channels as the flat where the accident occurred. Therefore, these flats were closest to the flat where the accident occurred in terms of the structure of the ventilation channels, and the smoke and pressure spread along the easiest route. The thump observed by several residents most likely occurred when the pressure and smoke rapidly entered the flats through the inlet air valves, i.e. the source of the sound was the inlet air valve.

If the flats' inlet air channels had been equipped with a proper smoke limiter instead of a simple choke, and the smoke would have been completely prevented from entering the ventilation ducts, no smoke would have spread into the other flats. A smoke limiter could be a mechanical backflow preventer or smoke damper. A backflow preventer would be simpler in terms of the building, since it does not require the same type of maintenance as a smoke damper. However, smoke would have nevertheless spread into the staircase through the flat's door due to positive pressure. If the exit into the staircase had been successful, smoke would have also spread through the open door.

2.2 The organisations and people involved in the accident

2.2.1 The family living in the flat

The family living in the flat was an immigrant family originally from Ghana[5]. The father, who was born in 1966, had moved to Finland in 1990, and the mother and her two children moved in 2013. The mother and two older children had also moved from Ghana, but they had previously been staying in Spain on a residence permit. The father of the older children was still living in Spain. The mother and children arrived in Finland due to family reasons and were not asylum seekers at any point.

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4 According to the observations of the next-door neighbour, smoke entered the flat through the kitchen hood.

5 Ghana is a republic of slightly more than 25 million people in West Africa, north of the Equator. The country became independent in 1957 and its political system is considered one of the most stable in all of Africa. The country has several ethnic groups and state-supported languages. English is a language that unifies the nation, even though very few speak it as their mother tongue. Christianity is the dominant religion. Especially in the past, adults had a low level of education, and even now, less than half of adult women and only two thirds of adult men are literate. The current system of basic education (for children 4–15 years of age) that was commissioned in the late 1980s is free and compulsory for everyone, and its effects can already be seen in the fact that the number of people receiving their sixth form diploma has tripled. Approximately 95% of Ghanaians finish school, and the percentage of girls is roughly the same as boys. Basic information on the country is available on the website of the Embassy of Ghana to the Nordic countries at www.ghanaembassy.dk.

After moving to Finland, the mother reported to the TE office, where an initial assessment[6] and integration plan[7] were drawn up for her in accordance with the Act on the Promotion of Immigrant Integration[8]. The mother had attended university in Ghana and acquired a vocational degree in Spain. Akan was her mother tongue, but she spoke good English. Due to the maternity leave, the mother started her integration training and the related Finnish studies in October 2016.

The municipality is responsible for drawing up an integration plan for a family if the overall situation of the family so requires. Since an initial assessment was performed for the mother at the TE office, a separate plan was not drawn up for the mother; this means that the mother and children were not customers at the City of Helsinki's Immigration unit. The family had brief contact with social work in the area, but a service needs assessment made possible by the Act on social services was not performed. Many of the neighbours described the family as happy, pleasant, sociable and well adapted to the conditions in Finland. The investigation did not show any particular problems in the family.

The family had moved to the flat on Vuotie in early 2015, after living for approximately one year in the adjacent house owned by the same tenement company. After the move, a neighbour had instructed the father in the use of the sauna in the flat. To be sure, the father had called a serviceman and asked him to check the operation of the sauna. The serviceman had provided advice on the use of the sauna and adjusted the thermostat to a suitable position, stating that it no longer needs to be touched. The family used to go to the sauna approximately twice per month. For this, the sauna was emptied, since it was used for storing shoes, a bag, a nappy basket, clothes and cleaning equipment.

According to his account, the father had observed some problems in the heating of the sauna of late. The sauna had not started warming up immediately and there was no sound to indicate that the sauna stove is working, even though according to him the timer switch had been turned to the middle of the heating position, around the two hour mark. The heating had only started 30 minutes or one hour after the power was turned on, even though the father said that the timer had not been used.[9] In the police interview, a neighbour said that their sauna stove might also have had problems with the timer not working.

According to the father, he did not know that the tenant is responsible for the fire detector. During the hearing, he stated that representatives from the company, such as servicemen,

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6 The initial assessment is the preliminary assessment of the immigrant's preparedness concerning employment, study and other aspects of integration and the need for language training and other measures and services promoting integration. The initial assessment involves, to the extent necessary, the examination of the immigrant's previous education, training, employment history and language skills and, if necessary, other matters influencing his/her employment prospects and integration.

7 An integration plan is a personalised plan drawn up for an immigrant covering the measures and services, the aim of which is to support him/her in acquiring a sufficient command of Finnish or Swedish and other skills and knowledge required in society and working life and to promote his/her opportunities to play an active role in society as an equal member of society. In addition to studies of Finnish or Swedish, it may also be agreed that the integration plan includes teaching of the immigrant's mother tongue, studies familiarising the immigrant with society, the teaching of reading and writing skills, studies complementing basic education, integration training and other personalised measures facilitating integration.

8 1386/2010

9 The Safety Investigation Authority of Finland requested an estimate of the possible causes of the problem from the sauna stove manufacturer. The manufacturer stated that a technical explanation is not easy to find. The manufacturer considered the most likely alternative to be human error related to the turning of the control knob; it is possible that, when the problems occurred, the knob had been turned slightly too far, into the timer area.
The manufacturer's opinion supports the understanding formed during the investigation that the operating logic of the control knobs on sauna stoves may easily cause mistakes or confusion.

have never made any comments regarding the lack of a fire detector even though they have visited the flat often.

2.2.2 Immigrants in Finnish society

In the legislation, an immigrant refers to a person who has moved to Finland and is staying in the country for a purpose other than tourism or a comparable short-term sojourn for which a permit has been granted. Immigrants include, for example, people who move here due to family ties and people who come to Finland for work or study, with the exception of short work assignments and courses, and asylum seekers and quota refugees. According to Statistics Finland, 339,925 people or 6.25% of the population in Finland were of foreign descent. Åland had a clearly higher percentage of people with a foreign background, 13% of the total population; in Uusimaa, 12% of the population was of foreign descent. Over half of all people with a foreign background lived in Uusimaa.

Immigrants are a very heterogeneous group of people, and their reasons for moving to Finland are also different. A study by Statistics Finland[10] from 2014 interviewed people of foreign descent permanently living in Finland (n=229,000) who gave a personal reason for moving to Finland. The most common reasons for moving to Finland were related to family and love: they were the most important reason for moving for more than half (54%) of the respondents. Family reasons were significantly more common for women (66%) than for men (42%). In the accident under investigation, the deceased mother and her older children arrived to Finland due to family reasons.

Less than one fifth (18%) had moved to Finland primarily due to work, and one in ten (10%) stated studies as the primary reason for moving. Persecution, asylum seeking or the need for international protection[11] have been the main reasons for roughly one in ten people (11%) with a foreign background. For 8%, the primary reason for moving to Finland was related to something other than the matters stated above. Based on the interviewers' estimate, returnees from Ingria are the largest group among those who selected another reason. However, there are also people who have become fascinated with the Nordic climate, longed for variation during a midlife crisis, arrived as tourists or wanted to study their Finnish roots.

Asylum seekers[12] are a special group among immigrants. They are foreigners who, after arriving in Finland, seek international protection. While waiting for a decision on refuge, they live in reception centres, which may be large institutional centres, decentralised facilities[13] or private homes. *The reception stage* typically lasts from 6 to 12 months, or longer, if the processing is burdened. The authority responsible for the reception activities and permissions to stay in the country is the Finnish Immigration Service (Migri) what operates under the Ministry of the Interior. After an asylum seeker receives a positive decision on refuge or another type of residence permit, the responsibility for their housing shifts from the Finnish Immigration Service to the municipalities. Those who receive a negative decision on refuge must leave the country.

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10 Nieminen, T., Sutela, H. & Hannula, U. (2014) *Ulkomaista syntyperää olevien työ ja hyvinvointi Suomessa 2014*.

11 The 32,500 asylum seekers who arrived during 2015 are not visible in these statistics.

12 The mother who died in the accident and her older children were not asylum seekers and did not participate in reception activities at any point. In order to achieve an overall picture of the safety of immigration, the investigation also discusses the reception activities for asylum seekers, i.e. immigration and the related studies and training are studied during the reception and integration stages.

13 In decentralised facilities, asylum seekers are housed in regular flats managed by the reception centre.

In 2010–2014, around 3,000–4,000 asylum seekers arrived in Finland each year. The number of asylum seekers increased significantly in 2015, when around 32,500 asylum seekers arrived in Finland. Reception units were established quickly, and there were around 200 of them at the end of the year. Around 27,300 adults and 2,500 minors lived in these units. The increase in the number of asylum seekers was a direct consequence of the global refugee crisis, which has been estimated to be the worst since World War II. In 2016, more asylum seekers arrived in Finland than earlier in the 2010s, but their number was significantly lower than the year before, approximately 5,600.

The *integration stage* of asylum seekers is considered to begin once they receive permission to stay in the country. People who move to Finland due to family ties or arrive for work or study, that is, everyone who is not covered by the reception activities, begin integration as soon as they arrive in Finland. The Ministry of Employment and the Economy is mainly responsible for integration, but the Ministry of Social Affairs and Health is responsible for guiding the social services of the municipalities.

The safety risks caused and encountered by immigrants vary depending on the type of society and culture they arrive from. A large part of the immigrants arriving in Finland for work or study or due to family reasons come from countries where the functions of society and the general safety culture are similar to Finland, and no special problems arise. On the other hand, most of the people covered by the reception activities, i.e. asylum seekers come from countries[14] where the concepts of safety and authority activities are very different from Finland. Safety risks are emphasised in the reception centres, since adjustment to the new society and culture is only beginning.[15]

Common risk contributors that all immigrants encounter include traffic and waterways, for example. The Finnish Immigration Service is aware of two drownings of their customers in 2016. According to the Crash Data Institute of the Motor Insurers' Centre, recent immigrants[16] have been involved in a low number of accidents. In 2014–2015, there were five fatal traffic

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14 According to the Finnish Immigration Service's statistics, in 2015–2016 the largest number of asylum seekers came from Iraq, Afghanistan, Syria, Somalia and Eritrea; in earlier years, they also came from Nigeria, Iran and Russia, for example.

15 Risks observed in the reception centres include smoking cigarettes and using waterpipes indoors, heating coal for the waterpipe on the stove, using hotplates for preparing food inside the rooms, using microwaves in the rooms, unmonitored use of the stove, using the oven at too high temperatures and alarms caused by dirty ovens, covering fire detectors with take or rubber gloves, inserting electrical wires in the outlet without a plug, electric shock hazards related to children playing, leaving children without adult supervision, domestic violence and fights, allowing overnight visitors into the reception centre, culmination of mental health problems, threatening situations caused by temporary mental disturbances (such as when receiving a negative decision on refuge), and threats caused by persons from outside the reception centre. During the investigation, information was also received regarding the use of electric ovens as heaters, incidents caused by hotplates acquired by the residents themselves (e.g. using them on wall-to-wall carpet, hotplates left on, hiding hot plates from centre personnel etc.), the use of deficient (self-made or poorly repaired) electrical equipment, different types of water damage, ignition risks related to screens made of sheets and curtains used as space dividers etc.

16 The cases involve people with a foreign background who had only stayed in Finland for a short time. The cases were mainly picked on the basis of the last part of the identity number; for foreigners who recently arrived in Finland, this is a nationality code. Immigrants who have been in Finland for a longer time cannot be screened on the basis of the identity number.

accidents where a lack of knowledge of the Finnish driving conditions or culture can be observed.[17]

2.2.3 The property where the accident occurred and the operation of the tenement company

The property where the fire being investigated occurred belonged to Helsingin kaupungin asunnot Oy. The renting of the flats and property maintenance was managed by the regional company Heka-Vuosaari Oy, a part of Helsingin kaupungin asunnot Oy; it is referred to as the tenement company in the investigation report.

The street address for the site of the accident was different from its visiting address. According to the customer relations manager of the tenement company, the address Vuotie 59 was selected from the options provided by the city based on a proposal prepared by the project manager for the construction stage. At that time, the viewpoint was that Vuotie is the main street in the area and some of the entrances for Vuotie 59 are also located on that side. Another aspect was to remain unified with another property owned by the same tenement company, Vuotie 61, which is located next to the building.

Helsingin kaupungin asunnot Oy and all its regional companies have their websites in only one language, since Finnish is the company's official language of communication. According to the tenement company's customer relations manager, the tenants are also under obligation to seek further information if, for example, they receive a letter from the company [and cannot understand it].

The tenement company had an extensive, appropriate *rescue plan* for the location that can be found on the company's website. The tenants can also acknowledge the plan as read online. According to the customer relations manager, a summary of the rescue plan is available for the tenants to read on the notice boards in the staircases. The location has a house committee that aims to promote cooperation between the tenants, living comfort and safety. The tenement company receives improvement proposals for improving safety through the house committees and occasionally from the tenants.

The terms and conditions of the lease agreement signed by the family on 15 December 2014 did not separately mention the maintenance of the fire detector, but the *house rules and regulations*[18] distributed to each new tenant mention the tenant's responsibility for testing and maintaining the fire detectors. The same clauses are also included in the written information material *Tervetuloa asumaan Vuosaareen!* (Welcome to live in Vuosaari!) that the tenement company started using in 2016, that is, after the family had moved in. The *Asukkaan käsikirja* (Tenant manual) on the company's website has a separate chapter on safety that discusses safe activities, i.e. risks related to housing and prevention thereof, in a versatile manner. The chapter has clear instructions for the acquisition and use of fire detectors. The tenant manual

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17 The accident investigation boards provided the following recommendations related to the accidents: More education must be provided for drivers (with emphasis on drivers with foreign backgrounds) on the correct and safe transport of children and the use of correct child seats; foreign drivers moving to Finland should be provided with training and education regarding the road traffic laws and regulations of Finland; foreigners moving to Finland should immediately be provided with training regarding Finnish traffic regulations; driver education should include substantially more training in the dark and under slippery conditions than at present; different population groups should receive tailored training on local conditions; special attention must be paid to traffic training provided to people arriving from foreign conditions; driver training in slippery weather must be required without exception before a licence to drive is granted.

18 When the family moved into the flat, the rules and regulations approved on 15 April 2010 were in force. As regards the matters studied in this investigation (fire detector maintenance, use of sauna in flat), the new rules and regulations that entered into force on 1 January 2017 have not changed. The new rules and regulations are also available in Swedish, English and Russian on the tenement company's website.

recommends drying laundry outside or in the separate drying rooms of the house, but the information material or rules and regulations do not directly address using the flat's sauna as a drying room or storage, for example.

According to the tenement company's technical property manager, inspections concerning the condition of the flats are performed whenever the tenant changes, i.e. approximately one week after the previous tenant's lease has been terminated. At this time, a supervisor from the company visits the flat. According to the *inspection protocol for dwellings,* attention is paid to 27 items, of which at least the fire detector, electrical outlets, switches, lights, stove, refrigerator and doors and locks are directly related to safety. The flat where the accident occurred had been inspected on 10 December 2014 and there was no mention on the inspection form that the fire detector was missing. The previous tenants lived in the flat until the end of the year. In the initial checklist filled in by the new tenant, also known as the *list of defects and deficiencies,* the items to be inspected are divided by room. On this form, items directly related to safety include at least the stove, refrigeration devices, fixed lighting, door locks and the electrical equipment listed as separate items; no separate mention of a fire detector is made. The sauna stove in the flat's sauna is not mentioned in either inspection or control document.

Upon completion of the building (in 2007), the tenement company had installed one fire detector in all flats. After the fire that is currently under investigation, the tenement company decided that the fire detectors in all flats will be replaced during 2017 and that after this, the responsibility for their maintenance will be transferred to the owner of the property.

The investigation studied the *Kodin kansio* ("Folder for the home") that had been compiled by the developer, Helsingin asuntotuotantotoimisto (ATT) and the constructor, Lujatalo Oy; it was found from the flat adjacent to the one where the accident occurred. The intention was that the folder should be stored inside the flat, but the investigation could not determine whether the flat where the accident occurred had this folder when the family moved in. The existence of the folder is not mentioned in the inspection protocol under items to be inspected.[19]

The contents of the folder are constructed in a manner where the first part consists of 41 pages of general instructions concerning the tenement, living and safety in Finnish. After this, the folder contains the original operating and service instructions for the different electrical equipment and other equipment in the flat and the balcony glazing, among other things. These are mainly available in Finnish and Swedish.

The general instructions in the folder forbid the drying of laundry in the sauna, since drying on a hot sauna stove may cause a fire hazard. The general part also includes basic instructions for emergencies. The attachment part of the folder also includes the operating instructions for the fire detector originally installed in the flat and the detailed operating instructions for the sauna stove mentioned earlier.

2.3 Authorities and other actors

2.3.1 Supervision and safety training provided by the rescue services

Helsinki City Rescue Department performs supervision with the aim to improve people's safety, reduce accidents and their consequences and to promote the independent preparation of the different actors. The supervision consists of fire inspections and in-house control for

[19] One copy of the protocol is handed over to the tenant who is leaving, and it contains a separate mention that the folder and the user instructions for the stove and refrigeration equipment must be left in the flat.

residential buildings, among other things. Periodic fire inspections apply an auditing inspection model, which is more communicative than the traditional model. Its aim is to affect the safety culture of the organisation being supervised.

In-house control has been used in the supervision of residential buildings in Helsinki since 2014. The aim is for in-house control to reach every residential building in Helsinki within a period of ten years. The purpose of in-house control is to improve the safety awareness of the owners and residents of the buildings. In-house control also provides the rescue department with an overall picture of the safety situation for residential buildings in Helsinki.

The property had outsourced its in-house control to a consulting company that had, before the fire, last submitted the in-house control form to the rescue department on 30 October 2015. Together with the filling of the in-house control form, the company had provided the rescue department with a power of attorney from Helsingin kaupungin asunnot Oy that concerned at total of 18 locations.

Helsinki City Rescue Department uses in-house control in the supervision of housing cooperatives with three or more dwellings. For the purposes of in-house control, the housing cooperatives are sent the instructions concerning in-house control for residential buildings and an in-house control form that is returned to the rescue department when filled. The same form can also be filled in online. In the model used by Helsinki City Rescue Department, the department only communicates with the cooperatives; individual residents do not receive any material.[20] Also, property managers are not required to collect information regarding fire detectors from the residents, for example. According to the fire inspector from Helsinki City Rescue Department who is responsible for in-house control, this is mainly a question of resources: If the control were extended to individual dwellings, this would multiply the workload on the property managers and the rescue department.

The in-house control form asks the housing cooperative's opinion on questions of responsibility and independent supervision. According to the *yes or no* answers concerning the tenement where the accident occurred, the tenants are aware of their responsibility to acquire a fire detector and they have been regularly informed concerning the acquisition and maintenance of the fire detector. The tenants have been made responsible for reporting any observed safety deficiencies, they have an opportunity to study the rescue plan and a summary of the instructions contained therein has been distributed to them. The property also has a clear practice for reporting safety deficiencies, and any near misses that have occurred at the property are discussed by the board. The in-house control form had "no" answers under *There are no unnecessary items in the staircases and the basement and attic corridors* and *There are no unnecessary items in the technical rooms*. In the freeform text fields under these questions, explanations were recorded concerning a sofa on the corridor of the small items storage in staircase D and cardboard boxes in the electrical switchboard room of staircase C.

On the basis of the in-house control information, a fire inspection protocol was drawn up at the Helsinki City Rescue Department on 3 November 2015. As the address, it used Maustetehtaankatu 10 which was fetched from the building database. According to the protocol, operations at the site were at the legally required level overall, but two correction orders pursuant to the Rescue Act[21] were issued. These ordered the removal of the items from the

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20 Each individual housing cooperative is targeted by in-house control every ten years. Approximately every five years, Helsinki City Rescue Department send safety communication, such as the brochure *Turvallisuus tehdään yhdessä* (Safety is created together) to all addresses. The rescue department is an active communicator in traditional media as well as social media.

21 379/2011 Sections 9–10

exits and technical rooms and the submittal to the rescue department of a report on how the correction orders have been followed and how the deficiencies have been corrected. However, this report was never submitted to the rescue department.

According to the information received in the hearing of a fire inspector from Helsinki City Rescue Department, the in-house control information submitted to the rescue department has usually been provided by the boards of the housing cooperatives. However, the share of consultants has been significant, since over 30% of housing cooperatives used a consultant during the second in-house control round of 2016. The rescue department has found it hard to supervise the operation of the consultants and, apparently, some consultants have filled in the in-house control form without visiting the site.

Some messages received by the rescue department indicated that property managers had ordered consultants without informing the board of the housing cooperative. Therefore, from 2017 onwards, the in-house control letters from the Helsinki City Rescue Department state that the in-house control form may only be filled in and returned by a consultant if the housing cooperative's board of directors or another competent responsible party has provided their express consent.

Instead of using consultants, the Helsinki City Rescue Department recommends that housing cooperatives enlist the help of the volunteer fire brigades, which is free for the housing cooperatives. The Rescue Department trains the members of the volunteer fire brigades who participate in the activities and, therefore, also answers for the quality of the operations.

Safety training for immigrants has only been provided in the rescue industry for a few years, even though risks encountered and caused by immigrants have been recorded in the field for as long as members of other cultures have been arriving in Finland.[22] In Pirkanmaa, training has been arranged for approximately ten years. There, the activities started when a language training group of immigrants visited a rescue station, and cooperation has continued in the same manner while constantly expanding and becoming more versatile. In most rescue departments, questions concerning the safety of immigrants became a concern in the autumn of 2015, when assignments at reception centres increased and questions regarding the fire and exit safety of the centres became a concern.

In Helsinki, safety training for immigrants has been provided during a few earlier years. According to the annual reports from the Rescue Department, training for immigrants has been provided in 2012 and 2015, and some 70 immigrants per year have taken part.[23] The safety training documented by Helsinki City Rescue Department reaches 30,000–50,000 people each year, which means that immigrants have most likely also participated in the training arranged for other target groups (pre-school children, schoolchildren, students, residents, general public etc.).

According to the service level decision (2013–2016) of the Helsinki City Rescue Department, housing safety must be covered more effectively by safety communications, and the Rescue Department's safety training plan includes immigrants as one of the risk-informed training

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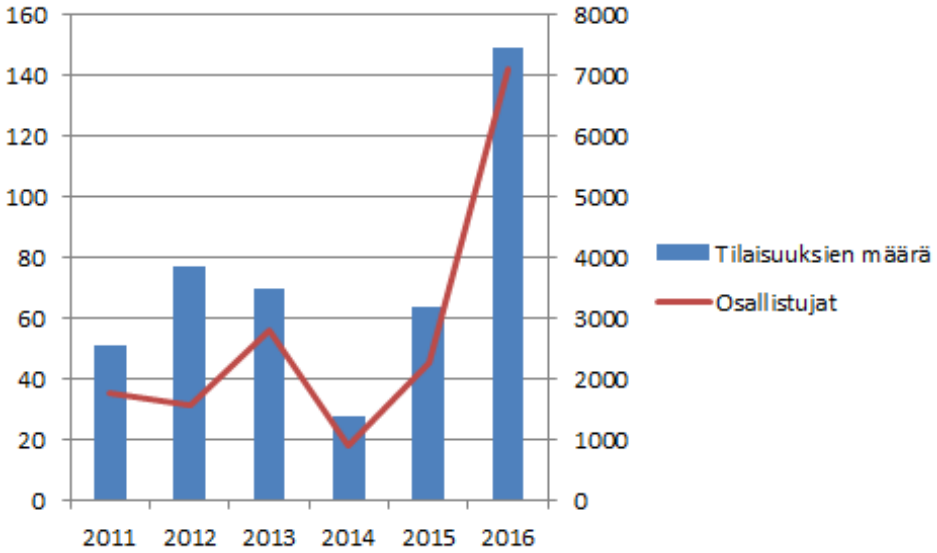
22 The challenges caused by immigrants have also been identified in the future strategy for rescue services; according to it, immigrants pose a challenge to accident prevention due to their deficient language skills and different cultural backgrounds. Ministry of the Interior (2016) *Turvallinen ja kriisinkestävä Suomi - pelastustoimen strategia vuoteen 2025* (Safe and crisis-resistant Finland - Rescue services strategy for 2025).

23 PRONTO data differs somewhat from the information in the annual reports. According to PRONTO, Helsinki City Rescue Department arranged three safety trainings for immigrants in 2012 and a total of 46 people took part. In 2015, there were four safety trainings and 38 participants.

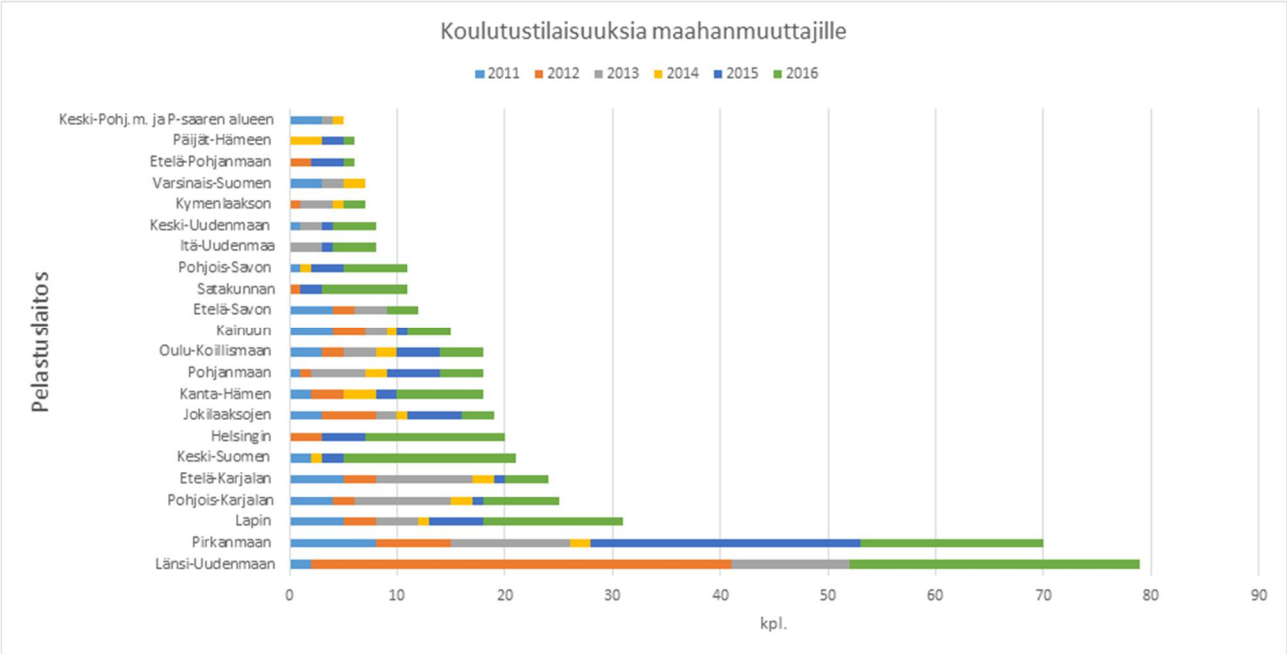
target groups. Starting in 2016, the Rescue Department has also entered into a training partnership with Social Services and Health Care.

According to the data from PRONTO, the Rescue Department's resource and accident statistics, the Helsinki City Rescue Department has arranged 13 training events intended solely for immigrants, and a total of 262 persons have taken part. Of these, 24 were employees and interpreters from reception centres or teachers from the educational institute mentioned above that arranges integration training. The other trainees were residents from reception centres or integration training students. The training discussed, among other things, everyday safety, the development of a fire, actions to be taken during emergencies and fire and exit safety. Exit and first response firefighting exercises were also arranged during the training, and the rescue authority's work description and equipment were presented. In early 2017, cooperation has been started with the Finnish Red Cross concerning the “Asumisen aakkoset” (ABC of housing) courses.



Kuva 6. The number of training events arranged for immigrants by rescue departments in Finland and their annual numbers of participants for the period of 2011–2016.

Across the country, rescue departments have trained immigrants in different ways in recent years. The below figures that contain annual variation are probably best explained by the situation with asylum seekers and immigrants that changes constantly and differs by region. The different attitudes of the rescue departments may also affect the amount of training arranged.



Kuva 7. The number of training events arranged for immigrants by different rescue departments for the period of 2011–2016.

A new mode of operation is the MAKO project (immigrant training programme) started by Helsingin Pelastusliitto ry (HELPE). The idea is that people with an immigrant background are recruited as trainers who then train immigrants coming from the same culture or another similar culture. According to the information received in a hearing during the investigation, the association has six suitable trainers, both men and women. The plan is for them to start working in April 2017.

Safety communications material is another good method alongside training for promoting safety awareness among immigrants. Material intended for immigrants has been published by the Finnish National Rescue Associations (SPEK), among others. The *Paloturvallisuutta kotona* (Fire safety in the home) brochure is a miniature guide to home fire safety and it has been published in nine different languages. The Finnish brochure is written in plain language. The brochure guides the reader with the help of images, and images crossed over indicate erroneous means of action. The material explains, among other things, that fire detectors are mandatory, provides instructions for their installation and testing and states that the sauna must not be used as a store or drying room. Instructor material related to the brochure has been published in Finnish, Swedish, English and Russian. The instructor's guide discusses the cultural starting points for safe operations to some extent.

Safety and guide material in different languages has also been produced by several cities, rescue departments and SPEK's member organisations. The guide *Minun kotini kerrostalossa* (My home in a housing block) created in the City of Helsinki Neighbourhood Project is available in five languages. The Helsinki City Rescue Department's brochures *Paloturvallisuus kerrostalossa* (Fire safety in an apartment building) and *Paloturvallisuus pientalossa* (Fire safety in a detached house) are available in three languages.

Turvaopas – Safety guide from the Western Uusimaa Rescue Department is available in ten different languages. This versatile and extensive 40-page material is available for download from the rescue department's website, and it has also been used by other rescue departments. In February 2017, Pirkanmaa Rescue Department published fire safety videos in ten languages

that were produced with support from the Fire Protection Fund. The videos are intended for use as educational videos for asylum seekers and immigrants.

The website paloturvallisuus.info, commonly maintained by SPEK and The Finnish Association of Fire Chiefs, contains information in English regarding housing and hot work, among other things. Furthermore, the Finnish Swimming Teaching and Lifesaving Federation has published the guide *Tule uimahalliin!* (Guide to the swimming hall) in eleven languages, including plain Finnish. This guide takes cultural matters very well into account.

Traffic safety material for immigrants is not available, with the exception of a single set of lecture material from Liikenneturva[24] that is available through the website of the Centre for Economic Development, Transport and the Environment. A Norwegian study found that specific nationalities of immigrants who receive a Norwegian driver's licence cause a significantly higher risk of accident or even death in Norwegian traffic.[25]

2.3.2 Other supervision and activities by the city

The Helsinki building inspection authority grants construction licences and permissions for minor construction within the area of the city and also supervises construction work for its part. Building inspection includes constructor supervision, i.e. the agency monitors that the parties involved in a construction project are competent and buildings thereby become safe and compliant with requirements.

The city engineering section of the City of Helsinki's Real Estate Department defines all the addresses that can be used to access a plot that will be constructed later. When a building is constructed on a plot, the holder of the property can select the address to be used from these available options. The holder of the property may also select two (or more) addresses, for example when the different staircases of a large housing block are accessed through different streets. According to the city engineering section, the most sensible and purposeful manner of choosing an address is to choose one that can be used to access the property. However, the city engineering section states that there is no authority control related to the selection of the address.

During the zoning stage, four possible addresses had been defined for the plot of Vuotie 59, the primary of which was Maustetehtaankatu 10. The other possible addresses were Pippurikuja 1, Vuotie 59 and Inkiväärikuja 7.

The address on Pippurikuja was also available, even though Pippurikuja is a cycleway according to the local plan confirmed in 2001. Earlier, there was also a connection to the Vuotie carriageway from Pippurikuja which, in principle, allowed emergency vehicles to use the Pippurikuja route. The junction was removed a few years before the fire, and a green wedge was constructed in its place that runs adjacent and parallel to the Vuotie carriageway and separates the cycleway and carriageway. During the change, the city did not react to the problem caused by the address Vuotie 59, even though removing the junction made it more difficult to reach the site.

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24 Liikenneturva's PowerPoint presentation *Maahanmuuttajat Suomen tieliikenteessä* (Immigrants in Finnish road traffic).
25 Nordbakke, S. & Assum, T. (2008) *Innvandreres ulykkesrisiko og forhold til trafikksikkerhet.* TØI rapport 988/2008.

The City of Helsinki's immigration unit's discretionary initial assessment for immigrants[26] determines who the person is and which types of resources or challenges they have. Furthermore, the initial assessment looks at the different aspects of life and assesses the service needs from the points of view of work, education, family life and social relationships, among other things. During the initial assessment, a social worker and social counsellor team is appointed for the person or family, and the team usually visits the home several times. The immigration unit also arranges group evenings and resident infos that study the Finnish life and review several everyday matters in detail.

After the initial assessment of the immigration unit, the persons or families receive support from one to three years. The first plan is usually made for one year, after which the status of the individuals is assessed. Support by the immigration unit is not resumed if the person is found to have sufficient prerequisites for using the normal services of society.

The *Minun muistivihkoni* (My notebook) publication available on the immigration unit's website contains some content regarding safety. Making an emergency call is discussed at two different points. Under "Police", dialling the emergency number in urgent cases is listed first, but under the Healthcare heading, dialling the emergency number is only listed after several numbers for making reservations.

The family involved in the accident was not a customer of the immigration unit.

2.3.3 The Finnish Safety and Chemicals Agency

The Finnish Safety and Chemicals Agency (Tukes) monitors the annual number of fires started by electrical equipment based on PRONTO data. According to the data, there have recently been slightly over one hundred building fires or fire hazards caused by sauna stoves per year. According to Tukes, 124 assignments by rescue departments related to electric sauna stoves or their use were recorded in 2016. Of these, a total of 52 assignments (42%) were caused by human activity, i.e. the steam room had been used for storing or drying clothes, ignitable items had been placed or forgotten on top of the stones in the stove or the space above the stones had not been inspected when power was connected. An almost equally large share of the assignment (48 pcs, 39%) were due to a technical problem with the device or its installation. In approximately every fifth case (24 pcs), the PRONTO data could not be used to determine a more detailed cause of the fire or fire hazard.

In Tukes's earlier analysis concerning electrical fires[27], a total of 156 assignments caused by electric sauna stoves were found in the PRONTO data for a one-year period (week 9/2012 – week 8/2013). Of these, 56% were the consequence of erroneous or careless human activity and 40% were caused by a technical defect. Out of the assignments caused by defects, 32% resulted from a defect in the heating resistor and 24% from a defect in the control knob. Other identified defects included the sauna stove's control thermostat (5%) and the electrical connection (2%). According to an expert from Tukes, the contributing factors behind these defects were resistors that had been used too long, poor quality components in the sauna stoves

[26] According to the Act on the Promotion of Immigrant Integration (1386/2010), creating the initial assessment and integration plan is the responsibility of the municipalities when the immigrant's state of health, age, family status or comparable reasons prevent the immigrant from participating in employment activities promoting integration. The municipality is also responsible for the integration plans of underage immigrants and integration plans for families on a discretionary basis.

[27] Hatakka, S., Valkeinen, H. & Huurinainen, V. (2014) *Sähkölaitteistoista aiheutuneet tulipalot ja palovaarat Suomessa - esiselvitys.* (Fires and fire hazards caused by electrical equipment in Finland – a preliminary analysis.) Report 1/2014. Tukes.

and installations in violation of the operating instructions in both the stoves and the separate thermostat sensors.

According to an expert from Tukes, innovations related to the technical safety of a sauna stove are difficult to envision. For example, any possible safety devices in the sauna stove that would be comparable to the devices on kitchen stoves would be technically fairly hard to implement, if they were intended to prevent material on top of the stove from igniting. From a safety perspective, however, it would be wise to ban switching on the sauna stove from outside of the steam room, since nobody can see the vicinity of the stove from behind a wall, for example. According to the expert from Tukes, the primary goal should be to influence human behaviour. The best ways to achieve this would be education and clear, visual operating instructions on sauna stoves. In the expert's opinion, people should also understand that "a store room should not have a working sauna stove"; in other words, a sauna should not be used as a store room, or if it is, the sauna stove should be disconnected in a manner that prevents simple reconnection.

Tukes has not separately communicated on the safety risks related to sauna stoves. According to the expert, however, a careful has been generally promoted in different information bulletins over the years.

2.3.4 Other authority activities concerning immigration

The TE offices have, pursuant to the Act on the Promotion of Immigrant Integration[28], the primary responsibility for the initial assessment and integration plan drawn up for immigrants, with certain exceptions. The initial assessment is made and the integration plan is drawn up once an asylum seeker has received a positive decision on refuge and they have become customers at the TE office. Those who arrive through other routes, such as due to family ties, are immediately covered by the Act on the Promotion of Immigrant Integration once they report at the TE office.

However, those who arrive for work or study are not usually customers of the TE offices, and their integration is not supported by authority actions. Their employer or educational institute may offer them safety training if so desired. Adults who stay at home to care for their children, most often mothers, are also outside of the services of the TE offices in many cases. Their integration may be supported with an integration plan drawn up by the municipality and related actions in the manner explained above.

The initial assessment performed by the TE office is somewhat more concise than the one drawn up by the municipality. The initial assessment determines the professional and educational background of the customer and reviews the services provided by Finnish society, providing advice to the necessary extent. Furthermore, the customer is referred to tests that measure language skills and learning abilities. The integration plan is used to record actions that aim to improve the employment opportunities of the customer. In practice, this refers to the personal specification of the integration training required by the customer. A contact person from the TE office is appointed for the customer for the duration of the integration training, and they can contact this person at any time. The integration supervised by the TE office lasts from one to three years. Some people, including some highly trained individuals, may integrate within six months.

TE offices distribute material to their customers, the most extensive of which is the *Opas työ- ja elinkeinotoimiston uudelle maahanmuuttaja-asiakkaalle* (Guide for new immigrant clients of

[28] 1386/2010

the Employment and Economic Development Office), published by TE services and available in several different languages. As the name implies, the publication deals with services that provide support for joining the working life, such as integration and employment training, work coaching and work trials and unemployment benefits. The last page of the guide has several Internet addresses that provide additional information, one of which is infopankki.fi that also contains safety information.

Infopankki.fi is a website that is especially designed for immigrants and available in twelve different languages. The Emergencies page has, in addition to clear basic instructions, a link to the Emergency Response Centre Administration's brochure *How to call the emergency number,* available in 11 languages, and links to first aid guides by the Finnish Red Cross and the Poison Information Centre, available in three languages. The page concerning housing includes links to the guides published in Helsinki mentioned above and the website of the Finnish National Rescue Association.

The Centres for Economic Development, Transport and the Environment are responsible for the administration of integration training in their area. The training is arranged by public or private educational institutes selected on the basis of competitive bidding. The bids participating in the competitive bidding must meet the requirements of the syllabus[29] for integration training. Since the syllabus does not contain specific provisions on safety training, the safety-related contents of the integration training vary significantly between different training providers.

The Uusimaa Centre for Economic Development, Transport and the Environment arranged competitive bidding for the framework arrangements of the integration training of adult immigrants for 2015–2017 with a call for tenders published in February 2015. The document concerning the description and minimum requirements of the object of purchase states that the training must be arranged according to the syllabus published by the National Board of Education. The training is divided into a basic group, a fast-moving group and a slow-moving group based on the individual, tested learning ability of the participants. The training consists of four 60-day modules; the slow-moving group differs from the others in that the final module lasts for 90 days. According to the purchase document, training for an occupational safety card may be included in the overall training according to individual needs. However, no requirements concerning training on safety matters beyond the syllabus were presented in connection with the competitive bidding.

In February 2016, the Uusimaa Centre for Economic Development, Transport and the Environment sent a questionnaire to nine training providers within its region. The purpose of the questionnaire was to determine how fire safety issues have thus far been discussed in the integration training. Information was received from seven educational institutes. The responses received for the open-ended question were self-assessments from the educational institutes, but probably nevertheless fairly realistic.

In two institutes, safety questions had not been addressed at all. One of these institutes was where the mother who died in the fire was receiving her integration training.

Safety matters within the school were included in the teaching at five institutions. Safety walkdowns were used to study the locations of first response fire-fighting equipment, exit routes and muster points, for example. In addition, the response from one educational insti-

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[29] Finnish National Board of Education (2012) *Aikuisten maahanmuuttajien kotoutumiskoulutuksen opetussuunnitelman perusteet* (Basics of the syllabus for the integration training for adult immigrants). Regulations and instructions 2012:1.

tute stated that material concerning safety in the home was being used and distributed. Calling the emergency number was practiced and the online materials for the 112 Day were utilised at one institute. Furthermore, one institute had started cooperation with a rescue department as a pilot project. One branch of this institute had held a training event arranged by the rescue department, and the feedback from students had been extremely positive. The institute had also been allowed to comment on the rescue department's educational material, and the cooperation with the rescue department had been considered valuable and interactive.

In a cooperation meeting held in January 2017, the Uusimaa Centre for Economic Development, Transport and the Environment has obligated the personnel of all service providers to participate in the training arranged by the rescue departments, and to review safety matters in all training groups, during both integration training and reading/writing training. The rescue departments in Uusimaa are organising the personnel training arranged for the above parties, i.e. instructing the teachers of immigrants in discussing fire safety matters during their own training sessions.

All of the seven educational institutes that responded to the above questionnaire had a positive attitude towards starting training cooperation with rescue departments.

People who enter the country as asylum seekers are customers at reception centres before their integration stage. The Finnish Immigration Service (Migri) guides and monitors the operation of the reception centres. The operator is responsible for the safety of the centres. The basic operation and safety of the reception centres are supported by different statutory plans and other plans required by Migri, including the in-house control plan, safety plan, rescue plan, emergency preparedness plan, medical care plan and orientation plan. The plans are a part of the preliminary supervision of the centres and they allow the centres to assess and improve their operation. The in-house control by the reception centres is also a key part of the preliminary supervision. In-house control is based on risk management implemented within the unit, where service processes are assessed from the point of view of quality and resident safety. The aim is to prevent the realisation of the risks and to react to the observed critical work phases or areas for improvement. Furthermore, practical safety is supervised at the reception centres with monthly inspections of the fire alarms or detectors and dwellings.

During 2016, Migri has performed assessment visits concerning the safety of the reception centres, and they have been used as the basis for issuing recommendations to the centres concerning the improvement of operations. Approximately 1,200 employees of the reception centres also received training in safe operations. Furthermore, Migri guides safety operations by means of monthly safety letters.

The work and study activities that are a part of the reception activities and practically mandatory for the residents mean two hours a week of studies in the Finnish language and two hours of labour. In addition to the language, the students learn the basics of Finnish society according to the study material prepared by the Finnish Immigration Service. The material or the studies do not contain matters directly related to safety. Therefore, several reception centres have been cooperating with the rescue departments or safety training companies in their

area, who have been training both the personnel and residents of the reception centres.[30] In some reception centres, the personnel have also acted as safety trainers, providing training to the residents; at times, volunteers from the Finnish Red Cross have been used for the task.

According to a safety expert from Migri, the amount and quality of safety training provided for the residents at different reception centres has been very varied. Reception centres are very different and they have their own financial liabilities. Therefore, no binding instructions have been provided for the exact nature and contents of the safety training arranged for residents; its arrangement and contents have been left for the local operators to decide. The resources of the centres and their locations and the motivation of the personnel have affected the practical solutions, which have therefore been different.

The reception centres have established rules and regulations, but small language minorities are a problem, since the rules have not been translated to all languages. Warnings are given for violating the rules, violations are discussed with the residents, and, if necessary, the director or responsible instructor reprimands the resident.

Fire safety trainings have been arranged in cooperation with trainers from the rescue department, and the goal has been to arrange training by language group, i.e. in five different groups. Trainings use videos, for example, and their contents are discussed together. After this, the reception centre's own personnel explain the matters and practices related to the safety of the centre, such as the characteristics of the fire detection system, the correct actions to take in case of a fire alarm, the use of first response fire-fighting equipment, activities that are forbidden inside the rooms (smoking, waterpipes, use of hotplates and microwave ovens), delays in helping others that are possibly caused by unnecessary alarms, calling the emergency response centre, the 112 application and actions to take in case of threatening situations, such as when moving in the city.

The Ministry of Employment's information material distributed to all immigrants, i.e. the brochure *Perustietoa Suomesta* (Welcome to Finland)[31] discusses risks and safety in a fairly concise manner. The brochure "Welcome to Finland" contains the section "Emergencies" which has been placed as the last subsection under the heading "Health". The chapter does not contain any instructions for different emergencies and accidents, and the instructions for calling the emergency number do not correspond to the instructions on the Emergency Response Centre Administration's website. The item concerning fire safety is placed under the heading "Looking after your flat", and the section warns against drying clothes and storing items in the sauna and states that a tenant must personally purchase a fire detector and install it according to the instructions. Even though the brochure states elsewhere that the average size of a Finnish apartment is 80 m^2, the need for more than one fire detector is not mentioned. The sub-

30 According to a thesis work written for the Emergency Services College in 2016, reception operators have provided training in first response fire-fighting and first aid to the personnel. At some locations, the residents have also received fire safety training, but this has varied greatly. Some rescue departments have produced safety instructions for immigrants, and it has been possible to train operations according to these instructions at the reception centres. Räisänen, T. (2016) *Länsi-Uudenmaan pelastuslaitoksen varautuminen pakolaiskriiseihin* (Preparation for refugee crises within the Western Uusimaa Rescue Department).

31 This brochure is the basic information material pursuant to the Act on the Promotion of Immigrant Integration (1386/2010) that is provided to everyone moving to Finland upon the service of their residence permit decision, registration of right of residence, issuing of a resident card or the registration of the domicile and population data.
The brochure in use during the investigation had been created by the Ministry of the Interior in 2011 and updated by the Ministry of Employment and the Economy in 2013. A renewal project for the brochure started under the leadership of the Ministry of Employment and the Economy in the spring of 2017.

chapters concerning emergencies have no Internet addresses that would lead to further information, such as the websites of rescue authorities, even though these are commonly present elsewhere in the brochure.

The Ministry of Employment and the Economy has decided to renew the Welcome to Finland brochure, and the plan is to publish the new version in the autumn of 2017.

2.4 Preparedness and operation of the organisations participating in the rescue

Firefighting and rescue services in the City of Helsinki area are the responsibility of the Helsinki City Rescue Department. Helsinki has eight rescue stations in different parts of the city that are open all year and around the clock. Each rescue station is equipped with at least one rescue unit. According to the Helsinki Rescue Services' service level decision for 2013–2016, the target strength of a rescue unit is 1+5, i.e. foreman, driver and two firefighter teams; the minimum strength is 1+3. For urgent assignments, the take-off time for units has been set at 60 seconds. The stations have special expertise and equipment according to the special needs of each region. The fifteen agreement fire brigades in Helsinki are employed for assistance when necessary.

Vuotie 59 is located in risk area 1, which means that the unit arrival time should be at most six minutes for the first rescue unit according to the set targets, and the time to receive assistance should be at most 13 minutes. In a team call, the rescue team, with the exception of the leader of the rescue activities, should be at the site within 20 minutes from the first unit receiving the alarm.

Based on PRONTO statistics, the median unit arrival time for the risk zones nearby Vuotie was eight minutes in 2016, which exceeds the target time defined by the Ministry of the Interior in the unit response time guidelines by two minutes.

Emergency medical care is the responsibility of the Hospital District of Helsinki and Uusimaa, and within the district of the Helsinki University Hospital, it is coordinated by HYKS Akuutti. The Helsinki City Rescue Department acts as the provider of emergency medical care within the City of Helsinki; each of its rescue stations have at least one emergency medical care unit on immediate standby duty. The emergency medical care service also includes first response operations, which means that another unit (usually a rescue unit) may be called in to assist a person who has suffered a sudden attack of illness or injury in addition to the actual unit(s). Furthermore, the field commander of emergency medical care and a doctor are on continuous standby. Non-urgent assignments or "D" assignments are managed by a private service provider in Helsinki.

The Helsinki Police Department is responsible for the general order and safety of the city, crime prevention, crime investigation and for the provision of permit and licence services.

The City of Helsinki's social and crisis emergency services operate around the clock. The minimum strength is two on-call social workers and two on-call crisis counsellors. Emergency social services manage situations that require immediate intervention from the social welfare authority. Emergency crisis services provide acute assistance in case of crises such as sudden deaths and accidents. Acute crisis counselling is short-term by nature, there are usually 1–5 meetings. Crisis counselling also includes a follow-up of the situation, such as an assessment of the need for further treatment and the arrangement of such, and telephone counselling.

Social and crisis emergency services and similar organisations from neighbouring municipalities have a cooperation agreement for major crises, allowing employees to be used across municipal borders.

The student welfare services of the City of Helsinki's basic education has a dedicated crisis team for the students; it includes four psychologists and four curators. In case of severe crisis, members of the group are requested to assist the school's student welfare organisation. The group receives training for its operations that consists of reviewing earlier cases, and occupational instruction and guidance is also offered. Drills are also arranged.

2.5 Records

The Safety Investigation Authority of Finland had access to the emergency response centre's records of the emergency calls and the radio traffic related to the assignment. The information received from them was used for the analysis of the emergency and rescue activities and the creation of the accident timeline.

Due to a technical problem, records from Helsinki City Rescue Department's internal voice communication groups were not received.

The electricity consumption information requested from the power company could be used to determine the time when the sauna stove was activated. By looking at the hourly consumption figures, it was first possible to determine the flat's average hourly electricity consumption at night, which was approximately 0.2 kWh. On the night of the accident between 01:00 and 02:00, the total consumption of the flat was 2.2 kWh, which leaves 2.0 kWh for the sauna stove; in other words, a 6-kW sauna stove was on for approximately 20 minutes during this period.

2.6 Rules, regulations, instructions and other documents

An initial inspection of the flat is usually performed for tenements before the tenancy begins. Most often, the inspection is performed together with the tenant, but the website of the Finnish Landlord Association, for example, states that the inspection may be performed by the lessor alone or with a witness. The purpose of the initial inspection is to ensure that, in accordance with the Act on Residential Leases[32], the flat is in the condition that can be expected in view of its age, the general standard of dwellings in the area and other local conditions when the tenancy begins (and that the previous tenant has left it in proper condition).

Fire detectors are not included in the condition of the flat defined above. Pursuant to the Rescue Act[33], the holder or occupant of the flat is responsible for ensuring that a suitable number of fire detectors is installed in the flat. The Ministry of the Interior's Decree on the placement and maintenance of fire detectors[34] states that each floor of a dwelling and the basements and attics connected to them must have fire detectors placed in a manner where at least one fire detector is available per each beginning 60 m^2 of floor area. The decree further states that fire detectors must be installed in a manner where they react to the smoke caused by the fire as early as possible, and that their operability must be ensured by means of regular testing. According to the Government Decree[35], the fire detectors must meet the requirements in the harmonised standard[36].

The Land Use and Building Act[37] defines the general prerequisites concerning construction, the essential technical requirements and the licence procedure and authority supervision for

32 481/1995
33 379/2011
34 239/2009
35 291/2009
36 SFS-EN 14604 Smoke alarm devices
37 132/1999

construction. More detailed regulations and instructions concerning construction are compiled in the National Building Code of Finland, which is maintained by the Ministry of the Environment[38].

The National Building Code of Finland's part D2 provides the regulations and guidelines concerning the indoor climate and ventilation of buildings. The basic requirements for limiting the spreading of fire and flue gases inside the building and from building to building are provided in the Ministry of the Environment's Decree on the fire safety of buildings[39], i.e. part E1 of the National Building Code of Finland, and the Ministry of the Environment's guideline E7 on the *fire safety of ventilation systems*. The requirements state that ventilation equipment must be designed in a manner where they do not contribute to the risk of the spreading of fire or flue gases.

Rescue departments must supervise adherence to the provisions in the second and third chapters of the Rescue Act[40], such as following the regulations for fire and exit safety concerning buildings and the provisions concerning the duty of care of the owner or holder of the property, independent preparation and the use of fire detectors. Supervision must be based on a risk assessment and it shall be of high quality, regular and efficient. Fire inspections and other activities required by the supervision task must be performed in order to arrange the supervision; according to the Act, these may be performed by the rescue authorities. The Rescue Act does not mention in-house control, but according to the standard interpretation, in-house control pursuant to a supervision plan is included in the other actions required for the supervision task mentioned in the legislation.

The Safety and Chemicals Agency's primary task, as stated in the related Act[41], is to supervise and promote the technical safety and compliance of products, among other things. As the second task, the Act mentions supervising and promoting consumer safety. According to the Agency's own definition, the most important target groups for the promotion of consumer safety are consumers, operators, authorities and the media. The other three tasks for Tukes mentioned in the Act are related to chemicals and pesticides and accreditation systems. Tukes also acts as the electrical safety authority defined in the Act on electrical safety.

The Act on electrical safety[42] contains on the assurance of the operational safety and compliance of electrical devices. According to the Act, electrical devices must be designed, manufactured and used according to their intended purpose in a manner where they will not jeopardise the life, health or property of anyone. In order for this to be possible, the safety information and instructions provided with the equipment must have the necessary information concerning its safe use. The information, the markings on the devices and the documents included with the devices must be clear, understandable and comprehensible.

The standard concerning household electrical appliances[43] contains provisions for the structural requirements of electric sauna stoves. However, the market introduction of electrical devices intended for consumer use is not separately supervised, and authorities do not perform advance testing on them. Compliance and safety are the responsibility of the parties introducing the products to the market, i.e. the manufacturers and importers.

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38 www.ym.fi/rakentamismaaraykset
39 3/11
40 379/2011
41 1261/2010
42 1135/2016
43 EN 60335-2-53: Household and similar electrical appliances - Safety - Part 2-53: Particular requirements for sauna heating appliances and infrared cabins

The standard concerning low voltage electrical installations[44] contains requirements for special rooms and installations. In addition to these requirements, the safety distances and safety instructions determined by the manufacturer must be followed during the installation and use of an electric sauna stove.

The municipal address system does not have a comprehensive basis in an Act or decree. The Land Use and Building Decree[45] contains provisions regarding the issuing and marking of street names, other names and address numbers. The structure of a mailing and postal address has been defined in the public administration's recommendation concerning postal addresses[46] and in the recommendation concerning dwelling identification[47]. More detailed instructions and recommendations concerning the address system are included in the Association of Finnish Local and Regional Authorities's publication *Kunnan osoitejärjestelmä* (Municipal address system, Guidelines and recommendation, 2006). According to the Association of Finnish Local and Regional Authorities' publication, the primary purpose of an address is to single out the location in a manner that makes it easy to locate and find if necessary. In particular, the address system for buildings and dwellings is required by the safety authorities, which means that the unavailability of the address system substantially reduces the efficiency of rescue activities in an emergency.

According to the provisions and guidelines mentioned above, addresses are primarily issued to properties used as construction sites, buildings and, where necessary, other locations that may include boatyards, piers or other locations that must be identified. The address of a plot or other construction site located at the corner of streets and roads or between them must primarily be defined according to the street or road through which the construction site or building is entered. A building may have several addresses, for example when a house is located at a corner, but an individual flat must always have only one address determined by the street or road that passes the staircase, even in corner houses. In other words, if access to different staircases within the same building occurs via different streets, the recommendation states that different addresses should be defined for them.

Provisions concerning immigration are contained in several different Acts. The Aliens Act[48] contains provisions for, among other things, the prerequisites for entry into the country and residence therein, employment, international protection, removal from the country and protection measures.

The Act on the Promotion of Immigrant Integration[49] contains provisions on the duty of the municipalities and government to promote the active participation in society of immigrants. The actions promoting integration listed in the Act include, for example, the initial assessment, the integration plan and its follow-up and the integration training. Performing the initial assessment and drawing up the integration plan is primarily the responsibility of the TE services. However, the municipality is responsible for them when the immigrant's state of health, age, family status or comparable reasons prevent the immigrant from participating in employment activities promoting integration. The municipality is also responsible for the integration plans of underage immigrants and integration plans for families on a discretionary basis. Furthermore, the municipal integration programme may include a plan on the promotion of the integration and social reinforcement of children, young people and other groups

44 SFS 6000. Electrical installations in saunas are discussed under item 7-703 in particular.
45 895/1999
46 JHS 106
47 JHS 109
48 301/2004
49 1386/2010

outside of the workforce. The integration training includes lessons in Finnish or Swedish and other education that promotes the immigrant's abilities as a member of society, their cultural skills and life management skills.

The Reception Act or the Act on the reception of persons seeking international protection[50] applies to asylum seekers or foreigners who, upon arrival in Finland, indicate that they are applying for international protection. The Finnish Immigration Service, operating under the Ministry of the Interior's guidance, is responsible for the guidance, planning and supervision of the practical reception arrangements. The reception centres may be established by the government, or the Finnish Immigration Service may agree on their establishing with municipalities, joint municipal authorities, public corporations (such as the Finnish Red Cross) and foundations. According to the Act, reception services include work and studies that aim to promote the independent initiative of the residents of the reception centre. In theory, these activities are mandatory for the residents.

The statutory task of the Finnish Immigration Service[51] is to process and decide on matters concerning foreigners and Finnish citizenship, and to manage the planning of the reception of asylum seekers. The Nationality Act[52] contains separate provisions on the receipt of a Finnish citizenship.

In addition to the acts mentioned above, some other acts also contain provisions regarding immigration and immigrants.[53]

The contents of integration training are defined in more detail in the *Foundations of the syllabus for the integration training of adult immigrants*[54]. The integration training includes language and communications studies, skills for working life and society, and personal guidance and consultation. The syllabus mentions slightly over fifty areas of language competence, one of them being acting in an emergency. Furthermore, the section concerning the basic services of society mentions safety as a word under the different topics. A student who proceeds to the working life training period studies the safety instructions of the worksite, and the optional parts of the integration training may include training for an occupational safety card and first aid training.

2.7 Other studies

2.7.1 Study on pressure management during flat fires from Aalto University

The publication *Paineenhallinta huoneistopaloissa*[55] (Pressure management during flat fires) by Aalto University states that positive pressure caused by a fire may prevent the residents from rescuing themselves if the room under fire has doors that open inwards. According to the study, a fire inside a tight low-energy building or a tall building will most likely cause positive pressure in excess of 100 Pa due to the tight external envelope of the building. In fires that develop very quickly, the pressure will rise substantially higher, such as to a value of 1,600 Pa measured experimentally.

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50 746/2011
51 156/1995
52 359/2003
53 Provisions concerning matters and phenomena related to immigration are also included in some other acts, such as the Act on the treatment of detained foreigners and detention units (116/2002), the Act on the Application of Residence-Based Social Security Legislation (1573/1993), the Non-discrimination Act (1325/2014) and several EU directives and decrees.
54 Finnish National Board of Education, Regulations and instructions 2012:1.
55 Hostikka, S. & Kallada Janardhan, R. (2017) *Paineenhallinta huoneistopaloissa* (Pressure management during flat fires).

The highest pressures observed in the study were even higher than those mentioned above. When fire dampers were used to close the inlet and exhaust air ducts, temporary pressures could reach up to 3,200–8,100 Pa. Positive pressure of this magnitude may cause severe structural damage and substantially affect the dynamics of the fire, for example due to the rapid release of additional oxygen through the broken structures.

The current provisions of the National Building Code of Finland (E1, 2011) on the fire safety of buildings does not recognise positive pressure and its risks for the rescue of people or the durability of structures. Therefore, the study by Aalto University recommended that positive pressure should be taken into account in the building code and that doors opening inwards should not be allowed along exit routes.

2.7.2 Earlier studies concerning the safety of immigrants

The safety and well-being of immigrants has been examined in several other studies[56], and the immigrants' sense of safety is also a separate question in the *immigrant barometers*.[57] In these studies, the immigrants' sense of safety refers to the lack (or existence) of external threats, such as threats of violence or racism, and on the other hand, it refers to the police force's visibility and ability to counter such threats. Based on these studies, the sense of safety for people with foreign backgrounds is built from psychological and physical well-being, sense of belonging and trust and opportunities to receive assistance for everyday situations. People with foreign backgrounds rely on the Finnish social and health care, the justice system and the police, and feel that they receive assistance from their neighbours. Experiences of discrimination and violence erode the sense of safety. Traumatic events experienced in the former home country may also affect life and the ability to function.

These studies have determined, among other things, that successful integration, active participation and a sense of community promote immigrants' sense of safety. One of the problems that arose, however, deals with the integration activities that were considered to cause lack of initiative and to start too late. Other observations concerning the development of integration are related to, for example, the focusing of resources between different authorities and agreeing on the focus points of the activities (process descriptions, competence chains), increasing encouragement and teaching wider topics during integration. The reports also focus attention on the fact that immigrants living in separate areas (excessive segregation) reduces the adoption of the Finnish culture and norms. Healthcare services for immigrants were also brought up as an area for improvement, since the current service system only reaches a part of the group that requires services.

However, a similar amount of researched information is not available regarding matters covered by the second definition of a sense of safety, such as the fire safety of the immigrants' homes or their accident risks. The matter has been discussed in at least the Ministry of the Interior's publication *Arjen ja asumisen turvallisuuden parantaminen*[58] (Improving the safety of

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56 Extensive reports on the subject include the following recently published reports, for example: Castaneda, A.E. et.al. (2012) *Maahanmuuttajien terveys ja hyvinvointi,* Castaneda, A. et.al. (2015) *Ulkomaalaistaustaisten psyykkinen hyvinvointi, turvallisuus ja osallisuus,* Tilastokeskus (2015) *Ulkomaista syntyperää olevien työ ja hyvinvointi Suomessa 2014 –tutkimusraportti,* Laitinen, K., Jukarainen, P. & Boberg, H. (2016) *Maahanmuutto & turvallisuus – arvioita nykytilasta ja ennusteita tulevaisuudelle.*

57 Ministry of Employment and the Economy (2013) *Maahanmuuttajabarometri 2012.*

58 Ministry of the Interior (2012) *Sisäisen turvallisuuden ohjelman alatyöryhmäraportti/2012* (Subworkgroup report from the internal safety programme).
The special analysis concerning immigrant safety is only included in the above subworkgroup report, not in the internal safety and security programme. Ministry of the Interior (2012) *Turvallisempi huominen. Sisäisen turvallisuuden ohjelma. (Safer tomorrow. Internal safety and security programme.)*

everyday life and housing), which states that a lack of language skills may contribute to the risk of fire hazards, traffic accidents, occupational accidents and leisure time accidents. The report brings up the improvement of the knowledge and skills of immigrants, which requires identifying attitudes and habits and providing the necessary coaching. Peer support and participation in the operation of the community are also discussed as tools for ensuring the understanding of the messages and preventing the realisation of the risks. In addition to improving language training, it should be ensured that any key safety information is available in plain language. In addition to immigrants, plain language is helpful to people with language difficulties, disabled people, children, young people and the elderly. The report also stated that more in-depth information is required in order to survey the safety situation of immigrants. The existing reports should be extended in a manner that allows for receiving information on the everyday safety of immigrants.

A thesis work prepared for the Emergency Services College in 2007[59] observed that the amount of education or safety advice targeted towards immigrants was low at that time. Education had been provided in the immigrant classes in secondary school, at the reception centres and during separate education events. The thesis work stated that induction training provided to immigrants should include safety training in fire safety in the home, making an emergency call and first aid, for example, since the immigrants' countries of origin may not have had any type of safety instruction or reliable authorities. The work description of the rescue authorities may also be unclear to immigrants, and the rescue department is often compared to the police. The role of social services was brought up as an observation: when the social workers visit the home, they review practical safety matters, such as the use of electrical devices and the significance of the fire detectors. These matters are also refreshed during the integration period when necessary, and safety may be a topic for a thematic day of integration training. One of the conclusions of the work was that rescue authorities and social authorities should improve their cooperation within the field of safety communication. For example, rescue departments could train social services employees who work with immigrants.

Another thesis work already mentioned above[60] made concrete suggestions for the improvement of safety at the reception centres. The development of safety requires interaction and cooperation between the asylum seekers, reception centre employees, the police and the rescue departments. Asylum seekers must be provided with training that includes, in addition to the factors affecting the safety of the reception centre, explanations of the rescue department's models for operation, values and organisation and the cooperation between different organisations, such as the police and the rescue department. An asylum seeker who has been at the reception centre for a longer time and has suitable personal characteristics for assuming responsibility may also be made a safety representative an provided with more training on safety-related matters. They may supervise and guide the other residents and manage the guidance of residents who share the same language, in particular.

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59 Kontula, E. & Salmela, E. (2007) *Maahanmuuttaja valistettavana - Erityistarkastelussa kiintiöpakolaiset kolmella pelastustoimen alueella.* (Immigrants as learners – Special focus on quota refugees in three rescue services districts.)

60 Räsänen, 2016.

2.7.3 Study on Finland's capability to accept large-scale entry

The safety of reception centres, especially from the point of view of the rescue authorities, was analysed as part of a project[61] that will be completed at the Ministry of the Interior in 2017. According to the PRONTO data utilised in the sub-study, there were 61 fires at reception centres[62] during the review period (1 January 2014 – 11 October 2016), of which 53 were building fires. Fires occurred at 40 different centres and most of them (71%) were considered to be caused by human activity. 13 people sustained minor injuries in the fires. Out of the building fires that led to injury, five were related to cooking and one was related to using a sauna as a drying room. Other assignment types used in the alarms included, for example, damage prevention (18 assignments), first response (11), assistance (11), rescue of humans (10), traffic accident (9) and animal rescue (9).

During the review period, by far the largest assignment group was the inspection or verification of automatic fire detectors, for which the rescue services received 1,480 alarms, 88% of all studied alarms concerning reception centres. Approximately half of these assignments were due to cooking. According to the information received from the author of the study in a hearing, the effects of a different culture could be seen in a very concrete manner during these assignments. For example, residents who were used to gas flames or open flames could keep a stove's cast iron hotplates permanently on in order to make it easier to start cooking, or they could fry fish on top of the bottom pan of an electric oven. The fact that apartment-type reception centres did not have enough personnel contributed to the problems. When responding to alarms, emergency medical care and rescue services could easily encounter barriers of language and culture.

According to the expert interviews included in the study, some of the rescue departments had identified the instruction and training needs concerning the operation of the reception centres in a risk-informed manner and entered into permanent cooperation with them. Safety trainings, such as exit drills and first response fire-fighting drills, safety walkdowns and presentations of emergency medical care had been arranged for the personnel and, in some areas, also to the residents of the centres. Some of the rescue departments had considered that arranging the training is primarily the responsibility of the operator.[63]

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61 Ojala T. & Kokki E. (2017) *Suomen kyky vastaanottaa turvapaikanhakijoita. Turvallisuus pelastustoimen ja viranomaisyhteistyön näkökulmasta.* (Finland's capability for receiving asylum seekers. Safety from the point of view of rescue services and authority cooperation.) The plan is to publish the final report for the entire project as *Suomen kantokyky laajamittaisessa maahantulossa eilen, tänään ja huomenna. Varautumissuunnitelmasta päätöksen toimeenpanoon* (Finland's ability to cope with large-scale entry yesterday, today and tomorrow. From preparedness plan to execution).

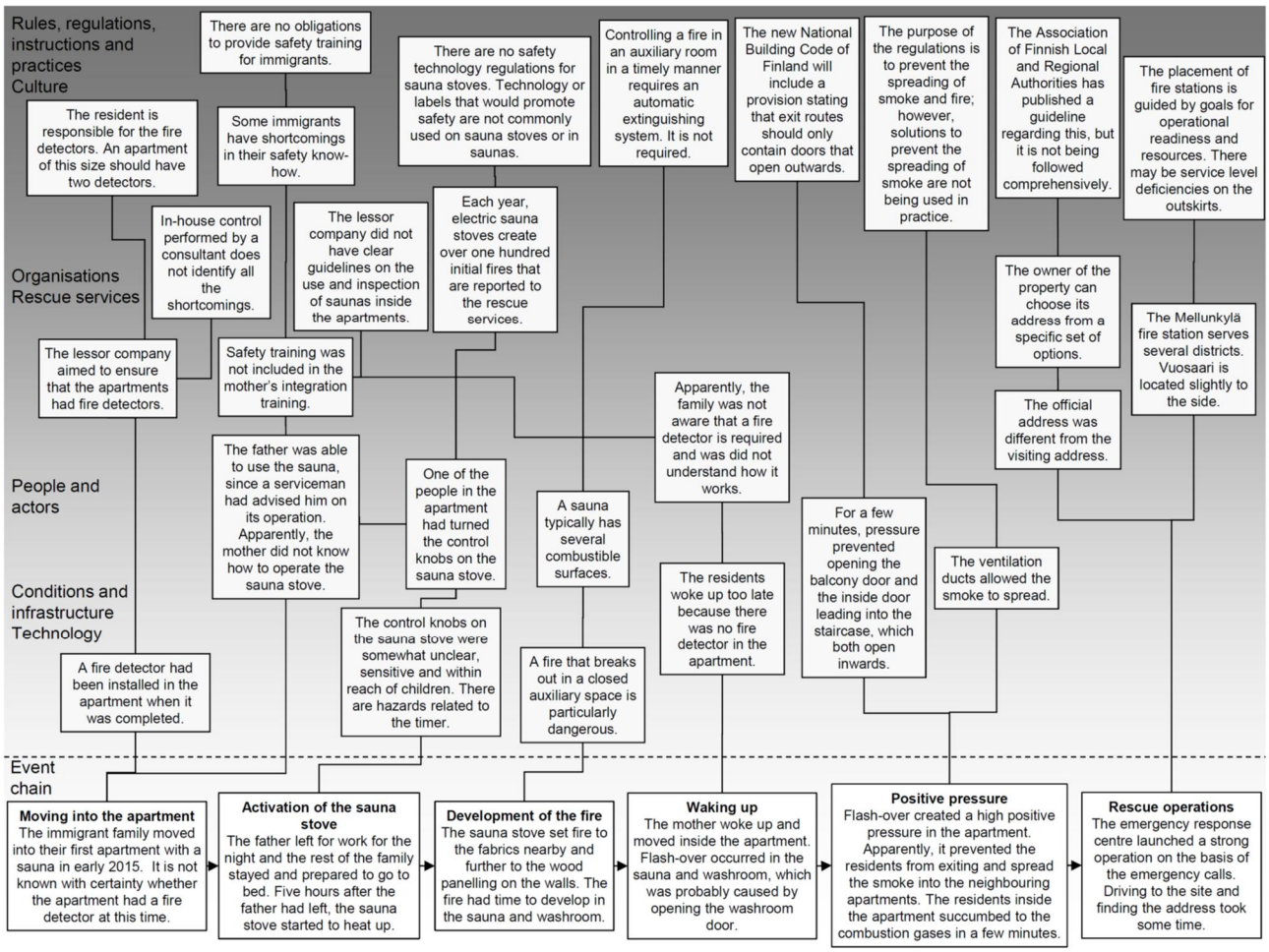
62 The study found that there had been rescue department assignments at 95 different (institutional) reception centres. The Finnish Immigration Service had provided the addresses of 112 reception centres for the study, which means that assignments concerned 85% of the reception centres.
During the review period, some asylum seekers were directly placed in flats or terraced houses. The above study could not receive information on emergencies and incidents that occurred there, mainly due to difficulties in the alignment of addresses and the exact time period.

63 The study also brought up safety risks related to reception activities as identified by different rescue departments. Some properties were housing clearly larger numbers of people than permitted in the construction licence for the facilities, or there were plans in place to do this. For example, there may have been a plan in place to use a former boarding house designed for 144 people to accommodate 450 asylum seekers. Some facilities were unsuitable for housing, and their fire and exit safety very often fell severely short of the requirements.
The partner network of rescue departments reacted to these problems immediately during the autumn of 2015, and on 3 November 2015, it approved for national use the reception centre guidelines drawn up by the Central Finland Rescue Department, which contained statements regarding, for example, the intended purpose of the buildings, the number of people, fire detectors and alarms, exit arrangements, fire compartmentation, surface materials, first response fire-fighting equipment, rescue plans and authority supervision.

The study also included a questionnaire sent to the reception centres. According to nearly all of the centres that responded (89%), their personnel had sufficient prerequisites for acting in case of emergency, and most (70%) also agreed on the prerequisites of the residents, despite the problems described above.

3 ANALYSIS

The Accimap method[64] has been used in the analysis of the accident, and the breakdown of the analysis text is based on the Accimap diagram drawn up by the investigation team.



Kuva 8. Accimap diagram.

3.1 Analysis of the accident

3.1.1 Moving into the flat

After the family's mother and the older children moved to Finland, the family had been living in the adjacent tenement for approximately one year. The flat where the accident occurred and where they moved in early 2015 was the first flat with a sauna for the mother and children.

Ensuring the safety of housing is an important part of the social responsibility of housing cooperatives and municipal tenement companies in particular. In the currently investigated

64 The accident is described as a chain of events in the lower part of the Accimap diagram. The identified decision-makers and other levels guiding the operations are marked on the left side. The analysis of the different parts of the event on different levels is performed from bottom to top. The bottom part of the diagram studies the individual accident under investigation, from where the analysis proceeds to wider perspectives and significances on the national or international level, for example.
J.Rasmussen and I.Svedung, 2000, Proactive Risk Management in a Dynamic Society (Accimap method), Swedish Rescue Services Agency, Karlstad, Sweden.

accident, the tenement company had originally installed fire detectors in all flats even though the lessor is not legally obligated to do so. The fire detector had been removed from the flat where the accident occurred, but it was not possible to determine the time of the removal. The missing of the fire detector was not observed in the flat inspection performed before the family moved in. However, the tenement company's inspection practice concerning the fire detector was inverse; the possible absence of the detector was marked in the protocol. It could be considered a better practice that the inspection protocol is marked when the fire detector has been tested and it is operating normally. This makes it substantially less likely that the matter is forgotten. The inspection also disregarded the fact that, according to regulations, the apartment would have required two fire detectors.

The instructions for the use of the flat's sauna and sauna stove are only included in the flat's folder. The material distributed to new tenants, the housing cooperative's rules and regulations or the rescue plan do not have any instructions or rules concerning them or their use. Reading through a massive may be considered substantially less likely way of familiarising oneself with a new flat than reviewing the shorter instructions distributed at time of moving. Furthermore, the folder or its contents may easily be lost or destroyed, in part or entirely, as the tenants change over the years.

The tenement company had provided no instructions for even an overall check of the condition of the sauna and sauna stove; they were not mentioned in the company's own flat inspection protocol or the supervision form intended for the new tenant to fill in. A functional inspection practice could affect the safety of saunas. Furthermore, checking for the existence of the home folder and verifying its condition was not a part of the company's practices, despite the fact that the folder contains unique information.

> Conclusion: *The tenement company had aimed to ensure safety above the minimum level required in the legislation, which means that it had operated according to the principles of ethical responsibility. However, the models of operation allowed for the existence of significant deficiencies. Tenement companies have substantial opportunities to influence the safety of the tenants.*

The only instructional material concerning the use of the sauna stove were the operating instructions in Finnish and Swedish, a single copy of which had been left in the home folder. Reading the instructions requires an understanding of the domestic languages. Whether or not the folder was still in the flat and whether its contents had remained in appropriate condition could not be determined during the investigation. In any case, the father requested assistance in the use of the sauna stove, first from the neighbour and then from the serviceman of the tenement company.

The family's father managed the use of the sauna and knowledge related to the operation of the sauna stove was not shared. This could have been due to the family's internal division of labour or at least in part due to an operations model arising from the culture.[65]

Since the mother of the family had only just started her studies in Finnish, it would have been impossible for her to independently study the use of the sauna stove from the operating instructions.

> Conclusion: *There was a level of incompetence in the family regarding the use of the sauna; competence in basic matters related to safety in the home was not shared. The*

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65 Lawrence-Webb, C., Littlefield, M. & Okundaye J.N. (2004) *African American intergender relationships. A Theoretical Exploration of Roles, Patriarchy, and Love.*

other adult was not aware of all the risks in the home and could not safely operate a hazardous electrical device.

3.1.2 Activation of the sauna stove

The sauna stove started warming up at around 01:40. The exact reason for the activation of the sauna stove could not be determined. Since the mother had hung laundry to dry in the sauna in the evening, it is possible that she considered leaving the sauna stove on for a while in order to expedite the drying. However, she was not successful at this and accidentally turned the control knob to the timer setting area. After this, the mother has forgotten about the matter, or the error could have been left uncorrected because the family had earlier encountered problems with the slow heating of the sauna. Without knowledge of the sauna's operating logic, she may have returned to the sauna after a while and considered the situation to be similar to before, without knowing that the control knob on the stove must be turned back to the zero position.

Another reason for the activation of the stove is that one of the children has turned the control knob for some reason. Since the sauna stove has an eight-hour timer, the activation may have occurred already at 17:40, or any time after that.

The possibility of an accident or technical defect was analysed during the investigation. According to the family's father, items in the sauna were in a slightly different order after the fire than they were when he left for work. For example, the baby-care table's side shelf made of linen that was found upright in the corner behind the sauna stove had previously always been on the floor of the sauna. Therefore, the mother has likely rearranged the items in the sauna in the evening, possibly while hanging the laundry. It is possible that when items were picked up from the floor, they have accidentally hit the easily turning control knobs, causing the sauna stove to activate. However, this may be considered unlikely, since in order to end up in the timer adjustment area, the control knob needs to turn extensively (by over 90 degrees) due to the impact. The suspicion of technical defect arose when the father of the family indicated during his hearing that there had been a problem with the heating of the sauna. However, when the sauna stove was examined by the laboratory of the National Bureau of Investigation, no technical defect was found that could have caused the fire to ignite.

The police investigation showed no indication that the fire had been wilfully caused and, therefore, a criminal act.

The control knobs on electric sauna stoves commonly operate in a manner where the power is connected by turning a switch that also acts as a timer. The sauna stove starts to warm up immediately when the knob is turned by only a little. When the knob is turned more, i.e. when the turning angle of the knob exceeds the start of the scale on the timer (in this case, at about 90 degrees or right angle), the control knob starts to act as a timer and only connects the power after the time selected on the scale has passed. The power connection logic in itself is not self-evident compared to conventional on/off switches used in most electrical equipment. The two-part scale on the control knob may cause surprises especially when using the stove for the first time or in cases that are otherwise unclear.

The operating instructions for the sauna stove were in a separate, printed booklet that was of high quality and identified the different risks. The sauna stove itself had no operating instructions or text that would allow for quickly checking the basic principles of its operation. The references to the operating instructions, in small print, that the sauna stove manufacturers use are not likely to be helpful; the operation of the stove will likely be experimented upon. The mentions of the fire hazard caused by covering the sauna stove, which are important in

themselves, may easily remain imprecise since, in addition to covering, a fire hazard is also created if items are placed nearby.

> Conclusion: *The logic of the control knobs of an electric sauna stove is not self-evident, and sauna stoves do not usually contain clear visual or otherwise understandable instructions that would simplify their use. The point of view of the unaccustomed user has typically not been properly taken into account in the design. The "user interface" could be substantially improved.*

Technical solutions improving the safety of electric sauna stoves have not been developed, even though rescue departments receive over one hundred alarms per year that are related to the use or technology of electric sauna stoves. In the flat where the accident occurred, the control knobs for the sauna stove were at the very bottom of the stove, hidden from sight. In terms of operating ergonomics and observing the movement of the knobs, the bottom edge is not a good place for the controls. If the knob is accidentally turned too far, to the timer area, the mistake is not easy to observe.

Control knobs located at the bottom edge of the stove were easily accessible to children. They turned easily and had no child lock mechanism. Furthermore, the sauna stove did not have an indicator to signal that the stove or its resistors are switched on, such as a light that would have notified that the power is on and indicated the area selected on the control knob in an easily understandable manner.

In addition to the temperature limiters and fuses built into the sauna stoves, there are no technical safety devices for switching off the sauna stove in case of problems.

> Conclusion: *Basic electric sauna stove models do not commonly contain even the most simple safety technology. These include, for example, better operating ergonomics and the use of child safety locks and indicators.*

The danger in saunas is not easy to identify, since saunas are a traditional part of Finnish culture. Those who have grown up here have, at least previously, become accustomed to saunas since they were little and understanding of their dangers has been passed on as oral tradition.

The design practices and building culture of saunas commonly only uses the minimum safety distances reported by the manufacturer of the sauna stove, and especially in smaller saunas, the foot railings act as the only protective railings for the sauna stove. It is not customary to create additional markings on the railings, such as symbols forbidding the drying of clothes.

> Conclusion: *More and more Finns have grown up under conditions where saunas do not exist, and going to the sauna is no longer an inseparable part of Finnish housing culture. In many cases, sufficient attention is not being paid to the structural safety of saunas during their design and execution. As more and more users are unfamiliar with the sauna, a user-oriented approach to safety is no longer enough.*

3.1.3 Development of the fire

The sauna stove set fire to the fabrics nearby. Fibrous substances usually burn in a manner where the substance itself glows and releases combustible gases which burn. This is likely how the fire advanced to the dry wood panels in the sauna, which ignited easily. The sauna had wood panelling overall, so there was slightly over 10 square metres of burning surface in the walls and ceiling. When organic substances such as wood warm up while burning, they also disintegrate chemically or form large amounts of combustible pyrolysis products. Since

there was not enough oxygen for the fire, the fire that started forcefully was partially smothered. The sauna and washroom started to fill up with hot combustion gases.

Since the flat did not have an automatic extinguishing system, the fire was able to develop in the closed auxiliary space (sauna and washroom). If an extinguishing system had been installed, it would have detected the fire, extinguished it and warned the tenants with a loud warning sound. Most systems will also automatically report the fire to the emergency response centre.

Air supply is often insufficient for a fire inside a confined space, which keeps the combustion gases at an ignitable concentration. When the family's mother, in all likelihood, opened the washroom door, the fire received the necessary oxygen and the combustion gases ignited quickly. The leak caused by the ruptured domestic water pipe in the ceiling of the washroom limited the fire somewhat.

> Conclusion: *A fire that breaks out in a closed auxiliary space is particularly dangerous. Controlling a fire in an auxiliary room in a timely manner requires an automatic extinguishing system, which is not required for dwellings in Finland. Research shows that it would be the most effective manner of preventing fire fatalities.*[66]

3.1.4 Waking up

The flat where the accident occurred did not have a fire detector, even though one had been installed by the tenement company. Someone had irresponsibly removed it.

Fire detectors react to smoke and help to observe the fire earlier, which leaves more time for first response fire-fighting, exiting the flat and alerting help. However, individual battery-operated fire detectors are easy and quick to deactivate by removing the battery or the entire detector, and the owner of the building, such as a housing cooperative or tenement company, cannot supervise the tenant's activities in real time without disturbing their domestic peace. The inoperability of the detectors is worryingly common.

The family woke up to the fire and at least the mother moved around in the flat. Since the flat's outer door was open, it is possible that the mother visited the staircase to find the source of the smoke, wanted to vent out the smoke inside the flat or check the availability of an exit. When returning to the flat from the staircase or otherwise moving inside the flat, she probably opened the washroom door, which caused the oxygen starved fire to flash over and the mother received burns on her other hand. At the same time, the flames penetrated deep into the rest of the flat.

The mother would have probably woken up sooner if the flat had had at least one working fire detector. According to the father's account, the family had no information about the need for a fire detector or its operation and requirements.

> Conclusion: *Regulations unambiguously make the tenant responsible for the fire detectors. Since this is the case, they may be unattended to for different reasons and nobody or no other party will cover for this deficiency. Not all apartments have the number of fire detectors required by the regulations. Furthermore, the fire detectors are also commonly inoperable due to the battery being missing or depleted, the detector being incorrectly placed or the ageing of the detector.*

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66 Rinne T., Tillander K., Vaari J., Belloni K. & Paloposki T. (2008 ja 2010) *Asuntosprinklaus Suomessa. Vaikuttavuuden arviointi. Osat 1 ja 2.* VTT's informational bulletins 2430 and 2527.

3.1.5 Positive pressure

The flash-over of ignitable flue gases caused a significant positive pressure in the flat; as a result, the doors that open inward were temporarily not available, even though exiting would still have been possible through the balcony door, at least. If the positive pressure created in the flat was at the lower limit of 100 Pa from the study by Aalto University, taking into account the size of the outside door it amounted to a force of slightly over 17 kg resisting the opening of the door. However, since the fire progressed very quickly, the positive pressure has probably been much higher than this. For example, the positive pressure of 1,600 Pa observed in the Aalto University study for a rapidly proceeding fire would create a force of over 270 kg resisting the opening of the door.

During fires inside dwellings, temporary overpressure usually lasts between 100 and 200 seconds. It is possible that those inside the flat where the accident occurred were prevented from leaving because the doors that open inward did not open. Positive pressure may also explain why the inner door leading from the flat into the staircase had been closed after the mother's possible visit into the staircase.

> Conclusion: *Positive pressure will temporarily prevent exiting the burning flat if there are doors that open inwards along the exit route. According to the new National Building Code under preparation, doors that open inwards will no longer be allowed in new and renovated dwellings.*

Smoke spread into the other flats through the ventilation channels due to the positive pressure caused by the fire. One tenant had to leave their flat in the early stages of the rescue and fire-fighting activities.

> Conclusion: *The fire and exit safety of housing blocks is based on people being able to safely remain in their own flats for the duration of a fire that takes place in another flat. However, the effects of positive pressure created by a fire is not sufficiently taken into account when designing ventilation systems. Even if the fire could not spread from one fire compartment to another, the spreading of the smoke through the ventilation ducts may cause danger to people in the other flats.*

3.2 Analysis of rescue operations

The emergency response centre received several emergency calls where the neighbours reported observations of noise and smoke. The emergency response centre made the alarm during the first emergency call. The assignment type used was in line with the information received in the report and the alarm was started very quickly, only 46 seconds after the start of the call.

The address used was the official street address of the location, Vuotie 59A, which was reported by the first caller. The address was misleading, which made finding the correct staircase difficult. The visiting address that differs from the official address and that was mentioned twice by the second caller was not relayed to the rescue units, which ended up in line on Vuotie. According to the neighbour who observed the situation from his balcony, this resulted in a time loss of approximately two minutes. In the hearings of the rescue department's personnel, the estimate of the time loss caused by the incorrect address was approximately one minute.

The emergency response centre did not provide the rescue units with additional information describing the nature of the situation.

Conclusion: *The information concerning the address and assignment are intended for the authority responsible for the activities, not only for recording into the emergency response centre's data system. A precise visiting address allows for locating the site without unnecessary delay, and other additional information improves the situational awareness of the rescue services, thereby improving operative leadership. The models of operation of emergency response centre work and the technology used for the work did not ensure information transfer, and as a result, the information was not properly relayed to the authorities responsible for the assignment.*

Rescue operations at the site were swift, resources were sufficient and emergency medical care was sufficient, but the fire claimed four lives nevertheless. The rescue and ambulance units used the same voice communications group. The arrangement worked well and allowed for data transfer from rescue services to emergency medical care and vice versa. Information exchange between the fire chief on duty and the police was also fluent.

A combustion engine operated saw that was intended to create a smoke removal opening on the door of the flat where the accident occurred did not start immediately, most likely due to the smoke that was in the staircase. However, this did not delay the entry of the smoke divers, since the door was already open. This problem would have been avoided with a battery operated saw.

The debriefing discussion for rescue personnel was arranged quickly and as comprehensively as was possible at that time.

The weather did not affect the creation of the accident or the rescue activities.

In Helsinki, the assignment type "402B building fire: medium severity" also includes an emergency medical care unit that is required to be present due to the occupational safety risks related to fire-fighting work and due to surprising situations such as this. Furthermore, the system used in Helsinki stipulates that firefighters participate in emergency medical care during nearly every shift by working in ambulances, which ensures that their emergency medical care skills are sufficient. The additional emergency medical care units were alerted immediately after the nature of the situation revealed itself and they were at the location very quickly.

Conclusion: *The practices of the Helsinki City Rescue Department were shown to be effective. The sufficient resources of the rescue services and the good integration of the medical rescue services ensure that assignments are handled effectively and emergency medical care is started in a timely manner.*

The nearest rescue station to Vuosaari is the Mellunkylä station that also serves several other districts. Even though the entire residential area of Vuosaari is in risk zone 1, reaching the area nearly always takes longer than the target time of six minutes.

Conclusion: *The unit arrival times are often longer for locations near the edges of the risk zones. The placement of rescue stations is not optimal in terms of the district of Vuosaari.*

3.3 Analysis of the operation of the authorities

3.3.1 Authority activities concerning immigration

The mother of the family was a stay-at-home mother after the family moved to Finland. She returned to the TE office as a customer after the youngest child turned two years old and started the integration training. At the start of the training, approximately three years had passed since her arrival in the country.

Since the family affected by the accident was not a customer of the City of Helsinki's immigration unit, they were not separately supported by house calls or other methods used by the immigration unit. Immigrant families are seldom supported by means of social property management or other similar support, for example.

> Conclusion: *The mothers of immigrant families can easily form a marginalised group, since they are not available for work and thus not customers at the TE offices, and because the initial assessment and integration plan prepared by the municipalities and the social work based on them are considered discretionary activities. Participation in society and development in a safety-aware manner require contact with other people as well as practical support and guidance.*

The safety skills of immigrants are, on average, weaker when the immigrants arrive from a very different culture. Immigrants both encounter and cause new and different risks in Finnish society. The risks are at their highest after their arrival in the country, such as in the reception stage, and they are emphasised in individual activities, such as in decentralised, apartment-type reception centres and in scenarios with stay-at-home mothers. A more systematic approach to safety training for immigrants was only adopted in 2015, when immigration reached higher levels than before. Pioneering areas, such as Pirkanmaa, have already taken action before this time.

There is no national minimum standard, such as a syllabus, for the safety training related to the reception stage. Furthermore, the Finnish Immigration Service has not provided any instructions on the matter, since the opinion of the agency is that the centres and their safety challenges are very different. In the absence of a national guideline, starting the safety-related training has depended on the initiative of the local actors, such as the reception centres and rescue departments. Therefore, there are large differences between the reception centres due to conditions and the available resources. Some asylum seekers continue to pass through the system with no safety training.

The official syllabus controlling the arrangement of integration training does not include any studies guiding towards the safety of everyday life and housing or other safe activities; the syllabus only makes vague references to safety. According to the syllabus, the organiser of the training should cooperate with, for example, social services, Kela, the police or non-government organisations, but rescue services or other safety authorities or trainers are not mentioned as potential partners.

The integration training of the mother who died in the fire had no safety content at all.

Those who move to Finland for work or study are not covered by the official integration system, so their employers and places of study are responsible for their induction into safety matters.

> Conclusion: *The safety skills of immigrants are not ensured, and national regulations concerning knowledge development or guidelines ensuring the sharing of good practices do not exist. Including safety training in reception activities, integration training and the induction activities of workplaces and places of study are at the responsibility of the operator and, therefore, the practices under different conditions and at different places are very different and varying in terms of quality.*

Safety communications material for immigrants has been published in large amounts in recent years. On the one hand, the activities have been planned, but they have also been spon-

taneous reactions to the different needs observed in different areas or sectors. In some respects, the work is still incomplete, since there is very little material on traffic safety available in plain language or in multiple languages.

The safety information contained only material that everyone is sure to receive, the Welcome to Finland brochure, is not very extensive or systematic. Furthermore, the brochure has no Internet addresses that would lead to further information, such as the websites of rescue authorities, even though these are commonly present elsewhere in the brochure.

Written or electronic safety communications material is typically one-way communication. Studying the material and acquiring the information is entirely at the responsibility of the recipient, and direct feedback on understanding is not available. Therefore, written or electronic material alone cannot replace training and advice. Another problem is that, even though there is a wealth of material available, it may not reach the key target groups, since they may not receive it or study it.

> Conclusion: *Safety information contained in the only basic information material handed out to all immigrants is dispersed and disappears among the rest of the information. Other, more extensive safety communications material is only distributed occasionally.*

3.3.2 Selection of building addresses

The street address for the site of the accident was different from its visiting address. This caused a delay in starting the rescue operations. The address chosen by the property was such that there was an obvious risk of misunderstanding.

According to the principles for selecting an address listed in the Association of Finnish Local and Regional Authorities' guideline, the primary address of the site of the accident should have been Maustetehtaankatu 10 and the address of the staircases accessed exclusively from the Vuotie side should have been Vuotie 59.

> Conclusion: *In Helsinki, the holder of a property may freely select an address from the alternatives defined by the city engineering section, without an inspection performed by the authority. The Association of Finnish Local and Regional Authorities' guidelines regarding the matter are not legislation, which means that adherence to them is voluntary.*

3.3.3 Inspection activities performed as in-house control by rescue services

The purpose of in-house control at Helsinki City Rescue Department is to improve the safety awareness of the owners and residents of the buildings. According to a study completed at the Emergency Services College[67], the personnel of different rescue departments consider that in-house control presents a significant opportunity for the holders and owners of properties to take responsibility for their own safety, thereby reducing fire fatalities.

The electronic in-house control form filled in and submitted to the rescue department by a consultant authorised by the tenement company relays a very positive image of the safety awareness of the tenants in the tenement. According to the form, the tenants are aware of their responsibility to acquire a fire detector and they have been regularly informed concerning the acquisition and maintenance of the fire detector, for example. However, the police inspection concerning the operability of the fire detectors clearly indicates that several tenants

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67 Kuoppala, M. (2013) *Sähköisen omavalvonnan hyödyt ja haitat Pirkanmaan pelastuslaitokselle* (Pros and cons of electronic in-house control at Pirkanmaa Rescue Department).

either did not know or did not understand that fire detectors must be kept operable and maintained.

The in-house control form stated that a summary of the rescue plan had been distributed to the tenants. In actuality, a summary of the rescue plan is available for the tenants to read on the notice boards in the staircases. During the safety investigation, it was also observed that nobody had acknowledged the reading of the housing cooperative's rescue plan online, even though this function was built into the system.

> Conclusion: *The results of in-house control performed by an external consultant very often indicate what the instructions in the company's documents are or how the matters could be arranged. Supervision performed by consultants does not sufficiently indicate the true status of the matters*[68]*, and the Rescue Act's requirements of high-quality, effective control are only met in part.*

3.3.4 Psychosocial support

Psychosocial support was implemented well and, according to the information received during the investigation, the recipients of the support were also satisfied with it. The resources in Helsinki made it possible to start effective pair work at the site and proceed to uninterrupted further treatment. Assistance from neighbouring municipalities was not required.

The only area for improvement identified within the field of psychosocial support during the investigation was communication. A representative from social and crisis emergency services was not available for the media briefing held by the rescue department shortly after the accident, despite the fact that an invitation was sent. Furthermore, the interviews provided by the manager of social and crisis emergency services contained information that was unnecessarily detailed and personal.

> Conclusion: *Models of operation prepared in advance and sufficient experience or training are necessary prerequisites for the success of psychosocial support. Communication regarding psychosocial support must also be prepared for, since timely communication on correct matters, such as facts concerning the situation, typical reactions and the availability of assistance will calm those shocked by the accident and improve their chances of receiving assistance.*

4 MEASURES THAT HAVE BEEN TAKEN

Helsingin kaupungin asunnot Oy has decided to take over the maintenance of the fire detectors in the flats.

The Ministry of Employment and the Economy has decided to renew the Welcome to Finland brochure.

Helsinki City Rescue Department has limited the use of consultants in the in-house control of housing cooperatives by adopting new guidelines according to which the in-house control information may only be returned by the board of directors or another competent, responsible authority.

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[68] A similar observation was made during the investigation of a fire in a terraced house in Raahe in September 2016 (Y2016-03). A consultant had drawn up the rescue plan for the housing cooperative and filled in the in-house control forms. The tenants had not received any actual induction training. As a general conclusion of the investigation, it was stated that in outsourced services, the participation of the residents in the development of safety and the benefits from the plans are often minor.

In a cooperation meeting held in January 2017, the Uusimaa Centre for Economic Development, Transport and the Environment has obligated the personnel of all service providers offering integration training to participate in the training arranged by the rescue departments, and to review safety matters in all training groups, during both integration training and reading/writing training.

The pressure increase that occurs during a fire and the prevention of the opening of doors has been taken into account in the new fire safety regulations that are being prepared and for which statements have been compiled. According to the draft, doors that open inwards will no longer be allowed along exit routes. For this reason, the Safety Investigation Authority of Finland will not provide a separate safety recommendation regarding the problem related to overpressure observed during the investigation.

In order to develop addresses and other location information, the Ministry of Agriculture and Forestry is working on a location analysis project until the end of 2017. The project involves eight ministries, the Association of Finnish Local and Regional Authorities and the National Land Survey of Finland.

5 SAFETY RECOMMENDATIONS

5.1 Maintenance of fire detectors

The purpose of the fire detectors is to enable the early detection of fire, especially during the night, and exiting the site before the conditions become life-threatening. However, there are different uncertainties related to their operation, such as the fact that children do not always wake up to their sound. Therefore, the Safety Investigation Authority of Finland recommended in investigation Y2016-03[69] that the number of fire detectors should clearly exceed the current minimum requirement, and they should mainly be installed in all rooms and along exit routes.

The tenants are responsible for the existence and operation of the fire detectors, which is often emphasised. Fire detectors have been missing in several fires investigated by the Safety Investigation Authority of Finland. It would seem that emphasising the tenant's own responsibility is not enough. The owners of the properties and the parties maintaining them have good opportunities for assisting clients in caring for fire detectors.

The Safety Investigation Authority of Finland recommends that

The Ministry of the Interior, together with the actors in the property business, analyse and execute good practices regarding how the owners and maintainers of properties can be committed to ensuring, for their part, the existence and maintenance of fire detectors. If necessary, the duty of care for the fire detectors should also be focused on the tenement companies. [2017-S53]

The housing cooperative or the lessor may enquire about the status of the fire detectors from the tenants from time to time. The company may, for example, provide fire detectors to the tenants and perform installations and battery replacements. The status of the fire detectors should be ensured in particular during inspections related the change of tenancy.

5.2 Ensuring the safety skills of immigrants

Immigrants are new Finns who are integrating into society. As a group, however, they are heterogeneous and the duration of their integration varies. For some, the western safety thinking and safety culture and the authorities' models of operation are familiar; to others, they may be very foreign. In reception centres in particular, it has been observed that the safety skills of immigrants are, on average, weaker when the immigrants arrive from a very different culture.

The Safety Investigation Authority of Finland recommends that

The Ministry of Employment and the Economy, the Ministry of the Interior, the Ministry of Social Affairs and Health and the Ministry of Education and culture act together to survey the problems faced by immigrants in terms of the safety of everyday life and housing and renew the reception, integration and training system for immigrants in a manner where the immigrants' basic competences concerning safety can be ensured. [2017-S54]

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69 Safety Investigation Authority of Finland (2017) *Kahden lapsen kuolemaan johtanut rivitalopalo Raahessa 13.9.2016.* (Fire in a terraced house that led to the deaths of two children in Raahe, 13 September 2016.) Investigation report Y2016-03.

Safety training should be included in reception activities, integration training and the induction provided by workplaces and places of study. Special attention should be paid to preventing the creation of marginalised groups due to the discretionary nature of authority activities.

5.3 Improving the structural safety of sauna stoves and saunas

Each year, the operation or technology of electric sauna stoves cause over one hundred accidents or incidents leading to a rescue services assignment; slightly over half are caused by the erroneous operation of the sauna stove or sauna. In addition to these, there are incidents that the user can bring under control.

No systematic effort has been put into the reduction or prevention of human errors related to the use of sauna stoves. For example, easily understandable operating instructions are not attached to electric sauna stoves, the operation of the sauna stoves is often unergonomic, and sauna stoves do not generally employ safety technology, such as child locks or signals that indicate when the devices is switched on. Furthermore, in addition to the temperature limiters and fuses built into the sauna stoves, no technical safety devices for switching off the sauna stove in case of problems have been developed.

The Safety Investigation Authority of Finland recommends that

Harvia, Helo, Narvi and Iki-kiuas, the largest manufacturers of electric sauna stoves in Finland, develop the "user interface" of the sauna stoves in a way that makes the operation of the control knobs understandable, clearly indicates the switching on of the timer and sauna stove to the user, improves the operating ergonomics and provides sufficient safety features for children. These human error prevention features are also required in entry-level sauna stoves. [2017-S55].

Changing the requirements in the sauna stove standards would be a comprehensive solution and binding to all sauna manufacturers. However, a quicker and better end result can be achieved by means of the sauna stove manufacturers' own product development efforts. Finnish sauna stove manufacturers have good prerequisites for this. The best practices are often adopted into standards.

Safety must also be considered more clearly in the design practices and construction of saunas. A simple user-oriented approach to safety is not enough.

5.4 Promoting the proliferation of automatic extinguishing systems

In particular, a fire that ignites in a closed auxiliary space can easily go unobserved and develop into a large fire without anyone noticing. In addition to Vuosaari, this happened in Naantali in 2009[70]. In this case, the fire cannot be extinguished manually and exiting the premises may fail due to different reasons. An automatic extinguishing system, also known as a sprinkler system, may prevent the development of the fire.

An automatic extinguishing system provides opportunities for reducing the number of fire fatalities. The other means that have been tested for decades have been shown to be ineffective,

[70] Safety Investigation Authority of Finland (2010) *Viiden nuoren kuolemaan johtanut tulipalo Naantalissa 9.10.2009* (Fire leading to the deaths of five young people in Naantali on 9 October 2009). Investigation report B1/2009Y.

since the number of deaths has only decreased slightly. Many other fire safety requirements concentrate on preventing the spreading of the fire and smoke and they do not help the people inside the dwelling under fire. Nearly without exception, the resident of the dwelling where the fire started dies in the fire. In recent years, the number of deaths has been nearly 80 per year, which is clearly higher per capita than in the other Nordic countries.

Studies concerning the benefits of automatic extinguishing systems have been available for a long time and discussions have been had, but there are no decisions concerning their utilisation in conventional dwellings. The Safety Investigation Authority of Finland repeats the recommendation issued in investigation report Y2014-02[71], according to which

The Ministry of the Environment shall prepare a justified, long-term plan regarding whether automatic fire extinguishing systems should be installed in new and renovated blocks of flats and, possibly, other residential buildings. [Y2014-02/S1]

The necessary impacts assessments and cost and benefit analyses may be prepared in order to support the decision-making.

5.5 Determining the street address based on visiting address

In the investigated accident, an unclear address caused unnecessary delays and trouble. Access to staircase A took place via a street that differed from the official address.

The primary purpose of an address is to single out the location in a manner that makes it easy to locate and find if necessary. This is especially important for urgent authority assignments, where street addresses that differ from the visiting address may cause significant delays.

There are no detailed provisions concerning the definition of the address. The principles stated in the guide published by the Association of Finnish Local and Regional Authorities are good and following them would eliminate any address problems. However, it is only a guideline and adherence to it is voluntary for the municipalities.

The Safety Investigation Authority of Finland repeats the recommendation issued in investigation report B3-2006Y[72], according to which

Alongside the Association of Finnish Local and Regional Authorities and other administrators of the address system, the Ministry of the Interior should investigate how well the creation and updating of the address system functions. Furthermore, the need for more detailed legislation in addition to the existing instructions should be investigated. [B3/06Y/S4]

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71 Safety Investigation Authority of Finland (2014) *Kerrostalopalo Turussa 17.3.2014* (Fire in a housing block in Turku on 17 March 2014). Investigation report Y2014-02.

72 Safety Investigation Authority of Finland (2007) *Onnettomuus louhintatyömaalla Espoossa 24.4.2006.* (Accident at an excavation site in Espoo on 24 April 2006.) Investigation report B3/2006Y.

The Ministry of the Interior shall ensure that the needs of the safety authorities are sufficiently taken into account in the ongoing location data reporting project.

While performing their duties and carrying out inspections and supervision, rescue services, social and healthcare services and the police should report to the municipalities any addresses that they discover to be difficult to find and incorrectly determined, in order for them to be corrected.

Helsinki, 4.9.2017

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Reijo Salminen

REFERENCES

Written sources

Castaneda, A., Larja, L., Nieminen, T., Jokela, S., Suvisaari, J., Rask, S., Koponen, P. & Koskinen, S. (2015) *Ulkomaalaistaustaisten psyykkinen hyvinvointi, turvallisuus ja osallisuus.* Ulkomaista syntyperää olevien työ ja hyvinvointi -tutkimus 2014 (UTH). THL's working document 18/2015.

Castaneda, A.E., Rask, S., Koponen, P., Mölsä, M. & Koskinen, S. (toim) (2012) *Maahanmuuttajien terveys ja hyvinvointi: Tutkimus venäläis-, somalialais- ja kurditaustaisista Suomessa.* THL's report 61/2012. Tampere: Juvenes Print - Tampereen Yliopistopaino Oy.

Hatakka, S., Valkeinen, H. & Huurinainen, V. (2014) *Sähkölaitteistoista aiheutuneet tulipalot ja palovaarat Suomessa - esiselvitys.* Report 1/2014. Tukes.

Hostikka, S. & Kallada Janardhan, R. (2017) *Paineenhallinta huoneistopaloissa.* Aalto University publication series Science + Technology 1/2017

Kontula, E. & Salmela, E. (2007) *Maahanmuuttaja valistettavana - Erityistarkastelussa kiintiöpakolaiset kolmella pelastustoimen alueella*. Thesis work for the Emergency Services college.

Kuoppala, M. (2013) *Sähköisen omavalvonnan hyödyt ja haitat Pirkanmaan pelastuslaitokselle.* Thesis work for the Emergency Services college.

Laitinen, K., Jukarainen, P. & Boberg, H. (2016) *Maahanmuutto & turvallisuus – arvioita nykytilasta ja ennusteita tulevaisuudelle*. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 7/2016.

Lawrence-Webb, C., Littlefield, M. & Okundaye J.N. (2004) *African American intergender relationships. A Theoretical Exploration of Roles, Patriarchy, and Love*. University of Maryland, Baltimore County.

Nieminen, T., Sutela, H. & Hannula, U. (2014) *Ulkomaista syntyperää olevien työ ja hyvinvointi Suomessa 2014*. Helsinki: Statistics Finland.

Nordbakke, S. & Assum, T. (2008) *Innvandreres ulykkesrisiko og forhold til trafikksikkerhet.* TØI rapport 988/2008. Oslo: Transportøkonomisk institut.

Ojala, T. & Kokki, E. (2017) *Suomen kyky vastaanottaa turvapaikanhakijoita. Turvallisuus pelastustoimen ja viranomaisyhteistyön näkökulmasta*. Emergency Services College.

Safety Investigation Authority of Finland (2017) *Kahden lapsen kuolemaan johtanut rivitalopalo Raahessa 13.9.2016*. Investigation report Y2016-03.

Finnish National Board of Education (2012) *Aikuisten maahanmuuttajien kotoutumiskoulutuksen opetussuunnitelman perusteet.* Regulations and instructions 2012:1. Tampere: Juvenes Print - Tampereen Yliopistopaino Oy.

Rinne, T., Tillander, K., Vaari, J., Belloni, K. & Paloposki, T. (2008 and 2010) *Asuntosprinklaus Suomessa. Vaikuttavuuden arviointi. Osat 1 ja 2*. VTT's informational bulletins 2430 and 2527.

Räisänen, T. (2016) *Länsi-Uudenmaan pelastuslaitoksen varautuminen pakolaiskriiseihin.* Thesis work for the Emergency Services college.

Ministry of the Interior (2012) *Sisäisen turvallisuuden ohjelman alatyöryhmäraportti/2012.*

Ministry of the Interior (2012) *Turvallisempi huominen. Sisäisen turvallisuuden ohjelma.* Helsinki: The Ministry of the Interior.

Sisäministeriö (2016) *Turvallinen ja kriisinkestävä Suomi - pelastustoimen strategia vuoteen 2025*. Ministry of the Interior publication 18/2016.

Statistics Finland (2015) *Ulkomaista syntyperää olevien työ ja hyvinvointi Suomessa 2014 –tutkimusraportti*. Helsinki: Statistics Finland.

Ministry of Employment and the Economy (2013) *Maahanmuuttajabarometri 2012*. Ministry of Employment and the Economy's reports 11/2013.

Investigation material

1) Alarm analysis, accident analysis and building analysis for the Vuosaari accident from the PRONTO system
2) Emergency response centre records
3) Meteorological data
4) Investigation material from the police, including the statement from the forensic laboratory of the National Bureau of Investigation
5) Information from the medicolegal investigations
6) Samples from the PRONTO system regarding training events arranged for immigrants and the unit response times for assignments in the Vuosaari area
7) Photographs by the Safety Investigation Authority of Finland, the rescue department and the police
8) Hearings and correspondence
9) Documentation concerning the building from Building Control
10) The National Building Code of Finland
11) Response from the Real Estate Department concerning the selection of address
12) Service level decisions and annual reports from the Helsinki City Rescue Department
13) In-house control form submitted by the tenement company to the Helsinki City Rescue Department
14) The tenement company's rescue plan for the location
15) The tenement company's instruction material distributed to the tenants, rules and regulations and the reporting forms
16) Flat inspection protocol for the flat where the accident occurred, filled in by the tenement company
17) Original "Kodin kansio" folder from the neighbouring flat
18) Separate analysis concerning the execution of the ventilation by Stravent Oy
19) A summary of statistics from the Finnish Safety and Chemicals Agency concerning building fires and fire hazards caused by electrical equipment in 2016
20) Response from the sauna stove manufacturer Harvia Oy concerning a possible problem with the sauna stove timer
21) Sauna stove operating instructions, the original of which was as included in the neighbour's "Kodin kansio" folder
22) Electricity consumption information
23) Memorandums related to the accident from the City of Helsinki social and crisis emergency services
24) Statistics and other information concerning immigration (Migri and Statistics Finland, among others)
25) Safety communications material published by different actors
26) Safety training material for immigrants drawn up and used by the different rescue departments in Helsinki and Uusimaa
27) The Ministry of Employment and the Economy's "Perustietoa Suomesta" brochure
28) Material distributed by the TE offices
29) Material from the Centre for Economic Development, Transport and the Environment in Uusimaa (for example, the competitive bidding for integration training and the questionnaire regarding safety contents)
30) Information bulletins and news related to the accident (including social media updates)
31) The websites of different authorities and actors
32) Liikenneturva's PowerPoint presentation "Maahanmuuttajat Suomen tieliikenteessä"

SUMMARY OF THE STATEMENTS RECEIVED FOR THE DRAFT INVESTIGATION REPORT

Statements regarding the draft investigation report have been requested from the Ministry of Employment and the Economy, the Ministry of Social Affairs and Health, the Ministry of the Interior, the Ministry of the Environment, the Ministry of Education and Culture, the Association of Finnish Local and Regional Authorities, Finland's largest manufacturers of electric sauna stoves (Harvia Oy, Helo Oy, Narvi Oy and IKI-kiuas Oy), Helsinki City Rescue Department, tenement company Heka Oy and the next of kin of the deceased. Pursuant to the Safety Investigation Act (525/2011), statements from private individuals are not published. A substantial amount of the matters raised in the statements have been taken into account in the text of the investigation report.

According to the Ministry of Employment and the Economy, the investigation report discusses the matters related to the accident in a broad manner, also from the point of view of the integration of immigrants, and considers the different questions and information channels related to the training of immigrants in a commendable manner.

Adding safety training to integration training would increase the safety awareness of the participating immigrants. The situation has improved after the accident. However, integration training that is arranged as labour market training cannot ensure the safety competence of all immigrants, since this training does not reach all immigrants. The aim is to offer more integration training to immigrants outside of the workforce going forward. The matter is under discussion at the Ministry of Education and Culture.

The ministry will consider the safety recommendations provided in the investigation as it renews the Welcome to Finland brochure in 2017. However, the ministry states that the brochure alone will not ensure sufficient safety competence. Utilising multiple channels is important for the distribution and adoption of information. The ministry lays special importance on recommendations and actions that affect the safety of everyone living in Finland, such as improving the structural safety of sauna stoves and saunas, providing guidance related to housing and distributing safety instructions in clear language to tenants in urban areas.

The Ministry of Social Affairs and Health thanks for the opportunity to provide a statement and states that it has no comments or corrections regarding the draft investigation report. The ministry states that it is utilising the results of the investigation together with the Association of Finnish Local and Regional Authorities in an ongoing project to renew the emergency preparedness planning guidelines for national social and health care.

The Ministry of the Interior considers it important that the investigation report includes the safety recommendations for the promotion of general safety, prevention of accidents, prevention of loss and the improvement of the effectiveness of the operations of search and rescue and other authorities. The Ministry of the Interior states that, in relation to immigration and the address system, the draft investigation report should have been sent for statement to many more parties than was the case.

According to the Ministry of the Interior, the investigation report emphasises the background of the victims to a large extent and draws extended, even conflicting conclusions based on it. In this case, the basic causes of the fire do not correlate with the problems related to immigrants and asylum seekers, which the investigation report goes to great lengths to discuss. The family had integrated well.

The ministry proposes clarifications in the sections concerning the communications, supervision tasks, operational readiness times, in-house control, fire detector liabilities and fire-

fighting equipment technology of the rescue department, and in some terminology and references to standards. The ministry states that in-house control still has a lot of room for improvement. In-house control within housing cooperatives should possibly be developed in a manner that provides better safety information and guidance for the residents in relation to ensuring their safety. Emphasising the liability of the housing cooperatives and applying good practices might give rise to a dedicated safety recommendation.

According to the Ministry of the Interior, it is not unclear who is responsible for ensuring the existence and maintenance of fire detectors. Therefore, the recommendation concerning liability for fire detectors is unclear. The problem is related to how the duty of care can be implemented in practice.

The ministry supports the recommendation concerning ensuring the safety competence of immigrants. The recommendation for developing the user interface of sauna stoves is also viable, but it should be targeted towards SESKO, which is the national standards organisation for the electrotechnical industry. The ministry also supports the recommendation concerning automatic firefighting equipment, but proposes that an impacts assessment be created to act as a basis for political discussion and decision-making. The recommendation concerning the functionality of the address system is important according to the Ministry of the Interior, but the Ministry of the Interior should be removed as the responsible party and the recommendation concerning accurate location data should be targeted towards the parties that are responsible for the accuracy of location data.

The Association of Finnish Local and Regional Authorities states that the investigation has been handled appropriately and the information created by it can and should be used in a comprehensive manner in order to prevent similar accidents. The Accimap system used in the investigation is purposeful. Furthermore, the investigation report's emphasis on the analysis of safety training provided to immigrants is very justified.

The Association of Finnish Local and Regional Authorities pays attention to the fact, stated in the report, that the assignment was switched to urgent class A in the initial data fairly late. The investigation report drew conclusions on the effects of positive pressure on the exit routes that are not entirely supported by the locations of the victims. The Association of Finnish Local and Regional Authorities also emphasises the responsibility of the housing cooperative and the related needs for improvement in order to ensure that they are sufficiently covered by the investigation. Housing cooperatives have the opportunity to maintain an appropriate safety induction system.

According to the Association of Finnish Local and Regional Authorities, rescue services should consider the risks related to the increased number of immigrants and other similar population groups in their work. Choosing time and region specific goals while taking into account the risk characteristics in the living environments and their changes would be more effective than performing preventive work at regular intervals.

The Association of Finnish Local and Regional Authorities finds it worrying that the Finnish Immigration Service has not standardised the safety training at reception centres. The recommendation concerning the improvement of safety competence among immigrants is justified, but the primary responsible party should be the Ministry of the Interior.

The Association of Finnish Local and Regional Authorities supports the use of parallel addresses in order to allow visiting addresses to be reported at the staircase level. Preparations for this are currently being made at the data system level. However, the caller's responsibility for guiding the units to the site is still required. According to the Association of Finnish Local

and Regional Authorities, any possible required changes in the address system should be noted in the government's recommendations on the matter. The rescue services, social and healthcare services and the police should standardise practices for reporting incorrect address data to the municipalities.

The Helsinki City Rescue Department presents several observations and corrections to the details in the investigation report. They are related to the description of rescue activities and emergency medical care, the opportunities for outsourcing in-house control and the participation of firefighters in emergency medical care in Helsinki.