

Possibilities of Technical Security of Elementary Schools

Rudolf Drga

Tomas Bata University in Zlin
Faculty of Applied Informatics
Zlin, Czech Republic
e-mail: rdrga@fai.utb.cz

Hana Charvatova

Tomas Bata University in Zlin
Faculty of Applied Informatics
Zlin, Czech Republic
e-mail: charvatova@fai.utb.cz

Abstract— This paper presents the technical security of elementary schools as one of the possible targets for terrorist attacks or unstable individuals. It explores the organizational structure of large and small schools, their regime precautions, the current level of technical support and possible options for improvement, both in the field of communication, and especially in the full utilization of existing security systems.

Keywords-Elementary school; technical security; organizational structure.

I. INTRODUCTION

Nowadays, elementary schools represent one of the possible soft targets for terrorist attacks or unstable individuals who themselves want to attract media attention. With regards to the mentioned second group of terrorists, some countries have a set of specific rules indicated by law, which prohibit broadcasting of such cases in public media. This constitutes a failure of attacker's goal (see. Anders Behring Breivik, a Norwegian far-right terrorist who committed the 2011 Norway attacks [1]. He is an idol for similar individuals, where media worldwide has broadcasted the case.)

For the evaluation of schools, it is necessary to divide them according to their size. We use the number of attending students as the most important parameter, as it affects the internal organization of the school. A clear division is shown in Table 1.

TABLE I. DIVISION OF ELEMENTARY SCHOOLS ACCORDING TO SIZE

Size of school	Number of students	Basic activities	Other activities
small	up to 100	Elementary school 1st to 5th grade, kindergarten, after-school club	irregular activities
medium	100-400	Elementary school 1st to 9th grade, kindergarten, after-school club, school canteen	regular activities - reduced range
large	over 400	Elementary school 1st to 9th grade, kindergarten, after-school club, school canteen	large regular activities

A small school, mainly located in a village, has up to 100 students. Its basic activities are teaching students of grade 1 to 4 or 5, running kindergarten and after-school clubs. Various other activities, which do not have regular character,

such as competitions, carnivals, etc., are organized on its premises or on the public ones.

A medium school teaches approximately 100 to 400 students. It is located in the catchment villages or small towns. Their activities include teaching of students of grade 1 to 9. Furthermore, there is one kindergarten, after-school clubs and other activities are run on a limited scale.

A large school has over 400 students, teaches grades 1 to 9, runs kindergarten, after-school clubs and the school canteen is open even to the public. Regular large-scale activities and events are organized by people who are not employees of the institutions, but have access to the premises.

II. SMALL SCHOOL

The organizational structure of a small school is shown in Figure 1. Its organizational structure is relatively simple and the possibility of penetration of potential perpetrators is relatively low in compliance with basic safety precautions. The regular daily schedule starts in the morning by bringing students to school. They are mostly accompanied by parents, siblings, grandparents or friends in order to be there by a certain time.

There is always a janitor at the entrance to the building. He guards the entrance and checks all the people coming to the school premise. He knows most of them personally and can thus let them into the cloakroom where students can change their shoes and leave some coats in the winter time. This is important at the beginning of the school year when new 1st grade students do not know the school rules and need the support of their loved ones. When the arrival time is over, the janitor makes sure there is nobody around the cloakroom and locks the entrance door. Furthermore, students will sit at their desks in classrooms and have their classes. The teacher checks the number of students. In case someone is missing, he checks if the child is excused. If not, he sends SMS to parents asking about the absence of the student and the child should be traced.

The situation is relatively simple, because parents and acquaintances are identifiable and know each other personally, so the penetration of strangers is rarely possible. Furthermore, the control of the number of students is easy. School employees are: a director, teachers, cooks and cleaners. With all those employees the work and psychological characteristics can be easily verified. School staff represents a small team. Interpersonal issues can arise

rather than an attack on the children by a staff member. The director is fully responsible for employees and internal organizational management. Other entities who cooperate with a small school are municipal offices and suppliers of services and materials to the kitchen. A special door with bell is used for the entrance of third parties. Every such person is then met by a school employee and thus a safe movement of a stranger in the school building is ensured.

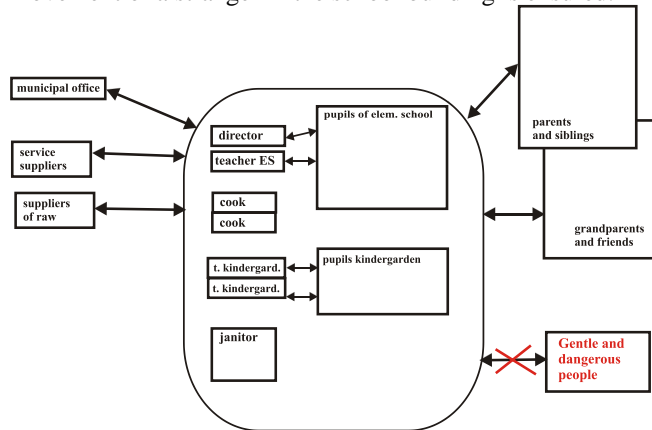


Figure 1. Organizational structure of small school.

The following Figure 2 shows an example of technical security of the small school object. The school is situated in a building with adjacent land for outdoor activities of students. The yellow line indicates perimeter protection, blue line protective shield of building and the red line the entrances for students and the suppliers of goods or services. After students and staff leave the building, arming of the building is set by the janitor. This starts the sheath and the inner protection of the building for the protection of property inside the building.



Figure 2. Technical security of small schools.

As explained above, the current security status of small school is very good due to good regime precautions. For communication with inputs, basic bells without a direct call to the recipient are used. So it is time consuming to handle the arrival of a stranger. Therefore, an internal communicator for the elementary school is proposed. It would have direct key presses for specific employee. Using a video phone has a

great advantage in the visual inspection of anyone entering. After verifying a person, we can remotely let her/him inside the building if she/he belongs to the circle of known people. On the other hand, if the person is unknown, we can provide a guide or meet her/him personally. The problem of current video communicators is that they do not offer a great variety of target recipients, optional by simple function keys. Another advantage would be if communication devices would be portable (mobile) and the staff would always have them with them. The second option would be a stable device in every classroom and different places all over school premises.

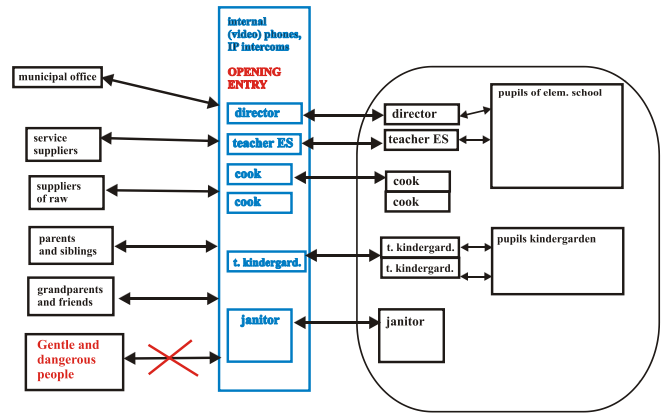


Figure 3. Addressed internal communication to specific individuals using videophones.

For monitoring of students on their way to and from school, a simple and fast tool for sending SMS and e-mail placed on a server (Figure 4) where every teacher would have their client access would be suitable. The advantage of this solution is that the information concerning the exchange of information with those responsible people for the students would have been clearly concentrated in one place, which would allow sharing among teachers, and also parents, after the definition and implementation of access rights. Even these small schools now have their websites to provide information to the public about the activities of teaching, but also for various events.

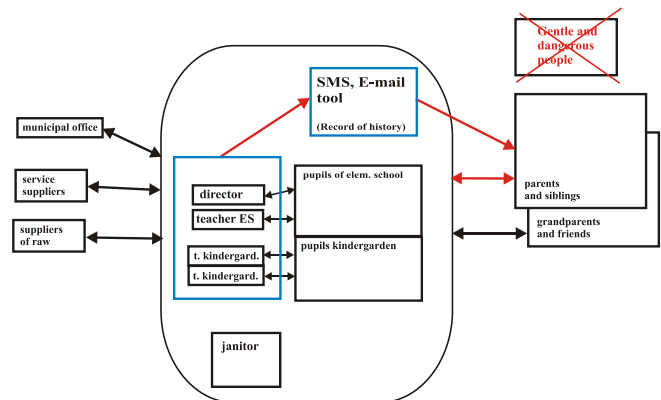


Figure 4. Tool for sending SMS and Email.

I&HAS (Intruder and Hold Up System) is used as a default system in small schools. Only after all students and employees leave the building, it works and guards in full mode. In the event that there would be arming the perimeter (yellow line) or shell (blue line) to protect the building envelope, the daily regime I&HAS is not used. In this case, the system protects the lives of persons who are inside the building.

Another feature that can extend this system is usage of emergency buttons. Mainly, teachers or school staff members who come into contact with the public and students would have them. The lowest level of distress would mean calling the school director, a higher degree would mean calling the emergency squad ARC (alarm receiving centre) and the highest grade then calling the state police. This is shown in Figure 5.

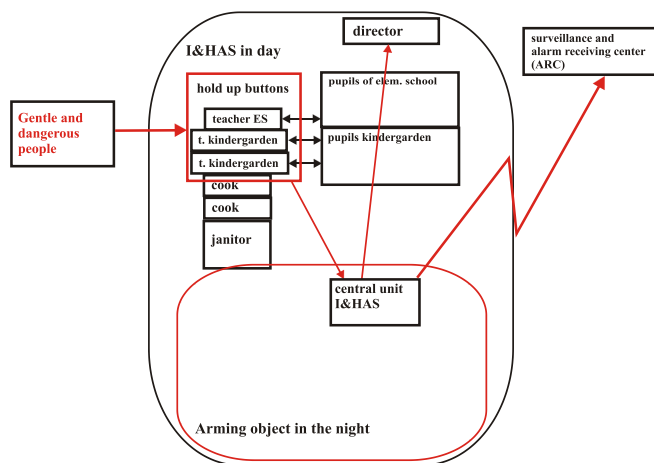


Figure 5. Modernization of technical security small school.

III. LARGE SCHOOL

The situation in the large school in comparison with a small school is completely different, as shown in Figure 6. Teachers do not know personally all the students, neither their families and friends. The arrival procedures of students to school are similar, but a janitor or supervising teacher is not able to memorize hundreds of students and identify among them a new student. The most difficult situation is in the beginning of the year when new parents accompany first-graders to the cloakroom and help them with changing clothes. After the arrival of students to school, the janitor locks the main door. Any stranger that comes to the school building from the outside either rings the bell to the janitor or the school office.

In the case when a student does not come to school, the absence is written to the class register and must be settled within the next day, not immediately. Also, an excuse of the student is realized through the school office and it is not processed until the next day. So, that there is always a delay.

Other school services in areas such as catering, schools have secured such a manner that external boarders have their own entrance to the dining room with a simple access system, where they are using an identification element - the card – that opens the entrance door. Under normal circumstances, these people have no access to the rooms outside of dining area.

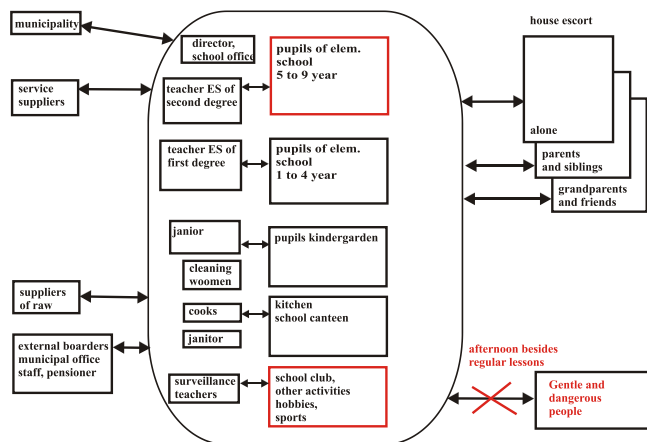


Figure 6. Organization structure of large school.

Technical support of school is done mechanically by securing the building envelope on the ground and indoor space with I&HAS, as shown in Figure 7. The electronic security system is only used at the time when all the students and staff leave all objects, without connection to ARC, with only alarm reporting to the director and his assistants.



Figure 7. Technical security of large school.

In order to improve an internal communication and to increase the visibility of strangers in all objects, systems should be installed, as is shown in Figure 8. In the areas of movement of people and potentially the possible intrusion of unknown and dangerous people, access points with a capacity of passages appropriate to the specific use must be installed. In addition to the record of the people who passed through the gates, it is appropriate to supplement those places on internal communicators that allows direct connection between the visitor and the specific person. In

large schools, the main entrance is directly connected to the director's. For suppliers of raw materials, it should be directly linked to the kitchen. For the access of external diners to the dining room, just an access point using a proximity card and a video recording of individual passages is needed.

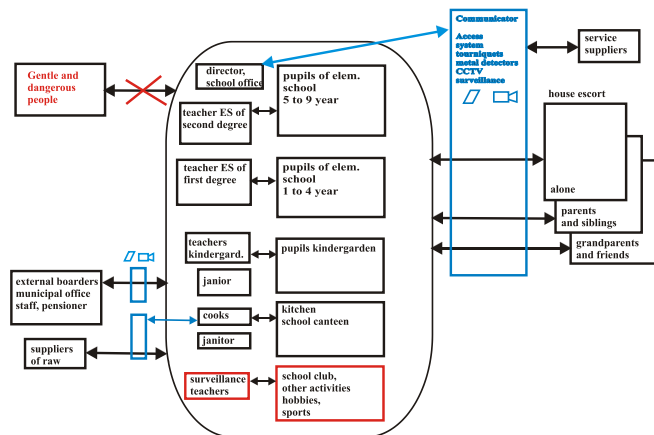


Figure 8. Access system with CCTV surveillance.

For the main entrance, which is used for the arrival and departure of students from school, it is necessary to use such a system approach, which has high passages. If we want to have maximum security, they must be installed turnstiles that cannot be skipped, or otherwise scour and students are identified individually, not in groups. In this case, there would have to be turnstiles installed in parallel in a number of 5-10 pieces to increase the capacity of passages, or the students would have come at a precise time and walk in groups, which is, with the number of more than 400 students, a fairly challenging task. In this case, an access server that accurately records the comings and goings of individual students can be installed and problems with attendance or truancy can be better traced. Another advantage would be that the class teacher would have a day by day overview of students who did not arrive to school and are unexcused.

Figure 9 shows a wider usage of I&HAS. The basis is the use of the system in day and night mode. In night mode, the system would work the same way as it works now, when students and staff are not at schools. In day mode, at least the emergency buttons should be available to all teachers. In case of emergency they would call to the director's office, at a higher level of distress than ARC and, in the case of a critical event then directly to the police.

Other function would be full roofing of the building shell (Figure 7 - blue line) except the access points. Last usable functions are guarding of the perimeter (Figure 7 - yellow line) in day mode. This is in practice very difficult to implement as the regular maintenance necessary to the surrounding vegetation is costly, especially on the banks of the river flowing around.

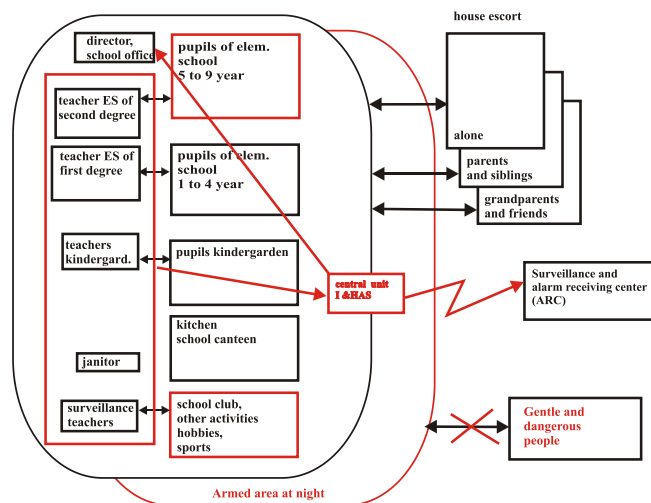


Figure 9. Modernization of technical security of large school.

As it is evident from the previous procedure, security systems I&HAS, ACCESS (Access System) and CCTV (Close Circuit Television) cooperate here. Therefore, the best solution is the realization of an integrated security system. For the realization we can use systems which are commercially available, where it is necessary to respect the extensiveness of the system.

IV. CONCLUSION

Currently, it can be stated that Czech society is very calm. Compared to other European countries or the world, the local crime rate is low. There is as well an important fact, that guns and weapons are not owned in large quantities, as is very common for example in the USA.

The disadvantage of our society is that we are naive and not trained to security risks. The citizen does not know how to take care of their own safety and security in their neighbourhood. They expect everything from government and state security forces.

Currently, great emphasis is placed on prevention against various threats. The goal should be education for active, mature multicultural society, as the current word is globalized.

It is possible to use standard regime precautions and regular technical support against the attacks of criminals. Against the threat of terrorists and unpredictable individuals, costly technical support (X-rays, metal detectors, drug detectors) and demanding regime precautions could be used.

Generally, the particular security level of an elementary school should be tailored to the criminality level of the specific location.

REFERENCES

- [1] The Guardian: *Anders Breivik*. [Online]. Available from: <https://www.theguardian.com/world/anders-behring-breivik>
- [2] L. Lukas, M. Adamek, R. Drga, A. Velas, T. Lovecek, J. Reitspis et al., "Security Technologies, Systems and Management I." (in Czech). Zlín: VeRBuM, 2011. ISBN 978-80-87500-05-7.
- [3] L. Lukas, M. Adamek, F. Brabec, Z. Dvorak, M. Kelemen, Z. Malanik et al., "Security Technologies, Systems and Management II." (in Czech). Zlín: VeRBuM, 2012. ISBN 978-80-87500-19-4.
- [4] L. Lukas, M. Adamek, F. Brabec, R. Drga, M. Hromada, V. Laucky et al., "Security Technologies, Systems and Management III." (in Czech). Zlín: VeRBuM, 2013. ISBN 978-80-87500-35-4.
- [5] L. Lukas, R. Drga, M. Hromada, J. Kamenik, S. Lichorobiec, J. Sevcik et al., "Security Technologies, Systems and Management IV." (in Czech). Zlín: VeRBuM, 2014. ISBN 978-80-87500-57-6.