Standard of installing hiding places for birds and bats as an element of heat insulation works

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Introduction

Blocks of flats and skyscrapers constructed since 1960s using large panels – a souvenir left by the previous political system – are still predominant in the landscape of large housing estates of our cities. There is no doubt that the thermal modernisation thereof is necessary. It is not about the economic effects thereof, meaning the reduction of heating costs. By contributing to the savings of energy, we act for the benefit of the environment. Unfortunately, heat insulation of buildings has negative side effects as well. When such works have been conducted, bird species nesting on buildings suddenly lose all or almost all breeding places.

As indicated by experience of other countries, as well as certain Polish housing estates, renovation works can be reconciled with the protection of birds and bats. In any case, such an obligation results from the national and Community law, which not only prohibits killing of animals, but also explicitly indicates that the investor is responsible for the preservation of existing values of nature – including the assurance of permanent existence of non-reduced number of hiding places of protected species.

This study is oriented at the practitioners – companies that make heating systems for blocks of flats, housing co-operatives, environmental organisation – everyone that is involved in the process of heating buildings and might exert influence on the type and scale of applied solutions. Among others, it contains certain minimal standards that should be implemented in such studies.

1. **Bird and bat species for which it is necessary to install replacements of hiding places on the buildings being equipped with heat insulation.**

2.1. Birds

Buildings represent nesting places for over a dozen of bird species. For several of them it is the primary breeding place. They include: sparrow, swift and kestrel. Renovations conducted on a broad scale, as well as heat insulation works and various building modernisations cause the limitation of the number of breeding places and constitute one of the main or even the main causes of population disappearance. Therefore at least in reference to these bird species, each following reduction of their number or potential hiding and breeding places is a substantial damage pursuant to the Act of 13 April 2007 on the prevention of damage in the environment and remedy for them.

Hence the investor’s obligation consists in the undertaking of measures that will compensate the damage incurred by the protected species.
**House sparrow Passer domesticus**

It predominantly nests in various crevices and crannies of buildings, sometimes in breeding boxes, and in it rarely builds nests also in dense bushes. Sparrow’s nest is abundantly strewed with dry grass and feathers. The laying season of these birds commences in March and ends in August. During this period this bird can hatch up to three times. The incubation period lasts very short, 11-14 days, and the young stay in the nest for approximately 14-16 days.

**Swift Apus apus**

They prefer building nests in crevices of buildings and heat vents, mainly under the very roof. Their breeding period lasts from the beginning of May until the end of August, although late hatches also happen, in the case of which the young leave the nest as late as in the first days of September. These birds hatch once a year. The incubation period lasts ca. 20 days and the young leave the nest after ca. 40 days.

**Common kestrel Falco tinnunculus**

It hatches in various crevices and crannies of buildings, in heat vents, and frequently in former nests of feral pigeons. They eagerly lay eggs in breeding boxes. The breeding period of common kestrels begins at the turn of March and April and usually last until the half of July, but sometimes (in the case of repeated hatches) until August. Their eggs are hatched for 27-29 days. The young are able to fly after 27-36 days.

### 2.2 Bats

So far 25 bat species have been detected in Poland. Most of them can be found in buildings created by human, at least partially. Bats are animal that are much more endangered by heating operations than birds. These animal hide much deeper in crevices, and they react to external sounds (e.g. installation of scaffolding, talks of workers) by remaining silent and waiting for the intruders to leave. In consequence, when they attempt to leave the hiding place, it turns out that they are bricked up. Due to covert way of life of bats, sometimes even the inhabitants of blocks of flats do not know about co-tenants, therefore there is nobody to intervene (as opposed to the destruction of nests and hatches of birds, which relatively frequently causes the protests of citizens who report it to relevant authorities). Four species that are found most frequently in blocks of flats have been described below. These are mainly the "crevice" species (they are fond of various crevice spaces). The species that are found in such conditions include predominantly the serotine bat, parti-coloured bat, pipistrellus and more and more often the common noctule.

The second species group that might be at disadvantage due to heating of buildings includes bats using larger spaces, e.g. attics, garrets, etc. These species are mainly the greater mouse-eared bat and lesser horseshoe bat. Confirmed occurrences of these bats in dilatation spaces are rare, but they are not to be excluded.

All bats in Poland are subject to strict species protection and are protected pursuant to international conventions and agreements, as well as the law of the European Union.
Common noctule *Nyctalus noctula*

One of the largest bats in Poland. Until recently, it was regarded as a species living in forests, however, for years, it has also lived in buildings, including blocks of flats to a greater and greater extent. It usually occupies narrow crevices under concrete slabs. Breeding colonies of these bats are usually composed of several dozen females. The young are born in June or at the beginning of July, and after ca. 4 weeks they are able to fly. Some common noctules leave Poland in autumn and fly to the west or to the south, yet many bats stay and winter here. It is assumed that a significant number of bats hibernates in the surface parts of buildings – crevices of multi-floor blocks of flats are found throughout the entire year.

Parti-coloured bat *Vespertilio murinus*

It is a medium-sized bat. It tends to use crannies in buildings, in the newer buildings in particular. In large cities, it can be found predominantly in autumn and early winter. Males use crevices in upper parts of high buildings as hiding places for mating. Housing estates also constitute a shelter for parti-coloured bats during winter. These bats hibernate in building crannies that are hard to reach (e.g. crevices between slabs of blocks of flats or ventilation shafts). Parti-coloured bats can undertake long trips to wintering areas.

Serotine bat *Eptesicus serotinus*

One of the largest and additionally most popular bat species in Poland. Both in the summer and winter, they prefer the neighbourhood of human. They settle in the attics of older buildings in rural areas, outskirts of cities and in the vicinity of forests, but they are also frequently found even in the centres of large agglomerations. Breeding colonies usually amount to over 100 specimens. The young are born in the early summer. The young are able to fly after 3-4 weeks. Serotine bats are rarely found in the hibernation period, but it results most probably from the fact that they winter in places that are hard to reach, e.g. spaces between the external and internal walls of buildings. These bats are usually resident ones and in winter they frequently (if possible) remain in the same buildings they inhabit in the summer.

Pipistrelles *Pipistrellus spp.*

In Poland, 4 species of these small bats have been identified so far. Breeding colonies of pipistrelles, established in April and May are large and can amount even up to a thousand of females. The young are usually born in the second half of June and are able to fly in mid-July. Pipistrelles can build breeding colonies in cities, but they are found there usually in the late summer or autumn (during mating and migration periods), as well as in the winter. These bats use buildings (the modern ones as well, e.g. blocks of flats) as a place for hibernation. Sometimes they form huge winter groups measuring even several thousand specimens, therefore the destruction of their wintering area or blocking the way out of it will be disastrous for a great number of bats.
2. Replacement for the refuges for birds and bats

3.1. General principles

- It is not always the case that in each building one can balance – by means of breeding boxes – the number of hiding places for birds and bats that disappeared as a result of renovation works. Therefore it is necessary to perform compensating measures in the case of all renovated buildings (blocks of flats) – including the ones that are not inhabited by animals at the given moment. Only in such case, the aggregate number of constructed potential refuges can compensate the loss.

- Boxes for birds and bats can be made of wood or sawdust and concrete. Both the former and the latter can be installed in the insulation layer – the more advantageous solution (with the exception of boxes for common kestrels, due to their size), or on the surface thereof (fig. 1). Boxes made of sawdust and concrete are common in the Western Europe. In Poland it is possible to purchase these boxes from the producers or companies that import them from other countries. A number of models of these boxes, adjusted to various bird species, are available. The most useful ones will the structure like Brick Box (intended mainly for sparrows, but common swifts can nest in it as well) and Swift Box (intended mainly for common swifts, but sparrows can nest in it as well). The structure of these boxes and installation can be obtained for instance on the website of Bird Control company: [www.sprzataj.net.pl](http://www.sprzataj.net.pl). An advantage of boxes made of sawdust and concrete is the possibility of painting them with paints used on the plaster surface.

- Boxes that are not installed within the insulation layer should be inspected every two years in order to replace damaged boxes.

- The measurements and structure of boxes should comply with the designs for each species, as presented in this study. In the case of boxes made of sawdust and concrete, models intended for specific species should be used (their structures are different).

- In order to improve the durability of wooden boxes, it is necessary to cover them with wood protection impregnants and to cover the box roof with roofing felt.

- The boxes have to be mounted at an appropriate height, which depends on the species for which the box is intended.

- The boxes have to be nailed together tightly in order to assure heat insulation and protection of the interior against precipitation water. Additionally, they must not be made of thin planks (measuring less than 1 cm in thickness).

- Boxes should be installed at the wall by means of metal clamps and by means of nail expansion anchor, unless the producer provided for another installation method.

- In order to assure safety of people, breeding boxes which are not installed in the insulation layer (and therefore not protected against breaking off the wall) should be
mounted in the same way so that no pavement or lawn is located under it, but for instance a roofed entrance to a staircase.

- Due to various building structures, is not always possible or it is not necessarily justified to use the design of bird or bat box distribution and the number thereof in accordance with the principles presented below. In each case consultation and supervision of ornithologist and chiropterologist over the conducted works are necessary. Their tasks consists in the indication of the most suitable places for the installation of boxes and the number thereof.

- In the case of certain buildings or types of renovation works, there is a possibility of applying – as a replacement or addition – solutions that are completely different from the ones presented in this study. It may for instance concern the situation when the existing heating vents are left unprotected, the situation of appropriate protection of existing cavities that are used by common kestrels or the situation when inlets to dilatation spaces are left open. However, such solutions should be always consulted with a specialist and the acceptance thereof should not result in the reduction in the number of convenient refuges in comparison with the proposed standard solutions.

3.2. Birds

3.2.1. Breeding boxes for sparrows

Types and structure of breeding boxes
The suggested solution for these birds involves special boxes made of sawdust and concrete and installed in the insulation layer or on its surface.

Installation method and number of breeding boxes
In the case of blocks of flats with up to four floors, boxes should be installed in the upper part of the building, below the gutters (usually at the level of heating vents), placed alternately with boxes for common swifts and over the staircase roofs, one for each floor. The distance between the boxes should measure approximately 3 m (fig. 5-6). The boxes should not be mounted over the windows (because of the possibility of windowsills getting dirty.

In the case of blocks of flats with over four floors, boxes should be installed up to the fourth floor, over the staircase roofs, one for each floor (fig. 5-6). The boxes should be also installed on the gable walls using the same principles as in the case of front walls (fig. 5-6). Therefore the total number of installed boxes depends on the building structure, primarily on its height and the number of staircases.
Fig. 1 Box made of sawdust and concrete of Brick Box type, intended for sparrows, installed on the insulation layer (on the left) and behind it (on the right).

3.2.2. Breeding boxes for swifts

Types and structure of breeding boxes
The suggested solution for these birds involves special boxes made of sawdust and concrete and installed in the insulation layer or on its surface. It is also possible to use wooden boxes (commonly installed on the insulation). In the case of the latter ones, one should remember to install a mobile front wall (closed by means of a hook) in order to be able to clean the boxes (at least twice a year) (fig. 2).

Installation method and number of breeding boxes
In the case of buildings with at least four floors, boxes for swifts should be installed in the upper part of the building, below the gutters (usually at the level of heating vents). In the case of blocks of flats with up to four floors, they should be installed alternately with boxes for sparrows. The distance between the boxes should measure approximately 3 m (fig. 5-6). In the case of buildings with over four floors, in the upper part of the building, boxes for sparrows should be replaced with boxes for swifts (sparrows are not eager to nest at high altitudes). The boxes should not be mounted over the windows (because of the possibility of windowsills getting dirty). Due to the willingness of swifts to nest in colonies, it is possible to mount the boxes in groups that are not adjacent to each other (within the distance measuring several centimetres away from each other). However, in this case, the total number of boxes should not be less than in the case of installing them at an identical distance between particular boxes. The boxes should be also installed on the gable walls using the same principles as in the case of front walls (fig. 5-6). In case when there is an lift motor room on the roof or another type of roof-top extensions, the boxes for swifts should be installed on them in groups of several pieces or even a dozen (fig. 7).
3.2.3. Breeding boxes for common kestrels

Type and structure of a breeding box

It is recommended to use wooden boxes of a relatively simple structure (fig. 3).

Installation method and number of breeding boxes

Boxes for common kestrels should be installed at least at the level of fourth floor. They may be mounted to a wall in two ways by means of metal clamps attached to the back wall, or by means of bolts going directly through the back wall. The application of metal clamps facilitates the work for the person installing the box.

The boxes for should be installed in the upper part of the building, below the gutters. One should keep in mind that the box should be installed at a distance of at least 0.5 m below the upper edge of the building wall.

The interior of boxes for common kestrels should be strewed with sawdust mixed with gravel since these birds do not bring the material for strewing the nest on their own. In order to increase the safety, they should be mounted over roofed staircases. At least one box for common kestrels should be installed on every block of flats. In the case of long blocks of flats (with more than 6 staircases), more breeding boxes may be installed, yet the distance between them should not amount to less than 20 m. The distance between a box for one species and the boxes of other species (sparrow, swift) should amount to at least 10 m.
Fig. 3 Construction design of a wooden box for common kestrel

3.3. Bats

In Poland there are no companies that specialise in the production of boxes for bats. Small carpenter companies sometimes build boxes for these animals, as commissioned e.g. by the State Forests Administration. Special boxes placed behind the insulation layer or on the plaster (and other types thereof) are available in many online shops, among others in Germany, Great Britain, Canada and the USA. The main types thereof are presented below, together with the exemplary place where they can be purchased. The bats that can be found in Poland generally (with the exception of mating period in the case of certain species) do not demonstrate strong territorialism. Therefore in the case of these animals, no specific distance has to be maintained between such refuges, although their distribution on the wall might influence how successful the bats are in finding the hiding places. It is extremely important for the refuges to not be placed on the coldest building walls (the northern ones). It is optimal to build groups of boxes placed behind the insulation layer horizontally (fig. 5-6), but, if dictated so by other circumstances (e.g. aesthetic), they can be dispersed to a greater extent. Flat walls should be avoided and boxes are to be mounted on the walls of staircases instead (so that bats generating noise, frequently at night as well, are prevented).

In the case of every box structure, it is extremely important that they are tight on a permanent basis. If they are airy, the bats will not settle in them.
3.3.1. Box placed behind the insulation – own product

The simplest version of the box placed behind the insulation layer – can be constructed by following these simple steps (fig. 4). Make a frame using 3 slats measuring 2-3 cm in thickness (sides and upper part), with measurements of at least 50x70 cm, and cover it with planks (unplaned). This way a space between the planks and the building wall will be created. From the bottom side, a crevice measuring 2-3 cm should be left (its lower edge may be reinforced by means of a slat, the upper one – by means of the plank edge). This crevice will be the only element of the refuge that is visible from the outside after plastering and finishing the facade. Below the crevice, the wall should be rough – as a landing surface for the bats. This roughness should be comparable with the roughness of an unplaned plank. The boxes should be mounted in horizontal groups measuring several of about a dozen pieces, at least at the two-three highest floors (fig. 5-6), and they can be installed even on each floor (beginning on the second). The photos of such shelters in a finished wall can be seen on the following website http://www.sprzataj.net.pl/index.php?strona=sztuczne_gniazda_8.

If the crevice used by bats to enter the space in the wall is known, it will do to leave the crevice in the insulation material open, so that they are able to enter the hiding place in the wall. Heat loss caused by the crack in the insulation surface will be minimal. Also in this case, one should remember the appropriate roughness of the landing place under the crevice.

The combined method can be applied – the above-mentioned box placed behind the insulation layer and installed above the crevice in the wall.

Fig. 4 Construction design of a refuge for bats placed behind the plaster
3.3.2. Ready-made boxes placed behind and on the plaster

There is a possibility of purchasing universal shelters that can be installed both on the plaster and in the wall (in new buildings as well). In Poland they are imported by the earlier-mentioned Bird Control (http://www.sprzataj.net.pl). One can also use the products offered by foreign companies, which frequently present pictures and photos showing the installation techniques and the final effect (np. http://www.ehlert-partner.de/Flederkist.html, http://www.alanaecology.com/acatalog/Bat_Boxes.html or http://www.batcon.org/bhra/models.html, where a list of companies from the USA is included whose products are recommended by the American organisation – Bat Conservation International).

![Diagram of boxes for birds and bats on a building with up to four floors]

**Fig. 5** An exemplary layout of boxes for birds and bats on a building with up to four floors
**Fig. 6** An exemplary layout of boxes for birds and bats on a building with more than four floors.

**Fig. 7** Other alternative solutions for common swift box distribution – installation in groups over staircases or on roof-top extensions. The distance between boxes can amount even to several centimetres.
4. Impact of building renovations on birds and bats – legal aspects

The necessity of taking into consideration the presence of birds and bats in buildings results from the provisions of Polish and Community law. It concerns a number of regulation groups – related to the prohibition on animal ill-treatment, species protection and new regulations concerning the responsibility for the damage inflicted to the environment.

1 The Act of 21 August 1997 on animal protection. In the case of renovations, including heating of buildings, bricking up of live animals often occurs (e.g. birds sitting in nests, bats in refuges, flightless birds), which leads to their slow starvation in torment or to nestlings and flightless bats being thrown out of nests and refuges and thus causing their slower or faster death. Pursuant to Articles 6 and 35 of this act, it is an indictable offence that carries a penalty of 2-year imprisonment, and the court may decide on imposing a prohibition on pursuing a specific profession or operating a specific activity on the offender, as well as it may decide on the forfeit of tools or items that were used for the purpose of committing the crime.

Ordinance of the Ministry of the Environment of 28 September 2004 on wild animal species subject to protection. All bird species that frequently use buildings as nesting places and all bats found in Poland are subject to strict species protection on the basis of this Ordinance. Prohibition on killing, inflicting damage to eggs and the young, damaging habitats and refugia, damaging their nests, clutches, wintering places and other hiding places, taking eggs, deliberate scaring and disturbing, translocating from the place of their regular occurrence to other places apply to these animals. Reproduction places and refuges are “the habitat” and the congestion n blocks of flats are “the refugia” for these species. In Article 10 of the Ordinance, examples of such activities have been listed that are treated as the protection methods for animal species. They include, among others, the construction of artificial clutches and adjustment of periods and methods of performing construction, renovation and other works to the hatching, reproduction and hibernation periods.

The Act of 16 April 2004 on nature protection. The Ordinance discussed in the previous point has been issued on the basis of delegation in Article 49 of the Act on nature protection. This Act contains also penal provisions applying in the case of violation of rules set in the Ordinance, as well as the conditions of award of permits for the derogation of prohibitions.

In reference to measures concerning the protected animal species which are subject to the above-mentioned prohibitions, according to Article 56(1)(1), one can receive permits to perform them (e.g. permits for the removal of abandoned bird nest from buildings also beyond the period in which such prohibition does not apply). However, such permit can be issued solely in the case of absence of alternative solutions and when it does not cause any threat for wild populations of protected species, and when the need to carry out these measures results from one of 6 reason groups referred to in Article 56 (4).
Pursuant to Article 60 of this Act, if modifications made to the environment threaten or might threaten animals subject to species protection in the future (and this is the case in the event of renovation works that might threaten habitats of birds or bats), the regional director of environmental protection should take measures in order to assure durable preservations of habitats and refugia of protected species, to eliminate the causes of threats and to improve the protection level of these habitats or refugia. On the basis of Article 123, the voivode is obliged and entitled to exercise control over the observation of provisions on nature protection in the course of economic exploitation of resources and components of nature by organisational units and legal and natural persons.

Pursuant to Article 127(2)(e) of the Act, the punishment of imprisonment or fine is imposed on the persons that deliberately infringe the prohibitions applicable to animals subject to species protection. Furthermore, Article 129 provides for that in the case of punishment for the violation of prohibitions concerning protected animal species, the court may decide on the forfeiture of items used in order to commit the offence or criminal act even if they do not belong to the offender, and on the restoration of the previous condition, and if such obligation was not be enforceable – the court would order punitive damages.

It should be pointed out that although on the basis of the Act on nature protection, the violation of prohibitions related to the protected species is only an offence, the Penal Code recognises them as a criminal act and introduces much higher sanctions if the effects of such actions are substantial. Damaging places for nests and shelters for endangered species for which one of the reasons for that threat is precisely the loss thereof should be treated as a significant (substantial) damage. It results, inter alia, from the the provisions of the Act discusses in the following point.

**Act of 13 April 2007 on the prevention of damage in the environment and remedy for them.** This Act has introduced a number of important rules imposing an obligation of preventing damage in the protected species on all the entities, and if the damage occurs – its full remedy and compensation of the damage incurred by the nature. In the case of modernisation of buildings constituting a refuge for birds and bats, the contractors of works should take preventive measures – by adjusting the duration and deadlines for works, by protecting the crevices promptly before the birds and bats occupy them, etc. Afterwards they should assure that after the renovation the usefulness of a habitat is not reduced – e.g. by means of an adequate number of constructed alternative refuges and clutches. The effectiveness of these measures should be subject to control. The scale thereof should be adjusted so that the possible damage incurred by the populations of protected species during the renovations is also compensated. It should be pointed out that the results of remedial measures should be long-term. According to the Directive and the Act, the responsibility of the offender lasts for 30 years after the occurrence of the damage-causing factor. Preventive or remedial measures are to be taken on one’s own initiative by the offender or by the nature protection body if the offender in question does not take the measures (the costs are to be borne by the offender). At the same time, the nature protection body is obliged to accept the notifications of emergence of threat or damage from anybody and they have to take appropriate measures.
Act of 27 April 2001 – Environmental Protection Law. Pursuant to Article 323 of this Act, in the case of damage incurred by the environment as the common good (and this is the case in the event of actions detrimental to protected species and their habitats) the State’s Treasury, territorial self-government unit and an environmental organisation may demand that the entity responsible for such threat or violation restore the condition complying with the law and take preventive measures, in particular by means of installation or devices preventing the threat or violation, and if impossible or excessively difficult, they may demand the activity causing the threat or violation be ceased. If the entity exploiting the environment has a negative impact on the environment, pursuant to Articles 362, 364 and 366, a competent body may impose an obligation to limit the impact on the environment, to restore the appropriate condition, carry out specified actions, and it may issue a decision on ceasing such activity which is immediately enforceable.

As you can see, the law regulates the issues related to the responsibility for the possible damage to environment made due to renovation works in buildings in a quite complex manner. In the case of absence of due diligence, and in particular in the cases of deliberate negligence of measures preventing the damage, criminal acts and offences are easy to commit. Furthermore, the provisions connected with the responsibility for the damage in the environment have introduced a new quality in this field by means of obligation to take remedial measures and by means of introduction of mechanisms that – due to the activity of citizens, social organisations and nature protection bodies – can significantly improve the effectiveness of protection of endangered species and habitats.