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Research paper

Biathlon Sports Complexes Forming Peculiarities and their Creation Practice Review

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Abstract

Related to the growing popularity of winter sports in general including biathlon as one of the most spectacular among them, there is a need to study, in particular, biathlon sports complexes formation basic features and peculiarities. It is an extremely up-to-date issue in Ukraine, as biathlon is developing really quickly though infrastructure level of biathlon complexes and sports camps is far from perfection. Legal and theoretical foundation for the ski and biathlon structures design and construction is also incomplete. That is why one of the top priority tasks for detailed examination of modernization ways for already existing and new sports complexes creating is design experience analysis of already existing biathlon facilities in Ukraine and abroad.
Ski and biathlon facilities developmental evolution has been analyzed in the article alongside with the determination of facility functional organization abroad, in CIS countries and Ukraine. Also determination of different biathlon facility types, mainly, biathlon center, biathlon complex, ski lodge and ski station has been done for more precise understanding of the object under consideration. Biathlon facilities in Germany, Finland, Slovenia, Italy, Russia, and Belarus have been studied. Domestic biathlon and ski-biathlon facilities have been analyzed as well. All these complexes have been examined according to same characteristic features, which resulted in their comparative analysis.

Keywords: *Biathlon, biathlon sports complex, ski and biathlon center, ski and biathlon track network, shooting zone.*

1. Introduction

Biathlon is one of the most popular kinds of winter sports in many countries around Europe. Biathlon is an Olympic kind of sports which combines competition in ski race with small-bore rifle aimed shooting. It is necessary to create specially designed sports complexes, combining sports and additional facilities with other required sports and service infrastructure to ensure competitions and training holding in this kind of sports [4].
The observations into developmental evolution of the design experience and construction analysis of such facilities in foreign and domestic practice are of great importance for the sake of biathlon sports complexes functional and planning organization detailed examination. Ski and biathlon facilities analysis has been done taking sports complexes and centers in countries of Europe, in CIS countries and home-country facilities separately. All of the complexes are studied according to the same characteristics: their total area and other facility quantitative parameters, required sports buildings occupancy including ski and biathlon and roller skis routes, capacity, tourist and sports infrastructure development, spatial and architectural qualities, the layout peculiarities.

2. Biathlon sports complexes forming peculiarities

It was historically determined that originally biathlon and ski sports complexes had been constructed in countries of Northern and Western Europe since 50-60s of the XX century. That is why it is viable to start analyzing the experience of these facilities design and construction from the European perspective, therefore, following their evolution since the origin, through the stages of their modernization and renewal and up to the modern developed multifunctional biathlon centers and complexes.
The appearance of modern biathlon facilities had been preceded by ski lodges, that later on were expanded and turned into ski stations, some of which, in course of time, were transformed into ski and biathlon or biathlon centers (as they are often referred to in European countries) or biathlon or ski and biathlon complexes (more typical of Ukraine, Russia, CIS countries). Ski lodges and stations, as well as ski and biathlon centers and complexes, have some differences and peculiarities in terms of their functional and planning organization and in some aspects of their infrastructure occupancy. That is why each type of such buildings and facilities should be defined terminologically for more precise further understanding of the objects of study [3].
Ski lodge is a set of buildings, comprising specially equipped lots of cross-country or mountainous terrain – ski tracks, with constructed around them facilities for athletes and support staff, ski

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storage facility, repair houses, other facilities and amenities, and grandstands for spectators.

Ski station is a kind of ski lodge, which infrastructure, apart from sports and service buildings, also includes accommodation for tourists and athletes, represented by the additional hotel block or separate residential buildings [1].

Biathlon (ski and biathlon) center is a structured set of sports and service buildings and facilities meant for ski and biathlon, located around main nucleus (biathlon stadium with grandstands and shooting zone), that can be used for biathlon and ski sports (if possible) competitions and trainings holding.

Biathlon (ski and biathlon) complex is a combination of multifunctional biathlon and ski sports facilities (ski and biathlon tracks, stadium, shooting zone) and tourist and athletes accommodation, as well as other service and additional buildings, centered on one territory and that can be used for biathlon and ski sports (if possible) competitions and trainings holding.

Ski lodges and stations are meant mostly for the amateur or professional athletes trainings, while the main purpose of ski and biathlon complexes and centers is different level competition holding [5].

Biathlon and ski and biathlon complexes (popular in CIS countries) differ from the centers (popular in Europe) by their expanded infrastructure which includes tourist and athletes accommodation, service blocks, sports and training camps for athletes, etc. European biathlon centers are mostly suitable for holding competitions and training at their own biathlon tracks. From the economically rational point of view tourist and service infrastructure in such centers is integrated into the nearest populated locality. Sports and training camp for athletes is mostly placed in separate training complex, which is not connected with the biathlon center, especially if to take into account European athletes' training strategy, who mostly work according to the individual programs.

2.1. Foreign biathlon complexes design experience (Western Europe).

The analysis of European biathlon complexes in Oberhof (Germany), Kontiolahti (Finland), Antholz (Italy), Pokljuka (Slovenia) have been done.

One of the biggest and the most famous biathlon centers in the world is **DKB-Ski-Arena in Oberhof in Germany**. The first military patrol biathlon club was established in 1953. Since 1958 biathletes began to train in the established center. In 1982 biathlon arena was built in Oberhof, which in 1984 hosted the first stage of the World Cup. Since 1999 the World Cup stages take place in Oberhof annually. In 2003 the biathlon center was reconstructed to its present state (fig. 1).

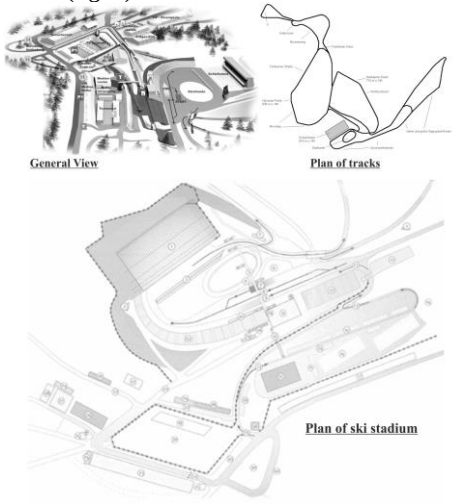


Fig. 1: DKB-Ski-Arena in Oberhof (Germany)

Biathlon center is located in mountainous forested place which 2.5 km from the town of Oberhof in Germany. Biathlon stadium is at 814 m above the sea level, ski and biathlon tracks are at the altitude of 774-839 m. So, the elevation difference makes up 64 m.

Total area of Oberhof biathlon center is 20.5 ha, the total coverage of biathlon tracks is 12.9 ha, of biathlon stadium with shooting zone and grandstands – 2.6 ha, and built-up area for other facilities is 5 ha. The other area is occupied by car parks, communication lines, landscape objects.

The Oberhof stadium grandstands after the renovation can capacitate 12 thousand spectators, around 8 thousand of supporters' places are provided along the tracks. Before the renovation in 2003 the whole complex could have accommodated 10 thousand spectators in general, which was not enough, taking into account the growing popularity of biathlon, especially in Germany. The actual biathlon complex sports infrastructure in Oberhof is represented by the shooting zone with 30 targets, ski and biathlon tracks of 6 km, 7.5 km, 10 km, 12.5 km, 15 km, 150 km long penalty lap, start and finish zone. Administrative and sports infrastructure also accounts for competition, doping control and referee offices, athlete test zone, teams wax cabins, coach and mixed zones. The sufficient number of car parks is provided to athlete teams. There is also a building for VIP guests with restaurant, conference hall, rest rooms and the club "Biathlon Family". Besides the grandstands and spotting places along the tracks for the supporters, there are also shops (food, clothes, merchandise, souvenirs etc.), WC, service, grounds for children entertainment, emergency station. The press center is located on the sports complex territory, where the required territory for TV and other equipment is provided to ensure maximum comfortable conditions for quality TV broadcasting and coverage.

Thus, Oberhof biathlon center is an example of optimal compact design for such type of facility to guarantee the international competitions holding at the highest level. But, at the same time, the disadvantage of this facility is underdeveloped sports and athlete training infrastructure (the absence of sports halls and gyms etc.) and the tourist facilities remoteness (hotels, restaurants, entertainment facilities are located in the town of Oberhof at a distance from the competition holding place) [11].

Biathlon sports club in Kontiolahti (Finland) is one of the biggest biathlon centers in Scandinavian countries. The sports club, originally named «Niemen Veto», was established in 1956 and served as a center for athletics, biathlon, orienteering and shooting. Later athletics lost its positions and since 80-s of the XX c. sports complex had gradually been turned into biathlon center.

The small town of Kontiolahti is situated in the eastern part of Finland, 70 km from the border with Russian Federation. The biathlon center is located 5km to the south from the city. The nearest airport Joensuu is 25 km away from the biathlon stadium. Biathlon center is at the banks of the Lake Höytiäinen. The stadium is at the altitude 120 m above the sea level. The elevation difference fluctuates from 90 to 126 m.

The biathlon center total area is 23 ha, the total coverage of biathlon and roller skis tracks is 13.8 ha, of biathlon stadium with shooting zone and grandstands –1.6 ha, and built-up area for other facilities is 2.8 ha.

Currently Kontiolahti biathlon center includes the stadium with grandstands for 10,000 spectators, shooting zone for 30 target stands, main building, where competition office, VIP guest rooms and doping control rooms as well as other premises are located. Press and TV centers are also located nearby. The restaurant for 100 visitors (fig. 2) is at close proximity to the grandstands. The sports center territory is equipped by the service zone with 31 team wax cabins, where athletes are tested before the competitions. Biathlon center in Kontiolahti has sufficient number of car parks with the convenient drive [12].

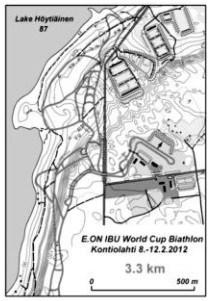
So, biathlon center in Kontiolahti is marked by compact location in natural landscape environment, attractive for tourists and possesses all the possibilities for hosting the highest level of competitions. Its disadvantage is the absence of developed immediate

tourist infrastructure within the sports complex and the need for the supporters to cover the distance from the locality to the place of holding competitions by public transport each time.

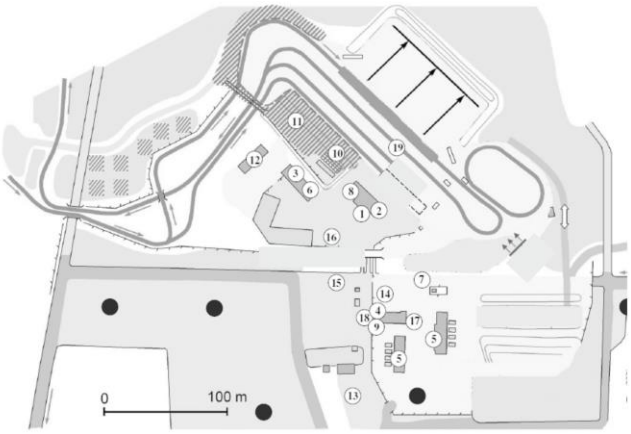
Biathlon center Südtirol Arena, located in **Antholz-Anterselva (Italy)** is the most attractive sports complex for holding biathlon competitions from the tourists' point of view. Biathlon stadium with tracks was built in 1971 for holding national competitions and, thanks to its sports infrastructure modern level, in 1973 it was already hosting first international competitions. In 1975 this biathlon center became the venue for the first Biathlon World Championship.



General view



Plan of tracks



Plan of biathlon stadium

Fig. 2: Biathlon sports club in Kontiolahti (Finland)

Biathlon center is located in municipal area of small towns and villages Rasun-Anterselva in north-eastern Italy, Bolzano province at Austrian border. The closest airport in Bolzano is 60 km away from the sports complex. The biathlon center is next to mountain Lake Antholzer See. The biathlon stadium is one of the most highland in the world and is located at 1,634 m above the sea level. Biathlon tracks marks are within the range of 1,626 and 1,673 m above the sea. Thus, despite the great altitude above the sea level, the elevation difference is relatively low and makes up 47 m.

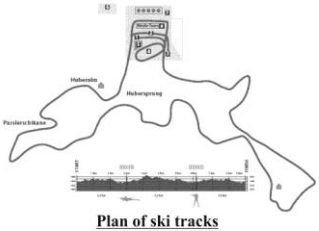
The ski and biathlon center total area is 27.2 ha, the total coverage of biathlon tracks is 18.7 ha, of biathlon stadium with shooting zone and grandstands – 2.8 ha, built-up area for other sports, administrative and tourist facilities is 5.7 ha. Biathlon center in Antholz is located in such a compact way that biathlon stadium and other facilities are placed inside the network of ski tracks.

After the renovation in 2007 biathlon stadium Südtirol Arena grandstands can capacitate around 10,000 of spectators alongside with 5 thousand supporters, whose can watch the competition along the ski tracks. Complex sport infrastructure is represented by the biathlon stadium with shooting zone for 30 target stands, the network of ski tracks with 2.5, 3, 3.3, 4 km loops, 150 m long penalty lap, ski testing service zone with team wax cabins. Special heated tents are put for the athletes, coaches, federation representatives and VIP guests, where refectories, rest halls and rooms and club "Biathlon Family" are placed. There is a relatively large press center with developed media infrastructure and conference halls, connected with sports complex administrative block. Also there are some guest houses with restaurants and hotel rooms on the premises. The technical zone with team parking spaces, TV equipment as well as technical maintenance building is separated from the stadium (fig. 3). Small shops, emergency and police stations are placed along supporters' routes.

Overall, biathlon complex in Antholz-Anterselva is distinguished by its compact layout, all infrastructure elements convenience and accessibility, attractive landscape features. According to supporters' evaluation, this sports center is the most popular and of greater demand among all the other European biathlon centers. This sports facility basic disadvantage is the hotel and entertainment facilities dispersal over vast territory, causing tourists and athletes some difficulties, as well as complex high-land location having negative effect on some athletes' sports results [10].



General view



Plan of ski tracks



Panoramic view



Plan of ski and biathlon stadium

Fig. 3: Biathlon center Südtirol Arena, Antholz (Italy)

One of the most famous biathlon centers in Eastern Europe that serves as a host for high level world competitions on regular basic is **biathlon sports complex in Pokljuka (Slovenia)**. The biathlon stadium was constructed at the beginning of 90-s in the XX century. First competitions took place here in season 1991-1992, and since 1993 stages of Biathlon World Cup have been held in Pokljuka annually. In summer time the stadium is used for summer biathlon competition with archery.

Biathlon center is located in Triglav, national landscape park, in the north-western part of Slovenia, 20 km from highland resort town Bled. The nearest airport is located in the city of Ljubljana, the capital of Slovenia, 45 km away from the sports complex.

Biathlon stadium is placed at the mark of 1,340 m above the sea level. Biathlon tracks marks are within the range of 1,333 to 1,372 m above the sea level, so, maximum elevation difference makes up 39 m.

The Pokljuka sports center total area is 23.6 ha, the total coverage of biathlon tracks is 14 ha, of biathlon stadium with shooting zone and grandstands – 2.5 ha, and built-up area for other sports, administrative and additional facilities is 7.1 ha.

Sports center infrastructure is represented by the biathlon stadium with shooting zone for 30 target stands, 150 m long penalty lap, start and finish zones. In front of the shooting zone there are grandstands that can accommodate 8 thousands spectators. There

is also a separate VIP guests grandstand. Team participant's service zone is next to the stadium. Triglav sports complex main building is located near VIP grandstand. This two-storied building accommodates competition office, organizing committee room, broadcast booth, TV center, press center, press room, referee room, teletype room. Rest rooms for VIP guests cover most of the first floor area. The second floor is for hotel rooms.

All tourist and entertainment facilities are located 20 km away from Pokljuka, in the town of Bled.

Thus, sports center in Pokljuka is an example for the modern rational solutions for biathlon facility, which combines both sports and tourists functions. As in the most of other European biathlon centers, basic disadvantage here is the remoteness from the locality, where hotels and other sports and tourist infrastructure elements are to be found.

2.2. CIS countries biathlon complexes design experience

It is also reasonable to consider CIS countries biathlon complexes design and construction experience, taking into account the similarities in sports facilities project design tendencies since the times of USSR.

Russia witnesses the most global new ski and biathlon complexes construction development, especially after getting the right for holding Winter Olympic Games in Sochi in 2014. Mainly, the most modern winter sports center in Khanty-Mansiysk is being reconstructed and renovated, biathlon complexes have been built in Ufa, Tyumen, Saransk, modern ski and biathlon complex Laura was constructed near Sochi for the Olympic Games in 2014.

The most illustrative examples of ski and biathlon complexes in CIS countries for the analysis given are Winter Sports Center in Khanty-Mansiysk (Russia) and sports center Raubichi near Minsk (Belarus).

Winter Sports Filipenko Center in Khanty-Mansiysk is one of the most famous ski and biathlon complexes with vast sports and tourists' infrastructure in Russia. The history of complex was established in 60-s of the XX century, when the shooting zone and sports school wooden structure were built. Since 1997 complex had been a subject to massive renovation, and in 2003 and 2011 sports center hosted biathlon world championship and stages of World Cup annually. In 2009-2011 facilities were modernized.

Ski and biathlon complex is located in the central part of Russian Federation, in Western Siberia, in the forests near Khanty-Mansiysk, 2 km away from the city center and 7.5 km from the international airport. Biathlon stadium is located at the mark of 83 m above the sea level, ski tracks marks are in the range of 63 and 114 m above the sea, so the elevation difference makes up 51 m.

Khanty-Mansiysk ski and biathlon center total area is 24.1 ha, the total coverage of biathlon tracks and roller skis routes is 16.4 ha, of biathlon stadium with shooting zone and grandstands – 2.1 ha, built-up area for other sports, administrative and additional facilities is 7.4 ha.

After the renovation in 2009 Khanty-Mansiysk biathlon stadium accommodates up to 15 thousand of supporters on its grandstands. Currently this ski and biathlon facility operates all year round, its structure includes a biathlon stadium with start and finish zones and a shooting one for 30 target stands, competition office, sports school, press center, separate building for club "Biathlon family", increased comfort VIP building with rest rooms and a restaurant, heated pavilion for the spectators, ski testing service zone with 41 wax cabins for athletes. Also infrastructure is supplemented by sports and administrative complex, sports and tourist hotel "On Seven Hills" and separate cottages for athletes (fig. 4).

All in all, ski and biathlon center in Khanty-Mansiysk, despite its location practically in the city itself, and unlike European biathlon centers, has developed infrastructure, that ensures sports facility autonomous operating, satisfying almost all tourists' and athletes' needs [7].

Major biathlon complex in Belarus is **Winter Olympic Sports Republican Training Center "Raubichi".**

This sports center is one of the first on the territory of the former USSR which construction was originally aimed at holding international competitions. Sports complex construction began in 1972, and in 1974 it had already become a host to Biathlon World Championship. Later Raubichi Center was used as a venue for holding international competitions on regular basis, including biathlon world championships in 1976, 1982 and 1990. Complex is a multifunctional sports facility, where not only biathlon, but also free style, ski race, ski jumping, orienteering competitions etc. can take place. At the moment sports infrastructure is a bit outdated, that is why recently Raubichi Center hosts national and regional competitions, as well as Belarus athletes' trainings.

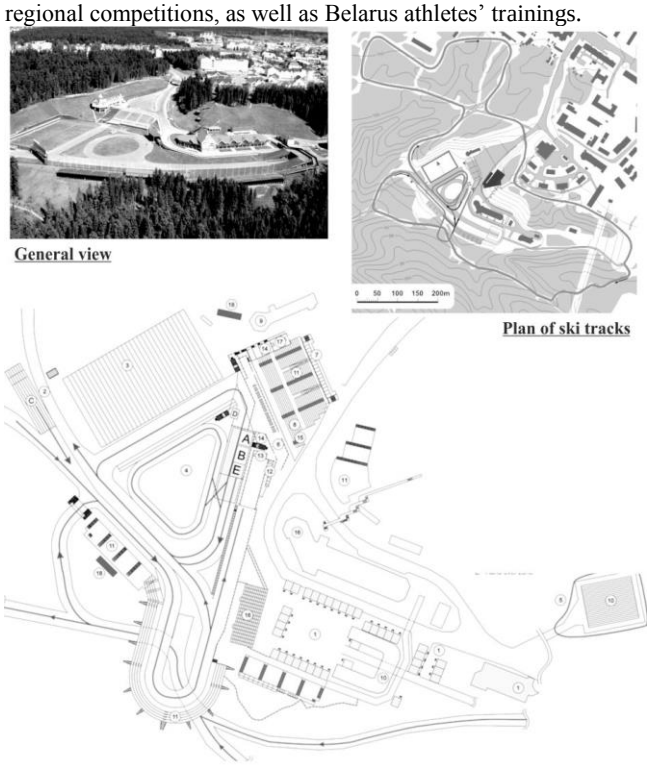


Fig. 4. Winter Sports Center in Khanty-Mansiysk (Russia)

Sports complex is located in the central part of the Republic of Belarus in Minsk region, 20 km away from Minsk (the capital of Belarus) and 30 km away from the international airport "Minsk-1". Biathlon stadium is located at the mark of 200 m above the sea level, ski tracks marks are in the range of 195 and 255 m above the sea, so the elevation difference makes up 60 m.

As Raubichi Sports Center is a multifunctional facility, where a lot of buildings for different winter sports are placed, it covers a relatively vast area of 42.8 ha. The total coverage of ski, biathlon, and roller skis and cross tracks is 27.2 ha, of a biathlon stadium with shooting zone is 2.3 ha, and built-up area for other sports, tourist and additional facilities is 13.3 ha.

Raubichi biathlon stadium grandstands can accommodate 2.5 thousand of spectators. Complex sports infrastructure includes: More than 20 km ski tracks, roller skis route (6.2 km), modern shooting zone for 31 target stands, a complex of ski hills, acrobatic slope, slalom route, gym and sports hall, tourist houses, 2 hotels for 40 and 190 guests, 2 restaurants, sauna, referee pavilion, indoor skating rink.

So, Raubichi sports center is better facilitated for sports and training, as well as health keeping and recovery athletes' exercising and tourists' active recreation, than for international competition holding, as its structure differs greatly from European biathlon complexes. To conclude, this sports complex is an example of rational solutions for multifunctional ski and biathlon sports and recreation center [6].

2.3. Ukrainian biathlon complexes design experience

Domestic ski and biathlon complexes are not characterized by such infrastructure occupancy and arrangement, as foreign and CIS countries facilities, but, for clearer understanding of modernization and renovation ways for already existing and construction of new complexes in Ukraine, the analysis of such facilities functional and planning organization seems to be a crucial aspect. Ski and biathlon lodges, centers and complexes in Ukraine are located in Sumy (educational and practice center "Dynamo"), Chernigiv (Olympics training center "Berizka"), Kharkiv (ski lodge "Temp"), Ternopil (sports society "Kolos"), Lviv region (educational and practice center "Tysovets"), and biathlon sports section in the city of Kyiv.

For the functional structure and location peculiarities observation ski and biathlon educational and practice center "Dynamo" in the city of Sumy and educational and practice center "Tysovets" near the village of Oriavchyk in Lviv region have been selected.

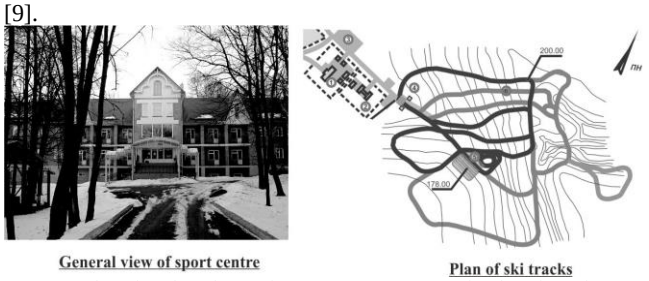
Ski and biathlon educational and practice center "Dynamo" in the city of Sumy is one of the major training center for Ukrainian national biathlon team preparation. Lodge was built in 1968 and was a physical education and sports center aimed at ski and biathlon for Dynamo society. In times of Ukrainian independence the lodge was reconstructed and renovated. After the renovation in 2003 all the necessary conditions for athletes' everyday life and training process, as well as for regional and national competitions holding were created here. Currently the gradual reconstruction is slowly taking place within the complex.

Ski and biathlon complex is located 5 km away to the east from the city of Sumy, next to Sumy - Kharkiv motorway. The distance to Sumy Airport from the sports station is 15 km. Biathlon shooting zone is located at the mark of 187 m above the sea level, ski tracks marks are in the range of 173 and 210 m above the sea, so the elevation difference makes up 37 m.

educational and practice center total area is 17.9 ha, ski, biathlon and roller skis tracks and routes cover 14.9 ha, biathlon stadium with shooting zone – 1.4 ha, built-up area for other sports, administrative and additional facilities is 1.6 ha.

Ski and biathlon complex in Sumy is mostly adapted to athletes' trainings and amateur skiing, that is why there are no grandstands or they are temporarily constructed. Lodge infrastructure includes ski and biathlon tracks and roller skis routes, biathlon shooting zone for 25 target stands, penalty lap, Olympic training lodge building, child junior sports schools, indoor shooting area, referees houses, start and finish zone, sports equipment rental point, shed for the equipment. Lodge building includes sports and training block with gym and sports hall, health-keeping and recovery block with sauna and massage parlors, athletes' refectory, administrative block and residential block with hotel rooms for athletes (fig. 5).

To sum it all up, educational and practice center in Sumy is a complex at a relatively satisfactory level for Ukrainian ski and biathlon athletes training. The facility can be renovated by means of sports and tourist infrastructure expanding and creating conditions not only for trainings, but also for high level competitions [9].



General view of sport centre Plan of ski tracks

Fig. 5: Educational and practice center "Dynamo" in the city of Sumy (Ukraine)

The most developed biathlon and ski complex in Ukraine is **educational and practice center "Tysovets"** in Skole district, Lviv region. The complex appeared in 1975 on the territory of the former military base, and later was turned into sports center for state society TsSKA.

The military base sports complex status still remains up to present times, but the facility is open both for the athletes and for the tourists. In 1990-s biathlon stadium and some other sports infrastructure elements were reconstructed. Since 2009 Tysovets host summer biathlon international competitions.

Sports complex is located in the western part of Ukraine, 2 km away from the village of Oriavchyk, 32 km away from the administrative center and railway station of the town Skole Lviv region and 130 km away from the international airport "Lviv". Biathlon stadium is placed at the mark of 980 m above the sea level. Biathlon tracks marks are in the range of 930 and 995 m above the sea, so the elevation difference is comparatively high and makes up 65 m.

The Tysovets sports complex total area is 34 ha, the total coverage of biathlon and ski tracks is 24.4 ha, of biathlon stadium with shooting zone and grandstands – 2.2 ha, built-up area for other sports, administrative and tourist facilities is 7.4 ha. The rest of the territory is occupied by massive forests, natural and landscape objects and transportation communications.

Complex sports infrastructure includes: Biathlon and ski tracks and roller skis routes network for 2.5, 5, 10, 15 km, biathlon stadium with shooting zone for 22 target stands and grandstands for 500 spectators, competition office with referee block, team wax cabins, sports building with sports hall, gym and emergency station, a complex of ski hills, skiing slopes, sports equipment rental points for the tourists. There is also a separate block of restaurants and refectory to meet athletes' special diet requirements. A hotel with rooms for athletes and tourists in also located in the sports center. The administrative block, saunas, rest rooms and rental points are placed in the hotel. Besides the hotel, some cottages were constructed for athletes and tourists [9]. Administrative infrastructure and support facilities are partly placed in the cottages (fig. 6).



General view Plan of ski tracks

Fig. 6: Educational and practice center "Tysovets" (Ukraine)

3. Conclusions

Having analyzed biathlon design and construction practices, some patterns and peculiarities in their formation, location and functional and planning organization both in Ukraine and abroad have been determined, common features and differences in their infrastructure organizations that depend not only on biathlon complex sport purpose, but, to great extend, on national traditions and athletes training process management peculiarities in different countries of the world.

The most developed and convenient within competition holding period are European biathlon sports complexes, as they are characterized by biathlon tracks, shooting zone, stadium, changing and wax rooms appropriate quality preparation. It means that competition holding infrastructure in European complexes is of the highest level. But the infrastructure for long-term trainings and educational training sessions at such facilities is underdeveloped. Mainly, sports lodges including sports and training and health-keeping and recovery blocks as well as rooms for accommodating athletes and child junior sports school are absent. The examples are observed above complexes in Oberhof, Antholz, and Pokljuka. The same tendency in biathlon centers functional and planning organization is typical of European countries, because athletes training process

usually occurs individually and it does not require constant holding of long-term training sessions. Team are gathered together only before the competitions for tactical preparation and tests. Within this period of time, as well as during competitions holding, athletes live in the hotels at the nearest residential localities, and they get to biathlon complex every day by special transfer. Within their infrastructure biathlon complexes also posses special heated wax cabins, where athlete can change their clothes, prepare their rifle and sports equipment.

The absence of developed tourist infrastructure is also typical of biathlon complexes and centers in European countries. It is represented by spectators' grandstands and special supporters' spots along biathlon tracks, temporary structures (heated tents) for warming with cafeterias and souvenir shops. Tourist hotels with well-developed service and entertainment infrastructure are also absent from complexes structure. As a rule, these facilities are laced in the nearest residential localities over a radius of 5-30 km from biathlon complex or center. It causes the spectators some inconvenience, as every time they have to get to biathlon complex by public transport.

So, European biathlon centers infrastructure is mostly presented by necessary minimal set of buildings for competition holding provision, but all the elements present are of highest quality. European complexes usually cover relatively small area - 20-25 ha, that is why the basic principles for their formation are compactness, economy and maximal functional efficiency.

Biathlon complexes located in CIS countries - Russia and Belarus were mostly formed on the basis of already existing Soviet biathlon and ski sports complexes. That is why they have a lot in common with Ukrainian ski and biathlon complexes. Compared to European sports centers and complexes, CIS countries facilities have expanded enough infrastructure, which includes the required set of buildings for different level competition holding (similar to Europe), but also they posses athletes sports lodges, separate child junior sports schools, hotels both for athletes and tourists, entertainment facilities, ski equipment rental points, structures for other winter and summer sports. Sports lodge can also include sports and training and health-keeping and recovery blocks, athletes' refectory, residential building, as well as sports schools for boys and girls as necessary elements for CIS countries biathlon complexes, because the training process is made in such a way, that team is constantly training together as a group and obligatory long-term training sessions are held several times a year. Ukrainian biathlon athletes also have similar training process structure.

Such sports complexes usually occupy vast territory (23-45 ha), require more funds for construction and maintenance, but, at the same time, they are almost autonomous from the nearest residential localities. Also thanks to their multifunctional nature they can be used all year around, and not only during the time of competition holding.

After analyzing Ukrainian biathlon and ski exiting sports complexes experience, the conclusion can be made that they have insufficiently developed infrastructure and many of the required for high quality competition holding and optimal athlete training process management objects are absent from them. But, for the sake of modernization of already existing facilities and new complexes construction the attention should be drawn to European examples and some modern complexes in CIS countries (in Khanty-Mansiysk, Ufa, Sochi) that are closer to Ukrainian experience in terms of their functional occupancy. In biathlon complexes in Ukraine the emphasis should be laid on biathlon shooting zones and stadiums renovation, grandstands, referee structure, administration and competition offices, press centers and commentary booths construction at the stadiums, tourist infrastructure and hotel elements building and renovation, maintaining biathlon tracks in compliance with international standards.

To conclude, having determined the basic prerequisites for biathlon facilities formation, having analyzed previous researches and biathlon sports complexes design and construction experience, it is reasonable to study their functional and planning structure, such facilities typology and classification alongside with determination of factors that influence their organization and location as well as their functional and planning means and principles.

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