

ANIMAL CROSSING BUILT OVER A2 MOTORWAY IN POLAND

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Abstract

Recently the number of animal crossings built in Poland has increased. This is connected with fast growth of road network and traffic which conflict with animal migration routes. In many cases both in Poland and other countries corrugated steel plate structures (CSPS) for construction of animal passages are used.

Animal passages can be built as overpasses or underpasses. Large number of various shapes of CSPS and simplicity in construction of additional elements such as shelves for small animals make the structures more and more popular. Additional advantages are short construction time with the use of minimum number of equipment and people and limiting of a conflict of construction time with local traffic.

There are many interesting examples of using of CSPS as animal passages all over the world. One of the most spectacular projects is located in Poland over A2 motorway which can be a proof that use of steel plate structures lets one to construct animal passages as environmental friendly, aesthetic looking and financial effective.

Key words: animal crossings, corrugated steel plate structures

1. INTRODUCTION

The fast growth of road network and modernization of a great number of existing roads in Poland cause the number of animal crossings has increased last time. Animal passages are built as underpasses or overpasses. They can have various shapes and can be built in various technologies (concrete, steel, plastics). Since introduction of flexible structures made of corrugated steel in XIX century this technology was gradually used in road construction [1] however animal overpasses with the use of flexible corrugated steel structures were introduced in Europe in late 80-ties of XX century [2]. Since development of deep corrugation (380mm×140mm) in 1975 new opportunities for construction of long span structures occurred.

Nowadays animal passings with use of corrugated steel structures can be built with spans over 24 m. Advantages of constructing of animal crossings with the use of flexible structures versus traditional technologies are lower costs, faster construction, minimum disruption to traffic and nice fit into landscape. Important environmental factor is use of soil as a structural element. Very often local soil can be used (if it is sand or gravel or stone) for backfill.

2. ANIMAL PASSINGS OVER A2 MOTORWAY IN POLAND

In the middle of 2006 two animal crossings over newly constructed A2 Motorway in Poland were put into service. Each of the overpasses consists of two corrugated steel arches placed on concrete footings and two corrugated steel structures with closed profile [3]. Figure 1 shows side view of the crossing.

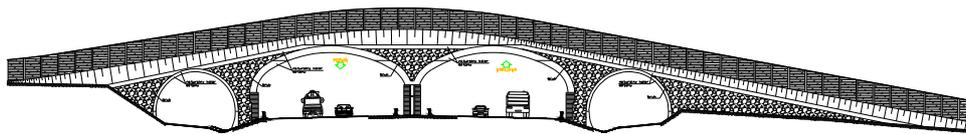


Figure 1. Side view of the animal overpass

Structures over motorway lines are arch shaped with a span of 17,67 m and rise of 5,50 m. Corrugation profile of these structures is 380×140 mm and the plate thickness is 7,0 mm. Structures are reinforced by means of ribs made of steel plates located on the whole length and whole perimeter of the structures. Length of the structure is about 59 m.

Structures for technological roads have closed profile with 9,36 m in span and rise of 8,13 m. Corrugation profile is 200×55 mm, plate thickness is 7,0 mm and structures are about 76 m long.

All CSPS are hot dip galvanized with a minimum thickness of 85 μm acc. to EN 1461:2000 and their whole inner area was epoxy painted with a layer of 200 μm thick. After assembly whole outside area was protected with bituminous emulsion.

Minimum width of each overpass is about 36 m in the middle section increasing up to 75 m at the base. Inlet and outlet slopes are beveled 1:1,5 and concrete collars are constructed to reinforce inlet and outlet ends of the structures.

In March 2005 assembly of steel structures started. Assembly schedule was prepared assuming 2 weeks for each corrugated structure what makes a total number of 16 weeks of assembly time. Phases of construction of animal overpasses are the following:

- a) Preparation of bedding for close shaped structures and concrete foundations for arches
- b) Assembly of close shaped structures.

Three bottom plates from one ring were first pre-assembled and then connected with the previous ones (Figure 2). After all bottom plates have been assembled the assembly of side plates (Figure 3) and top plates (Figure 4) started using the plate-by-plate method and with the help of movable scaffolding.
- c) Painting of close shaped structures from backfill side with bituminous coating (Figure 6).
- d) Partial backfilling of closed structures – (to the level of the top of concrete footings).
- e) Assembly of arches on concrete footings.

Arches were assembled using partial pre-assembly method. Side plates were connected to the base channel (Figure 7) and at the same time top plates were pre-assembled on the ground (Figure 8). Pre-assembled plates were next lifted with the use of crane into final position and connected with the structure (Figure 9). While four full rings were finished, reinforcing rib plates were assembled to the structure. Figure 10 shows assembled arch. In order to make the assembly faster and easier special movable scaffolding was constructed.
- f) Painting of arches from backfill side.
- g) Completion of backfilling (Figure 11). CSPS were backfilled with sand–gravel mix compacted to minimum 97% standard Proctor density. Minimum height of cover over arch structures is about 2,20 m.
- h) Construction of concrete collars for closed (Figure 12) and arch structures (Figure 13). Collars were designed in the way to cover corrugation profile of bevelled plates that gave nice aesthetic appearance of the structure (Figure 14).
- i) Finishing of the animal overpasses by slope paving and making of wooden fences on top of them to separate the animal passage from view of moving vehicles (Figure 15, 16).



Figure 2. Assembly of bottom plates of close shaped structure on prepared bedding



Figure 3. Assembly of side plates of closed structure



Figure 4. Assembly of top plates with using of plate-by-plate method



Figure 5. Assembled structure for technological road



Figure 6. Structure painted with bituminous coating from the backfill side



Figure 7. Assembly of side plates of arch to the base channel



Figure 8. Pre-assembly of top plates of arch on the ground



Figure 9. Assembly of pre-assembled top plates of arch



Figure 10. Assembled arch structure



Figure 11. Backfilling procedure



Figure 12. Construction of formwork for concrete collars for closed structures



Figure 13. Construction of formwork for concrete collars for arch structures



Figure 14. Side view of concrete collars for arch structures

The average assembly speed was 152 kg/man–hour. One crane (25T), movable scaffoldings and 10 electric wrenches were used. Assembly crew consisted of 10 workers in average.



Figure 15. Finished animal overpass



Figure 16. Bird's eye view of the crossing

3. CONCLUSIONS

Presented case study shows the biggest animal crossing in the world built with the use of corrugated steel structures. It shows that corrugated steel structures can be effectively used to build animal crossings over roads. Quick construction and minimum disturbance to surroundings limit negative influence of works on environment and save costs due to minimum disturbance of the traffic. Use of natural materials (sand, gravel stone, wood) enhances environmental effect. Financial effectiveness and aesthetic look support the idea of common use of those structures for construction of animal crossings over and under roads.

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PRZEJŚCIE DLA ZWIERZĄT ZBUDOWANE NAD AUTOSTRADĄ A2

Streszczenie

Liczba przejść dla zwierząt budowanych w ostatnim czasie w Polsce wzrosła. Powiązane jest to z szybkim rozwojem sieci dróg, które często przecinają trasy migracji zwierząt. Zarówno w Polsce jak i innych krajach w tego typu przypadkach do budowy przejść używane są konstrukcje stalowe z blachy falistej (CSPS). Przejścia dla zwierząt mogą zostać zbudowane jako przejścia górą lub przejścia dołem. Jedną z przyczyn rosnącej popularności konstrukcji zaliczyć można dużą liczbę różnych możliwych kształtów CSPS oraz prostotę w montażu dodatkowych elementów takich np. jak półki dla zwierząt. Kolejne zalety to krótki czas montażu, który wymaga minimalnej ilości sprzętu oraz ludzi i ograniczenie konfliktu pomiędzy czasem budowy a lokalnym ruchem.

Istnieje wiele ciekawych przypadków zastosowań CSPS jako przejść dla zwierząt na całym świecie. Jeden z najbardziej spektakularnych projektów znajduje się w Polsce nad autostradą A-2 i stanowi dowód, że użycie konstrukcji podatnych umożliwia budowę przejścia dla zwierząt, które będzie estetyczne, przyjazne dla środowiska i efektywne finansowo.

Słowa kluczowe: Przejście dla zwierząt, karbowane przepusty stalowe