THE EXPANSION AND FURNISHINGS OF THE FORTIFICATION STRUCTURES OF WROCŁAW FORTRESS – PART II

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Abstract:
The article presents part II of the description of furnishings for the fortification structures of Wrocław Fortress, built during the extension related to the mobilization in 1914. The furnishings include soldiers’ facilities, communication equipment and elements of ventilation and heating systems. In general, only the remains of furnishing details have survived till today, represented by installation elements in the floors, walls, floor slabs and vaults. The analysis of their location, combined with the relevant technical instructions, provides the basis for the theoretical, and perhaps in the future also practical, reconstruction of the interiors of selected casemates of Wrocław infantry bunkers at the time of their greatness.

Keywords: Wrocław Fortress (Festung Breslau) (19-20th cent.), fortification, furnishing

INTRODUCTION
The first part of the article included the description of permanent works of Wrocław Fortress, built in 1890-19181. Wrocław Fortress, like any other German fortress in the period preceding the Great War, functioned at two levels: during peacetime, when necessary permanent defensive works were built and furnished, which was accompanied by the identification of places for field and semi-permanent fortifications2, sup-

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1 S. Kolouszek, Fortyfikacje Festung Breslau, Jelenia Góra 2014, s. 106 – 193.
plementing the arrangement formed by permanent fortifications. The second level, during warfare, was the period when infantry posts, accompanying bunkers and artillery batteries were built at the previously identified places. One hundred years passed from the moment when the full version of the plan for extending the fortifications for mobilization purposes was implemented in Wroclaw. There are only few literature sources relating to the structures built in this period and the interior furnishings of such facilities have not been broadly discussed, either. This paper makes an attempt at reconstructing the said furnishings on the basis of archival documents and their remains preserved in situ in Wroclaw Fortress bunkers, built when the fortress was armed for warfare in 1914. Thus, it confirms the thesis that it is possible to reconstruct, so far theoretically and perhaps also in practice in the future, the furnishings not preserved till today, which could offer a more detailed view of the living conditions in the fortification structures at the beginning of the 20th century.

1. MOBILIZATION PLANS OF THE FORTRESS

While planning the construction of modern fortifications in Wroclaw, the Imperial General Staff took account of a variant of construction where all works would be built as semi-permanent ones at the time of commencing warfare. The plan proposed on 10 October 1889 included the construction of, among others, twelve semi-permanent defensive posts and ten field-works with shelters resistant to shrapnels. At the same time, in order to carry out this plan, the first two storages for supplies and armaments were completed, located on both banks of the Odra river, in present Krzywoustego and Borowska streets. Taking into consideration the vast scope of planned works, and to relieve the future mobilization, a decision was made to build twelve permanent infantry bunkers, designed as the future basis for permanent defensive infantry posts – forts. In the years 1890-1891 the construction of the first seven infantry bunkers (German Infanterie Raum, hereinafter “I. R.”) was started, and, concurrently, the previously established storages for armaments and supplies were enlarged, by delivering to them the materials accumulated in two already obsolete fortresses – Nysa and Torgau. At that time the mobilization storages (German Armierungsdepot) were filled with, among others, 1,000 sheets of corrugated plate and structural elements to build bunkers forming the warfare extension and 300,000 kg barbed wire to prepare anti-infantry obstacles. Stocks in both mobilization storages were enlarged still in 1903, by purchasing additional materials to be used for the creation of anti-infantry obstacles.

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3 Anleitung für den Kampf um Festungen, Berlin 1910.
4 Bayerische Hauptstaatsarchiv, München, sygn. MKr 4605/2, Die Entwicklung des Deutschen Festungssystem seit 1870, p. 236.
5 Ibidem, p. 237.
6 Geheimstaatsarchiv Preussischkulturbesitz, sygn. HA IX, B-70197.
8 Ibidem.
and in 1912, when the amount of 600,000 German marks was allocated to acquire supplies necessary for the warfare extension.\(^9\)

At the same time there was an ongoing discussion on the shape of not only the planned field fortifications but of the whole fortress. A number of mobilization plans for the fortress were developed, out of which only a cartographic part of one of these studies, proposed in 1903, is known.\(^10\) According to the plan, the defence was to be based on the existing infantry bunkers, from the north, the east and the west, and on the embankment of the railway ring, which was intended to be reinforced with five mobilization works (German Armierungs-Werk).\(^11\) A subsequent plan was presented in 1905, but, unfortunately, only its description is known. According to the plan, the existing location of the Main Combat Line\(^12\) was abandoned and the decision was taken to move the fortress position – to the west – to the Ślęza river line – to the east – to protect the bridges planned on the contemplated Odra channel, to the Kowale – Swojczyce – Bartoszowice line.\(^13\) Another significant modification to the mobilization plan was proposed in 1913, and like in the case of the plan referred to hereinabove, only its description is known.\(^14\) In accordance with this plan the mobilization structures, planned still in 1903, were to be moved further to the south from the embankment of the railway ring. The documented exchange of opinions between respective decision-making bodies was in progress still in 1911.\(^15\)

Finally, in 1914, one additional infantry defence point was built (German Infanterie Stützpunkt 8a), whereas eight bunkers, serving as a parados for the field posts, were designed to protect the Kowale – Swojczyce – Bartoszowice line, and two bunkers situated on the a hill, 136 m above sea level, near Kiełczów, formed the framework for a projected post. In the southern part of the city ten infantry defence points were built (German Infanterie Stützpunkt 15a, b, 16, 17, 18, 18a, 19, 21, 22, 23) and in Ślęza a projected post was created, comprising only one permanent structure – an ammunition bunker (German Munitions Raum).\(^16\)

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\(^10\) GStAPK, HA IX, B-70197.
\(^11\) Ibidem
\(^12\) Anleitung für den Kampf um Festungen, Berlin 1910. This line is most often set out by the location of permanent or semi-permanent fortifications, representing the basic line of fight for the fortress. In front of the Main Combat Post there are some projected posts, designed to ensure defence against enemy forces or, as in the case of Wrocław, to block the terrain points situated above the fortress. At the rear, behind the Main Combat Post, there are heavy artillery posts and reserve infantry posts, prepared in case of breaking through the Main Combat Post.
\(^14\) Ibidem, p. 238.
\(^15\) Service Historique de l’Armee de Terre, Vincennes, sygn. 1 V M 56, Artillerieoffizier von Platz.
\(^16\) Politisches Archiv Auswärtiges Amt, Bonn, sygn. II-FM 152/10, F 6/1, Erläuterung über die Festung Breslau.
2. TECHNICAL AND DESIGN ISSUES

In 1893 standardised sheets of bent corrugated plate were introduced in German fortifications, used for the construction of field bunkers (the so-called Heinrich corrugated plates)\(^\text{17}\). At the same time flat sheets of such plate were used for the construction of field bunkers, with transverse bracings and supported by steel structures\(^\text{18}\), which, in connection with the introduction of bent plates, were not commonly applied\(^\text{19}\). Such bent sheets were used in Wroclaw, from the year 1906, to build sentry posts and emergency bunkers in the infantry forts, being then under construction\(^\text{20}\). The application of prefabricated material of this type significantly accelerated the construction process and improved the functional features of the interiors, which could be used under fire, without exposing soldiers to hazards posed by pieces of the vault, in the case the structure was hit\(^\text{21}\).

The structures with the older design\(^\text{22}\), completed near Wroclaw as infantry bunkers for subunits in the southern and eastern parts of the city (U1-U8, I. St. 16, 18, 18a,19), represented the fortification works utilising steel trestles and concrete\(^\text{23}\). The materials for their construction were most probably purchased and stored beforehand at building depots. The original design drawings have not survived to the present time, however, the condition of a part of the structures preserved in Wroclaw makes it possible to restore, almost completely, their design and furnishings.

The design of the discussed structures was based on prefabricated steel elements, i.e. trestles made of riveted trusses, arranged in three rows, directly supporting massive I-beams. The sheets of corrugated plate were flat mounted to the frame, forming the walls, inclined towards the interior, and the floor slab of the bunker. Structural elements were linked by means of screws\(^\text{24}\), using small-sized intermediate elements (e.g. angle brackets). The stay-in-place formwork thus prepared supported the concrete poured to form the walls and the floor slab\(^\text{25}\). Concurrently, fixtures for benches were anchored and an opening for an air intake pipe was carried out. After the concrete

\(^{17}\) Feldbefestigungs – Vorschrift, Berlin 1893, 1911, p. 72 – 77.

\(^{18}\) Technische Vorschrift A. 23, Anleitung fur die Ausfuhrung die Behelfsbefestigungen, Berlin 1907, Table no. 3, Figure 5.

\(^{19}\) Ibidem, p. 14 – 24.

\(^{20}\) PAAA, Bonn, sygn. II-FM 152/10, F6/1, Denkschrift uber die Festung Breslau.


\(^{22}\) In the German military jargon these bunkers were also called coffins, because of their trapezoidal shape.

\(^{23}\) Similar bunkers, based on trestles, but built with bricks, were completed near Kostrzyn nad Odrą and served as ammunition storages (as cited in Barthel, G., Czarnuch, Z., “Die Festung, Heft 9…” , s. 21).

\(^{24}\) Hexagonal screws were used, 40 and 70 mm long, with nuts having a diameter of 25 mm (resembling the currently used type – M 16, DIN 601).

\(^{25}\) During the construction process attempts were made to strengthen the lintel by means of smooth steel bars.
hardened and its required strength parameters were obtained, interior furnishings were fitted.

**Fig. 1.** The present state of the interior of bunker U. 8, 2014  
*Source: Authors’ archive*

**Fig. 2.** An attempt at visualisation of the interior of bunker U. 8  
*Source: Own elaboration*
The discussed bunkers were characterised by the limited possibilities of adaptation, resulting from the use of steel structures. A big number of trestles located inside not only reduced the span, but also determined the interior design, including the circula-
tion system. Therefore, racks for rifles were placed in the central part of the bunker and along the walls, and within the voids between the trestles (195 cm or 115 cm wide) folding benches for soldiers were mounted\textsuperscript{26} as well as an entablement with a fan and one or two heaters. A telephone and a washbasin were placed at the opposite ends in the recesses formed by the entrance vestibules.

The discussed bunkers were characterised by a relatively high consumption of steel, as it was necessary to use trestles, beams and minor connecting elements\textsuperscript{27}. However, they were indispensable, because in the case of being under fire their task was to transfer the loads caused by detonations of artillery grenades from the concrete floor slab and walls. The lack of crosspieces in the interior would result in eliminating the bunker crew from combat if a grenade broke through the floor slab or the wall. Therefore, probably, bags with sand or wooden elements, performing the role of crosspieces, were placed between the benches for soldiers. It is possible that these spaces were occupied only by cabinets for the bunker crew and heaters.

The new design for bunkers was implemented when the sheets of corrugated plate bent in the form of arches were introduced. Such sheets were put together to form small casemates, 260 x 400 cm, two or three per structure\textsuperscript{28}. Facilities of this type were also built in the fortress at the time of mobilization (German Infanterie Stützpunkt 8a, 15, 15a, 17, 22, 23). Details regarding the design of bunkers were contained in Technical Instruction no. 23\textsuperscript{29}. Unlike in the so-called coffins, the circulation path was located outside the casemates, which, if required, could be separated with wooden partitions (partition walls). Therefore, the circulation within the casemates was limited to a minimum. Owing to the above, their central parts could be used for the installation of a set of benches and wall-mounted tables for the bunker crew.

The advantages offered by the new design undoubtedly included:

- lower consumption of steel, owing to the use of corrugated plate exclusively;
- quick and easy assembly of structural elements;
- possibility of dividing a bunker into separate casemates;
- increased adaptation possibilities, owing to the lack of intermediate supports inside casemates;
- better transfer of the loads arising when the bunker is under fire.

A small span of the room could be regarded as a disadvantage in terms of the possibilities of adapting casemates, but it could be compensated by their length.

\textsuperscript{26} These benches were lifted towards the inclined wall and grappled by means of a movable element, resembling the currently used one-sided wing knobs.

\textsuperscript{27} For the construction of only one bunker as many as 34 trestles were required, not to mention connecting elements.

\textsuperscript{28} T.V.A. 23, “Anleitung für die Ausführung die Behelfsbefestigungen”, Berlin 1907, Table no. 4, Figures 1-14.

\textsuperscript{29} Technische Vorschrift A. 23, “Anleitung für die Ausführung die Behelfsbefestigungen”, Berlin 1907.
3. FURNISHINGS OF BUNKERS

In principle, the basic variant of furnishings for both types of bunkers is described in the regulations Technische Vorschrift A.23 Anleitung fur die Ausfuhrung von Behelfsbefestigungen (hereinafter: T.V.A. 23)\textsuperscript{30}. However, the building structures in Wroclaw deviated to some extent from the theoretical models presented in T.V.A. 23. The most characteristic feature differentiating the mobilization structures of Wroclaw Fortress was a reduction in the size of the bunker recommended by the regulations by half\textsuperscript{31}, with regard to bunkers with a single interior space technical norms did not provide for the solution for a back wall that was adopted in Wroclaw. In the case of bunkers consisting of two or three casemates, next to one of the extreme casemates a small room was created, with a latrine and communication equipment.

3.1. Furnishings for living needs

In the bunkers with a single interior space relatively short benches were available to soldiers\textsuperscript{32}, placed in the niches, about 195 cm long, in the front and back walls. The folding benches were fastened to a catch mounted on the inclined part of the front or back wall. Such solution was not described in any regulations and it was discovered by the authors during their field research. Above the benches, over the niches, wooden shelves were mounted, designed for soldiers’ satchels and other parts of equipment. The shelves were hung on metal holders, resting on the structural elements of the bunker (Figure 1, 2). The narrower voids between the support trestles were filled with bags with sand or wooden cabinets where soldiers stored their supplies or elements of equipment. In some cases these niches were also used to store fuel for heaters. The whole bunker could house 60 soldiers\textsuperscript{33}, for whom a sanitary part with a washbasin was prepared, for which water was drawn from the well dug in the bunker (e.g. U. 4), using a manually operated pump.

The furnishings intended for the bunkers with several rooms were different. In general, the furnishings in each of the rooms did not differ from the standard furnishings for casemates in the infantry bunkers built in the years 1890-1901 which were not modernised. Each of the rooms had four rows of folding benches\textsuperscript{34} and a shelf, suspended under the ceiling, with the possibility of adjusting its distance from the ceiling by means of thumb screws\textsuperscript{35}. One room thus furnished could accommodate 32 soldiers (Figure 3, 4). Thus, the bunker, depending on its version (2-3 rooms), could house 64-

\textsuperscript{30} Ibidem, Tables.
\textsuperscript{31} Ibidem, Table no. 3.
\textsuperscript{32} The length of the benches folded towards the inclined wall was limited to about 120 cm because of the height of the room and the necessity of leaving a sufficient space for circulation. The benches have not been preserved in any of the bunkers, with the exception of their fastenings.
\textsuperscript{33} Adopting the occupancy capacity standards for building structures as cited in T.V.A. 26, Anleitung fur den inneren Ausbau bombensicherer Raume, Berlin 1905.
\textsuperscript{34} Cf. T.V.A. 23, Anleitung fur die Ausfuhrung die Behelfsbefestigungen, Berlin 1907, Table 3, T.V.A. 2, Mauerbau, Anhang 1, Berlin 1898, Table 9.
\textsuperscript{35} T.V.A. 26, Anleitung fur den inneren Ausbau bombensicherer Raume, Berlin 1905, Table 2, Figures 8, 9, 10.
96 soldiers. The wells made available to soldiers were always located in one of the pair of bunkers situated in the fort.

### 3.2. Ventilating and heating equipment

Bunkers, irrespective of their version, were equipped with one manually driven fan, which, however, was not a rule for the structures of this type. The fan was always placed in the axis of each of the bunkers, at the back wall, in which the air intake duct was prepared and protected by means of a perforated steel plate\(^\text{36}\). Probably, a counter-clockwise dedusting fan, manually driven (by means of a crank handle placed on the gear wheel), was used\(^\text{37}\) (Figure 5). Its appearance and capacity were similar to those of the fan presented in Figure 6a. The chain or the driving belt were probably shielded from the inside by means of a metal net expanded on the frame made of angle brackets.

In the bunkers with a single interior space the fan was placed on the free-standing concrete pedestal, with the base dimensions of about 130 x 40 cm and about 110 cm in height. In the above structures no details suggesting the existence of ducts for air distribution inside the bunker (e.g. fastenings for air-duct clamps under the ceiling) have been preserved. Perhaps they were regarded as needless, as the interior of the bunker was not divided into parts. In the bunkers comprising several rooms, a metal ventilation duct was suspended by means of clamping rings beneath the vault of the corridor, supplying air directly to the end of the room.

Another characteristic differentiating both types of Wrocław mobilization bunkers on the right bank of the Odra river is the lack of an air outlet duct, specifically introduced in the bunkers with a single interior space and located near the floor of the corridor. The role of air outlet ducts in the bunkers with a single interior space was probably performed by small openings, providing additional light, made in the back wall, under the ceiling of the room.

The two versions of these building structures were heated in a different way. In the bunkers divided into rooms the niches for trench heaters were always situated at the middle height of the front wall in each room. Under the niche a narrow shelf was mounted for an unknown purpose. The conditions in the bunkers with a single interior space were worse – in all bunkers located along the northern section of the fortress defence (Unterstand nos. 1-10) the only heater was installed directly at the pedestal for the fan. In the bunkers with a single interior space, forming the southern section of the fortress defence, which were a part of the infantry forts (l. St. 16, 18, 18a, 19, 21), in some cases (l. St. 16, 18, 18a) two heaters were installed in the front wall, using the narrower niches between the trestles of the bunker structure for this purpose.

\(^{36}\) T.V.A. 12 a, Anleitung für die künstliche Lüftung von Panzerbatterien der Landbefestigungen, Berlin 1908, s. 9, Table 4.

\(^{37}\) On the concrete pedestals for fans in bunkers U 3 and U 8 red arrows have been preserved, showing the direction of movement of the crank.
It should be mentioned that the architecture of bunkers comprising several rooms imposed the use of military trench heaters, whereas bunkers with a single interior space could be equipped with more functional civilian heating stoves\textsuperscript{38}.

\textbf{Fig. 5.} Diagram of a fan\textsuperscript{39} used in bunkers (patent no. 286604, 1913)

\textit{Source: Patentschrift Nr 286644A, Ventilator mit Staubabscheidung, 1913}

\textbf{3.3. Communication equipment}

Bunkers, regardless whether they comprised one or several rooms, had identical equipment for communication and alarming purposes\textsuperscript{40}; speaking tubes and a telephone system. However, the conducted research has revealed significant discrepancies regarding the communication and alarm equipment installed in the bunkers, as in at least two bunkers with a single interior space there were no speaking tubes (Unterstand 3 and 4 on the Widawa river).

In the bunkers where a complete set of communication and alarm equipment was installed, the location of such installation differed. In the bunkers with a single interior space the telephone and a set of power supply batteries were always located in the niche, created by forming a vestibule inside the bunker, on its left side. For the installed telephone it was necessary to provide an inspection chamber for the telephone

\textsuperscript{38} T.V. A. 23, \textit{Anleitung für die Ausführung die Behelfsbefestigungen}, Berlin 1907, p. 22 – 23.

\textsuperscript{39} German \textit{Ventilator mit Staubabscheidung}.

\textsuperscript{40} T.V. A. 13, \textit{Anleitung für die Anlage von Alarmierungseinrichtungen}, Berlin 1907.
cable, with a cover made of steel chequered plate. Each bunker had only one telephone. Where the bunkers were built in pairs, as an infantry fort, the telephone was installed only in one of them, in the bunker where the commander of the fortification work was staying. Such bunker usually consisted of three casemates. In a part of the bunkers with a single interior space the niche on their left side was used for the installation of speaking tubes, provided with mouthpieces (Figure 6). In bunker U 6, two speaking tubes were mounted – which was non-standard – at its back wall.

A different solution was used in bunkers with several rooms, where, as already mentioned, in all preserved bunkers the telephone was installed in the latrine. The outlets of the speaking tubes could also be placed in the front walls of respective casemates. The introduction of this solution did not accelerate the information flow, but it certainly reduced the length of speaking tubes and facilitated the installation of this inconvenient auxiliary means of communication.\(^{41}\)

3.4. Storage of arms and ammunition

In both types of bunkers soldiers staying inside could place their arms in the rack. In the bunkers with a single interior space the racks were placed on the middle row of steel trestles supporting the structure. The racks, placed on both sides of the trestle,

could hold twelve Mauser system rifles in total (Fig. 6b). There were five sets of such racks in the bunker. The racks were made of oak boards, four-centimetre thick and ten-centimetre wide, fastened by means of screws to the openings drilled in the structural element. Slightly above the floor of the bunker there was a board with openings for the rifle butts. No analogy to the preserved racks for rifles can be found in the existing documentation.

In the bunkers divided into several rooms the racks for rifles were mounted in the corridor connecting the rooms, in one long run, along the whole back wall of the bunker – this solution was similar to the one adopted in the modernised infantry bunkers, dating from 1890-1901. In addition, some racks were placed in the rooms, along the front wall of the bunker.

CONCLUSION

The furnishing of the fortification structures of Wrocław Fortress during the mobilization extension represents an interesting aspect of its development. Only in Mobilization Bunker no. 8 (U. 8) the original furnishings in the interior have been preserved to a considerable extent, including, among others, wooden racks for rifles, a blast proof door, a speaking pipe with a mouthpiece, etc. Owing to the furnishings and the good condition of the structure the discussed bunker represents one of the best preserved fortification structures of the Great War time in our country. On 28 October 2014, because of the exceptional value of this structure, Wroclawskie Stowarzyszenie Fortyfikacyjne submitted an application for entering it to the provincial monument register. At present, proceedings related to subsequent entries have been initiated, with regard to the structures of the southern line, composed of ten infantry defence points, where, unfortunately, almost all steel trestles and a considerable part of corrugated plates have already been stolen. However, it is worth mentioning that despite the vast extent of devastation, it is possible to protect and manage the preserved bunkers and the furnishings that have survived therein. In recent years, local groups of fortification fans have been actively participating in such protection, supported by the relevant public administration bodies so that the future generations could have an opportunity to catch a glimpse of the former greatness of the bunkers. The authors believe that the furnishings of the fortification structures of Wrocław Fortress require further research, specially intensive because of the currently celebrated Great War anniversaries. As mentioned at the beginning, it is possible to identify the original furnishings of the fortification works at the time of the Great War, and thus, to learn about the living conditions prevailing in the fortifications at that time. In the authors’ opinion the presented thesis has been fully substantiated by the conducted field research and search through archives.

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BIOGRAPHICAL NOTES

Stanisław KOLOUSZEK – President of Wrocławskie Stowarzyszenie Fortyfikacyjne, his major area of research interest includes German fortifications dating from the end of the 19th century and the beginning of the 20th century, the reinforcements of Wrocław in particular. Wrocławskie Stowarzyszenie Fortyfikacyjne is involved in the research, popularization and protection of architectura militaris monuments in Wrocław.
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