

NEW
HEADQUARTERS
IN
GERMANY

BY COLONEL H. GRATTAN, C.B.E.

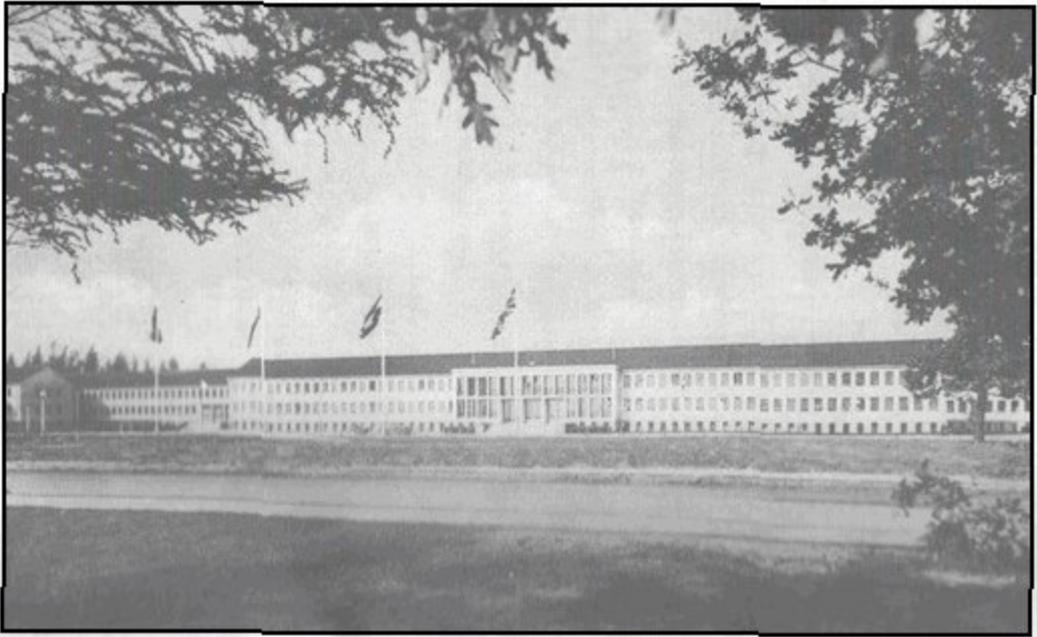


Photo 1.—Office building, HQ NORTHAG and 2 ATAF.

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NEW HEADQUARTERS IN GERMANY

(Part I)

By COLONEL H. GRATTAN, C.B.E.

BACKGROUND

IN May, 1945, the unconditional surrender of Nazi Germany was achieved, and the victorious Allied Forces met in the central axis of the mutilated remains of this country. Their immediate task lay in controlling the Zones into which Germany had, by agreement at Yalta, been divided. That task is described in its full complexity in Churchill's *War History*. In each Zone it consisted in feeding the stricken and swollen population, and disarming the Wehrmacht, setting up civilian administration, reviving agriculture and peaceful trade, and re-educating the people for a growing measure of responsible government.

The British Zone Forces, consisting of the 21st Army Group and 2nd Tactical Air Force, set up their Headquarters for this task in Bad Oeynhausen and Bad Eilsen respectively. These are two Spa towns in Westphalia, centrally located in the Zone, well served by road and rail, and consisting of commodious Kur houses, hotels and villas. Fences were thrown round these towns, and the populations evicted (except those as were needed to build up services for the proper comfort of the Headquarters). Until 1952 these arrangements suited the functions of the occupying Forces. The Headquarters of Flag Officer Germany was similarly settled in Minden, and directed the process of German Naval disarmament.

In the choice of these suitable and salubrious places there was no strategical concept, and indeed at that time no apparent need for one.

The scene has changed. It soon became evident that peace and disarmament were not likely to proceed undisturbed. By 1950 thoughts were inclining to the establishment of a peace-time Headquarters for the British Occupation Forces, West of the Rhine, and fitting into the N.A.T.O. scheme for the defence of Western Europe. The concept of a new headquarters so situated on the lines of communication took shape. This was stimulated by German pressure to restore the Spa towns and by the principle that after the ratification of the Bonn Convention, the cost of requisition of occupied properties would fall no longer on the German Occupation Budget, but on the British taxpayer.

EARLY PLANS

In 1952, plans and a preliminary rough estimate for a new headquarters were prepared at Headquarters B.A.O.R. and were presented to the Treasury on the following assumptions:—

(a) The new headquarters would be a joint headquarters for Northern Army Group, and 2nd Tactical Air Force, and for Flag Officer Germany. (I put the Royal Navy last from no disrespect, but only because their strength of twenty-two officers and ratings would occupy an infinitesimal portion of the scheme. In fact, in 1955 the Navy decided to move their headquarters to Bonn, and not to the new headquarters built for them.)

(b) Provision of office and living accommodation would be based on *Barracks Synopsis* 1948 scales (less 20 per cent).

(c) All three Services would be governed by that scale.

(d) The cost of the whole work would be borne by the Occupation Budget in Deutschmarks, with not a penny subscribed by the U.K. Treasury.

In June and July, 1952, zoning plans were started by the existing staff in Engineer Branch, Headquarters, B.A.O.R. The assumed site was in hilly country outside Aachen in the Belgian enclave. War Office blessing was given to continue planning, subject to the all important proviso that the work would be done entirely from German Deutschmarks, and no sterling expenditure would fall on the British taxpayer. This was the overriding factor at that time. It dictated the speed and urgency with which the project was undertaken.

In July a special Chief Engineer (Works) Establishment to plan and conduct the project was approved by the War Office. On the 6th August, 1952, I was appointed Chief Engineer and given my brief. From that day, therefore, my story starts.

A book could be written on this project. This is not a technical paper but a running account, without detail or indigestible appendices. Appendix "A" facing page 46 is the plan of the site. Appendix "B" on page 48 gives the strengths for which it was built. Appendix "C" on page 49 gives brief notes on the accommodation and services provided. This account sets out only to describe features which were unusual, interesting or instructive.

COMPARISON WITH CYPRUS PROJECT

It is appropriate at this stage to mark the striking contrast between this project and the Dhekelia project, which has been described in the *R.E. Journal* for December, 1954, and March, 1955. The only factor common to these two projects is that they were both estimated to cost about £14 million. There the similarity ceases. The Dhekelia project has been subject from its inception in 1948 to the normal scrutiny required in every detail under Vote 8A procedure and has been phased over the years in accordance with the amount of money

which can be annually allocated to it. The new headquarters project was conceived to live or die on the condition that the whole of it could be planned and completed before the end of the period in which Deutschmarks from occupational costs would remain available. Therefore the first consideration was *speed*, which far outweighed exactitude of scale or perfection of planning.

SPEED

In August, 1952, it was thought that the ratification of the Bonn Convention might be achieved on the 1st January, 1953, or at the latest June, 1953, and that only a year might remain after the ratification date for the allocation of Deutschmarks. *Speed* was therefore paramount. In comparison with speed other considerations were secondary. This did not give licence for extravagance or for ignoring *Barrack Synopsis* scales, but it meant that as far as possible standard barrack construction and existing drawings and contracts would be adopted—just as they existed—to make up the bulk of the building, and that such special planning of buildings and services as was necessary would be decided on the spot without reference to the War Office. The War Office, in order to satisfy themselves that there would be no sterling “tail”, demanded pretty firm assurance that we and the Germans would be able to spend Deutschmarks at a rate which they prescribed as the major consideration in granting approval to go ahead with the project.

The expenditure rate they prescribed, and of which we were asked to confirm the possibility, was:—

Twenty-five million Deutschmarks by 1st January, 1953, DM.70 million by 30th June, 1953, and the bulk of the remainder by 1st January, 1954. (For ready calculation DM.12 = £1.)

The new headquarters, then estimated at DM.130 million, was to be ready for occupation by June, 1954.

The operation named “Op. Humane”, described in the *R.E. Journal* for September, 1953, for housing new armoured divisions in Germany (at DM.90 million) was by then coming to a close. It provided the plans, schedules, and ready-made contract experience for standard barracks, messes, stores, etc., and was the basis upon which work could be put in hand rapidly on the new headquarters project.

Provided “Op. Humane” designs were used for standard buildings, the D.D.W. undertook to get somewhere near the target of expenditure, and planning was allowed to proceed.

On the 6th August, 1952, I received my brief. This was:—

(a) The schedule of accommodation based on the strength of the headquarters of the three Services as they then stood. This had been prepared earlier, and had been the basis for such planning as had by then been started.

(b) A preliminary rough estimate (P.R.E.) of DM.130 million (about £11 million).

(c) An announcement that the Belgians, in whose enclave Aachen lay, had now decided that they did not want the new headquarters there, but had offered other sites. (This nullified the embryo zoning plan which had been started, but the areas required had been worked out and the early planning could be applied to another site.)

(d) Orders to accompany a Board consisting of representatives of the Federal Government and of the Land Commissioner Northrhine/Westphalia, and "Q" Branch, Headquarters B.A.O.R., Belgian Army, British Resident, and German Ministry representatives to reconnoitre five various sites offered in the triangle Aachen, Roermond, Moenchen-Gladbach, on 8th/9th August.

(e) A draft copy of my establishment (Chief Engineer (Works) Special) with an indication by the D.D.W., that he had already got some of the places in it filled.

(f) Plans of all standard "Op. Humane" structures. The construction was single-storied barrack huts, cook-houses, officers' and sergeants' messes, offices, stores, N.A.A.F.I. canteens, garages, etc., with district heating and the usual public services. (The P.R.E. had been based on this type of design.) Having as a C.R.E. taken over several "Op. Humane" camps for maintenance, I was familiar with the design.

(g) Instructions to find some suitable accommodation to open my new office on any site I should choose.

(h) An indication of the sums of money I was to strive to spend as described above.

The job promised to be exciting, and in its nature, size and financial independence, unique. The D.D.W. said it could be done, so who were we to say it could not?

On the 7th August, I set up a temporary office in a room of Engineer Branch, Bad Oeynhausen, familiarized myself with the schedules and plans, such as they were, and met Kirby and Dollery (both newly commissioned Superintending draughtsmen), who had been working on the Aachen zoning plan since 15th July, and were appointed to my staff.

SITE SELECTION

On 8th/9th August, with Lieut.-Colonel H. J. Lord, who was to be my A.Q.M.G., and with the representatives described in paragraph (d) above, we saw five different sites in the area indicated. The first four were sandy wastes with sparse conifers and bushes, in the low hills on the Dutch border. None of them had independent access to services and communications, and it appeared at a glance that the development of any of them would add alarmingly to the cost given in the P.R.E., which had been prepared on the conditions existing on the Aachen site. The fifth and final offer was the Hardterwald some seven kilometres west of Moenchen-Gladbach, near the main road to Holland through Roermond. It was thick woodland,

sufficient in area, slightly undulating, sand and gravel soil, and within reach of the H.T. electric grid, gas, and of established water works at Rheindahlen, Uvekoven and Waldniel. It stood out as the only possibility, and not a bad one. It was owned, together with the Rheindahlener Wald adjoining it to the south, by a textile magnate, whose hobby was arboriculture. Single ownership would simplify acquisition and no agricultural land was involved. Everybody was pleased except the owner and the city of Moenchen-Gladbach, for whom these forests were their rural lungs. The site was near main rail and road communications, and within reach of such social amenities as Moenchen-Gladbach and Rheindahlen could offer.

So on the 10th August, we started a zoning plan on the Hardterwald site, including a road network, water mains and a temporary overhead electrical supply. On the 12th August a final board of officers under the chairmanship of Air-Marshal Sir Robert Foster, A.O.C.-in-C. 2nd A.T.A.F. assembled to ratify the choice of the site. In the intervening two days, however, the Germans had changed their minds, and offered the adjoining Rheindahlenerwald instead of the Hardterwald, with adjacent extra wings of forest land to make up the total area. The same advantages applied to this site, so it was finally accepted, a blanket requisition was immediately placed upon it, and detailed planning went ahead. From that moment it was ours. The site consisted of mature timber, both deciduous and coniferous, some scrub, large nurseries of immature trees and saplings and millions of roots of forests felled in previous generations. It had forest roads of sand with no bottoming. It was 3 kilometres long and about one kilometre broad. The soil appeared to drain well and had good bearing properties.

ASSEMBLY

On the 11th August, the main complement of my staff had been appointed, and were arriving. My S.O.R.E.I was Major (T/Lieut.-Colonel) J. M. H. Lewis, whose quality, as a D.C.R.E., I had already appreciated. My S.Q.S. was Major (T/Lieut.-Colonel) J. S. S. Biggs, and S.O.II (E. & M.) was Major D. White, both posted peremptorily from the War Office having dropped everything there. My planning officers, Lieutenants Kirby and Dollery, had already been working since mid-July. I was allowed to choose men I knew to fill other key posts. I had Major (Retd.) J. W. Dix, as Assistant Superintendent, in charge of Works, W.O.II Prentice as Superintending Clerk (to form my new office) and 2nd Lieutenant D. M. Brancher and Mr. Burrowes as Garrison Engineers. The obvious urgency of the project, if 25 million Deutschmarks were to be spent in four months, was not only a spur to us all, but was our "open sesame", for every reasonable demand for personnel, transport, tools, etc. Never before was such support given to a Chief Engineer and it was often at the expense of other over-burdened establishments.

tractors would have roads and services ready to reach their jobs. The roads were to be of 20 cm. unreinforced concrete on sand and of widths to conform with standard road-laying machinery.

Meanwhile conferences were held in Moenchen-Gladbach under the chairmanship of the British Resident, Colonel Cowgill, to define with the German authorities the exact boundaries of the land to be acquired. In the course of these meetings a superb air photograph of the whole site, which had been made by Hunting Aerosurveys Ltd., for the German agricultural authorities the year before, was produced. This was enlarged by the Survey Production Centre R.E. to a scale of 1/2,500 and enabled much detailed site planning to be done in the office. I cannot over-emphasize the value of a good air photograph enlarged to the planning scale from the beginning of planning. It was complementary to our detailed knowledge of the ground and saved many hours of foot slogging in the open and brain slogging in the office. On 12th September, I was able to get the broad agreement of the A.O.C. and his staff to our zoning plan, the Army Chief of Staff having already approved the plan from the Army standpoint. Three weeks later the clearing of forest for some twenty kilometres of road and work on road formations had begun, and on the 28th October, the road contractors having set up a massive batching plant on the site, had started laying concrete roads by machinery. By that time the permanent water mains ring was going in and had been filled by a temporary main from the Rheindahlen Water Works. Temporary overhead electrical supply had been established where it was first needed. Site offices for my staff and for branches of the F.S.B.A. were being erected. There was a magnificent and infectious spirit of urgency and endeavour, to which the Germans responded with typical industry.

On the 29th/30th September, Mr. McGregor, D.F.(c), Major-General Ritchie, Director of Quartering, and Mr. Gardiner, A.U.S.(S) came out to see for themselves whether the potentialities of progress justified their approval of the project and gave permission to proceed. The meeting was held under the Chairmanship of the M.G.A., Major-General G. S. Hatton, and after a visit to the site he and the D.D.W. persuaded the V.I.Ps. that the project could be conducted quickly enough to ensure no sterling hangover.

C.E. (WORKS) OFFICE

Up to this time my staff and I had been planning largely in the Bad Oeynhausen office, with dashes by night to Moenchen-Gladbach for local liaison conferences. I had found in Moenchen Gladbach a suitable office building, a bank, with a large hall for a drawing office. I myself drafted the details for its conversion to a C.E.'s Office, there was nobody else sufficiently unoccupied to do it. In a few days the local D.C.R.E. had done the conversion, and early in October we moved to Moenchen-Gladbach and got down to it in

earnest. Within a day we had our first contractors' representatives arriving to show us their wares. The very first was a beautiful gentleman with wavy hair in a plastic mackintosh who suggested we should need a *maison* for the troops, which he was competent and ready to furnish with attractive *filles de joie* (he did not bring any samples). It was necessary to explain that *Barracks Synopsis* does not make this particular provision.

ACCOMMODATION FOR C.E.'s. STAFF

There was already a formidable waiting list for married quarters in Mönchen-Gladbach; and no prospect of married accommodation for my staff for nine months, so I obtained approval for the rapid building of twelve Officers' and twelve O.Rs.' houses on our new site. Plans existed for quarters already being built in Germany, and these were taken for immediate application to the first twenty-four houses without prejudice to our special planning. These houses were started on the 4th November and were occupied between the 5th/6th March, four months later. This achievement and that of forcing the concrete roads ahead in winter can only be appreciated in relation to the weather, which produced conditions which the Germans likened to the Russian battle front. It was the wettest winter for fifty years, with November rainfall of 207 per cent of the average. The German workman came to the rescue as he does at the grimmest times. Admittedly overtime was authorized for these early rush jobs, but we felt it would be a good lesson to the building trade in England to have seen houses started and occupied within eighteen weeks in the face of severe winter conditions.

With these achievements and the stock piling of some 9½ million Deutschmarks worth of pipes, steel, sanitary equipment, cooking stoves and kitchen equipment, and boilers for the heating installation, and by paying advances on all contracts let for standard barrack building, we were able, in fact, to pass payment for over 20 million Deutschmarks by 1st January, 1953. This fell short of the 25 million target, but was considered sufficient assurance against the danger of eventual sterling expenses.

I have already much emphasized the urgency with which it was impressed upon us to spend money. This factor dominated everything over the first five months of the project. By the 1st March, 1953, we had made payments of 40 million Deutschmarks, and by the 1st June, 55 million Deutschmarks. As the ratification of the Convention was longer and longer deferred, this particular urgency subsided. Foundations for most of the standard types of buildings had started in February, and by June the whole site was a hive of industry. If mistakes in planning have been made, it was because of the headlong rush. It will certainly be argued in the future that two or three storied barracks and messes should have been built, and would have been cheaper if more compactly sited, but in the early

days the overriding consideration was to put to contract and pay running bills for every item of work for which standard designs already existed.

DESCRIPTION OF THE PROJECT

- (a) Site
- (b) Headquarters, offices
- (c) Single accommodation
- (d) Married quarters
- (e) Amenities
- (f) Services
- (g) Communications
- (h) Recreation grounds and site work.

(a) SITE

The nature of the site has already been described. It is 3 kilometres long and averages 1 kilometre in width. It is 7 kilometres from Moenchengladbach, an industrial textile town of little attraction. It is 20 kilometres from the Dutch border. The extent of the site is about 960 acres. It was full of roe and fallow deer, which used to surprise us by dashing through busy building sites months after our gross activities should have banished them to the Hardterwald. In the first winter we shot pheasants where the married quarters now stand.

History and Archaeology

Julius Caesar mentions the locality in his *Bellum Gallicum*. A Roman road borders the south of the site. A burial ground (A.D. second/third century) lies in the area occupied by the officers' messes. To the south, the village of Peel is undoubtedly Paludus (a swamp) to which reference is made by the Romans. In 1954 the nearest town, Rheindahlen, celebrated its 600th anniversary. It is clear from historical accounts that Rheindahlen was raised to the status of a town by the first Earl of Cambridge. He it was who as Count Wilhelm of Juliers was created Earl of Cambridge by Edward III in 1340 for services rendered to the English, and who in 1354 founded Rheindahlen. It also seems certain that in 1703 the Duke of Marlborough, having left his Dutch General Overkirk to guard the line of the Maas, traversed the Roman road to the siege of Bonn, and billeted some of his 19,000 Redcoats in this forest. They were Dragoons, Dragoon Guards, the Royal Scots, and other Infantry, and Artillery and Engineers.

Near our site office hut has been found a Cossack cutlass bearing the initial and crown of Alexander II of Russia, who in 1813 sent a token force of 300 cavalry to assist Wellington against Napoleon.

A Roman well and pottery works have been discovered and explored. This work is still going on.

(b) HEADQUARTERS

A level plateau of the right size and position, the highest part of the site, was chosen for the headquarters office block (Photo 1). The building has nearly 2,000 rooms on three floors of which the ground floor is a semi-basement, primarily for storage. It is 300 yards long and 180 yards wide in blocks with inter-connecting passages. The principles of its design were evolved at the War Office, but the details of allocation of space to branches was done by the "Q" and "ORG." staffs of Northern Army Group and 2nd A.T.A.F. respectively, with half a block for Flag Officer Germany and his Naval staff. The line plans were done by my office, and the architectural detailing by the German F.S.B.A.

The first foundations were dug and drainage work started on 9th April, 1953, after the forest had been cleared. The foundation stone was laid jointly by the Flag Officer Germany and the Commanders-in-Chief of Northern Army Group and 2nd A.T.A.F. on 1st July, 1953, by which time the roofs were being laid on the more advanced blocks.

It was occupied and Command passed to within its walls on 4th October, 1954.

The execution of the carcass work and roof was a lesson in efficient mechanical erection. There was no part of this vast building not within the arms of travelling gantries or scotch derricks from beginning to end, and material and cement were fed to their orbit of action by diesel trains from a batching plant at the east end (see Photo 2). All roof tiles were on by 30th September, 1953, after only five months work.

As was to be expected increases in Headquarters establishment and changes in plan enforced many changes on the design during the course of work. Therefore apart from the structural shell of the building, which is of hollow concrete block construction, most internal partitions were designed to be of factory-made interlocking wall plates of Heraklith and gypsum, not bonded into the floors or walls. These can be easily removed or can have doors or hatches sawn in them. They are remarkably soundproof and have the incidental virtue of holding drawing pins (so that thousands of square metres of map boarding are saved).

Apart from the standardization of office area imposed by *Barracks Synopsis* scales, there is little standardization in practice within these buildings. The functional requirements of Signals, Telecons, Cyphers Ops' Rooms, Photographic Processing, Steel Lined Safe Rooms, and of many other specialist activities necessitated a tremendous amount of detailed planning and deviation during the course of the work.

These factors led to the full availing of the elasticity of interior arrangement that had been made possible by the adoption of easily movable internal partitioning.

The building lies within a perimeter of unclimbable fencing (to the

extent that it would be unclimbable by an intruder with a guard dog hanging on to his pants). A guardroom is sited at one corner, and the area within the perimeter is liberally lighted at night.

Roof trusses are of "Filigran" light pressed steel trusses carrying tiles (Photo 3). Windows (of which there are 5,600) are steel with small panes 15 centimetres wide, so there is no need for steel bars. The degree of security for ordinary offices is then no less than that provided by any standard window with a steel grille. Windows are not hinged in the normal manner, but are pivoted top and bottom a quarter of their width from the edge; thus when they are open they can be cleaned externally by the charlady instead of demanding a window-cleaning contract, which in future would be a charge on sterling costs.

Situated within the perimeter of the Headquarters is the telephone exchange building, which was finished in October, 1953, so that the *Bundespost* (who have installed the automatic and manual exchanges therein, and are responsible for all telephone inter-communication) should have nine months in which to complete the formidable task of installation. I was told that there are something like 20 million soldered joints in the apparatus.

(c) SINGLE ACCOMMODATION

Barracks

Existing "Op. Humane" designs were adopted for all single accommodation. The reason has already been given. The single accommodation lies to the west of the main H.Q. block, the nearest to it being the lines of the Royal Signals and the Guard unit (Mixed Services Organization of Yugoslavs and Poles) who have night duties and therefore require to be near the Headquarters. The Army and R.A.F. personnel who work daily in the Headquarters offices are within ten minutes' walking distance of the main building. Standard barrack blocks for male and female O.Rs. of all Services are seventy-man blocks, providing living space of 60 sq. ft. per man, with toilet facilities, concentrated in the end of each block.

In the original "Op. Humane" design it was found that this type of building developed serious cracks which have called for much expenditure of maintenance money. In this project we isolated the roofs from the walls by omitting the metal ties which connected them in the original design, and by inserting two layers of smooth roofing felt (Photo. 4). This lets the roof move about without pushing the walls around. Further we inserted expansion joints at not less than 20 metres interval in every building as was done in the reconstruction of Quetta after the earthquake. It would appear that these modifications have been entirely successful.

The architecture in single storey flat roof blocks is inelegant, but is relieved by tasteful landscaping with broad expanses of grass and plantations and groups of immature trees.

Messes

Officers' messes are of similar construction. There are five 60-member messes for the Army, with an addition of an "A" mess for forty senior officers, and a standard mess for forty members of Royal Signals and R.A.S.C. which have their spider of single officers' quarters with connecting covered ways (see Photo 5). As far as possible the natural beauties of the site have been carefully used to give an atmosphere to each mess of "standing in its own grounds". The R.A.F. declined to accept two standard messes for sixty, and designed one for themselves for 120, still using the same standard type of construction.

W.O's. and sergeants' messes are similar in principle.

M.T. Garages

Barracks for two M.T. Companies R.A.S.C. are built to the west end of the site, near their vehicle garages. Garage designs were based on standard "Op. Humane" plans, but in order to eliminate the central line of supporting columns which naturally restricted the floor space (and always seemed to hit vehicles) the roof has been spanned in prestressed cast *in situ* beams, on the Remy system (see Photo 6). Garages therefore have a span of 28 metres (about 90 ft. clear). They have heated bays for L.A.D. They are functionally admirable and architecturally impressive and satisfying.

Administrative Offices

The Army and R.A.F. have their respective administrative camp headquarters with offices and barrack stores. There is a combined works office for the D.C.R.E. and the R.A.F. Works Unit.

M.I. Rooms, Fire Stations, Miniature Ranges, and all the normal complement of buildings for a headquarters make up the remainder of the accommodation.

German Accommodation

During the course of the years in Germany both Rhine Army and 2nd A.T.A.F. Headquarters have employed German clerks, typists, draughtsmen, personal assistants and the like, who have become key personnel in the peace-time functioning of the two headquarters. In order that those of them whom it was essential to retain should have housing in the new headquarters camp, barracks for 1,000 single Germans (half for female and half for male employees) were designed, using standard "Op Humane" sergeants' accommodation. These are at the western end of the site, and are served by a canteen whose function is the double one of providing for the 1,000 resident Germans and also for the midday meal of some 2,000 German employees who come in from the surrounding towns to work in the Headquarters.

Married German key personnel who have moved from Bad Oeynhausen and Bad Eilsen have been accommodated in 316 houses newly built for them in the surrounding villages. These were not part of our new headquarters project, but were built through the agency of German building societies. A further 190 such houses are being completed.

(d) MARRIED QUARTERS

To the east and south of the main headquarters building lies a township of married quarters. The total numbers included in the original plan of the Project, for Royal Navy, Army and R.A.F., were 282 Types "B" and "C" for O.Rs., and 500 Types III, IV, and V for officers up to and including the rank of brigadier. Houses for the C.-in-Cs. and other officers of general's rank have been acquired in the surrounding country, and were not part of this project.

In the middle of 1953, it was decided that the British Intelligence Organization (Germany) then quartered in Wahnerheide near Bonn should also be accommodated in the locality of the new headquarters. Hence as a much later phase of the project, another 244 houses (together with the single accommodation and messes required for the B.I.O.(G) Unit) were sited and started in the south-west extension of the site which lies to the south of the Royal Air Force playing fields. This raised the total numbers of houses planned to 650 for officers and 476 for O.Rs., a total of 1,126.

The money-spending schedule of 1952/53 demanded a very rapid rate of planning and building of the married quarters estate, which forms so large a proportion of the cost of the whole project. In August, 1952, the Federal Government had promised our headquarters that for the construction of this project we would have to deal with only *one* Ministry as our agent. This, we assumed, would be the *Finanzministerium*, whose F.S.B.A. was already established for the purpose. When, however, we got down to planning, the *Wiederaufbau Ministerium* (the Ministry of Reconstruction), who are responsible in Germany for all building of dwelling houses (as opposed to public structures) were not prepared to surrender their right to the planning of the housing estates in this Project. It had, therefore, to be conceded in the course of a succession of difficult conferences in October, 1952, that the Ministry of Reconstruction would be responsible for putting our requirements for the 1,126 houses into effect.

Previous experience had given sufficient reason for preferring the performance of the Finance Ministerium to that of the Minister of Reconstruction. However, architects were appointed by the Ministry of Reconstruction (under the nominal control of the F.S.B.A.) and were let loose on the town planning and the interpretation of our line plans and requirements for the various types of houses. This was a most unwelcome development.

It would be tedious to describe the difficulties that this dual control introduced in the planning and conduct of the married quarters construction. Suffice it to say that to design a mere eight different types of houses and to site them on the ground, a task which was promised to be fulfilled in October and November, 1952, took until April, 1953. The exasperation of the process of agreeing designs with the architects is now mercifully forgotten, but the consequences were serious, for the married quarters were not started till May and June, 1953, and to get them completed and furnished in time for the move which had been planned for July, 1954, was clearly going to tax us to the limit.

Design of Houses

German tradition demands a cellar. It is an excellent tradition. It is not provided for in *Barracks Synopsis*. The War Office was obliged to concede a half cellar for every house. The two main floors were based on *Barracks Synopsis*. There is a floor in the roof space which is good for box-room storage and also for children to play in. Houses for brigadiers or equivalent were provided with a servant's room in the attic over and above the scales. Servants are not easy to get in the Rhineland, nor will they be easily afforded after the financial privileges granted under the Occupation Statute are withdrawn, so in general the houses are designed to be run with the minimum of help, as at home. The architecture has many German characteristics about it, and is somewhat unattractive to our tastes. Officers' houses were built $3\frac{1}{2}$ to the acre and O.Rs.' seven to the acre, which is less congested than the scale laid down by the War Office or for housing estates in England.

Even so the effect is thoroughly suburban, especially as only the Type III houses are detached, every other type of officers' house being in semi-detached pairs, and the type "B"s in terraces of four houses.

Building started in June, in about twenty-three different contractors' lots, under the direct supervision of eighteen architects nominated by the Ministry of Reconstruction. In command of all these architects was he who had been appointed to design the houses and their lay out, and with whom during those maddening months of work over the drawing table, we had eventually come to agreement in design.

In the planning of houses, the latest labour-saving features were given emphasis. The kitchen has a gas cooker, a refrigerator, a sink with hot and cold water, draining board, plate rack and ample cupboards and work-tables. In the case of officers' houses a hatch leads to the dining room. Floors on the ground floor were of oak and beech parquet and upstairs in Marley or similar tiles. In concession to English tradition a fireplace was provided in the drawing-room of

every officer's quarter. This was in addition to the ample central heating. It is a much appreciated amenity. German architects thought we were queer! Two heating coils were fitted in the linen cupboard, one heated off the central heating, and the other connected with the hot-water circuit, so that a degree of warmth is ensured in winter or summer. Similarly, the bathroom has a small radiator and a hot towel rail off the hot-water circuit. A radio aerial was incorporated in the roof of every house. This, of course, was extra to *Barracks Synopsis* scales, but will save a forest of unsightly amateur aerials slung over the roofs.

In Service populations it is found that about 5 per cent of officers and men have five or more children. Such "outsized" families are normally allotted two houses. We therefore provided interconnecting doors on each floor of 5 per cent of pairs of semi-detached Types V and Type C quarters.

Large families so accommodated have expressed themselves very conveniently housed.

Prototype Interiors

By August, after two months work, we had internally completed one house of each of the eight different designs. These were then furnished to scale by the R.A.S.C. Barrack Department. Committees of ladies, the wives of Army and R.A.F. officers and O.Rs. ranging from brigadier to corporal, were invited down from Bad Oeynhausen and Bad Eilsen to criticize the finished fittings and furniture. Particular attention was directed to the kitchens, which had been initially designed by mere men. There were several visits, and there was seldom much unanimity of opinion, but the average findings of the Committee were of immense value. Thereafter, we knew exactly what was required for the other 1,100 houses and were able to plan accordingly. At the same time, those responsible for the design and provision of furniture, carpets, curtains, etc., were able over the course of the next year, to make modifications in their scales to suit the houses as they would be built. The value of this fearsome enterprise (the deliberation of a ladies committee) cannot be over-emphasized.

Gas Cooking

I have touched on gas cooking. German gas ranges are very much behind the times compared with the equivalent article at home. For an order of this size we were able to make the manufacturer of the ranges modify his ideas to suit the British housewife. Ovens were made large enough to take a turkey. Grills for toasting and grilling were incorporated and at a later stage a "Regulo" thermostatic control was fitted.

Services

The central heating which is piped to all houses is described later. The male reader will have appreciated that when he is posted to this station he will be free from such chores as humping coals in the early morning. Drainage was of course by water-borne system.

Estate Planning

In the planning of the housing estate provision was made for a common grass area between the road and the front door with access paths, and decoration by flowering shrubs, etc. The maintenance of this would be a "municipal responsibility". On the private side of the house each house was provided with a garden small enough to be tended by a householder of average keenness. It is surrounded by a dog-and-child-proof fence and has a small shed for garden tools, prams and bicycles. This feature was an essential but expensive outcome of the deliberations of the ladies' committees supported by the D.D.W. The exterior plaster colours of houses were chosen by a committee of architects. Four pastel shades were distributed broadly over the estate. The exterior painting of windows and doors was selected by a committee of officers and ladies. There was some diversity of opinion among them, but their average taste prescribed a variety of bold plain colours. There was German participation in these exercises. The general effect, set in surroundings of grass and natural trees, has been to give enlivening variety to the estate. The utmost advantage was taken of the existing trees on the site to screen houses from their view of each other and to give a rural effect.

(e) AMENITY BUILDINGS

(i) *Schools*

A primary school for 450 infants is provided in two standard B.A.O.R. type school buildings, so placed as to be within children's walking distance of most of the housing estate, with the minimum of main roads to be crossed. They are sited to catch the maximum of sun, and were designed with the classroom outlook almost entirely of glass. A third infant school of the same type was incorporated in the south-west extension with the further 244 houses which were approved to be built. The secondary school, which was not originally part of this project, but which had been under consideration to serve Army and R.A.F. stations west of the Rhine, was at a later stage sited within the new headquarters perimeter. Though it was started only in June, 1954, it was opened for the September term, 1955. It is a non-boarding school, catering not only for the considerable population on site, but also for the Army and R.A.F. units within transporting distance.

A misappreciation of the fecundity of the forces has thrown out the calculations which governed the provision of school places. In 1952 when the project was planned, the figure for children of primary school age was .55 per family. It has now proved to be .76 per family. Schools are overcrowded. Another primary school has just had its foundations laid on the site to meet the unforeseen demand.

(ii) *Shops*

A N.A.A.F.I. shop, Y.M.C.A. book shop and Malcolm Club shop with canteens, are sited in the amenity centre of the estate. The only detail worth noting in this group is the N.A.A.F.I. shop main hall, where the heating radiators are placed in the ceiling so as not to interrupt or desiccate wall space for show cases.

An area of three acres was earmarked in the zoning plan for the erection of German shops under private enterprise. Although this possibility was presented to the local Chamber of Commerce and the German Government very early in the planning, it was not until November, 1954, that loans had been negotiated to make the private building of German shops possible. Some thirty shops will be ready during 1955. In the same area B.P. erected at their own cost a petrol pump for private cars and a small servicing station.

(iii) *Churches*

A Church of England for 500 and a R.C. church for 300 were in the original project in Phase III. Later, the Free Churches and the Church of Scotland obtained approval to the building of a third church. The design of these involved some months of collaboration between German architects, padres and myself. Whether the designs meet with approval is a matter of personal taste. The third church was blessed (in an unfinished state) by the Moderator of the Church of Scotland in May, 1955. The Church of England was dedicated by the Archbishop of Canterbury on the 18th September, and the Roman Catholic Church jointly by Bishop Keenan and the Cardinal Archbishop of Cologne on 9th October, 1955.

(iv) *Cinemas*

There are two cinemas. One for 600 operated by A.K.C. and the other sponsored later by the R.A.F., run by their cinema service. The former was of high priority and was opened in June, 1954, for the benefit of those already living on the site. The latter was not started till the autumn of 1954. Both are of the latest design employing Cinemascope and stereophonic sound. Both were designed for smoking to be indulged in, but only the R.A.F. permits smoking.

(v) *Hostels*

An officers' hostel for forty-two families and an O.Rs. hostel for

thirty families with private rooms and communal dining-room and ante rooms were planned and erected for the reception of families from England who thereby are enabled to join their husbands promptly in anticipation of quarters on the estate falling vacant.

A visitors' mess embodying the same principles of design provides for touring officers and their families who may require a few nights in the station.

(vi) *Clubs*

An officers' club for 750 designed to be operated by N.A.A.F.I. was sited in the most attractive part of the grounds. There are many special features of internal design and finish, which gave to all concerned with it much interest and satisfaction in the planning. N.A.A.F.I. architects took over the internal architecture and in combination with their furnishing experts from England they produced a building of singular attraction. It has three squash courts, skittle alley, billiard room, gents' and ladies' hairdressing saloons, and a small shop and a goldfish pool as necessary adjuncts. Fourteen officers' tennis courts lie near it.

By private enterprise a 9-hole pitch-and-putt golf course has been laid out on the green sward fronting the club and H.Q. building.

A small sergeants' club in the sergeants' mess area provides some of the same amenities for W.Os. and sergeants and their families on a smaller scale.

(vii) *Junior Ranks' Clubs*

Junior ranks' clubs for 1,250 for the Army and 750 for the R.A.F. are sited conveniently near the men's lines and give club amenities unsurpassed in any other station in the world.

A regrettable lesson has been learnt in the men's N.A.A.F.I.s. In planning I adhered to the theory that if men are given a place to be proud of they will value it—and against advice I prescribed parquet floors for the main rooms. They are now burnt beyond recognition with cigarette ends. The task of cleaning them is a great burden on the staff. It is apparently considered "soft" by a certain type of man in both services to use an ash tray.

This is a trivial point, but it has its lesson. Linoleum would have been suitable and labour saving.

(viii) *Swimming Pool*

A swimming pool of Olympic standard dimensions, with a 10-metre diving-board, is sited in the corner of the Sports Grounds, equally distant from the O.R.'s barracks and the Married Families estate. The main peculiarity of this pool is that a small rectangular bay extruding from one side of the bath provides the deep water into which high divers can hurl themselves without the danger of landing

on top of rising swimmers, polo players or children. It was found that by giving the main pool two shallow ends and a deep middle (7 ft.) and by building the rectangular bay for diving (15 ft. depth being obligatory for a 10-metre dive) there is actually less excavation and building. We think this is unique. It is certainly attractive.

(ix) *Gymnasia*

Two gyms started late in the project have just been completed.

(x) *The Model Room/Theatre*

A headquarters of this size and function requires a tactical model room and lecture hall. This was not included in the first schedule of the scheme, but approval was obtained by the late Chief of Staff, and added as a deviation to the project. In the course of planning, it was found possible to give it the additional function of a theatre. It was started late in 1954, and since completion has served admirably in both the purposes for which it was designed. It is sited near the main Headquarters for its military purposes and near the officers club for its social function.

(xi) *Private Garages*

The War Office relegates private garages to the status of an amenity, that is why it finds itself in this paragraph. A concession of garages for 50 per cent of the number of houses was included in Phase III of the main project. Approval in detail of the building of this item was not granted until the project was half finished. Garages therefore (with the exception of those which had been designed to be part of the house of a brigadier's Type III quarters) were sited in blocks spread conveniently over the housing estate. These are not convenient. They are the cheapest possible, and without electric light or heat. They were difficult to site, and for the owner who arrives back in his car on a snowy night, and has to walk two to three hundred yards to his house after putting his car away, they give little satisfaction. Much more distressing than all this is the fact that in the twentieth century many more than 50 per cent of a population own cars. The surplus cars now clutter up the roads in front of people's houses, and make it impossible for ration lorries, road cleaning machinery and conservancy wagons to get past without mounting the kerbs and turf. The result reflects badly on the planners. However, the planners *did* plan the roads in accordance with the standards laid down in the English Town and Country Planning rules. In a properly planned town a car owner has a garage or at least a run-in, and does not have to leave his car on the road. As it has been impossible to overcome official resistance to building a rational scale of garages, it has become necessary since the occupation of this town to widen many of the roads. The cost of this must be

considerably greater than would have been incurred in providing garages. This criticism may show reprehensible disloyalty to those who lay down scales, but it seems, however, the more justified by the fact that if garages had been built out of German Occupation Deutschmarks they would subsequently have earned sterling rents.

(xii) *Education Centre*

A large education centre with all the normal facilities for military education has been provided in the amenity centre of the town. Besides the usual provision it houses the Command library, and provides a room for a museum containing archaeological relics found on the site, and pictures and objects of worth lent by the museums at Bonn and Moenchengladbach. A scale model of the site at 1/1000 which was completed in December, 1952 (see Photo 7) and largely used during the course of the work for purposes of planning and lecturing, also finds itself a permanent home in the museum. A German travel agency has set up a sub-office in this building for the convenience of the population.

(xiii) *M.I. Rooms*

There is a small hospital containing the Families M.I. Room, Dental Centre, S.A.A.F.A., and Ante-Natal Clinics for the station. There are Men's M.I. Rooms in the Army and R.A.F. barrack areas.

(xiv) *Fire Stations*

A fire station under R.A.S.C. control manned by German firemen is sited in the centre of the area.

(xv) *Post and Pay Offices*

There is an Army post office and a cash and pay office near the Headquarters block.

(xvi) *Clocks*

Clocks of appropriate size with aggressive faces are sited at convenient points on the estate. These, together with the clocks suspended in the intersecting passages of the main Headquarters, are all operated by a master clock in the Signals Centre, and ensure that nobody walking or riding to work can be late without being aware of it.

SERVICES

(a) *District Heating and Hot Water*

No attempt is made in this description to be technical on E. & M. matters. My E. & M. officer, Major White, is writing a technical account for the *R.E. Journal*. It was decided early in the planning that heating and hot water would be provided from central boiler

houses burning coal. This is the cheapest fuel in the vicinity of the Ruhr. Owing to the shape of the site this was most conveniently achieved by dividing the area in half and providing two boiler houses. In the zoning plan the eastern half, which included the first 882 houses with schools, hostels, shops and the main Headquarters building, was allotted to one boiler house which was placed at the eastern end of the site. A criticism of this siting has been that the boiler house is not in the centre of its load, but past experience had shown that the curse of smoke nuisance made it expedient to site the boiler house on the lee side of its load.

The western half of the site, consisting of barracks, messes, garages, etc., was covered by a similar boiler house, sited to the north of that lot, for the same reason. The eastern boiler house has ten boilers and the western boiler house twelve, each boiler being of 2.0 million kilocalories per hour capacity. This allowed in the original planning for about 20 per cent unforeseen expansion. The main Headquarters block, which uses 5.5 million kilocal/hour, was designed primarily to be run on the eastern load, but can be supplied from either boiler house. The two high pressure hot-water systems are interconnected at two other points, so that in mild seasons one boiler house could carry the total load of the estate, and in the summer, when the heating is not required, a few boilers in either boiler house could sustain the hot water and cooking demand. In June, 1954, when the south-west extension of an additional 244 houses with schools, messes, etc., was sanctioned a third boiler house of four boilers was incorporated in the plan for that extension. In principle, the functioning of this separate boiler house is similar to the other two, so no further mention is made of it.

Fuel is brought in by 6-ton tipper wagons, which were bought for the purpose. The provision of rail services for fuel to these boiler houses was dismissed in September, 1952, when planning started. It was unfortunately re-opened again in September, 1953, when it was too late to be feasible. Tippers dump the coal into a pit at each boiler house. This gives 1,300 tons reserve, which at the maximum demand of 100 tons a day per boiler house in the sharpest winter allows thirteen days reserve. The fuel pit is covered by a gantry, on which runs an electric travelling grab which hauls up 1 ton at a time and carries it into the hoppers high above the boilers. Therefore, instead of the master of each individual house doing his early morning coaling chores, one mechanical operator at the boiler house does all the work which would otherwise be required in 900 houses and other buildings. The hoppers over each boiler each hold 10 tons, which is a winter day's reserve. Fuel which is in the form of granular nuts falls on to the moving chain grate, the speed of which is adjusted by a four-speed gear-box to give the depth and intensity of fire required for the season. At the end of its run the

chain grate tips ash into a vast helical corkscrew which mechanically draws the ash into wheeled tubs, in which it is pushed by attendants into a lift and carried out of the boiler house above the ground to the ash pit. Thence the mechanical grab loads it into returning tipper wagons. The whole conception is designed to save labour.

The boilers (at full load) generate steam at 10 atmospheres pressure and pass it to a cascade, where it is mixed with the returning cold water in the distribution system, and heats the water to 175° Centigrade in the storage cylinder.

The hot water at 10 atmospheres pressure and 175° C. is then pumped from the boiler house through primary heating circuits. These heating circuits enter calorifier stations (of which there are seventy-one over the whole area), and provide heat for secondary circuits, one of which pumps hot water through the radiators of the buildings, and the other heats the inflow of domestic hot water to provide for the hot water taps in all dwellings and barracks. Direct high-pressure hot water is supplied to cook-houses for steam heating. There are no troubles due to hardness or impurity of water, because by good fortune the water in this locality is neutral and fairly soft.

There are over 1,000 miles of pipes for all purposes in this camp, a high proportion of which serve the heating and hot-water installations. Piping is of wrought steel of various sizes from 7½ in. for the mains, down to ½ in. for the house services. All is joined by welding; most of it was welded during severe winter seasons—and reflects much credit on the German worker. All systems were hydraulically tested to 2½ times their working pressure.

The pipes run in brick-work ducts underground with pre-cast concrete cover plates. The normal practice in the past has been to lag pipes with magnesium 80 per cent or glass-wool lagging. It had been represented to the planners early in the project that in a heating scheme in Holland, all main arteries and subsidiaries were lagged with a new material which was quicker and cheaper to employ. I therefore sent Major White and his German counterparts to see district heating installations at Schipol airfield (Amsterdam) and in Hamburg where the new system had been employed, and to judge their efficacy together with the engineers who had been responsible for them. The new system consisted in building a watertight duct of very much smaller cross section, in which the pipes were laid naked and then packed in with a light insulating material called vermiculite. This is a micaceous mineral mined in Africa, which when subjected to heat in a furnace at 900° C. exfoliates into a light mass, rather reminiscent of those comic little fireworks one finds in Christmas crackers.

The exfoliated material which looks rather like granulated cork, and is very light, arrives in paper sacks, and is loaded into the ducts

around the pipe and is levelled off with the top (Photo 8). The filled ducts are covered with concrete slabs and made watertight with strips of roofing felt, tarred over and covered up. The virtue of this system lies in its speed and cheapness. Difficulties of maintenance and of the diagnosis of leaks were discussed for a period, and it was eventually decided to adopt the new system not only for cheapness, but for speed. A vital pre-requisite of this method is that the vermiculite shall remain dry, so it was important that ducts should be waterproof and not laid in waterlogged land. At swan-necked expansion bends, where movement of the pipes is taken up, traditional lagging with glass wool was adopted. (The expansion at the bend is 27 cm. from the 100-metre length to the anchorage of the pipe for a range of 180° C. of temperature.)

At this stage it is appropriate to remark that in the exceptionally bad weather of August, 1954, when 3.4 in. rain fell in one night, while all the heating was under test, the man-hole covers in many instances were open to the flood. There was a gloomy period when the water and mud ran into some of the ducts and was quickly boiled by the super-heated pipes, and blew up a considerable length of the ducts. These teething troubles appear, in the intervening year, to have been eradicated. The new lagging system does not appeal to all E. & M. experts. Figures of performance have not yet confirmed the assertion that heat losses by this method are not materially greater than those by traditional methods. It appears that this is the case provided the vermiculite remains dry and in place.*

All the seventy-one heat exchange stations work on the same principle, they are varied in design according to siting and load. Some of them are above ground, others in cellars below buildings or houses (see Photo 9). There were distressing cases of early teething troubles when groups of houses received inadequate heat and hot water, but this has been a matter of balancing and adjusting, and has been cured.

(b) Electricity

By the end of 1952, a temporary overhead system, supplied from a public service, had been established on those parts of the site where contractors needed power for their work. This was extended *ad hoc* during the course of the project.

The permanent distribution system supplied at 15,000 v. from Rheydt, consists of an underground ring main round the site. There are seventeen transformer stations supplying low tension electricity to all buildings. A stand-by generator set is installed near the main Headquarters, to serve that building and the telephone exchange, and at each of the boiler house installations, and at the water works.

Standby sets are particularly important in boiler houses where there are twenty-eight separate electric motors, including the main

* "These words were written in 1956 and at that time they already disclosed misgivings about the vermiculite method of pipe lagging. When I revisited in 1961 I was disappointed to learn that it had not remained effective and all the main pipes were being re-lagged in the traditional manner. This must have been an expensive undertaking but I believe none the less that if we had foreseen events in 1953 we might still have been obliged by urgency to adopt the quicker method."

ones driving the high pressure hot-water pumps which supply the circulating system. A break-down of the supply to these during cold weather peak periods would be highly inconvenient, for it would be impossible with the few boiler attendants employed to draw fires quickly. Pressure within the boilers would rapidly rise to blow-off point, and it would take some time to restore balanced functioning.

The street lighting for this town is based on British standard practice. Mercury vapour discharge lamps are used and the system is controlled by time switches. For economy of power consumption the lighting in the main office building, and in clubs, messes (and in fact everywhere where it is expedient) is done by the use of fluorescent lamps of various kinds. The capital cost of this form of lighting is two or three times that of tungsten filament lighting of equivalent intensity, but the electrical consumption is reduced thereby to about 35 per cent.

(c) Drainage

Foul water drainage is by a normal water-borne system. In September, 1952, we obtained ready-made plans for a sewage disposal works already built on a similar site in the American Zone which we proposed to site in the lowest part of our estate. I had hoped that this could be put to contract immediately so that it would assist towards swelling our expenditure, which was then ever in our minds. The German authorities were anxious, however, to combine our treatment on this estate with their plans for the long-term development of the drainage of their neighbouring villages. After some conferences on the subject we eventually made a grant-in-aid (equivalent to the sum which we would have spent on the sewage works) towards a comprehensive scheme which was planned and carried out by the Stadt Moenchen-Gladbach. Our system now falls by gravity to a collecting chamber in the north-west corner of the site whence it is automatically pumped by rising main straight across the site to a public collecting chamber at Genhodder, 1 kilometre to the south of our estate. From there it is pumped by the Stadt authorities 13 kilometres, over a rise of 15 metres, to an up-to-date sewage works north of Moenchen-Gladbach.

Storm Water Drainage

On the whole the site drains well. The soil is substantially sand and gravel with a loamy top soil bearing heather and fir trees. It is not unlike that of Camberley Heath. There is, however, in its top ½-metre an annoyingly fine silt, almost approaching clay, which when puddled up by machines and tyres becomes pretty impervious. On this account the performance of the site in draining itself has been less good than was expected.

Drainage gulleys are provided on one side of all roads with a cross

fall to them. Roofs of all houses and buildings are provided with down pipes to gulleys, which discharge into the road-side system and eventually gather to a 1-metre pipe away in the low ground in the north-west corner of the site. Thence a natural stream, which was broadened and canalized, takes the storm water away to a near-by river.

The general conformation of the ground is a little flatter than would have been desired for ideal conditions, but no mechanical boosting is provided or has proved necessary either in the foul-water system or in the storm-water system, although some of the slopes of drains are less steep than is demanded by English practice. Both systems work, and since completion have not given much trouble in maintenance.

Test holes were dug all over the site in the early stages of the project to enable an appreciation to be made of the inherent drainage qualities of the land. On the whole the site absorbs all but the most violent rainfall fairly well, but it was proved in the first summer that some of the large areas of grass playing fields required agricultural drainage to free them from the formation of lakes. Over a small proportion of the playing fields herring-bone systems were dug in after the grounds had been finished. These led to the main drainage system, and have proved successful. The quality of playing fields is now very good, having been rendered more absorbent by the activity of roots and of worms.

I was confident in the early planning that much capital economy could be effected by using soak-away pits in the married quarters estate rather than connecting pipes to main drains. I overruled the German authorities on this point, against the advice of some of my staff. I proved wrong, for soak-aways would not function speedily enough, and we had to connect up much of the housing area to the system later. Moral: be cautious in ignoring specialist advice.

(d) Water Supply

In the site reconnaissance in August, 1952, I was glad to know that German water works existed at three points, within 8 kilometres of the site, and to have the assurance of the German authorities that these could be developed to supply sufficient water.

One of these, the one at Rheindahlen, was called upon immediately to supply water in temporary measure for contractors during the period of building. A 5-in. pipe was laid in September, 1952, for this purpose from Rheindahlen, a distance of 3 kilometres, to the south-east end of the site. On 6th September, 1952, the main water supply rings within the site had been planned and the laying of these mains (10-in.) went ahead during the winter. By February, when contractors were on site to start building, a temporary water supply system had been established, fed from these mains.

At this stage it cannot be over-emphasized that the general level of tendering for building work is substantially reduced if roads, water and electricity exist at the tendering stage or are known to be available when work starts. Therefore, we were very keen to have these three items established as early as possible in the spring, and in this, due to the German workmen's capacity for carrying on in the worst winter weather, we were successful.

As for the permanent water supply, chemical analysis of water from public undertakings showed that the waters available were hard and distinctly alkaline. At the same time it was observed that the local well supplying the hunting lodge of the owner of the site *in the middle of the estate* gave good water from a depth of 7 metres, which was both soft and neutral. I was, therefore, interested to see whether we could develop our own water supply to become wholly or partially independent of public supplies. This was additionally important from the point of seeking a good benevolent water for the extensive district heating system. Consequently a bore hole was put down and as expected water was found at 7 metres, but the bore was continued through a heavy clay stratum from 15 to 20 metres—*whereupon another source of water in a gravel and sand stratum was struck*. The bottom of this water-bearing stratum lay at 26 metres, where black clay was again encountered. This continued down to 40 metres depth, so boring was stopped. The water at the 20–26 metre depth proved to be soft and slightly acid. The most encouraging feature of this was that when the water-bearing stratum lying between the two clay layers was penetrated by the bore, water was forced up 10 metres above its imprisoned height by artesian effect. This indicated, I thought, that the field was a large one deriving its artesian pressure from the Dutch frontier hills. It therefore became evident that further exploration might prove advantageous and provide water of acceptable quality to satisfy the whole or part of the needs of the new town. At this juncture (March, 1953) I called in the German geological experts, who gave the opinion that there was insufficient water under the site because a geological fault running north to south through the very centre of the site would preclude the extension of the water-bearing stratum to the east of that fault, and because the River Schwalm running north and south, 1 kilometre off the west of site, would in their estimation prove to be the western boundary of the water-bearing stratum. On this advice the F.S.B.A. refused to continue water exploration. I was at this juncture very strongly backed up by my Chief Engineer and the staff who issued a letter ordering me to go ahead with explorations for water, on the grounds that for security reasons this Headquarters should be independent of public supply to any extent which might prove possible. I therefore continued exploration, and the F.S.B.A. continued to bore holes where we directed them.

During the course of the summer, it was proved by trial boring that the "sandwich" (the water-bearing stratum enclosed above and below by impervious layers of clay) extended horizontally at approximately the same level of 20 metres below the ground over an area of some 27 sq. kilometres. Seventeen bores were put down, some of them lying well out on the perimeter of the area in which I had reason to believe water would be found. They all gave this well defined sandwich of strata, and pumping from the wells produced similar water everywhere, a soft and slightly acid water. It is interesting to note that one of the outlying test bores in this exploration was put down within a quarter of a mile of the existing Uverkoven water works. *This proved by analysis that the water for which we were prospecting was from a different source to the water at that water works, only a quarter of a mile away.* Ours was soft and acid, theirs was hard and alkaline. The original German prospectors appear to have missed our source of water by a very small margin.

The reason why our source of water was unknown to the German authorities and not previously discovered, is that the area is rural and sparsely populated. For the farms fresh water had been found at 7-metre depth adequate for their purposes and the need to dig deeper had never arisen. My invitation to the geologists to comment on my findings (of which of course I sent them full reports) was never accepted. I do not think it is scandalous to suggest that public water undertakings, who are anxious to expand their services, do not encourage the development of supplies which will be independent of their provision.

In the final design of our water works an experienced consultant was employed to plan our development. Four 80 cm. tube wells were sunk on the site, from which water is pumped to the new water works for treatment and distribution. Deep well pumps of 100 m³/hr. capacity installed in the well filters are controlled by push-buttons at the water works. Water is discharged in the top of the building through a spray aeration system, thence through sand filters, and chlorine dosage plant to two underground reservoirs, each of which holds 2,000 cubic metres (440,000 gallons). Planned at 75 gallons per head per day, of a population of 10,000, this gives a reserve of more than a day's supply. In fact, since the occupation of the Headquarters, the consumed rate has been considerably less than this figure, varying between winter and summer from 40-55 gallons per head.

Water is pumped by electrically driven centrifugal pumps via air pressure vessels into the mains. The function of the pressure vessels is to replace the necessity for an overhead tank. They create a head of 6 atmospheres on the water at source. The supply pumps cut in and out automatically as water is drawn off from the pressure chambers. For fire-fighting purposes the pressure can be boosted up very rapidly

to 9 atmospheres. The fire hydrants are placed on the water mains and branches.

In the development stage, exhaustive pumping for three weeks showed that after an initial drop in level in the bore holes, the pumping level remained constant. This does not prove conclusively that the source of water will last for ever, but at the normal rate of supply to this town, a source of 27 square kilometres in extent, averaging 5 metres in depth, will in fact last for forty years without being replenished seasonally. The sources of replenishment of water in this stratum has not been discovered, but it is reasonable to suppose that there is in fact a seasonal topping up of the source of supply, and the source can be said to be established, and permanent, and is of good quality. An important point of interest is that the normal supply rate for water from public undertakings in that locality is 25 pfennigs per cubic metre. (Supply companies were willing to reduce this to 20 pfennigs for our bulk supply). This would have cost about £20,000 sterling per annum to keep the Headquarters supplied. The running of the newly established water works has not yet been costed over a full-load working year, but it is thought that it will be appreciably cheaper than the public supply. A great saving in maintenance will result from the avoidance of the aggressive waters which would have been drawn from public undertakings, the effect of which on heating and pipe system would have been most adverse.

I was gratified when sitting at lunch with a visiting American colonel one day, when he raised his glass with a twinkle in his eye and said: "Say, this is as good as a cocktail." The Americans are supposed to be judges of water.

The moral of the water story appears to be that one can sometimes ignore specialist advice.

(e) Gas

The cookers in 1,126 houses and in the two or three dozen messes and canteens are run off gas. (In men's cook-houses and canteens there is also steam cooking off the district heating, and electrical frying, but the main running is by gas. There is no handling of solid fuel anywhere in this estate). Gas in the Rhineland is supplied from the coke ovens near Duisburg, some 30 miles away from this site; it is fed into a high pressure pipe grid which serves Moenchen-Gladbach. A high pressure line was laid from Moenchen-Gladbach to the eastern end of the Headquarters site, where break-pressure valves in a small chamber pass gas at domestic pressure to the mains in the new town. The gas is of excellent quality and at constant pressure.

(f) Telephones

A sum of DM7½ million was included in the scheme for the establishment of Signal services within the Headquarters. This was not an R.E. responsibility, but a word about them is necessary.

Automatic and manual telephone exchanges, the provision of which was included in this sum, absorbed the major part. All officers' houses besides offices and technical buildings, are connected to the exchange. Work of establishing this system was done by the *Bundespost* (German G.P.O.) authorities on behalf of SX Branch. The work impinged to some extent on R.E. Works, because together with our underground services, it made still another trench-digging activity calling for co-ordination with our many excavations, and confusion was not uncommon.

Signal services also included the land lines from the radio receiver stations and transmitter stations, which were built by us and which formed part of this project. The receiver stations, separate ones for the Army and R.A.F., were built, with a network of forty masts, 2 kilometres to the north-west of the main Headquarters site. Transmitter stations very similar in layout and also with forty masts were built near the city of Rheydt, 5 kilometres to the south-west.

(g) Communications

The main railway from Düsseldorf, via Dalheim to Holland, runs 3 kilometres south of the site. The nearest railway station is at Rheindahlen (3 km.) and Moench-Gladbach (7 km.) away. The latter is used as the main railway station.

The two main roads from Moench-Gladbach to Holland, via Roermond and via Aachen, run within 3 kilometres of the site to the north and south respectively.

For air communications there is the R.A.F. station at Wildenrath, 15 kilometres away, and the civilian airport at Düsseldorf is little more than one hour's drive from the site. There is no Auster strip, but helicopters can and do alight at the front door of the main Headquarters block.

There are efficient tram services to Moench-Gladbach on the main roads described, and thanks to the planning and stimulus of the British Resident, in combination with the local bus companies, four different transport services run their new buses through the site and to the adjoining towns.

(h) Recreation Grounds and Site Work

The site was untouched forest with great clearings devoted to saplings and small trees. It appeared that the task of establishing recreation grounds and landscape in the spaces would not be so complicated as in the standing forests, but in fact, almost the whole area was studded with stumps of previous growths of conifer trees. In the original zoning plan the pattern of forest roads and the disposition of cleared space had a large influence on the layout. We all quickly concurred in the general shape of things, and it was not difficult to demonstrate to senior officers, up to the C.-in-C., how the layout and landscape would fall into its natural place. The

German authorities, not without reason, were apprehensive that we might be ruthless in the destruction of the natural amenities of the site. In fact, within our own staff we had very definite views about landscaping and in the main these fitted in very well with the sentiments of the British and German authorities who were concerned with the preservation of the natural surroundings.

The provision of sports grounds and grass was broadly defined by what we could do under the authority of *Barracks Synopsis*. The R.A.F. wanted their games area separate, and the Army wanted theirs with common facilities for all, provided by the garrison grounds in the centre of the site.

A central open space also fitted in with the architects' and planners' conception as giving a fair uninterrupted vista from the comparative eminence of the main Headquarters building.

In order to allow the maximum development of turf we were keen to get the main grass areas, including the playing fields, down to grass in the first year of work, so that when the Headquarters moved in they would have mature turf to play on. It was easy once the zoning plan was fixed to give orders for the development of these areas. They amounted to some 300 acres. The work of converting this land to turf was considerable. It involved felling trees, uprooting stumps, ploughing, tearing out roots and stragglers, re-ploughing with fertilizers and lime mixed in the soil, harrowing and rolling and sowing. Experts on soil analysis were brought in and our contracts for this work were based on their recommendations, which were given in detail, including weight per square metre and types of seed which was suitable to the soil.

In all, some 200,000 major roots and 750,000 small roots were removed. The successful contractor who did this part of the work (and who also did the clearance of roots and ground treatment of playing areas) devised an ingenious machine for root extraction. This consisted of an R.B. 19 Back-actor, with a vast steel walrus tooth, which was plunged into the ground on the far side of the root stump and tore the root out in one motion. It was a pleasure to watch the monster working.

The main areas were seeded to grass, not as early as we had hoped, in June and July, 1953. In the wet summers of 1953 and 1954 conditions were admirable for the development of turf (if for nothing else), and by the time the Headquarters moved down in October, 1954, much of the area was covered with good playing fields and grass. After financial resistance had been overcome pavilions were approved. Equipment for games fell within *Barracks Synopsis* scales.

Landscaping

The opinions of senior officers as to the treatment of trees varied between wide extremes. One would find the heavily forested country oppressive, and with a sweep of the hand would adjure me to see

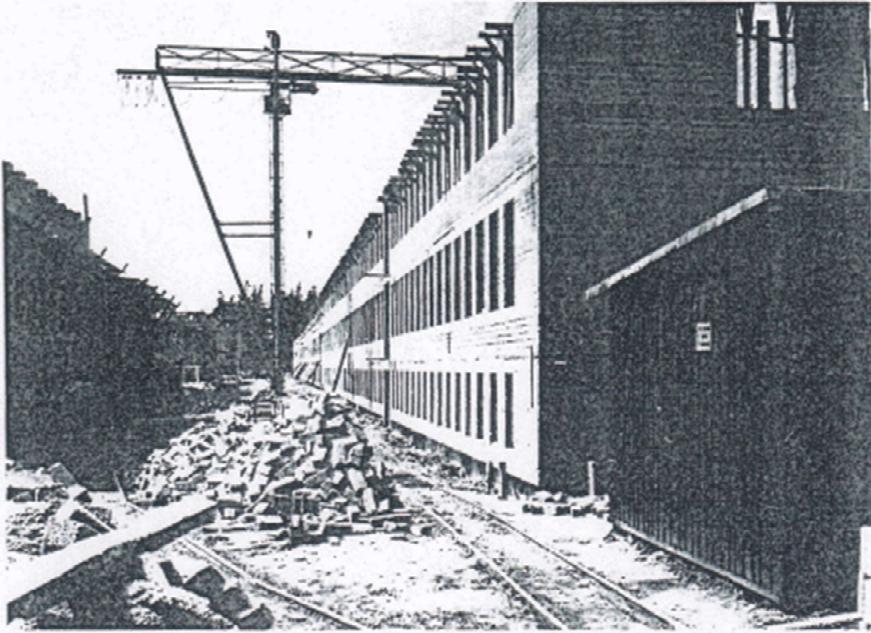


Photo 2.—HQ Building; Well mechanised construction.

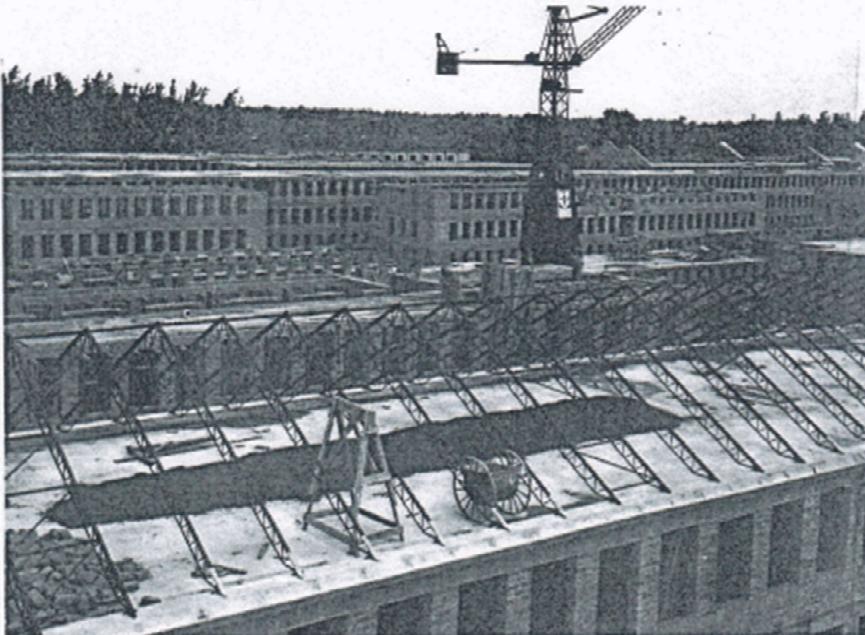


Photo 3.—HQ Building showing roof trusses.



Photo 5.—Standard Officers Mess.

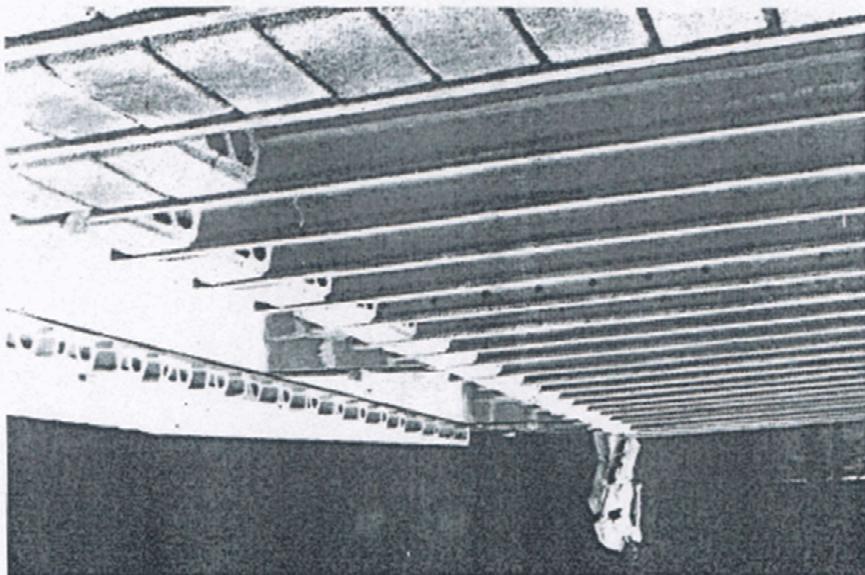


Photo 4.—Flat roof construction.

Photo 7.—The 1:1000 scale model.

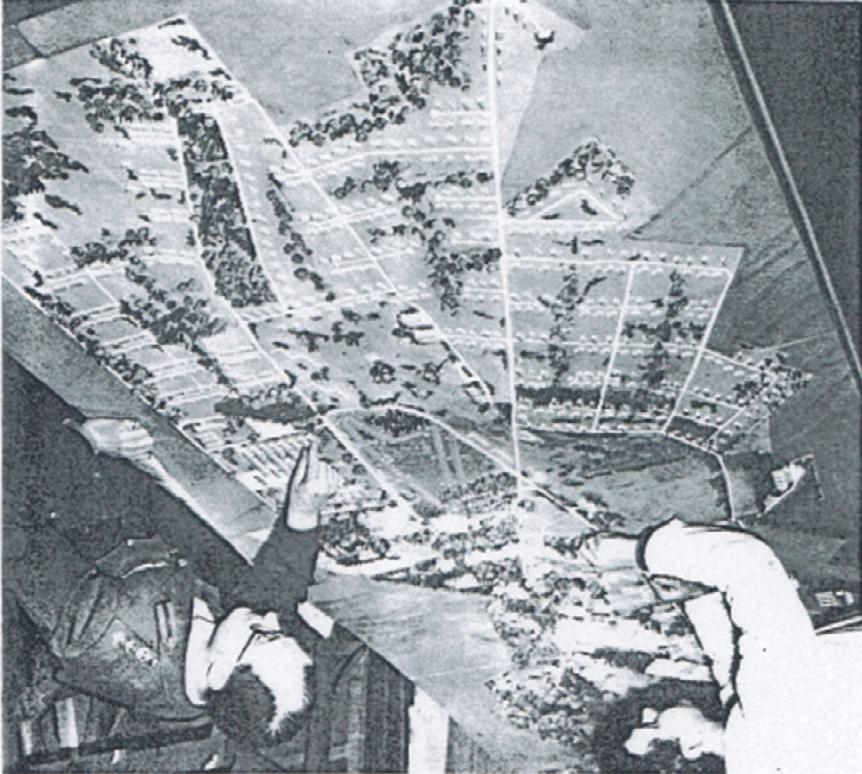


Photo 6.—MT Garages.





Photo 8.—Heating duct.

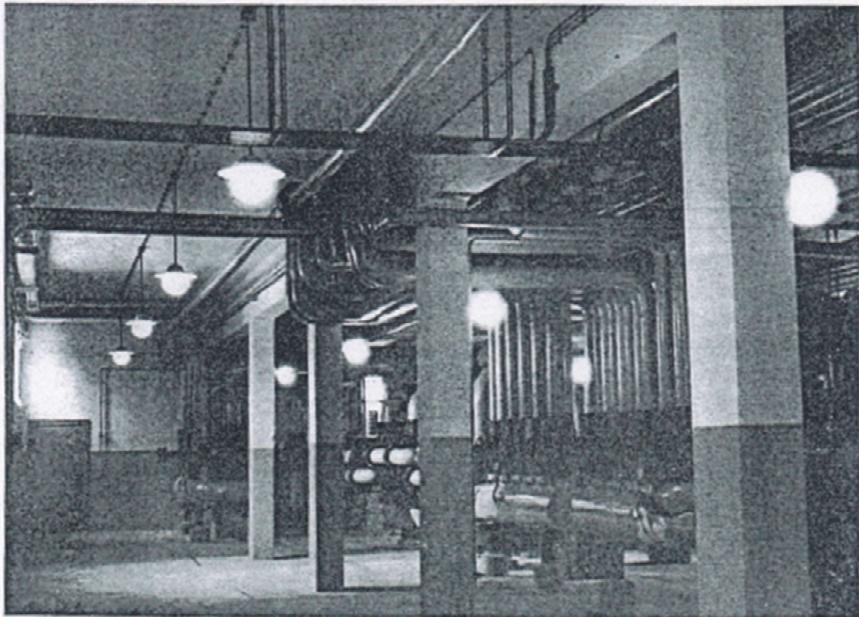


Photo 9.—Calorifier station.



Photo 10.—Club Bar.

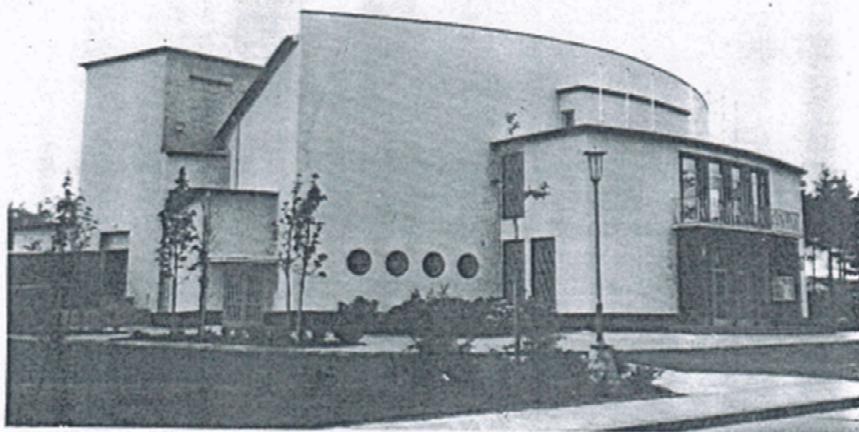


Photo 11.—The Theatre.

that most of the objectionable forest was removed. Another with a cautious wag of the finger would instruct me solemnly not to remove a single tree that could be left standing. Between these extremes it was obviously impossible to judge, so we asked for a committee of officers to decide on the extent of tree clearance and the planning of new growth. The committee assembled in October, 1953, when most of the buildings were up to roof height and the estate taking shape. It was a senior one under the chairmanship of the D.A.G. (who was interested in horticulture). It took seven days of careful marking of plans, in the course of which almost every tree with any character was individually considered, and an accurate plan was produced to define what should be cleared or left standing. The committee's deliberations also included the laying out of new trees, flowering shrubs, gardens, etc. We had by then already laid out and cultured half a dozen sample gardens in the married quarters estate. These also came under review, and the recommendations (within the costs that we could allow) formed the basis upon which the 1,126 gardens were planted. As far as was possible deciduous trees of every kind (of which there were all too few) were left standing, and the more dense conifer plantations, which harboured horse flies by the million, were removed to open up vistas. Thousands of shrubs were planted, and 1,000 creepers of various kinds have been encouraged to decorate the walls of the buildings. The future will see whether the committee did their job properly. On Christmas Eve, 1954, a slight amendment of the committee's plan was caused by a gale which blew down 1,200 trees which had been selected to remain standing.

We were astonishingly fortunate in having attached to us during the appropriate periods of the project 2nd Lieutenant Clegg, R.E., a National Service officer whose civilian trade was forestry, and Captain Allaway, R. Sussex, a short service officer who is a nurseryman. We could not well have done without them.

Road Naming—Notice Boards

The naming of roads was an important operation in which personal favour might have played a part. This also was undertaken by a committee of officers under the chairmanship of the D.A.G. Since the move a forest of international traffic signs has arisen.

A military cantonment must have adequate notice boards, direction posts, and traffic lights. These are being tastefully designed, and though they grow in density as the months go by, they have not yet overwhelmed the landscape. They have a crystalline surface which shines in the lights of even the oldest pre-war car.

NEW HEADQUARTERS IN GERMANY

(Part II)

FINANCIAL CONTROL

The preliminary rough estimate for the new headquarters project submitted to the War Office in July, 1952, for the work as it was then foreseen amounted to DM.130 million (£11 million). This was a broad estimate based chiefly on experience in the "Op. Humane" project, totalling DM.90 million, which was then coming to a close. The original estimate included percentages for contingencies both "Q" and "E" and for variations of price.

It was tempting for the staff, and indeed for us, to regard a total sum based on estimates so hastily produced, as containing a good deal of fat which could be drawn upon for *ad hoc* alterations to the scope of the project as the work proceeded. The "Q" Staff readily availed themselves of this, and we were not backward in satisfying their further demands as they arose. It would take too long in this account to show in detail how the scope of the project was increased from time to time throughout the construction.

This would not have been possible in a project conducted on Vote 8A procedure, but in Germany since the war R.E. services had been using deutschmarks from the occupational costs budget, and although money was not wasted in the spending of it, it had become a habit to change the scope of works locally, without reference to the authority who had approved the project in principle. This is a bad habit, but for a project planned as hastily as this, the practice served well to fill in minor detail.

Early in 1953, it was already apparent that extra accommodation and services would be required for new demands. For instance the establishment for Signals was raised to a L. of C. Signals Regiment for the headquarters, in place of a detachment, which in the original planning amounted to little more than a squadron. This and many more additions of the same nature were made during the course of the project, and put to contract as soon as they were authorized. Consequently the framing of revised estimates (AF.M1428) often lagged behind the execution of new work.

In June, 1953, much larger additions were made which fell within our responsibility. These were partly changes in scope which were properly chargeable to the main project, and partly additions which, though not part of the main project, were added to our load of work. Examples of such items were:—

(a) The building of a new office block with messes and houses and a children's primary school, and married quarters for the establishment, then known as British Intelligence Organization (Germany), which it was decided would be moved from Wahnerheide to the new headquarters site.

(b) The addition of 244 Officers and O.Rs. houses partly to satisfy (a) above and partly to augment Army and R.A.F. scales to bring them in line with the number of houses which had been occupied at Bad Oeynhausen and Bad Eilsen.

(c) A secondary day school for 400 which was required West of the Rhine, and might have been placed anywhere, but was at that stage reasonably sited on the main headquarters estate.

(d) An office block for N.A.A.F.I. headquarters moving from Bad Salzuflen.

The cost of these major additions was estimated with their services at DM.24 million. With reasonable prescience the original planning of the site and its services had left scope for these expansions.

As agency fees for a project of this size, the Germans required 3½ per cent of the cost. This had been normal practice. For this they undertook to set up the special works organization (the F.S.B.A.), accommodate and equip it, employ architects and consultants, and do all the drawings, bills of quantities, tendering and billing. By the beginning of 1954, it was becoming evident that the 3½ per cent allowed as agency fees was proving insufficient to cover their costs. In the end after much negotiation, it was decided that German authorities would be paid their *actual* costs for this project, which it would not be difficult to assess. The total sum has proved to be about 7 million Deutschmarks on this account, or about 4 per cent. (It is interesting at this juncture to note that the Ministry of Works undertakes the same duty on behalf of the War Office at home for 14 per cent.)

The factors described have brought the total estimated figure for the whole project to about 173 million Deutschmarks (£14.7 million).

Revised 1428s were from time to time submitted to the War Office to cover the increases described above. The method of conducting such a project whereby much definition of detail is left to the German authorities (and in fact by them to the contractors themselves, whose conception of a lump sum contract is not the same as that which is understood in England) gives room for much work of a higher

specification than is demanded to creep into contracts. It was not always possible to stop this happening, nor to dispute the claims of contractors who might have done more work than had been strictly specified in the tenders. Further, delays and bankruptcies gave grounds for unforeseen extra-contractual claims, many of which are not yet resolved. My ground staff was inundated with deviation orders, which in theory should have been priced before work was allowed to start, but which in fact often represented the measured results of urgent work which had already been taken in hand or completed. This was, therefore, not an easy project upon which to exercise successfully a meticulous financial control.

Progress reports were submitted monthly by my office, to the Chief Engineer, based on an easily workable system whereby every Garrison Engineer was required to record on a chart the percentage completion of every building operation within his charge. A monthly compilation from the charts by my office did not present anything more than a heavy mechanical process. These monthly progress reports were the basis for the payment to contractors—through the F.S.B.A.—of running payments on account, and for the transmission of information to H.Q. Northern Army Group and the War Office.

There were some 1,500 main contractors employed and countless sub-contractors. In Germany, there are no vast building concerns such as there are in England who could have conducted the major part of the project or the whole of it. The *biggest* single contractor carried only DM.4 million of work in the carcass and roof of the main headquarters block. The housing estate was divided into many small contracts of DM.1½ million each. A number of contractors went bankrupt, eight in the married quarters alone. These and a thousand other factors complicated the task of my S.Q.S. Lieut.-Colonel Biggs (and of his counterparts in the F.S.B.A.) in keeping abreast of exact financial progress. It may justifiably be said that at no moment could we give accurate financial detail for the probable cost of every item in the project. We therefore presented a difficult problem to Engineer Branch and the D.Q.M.G.; but although the billing has not yet been completed and is not likely to be for some time, it can be said that our estimates have not been grossly exceeded in the main, and that if some details of the work cost more than we expected we managed to foresee the possibility in time for financial provision to be made.

ORGANIZING THE MOVE

This was not a works matter. It was, however, so complicated an operation, and one which had so much bearing on our organization, that it must find a place in this account.

On 23rd September, 1953, a conference was held in Bad Oeynhausen under the Chairmanship of the M.G.A. to rough out the

principles upon which the move to the new headquarters would be planned. (It was then anticipated that the move would take place in July, 1954, though the reader may remember that works planning had only started in August, 1952.) The head of every branch at Headquarters, B.A.O.R., was represented, and the Royal Air Force sent representatives whose duty it was to observe the plan and presumably to base the R.A.F. move upon it. I was not concerned with the complicated problems of vacating and de-requisitioning accommodation in Bad Oeynhausen, which took up a large part of the time of the meeting; the existing Camp Commandant in Bad Oeynhausen, who was to remain there over the move and afterwards with rear parties and administration details, would deal with that aspect. I was, however, vitally interested in what followed, which was the plan for the receiving end.

In the new headquarters a camp commandant was to be appointed as soon as possible, whose responsibility would be to take charge of buildings as they were completed. At a later stage he would furnish the accommodation and phase in the troops and families who would arrive over a period of some months in 1954. I did not covet his job. It would be a welcome appointment, for it was vital to us to have on the site an authority to take over the finished buildings and who would be competent to guard them as they were handed over, so that neither the contractors nor my staff would incur the liability of looking after them. Most of the standard barrack buildings had started in February and March, 1953, and would be ready for handing over in the winter. Contracts with German building firms demanded that completed buildings should be taken off their hands within fourteen days of certified completion; therefore to have kept the completed buildings on contractors' hands would have been to incur a heavy extra-contractual obligation, for which no rates had been fixed. As far as I was concerned, the three most important agreements reached at the conference on 23rd September were, firstly, that a camp commandant's staff would be located on the site, secondly that a guard company of the Mixed Services Organization (a quasi-military unit consisting of Polish and Yugoslavian D.Ps.) would be posted to the site as soon as barracks with stove heating and field cookhouses could be furnished for them, and thirdly that early in 1954 a British regiment would be taken off all training duties and would be established on the site, either in tents or in completed buildings. Their task would be to take over and guard completed barracks and installations, and to see that large scale theft and petty pilfering, which were already rife, should be reduced to a minimum. This obviously would not be a welcome duty for the regiment appointed.

The M.S.O. unit, of depleted strength, duly arrived a month later, and proved most useful within their capacity. In November

an interim camp commandant's staff was set up. In the following spring a light A.A. regiment was posted. They did an unpleasant and thankless task with great thoroughness and understanding. They were relieved by another R.A. regiment in the summer, which carried out the same functions until the move took place in October, 1954.

We had all feared that once great areas of building were taken out of contractors' responsibility, the incidence of theft would exceed all bounds. We saw no method whereby replacements for such thefts could be authorized without frequent and ponderous courts of inquiry, which we would not have welcomed. In the event, the greatest single theft that ever took place was the dismantling of thirteen basins from a barrack one night. Apart from this there were only a few hundred minor pilferings. Most of them were within the powers of write-off of the Camp Commandant, Colonel A. E. Wilkinson, O.B.E., M.C., of the Gloucestershire Regiment, who had been posted to the site in May, 1954, or of Wing Commander R. A. Milward, D.F.C., A.F.C., who performed the same duty in the R.A.F. Camp.

In June, 1954, the Barrack Department collected the accommodation stores in the transport garages (which by then were virtually completed) for the main headquarters offices and barracks, and married quarters. As far as was foreseeable in the fog of the contracting world, priorities for completion had been agreed mutually between us and the Germans and we engineered the handover of buildings in accordance with these priorities. By far the greatest complications arose in the main headquarters block (the functions of which were subject to changes, even at that stage), and in the married quarters estate. For the latter, by setting up a special organization for the purpose, the R.A.S.C. reckoned that they could take over and furnish fifteen houses per working day. We on our part had to try to satisfy that rate of completion. This would spread the taking-over of houses and handing of them to the Camp Commandant over a period of three months from 1st September.

The C.-in-C. had promised all families that they would be settled in before Christmas. In another paragraph I will describe the troubles which beset the process of completing married quarters, or even of foreseeing which would be first completed in their proper order of priority. The move had necessarily been organized by Headquarters Northern Army Group on a programme of planned completion dates produced by us on the data available many months earlier. It inevitably occurred that for one reason or another the construction of houses which were scheduled to be early in the hand-over programme had to be deferred to a later stage. Potential occupants in the H.Q. had, however, been allotted definite addresses based on the original planned order of completion in relation to their

“points” entitlement to priority of moving. They heard of the various snags which deferred the handover of their particular house with telegraphic rapidity, and in consequence we were unmercifully prodded during the whole of the handover period. In the end I believe no single family was moved later than the end of the date bracket which had been allocated to them and many were surprised to be able to move earlier.

MAINTENANCE OF COMPLETED WORK

Early in 1954 a D.C.R.E. was appointed to the site, responsible to the permanent works organization of Rhine District for maintenance of completed work from Part III funds. He was Major K. H. Stevens, M.B.E., R.E. He carried the responsibility not only for maintenance but for such new works within the site which were demanded after that stage in the main project when additions to its scope could no longer be approved as a charge against it. He built up his staff largely from experienced members of mine. The passing of the baby to him proceeded with great smoothness from our point of view. We hope he thought so too.

SNAGS, MISTAKES, TROUBLES AND LESSONS

The discerning reader, that is to say anybody who has been in charge of a project, will by this time be sceptical of the apparent smoothness which is shown in my account. Let it not be thought that there were no difficulties. I have kept a whole chapter for them because their unexpectedness and the overcoming of them is the main spice of any project, and from them lessons for the future can be learnt.

(a) *The Weather*

Records in November, 1952, when the roads and water mains had started, and the foundations for the first twenty-four houses had been laid, showed a rainfall 207 per cent of normal. The site which we had regarded as good draining land, was churned up into a fair imitation of the Russian Front. Heavy transport bringing in material, not to speak of the tipper wagons carrying concrete from batching plant to road head, ground their axles deep into the forest tracks. Roads of sand and gravel in the surrounding country became impossible and vehicles cut wide swathes of morass through agricultural land. The natural falls of drainage were interrupted, and the puddling of the silt surfaces seemed to make an impermeable slough against the absorption of rain. Therefore the twenty kilometres of road which had been planned to be completed by the first week in February was not finished until the end of March. The summer of 1953 showed little improvement on the winter. It was favourable only for the growth of grass.

The winter of 1953/54 was said to be the most severe for thirty-nine years. There had been normal rain up to the middle of January, but on the 23rd January a frost which held for six weeks steadily gripped the site. Most of the rivers in Germany were frozen solid, and the Rhine was a mass of pack ice from bank to bank for several weeks. From 23rd January until the end of March, underground work on the site was at a standstill.

In a normal project planned over the years and undertaken with engineering expediency, the underground services would first have been laid. Admittedly we did get the roads and water mains in during the first winter, but for the other services, drainage, heating, electricity and gas, the mere process of designing them in detail took many months. By that time, owing to the condition under which the project had been allowed to start (namely the spending of vast sums of money by impossible dates), all the building work was forced well ahead during the summer of 1953. Barracks, canteens, clubs, messes, etc., had their roofs on by the end of 1953, and the 880 dwelling houses which had started in May and June were well up, with roofs going on as the winter set in. *But very little had been done for the underground services.* It would take too long to describe the confusion and difficulties of co-ordination between the various contractors. Those responsible for underground services were all at once let loose to contend for subterranean space among the activities of building contractors bringing in materials for surface work. Impedence was terrific and tempers ran warm with friction.

It had been planned that by mid December, 1953, the heating ducts would be largely completed, and the boiler houses functioning to supply heat. This was important, because if there had been heat within the buildings, internal plastering and decoration could have proceeded during the winter. As it was, the first heat provided was from the east boiler house on the 19th January, 1954, to the main headquarters block. This building was admirably suited for the dissipation of unwanted heat during the boiler testing time. During the big freeze which followed a few days later, work was able to go on within that building by virtue of its being heated. This happy condition was not fulfilled in any other part of the site, so for eight weeks virtually no work went on at all.

The first proving of the heating system was afforded by the main office block. After some three weeks, when there had been no trouble, and the calculations of the E. & M. experts were bearing fruit, a sudden uproar arose in the east boiler house. The hot water storage cylinder, upon which two cascades are mounted (in which high pressure steam from the boilers is mixed with the cooled return water from the circulation system), started shuddering and creating a minor earthquake. The whole unit when full weighs some seventeen tons, and is mounted in the top of the building. It was not built to

jump about. This phenomenon caused a considerable stir. Fires had to be drawn at once. The designer of the system arrived post-haste from Darmstadt and the D.D.W. and the staff in Bad Oeyhausen showed justifiable anxiety.

This particular design of cascade mixer for steam and hot water had been used in several large installations in Germany, and had up to that time never given any trouble. It was some twelve hours before the system had cooled down sufficiently for the cascades to be removed so that the inside of the apparatus could be examined. When the examination was made, it revealed little that could have accounted for the commotion which had been set up in it. Only a bucketful of black grit and welding spawls from the insides of the pipes was found in the hot-water reservoir and there seemed little to indicate how a recurrence of the trouble could be precluded. It was thought that on light loads, running both cascades at one time, a correct balance had not been maintained between the proportion of steam and water in the mixing. Hereafter, on light loads one of the cascades was cut out and only one employed, and the steam pipe leading into the cascades was modified in shape, so that the mixing of steam and pulverized water might be effected less violently. There has up to now been no recurrence of this phenomenon, though the nervous apprehension it induced was not dispelled for a long time.

By the time the thaw came, in March, 1954, it was obvious to the Engineers that there was no prospect of completing the project ready for a move in July. The C.-in-C. had determined on a move on the 1st of July, and it was only by his Chief Engineer and staff presenting to him the inescapable conditions as they had developed that the move was reluctantly postponed until 1st October. (We on the site would have preferred the 1st December.) In fact the C.-in-C. judged it to a nicety, but we then much doubted that it was possible for essentials to be ready by 1st October. The new date for the move brought even greater effort and co-ordination into play.

The summer of 1954 was again good for the growing of turf. There was constant rainfall the whole season, which made underground work, laying of services, etc., very difficult. By June, most of the heating ducts had been laid, and the sewage and storm water drainage had been established and tested, *but many of the man-holes serving both these systems had not been completed nor had their covers been fixed.* On the 19th June, there was a rain storm of 1.77 in. There were two main results of this, firstly, vast quantities of storm water flowed into the sewage system (which was by then functioning for the service of the Guard Regiment and Camp Staff details), and filled the collecting chamber with more water and rubbish than it could digest. Secondly water got into the heating ducts, where it was rapidly boiled by the pipes at 170° Centigrade. Steam was generated

so rapidly that lengths of duct were blown up, and much damage was done. In general all excavations which had not been filled in (and there were a good many) were grievously washed out. Pipes were displaced and sides fell in. It was a bit depressing.

On the night 14th/15th August, 3.4 in. of rain fell in six hours! Due to the minor set-back in June, underground work was by then little nearer completion than in June. The same troubles now reoccurred, but on a more magnificent scale. The sewage collecting chamber was again entirely blocked by debris, storm water backed up into sewage drains, and welled up in torrents into the nearest building. (I suppose it was justice that the building which suffered worst in this respect was the completed R.E. office, in which my own staff was working; at 3 a.m. there was 6 in. of water and sewage and mud in every room.) The sewage collecting system was designed to pump 3,500 cubic metres a day (with a normal diversity factor). In the June storm it coped with a rate of 5,000 cubic metres a day over the storm hours—and in the August storm it pumped, for the hours before it was choked by debris, at a rate corresponding to 9,000 cubic metres a day. This was of course storm water which had trespassed into the foul water system and represents only a fraction of the discharge in the mains, most of which back-filled and burst out of manholes. The heating ducts again suffered considerable damage, several hundred metres being entirely washed out of the ground. Sixteen of the underground calorifier stations, most of which had their delicate electrical control equipment and pump motors by then installed, were filled to the roof with water and mud. The cellars of over fifty houses were similarly inundated to the roof. Many more were less seriously flooded. In Germany various kinds of contractors do not co-ordinate themselves well. The contractors engaged on leading in the service pipes to the houses and underground calorifier stations had done little to bar flood water from rushing from their trenches straight into the buildings.

With the move impending within six weeks, and with many administrative units already on the site, it was discouraging to suffer this crisis. A storm of this magnitude had not been seen by the locals in living memory. I pleaded that we would appreciate further postponement of the move, but this was not granted, and as it proved rightly so. After the deluge followed a week of fine weather, the only sun that was seen the whole of that summer. The tenacity of the German workmen and his grim satisfaction in hard work eventually cleared up the mess in an extraordinarily short space of time.

There were ample illustrations of the difficulty of co-ordinating the various underground activities. My staff was too attenuated (and indeed it was not their duty), to co-ordinate directly the work of the underground contractors competing for the same earth space. I do not think it is unfair to say, in spite of the much vaunted ability of

German planners, that this vital collaboration is not a strong point in German construction work. German Engineers in charge of the various activities were inclined to be parochial in their demands, inconsiderate of the viewpoint of their colleagues, and often at loggerheads. When crises were reached it nearly always devolved on us to call a round-table conference, and metaphorically bang their heads together. In this exercise my S.O.I, Mike Lewis, was particularly able. The consequences of unco-ordinated work by contractors not only retarded general progress, but were in themselves infuriating. Six times in 1954 high tension cables already laid in the ground were cut by drivers of mechanical excavators engaged in opening up trenches for drains or heating ducts. This not only interrupted lights, but stopped work by cutting the power to contractors' machinery. Twice the gas main was similarly cut (it had been made live with gas in order to serve the Guard Regiment and other units living on the site). The possibility of gas line breaks had been foreseen, and a drill existed to cope with the eventuality. It took some time to get the gas people informed, and to have the source of supply turned off at the valve house. By that time a lot of gas had been discharged and more was trickling out of the broken ends, so that on each occasion for some hours all personnel had to be evacuated and all work stopped within 300 metres of the break to avoid the risk of fire.

The water mains were frequently cut. As for drains, it will not be known for a long time how many storm water branch drains have been thus interrupted and now fail to flow as designed into the main confluences!

By German law, any claim for damages on account of the breaking of underground connexions by an excavator can only be brought to the account of the operator himself. We could not punish contractors and they in turn could do no more than sack the operator; but operators are in high demand, as they are in England, and could always get another job immediately. There was, therefore, no effective redress against these "accidents", and with our sense of humour wearing thin in 1954, we were maddened by the phlegmatic attitude shown by the long-suffering German authorities to this recurring nuisance. Nothing would force contractors to resort to hand digging, even when ordered to, in localities where there was danger of excavators cutting other services. In fact no record plans of sufficient accuracy had by then been drawn to enable the F.S.B.A. or contractors to define exactly where services had already been laid.

A final exasperation of this kind occurred when the Bundespost (German G.P.O.) laid their main cables to the telephone exchange. We had given the strictest injunctions that the main cable route should be laid along the northern edge of the site where it would have reached the telephone exchange without any danger to other services. I was mortified therefore one day to see the trench for

Bundespost cables being carved regardless of all obstacles by the shortest route through the very centre of the married quarters area. We frequently progressed backwards when we could ill afford the time.

(b) *Main Headquarters Block*

Two-thirds of this building of 2,000 rooms was destined to be for Headquarters, Northern Army Group, and one-third for 2 A.T.A.F. In November, 1953, when the roofs of the building were finished, and much of the interior decoration starting, important changes of mind were made on the security aspect of the building. This is not the place to describe the measures then planned, but in short, another DM.2½ million of work had to be ordered in April as a result of deliberations on security measures. The work consisted mostly of building steel linings into a large number of rooms, the addition of five luggage lifts and shafts for dispatching graded files to the strong rooms below, and a great number of small alterations. Putting a steel lining into a room which already has a functioning radiator heating system and electric lighting is not easy because of communications having to be isolated and ripped out and then re-done after the steel lining is in.

This work would not have ranked as a "difficulty" if we had had longer to plan and execute it, but it was all too near the inescapable 1st of October, when the headquarters were to move.

Army Headquarters moved down between the 1st and 4th October and command passed with the new building on the 4th October as planned, but the attendant headaches were considerable. We had in the original planning foreseen a host of minor alterations which would inevitably be necessary once the Headquarters settled itself in, and to that end we had devised the light partitions capable of easy moving and re-building as has already been described; but for a month while the security measures were being completed and bell systems, doors and partitions were being moved, the Headquarters was not a comfortable place to work in. At the same time some thousands of desks and cabinets and chairs were being installed, while linoleum was being laid in nearly three miles of corridors. All complaints (and there were many) seemed to rise to Chief-of-Staff level and to fall with the acceleration of gravity on our heads. A large crate of glass diffusion shades was dropped while being unloaded from a lorry and 400 were broken, so that 400 officers had a legitimate objection to the lighting installed in their offices, which temporarily lacked this desirable fitment. The master clock of the clock system having been installed in the Signals Office *as directed*, was ordered at a later date to be moved *twice* again. There was rightful annoyance in Headquarters that even the clocks were late, and this small item kept my E. & M. staff uncomfortably chivvied about. It was difficult for us not to regard these incidents as trivial.

There were dozens of similar ones, and each naturally set the telephones of my overworked staff irately buzzing. There are no technical lessons to be learnt from these experiences, except to recognize the inevitability of such occurrences and to bear them.

As might be expected, hundreds of minor snags occurred in the 800 odd houses as soon as they were occupied. The process of taking over fifteen houses a day (after two preliminary examinations of them with the contractors) would have been complicated enough if every item had been perfectly finished. As it was, a list of thirty or forty minor items for every house remained to be rectified. It is difficult to get contractors back to do these little jobs, especially when the same contractors are being pressed to finish off houses which have only reached an earlier stage. The two most serious snags are worth describing, because lessons can be drawn from them.

When the painters and decorators are in, the W.C. pan is generally not yet fixed, and the drainage head on which it will be mounted makes a tempting repository into which a slip-shod workman can tip the carpenters' chips, paper, tins, plaster overspill, and other rubbish. It all falls to the bottom of the drain and as far as the workman is concerned, is satisfactorily disposed of. When the house is taken over and the W.C. plug is pulled, away goes the water just as designed. It is not until the house has been occupied for *several days* that the obstruction in the bottom of the pipe becomes a bung which solidifies and prevents the outflow of successive discharges of the W.C. A week or ten days later the dammed up products rise through the gullies and the house becomes flooded with a most unpleasant influx. *This happened in over sixty houses.* Our hearts ached for the unfortunate occupants, and as far as was humanly possible we sent contractor's men to rip out the drains if necessary and discover what was wrong. The bung was sometimes located in the bottom of the heel rest bend within the house, and sometimes only found by digging up the drains in the garden. These annoying troubles occur in any big project, but more frequently in Germany than elsewhere. There must be some way of preventing them.

The second serious source of trouble in houses was due to the faulty manufacture of water pipes. Out of the first fifty-six houses taken over, thirty-two developed very serious leaks in the hot-water pipes when the hot water had been set going in the system. Sometimes this occurred before occupation, and sometimes not till after the occupation of the house by a family. Every pipe system had been tested as prescribed to two-and-a-half times its working pressure by a cold water hydraulic test. Testing had not disclosed anything more than an occasional weeping joint. When the hot water entered the pipes, however, it was found that many of them were splitting along their longitudinal seam (a certain amount of longitudinally welded pipes in domestic sizes had been stock-piled for the job).

The effect of this failure, particularly if it occurred when the furnished house was locked up pending the arrival of an occupant, was in many cases disastrous. Some of the pipes were in the walls, behind casing, and when they leaked extensively wall plaster and wood block floors were quickly ruined.

To find these conditions rampant in 60 per cent of the first houses handed over at the beginning of the move was upsetting, to say the least of it. Mercifully as the handing-over proceeded, it was found that this trouble occurred only in certain limited contract lots. It was undoubtedly caused by the fact that hot-water pipes of the longitudinally welded type had not been in every case led through sleeves in the walls and their expansion on heating was forceful enough to open faulty welded seams. In the end this trouble was met in less than a hundred of the houses. The consequences of it were very serious, but after the first shock the contractors had gangs standing by to cut off points of failure and repair them before too much damage was done. The moral of this is that all pipes, particularly hot-water pipes, must be led through sleeves and not anchored to the building.

There were a number of cases of deliberate ill intention. Some chimneys were built with bricks blocking the flue so that smoke could not escape. These were discovered when fireplaces were tested. They probably only represented the efforts of one disgruntled workman and they did not inconvenience occupants, for the fault was corrected before houses were handed over.

There is no need to go into the hundreds of ordinary snags, mostly resulting from warping of timber, which beset joinery, doors and windows. There, is however, a lesson in this manifestation and that is that it is almost impossible to get contractors back quickly to put small defects right, and it is essential to have a gang of directly employed labour working systematically through the whole estate in the first month of its occupation. Quantity surveyors and contractual purists deplore this policy, but the need is inescapable in a large project done in a short time. We were fortunate in being able to get the services of about seventy artisans of a German artisan unit.

STORES

By Christmas, 1952, when the spending of money was the primary consideration, a requisition had been placed on the German authorities to stock-pile steel pipes of every kind, roof tiles, sanitary ware, cooking ranges, chain link fence, and other items in large quantities. Over 4,000 tons of pipes of all sizes were included in the stock-pile. This was possible, because by 1952 the remarkable recovery of German industry had already outstripped immediate demands. The total value of materials stock-piled was about DM. 9 millions, which made up a substantial proportion of the payment of DM. 20 million

we were able to make by the 1st of January, 1953. The stock-pile of manufactured goods was largely in the suppliers' factories. Only gradually was material of this kind brought into store within call of the site. Some of the piping, as has already been described, was longitudinal welded piping, which only proved itself vulnerable when it was incorporated in work a year and a half later.

If this project had been conducted two years earlier, before the recovery of German industry, or if it had been carried out two years later after the great revival of intensive building in Germany, it is probable that we should have suffered many shortages of ordinary material in the conduct of the work. As it was, it is gratifying to state that there was remarkably little delay through the failure of supply of stores and material.

In the broad specifications which were issued to the German authorities the choice of materials allowed for the carcassing, flooring and roofing of all buildings was very liberal. The purpose of this was to give contractors the option of tendering for a variety of materials within the specification, so that no particular commodity would be drawn upon to the extent of creating a shortage therein. The only memorable shortage occurred in the provision of oak and beech blocks for parquet flooring, which had been specified in the ground floors of all married quarters and in the main rooms of messes and clubs. The quantities required were considerable, but even so we were given assurance at first that there would be no difficulty in the supplying of wood blocks. In the summer of 1954 when the pressure to complete houses became almost more than we could cope with, flooring contractors suddenly announced that their capacity for completing the job on time was falling short by a great extent. In a small measure we relieved the situation by specifying various alternative types of tiles or indigenous stone floors for the halls of houses and messes and in the end by accepting the failure of some of the parquet contractors and scouring the face of Germany for others to take their place. The German authorities got them just in time. On the whole I don't think we could have been more fortunate than we were in the capacity of German industry to satisfy our demands for materials for so large a project.

We set up sample rooms of fittings and materials of approved specification. These contained every manner of domestic finishing and fitting. Except in respect of protection from frost German plumbing and sanitary design is much inferior to ours. By insisting on adherence to approved samples we avoided taps which squirt outwards and drench the user's torso, and waste pipes which take fifteen minutes to empty the bath. My insistence on English sanitary practice had one lamentable and incurable result: We prefer a "wash-down" water closet, whereas European practice is to install W.Cs. of the "hospital pan" type. German manufacturers agreed

to make a "wash-down" pattern at my orders. The result is my "patent non-flushing W.C.", for it is also European practice to flush W.Cs. by a push-button direct-off the mains. The combination simply doesn't work. Much time and water are spent in pushing the button with long delayed effect.

The moral appears to be not to interfere with established local practice.

LABOUR

When the project started it was calculated that the maximum labour force on the peak of the job would be about 15,000 men. Even so, the conditions of unemployment in Germany in 1952 allowed confidence on the part of German and British authorities that sufficient labour would be found. In fact at the peak period of intensity of work in the late summer of 1953, the labour force on the site was only 6,400. We had anticipated allotting contractors areas in which they could erect temporary labour camps on the site. This never occurred, as the surrounding towns and villages were able to absorb the influx of outside labour and only a few key men and watch keepers lived on the site. The rent for a room in the surrounding villages rose from DM. 30 a month to DM. 120. Labour worked overtime at rates which are considerably less than overtime rates in England, and the rent they were prepared to pay for their accommodation is a measure of their eagerness to get work at that time. The only shortage of labour we experienced was in layers of parquet flooring, which further aggravated the trouble I have described in finishing the married quarters.

Only three fatal accidents occurred during the project. In one case, a German labourer engaged on digging a drainage trench some four metres deep was buried by a failure of the shoring. In England, it is the practice to shore excavations by vertical planks laid behind horizontal waling. In Germany the practice is to lay horizontal planks behind vertical baulks. When the planks are laid horizontally the difficulty comes in striking the shoring, and in this case it collapsed and buried the man. The moral appears to be, stick to English practice.

The ever deteriorating temporary electrical supply which ran overhead to supply contractors on site was responsible for the other two fatalities. A German workman trod on the bare end of a live cable in hobnail boots on a wet day and was instantly killed. A gunner in the Light A.A. Regiment, on night patrol, picked up a trailing cable-end which had dropped from one of the temporary overhead poles. My E. & M. staff had frequently drawn the attention of the German authorities to the derelict state of the temporary supply, but in the urgency to catch up on work, such details had not received the attention they should.

The moral is obvious.

GARDENS

Each married quarter was provided with a manageable garden surrounded by a fence. Half of this was designed to be seeded to grass, and the remainder to be vegetables and flowers at the will and ability of the occupant. Flowering shrubs, a small hedge and three fruit trees were provided as part of the project in the average garden. The success of this scheme rested upon the proper re-spreading of the top soil over the formation after the excavations for the underground services had been completed and consolidated. I have already described the complications of performing underground services punctually when the above-ground building has started first. In the event, in many localities the trenches for underground work were not properly consolidated after filling, and in many instances a sufficient layer of top soil was not established because the contractors responsible for erecting the fences had gone ahead too early. To ensure that this work was thoroughly done everywhere in 1,000 gardens proved impossible with my small staff. Much difficulty arose in getting garden contractors back to complete their work, and one's sympathy must be with them when it is considered that the confusion did not allow them a clean run on the job. The lesson in this is, that if a housing project is done too quickly, the gardens are bound to suffer.

CONCLUSION

There has never been a project like this. It has never happened that one Chief Engineer and his staff have been able in the span of one military appointment to help choose the land, plan the site, and see it built, occupied and working. It is a task we have enjoyed and appreciated. I think the main ingredients of success with speed have been (a) the delegation of planning and control to a low level, with support by higher authority, (b) the ability of German labour to work hard, and (c) a first-class staff able to take advantage of this German characteristic. It is not military custom to write an acknowledgment of the individual efforts of one's staff, but they know what they have achieved. In addition to a splendid staff of officers, I was exceptionally well posted with warrant officers and senior N.C.Os.

A notable and unforeseen reinforcement lay in the young National Service officers and men who were posted to me in 1954 when the demand for supervision became urgent. I was given officers in their early twenties who had during their deferment gained qualifications of various kinds in civil engineering. They came with enthusiasm and the nature of the job increased it. The task could only with difficulty have been done without them, and I hope that they will have regarded it as considerable experience for their future in civilian life. (I could not persuade any of them to stay.)

I have not given Baudirektor Schmalbruch and the F.N.B.A. and higher German authorities their full due. If I have made too much of their inherent differences in outlook and method it is because the difficulties of a project provide its interest and instruction. In fact the keenness, tenacity and vigour of German effort, from the drive of the highest executive to the industry of the lowest labourer, was the main force we applied to the building of a complete town in little more than two years. I hope it may again fall to officers of the Corps to conduct a large project in such well favoured circumstances.

(Acknowledgment is gratefully given to those whose photographs have been published, namely Lieut.-Colonel Lewis, the B.A.O.R. Public Relations Branch, *Soldier*, and N.A.A.F.I.)



Photo 12.—Choosing a site.



Photo 13.—Main Entrance Rheindahlen site, 12 August 1952.



Photo 14.—Laying the first roads.

JOINT HEADQUARTERS
OF
FLAG OFFICER GERMANY
NORTHERN ARMY GROUP
2ND ALLIED TACTICAL AIR FORCE

THIS STONE WAS LAID JOINTLY BY

Rear Admiral R. St. V. SHERBROOKE. V.C., C.B., D.S.O.

General Sir Richard N. GALE. K.C.B., K.B.E., D.S.O., M.C.

Air Chief Marshal Sir Robert M. FOSTER. K.C.B., C.B.E., D.F.C.

ON

1ST JULY 1953

Contractor
Firma Christian Oelfing

Chief Engineer
Colonel H. Grattan

Photo 15.—The foundation stone.



Photo 16.—General view of HQ Offices.



Photo 17.—Barrack Blocks.



Photo 18.—A Cinema.

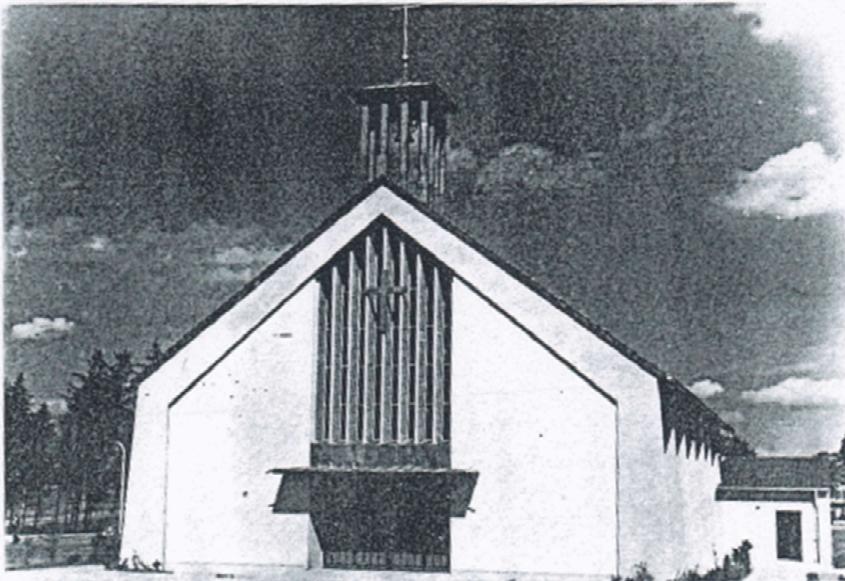


Photo 19.—St. Boniface Church.

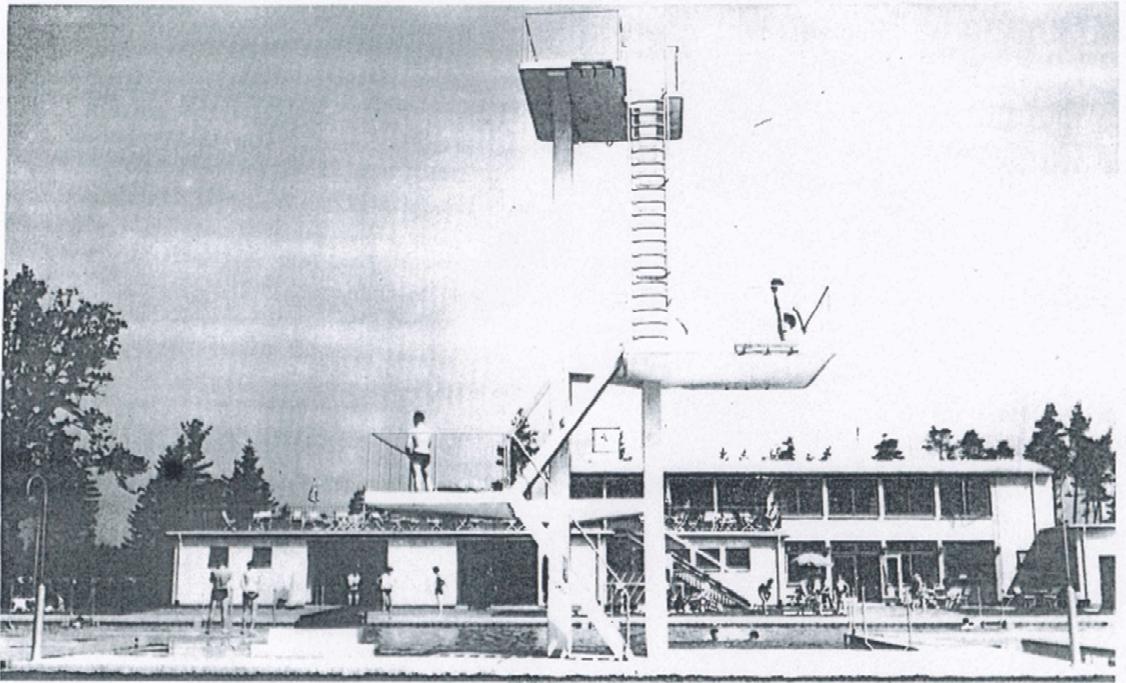


Photo 20.—The Swimming Pool with 10 metre diving board.

APPENDIX B

MAXIMUM POPULATION IN PLANNED ACCOMMODATION—NEW H.Q.

ALLIED ARMY AND AIR FORCES

BRITISH AND ALLIES

Item	Men	Women	Children	Remarks
Married quarters	1,126	1,126	1,689 (at 1½ per family)	
Single officers	374	107		
Single W.O's. and Sgts.	341	112		
Single O.R. male	1,569			} In 22 barracks of 70 men. In 8 barracks of 52 women.
Single O.R. female		416		
Fire station	25			
Hostels	72	72	108	
Haus Hellbach	9			Converted to flats for C.V.W.W., etc.
Haus Heinen		1		Dep. Director S.S.A.F.A., B.A.O.R.
Visitors' mess	15			
Transmitter site (W/T)	26			Personnel for receiver site live in barracks.
Total	3,577	1,834	1,797	Total British and Allies 7,208

GERMAN AND OTHERS

D.E.L. male	504			} In 35 blocks of sergeant type accommodation each for 28.
D.E.L. female		476		
G.S.O.*	700			
M.S.O.*	200			
M.S.O. supers	7			
Domestic help in married quarters		347		Assessed.
N.A.A.F.I. staffs	19	59		
Caretakers' quarters	3	3	5	
Officers' messes resident staff	20	4		
Other messes' resident staff	9			Total German and M.S.O. on site 2,356
Total	1,462	889	5	Total on site 9,564

MARRIED D.E.L. OFF THE SITE

Hardt	225	225	338	
Waldniel	60	60	90	
Rheindahlen	31	31	46	
Total	316	316	474	Total German off the site 1,106
				Grand total 10,670

* NOTE:—G.S.O. German Services Organization
M.S.O. Mixed Services Organization

The German contingent consists of disciplined Units of civilians organized with a small British element for M.T., Artisan or Labour Services.

The Mixed contingent consists of Yugoslav and Polish emigrés used as Guard Companies under British Officers.

APPENDIX C

NOTES ON THE NEW HEADQUARTERS PROJECT

A Main Building

3 storey. Nearly 2,000 offices and stores.
Over-all dimensions approx. 300 × 180 yds.

B Residential Areas

476 O.Rs. married quarters. Types "B" and "C".
650 officers' quarters. Types III, IV, V.
District heating. Fireplace in officers' drawing-room.
Gas cooking. Built-in cupboards in bedrooms.
Family hostels.
Generals' houses acquired, not on the site.

C Community Area

Schools for 720 infants, 5-11 years.
Separate project for secondary school for 400.
3 Churches, N.A.A.F.I. shop. M.I./S.S.A.F.A./Dental centres.
Swimming pool, two cinemas and model room/theatre.
Officers shop and some private shops.

D Barracks

93 "Op. Humane" type living quarters
5 dining halls and cook-houses.
Single Sgts type accommodation for 1,000 German D.E.L.

E Sergeants' Messes

5 "Op. Humane" types.

F Officers' Messes

Standard "Op. Humane" types
"A" Mess (40 members)
H.Q. Mess (40 members)
Visiting Officers' Mess (30 members)
Women's Mess (60 members)
Sigs./R.A.S.C.
4 male officers' messes (60 each)
R.A.F. mixed mess for 120. R.A.F. design.

G Clubs

Officers, Special design by N.A.A.F.I.
Warrant Officers/Sergeants.
Army O.R's. N.A.A.F.I. (based on "Op Humane") for 1,250.
R.A.F. O.R's. N.A.A.F.I. for 750.

H Sports Grounds

Football/hockey	17
Tennis courts	28
Basket ball	2
Cricket tables	5
Squash courts	5

J Roads

All concrete
Main artery 7½ m. 2 side walks.

(J Roads contd.)

Secondary net 6 m. 1 side walk.
Minor net 4½ m. 1 side walk.
Cul-de-sacs 3½ m.

Approx. length all roads is 25 kilometres.
Class "B" street lighting, and lighted signs.

K Water Supply

Found on site by boring. Good quality.
Treated and distributed through own waterworks. The existing temporary supply from Rheindahlen will serve as a standby.

L District Heating and Hot Water

From 3 boiler houses. One covering the married quarters area; a second the area inclusive of and westwards from the main office block; the third covering S.W. extension. The first two will be interconnected to sustain summer load from one boiler house.

M Electricity

Off the grid at 15,000 v., and distributed internally to 13 transformer substations. All cable underground.

N Gas

Off the Duisburg grid from Moenschen-Gladbach. All domestic cooking by gas. (There is no solid fuel used.)

O Sewage Disposal

Water-borne by pipes to a collecting chamber and thence pumped to a joint disposal plant shared with Stadt Moenschen-Gladbach. The joint collecting chamber is located at Genhodder, 800 metres south of the H.Q. site.

P Site Works

Only such trees as have had to be removed for roads, buildings and sports grounds have been cleared. The treatment of the landscape has been decided by a committee.

Q W/T Transmitters and Receivers

Stations are located some distance from the H.Q. There is an Army and a R.A.F. installation at each site.

R S.W. Extension

This is a residential area with the following accommodation:—
241 married quarters. (Included in total at B.)
Primary school for 240 pupils.
1 officers' mess for 11 male (2 storey).
1 officers' mess for 42 mixed (3 storey).
1 W.O. status mess for 100 mixed.
This area has district heating and hot water from its own boiler house.