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# ITC NEWS

- 12 - 2002

**Jurastrasse J2,  
By-pass Sissach, Chienbergtunnel,**  
complexes setting of tasks in geologically heterogeneous conditions



Fig 1 : Hammer heading the east portal. Tunnel heading and loading machine Schaeff type ITC 320

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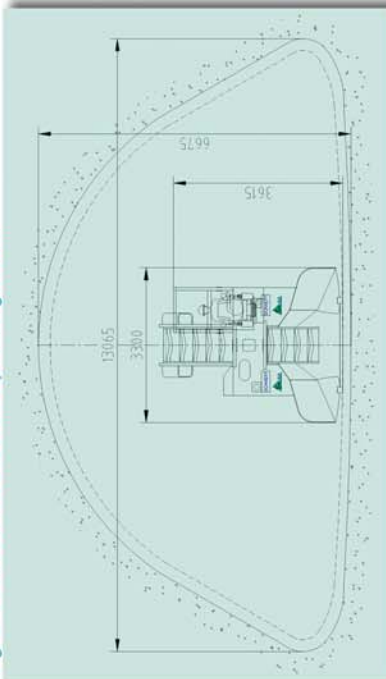
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Fig. 2: Front view ITC 312 in the top heading section



- west transition zone
- excavation east
- east transition zone
- pilot tunnel
- main tunnel section
- ventilation building
- east tunnel
- road construction

Some in the detail:

**Transition zone west and east**

From tunnel meter 760 to 1'110 afterwards to the cut and cover method begins the transition zone west, which is opened over an intermediate attack at the end of the cover.

The transition zone east is between tunnel meters of 2060 and 2200 at the other end of the conventional tunnel to drive. Geology in these zones is described in summary as follows: this section is to be regarded as delicate, since the weathered rock formations almost possess loose rock characteristics. Expressed the broeckelge and coherence less structure might offer stability problems at the working face and within the fighter ranges. A wide excavation might be hardly possible therefore.» The overburden amounts to here between 13 and 37 m whereby the surface is partially built. The tender documents of the owner planned road-heading machines as excavation equipment. After preparatory work for the intermediate attack, the roof pilot tunnel could be started at the end of May 2000.

In the entire cross section weathered clay was found, which shared after few meters the profile with compact not prognosticated, non-weathered rock. This exhibits uniaxial compressive strength around the 25 MN/m<sup>2</sup>. Of the joint ventur selected

**TUNNEL HEADING AND LOADING MACHINE SCHAEFF TYPE ITC 312 H6**

proved thereby as correct solution. On the one hand the soft full clay can be loosened and loaded profile-fairly and quickly, on the other hand the boom equipment with the V32-Montabert-hammer without changing the tools could excavate the hard rock layers and muck it. Besides also the solution with the ITC-tunnelling machine was correct in opposition to the roadheader planned by the owner. The found fat clay would have caused gliungs at the cutter head

Fig. 3: Side view ITC 312 in the top heading cross section

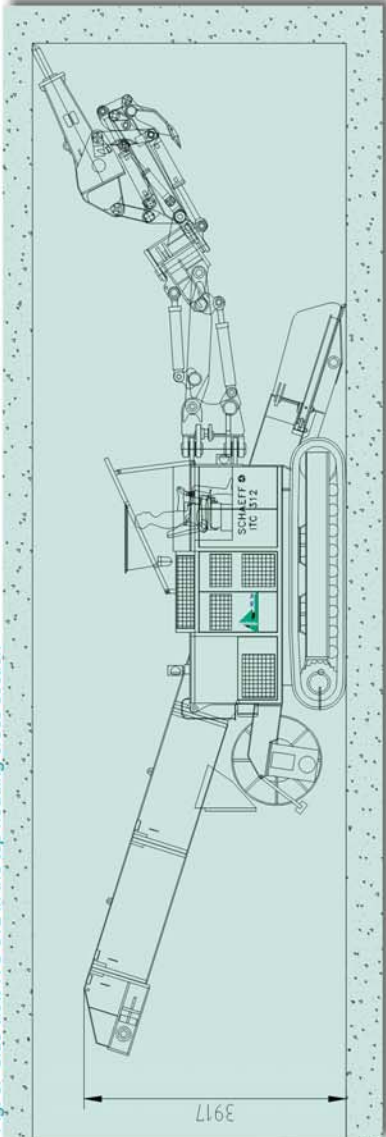
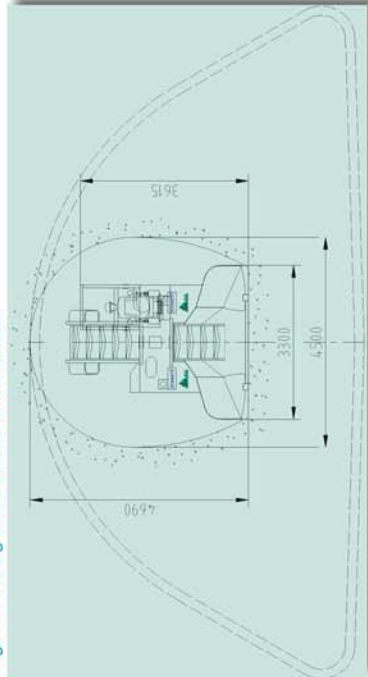


Fig. 4: Pilot lug cross section in the kalotte



and would not have been economical to the dedusting in this small cross section to solve. The evacuation was managed with small dump trucks (Astra 6 m<sup>3</sup>), the wet spraying concrete with a Aliva pump 500 by a spraying robot was applied.

After 120 m heading the rock portion in the profile increased so strongly that had to be changed over to careful heading by blasting. The selected ITC-machine proved also here as ideal loading machine, could be realized without niches nor make use of different mucking solution. The measured vibrations when blasting remained the far under permitted parameters.

**Main tunnel section.**

During the expansion of the top heading of the west transition zones, the excavation of the bench and invert begins. By tunnel meter 1110 to 2060 thereafter the main tunnel section is driven by Drill&Blast. The end 350 m of the long roof pilot tunnel was reached on 30 September 2000. This without having caused damage and with an advance on

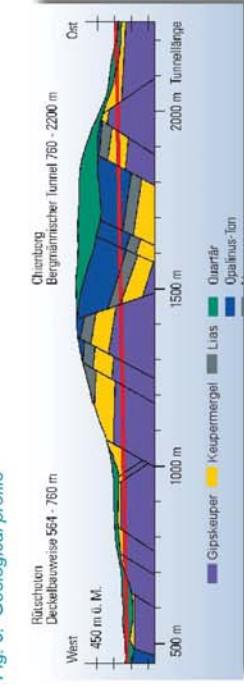
V45. According to H. Peter Baumann, site manager, was this «..the correct decision, the hammer has a fantastic Power... the excavation work goes nearly twice faster...».

Excerpt from the speech by dipl.-Ing. ETH/ SIA L Gruber, group line BATIGROUP Holding AG, CH - Zürich, leader section tunnel & bridges on the occasion of the VDMA conference in the Munich. Bauma 2001.

the schedule of work of some months. At present the expansion of the remaining section is under process. The same machines are used as with the roof pilot tunnel heading.

Situation on 01.01.2003: In the west still 500 m of the top heading were missing, 800 m of the bench and approx. 1000 m of the final lining. In the east the top heading is completed and the bench just begun. For this the joint venture already explains to be ready to test and use again the tunnel heading and loading machine Schaeff type ITC 320 with the heavy rock breaker IR Montabert

Fig. 6: Geological profile



Dump concept, B: Roof pilot tunnel, C: TBM heading direction).

**Special suggestions (a. o.)**

... in the transition zones the tender planned as the first processing step to excavate sidewalls tunnels and than expand these to the top heading cross-section. With the special suggestion however first a roof pilot tunnel is headed, which is extended thereafter on top heading. Apart from technical advantages, like symmetrical excavation profile, early development and securing of the area roof pilot tunnel, reaching a uniform position of the pilot tunnel on the whole tunnel length, reduction of the construction period...

**Geology**

The tunnels is driven in the geologically very delicate valley slope of the Talejuras, which is covered by slips, sagging, pendant debris and decomposition loams and in the core is characterized by non-weathered Gipskeuper, which involves strong swelling pressures with inflows of water. This Keuper changes itself with main trough stone (Dogger) and clay, tonus towards limes and dolomite rocks off, whereby the limestone lead by their good water permeability to the fact that on ton and clay on different heights sources are to be found. This impressive geology is coined/shaped additionally by strong tectonic distortions, which were caused in the course of sinking the Rhine ditch between Vogesen and Black Forest.

**Construction units**

The project can be subdivided in following building phases and/or construction units:  
- cut and cover method

Fig. 5: Layout plan

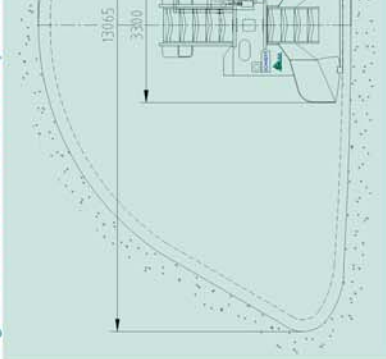
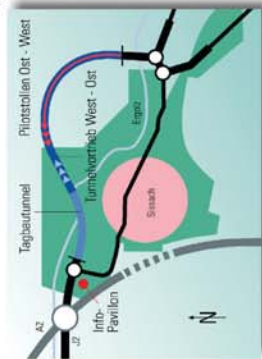


Fig. 5: Layout plan



TUNNEL HEADING and LOADING MACHINE SCHAEFF Type ITC 312 H6



Fig. 7: At bench excavation in the West



Fig. 8: At bench excavation in the East



Fig. 9: Loading onto 25 t articulated dump truck



Fig. 10: At bench excavation in the West



Fig. 11: At the vault extension in the West



Fig. 12: At the vault extension in the West



Fig. 13: Expansion of the pilot tunnel in the West