Design of Steel Swimming Pools with Respect to Maintenance, Rectification and Service Live

Conception de piscines métalliques, tenant compte de l'entretien, des réparations et de la durée de service

Entwurf von Stahlschwimmbädern, unter Berücksichtigung des Unterhaltes, der Reparaturen und der Nutzungsdauer

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INTRODUCTION

At present about seven steel swimming pools are being used for sport-swimming as well as for recreation purpose in Czechoslovakia. Another eleven pools are under construction.The main reason of the increasing use of structural steel is related first of all to the watertightness compared to the traditional concrete pools,to the short time of erection,and to the benefit of mass workshop-fabrication of large structural components.

The satisfactory utilization of steel pools depends on the long-term maintenance and some other aspects,which have to be considered in the design period.The arrangement of the structural system assuring the permanent watertightness,replacement of some parts of the pool and the surface protection are mentioned next in this paper.

ADJUSTABLE POOL SYSTEM

In order to reach the permanent and perfect watertightness of the pool even in the case of large irregular settelments of foundations a special system had been developed based on deformability prineip of the steel pool components - Ref./1,2/.The idea is shown on the Fig.1 and Fig.2.The deformable steel components in pool-walls allow rotation over internal wall supports without loosing watertightness.Similarly the structural system of the bottom allows irregular vertical deformations - the design may be based on elastic or plastic analysis.If required the empty pool is easy lifted into the correct position using hydraulic jacks.

The system permits to build even large swimming pools /e.g. 50 x 21 m/ in areas of mining subsidence fully protected against time-depending deformations of area surface due to mining activities.

The adjustable pool system was applied in the design of several steel pools of 25m and 50m length - Ref./3,4/.In Fig.3 upto Fig.7

the construction of swimming centre designated MV2 is shown.The size of the steel pool is 25 x 12,5 m and depth 1,1 upto 3,6 m.The total number of MV2 pools completed in different towns in ČSSR will reach soon ten /5/. A pool of the size 50 x 21 m is under construction in Prague.

As shown in Fig.2 the pool may be supported on steel columns, small concrete blocks or planar support of the steel bottom may be used.

In Fig.4 the deformable steel wall component is shown.The elasto-plastic design of this component is similar to the design of steel compenzation units in steel pipe-lines.

INTERCHANGEABILITY OF SOME COMPONENTS

In case of planar support of steel bottom of a big pool /e.g. 50 x 21 x 1,8 m in Prague-Vršovice/Ref.4/ – Fig.2 / several alternatives of the lower-surface protection of steel plates may be considered.With respect to the service life of the pool,cost ofthe protection and maintenance the attention was focused on the interchangeability of bottom steel plates cca 5 mm thick after period of about 10–15 years.Considering planned maintenance during the lifetime the designer has to compare the cost of the necessairy protection of the lower surface and the cost of replacement of some parts of the bottom if protection was omitted.In the case of the pool in Prague the corrosion effect was estimated,simple protection applied and the replacement of the bottom plate is expected in about 10–15 years.This solution corresponds to the estimated minimum of the sum of construction and maintenance costs.

The interchange just of small components for steel pool MV2 -Fig.3 upto 7.was considered in the design.

SURFACE PROTECTION

Several surface protection technics has been used in ČSSR and other countries with different results.It may be mentioned that the steel pool in Essen – BRD,built 60 years ago,is still being used, however the maintenance costs/repainting/are not negligable.

The steel pools completed in ČSSR are fire-zinced and painted. Fig.7 shows the last phase of painting of pool MV2 before the water would be let in.

The experiences accumulated in about three years proved that the design of the pool must be developed with respect to the maintenance of the internal surface of the pool – simple details would reduce the mechanical initiation of of the coating defects a corrosion especially at the edge of the pool.

CONCLUSIONS

The successful design of steel swimming pools depends on the evaluation of the maintenance criteria.The structural system may allow rectification and interchangeability of some components in order to reduce the total costs.The current surface protection systems are not fully satisfactory.

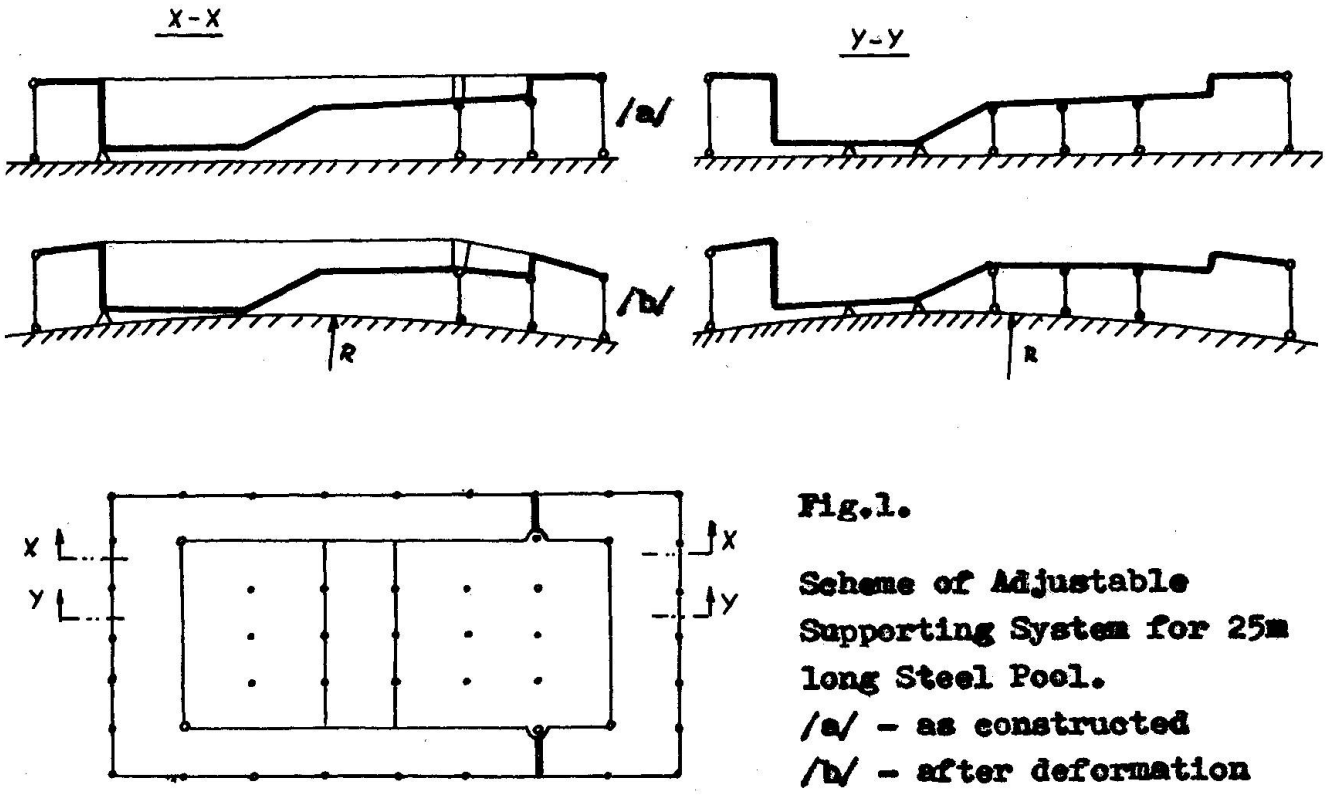

Fig.1.

Scheme of Adjustable Supporting System for 25m long Steel Pool.
/a/ - as constructed
/b/ - after deformation

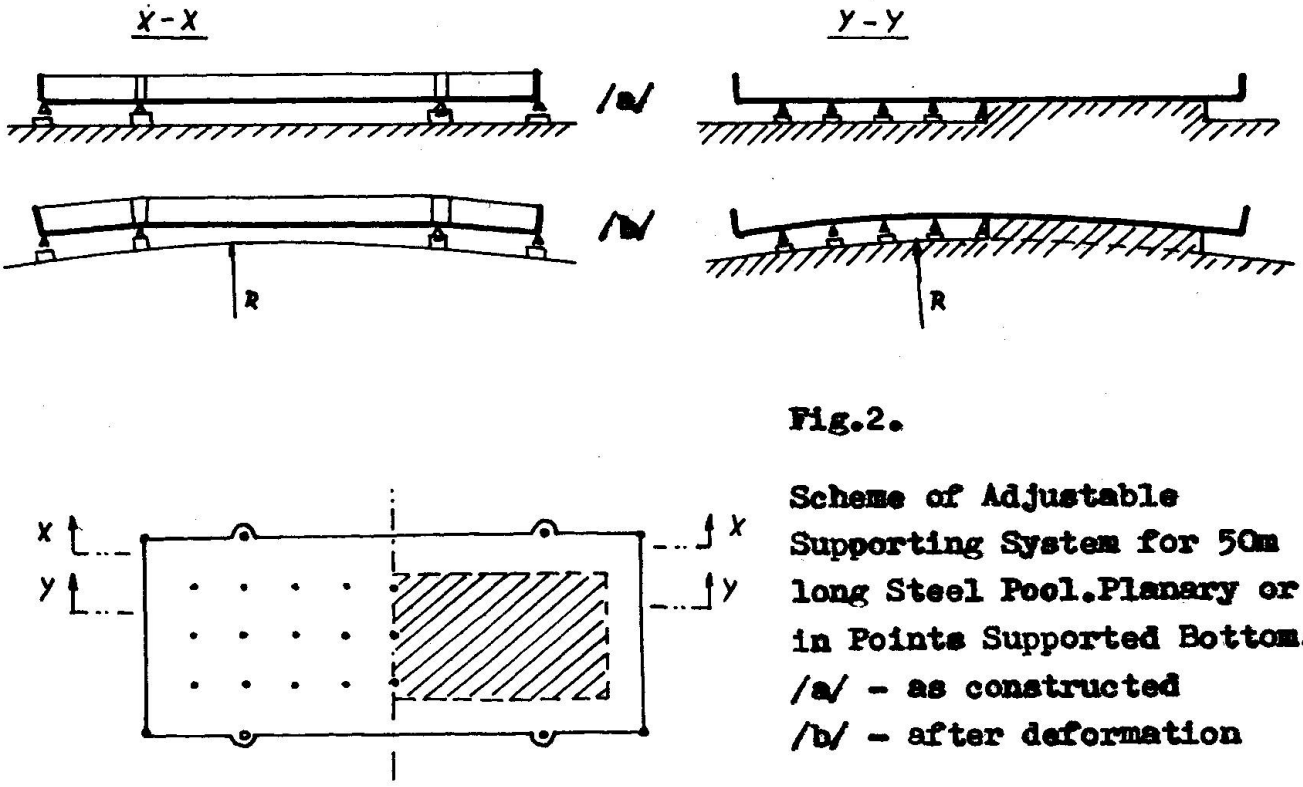

Fig.2.

Scheme of Adjustable Supporting System for 50m long Steel Pool.Planary or in Points Supported Bottom.
/a/ - as constructed
/b/ - after deformation

Fig.3.

Erection of the main structure of pool-bottom. The columns are adjustable in vertical direction.

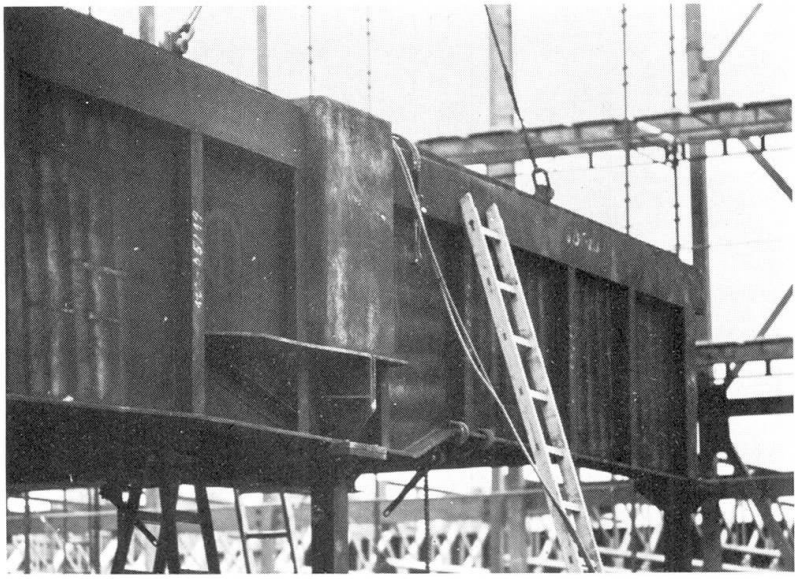

Fig.4.

"Compensation" -adjustable component in pool-wall, allowing rotation of wall-unit without losing watertightness.

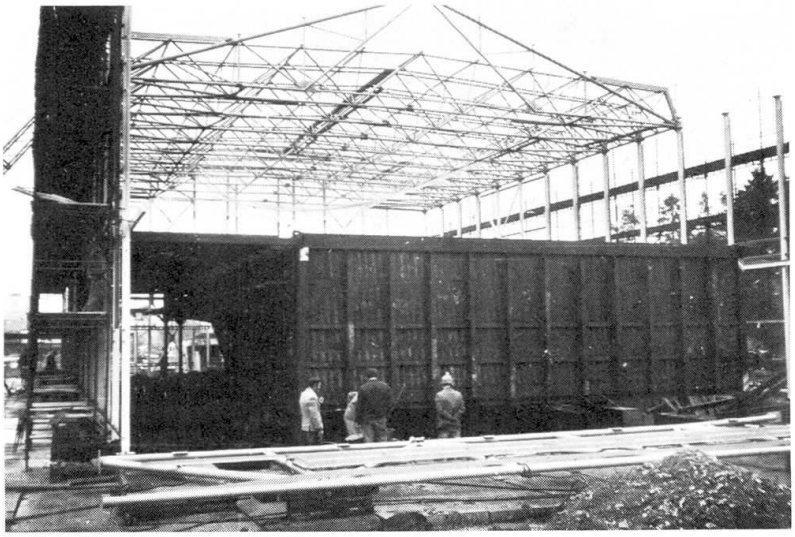

Fig.5.

Erection of steel walk-ways around the pool and of the steel structure of the building.

Fig.6. Completed Steel Pool 25m

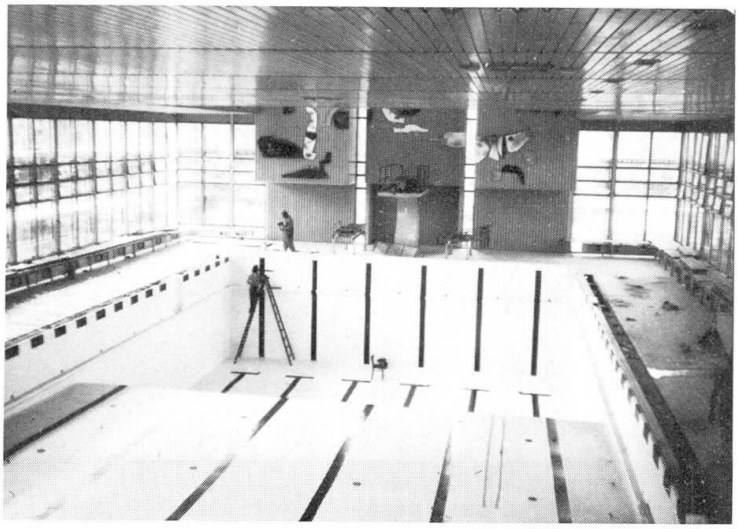

Fig.7.

Interrior of Swimming Centre MV2 - Surface protection of the pool /painting being completed/.

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SUMMARY

Steel swimming pools are being increasingly used in CSSR. The mass shop fabrication of components, perfect watertightness, short erection-period are the main advantage. The design includes maintenance requirements - especially the surface protection, rectification of the pool and replacement of some structural steel parts of the pool.

RESUME

Les piscines métalliques sont de plus en plus employées en Tchécoslovaquie. La fabrication en série d'éléments, l'étanchéité parfaite, la courte durée d'exécution en sont les principaux avantages. Le projet doit tenir compte des conditions d'entretien, en particulier la protection anti-rouille, les réparations, et le remplacement d'éléments de la structure.

ZUSAMMENFASSUNG

Stahlschwimmbäder werden in der Tschechoslowakei immer mehr benützt. Die Serienfertigstellung von Elementen, die perfekte Wasserdichtigkeit, die kurze Ausführungszeit, sind die Hauptvorteile. Das Projekt muss die Unterhaltsbedingungen berücksichtigen, besonders das Schützen der Fläche, die Reparaturen und das Ersetzen von Tragwerkelementen.