Hamco Dinslaken Bausysteme GmbH

Scientific and technical investigations, which significantly influenced the development of the MultiPlate construction method supported and executed by Hamco Dinslaken Bausysteme GmbH and Armco Dinslaken.

1960

Dynamic long-term load carrying test of a railway underpass made of MultiPlate prefab steel construction products attended by Prof. Dr.-Ing. K. Klöppel, Technical University Darmstadt (Germany)

Corrugation	152,40mm x 50,80mm
Profile	Circular profile
Plate thickness	4,00mm
Diametre	2,29m
Remark	3 millions load cycles with 30t vibration stress confirm the fatigue strength of MultiPlate constructions.

1963

Load carrying test of a MultiPlate pipe arch attended by Prof. Dr.-Ing. K. Klöppel and Dr.-Ing. D. Glock, Technical University Darmstadt (Germany)

Corrugation	152,40mm x 50,80mm
Profile	Pipe arch
Plate thickness	4,75mm
Span	6,30m
Rise	4,03m
Remark	The test was stopped with a load of 1.080t made by steel slabs. The stability of the steel slab tower became too dangerous. The analysis result of the extension and deformation measurements was without any objections in statical respect.

1970

Publication of the calculation method Klöppel/Glock

Theoretical and experimental investigations on the load carrying capacity of flexible underground pipes, H.10, Institut für Statik und Stahlbau, Technical University Darmstadt (Germany)

The ultimate loads determined in this paper and which are the basis for the dimensioning of flexible pipes are:

- Bending failure during backfilling
- Snap-through / buckling of pipe wall
- Failure of bolt connection
- Soil failure under small height of cover

The dimensioning regulations for roads and railways ARS 01/82 and DS 804 (RBR) are based on these ultimate loads.

1973

Preparation of the calculation method Klöppel/Glock for SuperSpan structures by Dr.-Ing. D. Glock

The special SuperSpan construction with concrete thrust beams requires a modification of the Klöppel/Glock method of calculation. As a result, again, the above ultimate loads were determined. With this investigation the largest MultiPlate structure at that time could be built in 1985 in the Netherlands with two pipes placed side by side and a span width of 16,00m each.

1974 – 1976

Reports of MultiPlate optimization by Dr.-Ing. D. Glock and Dipl.-Ing. C. af Sillen

The MultiPlate corrugation 152,4mm x 50,8mm used at this that time was analysed and the new corrugation 200mm x 55mm, improved with regard to ultimate load and steel consumption, was developed.

1974

Report of a MultiPlate sandwich construction for circular arches with span widths higher than 14,00m by Dr.-Ing. D. Glock

A sandwich structure made of two MultiPlate shells with concrete fill was developed for large arch structures.

1974

Statical calculation of the cut ends of MultiPlate structures with and without stiffenings by Dr.-Ing. D. Glock

A static investigation was necessary for the cut ends of large structures, which are susceptible to deformations and, at first, was made by means of the finite element method for the corrugated shell. Based on these results a load carrying calculation was developed by means of which the ultimate load of the cut ends with and without stiffening can be calculated.

1974

Gauge table for HelCor pipes by Dipl.-Ing. C. Sillen

A gauge table for quick dimensioning of HelCor pipes was made up based on the calculation method Klöppel/Glock.

1974

Dimensioning of MultiPlate pipes below airport areas by Dr.-Ing. D. Glock

The extremely high aircraft loads (up to 500 tons) with small height of fill of the pipes necessitate to follow up the load distribution through the concrete pavement of the airport runway and the determination of the pipe loading under consideration of the elasticity of flexible pipes.

1974

Dimensioning of MultiPlate silos by Dr.-Ing. D. Glock

A concept for the dimensioning of silos for gravel and liquids made of MultiPlate plates was made. A calculation procedure for the anisotropic, corrugated cylindric shell had to be developed, specifically for the wind loads of large silo constructions. Furthermore, investigations were made as regards the preconditions for large silos without longitudinal stiffeners.

1975

Summary of calculation method Klöppel/Glock

The investigations made by Klöppel/Glock were presented in several lectures. The manuscript is published and allows for a quick review of the calculation method Klöppel/Glock.

Publication and lecture

Institute for Scientific Research for Roads and Traffic, Paper 3/1979
Congress of Working Group 'Earthworks and Soil Engineering' of 29./30.05.1979 in Koblenz, Germany

108/Disclosure of Swiss Society for Soil and Rock Mechanics
Congress 06.05.1983 in Bern, Switzerland

1975

Load reduction of embedded, flexible pipes below large height of covers by Dr-Ing. D. Glock and Wiss. Rat. Dipl.-Ing. H. Glock

Publication: Professional journal 'Die Bautechnik' 3/1978

This paper deals with the load reduction of flexible pipes under high fill on the basis of the theory of elasticity and the theory of plastic zones of the plate with hole and inserted ring. It shows that the load reduction is primarily depending on the stiffness ratio Ea/EF – with radius a, modulus of elasticity of the soil E, compressive stiffness of the ring EF – whereas the yieldingness of the connection is considered in EF.

1976

MultiPlate retaining wall by Dr.-Ing. D. Glock

Design of retaining wall made of curved MultiPlate plates and beam profiles, which are anchored vertically backwards.

1976

Defelection and bending stress of MultiPlate structures
by Dr.-Ing. D. Glock and Dipl.-Ing. C. af Sillen

Defelections are of secondary importance in the calculation method Klöppel/Glock. However, for large structures – in particular with backfilling – follow up is recommendable. Here, an evaluation of the profile calculations with regard to deflection and bending moments was made and depicted in diagrams.

1976

Limitation of the loading of pipe arches caused by max. corner pressure
by Dr.-Ing. D. Glock

Extremely flat pipe arches require a determination of the max. load, where on account of soil failure the corner areas move sideways and this results in bulging of the profile bottom. The chosen computation method in accordance with the theory of plasticity is included in some of the re-gulations for flexible pipes.

1980

MultiPlate seam strength tests (compression tests, corrugation 200mm x 55mm), Technical University Darmstadt (Germany)

For the new corrugation 200mm x 55mm the ultimate loads for the bolt connection had to be determined in compression tests.

1982

Addition to the tests of 1980

1982

The reasonable alternative: Noise barrier tunnel by Prof. Dr.-Ing U. Smoltczyk, J. Pickert and Dr.-Ing. D. Glock

Publication
Geotechnik 1982/1
Journal for soil mechanics, rock mechanics, soil engieering, engineering geology

1986

MultiPlate seam strength tests (tensile tests, corrugation 200mm x 55mm), Technical University Darmstadt (Germany)

As the ultimate load of MultiPlate bolt connections differ with compression and tensile stress tensile tests had to be carried out for silo constructions.

1987

Additional MultiPlate seam strength tests (compression tests, corrugation 200mm x 55mm), Technical University Darmstadt (Germany)

1990

MultiPlate seam strength tests (compression tests, corrugation 152,40mm x 32mm), Technical University Darmstadt (Germany)

For the dimensioning of the new MultiPlate corrugation compression tests had to be carried out with the chosen bolt connection. It must be mentioned here, that all test bodies had to have special dimensions to meet the real loading conditions.

1991

Additional MultiPlate seam strength tests (compression and tensile tests, corrugation 200mm x 55mm), Technical University Darmstadt (Germany)

1993

Patent for the method of bridge reinforcement with special MultiPlate lining in cooperation with Prof. Dr.-Ing. J. Risse, University Rostock (Germany)

The method developed together with Prof. Dr.-Ing. Risse (construction and computing method) allows for a high-quality bridge reconstruction with MultiPlate and concrete filling.

1999

MultiPlate special bolt connection - MultiPlate seam strength tests (compression tests, corrugation 200mm x 55mm), Technical University Darmstadt (Germany)

Extreme loading of a planned, large MultiPlate circular arch (span 7,50m) and great height of fill (h=30,00m) required the use of high strength steel with special bolts. The compression test at the Technical University Darmstadt (Germany) showed with the same plate thickness a strength of the bolt connection which is 30% higher than the normal bolt connection.

2002

MultiPlate seam strength tests (compression tests, corrugation 152,40mm x 22mm), Technical University Darmstadt (Germany)

For the new corrugation again a series of compression tests were necessary for the dimensioning.

2004

Failure / buckling of the elastically bedded circular ring under concentrated load

Now and then this load occurs, e.g. when fastening a ventilation system or with high radial load acting on low height of fill. The failure loads ascertained in accordance with the energy method can be taken from a diagram. A closed solution is available for rigid bedding.