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## No. 1 — K. Kasper and His Sewerage Rule

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### Search for Kasper

In the technical magazine *Public Works*, issue of 12 December 1942, an article was published by Ir. G.S. Bos, an engineer for the “Department of Public Works” in Enschede. The article described how to calculate sewage culverts, and referred to a special sewerage slide rule, designed by K. Kasper, a technician at the same Department of Public Works in Enschede. The article included an offer that other technicians could order the slide rule, in kit form, from the designer.

### K. Kasper at age 85



I have two such Kasper slide rules in my collection, both of different construction, but with the same scales. Having read about the designer, I was intrigued to learn what had prompted the design and manufacture of my two slide rules.

The former address of Kasper was included in the article – he then lived in Enschede. I turned to the phone book for Enschede, looking for “K. Kasper”, in the hope I would find one of his relatives, a son(s) or a grandson(s), who might know about their ancestor from the forties. From them I might learn more about the background of its design. I found ten Kaspers, but only one with the initial K. Perhaps his son? I wrote to him explaining what I was looking for, and asked if he happened to have

known the K. Kasper I was searching for.

The next day I got a phone call in response to my letter. Replying to my question, “what is your relationship to the K. Kasper I am looking for”, he said, “I am he”! You can imagine my astonishment. I had assumed K. Kasper from the forties would, by now, have passed away.

Three days after my call, I visited the 85-year old Mr. Kasper. He told me much about the early forties, and about his activities leading to the design of his sewerage slide rule.

K. Kasper was born December 5th, 1911, in Winsum, in the province of Groningen, the Netherlands. After primary school, he followed a self-study course for carpenters, and later for building surveyor. He worked as draftsman-surveyor for several architects, gaining much experience and insight into the building trade.

### Municipal Works, Enschede

Looking for a better job, and helped by his uncle who was technical specialist at the Municipal Works in Utrecht, he was appointed to the Department of Civil Works at the Municipal Works, Enschede. His first assignment was to recalculate the existing sewage system and design a new system taking into account city development and expansion plans. His superior was Ir. G.S. Bos, the aforementioned author of the article, “Public Works”.

### Calculating a sewerage system

The only information he had at his disposal to calculate sewage systems was a book describing sewage systems by tables, diagrams, and nomograms. Kasper thought this was a very roundabout and time-consuming method of calculation, and proposed to his superior re-arranging them in the form of a slide rule. Bos did not believe it was possible to express the sewage formulae in a logarithmic way and so, initially, rejected the idea.

### Designing a sewerage slide rule

Kasper persevered, designing first a circular slide rule, which did not work satisfactorily before switching over to a straight slide rule. He managed to design a method of calculating sewage culverts based on slide rule scales.

He drew the scales by hand to a one-meter scale. A photographer made professional prints and reduced these in size to 40 cm.

### Official approval

To get official status for his slide rule as an approved calculation aid, he appealed to R.I.Z.A. (Governmental Institute for Purification of Effluent water). Approval came on June 27, 1941, and stated:

“The undersigned Joh. Jac. Hopmans, engineer at the R.I.Z.A., the Hague, declares herewith, that he has taken cognizance of a slide rule to calculate sewage culverts, water velocities, slope and filling levels of sewage

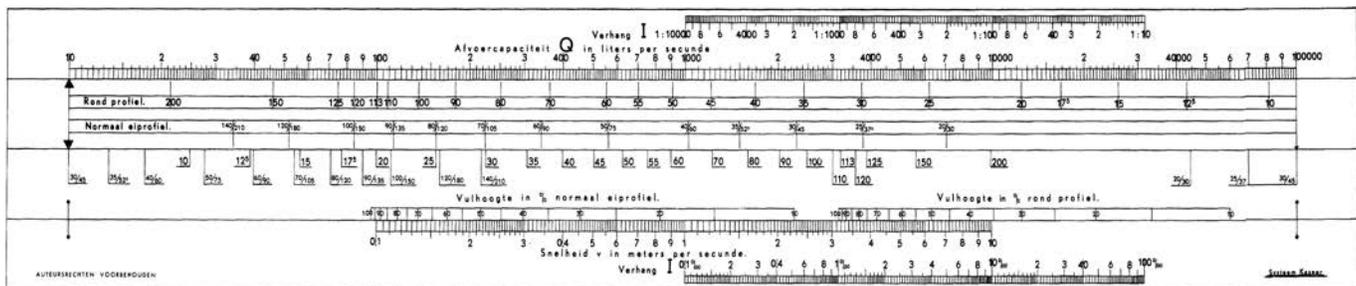
pipes, according to the Kasper System and the accompanying explanation. In the opinion of the undersigned, the Kasper System is based on theoretically correct fundamentals and a slide rule, based on this design, will be of great importance for calculating sewage systems.

A particular advantage of this slide rule is the possibility of calculating in a swift and simple way the sewage levels in culverts at a fixed outlet and slope.” (undersigned J.J. Hopmans)

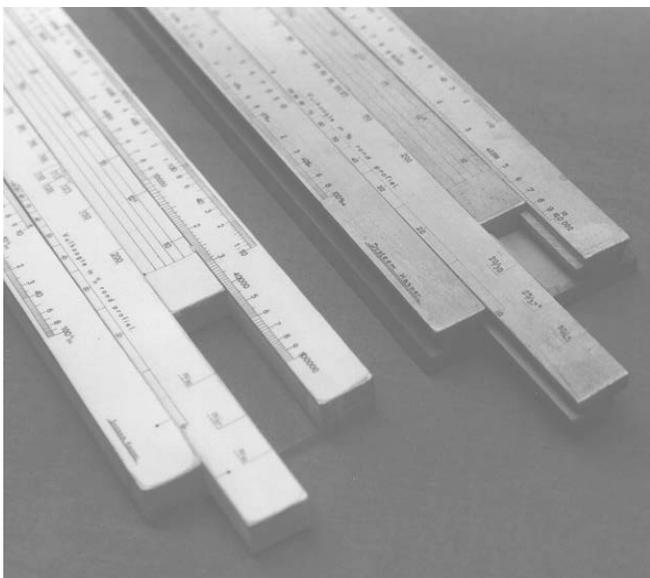
This was what Kasper sought to attain – official recognition of his design. Afterwards he looked for possibilities to introduce his slide rule into other departments of public works and recover some of his investment money. He started four different initiatives.

#### Bureau for inventors - 1941

### The Kasper Slide Rule



### Two Kasper Rules



In the beginning the kit cost 5 guilders. For customers wanting a ready-made slide rule, Kasper offered to arrange for a carpenter to make it for 18 guilders. A 1949 order from the Municipal Works of Venlo has been preserved. Also Heidemij, one of the biggest Dutch con-

tractors and advisers in city planning, placed an order. Later the price rose to 40 guilders for the kits. Private sales totaled no more than about 30, making existing Kasper slide rules a rarity.

### Private production

From newspapers he learned that inventors with insufficient means could get financial aid in applying for patents on inventions. The outcome of this effort was a 100-guilder donation from the Enschede city council in May, 1942.

Kasper put his slide rule on sale in kit form. It consisted of: a plastic scale bearer with scales photographed on it by a photo-setting firm, a transparent cursor film and a manual on how to construct and use the slide rule. He did not make the slide rules himself. Buyers had to do all the construction work themselves. The body could be made of any desired material, wood, perspex, or something else. Having prepared a body and slide, the scale print could be glued on. A runner frame, again self-made, was completed by adding the supplied runner film.

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### Aristo-Hamburg

In 1962, Kasper tried to get the firm Aristo, in Hamburg, to manufacture his slide rule. The resulting correspondence still exists:

- May 17, 1962: Kasper wrote to Aristo, sounding out potential interest.

- July 19, 1962: Aristo replied that they had previously been involved in designing and producing sewerage slide rules but given their peculiarities, had always found it difficult to combine all the requirements in a slide rule. Therefore they were very interested in Kasper's design, and under strict confidentiality would like to see it.

- Sept. 10, 1962: Kasper sent a slide rule and a German translation of the manual.

- Nov. 16, 1962: Aristo replied that the Kasper design is similar to their Kanalisations Rechenstab 918, System Vikari. This has one slide, compared with the two slides of Kasper's slide rule, but the same calculations can be performed. Because the demand for sewerage slide rules was very low, Aristo stopped production. If demand increases in the future, Aristo will use existing manufac-

turing machines to produce the model 918, instead of starting a new type based on the Kasper System. This effectively put an end to Aristo using Kasper's design.

(Remark: In August 1988, I met Mr. Hans Dennert of Aristo for the first time at his home in Hamburg. During my visit he showed me an Aristo Kanalisations Rechenstab 918, System Vikari. He told me it had been a very special slide rule for a very particular technical specialty, and because of lack of interest, only a few had ever been manufactured. This remark ties in with the Nov. 16, 1962 answer given to Kasper.)

### Ahrend

Ahrend is an office equipment supplier in the Netherlands. They do not manufacture, but resell products, partly under the Ahrend name. Kasper approached Ahrend as an outlet for his slide rule, but they refused to pay a him a royalty, and this avenue also came to nothing.

### Good calculation aid

On balance, the conclusion must be that the sewage slide rule, "System Kasper", was a good time-saving calculation aid that, after some training, was straightforward to use. The low sales figures are more a reflection that these kinds of calculations, compared to others like reinforced concrete etc., were rarely carried out. This was not only the case in the Netherlands but also in other countries, as shown by the letters from Aristo.

### Different construction designs

It appears the people who ordered the kits chose many ways to construct them, a fact clearly shown by the two different models of Kasper slide rules in my collection: one made of wood, and the other made of perspex.

### Formulas used

Kasper based his design on the so-called small formula by Kutter. He says in his manual:

$$v = \frac{100\sqrt{R}}{m + \sqrt{R}} \cdot \sqrt{RI}$$

where:

- $v$  = velocity of the water in meter/sec
- $R$  = hydraulic radius in meters
- $I$  = slope
- $m$  = a coefficient; usually 0.35 was used

and further:

$$F_v = \beta_p \cdot F_p$$

$$Q = F_p \cdot v = \frac{F_v \cdot v}{\beta_p}$$

$$F_p = \text{culvert wet cross section filled to } p\% \text{ level}$$

$$F_v = \text{culvert wet cross section, totally filled}$$

$$Q = \text{outlet in liters/sec}$$

$$d = \text{culvert diameter in meters}$$

$$p = \text{filling level as } \% \text{ of the height of the culvert}$$

### Slide rule description

He describes his slide rule as consisting of:

- a) a fixed upper part with scales for I and Q.
- b) two separate slides, the upper slide with scales for circular and egg-shaped conduits. On top of the lower slide are diameters and profile numbers corresponding to circular and egg-shaped profiles; and on the bottom of the lower slide, a scale for the filling levels of both circular and egg-shaped conduits.
- c) the lower body, a v-scale
- d) a wide cursor with an index line, running over the I-scale and two filling level scales, one running over the scale of circular shaped conduits and the other running over the scale of the egg-shaped conduits on the upper slide.

### Adjustment and reading

Kasper says: It is possible, after having adjusted the left index line on the upper slide at the outlet quantity Q, and having adjusted the index line of the cursor on the slope, without other adjustments, to read, for all available circular and egg-shaped conduits, the level at which they will flow. Included is the reading with a 100% fill level. Having chosen a special profile with a special filling level percentage, on the v-scale the velocity can be read under the filling level line on the applicable scale on the lower slide after adjusting the index line of this profile on the lower slide with the left index line on the upper slide.

### Theoretical analysis

In his manual Kasper gives a theoretical analysis of the formulae and the derived scales, and particular attention is given to the layout of the logarithmic scale configuration. He also explains in which cases he used simplifications in the theoretical analysis, and what consequences this has when reading the scales.

### End of career

After working for many years for the Department of Roads and Hydraulics, Kasper became a manager in the Department of Buildings and Building Supervision. He retired at the age of 65, after two years of sick leave.

### Conclusion

When we met, Mr. Kasper was a lively, hale and hearty gentleman of 85, who recounted with humor and pleasure his former activities. It was a great pleasure for me to have made his acquaintance, and to record an interesting part of Dutch slide rule history.