

# Obituary

## Theo van Robbroeck

1 November 1931 - 17 January 2021

### Water Engineer Extraordinaire



*Theo van Robbroeck*

It was with great sadness that we learnt that Theo van Robbroeck had succumbed to Covid-19 in the early hours of 17 January 2021. He was absolutely shattered by his wife Irma's passing away, also due to Covid-19, on 6 January 2021 and probably had no fight left. Theo van Robbroeck deserves to be remembered for the major role he played in the planning, development and management of the water resources of South (and Southern) Africa over a career of 40 years.

The information sources for this obituary are listed at the end of the document. An overview of Theo's water engineering accomplishments is first given followed by further detail which has been grouped in various specific phases of his illustrious career. The reader is referred to the list of references for greater detail.

#### **Overview**

In reviewing the extensive documentation listed in the Sources, certain major personal attributes that Theo possessed come to the fore which in combination led to an outstanding career in water engineering. Theo clearly had a very high intelligence level and was capable of solving complex problems. He had an enquiring mind and was always keen to learn new skills. Coming originally from Europe, he was already skilled in various languages which he expanded over the years to become a most effective international communicator. A strong thread of innovation runs throughout his career in whatever task he was undertaking. He was capable of assimilating knowledge from other disciplines and persons and applying these to his particular issue. Theo had above all a charming personality which engendered a great team spirit within his sphere of activities. He always took great pains to acknowledge the contributions and support of others. This personality trait was a tremendous

advantage in his important role as a water diplomat and in international circles in the International Commission on Large Dams (ICOLD). The culmination of his career was the planning and implementation of the Lesotho Highlands Water Project where he played a pivotal role. This international mega-water project benefits both Lesotho and South Africa in various ways and required a highly complex Treaty to negotiate during very strained political times. Throughout this period, Theo was supported by his charming wife Irma, who was also a wonderful ambassador for South Africa at the various international events. Theo van Robbroeck published extensively in addition to giving various talks and presentations.

A very good summary of Theo's contributions to water management is given in the citation of the AD Lewis Gold Medallion presented to him in 1991 when he left the Department of Water Affairs on promotion to become the Director General of the Department of Public Works. The citation reads:

*Dedicated with sincere gratitude to Mr Theo van Robbroeck for the considerable contribution rendered by him towards the advancement of the water engineering profession in South Africa and of the image of the Department of Water Affairs and Forestry by means of:*

- *The planning of resourceful water transfer schemes;*
- *The development of a national water management policy;*
- *The leading role played by him in national as well as international professional associations;*
- *His role as a "water diplomat";*
- *His diligence, perseverance and vision that gave form to the Lesotho Highlands Water Project.*

Theo received a number of awards over his career including an honorary doctorate in engineering from his *alma mater*, the University of Stellenbosch in 1994. Theo has left behind a wonderful legacy for South Africa and the international water engineering fraternity of a highly dedicated and innovative person who worked for the good of humanity in providing an assured supply of water for all.



***Theo van Robbroeck greatly enjoyed reminiscing with former colleagues: October 2019***



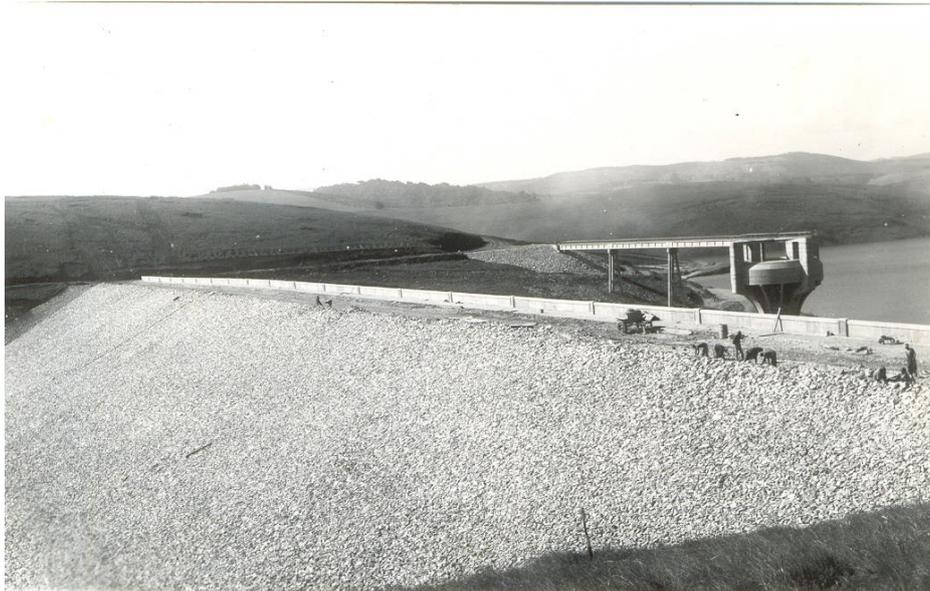
*Irma van Robbroeck chatting with Janet Roberts in 2019*

### **Early years and training**

Theo was born on 1 November 1931, Terhagen, Belgium. His parents decided to immigrate to South Africa in 1952 and Theo decided to study civil engineering at the University of Stellenbosch. Theo recalls that when his father visited South Africa from Belgium in 1951 to investigate possible immigration, he brought back some pamphlets and literature about the country. In one of these, it said that water would be the ultimate constraint for its development. This had a major influence on his decision to study civil engineering! How fortunate we are! The engineering studies were completed in 1956.

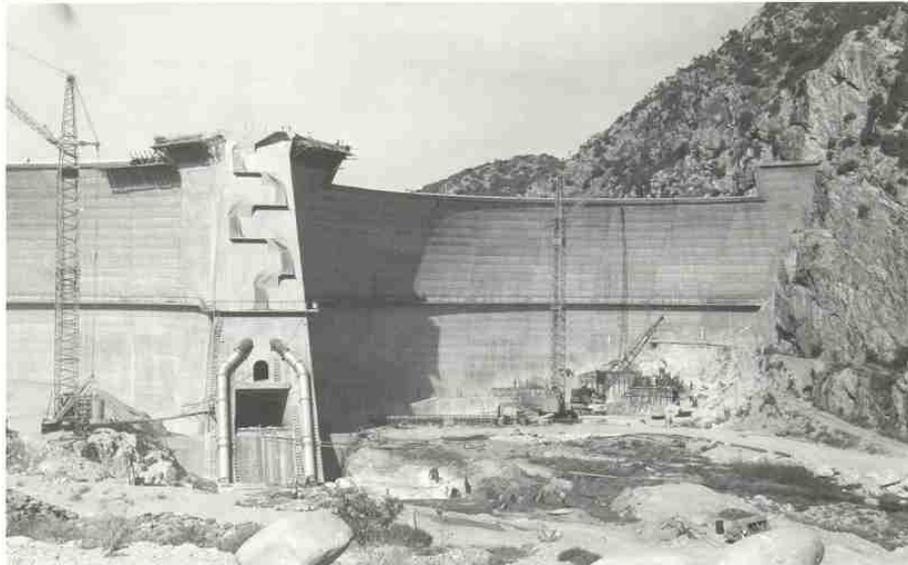
### **Early engineering years in Water Affairs**

Theo joined the then Department of Water Affairs (DWA) in January 1957 on contract as he still had immigrant status. Water Affairs had at that time a very well structured training programme for engineers and he was first exposed to survey work, then called reconnaissance. In 1958 he was transferred to the Ebenezer Dam near Tzaneen as the Assistant Resident Engineer. Many names of well-known DWA colleagues are mentioned in Theo's "Memories" which highlights his "people-skills". During this period Theo married his first wife and two daughters (Hilde and Ria) were born there.



*Ebenezer Dam with its morning glory spillway*

When the works were completed in the beginning of 1960, he was transferred to the construction site of the Stompdrift Dam. The Stompdrift Dam is situated on the Olifants River. The purpose of the dam was to stabilise the flow of the river for the benefit of downstream irrigation. The dam consists of three concrete arches or domes as shown in the photograph below. The van Robbroeck's third daughter, Lize, was born during this construction time.



**Portion of Stompdrift Dam**

All the setting out was initially done by him, including the calculations. Setting out the most complicated shape of the domes and their intersections with the buttresses was a major problem because of the severe overhang of the arches. Points could thus not be marked on a previously cast lift. The shape, as determined by the model tests, and expressed mathematically was defined as a series of ellipses with continuously changing major and minor axes. The joints are vertical parabolas, while the transition from ellipse to the straight lines of the buttresses was circular. All of these complex calculations were hand-calculated with an electric calculator as no computer was available at that time!

T.P.C. VAN ROBBROECK  
Eng. Gr. II

## STOMPDRIFT DAM

### CALCULATION AND SETTING-OUT METHOD.

*It is assumed that the reader is thoroughly familiar with Plans Reg. N° 39763/60, 39890/61 and 39891/61.*

*Setting out of the arches at Stompdrift was made difficult by the fact that the overhang was so severe that points could not be marked on a previously cast lift, with the result that some unusual procedures had to be followed.*

To find the exact mid-point of the extrados, the intersection between this normal and the arch extrados must be found.

$$y^2 = b^2_{extr} \left( 1 - \frac{x^2}{a^2_{extr}} \right) \quad \text{ellipse}$$

$$y^2 = m^2 x^2 + 2mx + h^2 \quad \text{normal}$$

$$y^2 = \frac{-b^2_{extr} x^2}{a^2_{extr}} + b^2_{extr} \quad \text{ellipse transformed.}$$

$$0 = x^2 \left[ m^2 + \frac{b^2_{extr}}{a^2_{extr}} \right] + x \left[ 2mb \right] + \left[ h^2 - b^2_{extr} \right] \quad \text{after subtracting}$$

$$\alpha x^2 + 2\beta x + \gamma = 0$$

$$\text{Solution } x_3 = \frac{-\beta + \sqrt{\beta^2 - \alpha\gamma}}{\alpha}$$

$$\text{and } y_3 = mx_3 + h.$$

} Co-ordinates of  
centre extrados. E

### Some excerpts from Theo's handwritten calculation notes

The detailed work illustrated above, shows Theo's drive to find innovative solutions as well as his engineering expertise. Theo later was the official in 1964 to arrange for DWA's first computer which was an IBM 1130.

In 1965 Theo was selected to attend a post-graduate training course in France as his knowledge of French was an added benefit. The course was presented by a number of great French Engineers giving Theo his first exposure of the international dam community. Sadly the lengthy stay in France induced stresses in his marriage and resulted in a divorce. Theo married Irma Scharffenorth on 28 March 1969 and they had one daughter, Nina. He also had a refresher course in France in 1971 where he was exposed to the concepts of pumped-storage-later see the Drakensberg Project.

### Consulting in the private sector

Theo left the Department during a period of low morale and joined Hydroconsults in the private sector for some three years. He was active in designing the spillway for the von Bach Dam in Namibia. In retrospect, this exposure to the private sector was an important career development as his further career entailed much management of consultants and contractors.

### Tugela-Vaal and Drakensberg Projects

Theo was recruited back into a re-vitalised Department of Water Affairs in mid-1969 with Minister Fanie Botha and Secretary (now Director-General) JP Kriel at the helm. He was in charge of the Earth and Rock fill dam Division of the Design Office where he and his team were involved with the design of a large number of dams. Theo and his team became involved in a re-planning of the Tugela-Vaal Transfer Project and made a proposal in May 1970 which incorporates the Sterkfontein Dam, Woodstock Dam and various diversion canals and weirs. The proposal showed great ingenuity and innovation as well as a fine sense of the economy of the proposal which was accepted by the decision makers. The Tugela-Vaal Transfer Scheme transferred water from the Tugela to the urban-industrial heartland of South Africa in the current Gauteng.

Additional water transfers were then required from the Tugela to the Vaal River and Theo joined up with Escom (as it was then called) to develop a combined water transfer and peak power generation

project. The technical details are well known and are not repeated. The success of the venture can be ascribed to the high engineering expertise (from both partners) which went into the project, but above all the great co-operation between the two entities. Theo's persuasive nature and pleasant personality were clearly key issues in promoting this project. His close relationship with his Escom counterpart, Bruno Graber, was also a vital matter in ensuring close cooperation between the two organisations. The Drakensberg Pumped-Storage Project was the first Water Affairs Project where environmental issues played an important role and was the trigger for greater environmental awareness within the Department.

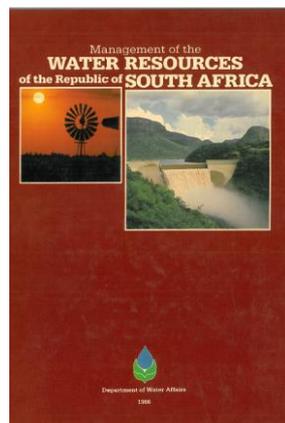


***Inspecting the site of the Drakensberg Project in 1974.  
L to R: ?, Bruno Graber (Escom), Alf Hardwick (Rand Water Board)?, GCD Claassens (DWA),  
Roger Phelines (DWA), Minister of Water Affairs Fanie Botha, ?, JP Kriel (DWA) and  
Robbie Myburgh (DWA). (Presumably Theo took this photo)***

Because of Theo's proven planning skills, he was transferred to the Planning Division where he was responsible for the Western Part of the country. It is often said that a planning engineer needs to be a "complete engineer" and clearly Theo had reached this milestone.

### **Water resources management policy**

A major achievement of Theo's Planning Chief Directorate team was its 1986 "*magnum opus*": "Management of the Water Resources of the Republic of South Africa." This publication attracted international attention.



***The so-called red book***

### **Lesotho Highlands Water Project**

Proposals were received from the private sector for an alternative water transfer scheme to the Vaal River system which would compete with the Tugela-Vaal Project. Ultimately, an amended solution culminated in the various phases of the Lesotho Highlands Water Project (LHWP). Full details of this project are described in Theo van Robbroeck's article entitled "Recollections of a mega project" which is in his "Memories". Theo played a pivotal role in various aspects of the planning and implementation of Phase 1 of the LHWP given below:

- He was the RSA Study Leader which culminated in the Treaty compilation and signing in 1986;
- Chief Delegate: RSA Delegation to the Joint Permanent Technical Commission now the Lesotho Highlands Water Commission.

Theo was involved in the Project for some 21 years and much of the success of the Project can be ascribed to his ingenuity, perseverance and character traits. The investigations were started in a period when South Africa was in a poor political position and just before the Sharpsville massacre. Both Parties were highly suspicious of each other, but gradually the charm and innate fairness of Theo's approach paid fruit. The Treaty required some innovative approaches on a variety of issues which Theo influenced such as:

- How to determine a Royalty stream to Lesotho for the advantages of using the Lesotho territory which is at high elevation;
- How to implement a practical governance structure for the Project within the constraints of the current political climate;
- How to cater for the uncertainties of the rather meagre hydrological information which governed sizing of components and cost sharing;
- Measures to ensure that South African and Regional consultants and contractors received an acceptable share of the work;
- Containment of cost of the project borne by the two Parties.



***Katse Dam (185 m high) in Lesotho***

The Project started delivering water to South Africa in 1998.

### **Water diplomat**

South Africa shares a number of its rivers with neighbouring countries. The situation was even more complex in the pre-1994 period when the independent and self-governing territories existed. International water law requires due consideration and consultation with shared basin states in the development and utilisation of shared water resources. Specific countries concerned were Botswana, Lesotho, Mozambique, Namibia, Swaziland and Zimbabwe. These contacts required much contact and diplomacy. Theo was the main contact for many years and at some stage he was called “South Africa’s water diplomat” in the media. Theo was able to convince several neighbouring countries to participate in joint studies of the river basin which would provide sound information for the planning of further development and the equitable sharing of water resources. An example of a successful outcome was the establishment of KOBWA (Komati Basin Water Authority) and the joint construction of the Maguga Dam on the Incomati in Swaziland and the Driekoppies Dam in the RSA, downstream of Swaziland.



**Maguga Dam**

#### **SANCOLD and ICOLD**

South Africa became a member of the International Commission on Large Dams (ICOLD) in 1964 and formed the South African National Committee of Large Dams (SANCOLD). Because of his ability in French, Theo was appointed as the Assistant Secretary who did all “donkey” work. Theo, over the years rose through the ranks of SANCOLD and ICOLD (see “Memories”) and this culminated with his election as President: ICOLD in 1994 which he served for three years. Another career highlight was when South Africa hosted ICOLD for a Congress in 1994 in Durban. Because of his prominent position as Director General of Public Works, Theo was able to persuade President Mandela to open the Congress much to the delight of all of the delegates. President Mandela mentioned in his Keynote address at the Opening of the 1994 ICOLD Congress in Durban. *I am proud of the active role South African engineers play in your organisation. I want to make use of this opportunity to congratulate our own Theo van Robbroeck on the honour of having been chosen to serve as President of the august body (ICOLD) for the three years following upon this Congress. I consider his election as a mark of the confidence your organisation has in the competence of South African hydraulic engineers*



***Theo greeting President Mandela at the opening of the 1994 ICOLD Congress, Durban 1994***

The international exposure was of great benefit to South Africa as it provided the incentive to institute dam safety legislation and even the ICOLD President featured prominently in the Lesotho Treaty in

connection with settlement of disputes via arbitration. Theo's term of office as ICOLD President was rather stressed as it also coincided with the creation of the controversial World Commission on Dams under South African Prof Kader Asmal.

### **Public Works**

Theo's "Memories" indicate that he was rather reluctant to leave Water Affairs for the promotion to Public Works, but accepted it because of the improved pension benefits.

### **Publications**

Theo produced a large number of publications which are listed in his "Memories".

### **Awards and Tributes**

AD Lewis Medallion: Department of Water Affairs and Forestry award for outstanding achievement given to Theo van Robbroeck in 1991

SAICE Water Engineering Award 1992 presented for contribution to Water Engineering in South-Africa

Honorary doctorate in Engineering, University of Stellenbosch, 1994



***Dr Theo van Robbroeck  
University of Stellenbosch, 1994***

We received a large number of **tributes** from former colleagues when the news of the passing of Theo and Irma was circulated. A small sample of these tributes are given below

*It was very sad news to learn of Theo van Robbroeck's death and that of his wife Irma. Theo was a powerful force in the Department of Water Affairs and in the engineering profession in South Africa through difficult political and technical times. He also did much to maintain the position of South African engineering on the international scene through his work and his period as president of the International Commission on Large Dams (ICOLD). I remember him particularly for working with him on the planning and implementation of the first phase of the Lesotho Highlands Scheme where he applied his energy and enthusiasm to promote the project and ensure it did not go off the rails! Theo will be remembered for his great legacy to engineering in the country in the field of water planning and management. I extend my deepest sympathy to his daughters and their families and to the many colleagues who have enjoyed working with him over the years. Robin MacKellar, Consultant*

*A gentle giant. Had immense contribution to SA's water management especially his role in SANCOLD and ICOLD. I am glad I got to meet him. May his soul rest in peace.* Livhuwani Mabuda, Chief Director Integrated Water Resource Planning DWS.

*This is sad news. He was a Civil Engineer's Civil Engineer.* Gary Crisp, Engineer, Perth, Australia

<b>Paul Roberts PrEng FSAICE</b>
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## **SOURCES**

MEMORIES OF A CAREER IN WATER ENGINEERING AND MANAGEMENT by TPC van Robbroeck (Date unknown). This 99 page document is also on the Internet at [www.lieberheim.blogspot.com](http://www.lieberheim.blogspot.com)

Keynote opening address by President Mandela at the 18<sup>th</sup> ICOLD Congress in Durban in 1994.

ALFRED SNAPE MEMORIAL LECTURE, Water on the brain: some reminiscences of a career in water engineering, Theo van Robbroeck, Cape Town, 2006.

SANCOLD 1965 TO 2015, KEYNOTE ADDRESS: MEMORIES OF A CAREER IN WATER ENGINEERING AND MANAGEMENT, TPC VAN ROBBROECK, ICOLD Honorary President, SANCOLD Annual Conference 2015, Cape Town.

South African Large Dams-A century of engineering innovation, SANCOLD 2016, pages 165-167.

CURRICULUM VITAE, TPC VAN ROBBROECK ca 1995.

Memories from several former colleagues and friends.

Google "Theo van Robbroeck".