Anton Tedesko (1903–1994)

Jörg Schlaich, Prof., Schlaich Bergermann und Partner, Stuttgart, Germany

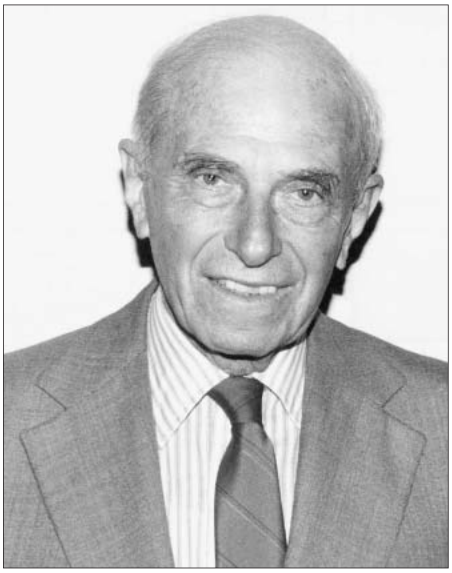

Fig. 1: Anton Tedesko

The Shell-Builder

From a professional point of view Anton Tedesko was the North-American reinforced-concrete-shell-builder (*Fig. 1*). He was born in Germany, May 25, 1903 but grew up in Austria where he attended the Technical University in Vienna, receiving in 1926 a Diploma in Structural Engineering. In 1932 when his employer Dyckerhoff + Widmann (D+W) contractors from Munich, Germany, delegated him to work with Roberts and Schaefer (R+S) Consulting Engineers, New York it was with the order to introduce shell construction in the USA.

Theory and practice of shell design in fact goes back to the early 1920s when D+W, together with Walter Bauersfeld and Franz Dischinger, developed the famous cupola for the Zeiss-Planetarium in Germany, using what Buckminster Fuller some 30 years later reinvented as the Geodesic Dome as stay-in-place formwork and reinforcement for the concrete to be placed by gunniting. When Tedesko came to work with D+W in 1930 it was first with Dischinger, then Ulrich Finsterwalder and Hubert Rüsch, all legendary structural engineers today. They remained his lifetime friends. So in 1988, Tedesko, then 84 years old, and Finsterwalder, 90, participated together in the competition for the replacement of the Williamsburg Bridge in New York, typical for Anton's proverbial faithfulness and reliability.

These short two years with D+W, characterized by a stormy development of shell design and construction, have coined Tedesko's professional career. The first reinforced concrete shell he designed in the USA for R+S was the Hayden-Planetarium in New York with a cupola following the Zeiss-D+W concept. Owing to him shell design in the USA did not copy what had been developed elsewhere but went its own ways. He writes:

"The architects of those days chose shells only when they could be built for less money than the conventional steel structure, and especially when the owner could be persuaded that in using a shell there was some advantage from the standpoint of fire safety. … Labor/material cost relationships in America were different from those in Europe. Low cost labor, which makes possible economical construction of thin shells in Mexico, is simply not available in New York. As a result, American shells are different from their foreign counterparts, with the designs emphasizing labor savings at the expense of additional material (1970)."

Unfortunately this could have been written today and describes the reasons why shells, in spite of all efforts of Finsterwalder, Tedesko, Candela, Isler and others have almost disappeared. Nevertheless Tedesko designed about 60 concrete shells throughout his career with R+S. Well known amongst his earlier ones are the Hershey-Ice Hockey Arena, a barrel vault with stiffening ribs (1936) and the cupola for the auditorium of Tulane University, New Orleans (1939). Tedesko complained that the architects later concealed the shape of this shell from the inside by introducing a suspended ceiling, because already there he was a strong advocate of honesty in structural design and of structure corresponding with form.

A highlight of his early shells is the elliptic rotational shells for a water filter plant in Hibbing, MN (1939) (*Fig. 2*).

But there he also had to learn that reinforced concrete is not durable and permanent by itself, but that also in shell design it is the detail that determines the quality. At that time progress in shell design mainly aimed at more sophisticated analysis. Much later he wrote:

"Young engineers are often perfect in using computers, but they don't know where to put the comma. It's not the computer which produces ideas. Let us not throw away the pencil and the slide-rule (1967)."

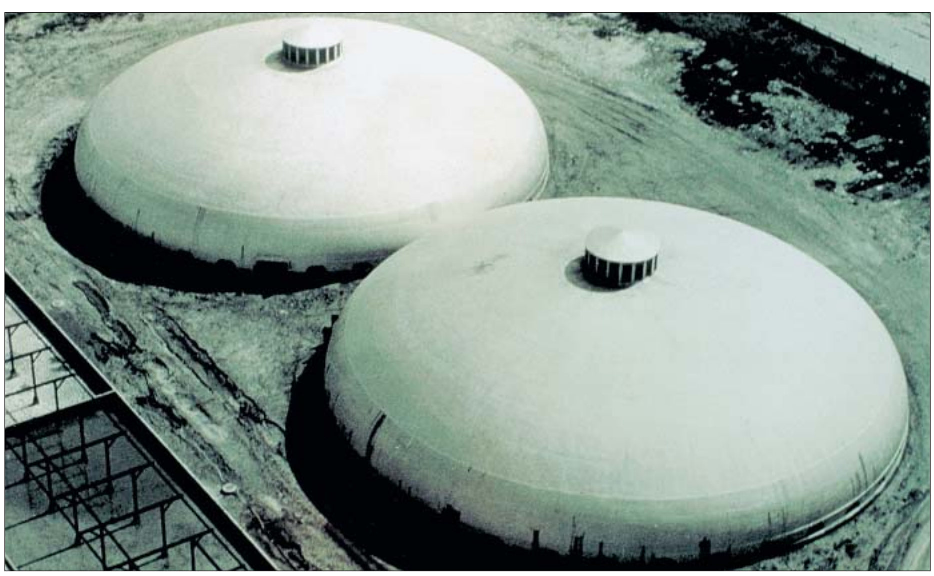

Fig. 2: Water Filter Plant in Hibbing, MN (1939)

Fig. 3: Anton Tedesko participating in model test, Harvey, IL (1956)

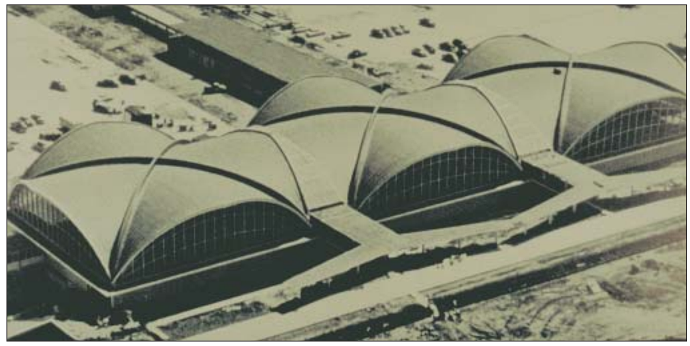

Fig. 4: Terminal Building of St. Louis Airport (1954)

During the Second World War and the following Cold War R+S designed numerous huge aircraft hangars; e.g. in San Diego, CA (1941); Rapid City, SD (1947); Limestone, ME (1948); Middletown, PA (1959). There the stiffening of large cylindrical shells with transversal ribs became an issue: Are they to be arranged on the inside, causing problems during construction? … or on the outside conflicting with the roofing? Both approaches couldn't satisfy Tedesko with his instinct that form must develop from the flow of forces and so – calling on Franz Dischinger, now professor at Berlin – he developed a ribless solution, with the shells thickening at their supports, demonstrating their feasibility by model tests (1956). Incidentally, there is a well-known similar photo made in 1931 of a model test of a double curved concrete shell at Wiesbaden, Germany where Anton Tedesko is part of the load, a gag he liked so much that he repeated it 25 years later (*Fig. 3*).

Never dogmatic, Tedesko, on the other side, made its diagonally arranged outer ribs the distinctive mark of the terminal building of the St. Louis, MO, airport (*Fig. 4*).

He summarizes his experience with concrete shells:

"… There are three important points on which depends the success of shells:

1. Designers learn from having experience with full-scale structures.
2. Engineers should visualize the actual construction during the design stage; the economy of shells depends on the close collaboration of designer and builder.
3. Even in working with architects of prestige the engineer must stand firm, making it clear as to what can be done and what should not be done (1980)."

Other Designs

Due to his European origin and continuous contact with his colleagues in Europe, Tedesko not only followed up on shell construction but also bridge design, always asking what could be useful technology for his new homeland America. However, when transversal prestress of concrete bridges was first being applied in Europe but was considered problematic in the USA Tedesko prudently waited until the early 1970s before he fully supported and pushed it forward in the USA.

Tedesko worked with many well-known architects, such as I.M. Pei, with whom he designed a 427 m high office building with an attractive rotational hyperbolic shape, to be built near Grand Central Station in New York City (1956).

One of his best known works is the Vehicle Assembly Building (VAB), at Cape Canaveral, completed in 1966 (*Fig. 5*). It was built for the assembly of the Saturn space vehicles and was at that time, based on volume, the largest building in the world. It is a rather trivial space structure made of 100 000 tons of steel composite with light-weight concrete slabs. Other more elegant approaches were studied but rejected to permit the involvement of less experienced contractors in view of low cost and short timing. So Anton Tedesko had become a pragmatic American! And yet he considered the VAB to be the prime satisfaction of his life as an engineer.

The Communicator

In fact, the VAB challenged him as an engineer and a communicator as well. In 1993 he wrote to me:

"I don't consider myself to be an outstanding designer of bridges or shells but as an experienced strategist who tries to push forward the best possible solution under given boundary conditions. Often I fought for a matter, sometimes successfully, sometimes losing. Even if the result was not exceptional I was satisfied with the impact I could give."

Both the great engineer and the communicator Anton Tedesko justify this homage. From the communicator Tedesko we can learn that the best design, the most refined detailing, sophis-

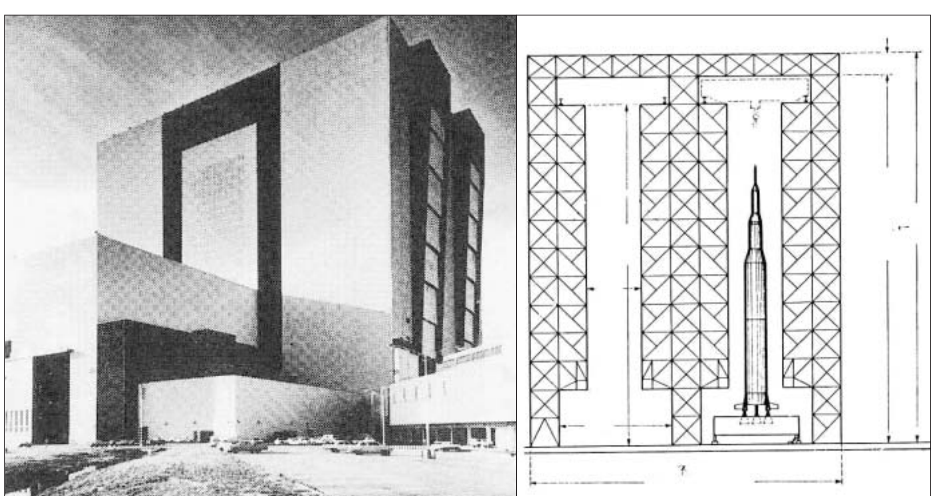

Fig. 5: Vehicle Assembly Building (VAB) (1966)

ticated analysis (this from his point of view at last!), advanced fabrication, and the lowest offer will not result in a success, if not all participants, starting with the ambitious but tight and timid client down to the dull worker, learn and are able to communicate. To file smooth relations and to make all involved to talk to each other frequently may turn out to be the most delicate and toilsome but also noblest and most rewarding assignment of the engineer!

So it was logical for Anton Tedesko to leave his professional nut-shell and to consider himself as a lobbyist for the image of the structural engineer and his role in society and to speak out on what needs to be said:

"The engineer, I feel, is unjustly blamed for many of our ills today. But if one does things, one is bound to make some mistakes. An easy way to avoid mistakes and criticism is to do nothing (1973)."

"There is little excuse today for a least-expensive solution to look ugly, and for defending clumsy and substandard appearance by stating that it was the necessary result of economy (1976)."

"Structural engineering at its best is an art form, parallel to and independent of architecture and sculpture (1982)."

In this context the famous public discussion on the structures for the 1976 Montreal Olympics must be mentioned. Due to serious problems during the construction of the stadium its tower from which a convertible roof was to be suspended could not be completed in time and tower and roof were built more than 10 years later. In June 1976 during an IASS-Symposium in Montreal a podium discussion with 400 participants took place in which Anton Tedesko played a major role. It is published [1] and really worth reading since it is still timely. And, it tells us a lot about Anton Tedesko's art to debate openly and directly but never insulting.

Epilogue

The IABSE Foundation created an award in the name of Anton Tedesko shortly after his death. The award [2] reflects the character of Anton Tedesko, the great engineer and communicator. The author is happy to have been given a chance to introduce Anton Tedesko especially to the young readers of SEI. Since he cannot deny that he likes and admires Anton, he may not be considered to be the right person to conclude with an impartial judgment. Therefore, a document of the National Academy of Engineering, Washington D.C. is cited:

"Anton Tedesko, outstanding engineer, eminent designer and builder of pleasing innovative structures, one who with a warm human touch has given guidance and strength to many in the profession."

References

[1] Experts slam the Olympic structures of Montreal, *Civil Engineering* – ASCE, December 1976.

[2] http://www.iabse.org/association/iabsefoundation/activities/antonmedal