

Behind the Pipes

By Dirk A. Flentrop, Flentrop Orgelbouw, Zaandam, Holland, 1976

It was in 1968 that I was kindly invited to investigate the possibility of making an organ for the Duke Chapel. During the many visits which followed that invitation, I became well acquainted with the Chapel — its structure, architectural qualities, and acoustics. At the same time, I had the pleasure of learning to know many Duke officials, all of them kind and helpful to me, and most supportive in the development of the design and construction of the organ. I would like to name them all but being afraid of forgetting someone, I would like to say a general and heartfelt “thank you.”

Let me try to explain the Duke design by beginning with a negative statement: “The Duke organ is not a copy of any baroque organ.” The Duke organ is entirely and especially designed for Duke Chapel, and according to the specific requirements of the Chapel.

Modern organ building has rediscovered and adopted the principles of 18th-century organ building. These principles require a definite unity in tonal, technical, and visual design. This means that together with designing the tonal structure, an architectural layout must be made according to the size of the building. The result is an organ in which every part is integrally related to every other.

There are five basic components of the Duke Chapel organ: Pedaal, Rugwerk, Echo, Hoofdwerk and Bovenwerk. The pipes in the first row of each division are called “Prestant” pipes (derived from the Latin *præstare*, “to stand in front”). Depending on the size of each division there are from 8 to 30 rows of pipes behind each row of Prestants. There are rows of 56 pipes for the manuals, and rows of 30 pipes for the pedal.

In order to achieve the desired unity in the Duke Chapel organ, the following foundation stops were chosen for their respective divisions:

Prestant 16': Pedaal — the large, round towers at both sides of the organ's main case.

Prestant 8': Rugwerk — smaller, separate case in the gallery rail.

Prestant 4': Echo — the smallest division, behind the decorated doors, just above the Rugwerk and underneath the horizontal trumpets.

Prestant 16': Hoofdwerk — the main division of the organ between the pedaal towers, above the horizontal trumpets. The Prestant 16' of the Hoofdwerk begins in the front, at low F; therefore the longest front pipe of the Hoofdwerk is 12'. The pipes, C–E, placed behind, are stopped, and are thus half the length of 16'.

Prestant 8': Bovenwerk — the center division at the top of the organ.

Within each major division, there are pipes with different characteristics and pitches. In general, they are

A. Flue pipes — constructed like flutes and recorders.

a. “Male” stops — like the Prestant pipes, ranging in pitch from 16' (one octave below normal pitch) to 1' (three octaves above normal pitch).

b. “Female” stops — more flutelike than the Prestant group, ranging from 16' to 1'.

B. Reed pipes —

constructed like woodwinds, their initial sound is enhanced and colored by various shapes of sound resonators. Pitch varies

from 16' to 2'. Most of the reed stops in the new organ are designed and made in the 18th-century Dutch manner, with a limited number following the French mode of the same time. The three horizontal stops in the front of the organ are made in the brilliant style of the great 18th-century Spanish organs.

After the diameters of pipes have been decided upon, the layout of each division is made. This is a full-size layout, and each pipe is drawn in its exact diameter.

To find the proper place for the larger front pipes (Prestants), it is often necessary to arrange them along curved and pointed lines, thus allowing more pipes in a given area than if they were all placed in a straight line. The resulting configuration appears to be a tribute to Baroque design, but such is not the case; it is purely for functional reasons.

This same functional need also exists with respect to the pipe shades. Pipe shades cover the openings at the tops of the front pipes and help to blend the sounds of these pipes with those of the interior pipes. Like the placement of the front pipes, the pipe shades also follow an irregular mode, being of many different shapes. This too, however, is functional rather than decorative, for the irregularity of the pipe shades prevents them from giving preference to certain overtones. Similarly, the intricate shapes of the mouldings help to diffuse the sound into all parts of the Chapel. As with any other traditional musical instrument, only natural products have been used in construction materials.

Pipes: alloys of tin and lead, with the exception of 30 pipes of Subbas 16', five pipes of Bourdon 16' and five pipes of Gedekt 8', which are made of mahogany.

Wind chests: mahogany and oak, with sheep leather for the pallets.

Wind trunks: mahogany.

Bellows: mahogany and sheep leather.

Key action: trackers and rollers of red cedar, manual keys faced with thick ivory (naturals) and ebony (sharps), pedal keys of oak.

Stop action: mahogany with ebony stopknobs.

Organ case: mahogany.

Pipe shades: hand-carved mahogany, overlaid with gold leaf.

The stoplist includes the names of the stops of each division, the composition of the mixture and diameters of the pipes on each C of the keyboard. From Specification A, over seventy diagrams were made, giving the exact dimensions for each pipe and stop, including length, diameter, mouth width, and material thickness for the flue pipes, as well as resonator length and diameter, tongue length, width, and thickness for the reed pipes.

Drawings B, C, D, and E are the basic drawings from which over 90 detailed drawings were made, giving full information about the hundreds of individually handmade parts of the organ, the organ case, and the pipe shades.

After the full-size layouts of each division have been made, a scale drawing is made of a cross section through the center of the organ. Drawing D also shows the wind supply, powered by electric blower, bellows, and wind trunks. The blower, which supplies the wind for nearly 5,000 pipes, has only a two-horsepower motor. The blower pressure is 120 mm water column, and bellows reduce wind pressure to 87 mm.

As shown in Drawing D, the key action connects the keys with the pallets in the wind chests. When the key is pushed down, the pallet opens and wind flows from the bellows through the wind trunks and wind chests to the organ pipes on top of the wind chests.

The stop action connects the stop knobs with the sliders underneath the pipe board. It is the mechanism by which the pipes function in response to pulling or pushing of the stop knobs.