Half Value Layer Concepts.

The half value layer of the radiation beam is an essential measurement of a survey program. It is a measure of the beam hardness which relates to the type and thickness of shielding required in the facility and it also determines to a reasonable extent how much soft radiation is present in a beam. This soft radiation is absorbed in the surface tissue and results in unnecessary radiation being absorbed by the patient. In addition, it also contributes to unnecessary scatter within the patient which detracts from the desired image. It should be noted that much of the soft radiation generated in pulsed (half wave) dental x-ray machines results as the voltage rises from 0 to the peak value and falls again during each pulse. It is only near the peak value that effective radiation is emitted and the rest is practically unusable. Hence, pulse or half wave machines are less efficient converters of energy to useful radiation than constant potential or (high frequency) machines. It is necessary to filter out this soft radiation and this is accomplished by placing a filter material, usually a few mm of aluminium between the output window and the entrance to the beam limiting device. This filter must be installed in such a manner that tools are required to remove it.
The half value layer of a machine should not change for the lifetime of a machine unless someone removes the filter and as such it should be measured at least during the installation of a new machine and after extensive repairs involving its removal have been completed.

X-Ray Tube Voltage (kvp)	First Half-Value Layer (mm Al)
50	1.5
60	1.5
70	1.5
71	2.1
80	2.3
90	2.5
100	2.7

The table above shows the values of the first half value layer of aluminium (measured in mm) for dental x-ray heads. For values of KV or KVP between these values, the minimum values for the first HVL can be obtained by extrapolation. The value of the first HVL must not be less than that shown in the table. There are, at present no upper limits.

HVL values are evaluated by the survey program to ensure adequate filtration of the beam.