III. THE KIVA-3V VALVE MODEL

KIVA-3V can model any number of valves in the cylinder head. Each valve can have its own size and profi

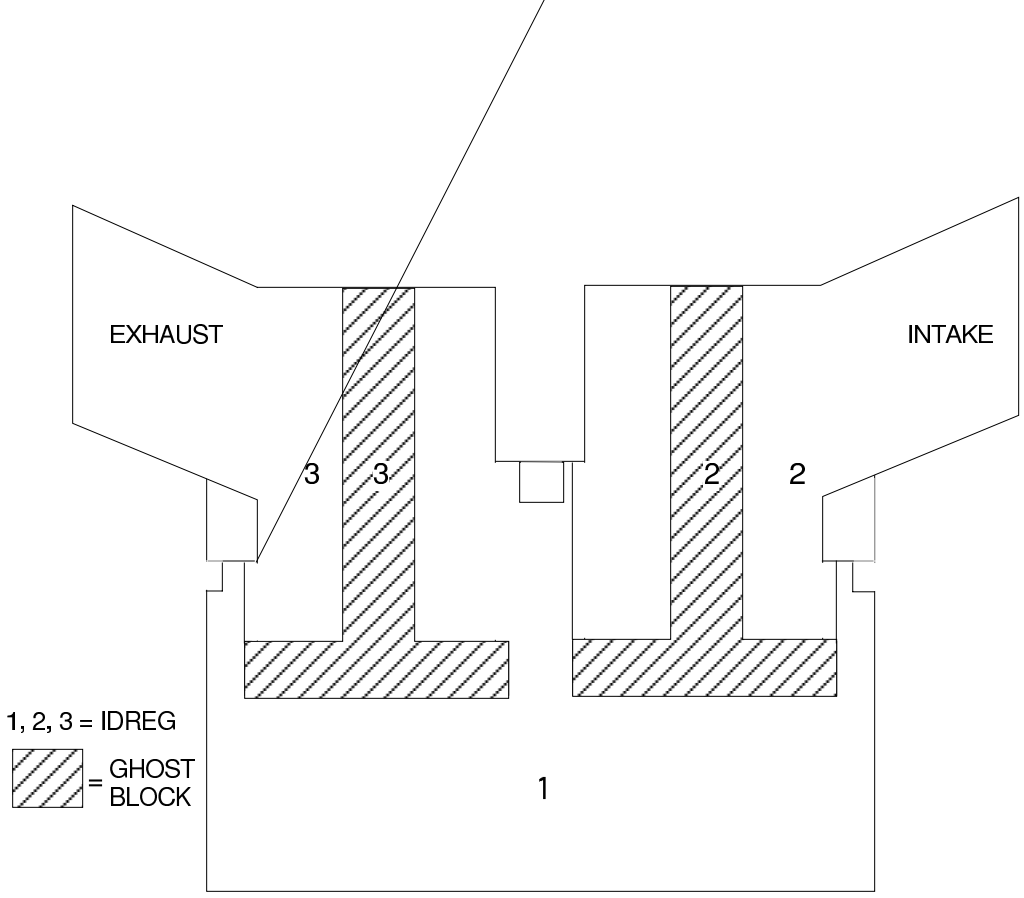

Fig. 1. The three physical regions in a KIVA-3V grid for a typical valved IC engine.

currently above or below them. Cells in a valve recess or pocket always have IDREG = 1.

A new vertex flag array, IDFACE, must also be supplied by the grid generator as part of the ITAPE17 data file. *The addition of IDFACE is the only change to the ITAPE17 file.* In the original KIVA-3, there were only two possible moving surfaces: the piston and the optional upper piston. The program was able to use z-coordinates and vertex and flag information to identify moving surfaces, without requiring additional input data. The implementation of valves and their associated multiple moving surfaces requires additional information to identify *which* moving surface a vertex or cell face is identified with. By the new definition, a lower piston is always moving surface 0, and all vertices on the piston face have a flag IDFACE = 0. Vertices on the upper piston face in an opposed-piston geometry have vertex flags IDFACE = 1.

Although both the lower and upper surface of a valve move with the same velocity, each surface is identified separately because each moving surface is treated as a separate entity by the valve snappers. Because an upper piston is not an option in a valved geometry, the value IDFACE = 1 is available. The vertices of bottom surfaces of valves (i.e., the valve face) always have *odd* values for IDFACE (1, 3, ...), and the top valve surfaces and stems always have *even* values for IDFACE (2, 4, ...). By this definition, any moving surface, be it piston or valve, that has fluid above it has an even IDFACE. Conversely, if fluid lies below

the face, the IDFACE is odd. All the remaining vertices in the grid, which are not associated with any moving surface, are assigned IDFACE = –1.

B. Valve Da