14.45   SOLID45 — 3–D Structural Solid
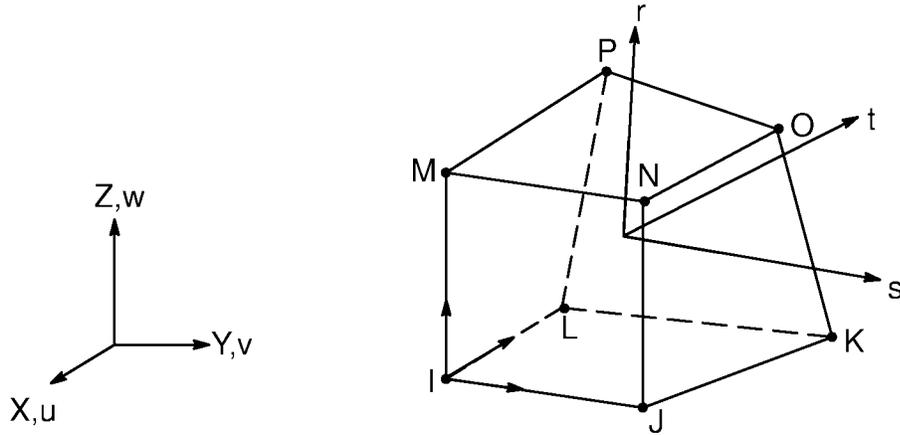
Matrix or Vector	Shape Functions		Integration Points
Stiffness Matrix	Equations (12.8.18–1), (12.8.18–2), and (12.8.18–3) or, if modified extra shape functions are included (KEYOPT(1)=0) and element has 8 unique nodes, (12.8.19–1), (12.8.19–2), and (12.8.19–3)		2 x 2 x 2 if KEYOPT(2) = 0 1 if KEYOPT(2) = 1
Mass Matrix	Equations (12.8.18–1), (12.8.18–2), and (12.8.18–3)		Same as stiffness matrix
Stress Stiffness Matrix	Same as mass matrix		Same as stiffness matrix
Thermal Load Vector	Same as stiffness matrix		Same as stiffness matrix
Pressure Load Vector	Quad	Equation (12.5.8–1) and (12.5.8–2)	2 x 2
	Triangle	Equation (12.5.1–1) and (12.5.1–2)	3

Load Type	Distribution
Element Temperature	Trilinear thru element
Nodal Temperature	Trilinear thru element
Pressure	Bilinear across each face

Reference: Wilson(38), Taylor et al(49)

14.45.1   Other Applicable Sections

Chapter 2 describes the derivation of structural element matrices and load vectors as well as stress evaluations. Section 13.1 describes integration point locations. Uniform reduced integration technique (Flanagan and Belytschko(232)) can be chosen by using KEYOPT(2) = 1.