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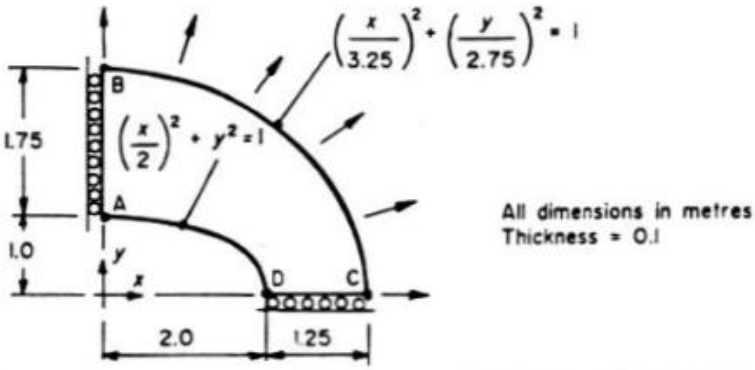
Finite Element Analysis for Elliptical membrane

NAFEMS	ELLIPTIC MEMBRANE	TEST No LE1	DATE/ISSUE 1-7-86/1
ORIGIN	NAFEMS report C1		
ANALYSIS TYPE	Linear elastic		

GEOMETRY

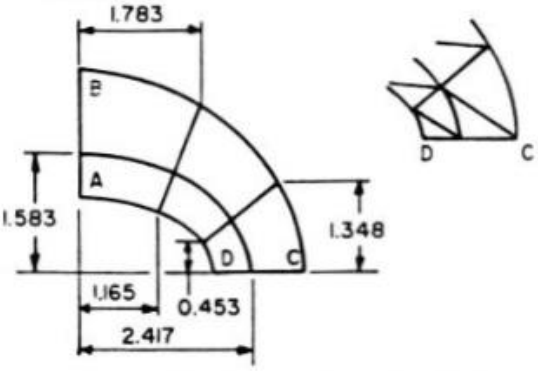


All dimensions in metres
Thickness = 0.1

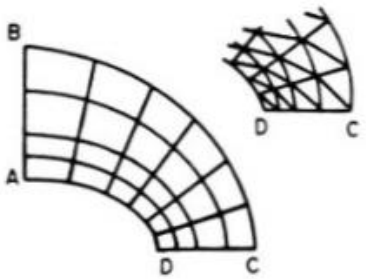
LOADING	Uniform outward pressure of 10MPa at outer edge BC Inner curved edge AD unloaded
BOUNDARY CONDITIONS	Edge AB, symmetry about y axis, e.g. zero x displacement Edge CD, symmetry about x axis, e.g. zero y displacement
MATERIAL PROPERTIES	Isotropic, $E = 210 \times 10^3$MPa, $\nu = 0.3$
ELEMENT TYPES	Plane stress quadrilaterals or triangles

MESHES (Corner nodes only given)

Coarse



Fine - Approx. halving of coarse mesh



OUTPUT	Tangential edge stress (σ_{TT}) at D	TARGET	92.7MPa

Results: Stress contours

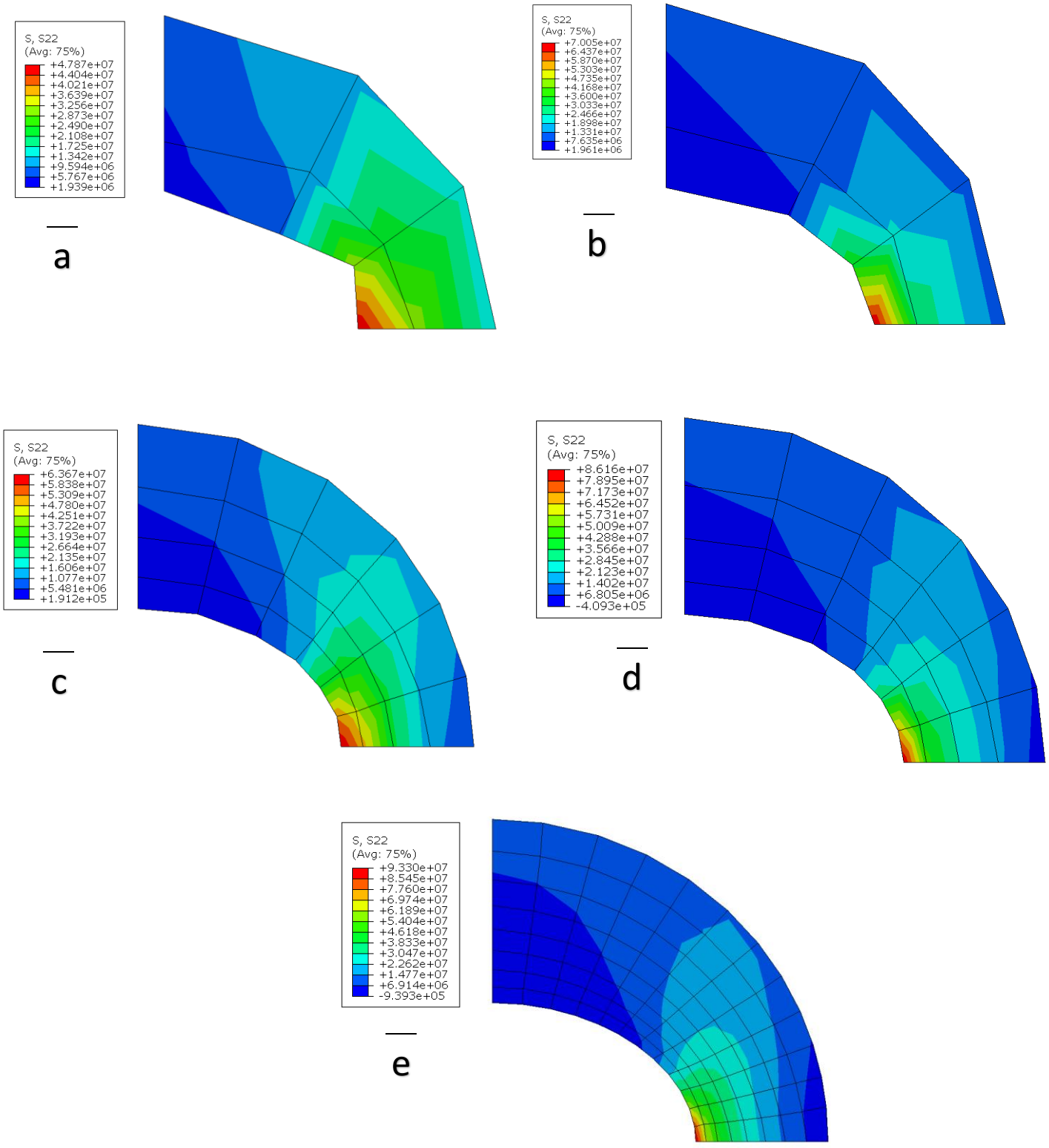


Figure 3. (a) Stress heatmap (σ_{yy}) for 6 element model with reduced integration, (b) Stress heatmap (σ_{yy}) for 6 element model with full integration, (c) Stress heatmap (σ_{yy}) for 24 element model with reduced integration, (d) Stress heatmap (σ_{yy}) for 24 element model with full integration, (e) Stress heatmap (σ_{yy}) for 96 element model with full integration.

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