APPENDIX-I

CRUSTAL VELOCITY AND POISSON'S RATIO

Poisson's ratio is the ratio of the lateral contraction of a material to the longitudinal extension under normal stresses. This ratio is a measure of the rigidity of the material.

In a fluid, \( \sigma = \frac{1}{2} \); in a rigid body, \( \sigma = 0 \). Poisson's ratio is related to the elastic constants in the following manner.

\[
\sigma = \frac{\lambda}{2(\lambda + \mu)}
\]

where \( \lambda \), \( \mu \) are Lame's constants.

Furthermore,

\[
\sigma = \left[ (1 - \frac{1}{2} \frac{\alpha^2}{\beta^2}) \right] / \left[ (1 - \frac{\alpha^2}{\beta^2}) \right]
\]

or

\[
\alpha^2 = \left[ 1 + \frac{1}{(1 - 2\sigma)} \right] \beta^2
\]

where \( \alpha \) and \( \beta \) are the compressional and shear velocities respectively.

The variation of \( \alpha \) and \( \beta \) with different \( \sigma \) is shown in the figure in the next page.
VARIATION OF POISSON'S RATIO WITH $\alpha$ & $\beta$

$\alpha = \text{COMPRESSIONAL WAVE VELOCITY}$

$\beta = \text{SHEAR WAVE VELOCITY}$

$$\frac{\alpha}{\beta} = 1 + \frac{1 - 2\sigma}{\beta^2}$$

OR $\sigma = 1 - \frac{1 - 2\sigma}{\beta^2}$