Problem

Let $\nu \in 1, \ldots, n-1$ and let $\langle v, w\rangle_\nu = -\sum_{i=i}^{\nu} v_i w_i + \sum_{i=\nu+1}^{n} v_i w_i, \quad v, w \in \mathbb{R}^n$, be a symmetric, non-degenerate bilinear form on $\mathbb{R}^n$ of index ν. A tensor field b on $T(\mathbb{R}^n) \simeq \mathbb{R}^n \times \mathbb{R}^n$ is defined by $b_x(v, w) := \langle v, w\rangle_\nu$. Show that:

There is no compact hypersurface $M \subset \mathbb{R}^n$ such that the induced symmetric $(2, 0)$-tensor field i^*b of b on M is non-degenerate at every point $x \in M$.

Hint: First consider that every hyperplane in $\mathbb{R}^n$ appears as a tangent plane of M.