We consider optimal control problems in coefficients for boundary value problem of the form

\[
\begin{cases}
-\text{div}(A(x)\nabla y) = f & \text{in } \Omega, \\
y = 0 & \text{on } \Gamma_D, \\
\frac{\partial y}{\partial n_A} = g & \text{on } \Gamma_N,
\end{cases}
\]

where \( f \in L^2(\Omega) \) and \( g \in L^2(\Gamma_N) \) are given functions, the boundary of \( \Omega \) consists of two disjoint parts \( \partial \Omega = \Gamma_D \cup \Gamma_N \), and \( A \) is a measurable non negative square symmetric matrix on a bounded open domain \( \Omega \) in \( \mathbb{R}^N \).

The controls are taken as the matrix of the coefficients \( A(x) \) in the main part of the elliptic operator.

We suppose that \( A \in L^1(\Omega; \mathbb{R}^{N(N-1)/2}) \).

The most important feature of such controls is the fact that eigenvalues of the matrix \( A \) may either vanish on subsets with zero Lebesgue measure or be unbounded. Equations of this type may exhibit the Lavrentieff phenomenon and non-uniqueness of weak solutions. In this case the precise answer for the question of existence or none-existence of optimal solutions heavily depends on the class of admissible controls chosen. The main questions are: what is the right setting of the optimal control problem with \( L^1 \)-controls in coefficients, and what is the right class of admissible solutions to the above problem? Using the concept of convergence in variable spaces and following the direct method in the Calculus of variations, we establish the solvability of this optimal control problem in the class of weak admissible solutions.