

# *The Green's Function for Periodic Structures in Diffraction Theory with an Application to Parallel Plate Media, II*

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**1. Introduction.** In our first paper [1] in this series, we discussed the effect of a plane wave incident upon an infinite stack of semi-infinite parallel plates with equal spacing and constant angle of stagger. We found there that this problem could be reduced to the solution of the two-dimensional wave equation in a duct because of the periodic character of the structure and the mode of excitation. With the appropriate Green's function, which we derived in [1], the boundary value problem was reduced to an integral equation of the Wiener-Hopf type and could, in theory, be solved for any range of the parameter  $bk$ , where  $k$  is the wave number and  $b$  the spacing between the parallel plates. However, we only treated the case  $\pi < bk < 2\pi$  with the wave function subject to Dirichlet conditions, that is, when the wave function vanished on the parallel plates.

There is a second problem which can be solved with the methods we employed in [1]. This problem deals with the same geometry and excitation as we employed in our first paper, but now we impose Neumann conditions on the plates, that is, the normal derivative of the wave function vanishes on the parallel plates. A number of details require modification by this change of boundary condition, one being that the parallel plate region can now sustain a parallel plate mode of the form  $e^{*ikz}$  for  $0 \leq bk \leq \pi$ .<sup>\*</sup> We shall not attempt to solve this problem for a larger wave-length band, although this is possible. A second point deals with the application of the boundary condition. If we carry out the operations formally, we encounter a non-integrable kernel for the integral equation. This

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<sup>\*</sup> We shall use the same notation that we employed in [1] so that we can take over any similar details.