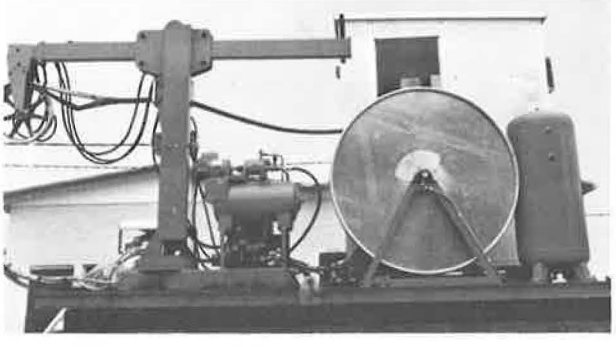
Development of a Shaft Inspection Device

Robert Ho

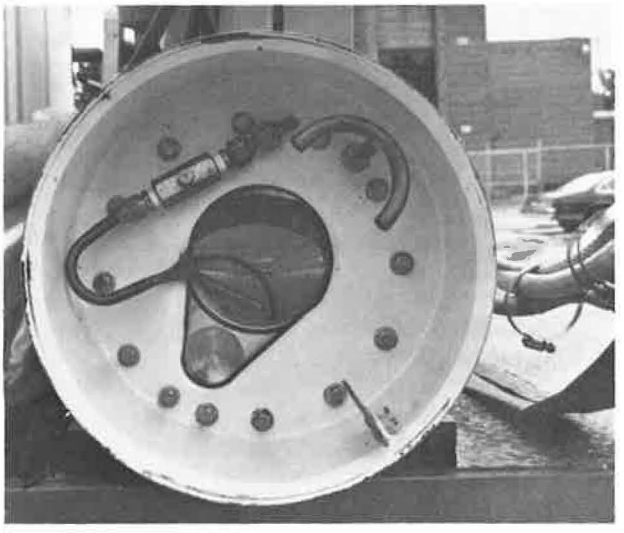
Since the disastrous accident that destroyed a section of the Skyway Bridge in May 1980, the Florida Department of Transportation (FDOT) has proceeded with the design of a new cable-stayed bridge to replace the two existing bridges. The two main piers of the new Skyway Bridge support a center span of 1200 ft, and each pier is founded on 44 5-ft-diameter drilled shafts approximately 70 ft long. The shafts will be drilled under water. To ensure that the bottom of the shaft is virtually clear of debris, a special inspection device will be used. The device is the only one of its kind in the United States. It was recommended by Schmertmann and Crapps, Inc., geotechnical consultants to the Skyway Bridge and designed by J.C. Holden of the County Roads Board of Victoria, Melbourne, Australia, which has used the device.

The device, constructed in the United States under Holden's supervision, basically comprises a color television camera enclosed in a waterproof housing that is mounted

Different view of extendible arm with hydraulic controls and diving bell disassembled.



Side view of SID shows extendible arm with cable coil and cabin.



Underside of diving bell shows water jets, air jet, and depth gage (bottom right).

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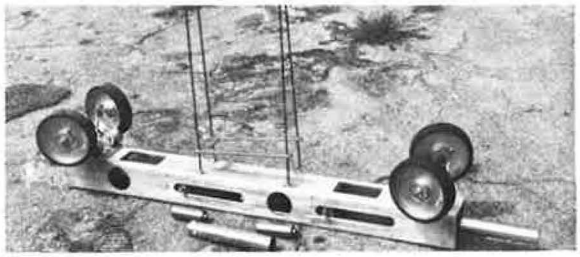
Inside cabin showing television monitor and hydraulic controls; part of extendible arm and diving bell can be seen through window.



Variable horizontal compressed air soil sampler with sample tube in foreground.

on top of a diving bell (12 in in diameter and 24 in high). Compressed air displaces the surrounding fluid from the diving belt and enables the camera to clearly view and record on video tape any material at the base of the hole. The bell is fitted with a depth gage to indicate the thickness of soft debris and also a pair of water jets that can clean the base of the hole. The diving bell is raised and lowered by a system of hydraulically operated controls. The operation of the camera and water jets is controlled inside the cabin, which houses all the electronic equipment. The device can be used to inspect drilled shafts up to a depth of approximately 150 ft.

By attaching a horizontal sampling device to the end of the bell, soil samples of about 1.5 in in diameter can be obtained from the walls of the shaft at any depth. The entire equipment setup is mounted on an 8x12-ft rigid frame that can be lifted with a crane to fit on top of a flatbed truck. For the Skyway project, the equipment may be operated from the top of a barge or some stable platform.