

because FAA would extend aid only for 15 in., but since has agreed to thicker pavements. He says that but that cal soil conditions and temperatures have dramatic effects on load bearing ability.

But PONYA's Yang insists that weight is only one factor to consider. "Basically, pavement theory is wrong," he says with near missionary zeal. "We didn't design for moving aircraft, but for a static load like a parking lot. Vibration that develops on the runway is the big thing." In this respect, he says airport designers can learn from highway practice, though most engineers criticize the fact that many airport pavements have been designed as beefed up highways.

The FAA's new program may resolve all that. It's first phase, coordinated

with the Corps of Engineers' research center at Vicksburg, Miss., will include on several of present theories aiming for "development and validation of a rational method of pavement design both rigid and flexible, in consonance with aircraft development."

It will cover analysis of dynamic loading, plus studies of continuously reinforced and prestressed concrete pavements, stabilized and membrane sealed subgrades, the effects of frost and permafrost and load transfer devices for rigid pavement joints.

The second phase, to develop criteria for rehabilitation, will include field observations to determine the effects of aircraft operations on all pavements. Researchers will instrument pavements and subgrades and evaluate nondestructive testing techniques.

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CM, the team

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Producers of building products tried for two days last week in Washington, D.C., to get caught up with what impact they will feel from the systems approach to building, the building team concept and the advent of the construction manager.

First at Producers' Council's 50th anniversary meeting, then at the annual Building Products Executives Conference run by McGraw-Hill Information Systems Co., the speakers who roused most interest described the changes currently under way in construction.

Robert F. Hastings, president of the American Institute of Architects, predicted that the gathering of building products men would be renamed a building systems conference in a few years in recognition of changes he sees in the construction process. Hastings urged materials producers to get on the building team, "become problem solvers rather than vendors."

"Instead of looking to you for products, we will look to you for solutions to design problems," said Hastings. "If this process develops as I expect it to, we will call you into the early meeting of the design team, and you will be offered a professional fee for your counsel."

Hastings warned that with changes in manufacturing there will be marketing and selling changes for materials or systems producers. With increased pressures of quality, cost and time on construction, design teams will need more producers who can meet performance specifications and guarantee in-place performance of systems or subsystems. Designers will no longer be able to specify products in detail, he said. "You will be the logical professional to design, build, test, fabricate, install and guarantee the system or subsystem you offer the building team," he told the building products executives.

**Manager's role.** Gerald McKee, president of McKee-Berger-Mansueto, Inc., New York City, joined Hastings in describing the role of construction manager (CM) as it has burst upon the construction scene of late. Hastings' Detroit A-E firm, Smith, Hinchmann & Grylls Associates, Inc., has been telescoping construction schedules as CM on buildings for the State University of New York. McKee's firm is in partnership with Walter Kidde Constructors, and its first CM contract let by the General Services Ad-

### Taxiway overpass tested to see if it can handle jumbo jets

Engineers are testing a five-year-old taxiway bridge at Chicago's O'Hare International Airport to see whether it can handle jumbo jets. The four-span structure over eight lanes of the airport's main access route was designed for gross weights of 600,000 lb with an impact factor of 30%. The Boeing 747 weighs in at up to 750,000 lb and heavier craft are expected.

Theoretical studies by Westenhoff & Novick, Inc., Chicago, indicated that the 225-ft bridge can take heavier loading, but engineers wanted a more definite answer. Loading tests conducted by Wiss-Janney-Elstner & Associates, Northbrook, Ill., concluded recently and recommendations are expected later this month.

The bridge is a continuous welded girder structure with a 13-in. concrete deck cast compositely with 22 stringers. Center spans are 73.5 ft long and each end span is 39 ft. Two longitudinal joints divide the 125-ft-wide structure with the center section being 44 ft wide.

When design started eight years ago, attempts to get forecasts of future aircraft weights from manufacturers were unsuccessful, according to the city's bureau of engineering. The largest planes then operating were about 300,000 lb and the bureau decided on a design load twice that, assuming dual tandem landing gears that concentrate loading on a few stringers. A 747 has four landing gears in a trapezoidal configuration that spreads 36 ft transversely.

This summer the consultants instru-



Test plane heavier than bridge design load.

mented the bridge with more than 100 strain gages plus meters to measure acceleration and velocity for static and dynamic testing. They monitored normal operations during the day, then closed the taxiway at night for controlled testing. First they ran a cart on a 747 gear loaded with 190,000 lb of iron, then a DC-8 aircraft and finally a 747.

The aircraft were taxied at various speeds, braked to a stop and accelerated at four locations. Because the jumbo's outboard engines overhang the bridge, the consultants also measured jet wakes and noise levels on the roadway below.

Among determinations to be made are the distribution of loads and the 747's actual impact loading, stresses that would be imposed by heavier 747s and other jumbo jets with different configurations, plus the expected life of the structure under repetition of various loadings. The consultants will also determine whether the 30% impact factor, typically applied on highway bridges, is unnecessarily conservative.

Taxiway overpasses at Kennedy International have been strengthened for jumbos and Los Angeles International plans to strengthen runway overpasses.

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# and systems intrigue producers

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administration for its Beltsville, Md., building (ENR 9/9 p. 9).

"CM is an owners' invention," McKee said. The owners have seized upon simultaneous design and construction under coordination of a CM as a way to cut time and dollars out of their jobs. As to who will be the CM, McKee said the good general contractor (GC) has a head start, but the CM and the GC are two fundamentally different roles. McKee said the GC's usual management functions are "only a point of departure toward the CM role" as an agent of the owner with authority over design, costs and scheduling as well as construction.

The CM has to "manage costs, not just predict them," said McKee.

Saul Horowitz, Jr., president of HRH Construction Corp., New York City, and a vice presidential nominee of the Associated General Contractors (AGC), told the Producers' Council audience that the ranks of design-construct organizations will grow as a result of the CM concept.

Horowitz reminded the producers that he predicted the growing use of construction managers at a Producers' Council meeting in 1968. He told them the concept really got its start with manufacturing industries. The government, he said, is following industry.



Robert Hastings



Gerald McKee

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Speakers on CM, team approach.

Horowitz discussed AGC's action on CM at its mid-year meeting (ENR 9/30 p. 14). That action in effect put off at least until next March any definitive AGC policy statement.

Horowitz said general contracts will be mobilizing to provide CM services.

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## Pollution bill says EPA will pay its overdue bills

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Pollution control officials in states that routinely prefinanced the federal share of treatment plant construction costs got good news last week.

They will get their money back if the water pollution bill now before the Senate passes as expected (ENR 10/28 p. 13). The bill authorizes the reimbursement of the \$2.4 billion the Environmental Protection Agency (EPA) estimates it owes states and communities that went ahead with construction despite lack of promised federal funds.

According to EPA, the federal program under the 1966 Clean Water Restoration Act actually covered only 6% of construction costs nationwide instead of the promised maximum of 55%.

Under the new bill, \$2 billion is specifically earmarked for reimbursing communities for plants built between July 1, 1966, and the date the new bill becomes law. Another \$400 million is included to cover reimbursement for plants built between 1956 and 1966. As an added attraction, all reimbursements for plants built after 1966 will be at 50% of construction costs even if the individual community was eligible for only a 30% grant because its state did not participate.

The Senate Public Works Committee, in its report on the bill, called the old sliding grant system inequitable for many communities, especially large ones. The report says that the reimbursement was aimed at "righting any past discrimination against those . . . municipalities that . . . have not received full federal contribution."

For the 1956 to 1966 period, the reimbursements will be a maximum of 30% because that was the maximum under the law covering those years. More money may be authorized if the \$400 million is inadequate.

The bill calls for the EPA administrator to divide the available funds by giving "to each project approved for reimbursement an amount which bears the same ratio to the reimbursement approved for such project as the total of such sums appropriated bears to the total reimbursement authorized for all projects eligible for reimbursement as estimated by the administrator."

Worry over reimbursement started in New York state, where a large chunk of a \$3-billion pollution control bond issue has gone to prefinancing promised federal money.

State officials have expressed concern in recent weeks because a letter from EPA extending the provisions of the expired 1966 law failed to mention extension of reimbursement. Since reimbursement has never been actually written into law, some state officials felt that New York might be left holding the bag. EPA officials in Washington last week said that the omission is meaningless.

## Building failure may bring \$1-million suit

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The Dade County, Fla., Port Authority has voted to sue a general contractor, an A-E firm, a consultant, a steel fabricator and a steel erector for over \$1 million to cover repair of three garages built or under way at Miami International Airport.

Last January cracks developed in the main supporting columns of two seven-story reinforced concrete garages that have post-tensioned slabs and beams (ENR 4/29 p. 14). The original contract for three garages totaled \$10.3 million. Cost is now estimated at \$11.3 million.

If a suit is filed, the defendants will be general contractor Gust K. Newberg Construction Co., Chicago; architect-consultant Howard, Needles, Tammen &

Bergendoff, New York City, consultant to the owner, the Dade County Port Authority; Inland-Ryerson Construction Products Co., Chicago, suppliers of tendons and equipment for stressing and grouting during the post-tensioning operations; and the erector, Gateway Erectors, division of Imoco-Gateway Corp., Chicago.

The third structure, now under construction, was not under way when the cracks were found. Redesign of the third garage, including additional reinforcing steel, forming and post-tensioning, resulted in an increase in cost of \$476,000. Repair of the first two structures, including removal of concrete and replacement with stronger members, is costing \$609,000.

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