continue to deteriorate throughout its life after being put into service. For any given design life, the corresponding value of working strength level can now be selected from the graph and used in design curves established for conventional concrete even though the concrete is not "conventional."

As an additional example, if brittle concrete were used instead of the tougher fibrous concrete, it would probably achieve high initial static strength, but would deteriorate more rapidly throughout its design life because of more rapid fatigue loss.

Conclusions

The application of new technology to concrete and the use of new concreting materials has produced portland cement concrete pavements which have fatigue properties different from those assumed in design procedures for "conventional" concrete. These materials should be evaluated from a fatigue standpoint to determine if pavement thicknesses should be increased or if a more economical section with decreased thickness can be used. The effects of fatigue should be combined with long-term strength gains to predict usable strengths available throughout the design life of a pavement. It is possible to have concretes with lower early age laboratory strengths that perform better throughout their design life than pavements with higher initial laboratory strengths.

References

1. State-of-the-Art Report on Fiber Reinforced Concrete, American Concrete Institute Committee Report 544.1R-82, Detroit, Michigan.

2. Brandshaug, Ramakrishnan, Coyle, and Schrader, "A Comparative Evaluation of Concrete Reinforced with Straight Steel Fibers and Collated Fibers with Deformed Ends," Report SDSM&T-CBS 7801, South Dakota School of Mines and Technology, Rapid City, South Dakota, 1978.

TABLE 1 - FIBROUS CONCRETE FIELD DATA

PROJECT: SALT LAKE CITY 1980 AIRFIELD PAVEMENT
MIX: 83 LBS/CY STEEL FIBERS (ZP 50/50)
583 LBS/CY TYPE I CEMENT
203 LBS/CY FLY ASH
1/2-INCH MAXIMUM SIZE AGGREGATE

AGE	FLEXURAL STRENGTHS (PSI)								AVERAGE (PSI)	STANDARD DEVIATION (PSI)
7 DAY	980	1000	800	800	830	950	980	1010	919	86
14 DAY		860	1000	810	860	1210	1080	1150	996	145
16 DAY	1020								1020	---
28 DAY	1430	1160	960	820	920	1210	1070	1170	1093	180
40 DAY	1200								1200	---
90 DAY	1330	1030	1190	900	1330	1250	1120	1180	1166	148
									AVERAGE	140

TABLE 2 - CONVENTIONAL CONCRETE FIELD DATA

PROJECT: SALT LAKE CITY 1980 AIRFIELD PAVEMENT
MIX: 592 LBS/CY TYPE 1 CEMENT
1-1/2 - INCH MAXIMUM SIZE AGGREGATE

AGE	FLEXURAL STRENGTH (PSI)															AVERAGE (PSI)	STANDARD DEVIATION (PSI)
7 DAY	690	630	720	760	600	650	760	600	700	710	710	700	610	740	680	677	60
14 DAY	620	610	680	720	580	730	700	760	740	690	670	780	650	750	670	690	58
28 DAY	580		700	720	660	680	710	730	720	790	880	775	920	730	730	738	85
37 DAY		580															---
90 DAY	630	680	810	780	720	770	750	730	830	840	720	730	610	740	780	741	66
98 DAY						780											---
99 DAY					730												---
102 DAY				790													---
106 DAY	690																---
107 DAY		690															---
																AVERAGE	67

TABLE 3

EQUIVALENT ANNUAL DEPARTURES FOR THE EXAMPLE

PAVEMENT AREA	AIRCRAFT	EQUIV. ANNUAL DEPARTURES
I	B-727	9,139
	DC-10	3,880
II	B-727	10,728
	DC-10	4,476
III	B-727	49,668
	DC-10	19,572
IV	B-727	9,139
	DC-10	3,880

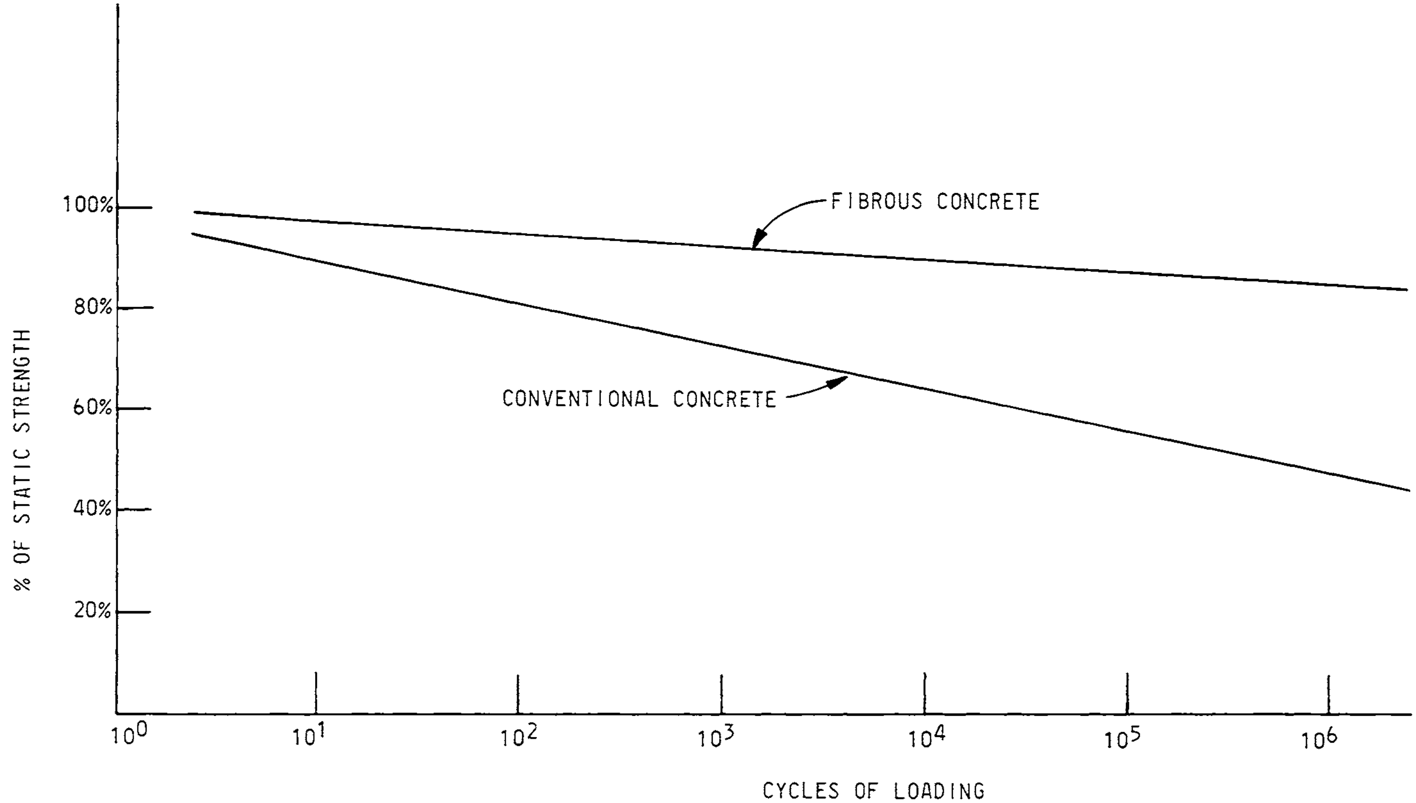

Fig. 1--Strength versus fatigue cycles

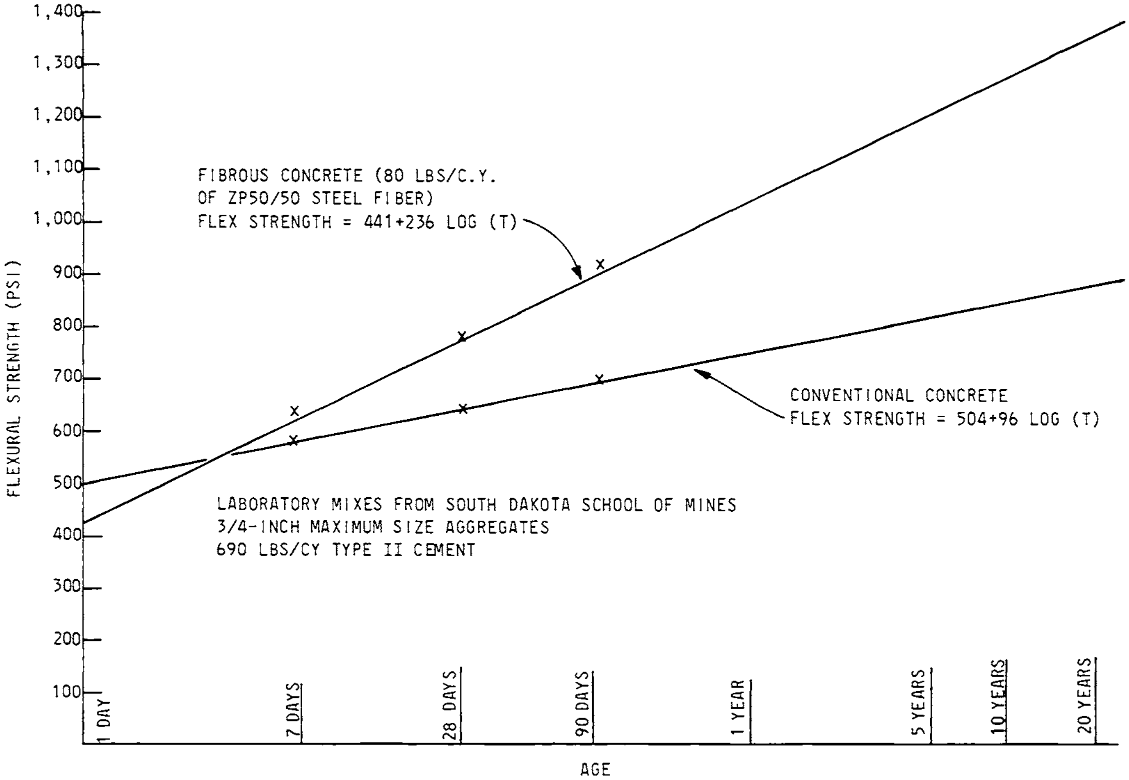

Fig. 2--Flexural strength versus age

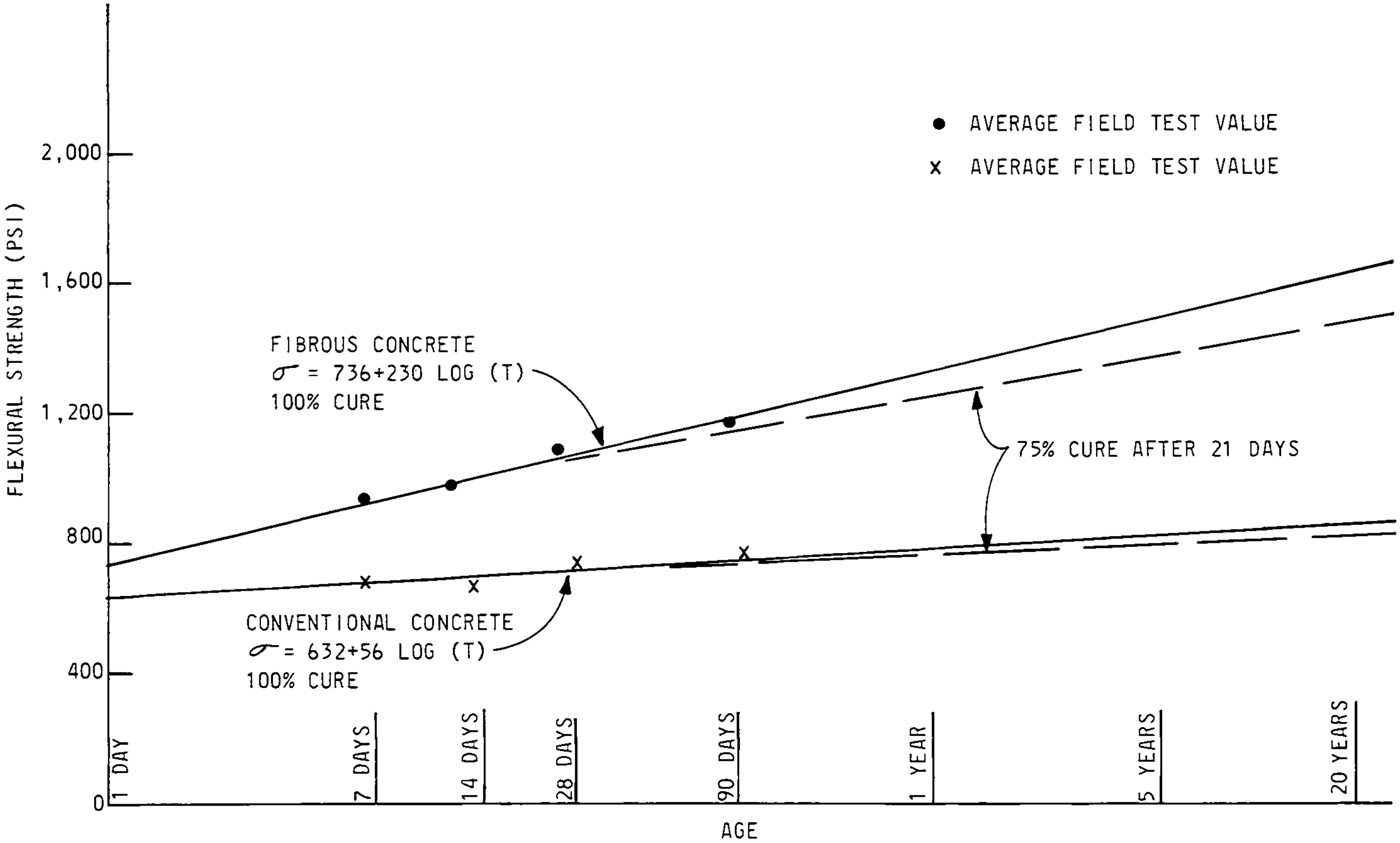

Fig. 3--Flexural strength based on a regression analysis of all 1980 field data for the Salt Lake City Airport

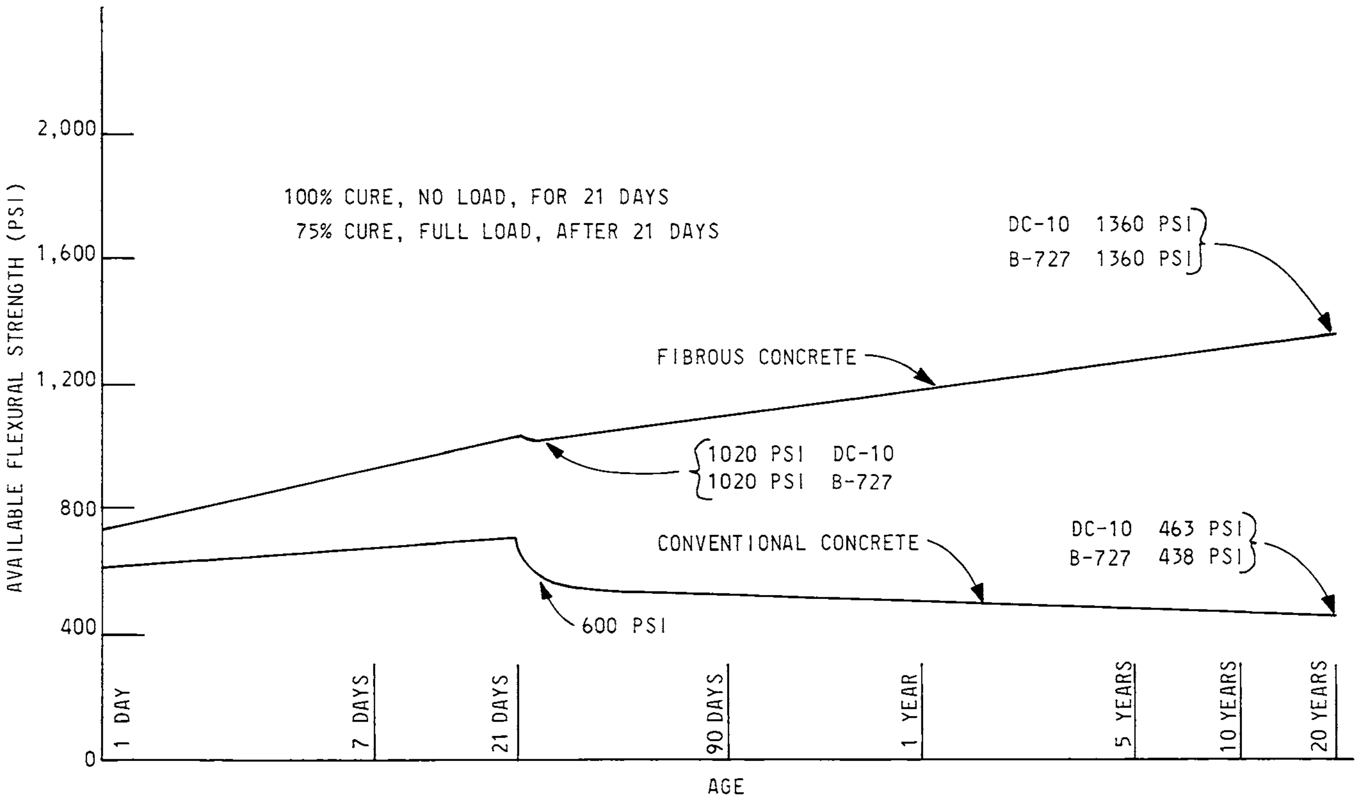

Fig. 4--S.L. City Type I and IV pavement areas

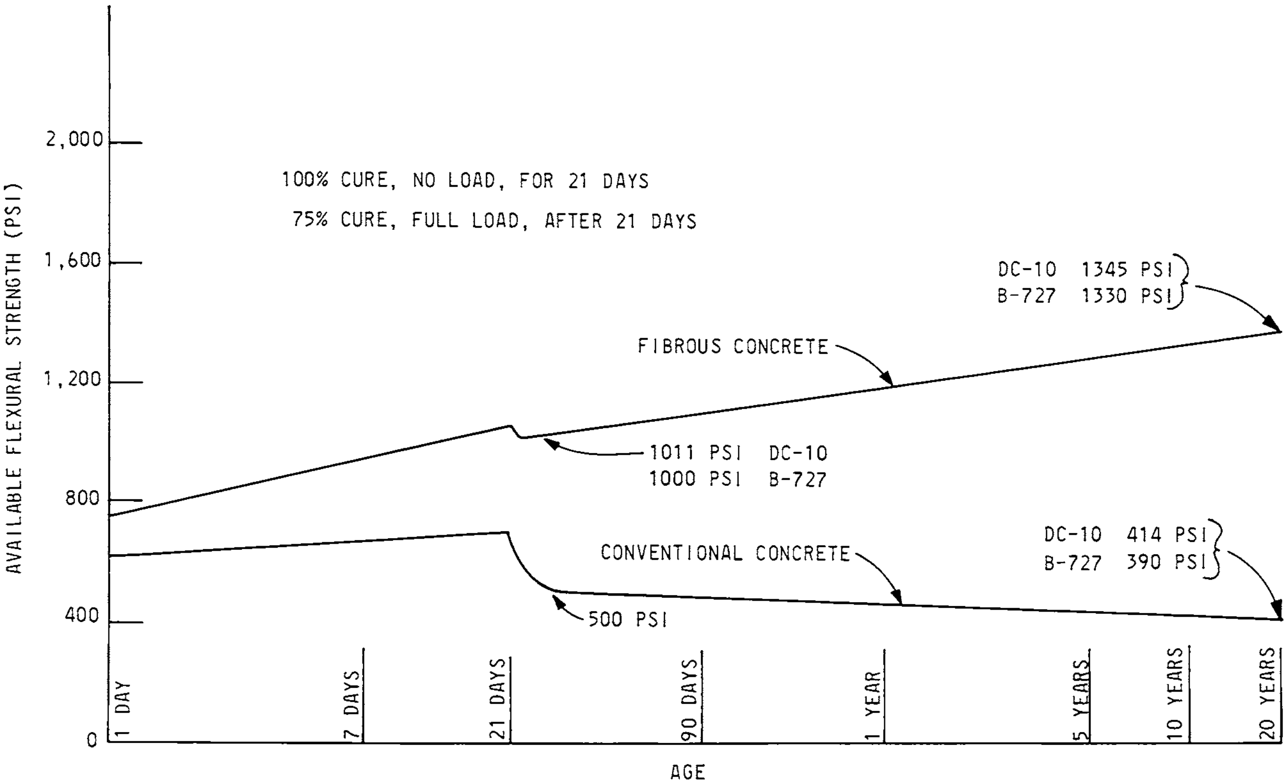

Fig. 5--S.L. City Type III pavement areas

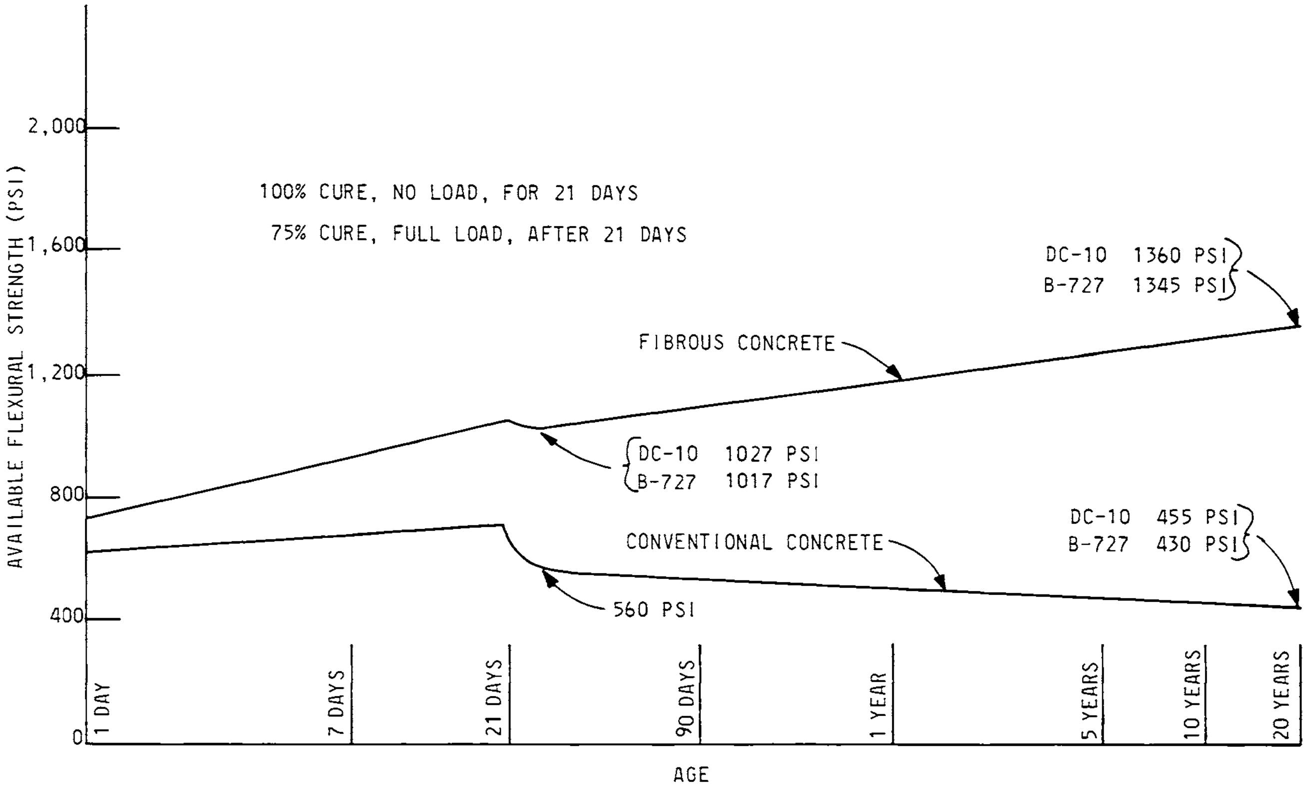

Fig. 6--S.L. City Type II pavement areas