TABLE 4

Mix Proportions and Properties of Fresh Concrete

Mix No.	Mix Proportions		Properties of Fresh Concrete						
			Temp		Slump		Unit Weight		Air Content, %
	W/C*	A/C**	°F	°C	in.	mm	lb/ft^3	kg/m^3	
1	0.35	3.21	76	24	2.75	70	147.2	2358	5.5
2	0.35	3.21	75	24	2.75	70	147.2	2358	4.8
3	0.39	3.94	74	23	2.75	70	146.0	2339	5.6
4	0.39	3.94	74	23	2.75	70	145.6	2333	4.9
5	0.44	4.53	73	23	4.25	110	143.2	2294	7.2
6	0.44	4.53	74	23	3.25	80	142.4	2280	6.2
7	0.45	4.53	71	22	4.0	100	142.4	2280	6.4
8	0.47	5.21	72	22	3.0	80	142.4	2280	6.4
9	0.50	6.02	65	18	4.5	110	138.8	2224	8.0
10	0.51	5.75	72	22	3.0	80	144.8	2320	5.4
11	0.51	5.75	68	20	3.5	90	142.4	2281	6.5
12	0.55	6.33	71	22	2.5	60	146.4	2345	4.8
13	0.55	6.33	75	24	2.75	70	145.6	2333	5.1
14	0.58	7.23	70	21	2.50	60	146.0	2340	5.2
15	0.60	6.94	69	21	3.0	80	145.2	2326	5.2
16	0.61	6.92	68	20	3.5	40	143.2	2294	5.4
17	0.67	7.56	71	22	2.0	50	145.6	2333	4.8
18	0.67	7.92	-	-	4.0	100	138.3	2216	5.6
19	0.68	7.56	65	18	3.0	80	139.6	2236	5.8
20	0.72	8.15	75	24	2.25	60	140.8	2256	5.8
21	0.72	8.17	68	20	3.75	100	139.2	2230	6.4
22	0.76	8.73	71	22	3.25	80	138.8	2224	7.2

* Water-cement ratio (by weight)
** Aggregate-cement ratio (by weight)

TABLE 5

Densities of Test Specimens at One Day

Mix No.	W/C*	Density of Cylinders**		Density of Prisms***	
		lb/ft^3	kg/ft^3	lb/ft^3	kg/ft^3
1	0.35	148.47	2378	147.68	2366
2	0.35	149.61	2397	147.89	2369
3	0.39	147.77	2367	146.27	2343
4	0.39	148.37	2377	147.75	2367
5	0.44	144.72	2318	143.51	2299
6	0.44	144.72	2318	144.47	2314
7	0.45	144.48	2315	144.05	2308
8	0.47	146.18	2342	145.15	2325
9	0.50	144.40	2313	142.81	2288
10	0.51	146.73	2351	146.09	2340
11	0.51	145.19	2326	145.40	2329
12	0.55	148.12	2373	146.81	2352
13	0.55	148.06	2372	146.83	2352
14	0.58	147.94	2370	139.77	2239
15	0.60	147.25	2359	145.93	2338
16	0.61	146.73	2351	144.63	2317
17	0.67	145.91	2337	145.65	2333
18	0.67	145.94	2338	140.30	2248
19	0.68	145.11	2325	142.75	2287
20	0.72	145.92	2338	143.29	2296
21	0.72	142.82	2288	142.20	2278
22	0.76	144.80	2320	140.63	2253

* Water-cement ratio by weight.
** Average of eight 6 x 12-in. (152 x 305-mm) cylinders.
*** Average of two 3.5 x 4 x 16-in. (89 x 102 x 406-mm) prisms.

TABLE 6

Summary of Strength Test Results

Mix No.	W/C*	Splitting-Tensile Strength*						28-Day Compressive Strength*		28-Day Flexural Strength**	
		28.5 hr Moist-cured		28.5 hr Accelerated		28-day Moist-cured					
		psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa
1	0.35	395	2.72	455	3.14	585	4.03	6170	42.5	1225	8.4
2	0.35	340	2.34	465	3.21	590	4.07	5520	38.1	1135	7.8
3	0.39	345	2.38	340	2.34	525	3.62	5270	36.3	845	5.9
4	0.39	345	2.38	325	2.24	555	3.83	4810	33.2	1060	7.3
5	0.44	315	2.17	315	2.17	470	3.24	3965	27.3	945	6.5
6	0.44	265	1.83	310	2.14	470	3.24	3855	26.6	880	6.1
7	0.45	220	1.52	325	2.24	510	3.52	4050	27.9	980	6.8
8	0.47	235	1.62	290	2.00	465	3.21	4045	27.9	860	5.9
9	0.50	110	0.76	250	1.72	505	3.48	3815	26.3	840	5.8
10	0.51	230	1.59	275	1.90	425	2.93	4015	27.7	790	5.4
11	0.51	215	1.48	295	2.03	475	3.27	3875	26.7	925	6.4
12	0.55	230	1.59	240	1.65	465	3.21	3670	25.3	885	6.1
13	0.55	195	1.34	265	1.83	490	3.38	3320	22.9	790	5.4
14	0.58	110	0.76	220	1.52	540	3.72	3770	26.0	810	5.6
15	0.60	159	1.10	225	1.55	455	3.14	3720	25.6	750	5.2
16	0.61	140	0.97	225	1.55	415	2.86	3275	22.6	775	5.3
17	0.61	135	0.93	185	1.28	410	2.83	3055	21.1	715	4.9
18	0.67	70	0.48	175	1.21	385	2.65	2615	18.0	650	4.5
19	0.68	115	0.79	185	1.28	380	2.62	2880	19.9	645	4.8
20	0.72	115	0.79	175	1.21	405	2.79	2860	19.7	695	4.8
21	0.72	75	0.52	175	1.21	390	2.69	2680	18.5	755	5.2
22	0.76	70	0.48	150	1.03	360	2.48	2925	20.2	605	4.2

* Average of two 6 x 12-in. (152 x 305-mm) cylinders.
** Average of two 3.5 x 4 x 16-in. (89 x 102 x 406-mm) prisms.

TABLE 7

Within-Batch Standard Deviations and Coefficients of Variation for Splitting-Tensile Strengths

Mix No.	W/C*	28½-hr Moist-Cured Strength**					28½-hr Accelerated Strength**					28-day Moist-Cured Strength**				
		Average Strength		S.D.+		C.V.++	Average Strength		S.D.+		C.V.++	Average Strength		S.D.+		C.V.++
		psi	MPa	psi	KPa	%	psi	MPa	psi	KPa	%	psi	MPa	psi	KPa	%
1	0.35	395	2.72	12	83	3.0	455	3.14	41	283	9.0	585	4.03	50	345	8.6
2	0.35	340	2.34	19	131	5.6	465	3.21	64	441	13.9	590	4.07	6	41	1.0
3	0.39	345	2.38	64	441	18.5	340	2.34	1	7	0.2	525	3.62	22	152	4.1
4	0.39	345	2.38	3	21	1.0	325	2.24	29	200	8.9	555	3.83	31	214	5.6
5	0.44	315	2.17	16	110	5.0	315	2.17	6	41	2.0	470	3.24	19	131	4.0
6	0.44	265	1.83	6	41	2.1	310	2.14	19	131	6.1	470	3.24	16	110	3.3
7	0.45	220	1.52	13	89	5.8	325	2.24	19	131	5.9	510	3.52	44	303	8.6
8	0.47	235	1.62	28	193	11.9	290	2.00	9	62	3.2	465	3.21	23	159	5.0
9	0.50	110	0.76	6	41	5.8	250	1.72	19	131	7.6	505	3.48	6	41	1.1
10	0.51	230	1.59	7	48	3.1	275	1.90	13	89	4.6	425	2.93	16	110	3.8
11	0.51	215	1.48	91	627	4.2	295	2.03	11	76	3.8	475	3.27	42	290	8.9
12	0.55	230	1.59	8	55	3.7	240	1.65	21	142	8.9	465	3.21	40	276	8.6
13	0.55	195	1.34	0	0	0	265	1.83	1	7	0.3	490	3.38	42	290	8.7
14	0.58	110	0.76	2	14	1.9	220	1.52	6	41	2.6	540	3.72	10	69	1.8
15	0.60	160	1.10	21	145	13.6	225	1.55	11	76	4.8	455	3.14	25	172	5.4
16	0.61	140	0.97	3	20	2.0	225	1.55	7	48	3.2	415	2.86	57	393	13.7
17	0.61	135	0.93	7	48	5.2	185	1.28	1	7	0.4	410	2.83	50	345	12.2
18	0.67	70	0.48	3	20	2.1	175	1.21	6	41	3.7	385	2.65	16	170	4.2
19	0.68	115	0.79	0	0	0	185	1.28	13	89	6.8	380	2.62	6	41	1.7
20	0.72	115	0.79	2	14	1.9	175	1.21	17	117	9.6	405	2.79	29	200	7.1
21	0.72	75	0.52	9	62	12.2	175	1.21	9	62	5.2	390	2.69	28	193	7.2
22	0.76	70	0.48	4	28	6.2	150	1.03	3	21	1.9	360	2.48	3	21	0.9

* Water-cement ratio by weight.
** Each value is average of two 6 x 12-in. (152 x 305-mm) cylinders.
\+ S.D. = Standard deviation.
++ C.V. = Coefficient of variation.

TABLE 8

Within-Batch Standard Deviation and Coefficients of Variation for Compressive and Flexural Strengths

Mix No.	W/C*	28-day Compressive Strength**					28-day Flexural Strength***				
		Average Strength		S.D.+		C.V.++	Average Strength		S.D.+		C.V.++
		psi	MPa	psi	KPa	%	psi	MPa	psi	KPa	%
1	0.35	6170	42.5	270	1862	4.3	1225	8.4	9	62	0.7
2	0.35	5520	38.1	398	2744	7.2	1135	7.8	39	269	3.4
3	0.39	5270	36.3	238	1641	4.5	845	5.9	3	21	0.3
4	0.39	4810	33.2	250	1724	5.2	1060	7.3	12	83	1.1
5	0.44	3965	27.3	375	2585	9.0	945	6.5	22	152	2.3
6	0.44	3855	26.6	151	1041	3.9	880	6.1	27	186	3.0
7	0.45	4050	27.9	275	1896	6.8	980	6.8	102	703	10.4
8	0.47	4045	27.9	378	2606	9.4	860	5.9	56	386	6.5
9	0.50	3815	26.3	64	441	1.7	840	5.8	8	55	1.0
10	0.51	4015	27.7	91	627	2.2	790	5.4	82	565	10.3
11	0.51	3875	26.7	100	689	2.6	925	6.4	29	200	3.1
12	0.55	3670	25.3	64	441	1.7	885	6.1	61	421	6.7
13	0.55	3320	22.9	392	2703	11.8	790	5.4	9	62	1.2
14	0.58	3770	26.0	138	951	3.6	810	5.6	1	7	0.2
15	0.60	3720	25.6	212	1462	5.7	750	5.2	13	90	1.7
16	0.61	3275	22.6	75	517	2.3	775	5.3	37	255	4.7
17	0.67	3055	21.1	221	1524	7.2	715	4.9	1	7	0.2
18	0.67	2615	18.0	7	48	0.2	650	4.5	9	62	1.4
19	0.68	2880	19.9	88	607	3.1	645	4.8	21	145	3.3
20	0.72	2860	19.7	15	103	0.5	695	4.8	23	159	3.4
21	0.72	2680	18.5	37	255	1.4	755	5.2	70	483	9.2
22	0.76	2925	20.2	76	524	1.9	605	4.2	16	110	2.7

* Water-cement ratio by weight.
** Each value is average of two 6 x 12-in. (152 x 305-mm) cylinders.
*** Each value is average of two 3.5 x 4 x 16 in. (89 x 102 x 406-mm) cylinders.
\+ Standard deviation.
++ Coefficient of variation.

TABLE 9

Summary of Regression Analysis of 28-Day Test Results

	Refer to Figure No.	Correlation Coefficient	Regression* Equation	Standard Error of Estimate	
				psi	MPa
Accelerated splitting-tensile strength - 28.5 hours, versus moist-cured splitting-tensile strength - 28.5 hours	1	0.91	$Y_1 = 1.07 \times -84$ psi	43	0.3
Accelerated splitting-tensile strength 28.5 hours versus moist-cured splitting-tensile strength, - 28 days	2	0.86	$Y_2 = 0.67 \times +288$ psi	35	0.25
Accelerated splitting-tensile strength 28.5 hours versus moist-cured compressive strength - 28 days	3	0.94	$Y_3 = 10.3 \times +1088$ psi	333	2.3
Accelerated splitting-tensile strength 28.5 hours versus moist-cured flexural strength - 28 days	4	0.93	$Y_4 = 1.7 \times +385$ psi	59	0.39

* X = 28.5 hours accelerated splitting-tensile strength.
Y_1 = 28.5 hours moist-cured splitting-tensile strength.
Y_2 = 28 days moist-cured splitting-tensile strength.
Y_3 = 28 days moist-cured compressive strength.
Y_4 = 28 days moist-cured flexural strength.

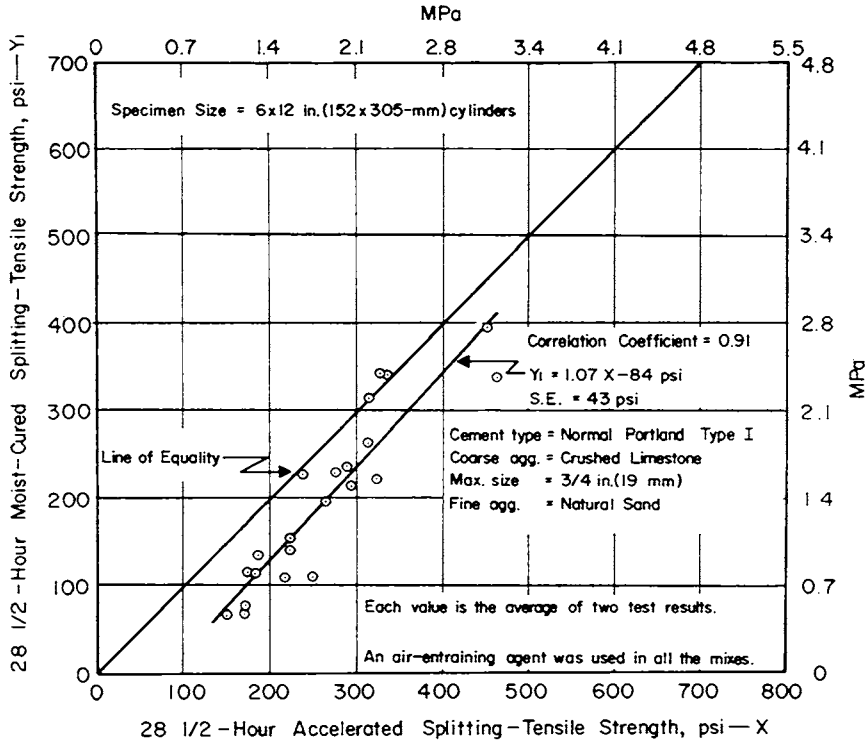

Fig. 1--Relationship between 28.5-hr accelerated splitting tensile strength and 28.5-hr moist-cured splitting tensile strength

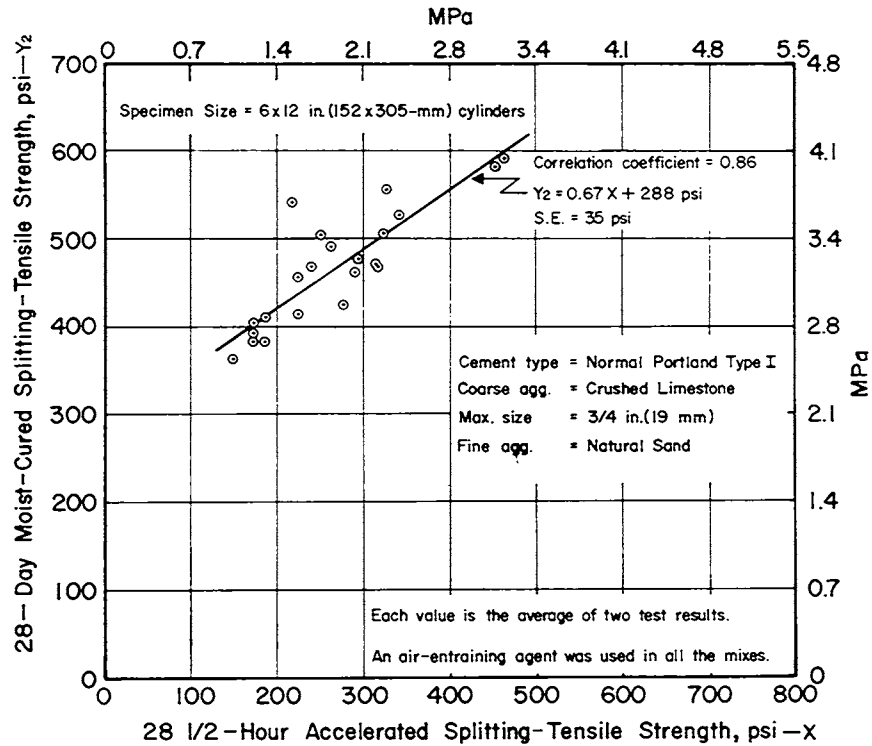

Fig. 2--Relationship between 28.5-hr accelerated splitting tensile strength and 28-day moist-cured splitting tensile strength

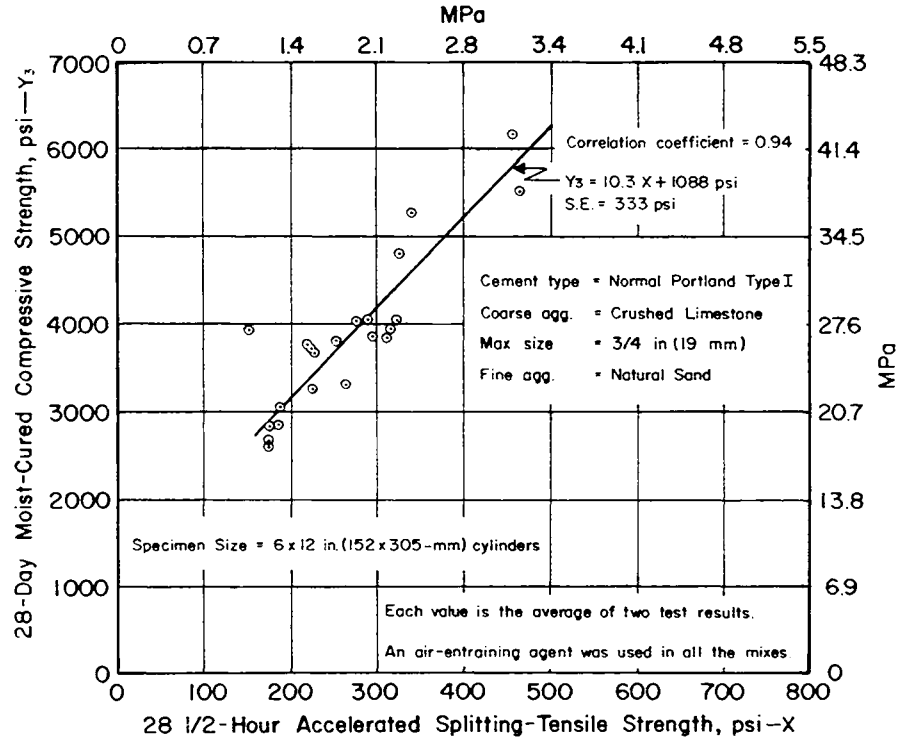

Fig. 3--Relationship between 28.5-hr accelerated splitting tensile strength and 28-day moist-cured compressive strength

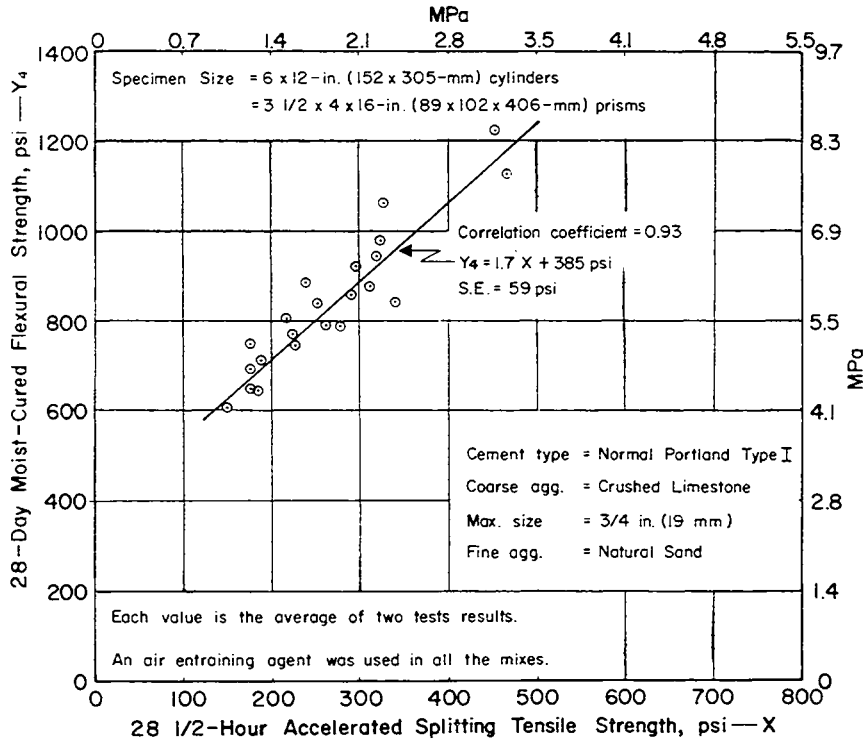

Fig. 4--Relationship between 28.5-hr accelerated splitting tensile strength and 28-day moist-cured flexural strength