Strip A at Centre

As there is no reading on the concrete for strip A at the centre, we cannot find the moment of inertia of this section.

By reference to Table 3 it will be noted that for the points of negative bending moment in strips A and B there is a fairly good agreement between the results obtained by test and those computed by the bending moments specified in the various codes, making allowance for tension in the concrete.

There is not a good agreement between the results obtained at the one point of positive bending moment for which readings were given so that I could be found.

	Strip A at edge of Capital		Strip A at Center	Strip B at centre				Strip B at ℄ of Cols	
Reading No.	710, 713, 717	601, 607, 614	656	657-8	659-60	785-6	800-1	784	583
Stress in	Steel	Concrete	Steel	Steel	Steel	Conc.	Conc.	Steel	Conc.
Chicago Code	5020	-357	855	750	750	-200	-200	2890	-176
Philadelphia Code	5300	-377	727	900	900	-185	-185	2240	-151
Joint Comm'te Report	6150	-428	1231	483	483	-180	-180	3460	-210
Test	4230	-476	3860	7175	1847	-645	-622	3960	-319

Table 3—Comparison of Stresses for Live and Dead Loads Combined According to Various Codes, with Those Found by Test Using the Section Modulus Determined by Deformation Readings

This may possibly be partly due to the fact that the adjacent panels were not loaded, which would have the effect of increasing the positive moments in the loaded panels.

Moments which correspond to results found by test:—

$M_r = -\dfrac{WL}{29}$

$M_b =$ (could not be determined).

$M_c = \dfrac{WL}{44}$ A large variation partly due, no doubt, to adjoining panels not being loaded.

$M_s = \dfrac{WL}{77}$

THE QUESTION OF UNBALANCED THRUST

By Peter Gillespie, M.Can.Soc.C.E.

NO other type of reinforced concrete construction has appealed to the building public or has caught the popular fancy as has that commonly described as the flat slab or girderless floor. The resulting economy in story heights, the simplified form construction, the unbroken ceilings and the ease with which auxiliary equipment as, for example, sprinkler systems, can be installed have all contributed to that popularity. But while these advantages have been generally recognized, the difficulties attending the rational design of flat slab structures have also been appreciated because this type does not lend itself to either simple or satisfactory theoretical treatment. Recognizing this, public-spirited firms and organizations have provided facilities whereby tests of full-size buildings have been made with a view to studying the behavior of floors under load and thereby formulating empirical rules for the design of flat slabs which, when constructed, would be safe without being wasteful. These tests have usually consisted in applying to the floor a live load equal to or exceeding that for which the structure was built and then measuring the deflections and the deformations in the steel and concrete at certain selected places in order to determine the intensity of the stress resulting. From the

Gage Line	135# on 4 panels	270# on 4 panels	270# on 2 panels	Load Removed	Gage Line	135# on 4 panels	270# on 4 panels	270# on 2 panels	Load Removed
580	±0.0	-2.4	-3.7	-3.7	650	-2.2	-2.8	-3.4	-1.5
581	-1.8	-2.9	-3.0	-5.0	651				
582	-0.5	-1.5	-5.2	-4.6	652	-1.3	-2.7	-3.8	-2.1
583	+2.0	-0.9	+1.0	-1.2	653	-1.8	-2.7	-4.3	-2.7
584	-3.5	-6.0	-6.1	-7.0	654	-2.1	-3.2	-4.8	-3.5
585	-1.5	-2.8	-4.7	-1.2	655	-1.6	-1.8	-3.2	-2.9
586	Cancelled	— —	—	—	656	+2.8	+5.2	+4.0	+0.1
587	-0.6	-2.2	-3.2	-2.2	657	+5.3	+9.7	+15.1	-0.4
588	-0.9	-1.4	-2.7	-3.2	658	+5.2	+11.6	+1.3	+2.1
589	-1.0	+2.0	+0.3	-3.0	659	+1.1	+4.8	+5.6	+4.4
590	-0.9	0.0	-1.0	-3.1	660	+1.6	+4.8	+6.6	+3.3
591	-2.0	-2.2	-3.1	-4.6	661	+0.9	+2.2	+3.3	+3.3
592	-4.7	-10.1	-9.1	-6.9	662	+4.7	+13.5	+16.5	+8.8
593	-3.0	-5.1	-5.7	-5.9	663	+5.6	+18.1	+1.8	+1.6
594	-3.5	-3.8	-4.9	-4.9	664	+2.0	+11.2	+3.0	-1.5
595	-3.6	-6.0	-6.3	-6.2	665	+2.0	+10.2	+2.6	+1.1
596	-5.9	-6.4	-5.1	-7.1	666	+1.3	+7.5	+5.6	+1.7
597	-3.9	-2.5	-3.2	-5.2	667	+1.3	+12.1	+13.8	+8.0
598	-1.0	-1.2	-1.7	-0.9	668	+1.7	+7.8	+9.3	+5.7
599	-3.4	-3.4	-4.2	-3.2	669	+1.0	+3.1	+3.1	+1.7
600					670	-3.8	-8.2	-8.5	-7.0
601	-1.1	-4.4	-5.1	-5.8	671	-2.2	-3.0	-4.9	-2.6
602	-4.1	-8.7	-7.5	-6.5	672	-4.1	-4.0	-6.0	-4.1
603	-2.6	-5.2	-5.3	-6.1	673	-2.9	-2.0	-2.3	-2.2
604	-1.0	-2.0	-2.2	-4.2	674	-2.2	-2.7	-3.6	-1.6
605	+0.4	-1.6	-1.8	-3.0	675	-4.2	-5.5	-5.9	-5.0
606	-1.6	-4.0	-4.9	-6.2	676	-5.3	-8.1	-9.3	-4.7
607	-4.2	-9.9	-11.0	-8.0	677	-2.1	-2.8	-3.0	-3.0
608	-3.4	-5.0	-6.4	-5.4	678	-5.5	-12.4	-13.2	-7.6
609	-5.4	-10.5	-11.7	-7.4	679	-3.8	-6.7	-7.8	-3.7
610	-1.6	-1.5	-1.3	-3.9	680	-5.0	-6.9	-7.5	-4.0
611	-2.8	-5.7	-5.9	-5.6	681	-4.0	-3.9	-3.9	-3.1
612	-2.7	-2.5	-3.7	-5.0	682	-0.1	-0.8	-0.8	-1.8
613	-1.4	-2.5	-3.9	-5.9	683	-1.9	-3.1	-3.0	-1.5
614	-3.5	-6.5	-7.5	-7.4	684				
615	-7.2	-13.1	-13.9	-9.7	685				
616	-1.3	-3.6	-3.8	-4.6	686	-0.6	-0.2	-0.2	-1.2
617	-3.8	-11.2	-12.2	-8.4	687	-0.6	+1.3	+1.8	-0.8
618	-2.5	-6.9	-8.5	-6.2	688	-5.1	-5.7	-7.4	-5.8
619	-5.2	-9.5	-10.0	-6.6	689	-3.5	-4.8	-5.0	-7.1
620	-0.4	-3.4	-5.0	-5.2	690	-3.5	-4.1	-5.1	-6.1
621	-0.1	-0.9	-1.9	-4.4	691	-3.7	-5.3	-6.3	-4.5
622	+0.4	+0.2	-0.5	-3.7	692	-6.4	-10.7	-11.4	-8.3
623	-1.9	-5.4	-3.9	-4.5	693	-5.5	-7.1	-7.8	-7.4
624	-6.8	-11.8	-9.7	-7.2	694	-6.5	-8.7	-10.1	-6.8
625	-1.2	-3.6	-3.1	-4.8	695	-2.1	-1.9	-3.4	-5.8
626	+0.8	+0.5	+0.7	-2.5	696	-4.9	-5.4	-5.2	-4.8
627	-0.6	-1.1	-3.1	-1.9	697	-2.4	-2.5	-4.2	-4.2
628	-2.2	-4.0	-4.3	-3.2	698	-2.2	-2.3	-2.7	-5.1
629	0.0	-1.8	-2.5	-2.0	699	-0.4	+0.2	+0.3	-2.2
630	-1.5	-2.1	-2.2	-2.2	701	+0.9	+1.1	-1.1	-1.1
631	-3.6	-4.5	-4.0	-4.0	702	+3.6	+6.2	+3.0	+1.5
632	-1.5	-8.5	-10.6	-4.0	703	+2.2	+3.4	+1.6	-1.4
633	-3.9	-5.3	-6.5	-2.4	704	+2.2	+4.9	+4.4	+2.5
634	-5.5	-11.4	-12.5	-5.3	705	+1.0	+3.2	+1.5	+1.2
635	-0.1	-0.3	-1.0	-1.7	706	+0.3	+2.0	+0.1	-1.2
636	-2.0	-5.0	-5.1	-2.0	707	+3.0	+4.7	+3.9	+2.1
637	-0.6	-1.1	-1.1	-1.0	708	+3.0	+4.1	+2.0	+0.5
638	-1.8	-3.3	-2.6	-1.8	709		+7.7	+1.6	-1.0
639	-4.0	-4.2	-5.2	-3.4	710	+4.3	+5.7	+3.1	+1.8
640	-1.8	-4.2	-4.9	-3.4	711	+1.4	+3.2	+1.2	+0.4
641	-2.8	-4.9	-6.2	-3.8	712	+2.9	+6.7	+6.0	+0.7
642	-2.7	-4.0	-5.5	-1.7	713	+3.4	+7.0	+7.1	+1.6
643	-3.0	-9.3	-11.4	-4.0	714	+6.3	+10.3	+9.9	+3.9
644	-4.0	-2.1	-3.3	-3.5	715	+0.2	+4.5	+1.2	-0.5
645	-3.9	-10.5	-10.4	-4.6	716	+3.8	+2.5	+4.5	-1.4
646	-3.2	-6.3	-7.8	-4.9	717	+1.5	+3.5	+5.3	+0.4
647	-4.1	-8.9	-9.9	-4.5	718				
648	-2.5	-4.1	-6.0	-3.0	719	+5.1	+9.1	+8.6	+3.6
721	+5.3	+8.3	+10.0	+1.9	764	+0.6	+8.7	+7.7	-1.0
722	+1.0	+5.0	+2.8	+0.5	765	+0.9	+0.8	+0.2	-4.5
723	+1.1	+3.4	+2.3	+1.2	766	+0.6	+1.7	-0.8	-3.1
724	+0.8	+1.5	-0.1	-1.5	767	0.0	+2.8	+0.5	-0.1
725	+0.7	+1.3	+1.0	-1.0	768	+0.4	+3.7	+0.9	+0.4
726					769	+2.0	+4.6	+4.5	+0.9
727	+1.8	+1.1	+0.4	+0.3	770	+5.6	+12.6	+12.4	+4.8
728	-0.3	+0.7	+1.3	-0.7	771	+2.9	+6.4	+6.0	+2.5
729	+3.2	+5.2		+5.1	772				
730	+0.7	+4.1	+3.3	+1.7	773	+0.7	+1.7	+0.6	-1.5
731	+1.8	+3.9	+2.1	-0.8	774	+1.8	+3.3	+1.3	-2.2
732	+1.4	+2.6	+2.9	-0.4	775	+2.2	+2.6	+1.2	+0.3
733	+4.6	+10.8	+11.0	+4.2	776	+1.7	+0.5	+2.7	-1.3
734	+5.2	+10.9	+11.3	+3.6	777	+1.0	+7.2	+3.8	+1.7
735	+5.1	+8.9	+9.0	+4.7	778	+6.9	+12.9	+7.9	+4.8
736	+2.0	+6.3	+6.0	-1.6	779	+2.0	+5.3	+4.0	+2.6
737	-0.1	+2.8	+2.7	-1.8	780	+3.0	+5.3	+3.3	+3.5
738	-0.7	+2.1	+2.5	-3.4	781	+1.6	+4.2	+2.2	+0.1
739	+3.1	+7.9	+8.3	-1.0	782	-1.6	-2.9	-2.2	-3.1
740	+3.1	+6.4	+7.7	+1.7	783	-3.0	-5.0	-3.5	-4.4
741	+5.0	+9.0	+9.4	+2.6	784	+2.9	+4.3	+1.9	+1.1
742	+3.9	+8.4	+8.3	+1.8	785	-3.6	-3.6	-3.6	-3.1
743	+5.6	+7.6	+7.6	+4.8	786	-4.5	-6.9	-4.3	-4.8
744	+3.4	+5.4	+8.4	+2.9	787	-0.5	+0.9	0.0	-1.3
745	-1.4	+1.8	-1.2	-1.4	788	+0.4	+3.0	+1.3	-0.5
746					789	+2.0	+2.1	+1.5	+1.3
747	-0.2	+6.1	+5.6	+4.9	790	+1.1	+1.7	+1.0	-1.0
748	-0.1	+1.8	+0.9	-2.1	791	+1.4	+4.1	+2.5	+0.7
749	+0.1	+1.6	+0.1	-2.1	792	+1.9	+3.9	+1.8	-0.5
750	-1.0	-1.4	-1.4	-2.6	793	+0.5	+3.8	+1.4	-1.0
751	+0.5	+0.9	+1.7	-0.8	794	+2.7	+4.9	+2.5	+1.3
752	-2.0	-2.0	-1.8	-2.9	795	-0.4	+3.0	+0.5	-2.9
753	+0.2	+5.0	+5.9	+0.3	796	0.0	+2.5	+1.3	-2.1
754	+2.7	+7.0	+8.2	+2.6	797	+2.4	+2.9	+1.7	-0.7
755	+2.2	+3.3	+4.9	+0.5	798	+0.2	+0.9	-0.8	-2.5
756	-0.1	-0.2	-0.7	-3.1	799	+0.7	+3.8	+1.4	-0.8
757	+1.3	+3.4	+4.0	+0.8	800	-4.3	-6.5	-9.0	-6.1
758	-0.5	+1.6	+1.3	-1.6	801	-3.5	-6.4	-6.9	-7.2
759	+0.8	-0.2	-0.7	-3.7	802	+0.3	-0.7	-1.7	+0.2
760	+0.7	-1.1	-0.9	-1.8	803	-1.9	-5.7	-7.6	-4.4
761					804	-2.6	-8.2	-13.2	-8.5
762	0.0	-0.7	+0.3	-1.0	805	-1.1	-2.0	-2.1	-1.8
763	0.0	+1.3	+0.2	-1.5	806	+6.0	+15.0	+11.0	+5.3

+ = TENSION — = COMPRESSION

Note—Deformation readings are multiplied 5000 times. Also, the deformations are for a distance of 8 inches, so for actual unit deformations figures given should be divided by 40,000.

Table 4—Extensometer Readings of Deformation Caused by Live Loads