CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS
DOMINION OBSERVATORIES

PUBLICATIONS

OF THE

Dominion Observatory

OTTAWA

VOLUME XVIII No. 6

TABLES OF EXTENDED DISTANCES FOR S, SS and sS

BY

J. H. Hodgson, J. F. J. Allen and J. Irma Cock

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1956

600—1956

Tables of Extended Distances for S, SS and sS

BY

J. H. Hodgson, J. F. J. Allen and J. Irma Cock

ABSTRACT

Tables of extended distances, consistent with those already published for the P phases, are presented for those S phases which are likely to be useful in fault-plane studies. As in earlier papers, the extended distances are given for surface focus, and for focal depths from 0·00R to 0·12R in steps of 0·1R.

INTRODUCTION

For the past several years this Observatory has been studying the direction of faulting in earthquakes. To date these studies have made use only of P waves or their derivatives, and for this reason unique solutions have not been obtained. Instead the solutions define a pair of orthogonal planes, without indicating which of these represents the fault.

It has long been recognized that this ambiguity could be resolved through the use of shear waves. The difficulties in this work are several. It is frequently very difficult to identify the beginning of S with certainty, and even if this can be done it is often impossible to determine the direction of first motion. Nevertheless, considering the interest which attaches to the result, one often wishes to attempt the use of shear waves. The tables of extended distances for S, SS and sS here presented should facilitate these experiments. It seems doubtful that waves with more complicated history will be useful due to the uncertainty of the phase relationships on reflection.

THEORY

Extended Distances for S

The work of this section is closely analagous to that of an earlier paper (Hodgson and Allen, 1954a) in which extended distances were obtained for PKP. In that earlier paper the formula was developed:

$$\sin i_d = \frac{r_s}{r_d} \cdot \frac{v_d}{111{\cdot}11} \cdot \frac{dt}{d\Delta} \; ; \tag{1}$$

where

i_d = angle between ray and radius vector at the focus, such that extended distance = cot i_d,

r_s = radius of the earth, measured in km.,

r_d = radius of an earth stripped to focus of depth d, measured in km.,

v_d = velocity of wave propagation at focus of depth d, measured in km/sec.

$dt/d\Delta$ = slope of the travel time wave, measured in seconds/1°.

63256—1½

In the earlier application of this formula $dt/d\Delta$ was determined from the surface focus curve at an epicentral distance $\delta + \Delta$ (*see* Figure 1). It was then necessary to determine the value of δ, which was very complicated. It is clear that we may work much more simply in applying formula (1) by evaluating $dt/d\Delta$ at distance Δ on the travel time curve appropriate to depth d.

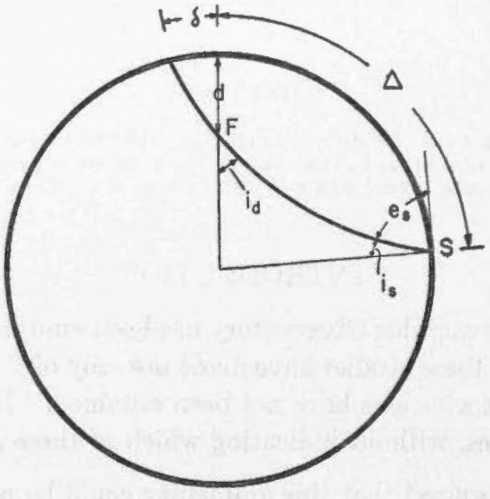

FIGURE 1

In evaluating equation (1) the radii and velocities shown in Table I have been used. These have been taken from Jeffreys (1939). $dt/d\Delta$ have been determined from the appropriate curves of the Jeffreys-Bullen tables (1940).

TABLE I

Depth	Radius (km)	Velocity (km/sec.)
Surface	6371	4·35
0·00	6338	4·353
0·01	6275	4·444
0·02	6211	4·539
0·03	6148	4·638
0·04	6084	4·741
0·05	6021	4·850
0·06	5958	4·962
0·07	5894	5·227
0·08	5831	5·463
0·09	5768	5·670
0·10	5704	5·850
0·11	5641	6·002
0·12	5577	6·125

Extended distances for S will be found in Table II, (pages 106 to 108). As is usual in these tables a negative extended distance indicates that the ray reaching that point is a rising one. Such stations are plotted at an azimuth exactly opposite to their true one.

Extended Distances for SS and sS

The method used in deriving extended distances for these phases is exactly the same as that used in the case of PP and pP, (Hodgson and Allen, 1954b). Sets of related points A, B at epicentral distances Δs, ΔS, must first be determined from the S tables of extended distance, such that they have extended distances numerically identical but

opposite in sign. Then the sums

$$\Delta SS = 2\Delta S + \Delta s$$

and

$$\Delta sS = \Delta S + 2\Delta s \ ,$$

are formed. The extended distance of an S at ΔS is the same as that of an SS at ΔSS; the extended distance of an S at Δs and of an sS at ΔsS is the negative of this.

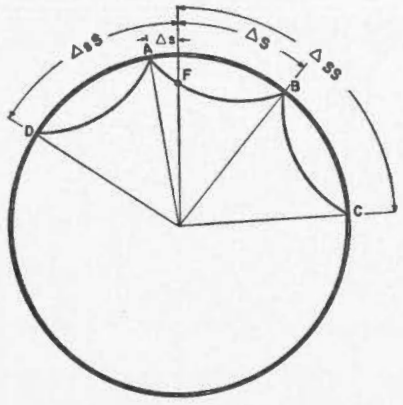

FIGURE 2

Each extended distance selected yields a set of related points and associate distances ΔSS and ΔsS. By selecting enough points curves are constructed which may be entered at even values of ΔSS, ΔsS.

The results of this work will be found in Table III, pages 109 to 113, which gives extended distances for SS, and in Table IV, pages 114 to 116, which gives extended distance for sS. In the latter case, since sS derives from an upward rising ray, the extended distances are all negative.

REFERENCES

Hodgson, J. H., and Allen, J. F. J.,

1954a "Tables of Extended Distances for PKP and PcP", *Publications of the Dominion Observatory*, 16, 327-348.

1954b "Tables of Extended Distances for PP and pP", *Publications of the Dominion Observatory*, 16, 349-362.

Jeffreys, H.,

1939 "Times of P, S and SKS, and Velocities of P and S", *Mon. Not. Royal Astron. Soc., Geophys. Suppl.*, 4, 498-533.

Jeffreys H., and Bullen, K. E.,

1940 *Seismological Tables*, (Brit. Assoc. Adv. Sci.).

TABLE II

Extended Distances for S

Δ	*Depth h =*													
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
0·0	0·000	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞
0·5	0·033	−0·740	−1·600	−2·733	−3·655	−4·548	−5·850	−6·612	−7·207	−7·700	−9·357	−10·02	−10·39	−11·20
1·0	0·059	−0·408	−0·851	−1·303	−1·819	−2·300	−2·840	−3·312	−3·732	−3·867	−4·705	−4·915	−5·193	−5·671
1·5	0·081	−0·198	−0·575	−0·839	−1·230	−1·600	−1·881	−2·205	−2·488	−2·619	−3·060	−3·251	−3·511	−3·812
2·0	0·097	−0·045	−0·272	−0·603	−0·885	−1·142	−1·397	−1·651	−1·834	−1·980	−2·225	−2·402	−2·660	−2·888
2·5	0·112	−0·024	−0·112	−0·449	−0·669	−0·875	−1·095	−1·299	−1·433	−1·576	−1·732	−1·921	−2·116	−2·322
3·0	0·125	0·013	−0·061	−0·358	−0·532	−0·711	−0·894	−1·069	−1·175	−1·294	−1·407	−1·588	−1·732	−1·897
3·5	0·137	0·051	−0·035	−0·296	−0·420	−0·584	−0·737	−0·894	−0·983	−1·084	−1·183	−1·327	−1·450	−1·576
4·0	0·149	0·085	−0·019	−0·240	−0·342	−0·471	−0·625	−0·754	−0·833	−0·916	−1·014	−1·126	−1·235	−1·347
4·5	0·160	0·111	−0·005	−0·176	−0·281	−0·392	−0·534	−0·649	−0·703	−0·776	−0·875	−0·969	−1·069	−1·183
5·0	0·169	0·132	0·024	−0·128	−0·235	−0·337	−0·456	−0·587	−0·589	−0·657	−0·759	−0·842	−0·933	−1·057
5·5	0·180	0·148	0·056	−0·089	−0·194	−0·291	−0·386	−0·496	−0·499	−0·552	−0·647	−0·737	−0·827	−0·952
6·0	0·189	0·162	0·077	−0·056	−0·158	−0·247	−0·325	−0·410	−0·418	−0·471	−0·550	−0·644	−0·737	−0·863
6·5	0·200	0·175	0·096	−0·028	−0·121	−0·205	−0·275	−0·348	−0·352	−0·404	−0·468	−0·563	−0·654	−0·778
7·0	0·209	0·187	0·114	0·000	−0·079	−0·166	−0·229	−0·294	−0·294	−0·340	−0·394	−0·499	−0·577	−0·700
7·5	0·218	0·200	0·130	0·040	−0·028	−0·128	−0·189	−0·253	−0·246	−0·279	−0·329	−0·431	−0·507	−0·618
8·0	0·229	0·213	0·146	0·072	0·024	−0·095	−0·153	−0·216	−0·203	−0·224	−0·272	−0·346	−0·437	−0·538
8·5	0·239	0·225	0·162	0·096	0·058	−0·061	−0·103	−0·182	−0·164	−0·175	−0·224	−0·272	−0·382	−0·452
9·0	0·250	0·238	0·176	0·117	0·080	−0·031	−0·062	−0·148	−0·125	−0·132	−0·180	−0·216	−0·342	−0·378
9·5	0·260	0·251	0·193	0·135	0·102	0·000	−0·022	−0·114	−0·084	−0·095	−0·144	−0·176	−0·300	−0·323
10·0	0·272	0·264	0·205	0·153	0·117	0·028	−0·019	−0·079	−0·042	−0·061	−0·112	−0·142	−0·235	−0·281
10·5	0·284	0·277	0·220	0·169	0·133	0·058	0·056	−0·042	0·000	−0·031	−0·082	−0·110	−0·153	−0·244
11·0	0·297	0·291	0·235	0·185	0·149	0·084	0·096	0·000	0·042	0·000	−0·054	−0·080	−0·114	−0·211
11·5	0·310	0·304	0·249	0·200	0·166	0·110	0·137	0·164	0·082	0·035	−0·026	−0·054	−0·082	−0·180
12·0	0·324	0·319	0·264	0·216	0·180	0·133	0·193	0·231	0·125	0·070	0·000	−0·026	−0·052	−0·151
12·5	0·338	0·333	0·279	0·233	0·198	0·158	0·236	0·277	0·166	0·103	0·037	0·000	−0·026	−0·123
13·0	0·352	0·346	0·296	0·249	0·214	0·182	0·275	0·313	0·205	0·137	0·072	0·028	0·000	−0·096
13·5	0·367	0·362	0·313	0·266	0·233	0·203	0·311	0·344	0·244	0·167	0·107	0·058	0·023	−0·070
14·0	0·384	0·378	0·329	0·283	0·251	0·225	0·348	0·376	0·279	0·200	0·139	0·086	0·047	−0·047
14·5	0·400	0·392	0·346	0·302	0·272	0·247	0·384	0·404	0·313	0·231	0·169	0·112	0·070	−0·023
15·0	0·416	0·408	0·366	0·321	0·291	0·268	0·427	0·435	0·346	0·259	0·198	0·137	0·093	0·000
15·5	0·433	0·424	0·384	0·338	0·313	0·289	0·466	0·462	0·378	0·287	0·227	0·160	0·114	0·017
16·0	0·450	0·441	0·404	0·360	0·338	0·380	0·501	0·490	0·408	0·315	0·255	0·184	0·135	0·035
16·5	0·466	0·458	0·424	0·382	0·368	0·552	0·534	0·518	0·439	0·342	0·281	0·205	0·157	0·052
17·0	0·484	0·475	0·447	0·406	0·414	0·582	0·566	0·547	0·468	0·370	0·308	0·225	0·175	0·068
17·5	0·502	0·492	0·471	0·433	0·557	0·610	0·594	0·575	0·494	0·396	0·333	0·246	0·193	0·086
18·0	0·518	0·510	0·499	0·516	0·632	0·640	0·622	0·603	0·518	0·422	0·354	0·264	0·209	0·102
18·5	0·532	0·527	0·534	0·608	0·682	0·669	0·649	0·632	0·541	0·445	0·374	0·283	0·224	0·117
19·0	0·548	0·545	0·584	0·682	0·713	0·700	0·677	0·657	0·561	0·466	0·394	0·300	0·236	0·132
19·5	0·569	0·566	0·698	0·745	0·748	0·729	0·705	0·680	0·582	0·486	0·410	0·317	0·249	0·146
20	0·612	0·695	0·784	0·801	0·778	0·756	0·732	0·700	0·601	0·503	0·424	0·333	0·262	0·158
21	0·838	0·882	0·875	0·863	0·836	0·810	0·778	0·737	0·632	0·536	0·452	0·362	0·283	0·185
22	0·953	0·952	0·942	0·920	0·888	0·842	0·818	0·770	0·662	0·561	0·475	0·390	0·302	0·203
23	1·024	1·018	1·000	0·966	0·929	0·888	0·848	0·798	0·687	0·587	0·496	0·408	0·317	0·216
24	1·094	1·080	1·046	1·000	0·962	0·923	0·875	0·821	0·708	0·606	0·512	0·422	0·329	0·231

TABLE II—*Continued*

Extended Distances for S

Δ	*Depth h =*													
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
25	1·140	1·134	1·087	1·032	0·990	0·952	0·897	0·842	0·727	0·622	0·527	0·435	0·340	0·249
26	1·172	1·171	1·118	1·061	1·011	0·972	0·916	0·860	0·743	0·637	0·538	0·441	0·348	0·266
27	1·202	1·200	1·146	1·091	1·028	0·983	0·933	0·875	0·756	0·647	0·547	0·452	0·360	0·283
28	1·228	1·222	1·167	1·111	1·046	0·997	0·942	0·885	0·767	0·654	0·557	0·460	0·374	0·300
29	1·249	1·244	1·183	1·126	1·065	1·007	0·949	0·894	0·776	0·662	0·568	0·473	0·392	0·319
30	1·266	1·257	1·196	1·142	1·080	1·018	0·959	0·900	0·781	0·667	0·577	0·486	0·410	0·338
31	1·280	1·271	1·205	1·154	1·091	1·028	0·969	0·910	0·790	0·677	0·589	0·499	0·429	0·358
32	1·292	1·285	1·213	1·163	1·103	1·039	0·979	0·920	0·795	0·687	0·601	0·516	0·447	0·380
33	1·302	1·294	1·226	1·171	1·111	1·050	0·990	0·929	0·804	0·700	0·615	0·534	0·464	0·400
34	1·310	1·299	1·235	1·183	1·122	1·061	1·003	0·939	0·816	0·716	0·630	0·550	0·481	0·420
35	1·315	1·308	1·248	1·192	1·134	1·072	1·014	0·952	0·830	0·732	0·642	0·566	0·499	0·439
36	1·321	1·317	1·257	1·205	1·146	1·087	1·028	0·966	0·845	0·748	0·657	0·582	0·514	0·456
37	1·330	1·327	1·271	1·217	1·159	1·099	1·043	0·983	0·860	0·765	0·672	0·598	0·527	0·475
38	1·347	1·342	1·285	1·230	1·175	1·111	1·057	0·997	0·879	0·781	0·685	0·615	0·543	0·492
39	1·363	1·356	1·299	1·244	1·188	1·126	1·072	1·011	0·894	0·795	0·700	0·630	0·559	0·507
40	1·389	1·371	1·313	1·257	1·205	1·142	1·087	1·025	0·910	0·810	0·716	0·647	0·573	0·523
41	1·398	1·387	1·332	1·275	1·222	1·159	1·099	1·043	0·923	0·824	0·729	0·662	0·587	0·538
42	1·414	1·402	1·347	1·294	1·235	1·175	1·115	1·057	0·939	0·839	0·745	0·677	0·603	0·552
43	1·432	1·418	1·366	1·303	1·248	1·188	1·130	1·072	0·952	0·851	0·759	0·690	0·618	0·568
44	1·448	1·433	1·376	1·317	1·262	1·205	1·146	1·084	0·966	0·866	0·773	0·705	0·632	0·582
45	1·466	1·450	1·392	1·332	1·275	1·222	1·159	1·099	0·979	0·879	0·787	0·719	0·647	0·596
46	1·481	1·466	1·407	1·347	1·294	1·235	1·175	1·115	0·993	0·891	0·801	0·732	0·662	0·610
47	1·497	1·488	1·423	1·361	1·308	1·248	1·188	1·126	1·007	0·907	0·816	0·748	0·677	0·625
48	1·512	1·505	1·439	1·376	1·322	1·262	1·205	1·142	1·021	0·920	0·830	0·762	0·692	0·640
49	1·527	1·517	1·455	1·397	1·337	1·275	1·217	1·154	1·036	0·933	0·845	0·776	0·705	0·654
50	1·541	1·534	1·471	1·412	1·351	1·289	1·230	1·167	1·050	0·946	0·860	0·790	0·721	0·669
51	1·556	1·546	1·483	1·428	1·366	1·303	1·248	1·183	1·065	0·959	0·875	0·804	0·737	0·685
52	1·572	1·564	1·499	1·444	1·381	1·317	1·262	1·196	1·080	0·972	0·888	0·818	0·751	0·700
53	1·589	1·582	1·517	1·460	1·397	1·332	1·275	1·209	1·095	0·990	0·904	0·833	0·767	0·716
54	1·605	1·600	1·534	1·477	1·412	1·347	1·289	1·226	1·111	1·003	0·920	0·851	0·784	0·735
55	1·622	1·613	1·552	1·494	1·428	1·361	1·303	1·239	1·126	1·018	0·936	0·866	0·801	0·751
56	1·639	1·632	1·570	1·505	1·444	1·376	1·322	1·257	1·142	1·036	0·952	0·882	0·818	0·767
57	1·656	1·651	1·582	1·522	1·460	1·397	1·337	1·271	1·159	1·054	0·969	0·897	0·836	0·784
58	1·673	1·671	1·600	1·540	1·477	1·412	1·351	1·289	1·175	1·072	0·986	0·913	0·854	0·804
59	1·692	1·684	1·619	1·558	1·494	1·433	1·371	1·308	1·188	1·087	1·003	0·929	0·869	0·821
60	1·712	1·704	1·638	1·576	1·517	1·450	1·387	1·322	1·205	1·107	1·021	0·946	0·888	0·839
61	1·732	1·725	1·658	1·594	1·534	1·471	1·407	1·342	1·222	1·126	1·039	0·966	0·907	0·857
62	1·752	1·746	1·678	1·613	1·552	1·488	1·428	1·361	1·239	1·146	1·057	0·983	0·923	0·875
63	1·771	1·767	1·698	1·632	1·576	1·511	1·444	1·381	1·257	1·163	1·076	1·000	0·942	0·894
64	1·794	1·789	1·725	1·658	1·594	1·534	1·466	1·402	1·275	1·183	1·095	1·018	0·962	0·913
65	1·819	1·811	1·746	1·678	1·619	1·552	1·488	1·423	1·299	1·200	1·115	1·036	0·979	0·929
66	1·844	1·834	1·767	1·698	1·638	1·570	1·511	1·444	1·317	1·222	1·134	1·054	0·997	0·949
67	1·868	1·857	1·789	1·725	1·664	1·594	1·534	1·466	1·337	1·244	1·150	1·076	1·018	0·969
68	1·889	1·881	1·819	1·753	1·691	1·619	1·558	1·488	1·361	1·262	1·171	1·095	1·036	0·990
69	1·909	1·905	1·842	1·775	1·711	1·638	1·576	1·511	1·381	1·285	1·192	1·115	1·057	1·007

TABLE II—*Concluded*

Extended Distances for S

Δ	*Depth h =*													
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
70	1·930	1·929	1·865	1·797	1·732	1·664	1·600	1·534	1·407	1·303	1·209	1·134	1·076	1·028
71	1·956	1·954	1·889	1·827	1·760	1·684	1·625	1·558	1·428	1·322	1·230	1·159	1·095	1·050
72	1·985	1·980	1·913	1·849	1·782	1·711	1·651	1·582	1·450	1·342	1·248	1·179	1·115	1·069
73	2·016	2·006	1·937	1·873	1·811	1·732	1·671	1·607	1·471	1·366	1·271	1·205	1·138	1·091
74	2·046	2·032	1·963	1·897	1·834	1·760	1·698	1·625	1·494	1·387	1·294	1·226	1·159	1·111
75	2·076	2·059	1·988	1·929	1·857	1·789	1·718	1·651	1·517	1·407	1·317	1·248	1·179	1·134
76	2·108	2·087	2·014	1·954	1·881	1·811	1·746	1·678	1·540	1·428	1·342	1·275	1·205	1·154
77	2·140	2·116	2·041	1·980	1·905	1·842	1·767	1·704	1·564	1·455	1·371	1·299	1·226	1·179
78	2·168	2·145	2·069	2·006	1·937	1·873	1·797	1·725	1·594	1·483	1·397	1·327	1·253	1·205
79	2·197	2·174	2·106	2·032	1·963	1·897	1·827	1·753	1·619	1·511	1·423	1·356	1·280	1·226
80	2·228	2·204	2·135	2·069	1·988	1·929	1·857	1·782	1·651	1·540	1·455	1·387	1·308	1·253
81	2·256	2·246	2·174	2·097	2·023	1·963	1·889	1·811	1·678	1·570	1·483	1·412	1·337	1·285
82	2·287	2·278	2·204	2·135	2·059	1·997	1·921	1·849	1·711	1·600	1·511	1·444	1·366	1·313
83	2·324	2·311	2·246	2·174	2·097	2·032	1·954	1·881	1·746	1·632	1·546	1·471	1·397	1·342
84	2·360	2·356	2·289	2·204	2·135	2·069	1·988	1·921	1·775	1·664	1·576	1·499	1·428	1·371
85	2·399	2·391	2·322	2·246	2·174	2·106	2·023	1·963	1·811	1·698	1·607	1·528	1·460	1·402
86	2·442	2·426	2·367	2·289	2·215	2·145	2·059	1·997	1·849	1·732	1·638	1·558	1·494	1·433
87	2·489	2·475	2·414	2·333	2·257	2·184	2·106	2·032	1·881	1·760	1·671	1·588	1·522	1·466
88	2·533	2·526	2·463	2·379	2·300	2·225	2·145	2·069	1·921	1·789	1·698	1·619	1·552	1·494
89	2·584	2·565	2·513	2·414	2·344	2·267	2·184	2·106	1·963	1·827	1·725	1·645	1·576	1·517
90	2·638	2·619	2·565	2·463	2·379	2·300	2·225	2·145	1·988	1·849	1·753	1·671	1·600	1·540
91	2·688	2·660	2·605	2·500	2·426	2·333	2·257	2·174	2·014	1·881	1·775	1·691	1·619	1·558
92	2·711	2·703	2·633	2·539	2·463	2·367	2·289	2·204	2·041	1·913	1·797	1·711	1·638	1·570
93	2·747	2·733	2·660	2·565	2·488	2·402	2·311	2·225	2·059	1·937	1·819	1·732	1·651	1·581
94	2·795	2·762	2·689	2·592	2·513	2·414	2·333	2·246	2·078	1·954	1·834	1·746	1·664	1·594
95	2·821	2·778	2·718	2·619	2·526	2·438	2·344	2·257	2·097	1·963	1·849	1·753	1·671	1·600
96	2·844	2·808	2·733	2·633	2·552	2·450	2·356	2·267	2·106	1·971	1·857	1·760	1·678	1·607
97	2·859	2·824	2·733	2·646	2·565	2·463	2·367	2·278	2·116	1·980	1·865	1·767	1·684	1·613
98	2·868	2·840	2·747	2·660	2·565	2·475	2·379	2·289	2·125	1·988	1·873	1·767	1·691	1·619
99	2·873	2·856	2·762	2·675	2·578	2·488	2·391	2·300	2·125	1·988	1·881	1·775	1·698	1·625
100	2·880	2·872	2·762	2·675	2·578	2·500	2·402	2·300	2·135	1·997	1·881	1·782	1·698	1·625
101	2·889	2·872	2·778	2·689	2·592	2·500	2·402	2·311	2·135	1·997	1·889	1·782	1·703	1·631
102	2·896	2·888	2·778	2·689	2·592	2·500	2·402	2·311	2·145	2·006	1·889	1·782	1·703	1·631
103	2·902	2·888	2·778	2·689	2·592	2·500	2·409	2·311	2·145	2·006	1·889	1·788	1·703	1·631
104	2·908	2·888	2·793	2·703	2·605	2·500	2·409	2·311	2·145	2·006	1·889	1·788	.....	.....
105	2·910	2·888	2·793	2·703	2·605	2·500	2·409	2·311	2·145	2·006	.....	.....	.....	.....
106	2·910	2·888	2·793	2·703	2·605	2·500	.....	.....	.....	.....	.....	.....	.....	.....
107	2·910	2·888	2·793	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE III

Extended Distances for SS

Δ	*Depth h =*												
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
0·0	0·000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
0·5	0·019	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1·0	0·033	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1·5	0·047	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2·0	0·059	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2·5	0·071	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3·0	0·081	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3·5	0·089	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4·0	0·097	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4·5	0·106	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5·0	0·112	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5·5	0·119	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6·0	0·125	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6·5	0·132	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7·0	0·137	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7·5	0·143	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8·0	0·149	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8·5	0·154	0·006	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9·0	0·160	0·051	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9·5	0·165	0·069	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10·0	0·169	0·089	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10·5	0·175	0·101	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11·0	0·180	0·115	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11·5	0·185	0·126	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12·0	0·189	0·136	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12·5	0·194	0·145	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13·0	0·200	0·152	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13·5	0·204	0·160	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14·0	0·209	0·168	0·052	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14·5	0·214	0·175	0·068	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15·0	0·218	0·181	0·082	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15·5	0·224	0·187	0·094	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16·0	0·229	0·193	0·104	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16·5	0·234	0·200	0·113	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17·0	0·239	0·206	0·122	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17·5	0·245	0·213	0·132	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18·0	0·250	0·220	0·140	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18·5	0·255	0·226	0·148	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19·0	0·260	0·232	0·156	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19·5	0·266	0·239	0·165	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	0·272	0·246	0·172	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21	0·284	0·259	0·189	0·000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	0·297	0·273	0·203	0·080	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	0·310	0·287	0·217	0·115	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	0·324	0·300	0·233	0·137	0·051	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE III—*Continued*

Extended Distances for SS

Δ	*Depth h =*													
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
25	0·338	0·315	0·248	0·158	0·080	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	0·352	0·328	0·264	0·177	0·108	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	0·367	0·344	0·280	0·194	0·128	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	0·384	0·359	0·298	0·212	0·147	0·000	.....	.....	.....	.....	.....	.....	.....	.....
29	0·400	0·376	0·315	0·230	0·168	0·028	.....	.....	.....	.....	.....	.....	.....	.....
30	0·416	0·392	0·332	0·250	0·184	0·079	0·052	.....	.....	.....	.....	.....	.....	.....
31	0·433	0·408	0·352	0·269	0·208	0·118	0·130	.....	.....	.....	.....	.....	.....	.....
32	0·450	0·424	0·370	0·290	0·233	0·156	0·243	0·262	0·042	.....	.....	.....	.....	.....
33	0·466	0·442	0·392	0·313	0·255	0·188	0·342	0·324	0·125	0·000	.....	.....	.....	.....
34	0·484	0·457	0·408	0·336	0·280	0·216	0·372	0·366	0·205	0·075	.....	.....	.....	.....
35	0·502	0·475	0·431	0·360	0·306	0·247	0·411	0·404	0·270	0·140	.....	.....	.....	.....
36	0·518	0·495	0·454	0·385	0·337	0·285	0·473	0·439	0·322	0·188	0·000	.....	.....	.....
37	0·532	0·513	0·480	0·423	0·377	0·568	0·514	0·473	0·364	0·233	0·101	.....	.....	.....
38	0·548	0·529	0·512	0·501	0·389	0·599	0·555	0·506	0·405	0·270	0·160	0·028	.....	.....
39	0·569	0·558	0·552	0·590	0·655	0·630	0·589	0·540	0·442	0·308	0·208	0·092	0·000	.....
40	0·612	0·640	0·639	0·703	0·698	0·663	0·622	0·572	0·478	0·342	0·248	0·133	0·043	.....
41	0·764	0·750	0·764	0·774	0·734	0·700	0·653	0·606	0·507	0·376	0·284	0·179	0·083	.....
42	0·838	0·860	0·839	0·818	0·771	0·731	0·684	0·644	0·533	0·408	0·318	0·201	0·114	.....
43	0·920	0·908	0·875	0·848	0·803	0·760	0·716	0·671	0·557	0·439	0·347	0·228	0·144	.....
44	0·953	0·942	0·911	0·880	0·833	0·789	0·745	0·694	0·582	0·466	0·370	0·252	0·167	.....
45	0·985	0·980	0·946	0·909	0·860	0·815	0·769	0·716	0·603	0·488	0·394	0·273	0·188	0·000
46	1·024	1·012	0·978	0·935	0·888	0·832	0·793	0·736	0·620	0·507	0·412	0·293	0·205	0·028
47	1·063	1·040	1·004	0·960	0·912	0·851	0·714	0·754	0·635	0·526	0·427	0·312	0·222	0·055
48	1·094	1·066	1·028	0·980	0·932	0·876	0·830	0·772	0·652	0·541	0·442	0·330	0·236	0·081
49	1·121	1·103	1·051	0·996	0·948	0·898	0·847	0·788	0·665	0·556	0·456	0·348	0·250	0·106
50	1·140	1·131	1·071	1·012	0·964	0·916	0·860	0·801	0·679	0·569	0·469	0·364	0·263	0·127
51	1·156	1·149	1·091	1·029	0·979	0·932	0·873	0·813	0·692	0·583	0·481	0·380	0·276	0·144
52	1·172	1·168	1·109	1·044	0·993	0·946	0·885	0·824	0·703	0·594	0·492	0·393	0·287	0·160
53	1·187	1·183	1·123	1·059	1·003	0·959	0·897	0·834	0·713	0·604	0·502	0·403	0·297	0·178
54	1·202	1·197	1·137	1·072	1·012	0·969	0·907	0·845	0·723	0·613	0·510	0·411	0·307	0·193
55	1·216	1·208	1·150	1·088	1·021	0·977	0·917	0·855	0·732	0·621	0·518	0·418	0·315	0·202
56	1·228	1·220	1·160	1·100	1·029	0·981	0·926	0·864	0·740	0·628	0·525	0·425	0·323	0·210
57	1·239	1·231	1·169	1·110	1·039	0·988	0·934	0·871	0·748	0·637	0·532	0·431	0·328	0·217
58	1·249	1·242	1·177	1·119	1·049	0·995	0·939	0·877	0·754	0·643	0·537	0·436	0·335	0·225
59	1·257	1·249	1·185	1·125	1·059	1·001	0·943	0·883	0·760	0·648	0·541	0·440	0·340	0·234
60	1·266	1·256	1·192	1·133	1·068	1·005	0·946	0·887	0·766	0·651	0·547	0·444	0·344	0·244
61	1·273	1·262	1·197	1·140	1·075	1·012	0·950	0·891	0·770	0·654	0·552	0·449	0·349	0·254
62	1·280	1·269	1·201	1·148	1·082	1·017	0·954	0·895	0·774	0·658	0·557	0·454	0·355	0·264
63	1·286	1·276	1·206	1·153	1·088	1·021	0·960	0·889	0·778	0·662	0·562	0·459	0·362	0·273
64	1·292	1·283	1·211	1·160	1·092	1·027	0·965	0·902	0·780	0·664	0·568	0·464	0·368	0·283
65	1·297	1·289	1·216	1·162	1·099	1·033	0·971	0·907	0·784	0·667	0·573	0·472	0·377	0·292
66	1·302	1·293	1·221	1·166	1·105	1·038	0·975	0·913	0·788	0·672	0·578	0·479	0·387	0·302
67	1·307	1·296	1·228	1·169	1·109	1·043	0·980	0·918	0·792	0·678	0·584	0·485	0·398	0·312
68	1·310	1·298	1·232	1·175	1·112	1·049	0·985	0·924	0·795	0·682	0·593	0·492	0·408	0·324
69	1·312	1·302	1·237	1·182	1·118	1·054	0·991	0·928	0·799	0·688	0·597	0·499	0·418	0·333

TABLE III—*Continued*

Extended Distances for SS

Δ	*Depth h* =													
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
70	1·315	1·307	1·244	1·186	1·124	1·060	0·998	0·932	0·803	0·693	0·604	0·507	0·428	0·345
71	1·318	1·312	1·249	1·191	1·130	1·065	1·004	0·937	0·809	0·701	0·609	0·517	0·438	0·456
72	1·321	1·316	1·255	1·197	1·136	1·071	1·010	0·943	0·815	0·708	0·616	0·526	0·448	0·468
73	1·325	1·321	1·260	1·204	1·142	1·078	1·017	0·949	0·822	0·717	0·624	0·536	0·457	0·480
74	1·330	1·325	1·266	1·210	1·149	1·086	1·023	0·956	0·830	0·726	0·632	0·544	0·466	0·491
75	1·338	1·332	1·273	1·216	1·155	1·092	1·030	0·964	0·837	0·735	0·640	0·553	0·474	0·501
76	1·347	1·340	1·280	1·223	1·162	1·098	1·037	0·972	0·845	0·743	0·646	0·561	0·484	0·512
77	1·355	1·347	1·288	1·229	1·169	1·104	1·045	0·980	0·853	0·752	0·653	0·570	0·492	0·523
78	1·363	1·354	1·294	1·236	1·177	1·110	1·052	0·988	0·861	0·760	0·660	0·578	0·503	0·532
79	1·370	1·361	1·301	1·244	1·183	1·117	1·060	0·996	0·870	0·768	0·668	0·587	0·511	0·542
80	1·379	1·370	1·309	1·250	1·191	1·126	1·067	1·003	0·880	0·776	0·676	0·596	0·517	0·551
81	1·388	1·377	1·317	1·257	1·200	1·133	1·075	1·009	0·888	0·784	0·682	0·604	0·524	0·560
82	1·398	1·385	1·326	1·266	1·209	1·142	1·082	1·017	0·895	0·792	0·689	0·613	0·532	0·570
83	1·406	1·392	1·335	1·275	1·217	1·150	1·090	1·024	0·903	0·800	0·697	0·621	0·541	0·580
84	1·414	1·400	1·343	1·285	1·225	1·159	1·095	1·033	0·912	0·807	0·705	0·628	0·549	0·589
85	1·424	1·408	1·351	1·295	1·231	1·166	1·103	1·041	0·918	0·814	0·713	0·637	0·558	0·598
86	1·432	1·416	1·360	1·299	1·238	1·175	1·111	1·050	1·005	0·822	0·722	0·647	0·566	0·605
87	1·441	1·423	1·369	1·303	1·244	1·181	1·119	1·057	1·013	0·829	0·728	0·655	0·573	0·613
88	1·448	1·431	1·374	1·309	1·250	1·189	1·126	1·064	1·041	0·839	0·737	0·663	0·580	0·622
89	1·457	1·439	1·380	1·317	1·258	1·197	1·135	1·072	1·048	0·844	0·744	0·671	0·588	0·629
90	1·466	1·447	1·388	1·323	1·265	1·206	1·142	1·078	1·054	0·850	0·751	0·679	0·596	0·638
91	1·473	1·456	1·397	1·332	1·272	1·214	1·150	1·084	1·060	0·857	0·759	0·685	0·605	0·645
92	1·481	1·464	1·403	1·339	1·280	1·223	1·156	1·091	1·069	0·864	0·767	0·691	0·613	0·653
93	1·489	1·474	1·409	1·346	1·289	1·229	1·163	1·100	1·076	0·871	0·774	0·698	0·620	0·560
94	1·497	1·485	1·417	1·353	1·299	1·235	1·171	1·108	1·082	0·878	0·780	0·707	0·627	0·569
95	1·505	1·493	1·426	1·361	1·305	1·241	1·179	1·116	1·088	0·884	0·788	0·721	0·634	0·577
96	1·512	1·502	1·434	1·368	1·312	1·248	1·185	1·121	1·096	0·890	0·796	0·728	0·641	0·584
97	1·520	1·510	1·442	1·376	1·319	1·255	1·194	1·127	1·103	0·898	0·802	0·736	0·650	0·592
98	1·527	1·516	1·450	1·388	1·326	1·263	1·202	1·135	1·111	0·906	0·809	0·744	0·657	0·600
99	1·534	1·524	1·454	1·399	1·334	1·269	1·210	1·143	1·018	0·913	0·817	0·744	0·666	0·606
100	1·541	1·532	1·467	1·405	1·341	1·276	1·215	1·148	1·025	0·920	0·824	0·752	0·674	0·613
101	1·549	1·539	1·474	1·413	1·348	1·282	1·221	1·156	1·032	0·927	0·832	0·759	0·681	0·620
102	1·556	1·545	1·480	1·420	1·355	1·290	1·228	1·161	1·040	0·934	0·840	0·766	0·689	0·628
103	1·565	1·553	1·487	1·429	1·362	1·297	1·236	1·168	1·048	0·940	0·848	0·773	0·697	0·636
104	1·572	1·561	1·495	1·436	1·371	1·304	1·246	1·176	1·055	0·945	0·856	0·781	0·704	0·644
105	1·580	1·571	1·503	1·445	1·379	1·310	1·254	1·184	1·063	0·952	0·864	0·788	0·712	0·651
106	1·589	1·580	1·512	1·453	1·386	1·319	1·261	1·191	1·070	0·960	0·871	0·795	0·720	0·660
107	1·597	1·589	1·521	1·461	1·394	1·326	1·267	1·198	1·078	0·966	0·878	0·802	0·728	0·667
108	1·605	1·598	1·529	1·470	1·402	1·334	1·274	1·204	1·086	0·974	0·885	0·810	0·737	0·675
109	1·613	1·606	1·539	1·478	1·409	1·340	1·280	1·212	1·093	0·982	0·892	0·817	0·744	0·684
110	1·622	1·611	1·547	1·487	1·417	1·349	1·288	1·220	1·101	0·992	0·900	0·824	0·752	0·692
111	1·630	1·620	1·556	1·495	1·425	1·356	1·294	1·228	1·108	0·999	0·909	0·833	0·760	0·700
112	1·639	1·630	1·565	1·500	1·433	1·362	1·301	1·234	1·116	1·005	0·918	0·841	0·769	0·708
113	1·648	1·640	1·573	1·505	1·441	1·369	1·310	1·244	1·125	1·012	0·926	0·851	0·778	0·717
114	1·656	1·649	1·580	1·513	1·449	1·379	1·320	1·252	1·133	1·020	0·934	0·858	0·787	0·726

TABLE III—*Continued*

Extended Distances for SS

Δ	*Depth h =*													
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
115	1·665	1·658	1·586	1·523	1·457	1·389	1·328	1·260	1·141	1·030	0·941	0·867	0·796	0·737
116	1·673	1·668	1·596	1·532	1·465	1·399	1·336	1·267	1·151	1·040	0·950	0·875	0·805	0·745
117	1·683	1·676	1·606	1·541	1·475	1·407	1·343	1·274	1·159	1·048	0·958	0·884	0·813	0·753
118	1·692	1·683	1·614	1·550	1·484	1·415	1·350	1·284	1·166	1·057	0·967	0·891	0·821	0·762
119	1·702	1·692	1·624	1·559	1·492	1·425	1·360	1·294	1·175	1·066	0·976	0·899	0·831	0·770
120	1·712	1·702	1·632	1·568	1·503	1·436	1·371	1·304	1·181	1·075	0·985	0·909	0·841	0·778
121	1·722	1·713	1·642	1·577	1·514	1·444	1·379	1·312	1·188	1·083	0·994	0·915	0·850	0·789
122	1·732	1·723	1·650	1·585	1·524	1·453	1·387	1·319	1·196	1·092	1·003	0·922	0·858	0·800
123	1·742	1·733	1·663	1·596	1·532	1·464	1·397	1·327	1·206	1·101	1·011	0·931	0·867	0·810
124	1·752	1·744	1·673	1·604	1·541	1·474	1·407	1·337	1·213	1·112	1·021	0·940	0·875	0·818
125	1·762	1·755	1·684	1·613	1·550	1·482	1·417	1·348	1·223	1·122	1·031	0·950	0·886	0·828
126	1·771	1·765	1·694	1·623	1·560	1·492	1·428	1·357	1·231	1·132	1·040	0·960	0·895	0·838
127	1·782	1·776	1·705	1·633	1·573	1·504	1·436	1·367	1·240	1·142	1·049	0·969	0·905	0·847
128	1·794	1·787	1·717	1·647	1·584	1·515	1·444	1·377	1·249	1·152	1·058	0·978	0·915	0·857
129	1·806	1·796	1·729	1·659	1·592	1·526	1·456	1·388	1·258	1·160	1·068	0·986	0·923	0·866
130	1·819	1·808	1·740	1·669	1·604	1·538	1·467	1·398	1·268	1·169	1·078	0·995	0·932	0·876
131	1·831	1·820	1·751	1·679	1·616	1·546	1·478	1·408	1·277	1·180	1·087	1·005	0·942	0·885
132	1·844	1·831	1·761	1·689	1·627	1·555	1·489	1·419	1·288	1·189	1·097	1·014	0·952	0·896
133	1·856	1·843	1·773	1·701	1·636	1·564	1·500	1·434	1·300	1·198	1·107	1·023	0·963	0·905
134	1·868	1·855	1·785	1·713	1·648	1·576	1·512	1·440	1·310	1·208	1·118	1·033	0·972	0·915
135	1·879	1·868	1·797	1·727	1·662	1·588	1·524	1·451	1·320	1·219	1·128	1·042	0·980	0·923
136	1·889	1·880	1·812	1·740	1·676	1·601	1·536	1·462	1·330	1·231	1·136	1·052	0·989	0·932
137	1·899	1·892	1·826	1·755	1·689	1·613	1·547	1·474	1·341	1·243	1·144	1·062	1·000	0·943
138	1·909	1·903	1·837	1·767	1·700	1·624	1·559	1·486	1·353	1·252	1·154	1·073	1·009	0·953
139	1·920	1·914	1·848	1·776	1·711	1·633	1·568	1·497	1·365	1·261	1·164	1·084	1·020	0·964
140	1·930	1·927	1·860	1·788	1·720	1·644	1·578	1·508	1·375	1·272	1·176	1·094	1·029	0·975
141	1·941	1·939	1·872	1·800	1·730	1·656	1·589	1·520	1·386	1·284	1·185	1·103	1·040	0·986
142	1·956	1·951	1·884	1·814	1·744	1·668	1·602	1·532	1·398	1·293	1·196	1·114	1·051	0·996
143	1·971	1·965	1·896	1·828	1·760	1·679	1·614	1·544	1·411	1·303	1·204	1·124	1·060	1·005
144	1·985	1·979	1·908	1·840	1·772	1·691	1·628	1·556	1·422	1·312	1·216	1·134	1·070	1·014
145	2·000	1·992	1·920	1·853	1·782	1·704	1·641	1·568	1·433	1·322	1·225	1·146	1·080	1·026
146	2·016	2·004	1·932	1·864	1·797	1·717	1·653	1·580	1·444	1·332	1·234	1·160	1·090	1·038
147	2·032	2·016	1·944	1·876	1·811	1·728	1·664	1·593	1·455	1·343	1·244	1·169	1·100	1·050
148	2·046	2·030	1·956	1·888	1·823	1·740	1·675	1·606	1·464	1·355	1·253	1·180	1·111	1·060
149	2·061	2·044	1·970	1·901	1·834	1·754	1·688	1·616	1·476	1·367	1·266	1·192	1·122	1·069
150	2·076	2·057	1·983	1·917	1·845	1·768	1·701	1·625	1·488	1·376	1·278	1·206	1·133	1·080
151	2·092	2·070	1·995	1·933	1·857	1·783	1·710	1·637	1·501	1·388	1·290	1·217	1·145	1·092
152	2·108	2·084	2·008	1·945	1·868	1·796	1·722	1·651	1·512	1·397	1·302	1·228	1·156	1·102
153	2·124	2·100	2·023	1·958	1·881	1·807	1·737	1·664	1·524	1·409	1·314	1·240	1·167	1·113
154	2·140	2·114	2·036	1·970	1·892	1·820	1·750	1·678	1·536	1·420	1·327	1·253	1·177	1·124
155	2·154	2·128	2·050	1·983	1·905	1·836	1·761	1·691	1·547	1·432	1·340	1·267	1·189	1·136
156	2·168	2·143	2·063	1·996	1·921	1·853	1·773	1·704	1·560	1·444	1·355	1·280	1·203	1·148
157	2·182	2·157	2·080	2·010	1·938	1·868	1·788	1·715	1·573	1·458	1·369	1·292	1·215	1·158
158	2·197	2·172	2·097	2·022	1·950	1·882	1·803	1·727	1·589	1·472	1·384	1·304	1·227	1·171
159	2·212	2·187	2·115	2·037	1·964	1·894	1·817	1·740	1·603	1·487	1·397	1·320	1·240	1·185

TABLE III—*Concluded*

Extended Distances for SS

Δ	*Depth h* =													
	Surface	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
160	2·228	2·202	2·128	2·056	1·976	1·908	1·833	1·755	1·615	1·501	1·410	1·333	1·253	1·200
161	2·242	2·222	2·145	2·072	1·990	1·924	1·849	1·768	1·630	1·516	1·423	1·349	1·267	1·211
162	2·256	2·244	2·165	2·088	2·006	1·940	1·865	1·783	1·648	1·530	1·439	1·364	1·281	1·221
163	2·270	2·260	2·182	2·102	2·024	1·960	1·881	1·798	1·660	1·545	1·456	1·380	1·296	1·235
164	2·287	2·276	2·198	2·121	2·042	1·978	1·897	1·813	1·675	1·561	1·469	1·393	1·311	1·248
165	2·305	2·292	2·216	2·141	2·060	1·994	1·913	1·829	1·690	1·576	1·484	1·407	1·325	1·264
166	2·324	2·309	2·239	2·162	2·079	2·011	1·929	1·848	1·707	1·592	1·500	1·422	1·340	1·280
167	2·343	2·331	2·260	2·180	2·098	2·028	1·945	1·866	1·725	1·608	1·515	1·439	1·355	1·296
168	2·360	2·353	2·283	2·194	2·116	2·048	1·962	1·885	1·743	1·624	1·531	1·453	1·372	1·311
169	2·378	2·372	2·300	2·212	2·136	2·065	1·979	1·905	1·758	1·640	1·549	1·467	1·387	1·327
170	2·399	2·388	2·317	2·232	2·156	2·085	1·997	1·928	1·773	1·657	1·564	1·481	1·403	1·342
171	2·420	2·407	2·337	2·255	2·178	2·104	2·015	1·948	1·792	1·675	1·580	1·495	1·418	1·356
172	2·442	2·424	2·359	2·276	2·198	2·124	2·033	1·968	1·811	1·692	1·595	1·510	1·434	1·372
173	2·466	2·447	2·383	2·296	2·220	2·143	2·051	1·985	1·829	1·708	1·612	1·526	1·451	1·388
174	2·489	2·472	2·407	2·318	2·240	2·161	2·073	2·000	1·849	1·724	1·628	1·540	1·469	1·404
175	2·511	2·496	2·430	2·341	2·261	2·182	2·096	2·019	1·864	1·740	1·645	1·556	1·487	1·420
176	2·533	2·523	2·455	2·365	2·281	2·204	2·119	2·037	1·881	1·754	1·661	1·572	1·502	1·437
177	2·557	2·543	2·480	2·385	2·304	2·224	2·139	2·056	1·902	1·769	1·677	1·588	1·517	1·453
178	2·584	2·564	2·504	2·402	2·326	2·245	2·158	2·076	1·924	1·785	1·690	1·604	1·532	1·471
179	2·612	2·588	2·530	2·423	2·348	2·267	2·177	2·094	1·945	1·802	1·704	1·619	1·548	1·485
180	2·638	2·616	2·556	2·448	2·366	2·283	2·196	2·113	1·965	1·822	1·718	1·631	1·561	1·497

TABLE IV

Extended Distances for sS

Δ	Depth h =												
	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
7·5	−0·051	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8·0	−0·101	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8·5	−0·137	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9·0	−0·156	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9·5	−0·171	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10·0	−0·187	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10·5	−0·200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11·0	−0·213	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11·5	−0·228	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12·0	−0·244	−0·114	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12·5	−0·260	−0·136	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13·0	−0·274	−0·156	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13·5	−0·288	−0·173	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14·0	−0·303	−0·194	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14·5	−0·322	−0·208	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15·0	−0·339	−0·226	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15·5	−0·356	−0·245	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16·0	−0·372	−0·264	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16·5	−0·388	−0·284	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17·0	−0·420	−0·303	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17·5	−0·426	−0·319	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18·0	−0·446	−0·338	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18·5	−0·464	−0·360	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19·0	−0·483	−0·380	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19·5	−0·504	−0·400	−0·162	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	−0·524	−0·421	−0·195	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21	−0·695	−0·480	−0·262	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	−0·911	−0·584	−0·360	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	−0·982	−0·875	−0·770	−0·117	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	−1·056	−0·956	−0·863	−0·739	−0·582	.....	.....	.....	.....	.....	.....	.....	.....
25	−1·112	−1·019	−0·933	−0·823	−0·700	.....	.....	.....	.....	.....	.....	.....	.....
26	−1·159	−1·062	−0·980	−0·888	−0·768	−0·622	.....	.....	.....	.....	.....	.....	.....
27	−1·189	−1·103	−1·015	−0·934	−0·830	−0·732	−0·481	.....	.....	.....	.....	.....	.....
28	−1·213	−1·137	−1·049	−0·968	−0·888	−0·792	−0·669	.....	.....	.....	.....	.....	.....
29	−1·235	−1·159	−1·082	−0·999	−0·947	−0·842	−0·728	−0·534	.....	.....	.....	.....	.....
30	−1·253	−1·177	−1·107	−1·018	−0·964	−0·869	−0·778	−0·609	.....	.....	.....	.....	.....
31	−1·266	−1·192	−1·122	−1·037	−0·976	−0·897	−0·808	−0·649	−0·460	.....	.....	.....	.....
32	−1·280	−1·202	−1·140	−1·057	−0·987	−0·920	−0·832	−0·680	−0·527	.....	.....	.....	.....
33	−1·290	−1·209	−1·152	−1·075	−1·001	−0·936	−0·855	−0·708	−0·561	−0·224	.....	.....	.....
34	−1·297	−1·220	−1·161	−1·087	−1·012	−0·944	−0·872	−0·731	−0·598	−0·442	.....	.....	.....
35	−1·303	−1·231	−1·169	−1·098	−1·024	−0·952	−0·885	−0·748	−0·617	−0·475	−0·252	.....	.....
36	−1·313	−1·244	−1·180	−1·108	−1·033	−0·963	−0·894	−0·760	−0·633	−0·504	−0·322	.....	.....
37	−1·323	−1·255	−1·191	−1·120	−1·045	−0·972	−0·900	−0·769	−0·647	−0·520	−0·372	.....	.....
38	−1·335	−1·268	−1·203	−1·132	−1·057	−0·983	−0·910	−0·778	−0·654	−0·535	−0·404	−0·186	.....
39	−1·350	−1·283	−1·215	−1·144	−1·068	−0·995	−0·920	−0·786	−0·662	−0·546	−0·420	−0·236	.....

TABLE IV—*Continued*

Extended Distances for sS

Δ	*Depth h* =												
	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
40	−1·365	−1·296	−1·227	−1·156	−1·082	−1·008	−0·931	−0·793	−0·667	−0·557	−0·435	−0·278	.....
41	−1·380	−1·309	−1·244	−1·171	−1·096	−1·022	−0·943	−0·800	−0·678	−0·570	−0·444	−0·302	.....
42	−1·396	−1·327	−1·257	−1·185	−1·107	−1·038	−0·957	−0·813	−0·690	−0·580	−0·454	−0·324	.....
43	−1·410	−1·343	−1·275	−1·205	−1·126	−1·054	−0·974	−0·830	−0·706	−0·594	−0·465	−0·340	.....
44	−1·425	−1·361	−1·294	−1·222	−1·142	−1·069	−0·992	−0·845	−0·724	−0·610	−0·483	−0·350	−0·195
45	−1·443	−1·374	−1·303	−1·235	−1·159	−1·087	−1·005	−0·864	−0·744	−0·625	−0·499	−0·370	−0·220
46	−1·459	−1·390	−1·317	−1·248	−1·175	−1·099	−1·021	−0·884	−0·765	−0·642	−0·521	−0·399	−0·255
47	−1·478	−1·404	−1·332	−1·262	−1·191	−1·115	−1·040	−0·901	−0·781	−0·657	−0·546	−0·425	−0·283
48	−1·499	−1·420	−1·347	−1·278	−1·208	−1·134	−1·057	−0·918	−0·798	−0·675	−0·566	−0·451	−0·319
49	−1·513	−1·435	−1·361	−1·297	−1·225	−1·149	−1·072	−0·934	−0·813	−0·690	−0·586	−0·473	−0·344
50	−1·526	−1·451	−1·376	−1·310	−1·237	−1·161	−1·086	−0·950	−0·830	−0·708	−0·606	−0·494	−0·380
51	−1·540	−1·471	−1·400	−1·324	−1·250	−1·177	−1·102	−0·963	−0·845	−0·726	−0·626	−0·514	−0·406
52	−1·556	−1·483	−1·415	−1·340	−1·265	−1·195	−1·118	−0·979	−0·860	−0·743	−0·647	−0·532	−0·433
53	−1·574	−1·499	−1·431	−1·354	−1·279	−1·210	−1·133	−0·993	−0·873	−0·759	−0·666	−0·555	−0·456
54	−1·591	−1·517	−1·446	−1·372	−1·295	−1·222	−1·146	−1·009	−0·888	−0·776	−0·683	−0·573	−0·479
55	−1·608	−1·534	−1·463	−1·387	−1·309	−1·238	−1·160	−1·024	−0·907	−0·792	−0·698	−0·591	−0·500
56	−1·624	−1·552	−1·480	−1·402	−1·323	−1·257	−1·173	−1·039	−0·920	−0·808	−0·716	−0·611	−0·518
57	−1·642	−1·570	−1·496	−1·418	−1·337	−1·270	−1·189	−1·056	−0·936	−0·824	−0·732	−0·629	−0·528
58	−1·662	−1·582	−1·508	−1·435	−1·352	−1·283	−1·204	−1·071	−0·949	−0·841	−0·753	−0·647	−0·556
59	−1·679	−1·600	−1·526	−1·449	−1·369	−1·298	−1·220	−1·088	−0·961	−0·857	−0·765	−0·662	−0·575
60	−1·696	−1·619	−1·543	−1·467	−1·388	−1·314	−1·235	−1·104	−0·980	−0·877	−0·782	−0·680	−0·583
61	−1·716	−1·638	−1·561	−1·488	−1·407	−1·333	−1·252	−1·121	−0·994	−0·888	−0·799	−0·698	−0·608
62	−1·736	−1·658	−1·580	−1·508	−1·425	−1·350	−1·270	−1·139	−1·011	−0·908	−0·815	−0·716	−0·625
63	−1·759	−1·678	−1·601	−1·528	−1·443	−1·371	−1·289	−1·159	−1·032	−0·926	−0·833	−0·737	−0·643
64	−1·780	−1·698	−1·620	−1·545	−1·463	−1·387	−1·308	−1·175	−1·052	−0·944	−0·851	−0·755	−0·661
65	−1·802	−1·725	−1·641	−1·566	−1·484	−1·407	−1·325	−1·188	−1·072	−0·963	−0·870	−0·775	−0·681
66	−1·824	−1·746	−1·667	−1·587	−1·506	−1·428	−1·345	−1·208	−1·087	−0·981	−0·888	−0·796	−0·700
67	−1·848	−1·770	−1·687	−1·612	−1·529	−1·444	−1·365	−1·226	−1·111	−1·003	−0·906	−0·815	−0·721
68	−1·872	−1·794	−1·709	−1·634	−1·548	−1·473	−1·384	−1·244	−1·130	−1·021	−0·924	−0·836	−0·742
69	−1·895	−1·823	−1·737	−1·659	−1·570	−1·492	−1·408	−1·264	−1·150	−1·042	−0·942	−0·857	−0·762
70	−1·919	−1·847	−1·761	−1·686	−1·594	−1·515	−1·431	−1·284	−1·170	−1·062	−0·966	−0·878	−0·784
71	−1·942	−1·869	−1·783	−1·707	−1·619	−1·540	−1·452	−1·306	−1·192	−1·083	−0·983	−0·901	−0·813
72	−1·972	−1·893	−1·809	−1·728	−1·638	−1·562	−1·477	−1·330	−1·213	−1·104	−1·004	−0·923	−0·835
73	−2·001	−1·918	−1·837	−1·760	−1·664	−1·585	−1·501	−1·353	−1·235	−1·128	−1·024	−0·942	−0·857
74	−2·026	−1·942	−1·864	−1·782	−1·690	−1·608	−1·524	−1·379	−1·259	−1·148	−1·044	−0·967	−0·880
75	−2·052	−1·967	−1·888	−1·811	−1·715	−1·633	−1·552	−1·401	−1·285	−1·171	−1·066	−0·987	−0·904
76	−2·080	−1·993	−1·915	−1·834	−1·737	−1·661	−1·578	−1·428	−1·303	−1·192	−1·090	−1·006	−0·926
77	−2·108	−2·018	−1·945	−1·857	−1·765	−1·686	−1·601	−1·450	−1·322	−1·213	−1·115	−1·031	−0·948
78	−2·140	−2·047	−1·971	−1·811	−1·795	−1·712	−1·625	−1·471	−1·347	−1·233	−1·134	−1·057	−0·974
79	−2·168	−2·076	−1·996	−1·905	−1·818	−1·739	−1·651	−1·498	−1·370	−1·253	−1·161	−1·076	−0·998
80	−2·197	−2·112	−2·022	−1·943	−1·855	−1·763	−1·678	−1·521	−1·392	−1·279	−1·186	−1·100	−1·020
81	−2·237	−2·142	−2·056	−1·967	−1·883	−1·791	−1·704	−1·545	−1·415	−1·304	−1·211	−1·120	−1·050
82	−2·272	−2·180	−2·087	−1·994	−1·909	−1·821	−1·729	−1·574	−1·440	−1·336	−1·240	−1·148	−1·069
83	−2·307	−2·213	−2·123	−2·029	−1·945	−1·857	−1·759	−1·604	−1·476	−1·364	−1·268	−1·170	−1·095
84	−2·345	−2·261	−2·168	−2·066	−1·982	−1·889	−1·787	−1·633	−1·505	−1·397	−1·295	−1·198	−1·120

TABLE IV—*Concluded*

Extended Distances for sS

Δ	*Depth h =*												
	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·10	0·11	0·12
85	−2·384	−2·302	−2·198	−2·106	−2·017	−1·921	−1·819	−1·664	−1·533	−1·423	−1·327	−1·226	−1·148
86	−2·417	−2·336	−2·236	−2·143	−2·054	−1·954	−1·856	−1·696	−1·570	−1·460	−1·361	−1·253	−1·179
87	−2·466	−2·382	−2·280	−2·189	−2·096	−1·988	−1·900	−1·732	−1·600	−1·489	−1·393	−1·287	−1·209
88	−2·515	−2·432	−2·325	−2·229	−2·139	−2·024	−1·944	−1·766	−1·637	−1·524	−1·424	−1·321	−1·232
89	−2·556	−2·480	−2·368	−2·273	−2·175	−2·066	−1·983	−1·801	−1·673	−1·562	−1·457	−1·352	−1·268
90	−2·608	−2·533	−2·407	−2·316	−2·218	−2·093	−2·017	−1·849	−1·712	−1·595	−1·491	−1·391	−1·305
91	−2·652	−2·580	−2·452	−2·358	−2·267	−2·154	−2·060	−1·881	−1·744	−1·632	−1·520	−1·422	−1·342
92	−2·694	−2·616	−2·492	−2·396	−2·300	−2·191	−2·098	−1·930	−1·773	−1·664	−1·556	−1·460	−1·376
93	−2·728	−2·644	−2·539	−2·425	−2·333	−2·231	−2·138	−1·967	−1·810	−1·692	−1·588	−1·500	−1·408
94	−2·756	−2·672	−2·565	−2·477	−2·367	−2·265	−2·174	−1·995	−1·840	−1·725	−1·619	−1·530	−1·451
95	−2·778	−2·700	−2·592	−2·504	−2·402	−2·296	−2·204	−2·020	−1·873	−1·753	−1·652	−1·563	−1·481
96	−2·802	−2·724	−2·619	−2·520	−2·414	−2·320	−2·225	−2·049	−1·906	−1·775	−1·676	−1·588	−1·512
97	−2·820	−2·734	−2·633	−2·541	−2·438	−2·338	−2·246	−2·067	−1·932	−1·803	−1·699	−1·612	−1·535
98	−2·836	−2·743	−2·646	−2·560	−2·450	−2·349	−2·257	−2·084	−1·954	−1·822	−1·720	−1·631	−1·558
99	−2·853	−2·752	−2·660	−2·567	−2·463	−2·360	−2·267	−2·100	−1·963	−1·838	−1·739	−1·648	−1·570
100	−2·869	−2·762	−2·670	−2·574	−2·475	−2·371	−2·278	−2·110	−1·971	−1·852	−1·750	−1·662	−1·581
101	−2·881	−2·771	−2·679	−2·580	−2·488	−2·383	−2·289	−2·120	−1·980	−1·859	−1·756	−1·670	−1·594
102	−2·888	−2·776	−2·685	−2·585	−2·500	−2·394	−2·300	−2·126	−1·988	−1·867	−1·764	−1·677	−1·600
103	−2·888	−2·781	−2·689	−2·590	−2·500	−2·402	−2·307	−2·131	−1·992	−1·876	−1·769	−1·683	−1·607
104	−2·888	−2·787	−2·693	−2·596	−2·500	−2·402	−2·311	−2·136	−1·997	−1·880	−1·774	−1·689	−1·614
105	−2·888	−2·793	−2·699	−2·601	−2·500	−2·405	−2·311	−2·140	−2·001	−1·887	−1·777	−1·696	−1·620
106	−2·888	−2·793	−2·703	−2·605	−2·500	−2·409	−2·311	−2·144	−2·006	−1·889	−1·781	−1·700	−1·626
107	−2·888	−2·793	−2·703	−2·605	−2·500	−2·409	−2·311	−2·145	−2·006	−1·889	−1·784	−1·702	−1·629
108	.....	.....	.....	.....	−2·500	.....	−2·311	−2·145	−2·006	−1·889	−1·786	−1·703	−1·631
109	.....	.....	.....	.....	.....	.....	.....	.....	−2·006	.....	−1·788	−1·703	−1·631