5.3×10^{-5}, which can be neglected even for the precisest measurements.

It is difficult to estimate the relative uncertainty of Z due to the impurities in the sample gases. However the majority of the samples were pure above 99.9%, and it was regarded that the most abundant impurities were similar hydrocarbons having the like values of Z to the value of ethane or ethene. No correction was made in the calculation of Z and the considerations on purity were taken into the evaluation together with other factors.

In the present correlations of the compressiblitity factors of ethane and of ethene at high pressure, the so-called grid-point method was employed predominantly as follows.

It is the same method as used in the early correlation of the *P-V-T* properties of methane. That is, the values of Z at common grid-points of temperatures and pressures were obtained from the original data reported in respective works. When the data reported are not at one of the common grid-points specified, the interpolation procedures were carried out along an isotherm or an isobar on a digital computer using the least squares method. The precaution was paied for this procedure in order to keep on the experimental accuracy in each original data. Then the mean values at each grid-point were calculated with the weights determined by the critical evaluation in the preceding section. The standard deviations σ were also calculated by the following expression :

$$\sigma = \sqrt{\frac{\Sigma[\omega_i(Z_i - \overline{Z})^2]}{\Sigma\omega_i(n-1)}} \ ,$$

where $\omega_i =$ the weight given,

        $Z_i =$ the compressibility factor in the original work,

        $\overline{Z} =$ the tabulated compressibility factor value,

        $n =$ the number of data sources.

The weighted mean compressibility factor values obtained for ethane are shown in Table 1. The values surrounded by the broken line in the table are "the most probable values of Z" recommended in the Committee because they were obtained by treating the original data in the region containing the most reliable one. The standard deviations to them are also given in the parentheses. The values outside of the broken line in the table are relatively less reliable than the above, because they were obtained only from the data given by low weights. However, they are useful as the reference values, because there is no data more reliable in the present than the data used.

Similarly, as the most probable Z values recommended in the Committee, the weighted mean values obtained for ethene are shown together with the standard deviations in the range surrounded by the broken line in Table 2.

For the evaluation of the compressibility factor of ethane and that of ethene, another method was also tried as follows. At first, sets of the original values of Z with the weights given by the Committee were developed to the power series of density along respective experimental isotherms up to 0.3 g/cm³ for ethane and up to 0.45 g/cm³ for ethene. Then the values of Z at round densities calculated by the above procedures were developed to the power series of temperature along each isochore with the reasonable weights given to the values of Z on each isotherm, and the values of Z were calculated at round densities and at the tabulated temperatures. Using these values, the correlations for the isotherms were obtained in the power series of density. Finally, the correlated values of Z at the grid-

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Table 1   Most probable values and additional recommended values for the
compressibility factor of ethane

Pressure		Temperature K (°C)									
10⁵Pa	(atm)	273.15 (0)	298.15 (25)	323.15 (50)	348.15 (75)	373.15 (100)	398.15 (125)	423.15 (150)	448.15 (175)	473.15 (200)	498.15 (225)
1.01325	(1)	0.99003 (0.00030)	0.99233 (0.00030)	0.99406 (0.00030)	0.99534 (0.00030)	0.99628 (0.00030)	0.99699 (0.00030)	0.99755 (0.00030)	0.99799 (0.00030)	0.99837 (0.00030)	0.99870 (0.00030)
10.132	(10)	0.8921	0.9199 (0.0012)	0.9386 (0.0009)	0.9523	0.9623	0.9697	0.9755	0.9800	0.9835	0.9864
20.265	(20)	0.7522 (0.0008)	0.8268 (0.0009)	0.8718 (0.0006)	0.9025 (0.0016)	0.9237 (0.0018)	0.9387 (0.0014)	0.9502 (0.0017)	0.9593	0.9662	0.9726
30.398	(30)		0.7125 (0.0015)	0.7976 (0.0008)	0.8491 (0.0010)	0.8836 (0.0011)	0.9084 (0.0007)	0.9269 (0.0010)	0.9400	0.9510	0.9603
40.530	(40)		0.5301 (0.0005)	0.7116 (0.0007)	0.7921 (0.0010)	0.8426 (0.0011)	0.8776 (0.0009)	0.9031 (0.0011)	0.9212	0.9363	0.9486
50.662	(50)			0.6069 (0.0005)	0.7312 (0.0009)	0.8006 (0.0012)	0.8463 (0.0007)	0.8793 (0.0011)	0.9033	0.9235	0.9382
60.795	(60)			0.4664 (0.0001)	0.6664 (0.0013)	0.7576 (0.0010)	0.8157 (0.0008)	0.8566 (0.0011)	0.8865	0.9097	0.9274
70.928	(70)				0.5976 (0.0006)	0.7146 (0.0008)	0.7859 (0.0011)	0.8347 (0.0014)	0.8697	0.8969	0.9178
81.060	(80)				0.5327 (0.0009)	0.6735 (0.0008)	0.7571 (0.0008)	0.8135 (0.0011)	0.8541	0.8853	0.9092
91.192	(90)				0.4849 (0.0004)	0.6365 (0.0008)	0.7306 (0.0008)	0.7942 (0.0012)	0.8396	0.8744	0.9003
101.32	(00)				0.4618 (0.0003)	0.6059 (0.0007)	0.7072 (0.0009)	0.7767 (0.0013)	0.8264	0.8643	0.8933
111.46	(110)					0.5839 (0.0007)	0.6873 (0.0009)	0.7614 (0.0013)	0.8151	0.8557	0.8866
121.59	(120)					0.5713 (0.0011)	0.6720 (0.0005)	0.7484 (0.0010)	0.8056	0.8485	0.8812
131.72	(130)					0.5668 (0.0008)	0.6612 (0.0004)	0.7391 (0.0008)	0.7972	0.8423	0.8766
141.86	(140)					0.5678 (0.0008)	0.6555 (0.0005)	0.7320 (0.0010)	0.7912	0.8377	0.8732
151.99	(150)					0.5738	0.6540 (0.0004)	0.7275 (0.0007)	0.7886	0.8342	0.8707
162.12	(160)					0.5835	0.6568 (0.0004)	0.7259 (0.0007)	0.7862	0.8322	0.8694
172.25	(170)					0.5957	0.6618 (0.0004)	0.7270 (0.0007)	0.7859	0.8335	0.8689
182.38	(180)					0.6104	0.6694	0.7302 (0.0004)	0.7869	0.8348	0.8729
192.52	(190)					0.6250	0.6789	0.7358 (0.0004)	0.7900	0.8366	0.8744
202.65	(200)						0.6900	0.7426 (0.0005)	0.7943	0.8396	0.8768
253.31	(250)							0.7954	0.8330	0.8693	0.9021
303.98									0.8895	0.9163	0.9425

(   ) : Value of standard deviation

⌐‾‾‾‾¬ : The most probable values

points were calculated from these expressions by the Newton-Raphson method.

These correlated values were compared with those obtained by the grid-point method. Both the values were in good agreement within their standard deviations, but there are slight differences at 298.15 K and 40 atm for ethane, and at 298.15 K and 60 atm for ethene.

Compared with the grid-point method, the above method of correlation is useful for the ranges