

# Idealized Pancake Theory Collapse Time

By David Chandler

Inspired by Kenneth Kuttler's article at <http://worldtradecentertruth.com/W7Kuttler.pdf>

Data Source: <http://www.tms.org/pubs/journals/JOM/0112/Eagar/Eagar-0112.html>

(Note: This data source advocates for the official "fire-induced" collapse theory.)

<b>110.00</b> Number of floors	<b>9.16</b> Free fall time (sec)
<b>411.00</b> Height of building (m)	<b>13-15</b> Observed time of fall (sec)
<b>3.74</b> Floor spacing (m)	<b>14.92</b> Computed min time to fall (sec)
<b>5.00E+08</b> Total mass (kg)	
<b>4.55E+06</b> Mass per floor (kg)	
<b>1.01E+12</b> Total initial PE of building (J)	

Floor	Freefall Between Impacts			Inelastic Collisions					Time of Fall	
	Initial V	Impact V	KE at impact	Falling mass	New Mass	New V	Energy Lost	New KE	Step time	Total time
110	0.00	8.56	1.66E+08	4.55E+06	9.09E+06	4.28	8.32E+07	8.32E+07	0.87	0.87
109	4.28	9.57	4.16E+08	9.09E+06	1.36E+07	6.38	1.39E+08	2.77E+08	0.54	1.41
108	6.38	10.67	7.77E+08	1.36E+07	1.82E+07	8.00	1.94E+08	5.83E+08	0.44	1.85
107	8.00	11.72	1.25E+09	1.82E+07	2.27E+07	9.37	2.50E+08	9.99E+08	0.38	2.23
106	9.37	12.69	1.83E+09	2.27E+07	2.73E+07	10.58	3.05E+08	1.53E+09	0.34	2.57
105	10.58	13.61	2.52E+09	2.73E+07	3.18E+07	11.66	3.61E+08	2.16E+09	0.31	2.88
104	11.66	14.47	3.33E+09	3.18E+07	3.64E+07	12.66	4.16E+08	2.91E+09	0.29	3.16
103	12.66	15.28	4.24E+09	3.64E+07	4.09E+07	13.58	4.72E+08	3.77E+09	0.27	3.43
102	13.58	16.05	5.27E+09	4.09E+07	4.55E+07	14.45	5.27E+08	4.74E+09	0.25	3.68
101	14.45	16.79	6.41E+09	4.55E+07	5.00E+07	15.26	5.83E+08	5.83E+09	0.24	3.92
100	15.26	17.50	7.66E+09	5.00E+07	5.45E+07	16.04	6.38E+08	7.02E+09	0.23	4.15
99	16.04	18.18	9.02E+09	5.45E+07	5.91E+07	16.78	6.93E+08	8.32E+09	0.22	4.37
98	16.78	18.84	1.05E+10	5.91E+07	6.36E+07	17.49	7.49E+08	9.74E+09	0.21	4.58
97	17.49	19.47	1.21E+10	6.36E+07	6.82E+07	18.18	8.04E+08	1.13E+10	0.20	4.78
96	18.18	20.09	1.38E+10	6.82E+07	7.27E+07	18.83	8.60E+08	1.29E+10	0.20	4.98
95	18.83	20.69	1.56E+10	7.27E+07	7.73E+07	19.47	9.15E+08	1.46E+10	0.19	5.17

94	19.47	21.27	1.75E+10	7.73E+07	8.18E+07	20.09	9.71E+08	1.65E+10	0.18	5.35
93	20.09	21.83	1.95E+10	8.18E+07	8.64E+07	20.68	1.03E+09	1.85E+10	0.18	5.53
92	20.68	22.38	2.16E+10	8.64E+07	9.09E+07	21.27	1.08E+09	2.06E+10	0.17	5.70
91	21.27	22.92	2.39E+10	9.09E+07	9.55E+07	21.83	1.14E+09	2.27E+10	0.17	5.87
90	21.83	23.45	2.62E+10	9.55E+07	1.00E+08	22.38	1.19E+09	2.50E+10	0.17	6.03
89	22.38	23.96	2.87E+10	1.00E+08	1.05E+08	22.92	1.25E+09	2.75E+10	0.16	6.20
88	22.92	24.47	3.13E+10	1.05E+08	1.09E+08	23.45	1.30E+09	3.00E+10	0.16	6.35
87	23.45	24.96	3.40E+10	1.09E+08	1.14E+08	23.96	1.36E+09	3.26E+10	0.15	6.51
86	23.96	25.44	3.68E+10	1.14E+08	1.18E+08	24.47	1.41E+09	3.54E+10	0.15	6.66
85	24.47	25.92	3.97E+10	1.18E+08	1.23E+08	24.96	1.47E+09	3.82E+10	0.15	6.81
84	24.96	26.38	4.27E+10	1.23E+08	1.27E+08	25.44	1.53E+09	4.12E+10	0.15	6.95
83	25.44	26.84	4.59E+10	1.27E+08	1.32E+08	25.92	1.58E+09	4.43E+10	0.14	7.10
82	25.92	27.29	4.91E+10	1.32E+08	1.36E+08	26.38	1.64E+09	4.75E+10	0.14	7.24
81	26.38	27.74	5.25E+10	1.36E+08	1.41E+08	26.84	1.69E+09	5.08E+10	0.14	7.37
80	26.84	28.17	5.59E+10	1.41E+08	1.45E+08	27.29	1.75E+09	5.42E+10	0.14	7.51
79	27.29	28.60	5.95E+10	1.45E+08	1.50E+08	27.74	1.80E+09	5.77E+10	0.13	7.64
78	27.74	29.03	6.32E+10	1.50E+08	1.55E+08	28.17	1.86E+09	6.13E+10	0.13	7.78
77	28.17	29.44	6.70E+10	1.55E+08	1.59E+08	28.60	1.91E+09	6.51E+10	0.13	7.91
76	28.60	29.86	7.09E+10	1.59E+08	1.64E+08	29.03	1.97E+09	6.89E+10	0.13	8.03
75	29.03	30.26	7.49E+10	1.64E+08	1.68E+08	29.44	2.02E+09	7.29E+10	0.13	8.16
74	29.44	30.66	7.91E+10	1.68E+08	1.73E+08	29.85	2.08E+09	7.70E+10	0.12	8.28
73	29.85	31.06	8.33E+10	1.73E+08	1.77E+08	30.26	2.14E+09	8.12E+10	0.12	8.41
72	30.26	31.45	8.77E+10	1.77E+08	1.82E+08	30.66	2.19E+09	8.55E+10	0.12	8.53
71	30.66	31.83	9.21E+10	1.82E+08	1.86E+08	31.06	2.25E+09	8.99E+10	0.12	8.65
70	31.06	32.21	9.67E+10	1.86E+08	1.91E+08	31.45	2.30E+09	9.44E+10	0.12	8.77
69	31.45	32.59	1.01E+11	1.91E+08	1.95E+08	31.83	2.36E+09	9.90E+10	0.12	8.88
68	31.83	32.96	1.06E+11	1.95E+08	2.00E+08	32.21	2.41E+09	1.04E+11	0.12	9.00
67	32.21	33.33	1.11E+11	2.00E+08	2.05E+08	32.59	2.47E+09	1.09E+11	0.11	9.11
66	32.59	33.70	1.16E+11	2.05E+08	2.09E+08	32.96	2.52E+09	1.14E+11	0.11	9.22
65	32.96	34.06	1.21E+11	2.09E+08	2.14E+08	33.33	2.58E+09	1.19E+11	0.11	9.34
64	33.33	34.41	1.26E+11	2.14E+08	2.18E+08	33.70	2.64E+09	1.24E+11	0.11	9.45
63	33.70	34.76	1.32E+11	2.18E+08	2.23E+08	34.06	2.69E+09	1.29E+11	0.11	9.55
62	34.06	35.11	1.37E+11	2.23E+08	2.27E+08	34.41	2.75E+09	1.35E+11	0.11	9.66
61	34.41	35.46	1.43E+11	2.27E+08	2.32E+08	34.76	2.80E+09	1.40E+11	0.11	9.77

60	34.76	35.80	1.49E+11	2.32E+08	2.36E+08	35.11	2.86E+09	1.46E+11	0.11	9.88
59	35.11	36.14	1.54E+11	2.36E+08	2.41E+08	35.46	2.91E+09	1.51E+11	0.10	9.98
58	35.46	36.48	1.60E+11	2.41E+08	2.45E+08	35.80	2.97E+09	1.57E+11	0.10	10.08
57	35.80	36.81	1.66E+11	2.45E+08	2.50E+08	36.14	3.02E+09	1.63E+11	0.10	10.19
56	36.14	37.14	1.72E+11	2.50E+08	2.55E+08	36.48	3.08E+09	1.69E+11	0.10	10.29
55	36.48	37.47	1.79E+11	2.55E+08	2.59E+08	36.81	3.13E+09	1.76E+11	0.10	10.39
54	36.81	37.79	1.85E+11	2.59E+08	2.64E+08	37.14	3.19E+09	1.82E+11	0.10	10.49
53	37.14	38.11	1.91E+11	2.64E+08	2.68E+08	37.47	3.25E+09	1.88E+11	0.10	10.59
52	37.47	38.43	1.98E+11	2.68E+08	2.73E+08	37.79	3.30E+09	1.95E+11	0.10	10.69
51	37.79	38.75	2.05E+11	2.73E+08	2.77E+08	38.11	3.36E+09	2.01E+11	0.10	10.79
50	38.11	39.06	2.12E+11	2.77E+08	2.82E+08	38.43	3.41E+09	2.08E+11	0.10	10.88
49	38.43	39.37	2.18E+11	2.82E+08	2.86E+08	38.75	3.47E+09	2.15E+11	0.10	10.98
48	38.75	39.68	2.25E+11	2.86E+08	2.91E+08	39.06	3.52E+09	2.22E+11	0.10	11.07
47	39.06	39.99	2.33E+11	2.91E+08	2.95E+08	39.37	3.58E+09	2.29E+11	0.09	11.17
46	39.37	40.29	2.40E+11	2.95E+08	3.00E+08	39.68	3.63E+09	2.36E+11	0.09	11.26
45	39.68	40.59	2.47E+11	3.00E+08	3.05E+08	39.99	3.69E+09	2.43E+11	0.09	11.36
44	39.99	40.89	2.55E+11	3.05E+08	3.09E+08	40.29	3.74E+09	2.51E+11	0.09	11.45
43	40.29	41.19	2.62E+11	3.09E+08	3.14E+08	40.59	3.80E+09	2.58E+11	0.09	11.54
42	40.59	41.49	2.70E+11	3.14E+08	3.18E+08	40.89	3.86E+09	2.66E+11	0.09	11.63
41	40.89	41.78	2.78E+11	3.18E+08	3.23E+08	41.19	3.91E+09	2.74E+11	0.09	11.72
40	41.19	42.07	2.86E+11	3.23E+08	3.27E+08	41.49	3.97E+09	2.82E+11	0.09	11.81
39	41.49	42.36	2.94E+11	3.27E+08	3.32E+08	41.78	4.02E+09	2.90E+11	0.09	11.90
38	41.78	42.65	3.02E+11	3.32E+08	3.36E+08	42.07	4.08E+09	2.98E+11	0.09	11.99
37	42.07	42.93	3.10E+11	3.36E+08	3.41E+08	42.36	4.13E+09	3.06E+11	0.09	12.08
36	42.36	43.22	3.18E+11	3.41E+08	3.45E+08	42.65	4.19E+09	3.14E+11	0.09	12.16
35	42.65	43.50	3.27E+11	3.45E+08	3.50E+08	42.93	4.24E+09	3.23E+11	0.09	12.25
34	42.93	43.78	3.35E+11	3.50E+08	3.55E+08	43.22	4.30E+09	3.31E+11	0.09	12.34
33	43.22	44.05	3.44E+11	3.55E+08	3.59E+08	43.50	4.36E+09	3.40E+11	0.09	12.42
32	43.50	44.33	3.53E+11	3.59E+08	3.64E+08	43.78	4.41E+09	3.48E+11	0.09	12.51
31	43.78	44.61	3.62E+11	3.64E+08	3.68E+08	44.05	4.47E+09	3.57E+11	0.08	12.59
30	44.05	44.88	3.71E+11	3.68E+08	3.73E+08	44.33	4.52E+09	3.66E+11	0.08	12.68
29	44.33	45.15	3.80E+11	3.73E+08	3.77E+08	44.61	4.58E+09	3.75E+11	0.08	12.76

28	44.61	45.42	3.89E+11	3.77E+08	3.82E+08	44.88	4.63E+09	3.84E+11	0.08	12.84
27	44.88	45.69	3.98E+11	3.82E+08	3.86E+08	45.15	4.69E+09	3.94E+11	0.08	12.92
26	45.15	45.95	4.08E+11	3.86E+08	3.91E+08	45.42	4.74E+09	4.03E+11	0.08	13.01
25	45.42	46.22	4.18E+11	3.91E+08	3.95E+08	45.69	4.80E+09	4.13E+11	0.08	13.09
24	45.69	46.48	4.27E+11	3.95E+08	4.00E+08	45.95	4.85E+09	4.22E+11	0.08	13.17
23	45.95	46.74	4.37E+11	4.00E+08	4.05E+08	46.22	4.91E+09	4.32E+11	0.08	13.25
22	46.22	47.00	4.47E+11	4.05E+08	4.09E+08	46.48	4.97E+09	4.42E+11	0.08	13.33
21	46.48	47.26	4.57E+11	4.09E+08	4.14E+08	46.74	5.02E+09	4.52E+11	0.08	13.41
20	46.74	47.52	4.67E+11	4.14E+08	4.18E+08	47.00	5.08E+09	4.62E+11	0.08	13.49
19	47.00	47.78	4.77E+11	4.18E+08	4.23E+08	47.26	5.13E+09	4.72E+11	0.08	13.57
18	47.26	48.03	4.88E+11	4.23E+08	4.27E+08	47.52	5.19E+09	4.82E+11	0.08	13.65
17	47.52	48.28	4.98E+11	4.27E+08	4.32E+08	47.78	5.24E+09	4.93E+11	0.08	13.72
16	47.78	48.54	5.09E+11	4.32E+08	4.36E+08	48.03	5.30E+09	5.03E+11	0.08	13.80
15	48.03	48.79	5.19E+11	4.36E+08	4.41E+08	48.28	5.35E+09	5.14E+11	0.08	13.88
14	48.28	49.04	5.30E+11	4.41E+08	4.45E+08	48.54	5.41E+09	5.25E+11	0.08	13.96
13	48.54	49.28	5.41E+11	4.45E+08	4.50E+08	48.79	5.46E+09	5.36E+11	0.08	14.03
12	48.79	49.53	5.52E+11	4.50E+08	4.55E+08	49.04	5.52E+09	5.46E+11	0.08	14.11
11	49.04	49.78	5.63E+11	4.55E+08	4.59E+08	49.28	5.58E+09	5.58E+11	0.08	14.18
10	49.28	50.02	5.74E+11	4.59E+08	4.64E+08	49.53	5.63E+09	5.69E+11	0.08	14.26
9	49.53	50.27	5.86E+11	4.64E+08	4.68E+08	49.78	5.69E+09	5.80E+11	0.07	14.33
8	49.78	50.51	5.97E+11	4.68E+08	4.73E+08	50.02	5.74E+09	5.91E+11	0.07	14.41
7	50.02	50.75	6.09E+11	4.73E+08	4.77E+08	50.27	5.80E+09	6.03E+11	0.07	14.48
6	50.27	50.99	6.20E+11	4.77E+08	4.82E+08	50.51	5.85E+09	6.15E+11	0.07	14.56
5	50.51	51.23	6.32E+11	4.82E+08	4.86E+08	50.75	5.91E+09	6.26E+11	0.07	14.63
4	50.75	51.47	6.44E+11	4.86E+08	4.91E+08	50.99	5.96E+09	6.38E+11	0.07	14.70
3	50.99	51.70	6.56E+11	4.91E+08	4.95E+08	51.23	6.02E+09	6.50E+11	0.07	14.78
2	51.23	51.94	6.68E+11	4.95E+08	5.00E+08	51.47	6.07E+09	6.62E+11	0.07	14.85
1	51.47	52.17	6.80E+11	5.00E+08	5.05E+08	51.70	6.13E+09	6.74E+11	0.07	<b>14.92</b>

## Other Data

Source: <http://www.tms.org/pubs/journals/JOM/0112/Eagar/Eagar-0112.html>

# Why Did the World Trade Center Collapse? Science, Engineering, and Speculation

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Each tower was 64 m square, standing 411 m above street level and 21 m below grade.

The total weight of the structure was roughly 500,000 T (= 5E8 kg)

244 exterior columns; 36 cm square; 1 m centers

27 m by 40 m core

(No mention of 47 large core columns)

90,000 L of jet fuel

"The ensuing fire was clearly the principal cause of the collapse"

"The buildings collapsed within ten seconds" (low estimate)

Virtually any hydrocarbons: maximum flame temperature, using pure oxygen, ~ 3,000 C

burning in air produces 1/3 the temperature increase

maximum flame temperature increase for burning hydrocarbons (jet fuel) in air is, thus, about 1,000 C

steel melts at 1,500 C

very difficult to reach this maximum temperature with a diffuse flame

This fuel-rich diffuse flame can drop the temperature by up to a factor of two again

temperatures in a residential fire are usually in the 500 C to 650 C range

Factors such as flame volume and quantity of soot decrease the radiative heat loss in the fire, moving

However, it is highly unlikely that the steel at the WTC experienced temperatures above the 750–800° C

structural steel begins to soften around 425 C and loses about half of its strength at 650 C

But even a 50% loss of strength is still insufficient, by itself, to explain the WTC collapse.

a 500,000 T structure has too much inertia to fall in any direction other than nearly straight down

**"As scientists and engineers, we must not succumb to speculative thinking when a tragedy su**  
**Quantitative reasoning can help sort fact from fiction, and can help us learn from this unfortun**  
(quote from web site used as source of data)

301;

the temperature closer to the maximum of 1,000°C.  
C range.

**ch as this occurs.  
ate disaster."**