high voltage power fuses

types BA, DBA, BAL, CLS and BAL-LR

application data

36-660-A

curves

This envelope contains...

time-current characteristic curves of high voltage power fuses and coordination charts as listed below:

fuse type	speed ratio■	speed designation	voltage range kv	curve number✣ melting	curve number✣ total clearing
BA-200	6.5— 8	standard	2.4 to 34.5	1	2
BA-200	8 —10	time-lag	2.4 to 34.5	3	4
BA-400	6 —12.5	standard	2.4 to 34.5	5	6
BA-400	15 —19	time-lag	2.4 to 34.5	7	8
BA-800	9 —12.5	standard	2.4 to 14.4	9	9
DBA-1, 2 and 5	5.5—11.5	standard	2.4 to 138	10	
DBA-1		standard	2.4 to 23		11
DBA-1, 2 and 5		standard	34.5 to 69		12
DBA-2		standard	92 to 138		13
DBA-1, 2 and 5	14.5—19	time-lag	2.4 to 138	14	
DBA-1		time-lag	2.4 to 23		15
DBA-1, 2 and 5		time-lag	34.5 to 69		16
DBA-2		time-lag	92 to 138		17
BAL-PT, 10, 25, 200 and 300	7 — 9.5		2.4 to 23▲	18	19
CLS and BAL-LR			2.4 to 4.8	20	21
coordination and overload chart for transformers and fuses				22 (two copies)	
coordination chart for reclosing circuit breaker and fuse				23	

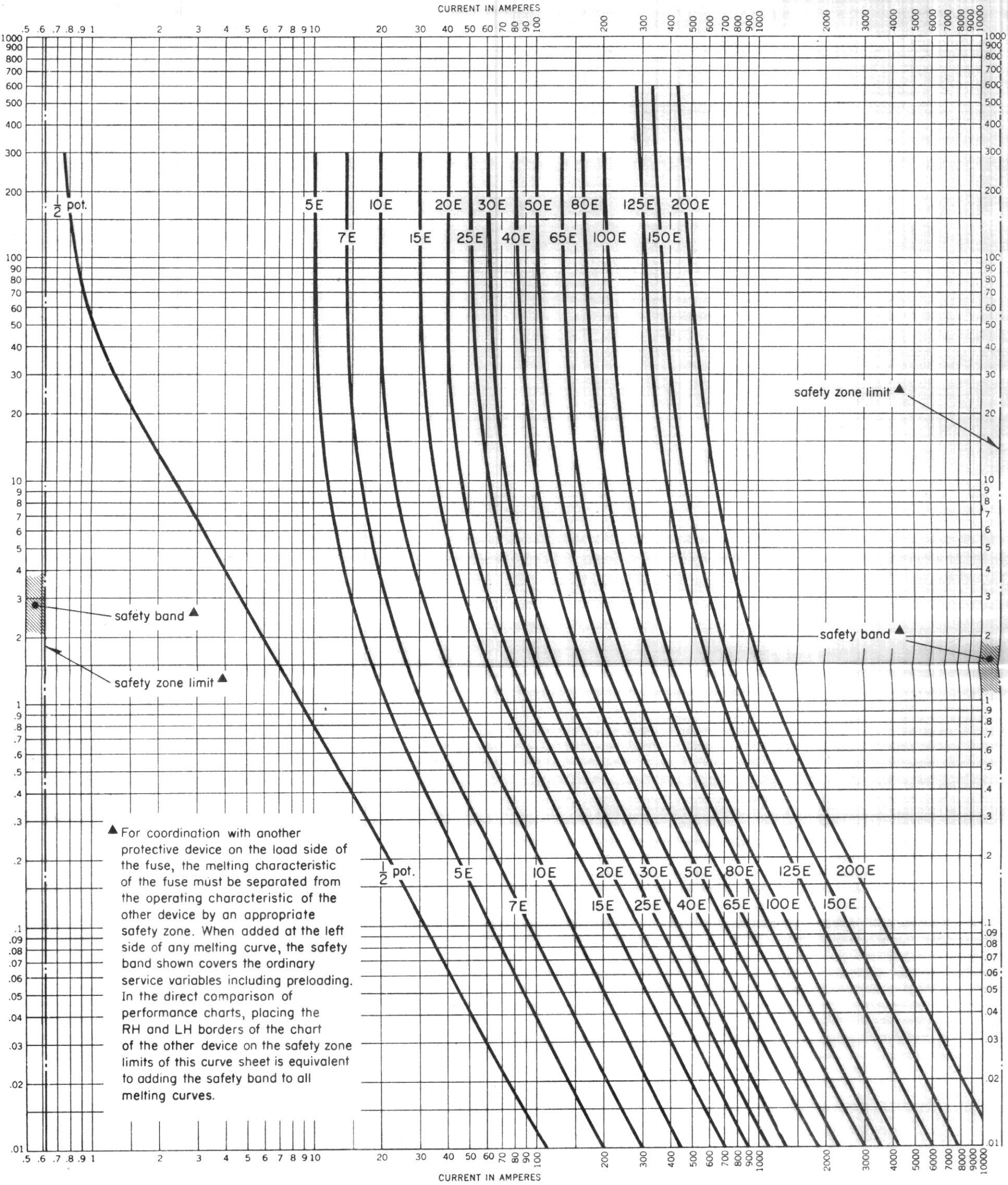
■ The speed ratio of a fuse is the ratio between the 0.1 second and the 300 to 600 second melting current.
▲ 23 kv for potential transformer (PT) fuses only.
✣ Individual replacement curves may be obtained through nearest district office.

These curves to be used in conjunction with application data 36-660.

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.

mailed to: E/294/AD; D/816/DB; C/352/AD
printed in U.S.A.

20M—60



▲ For coordination with another protective device on the load side of the fuse, the melting characteristic of the fuse must be separated from the operating characteristic of the other device by an appropriate safety zone. When added at the left side of any melting curve, the safety band shown covers the ordinary service variables including preloading. In the direct comparison of performance charts, placing the RH and LH borders of the chart of the other device on the safety zone limits of this curve sheet is equivalent to adding the safety band to all melting curves.

type BA-200 refill power fuses · standard speed refills

melting time-current characteristics

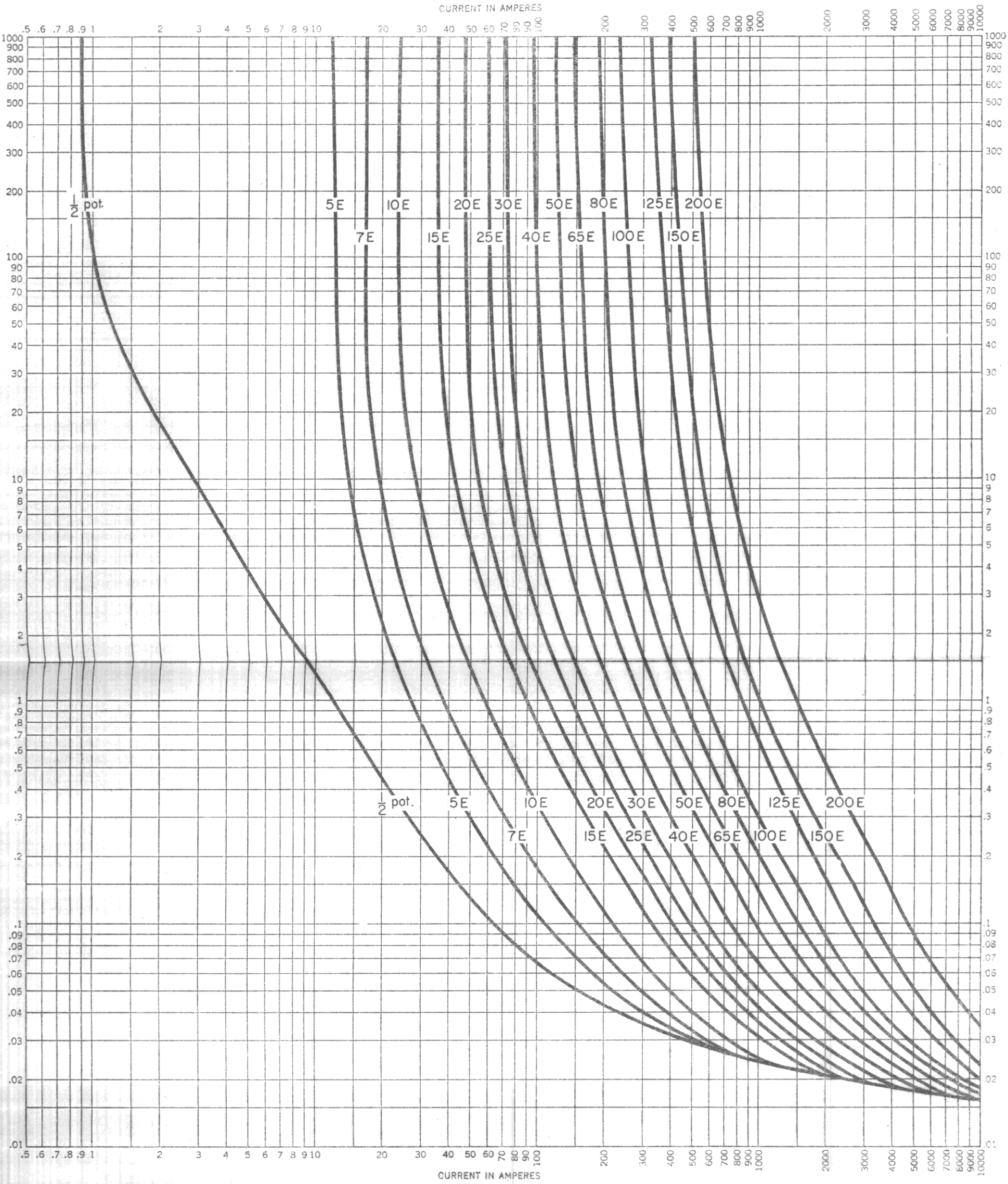
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points so all variations should be positive.

curve no. 1

reference no. 281158

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



type BA-200 refill power fuses · standard speed refills

total clearing time-current characteristics—2.4 to 34.5 kv

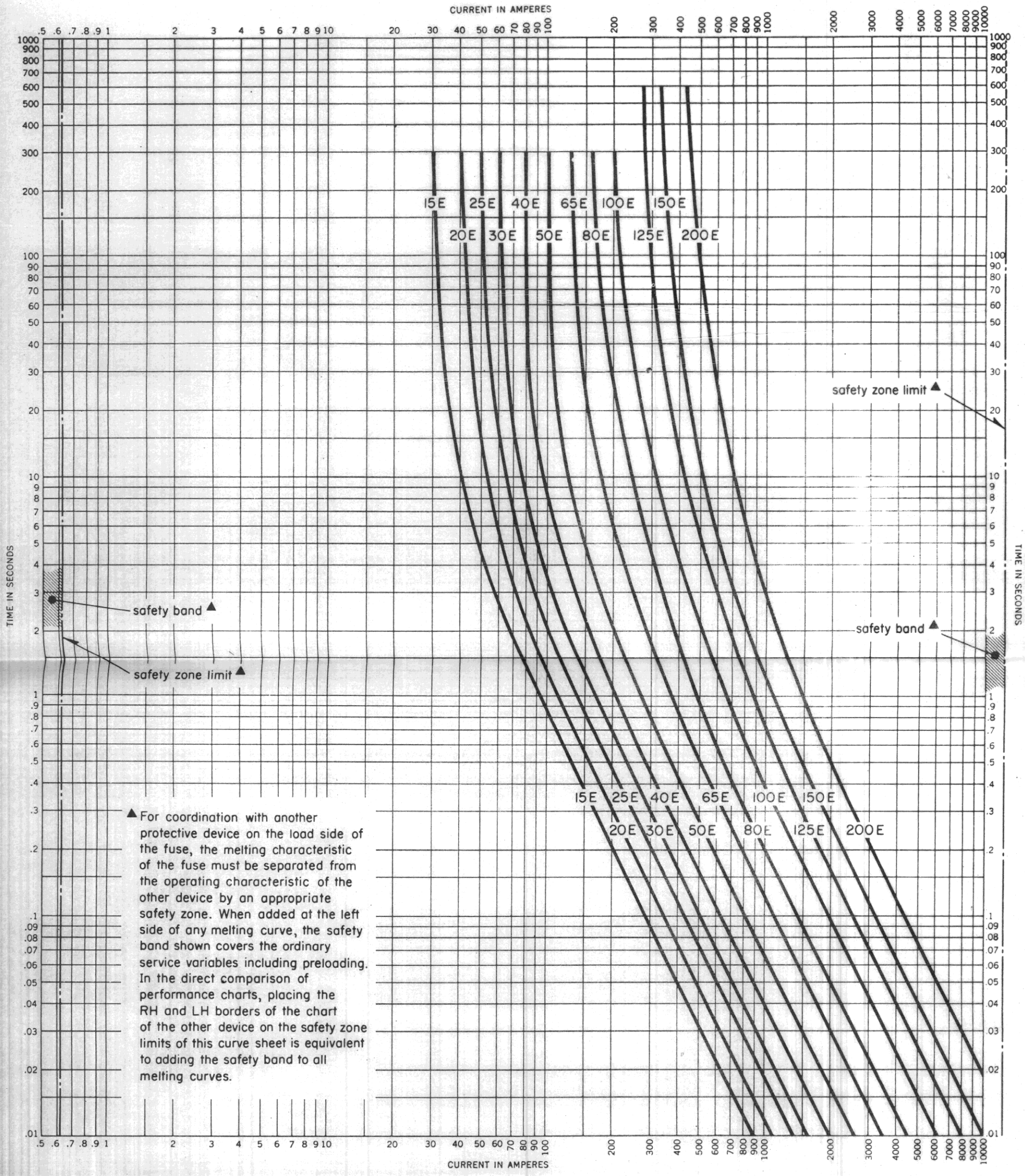
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. 2

reference no. 280216

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



type BA-200 refill power fuses · time lag refills

melting time-current characteristics

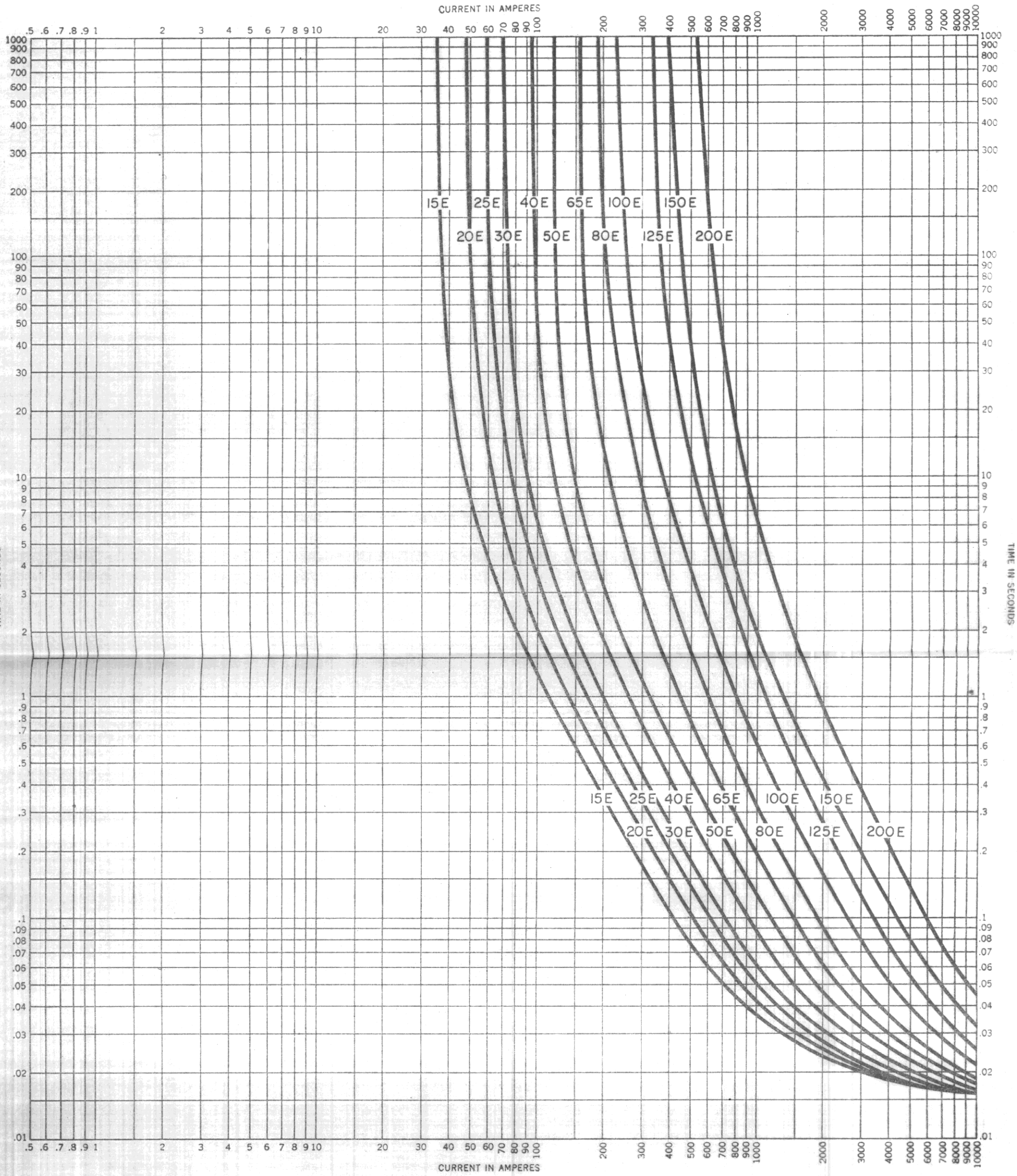
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points so all variations should be positive.

curve no. 3

reference no. 280209

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



type BA-200 refill power fuses · time lag refills

2.4 to 34.5 kv

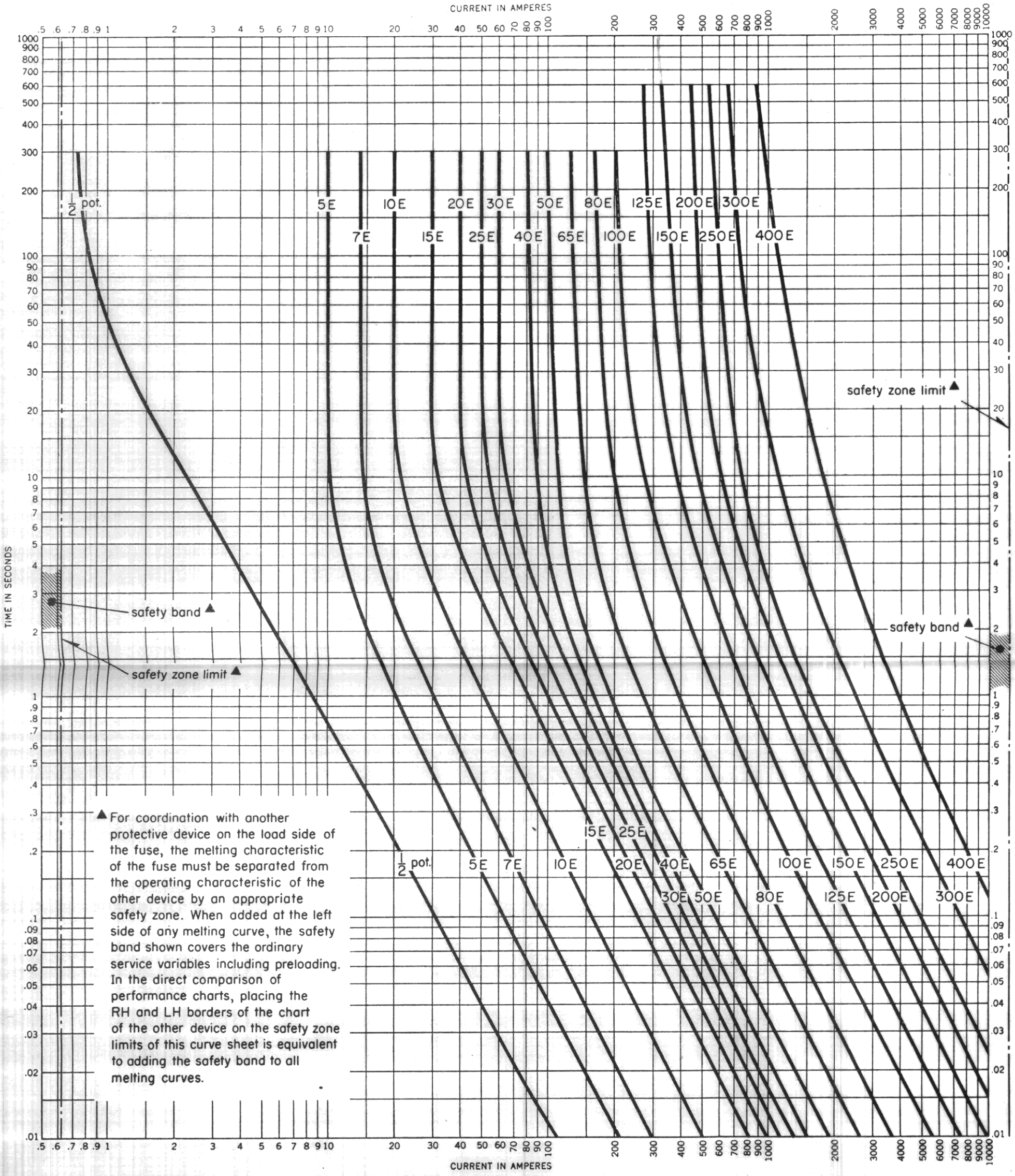
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. **4**

reference no. 280211

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



▲ For coordination with another protective device on the load side of the fuse, the melting characteristic of the fuse must be separated from the operating characteristic of the other device by an appropriate safety zone. When added at the left side of any melting curve, the safety band shown covers the ordinary service variables including preloading. In the direct comparison of performance charts, placing the RH and LH borders of the chart of the other device on the safety zone limits of this curve sheet is equivalent to adding the safety band to all melting curves.

type BA-400 refill power fuses • standard speed refills

melting time-current characteristics

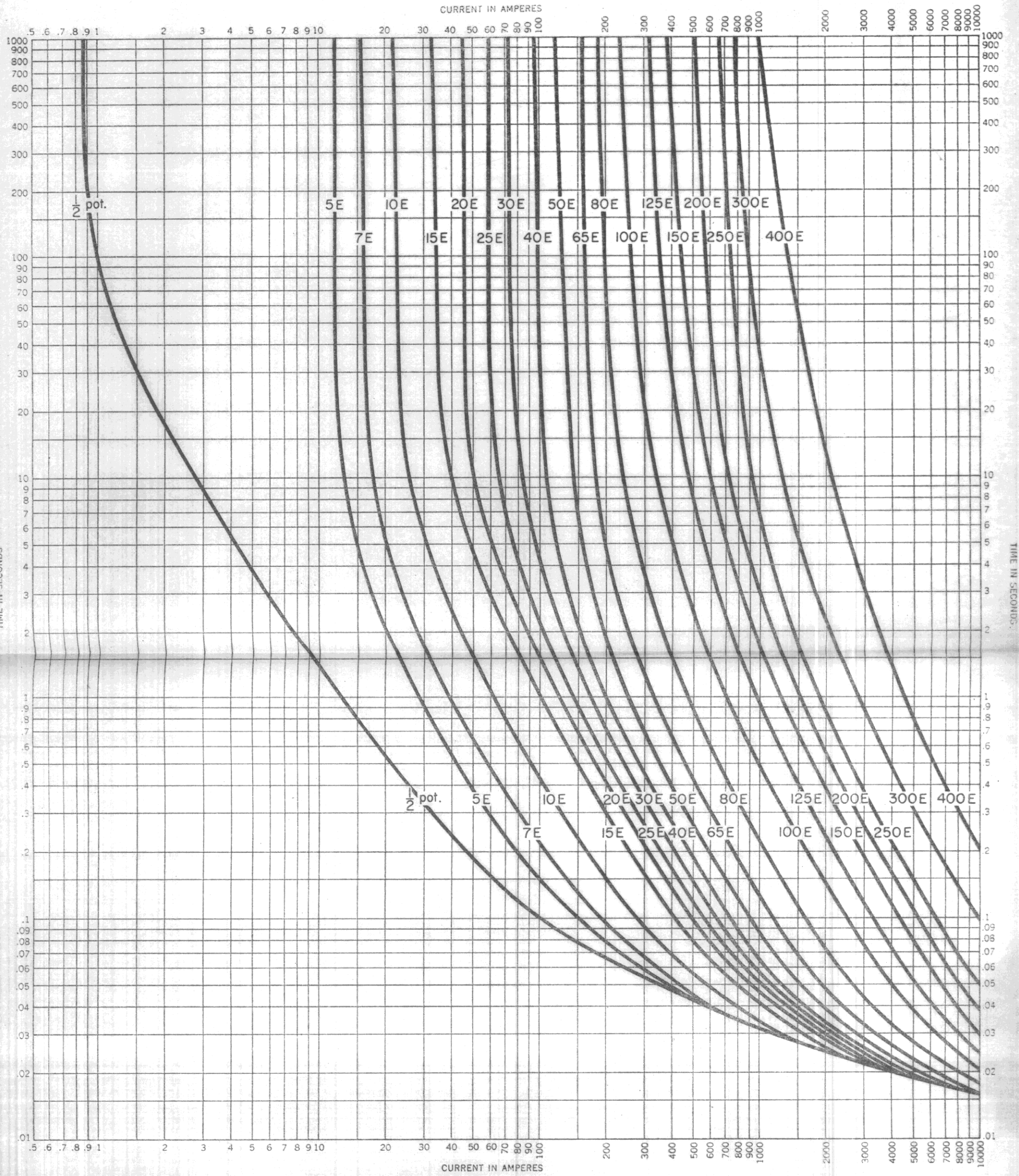
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points so all variations should be positive.

curve no. 5

reference no. 280212

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type BA-400 refill power fuses · standard speed refills

total clearing time-current characteristics—2.4 to 34.5 kv

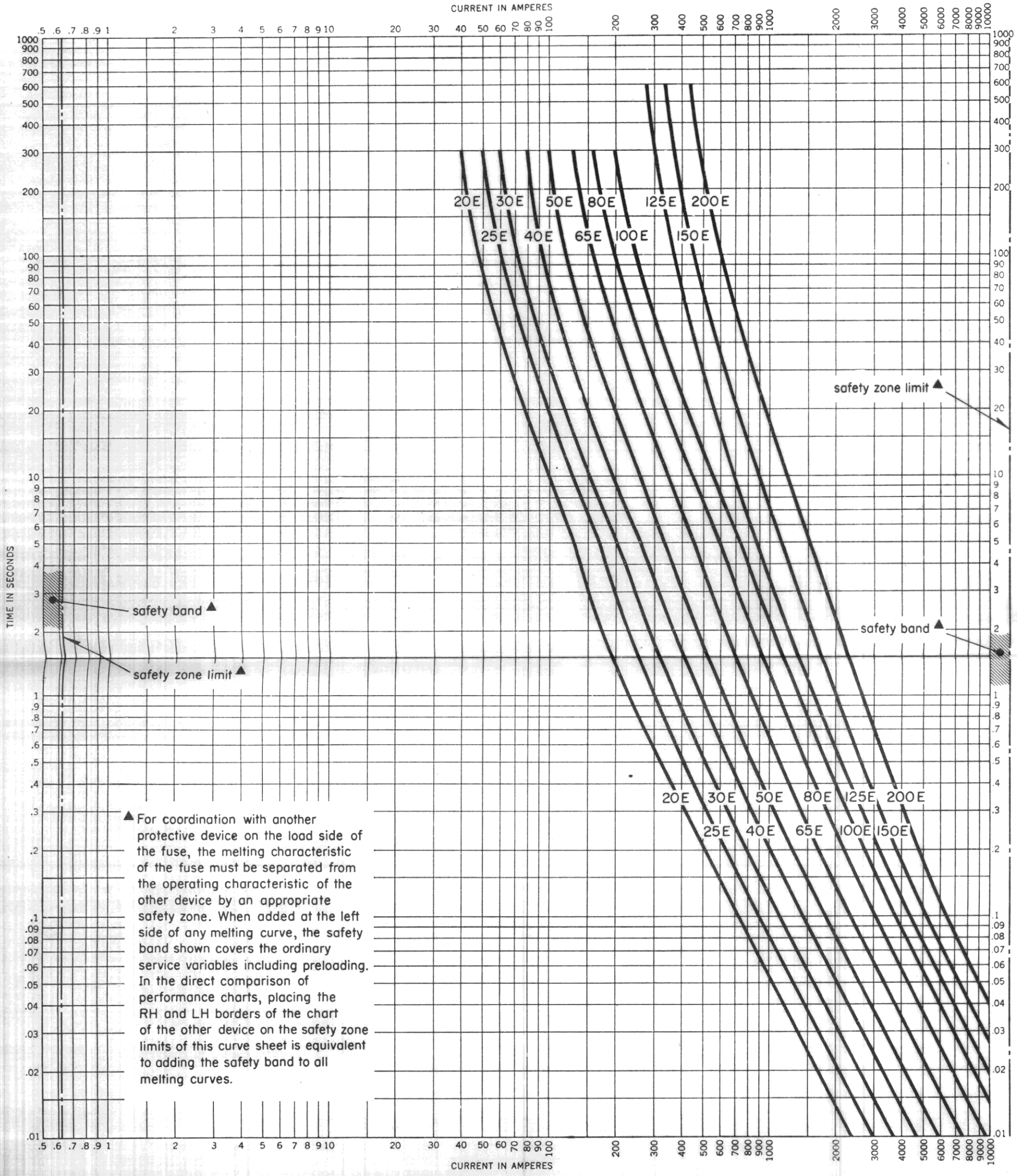
Curves are based on tests starting with fuse unit at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so variations should be negative.

curve no. 6

reference no. 280214

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



type BA-400 refill power fuses • time lag refills

melting time-current characteristics

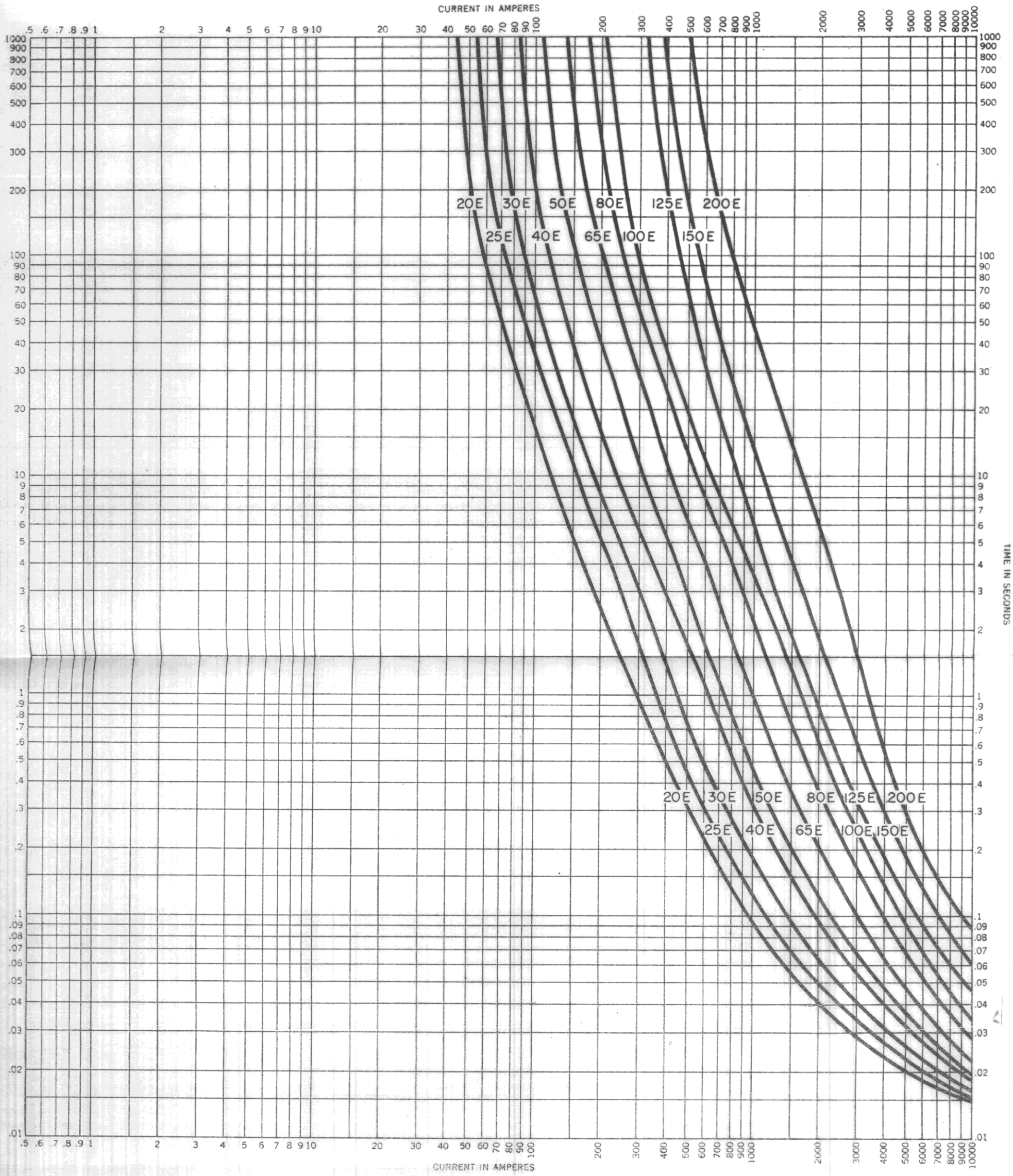
Curves are based on tests starting with fuse unit at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points so all variations should be positive.

curve no. 7

reference no. 369679

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type BA-400 refill power fuses · time lag refills

total clearing time-current characteristics—2.4 to 34.5 kv

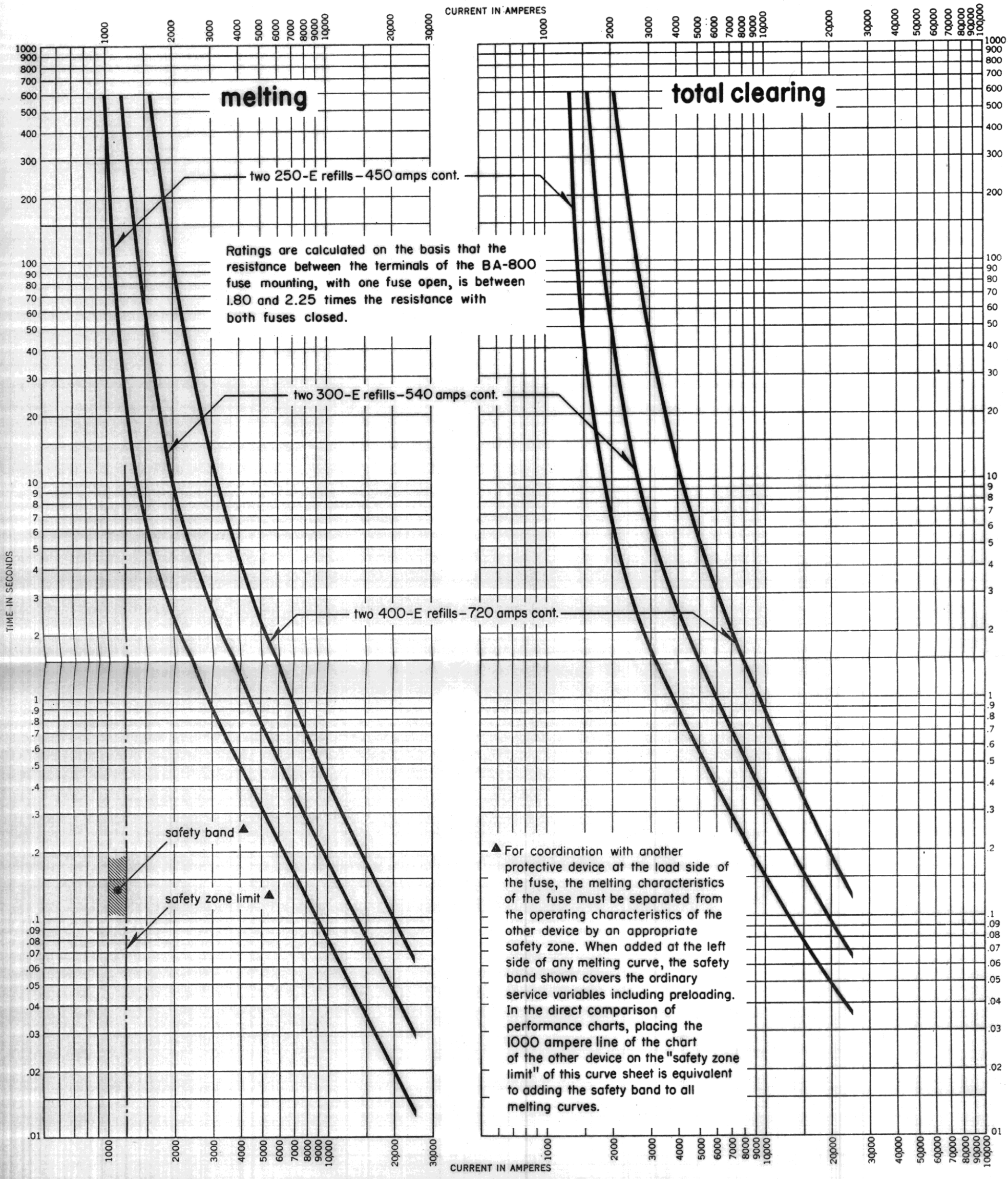
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points.

curve no. 8

reference no. 369681

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
Printed in U.S.A.



type BA-800 refill power fuse • two BA-400 fuse holders with **standard speed refills**

melting and total clearing time-current characteristics

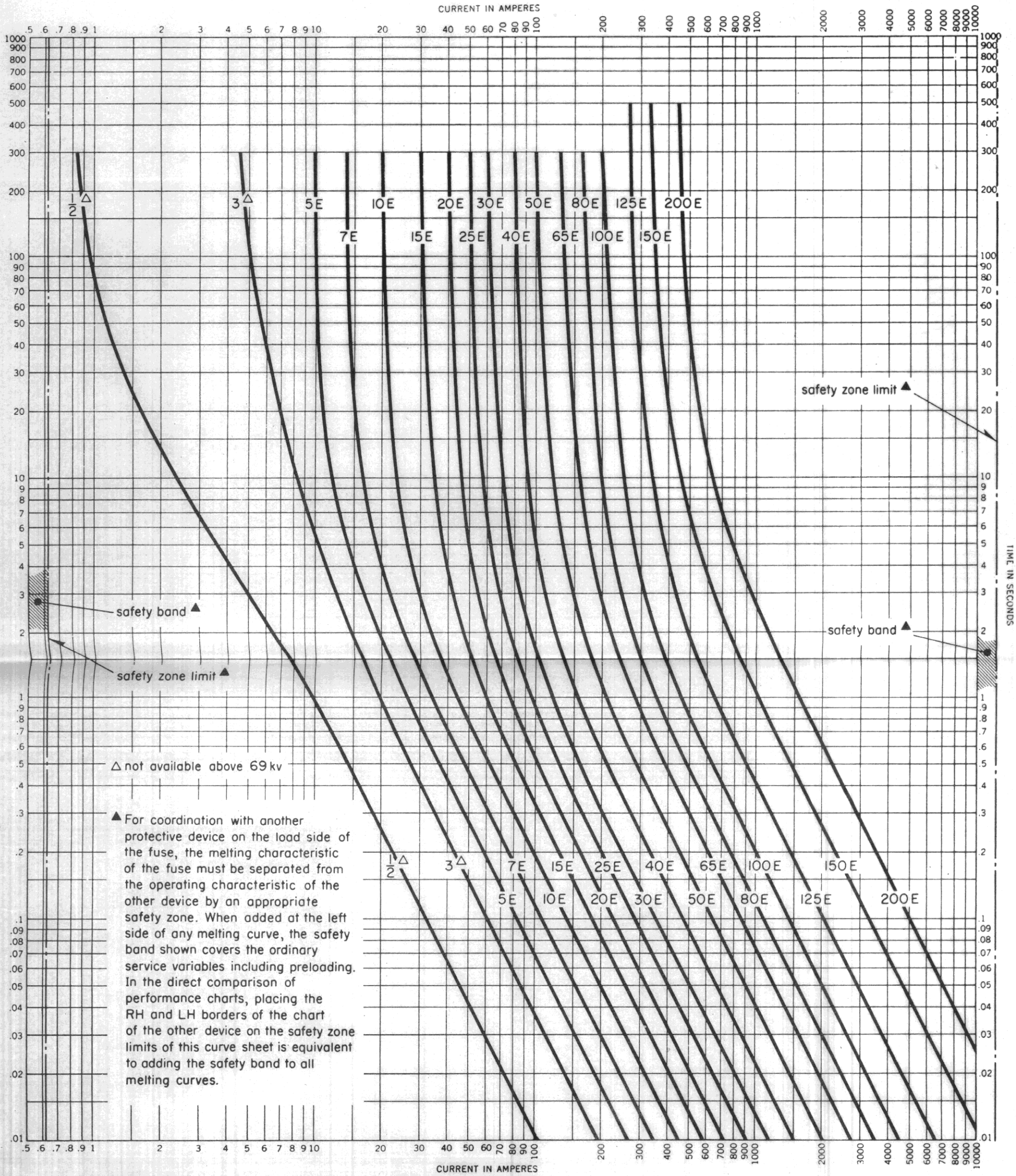
Curves are calculated on the basis that the resistance between the terminals of the BA-800 fuse mounting, with one fuse open, is between 1.80 and 2.25 times the resistance with both fuses closed, conditions otherwise being the same as for BA-400 units.

curve no. **9**

reference no. 459360

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type DBA-1, -2 and -5 dropout power fuses • standard speed fuse elements

melting time-current characteristics

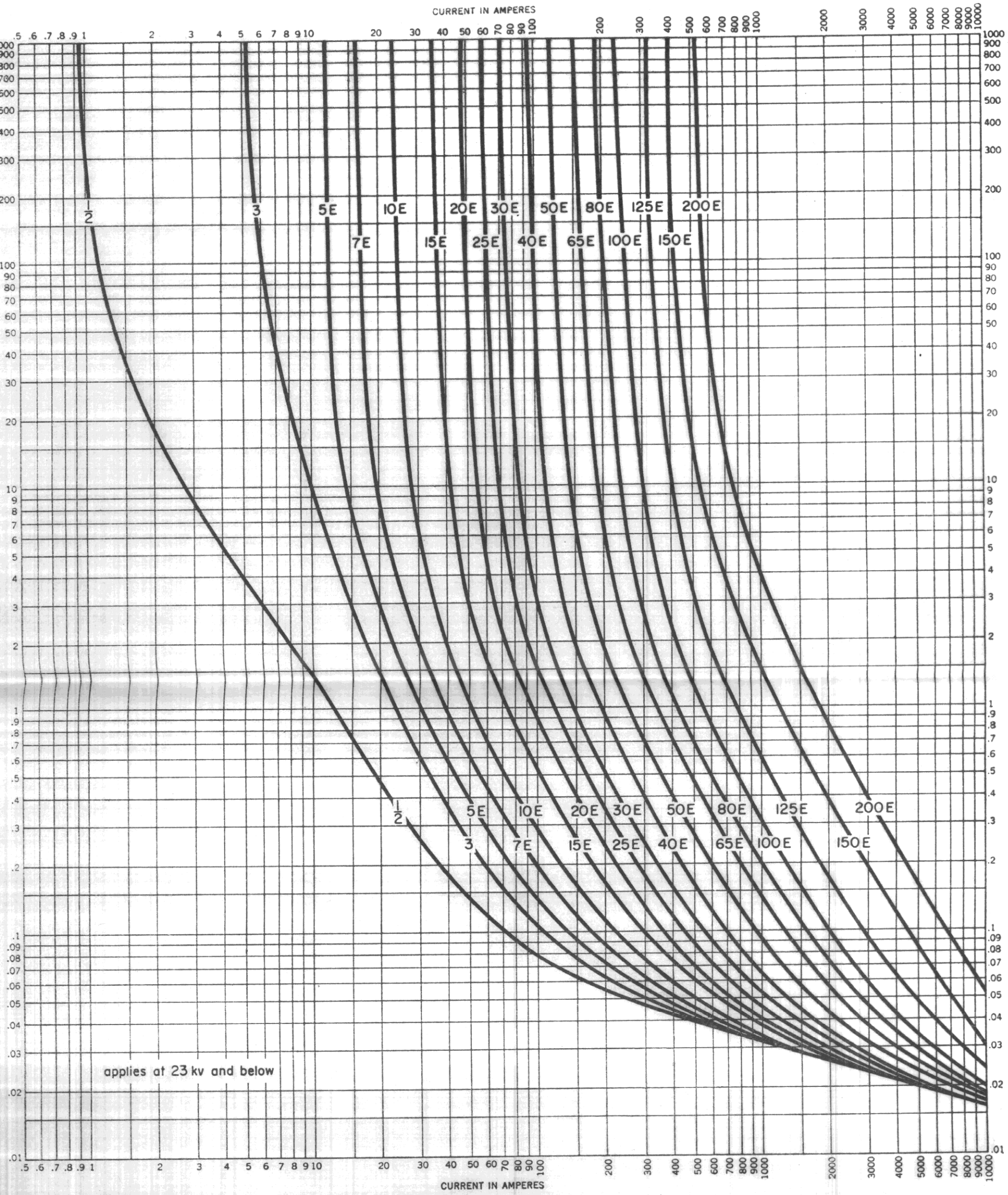
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points so all variations should be positive.

curve no. 10

reference no. 459351

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type DBA-1 dropout power fuses • standard speed fuse elements

total clearing time-current characteristics—2.4 to 23 kv

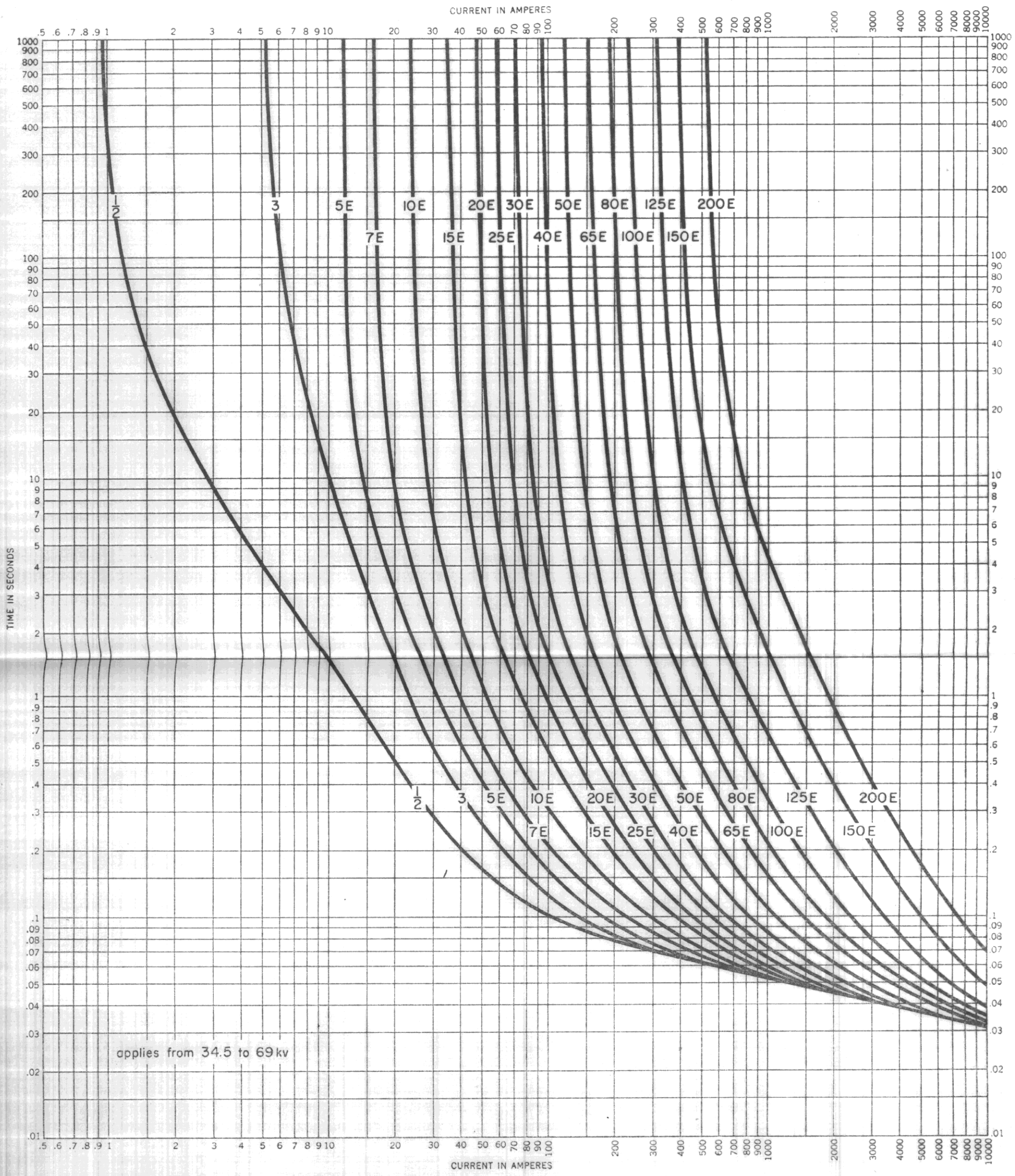
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. 11

reference no. 459352

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type DBA-1, -2 and -5 dropout power fuses • standard speed fuse elements

total clearing time-current characteristics—34.5 to 69 kv

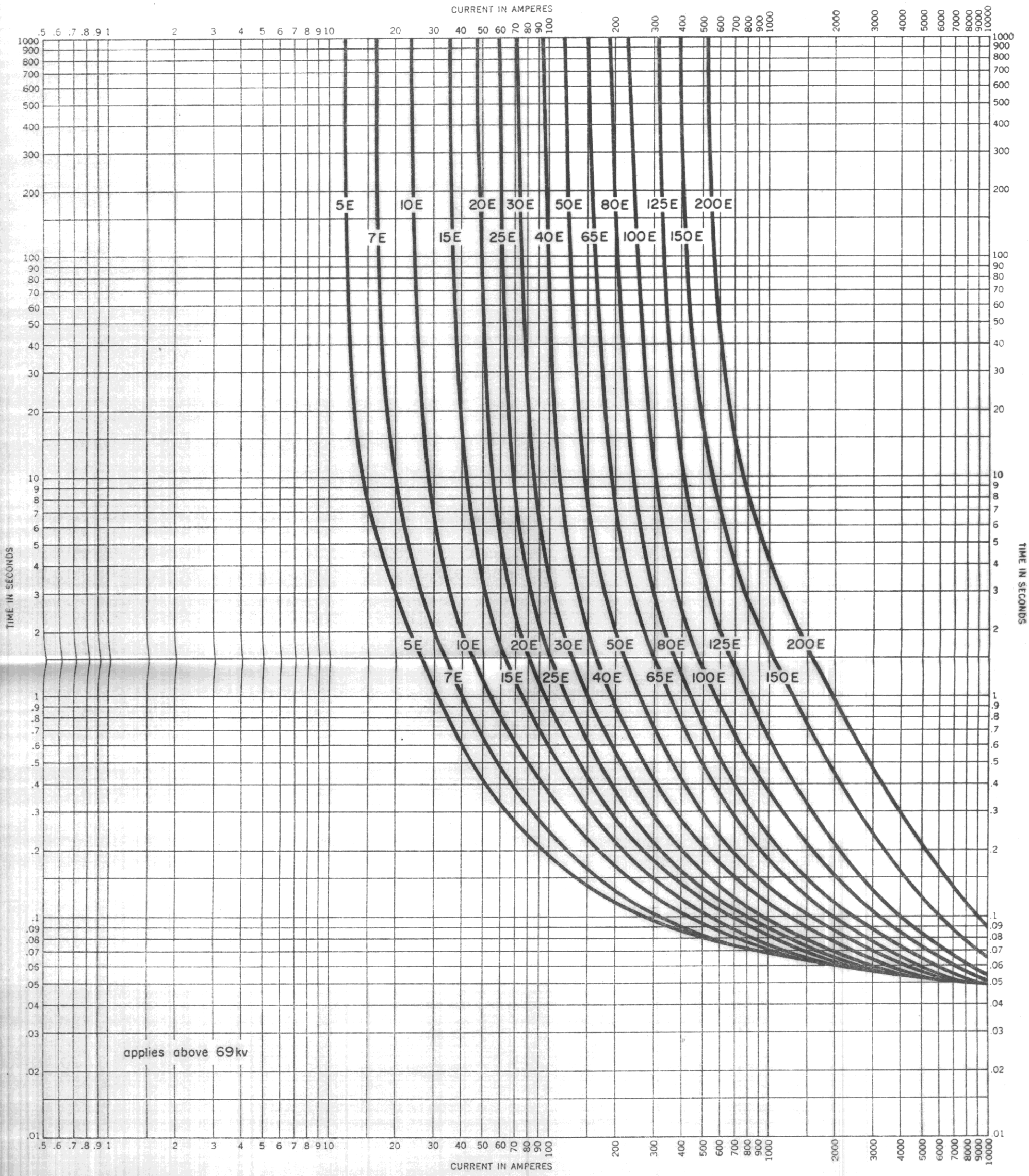
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. 12

reference no. 459353

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type DBA-2 dropout power fuses · standard speed fuse elements

total clearing time characteristics—92 to 138 kv

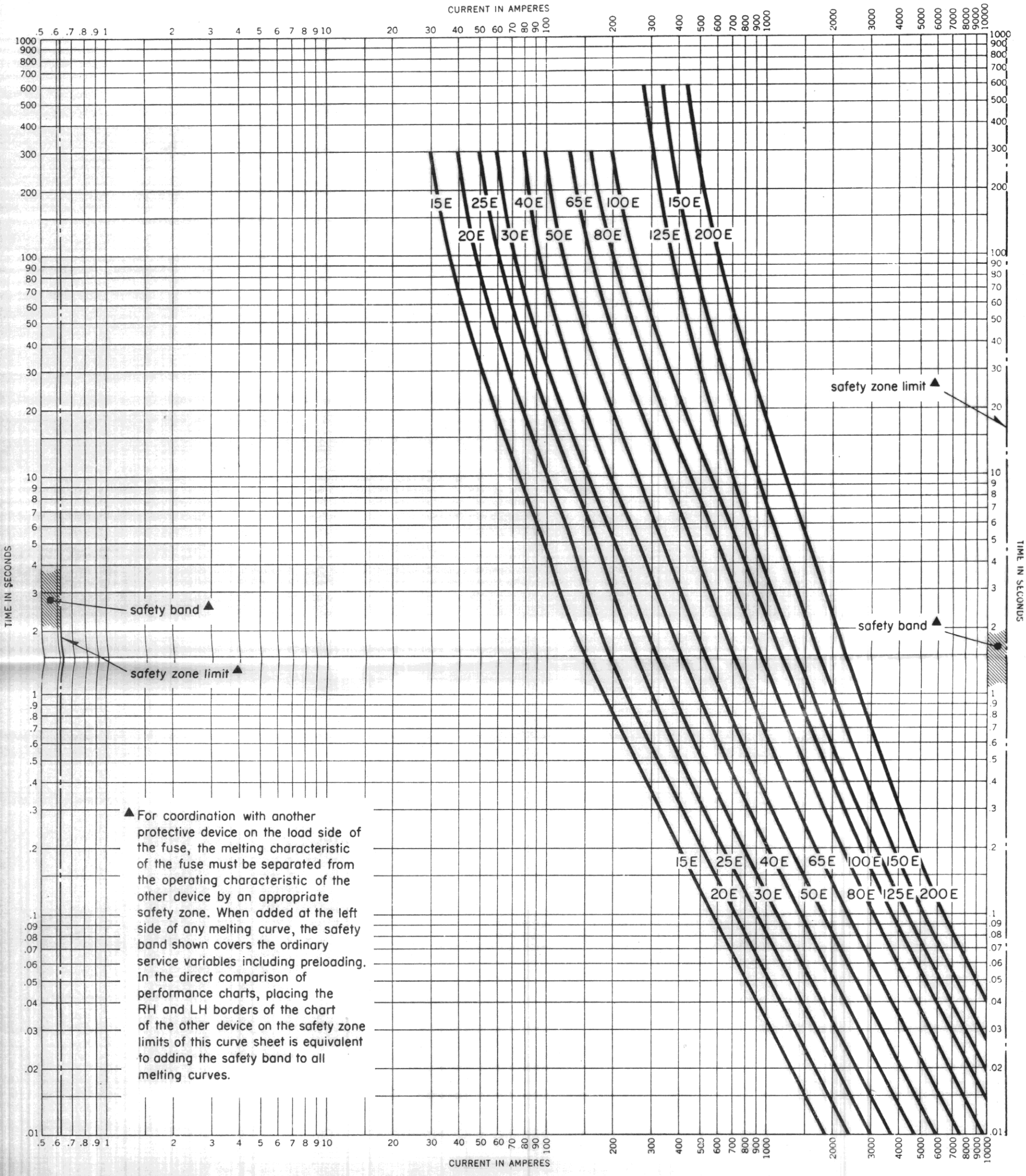
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. 13

reference no. 459354

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



type DBA-1, -2 and -5 dropout power fuses • time lag fuse elements

melting time-current characteristics

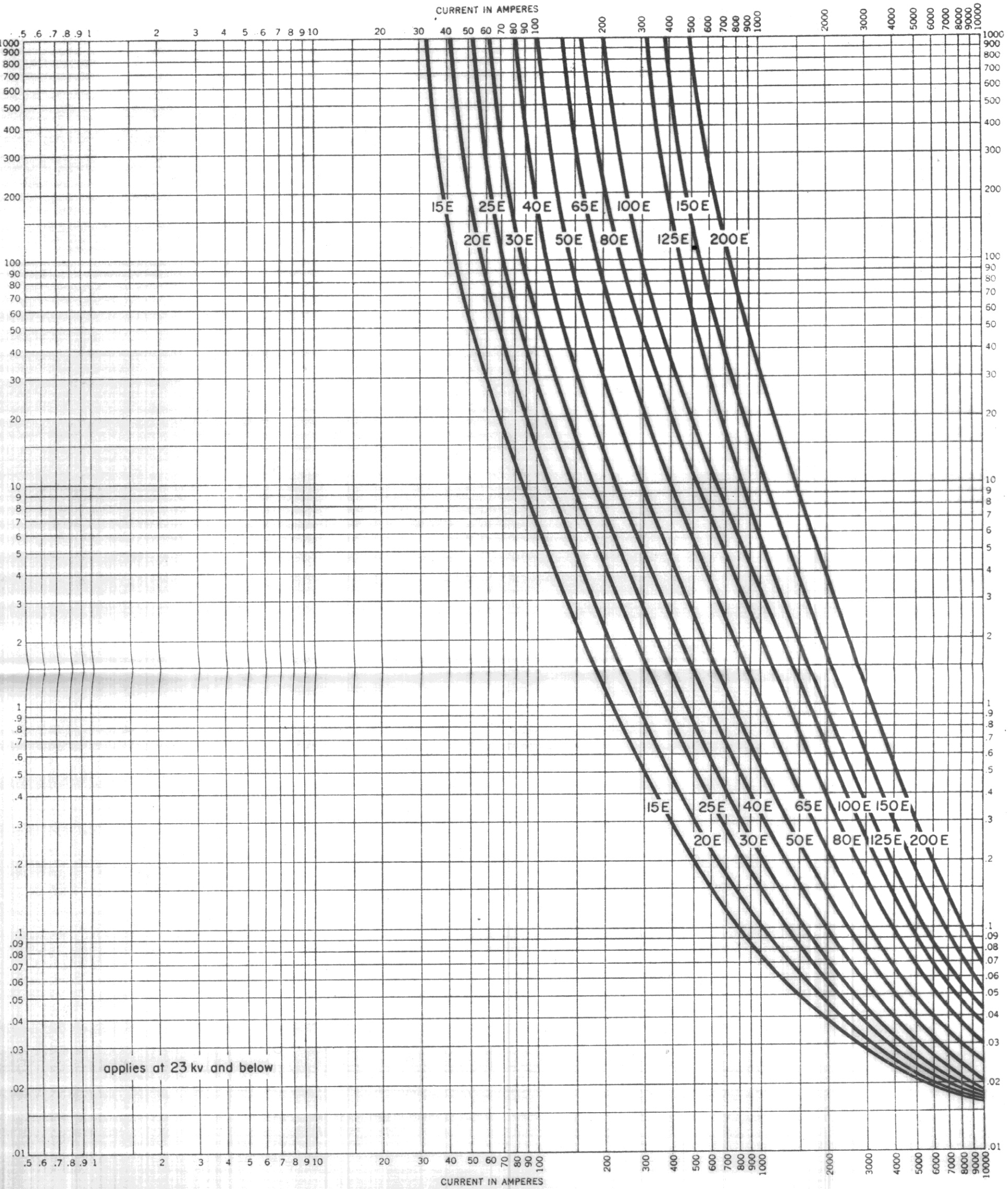
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points so all variations should be positive.

curve no. 14

reference no. 459355

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type DBA-1 dropout power fuses · time lag fuse elements

total clearing time-current characteristics—2.4 to 23 kv

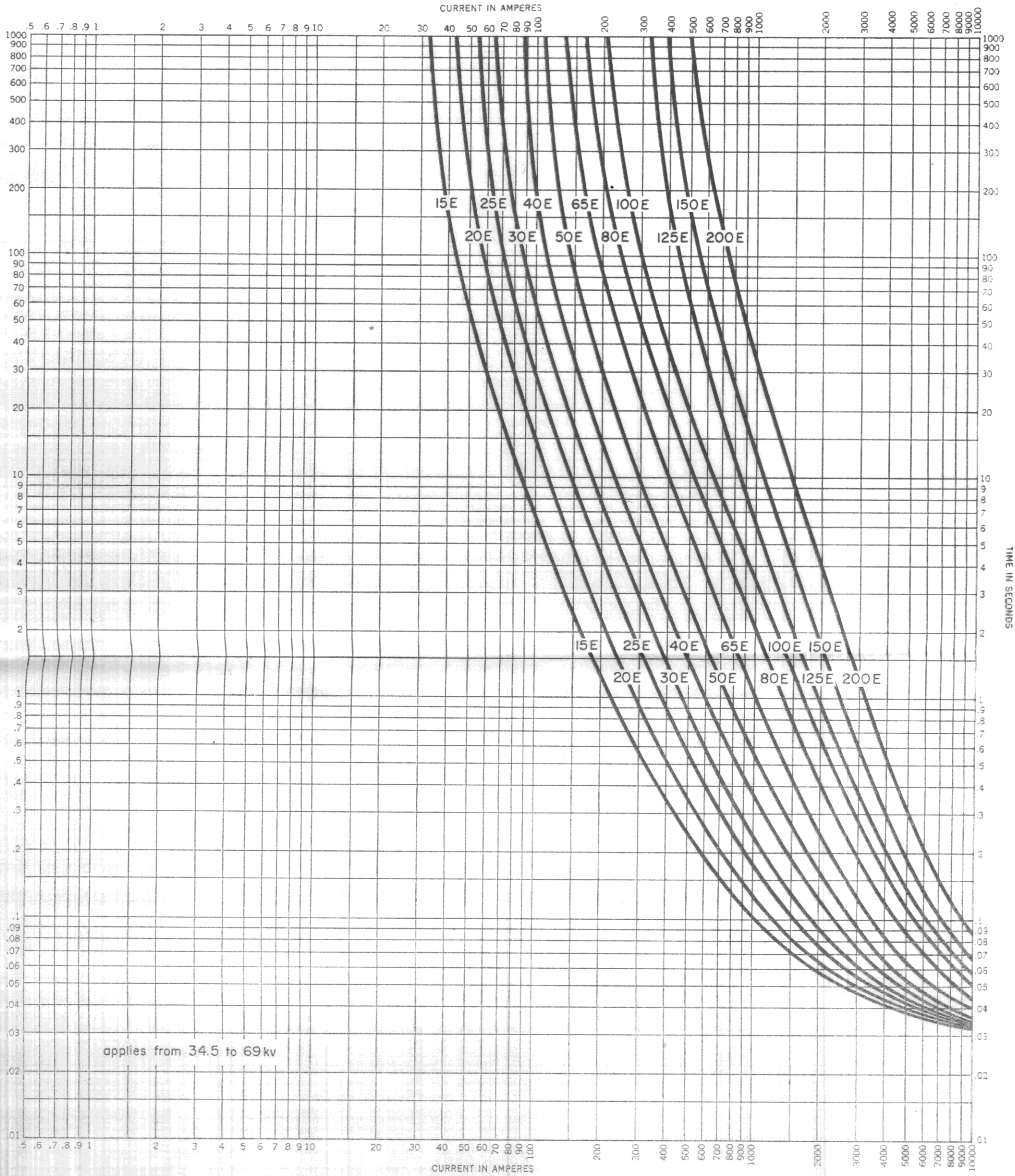
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. 15

reference no. 459356

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



type DBA-1, -2 and -5 dropout power fuses • time lag fuse elements

total clearing time-current characteristics—34.5 to 69 kv

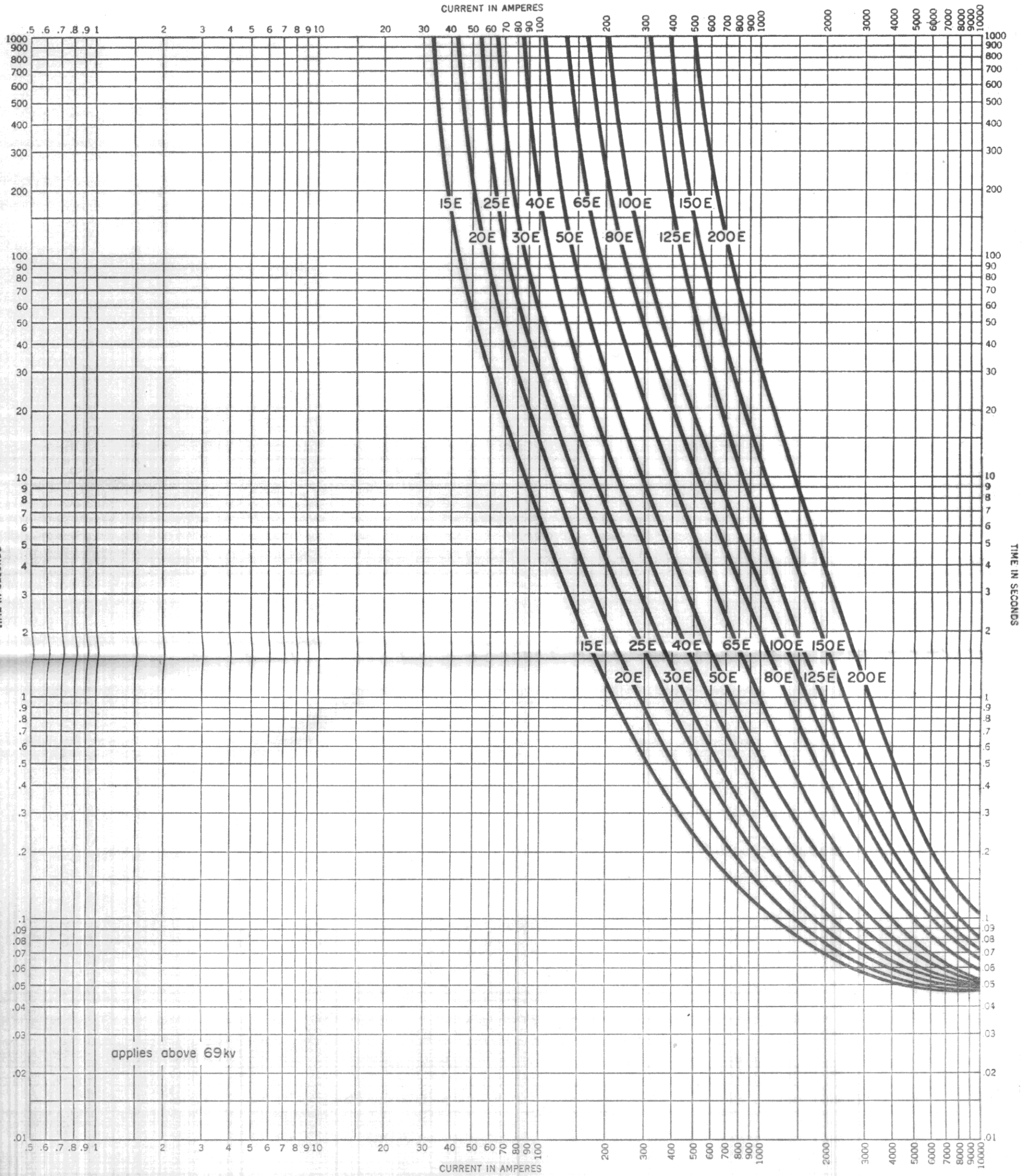
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. 16

reference no. 459357

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type DBA-2 dropout power fuses • time lag fuse elements

total clearing time-current characteristics—92 to 138 kv

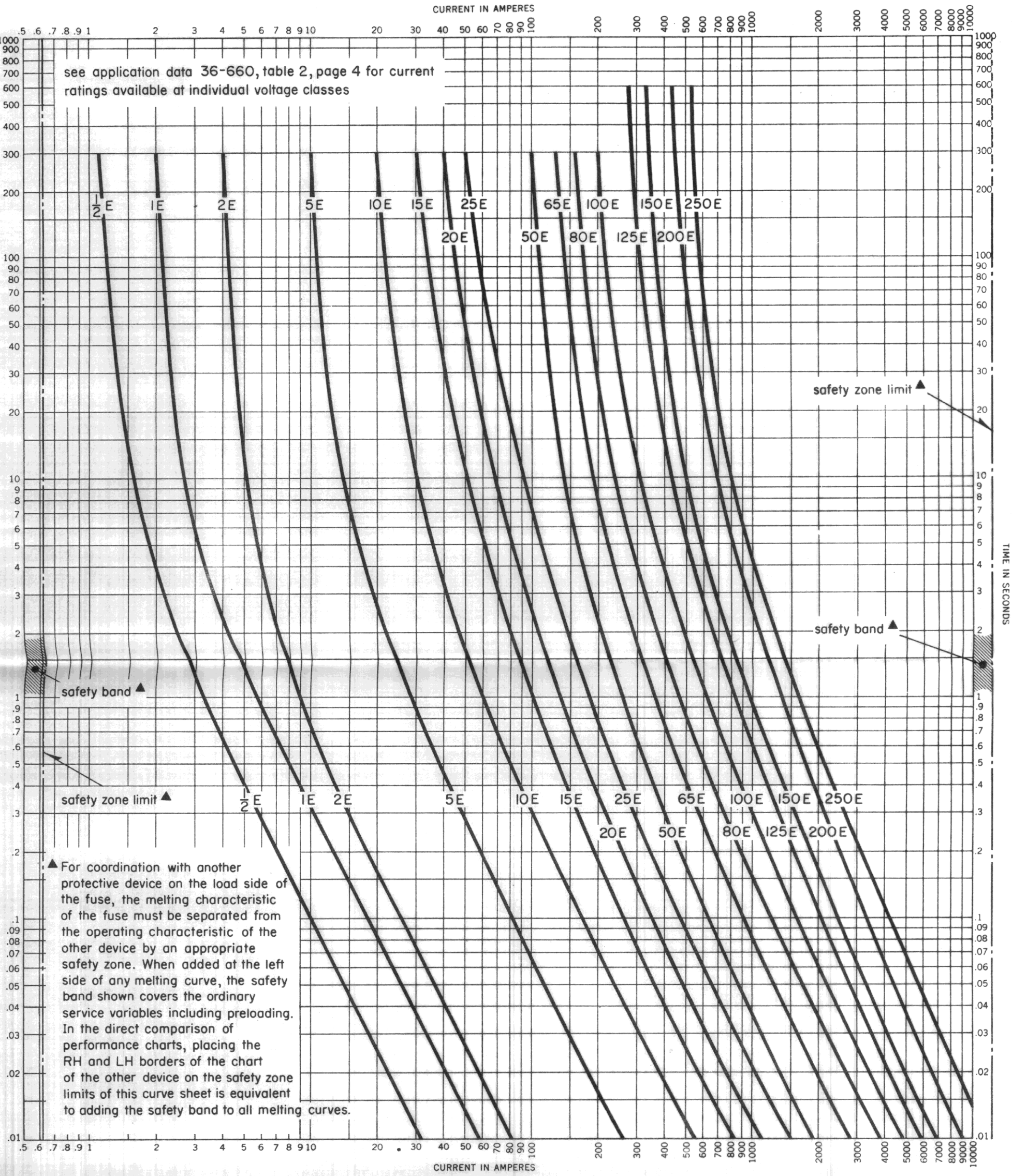
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so all variations should be negative.

curve no. 17

reference no. 459358

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type BAL-PT, -10, -25, -200 and -300 current limiting power fuses

melting time-current characteristics

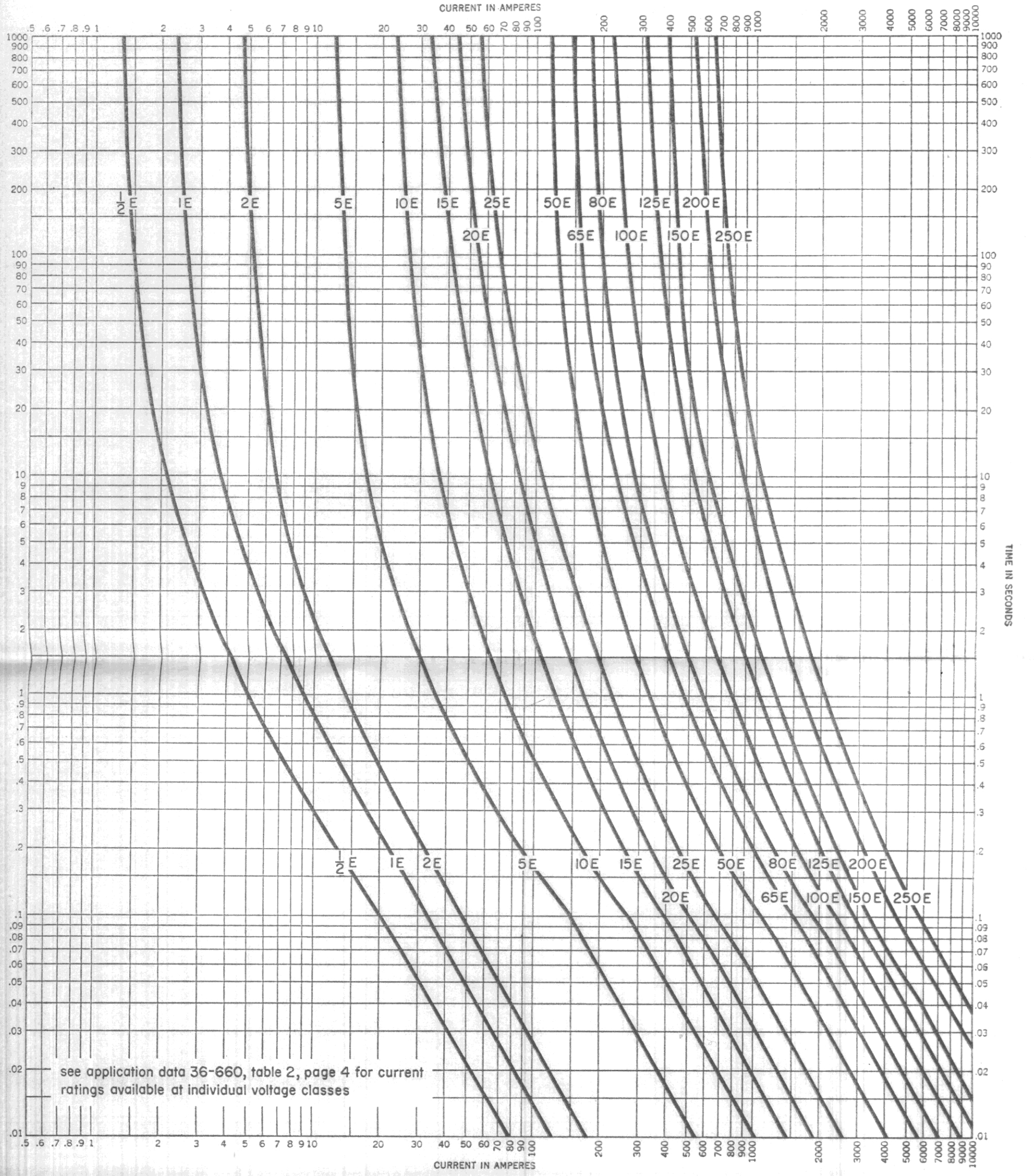
Curves are based on tests startin with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points so variations should be positive.

curve no. 18

reference no. 459344

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



see application data 36-660, table 2, page 4 for current ratings available at individual voltage classes

type BAL-PT, -10, -25, -200 and -300 current limiting power fuses

total clearing time-current characteristics—2.4 to 34.5 kv

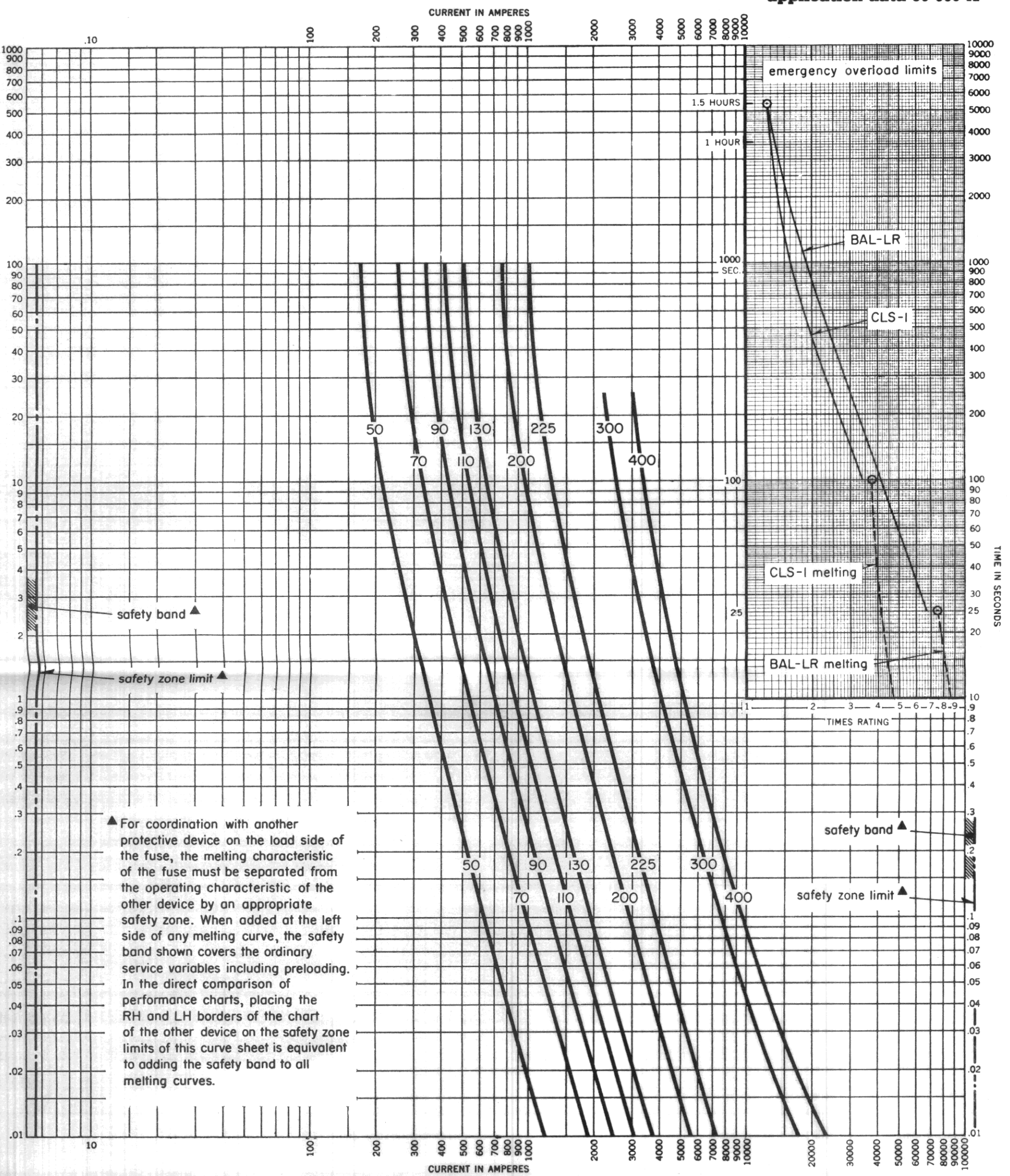
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points so variations should be negative.

curve no. 19

reference no. 459292

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.



type CLS-1 and BAL-LR · current limiting fuses

melting time-current characteristics—2.0 to 5.5 kv

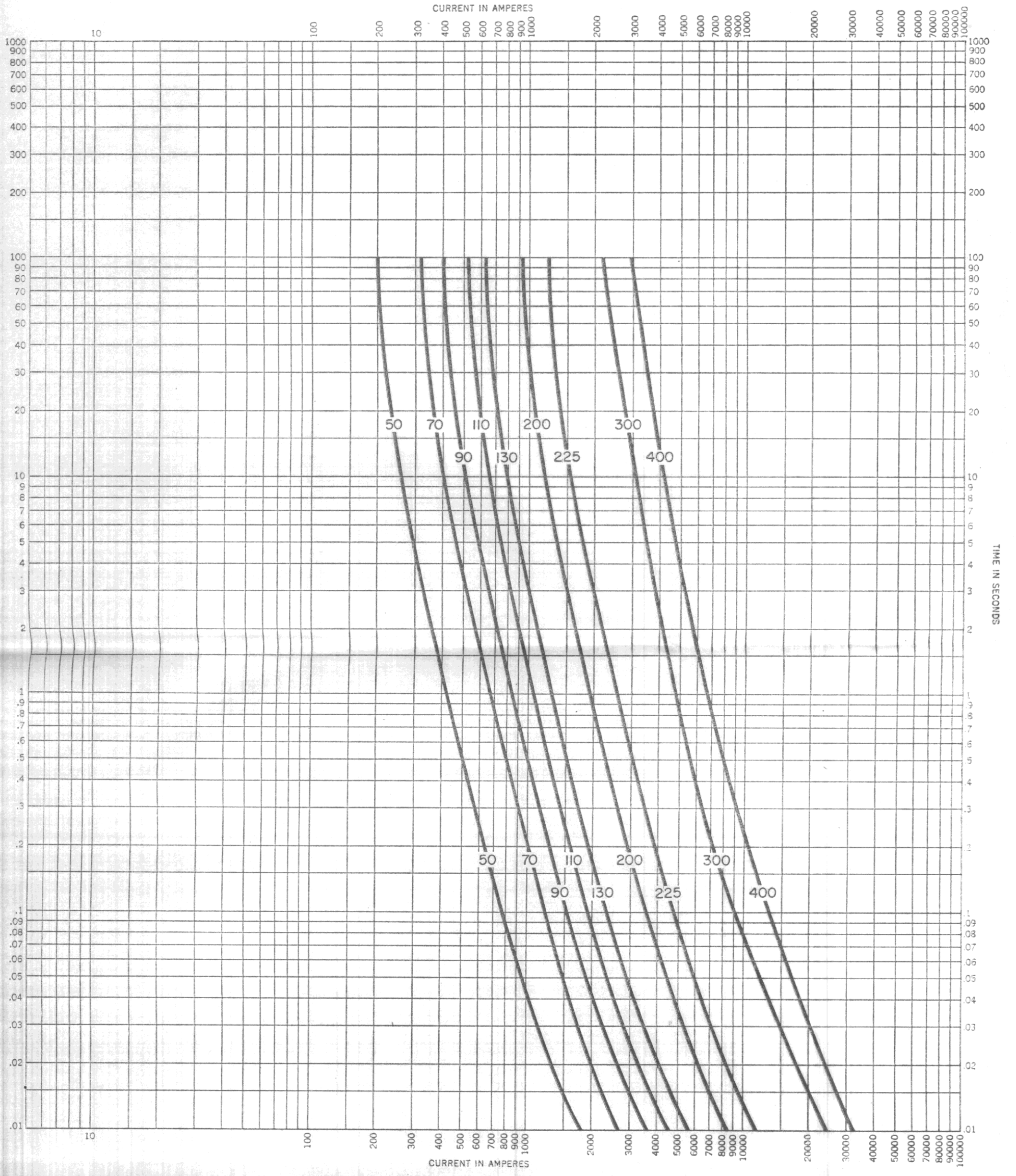
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to minimum test points.

curve no. 20

reference no. 512853

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



type CLS-1 and BAL-LR · current limiting fuses

total clearing time-current characteristics—2.0 to 5.5 kv

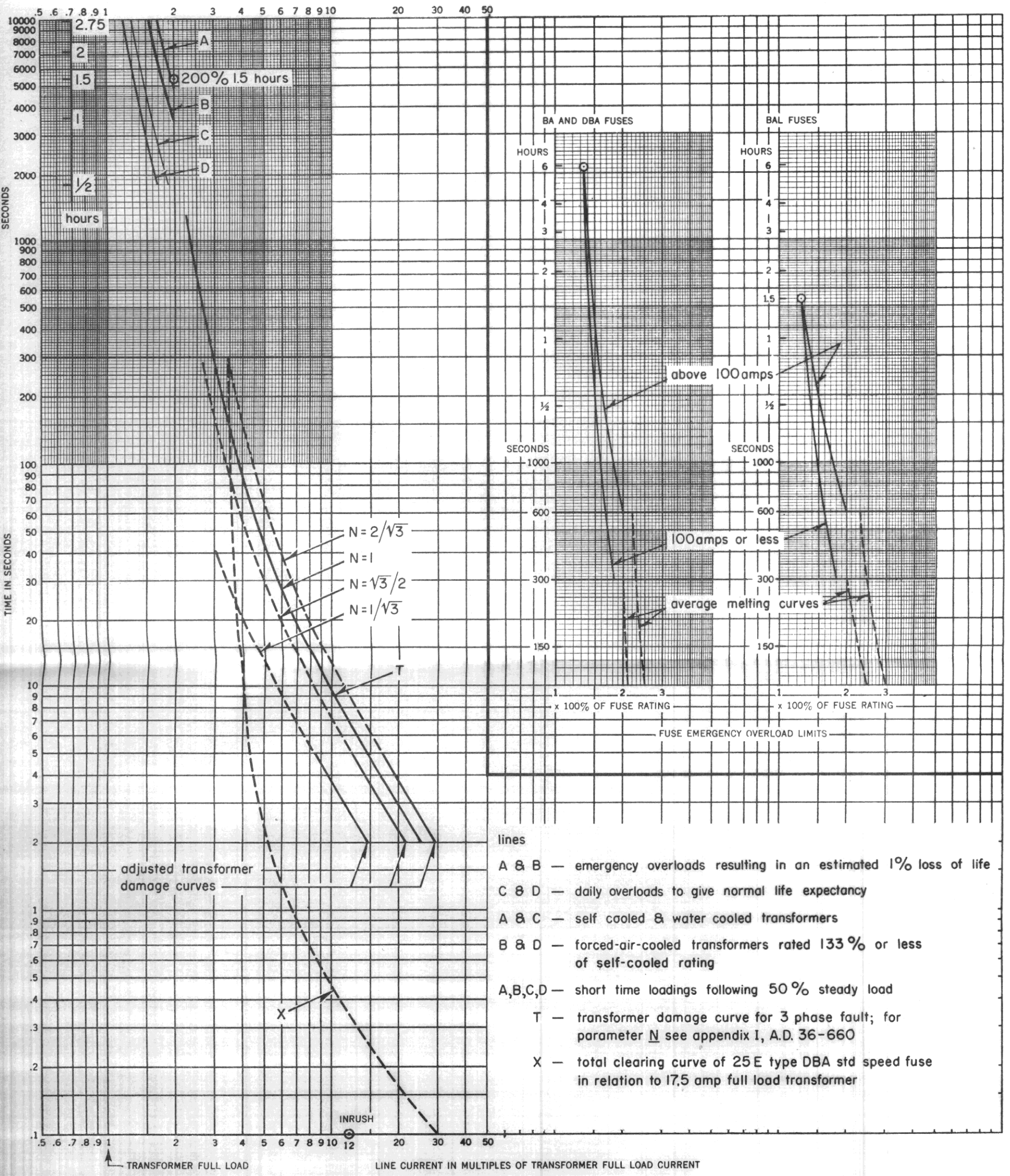
Curves are based on tests starting with fuse units at an ambient temperature of 25°C and without initial load. Curves are plotted to maximum test points.

curve no. 21

reference no. 512854

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.



lines

A & B — emergency overloads resulting in an estimated 1% loss of life

C & D — daily overloads to give normal life expectancy

A & C — self cooled & water cooled transformers

B & D — forced-air-cooled transformers rated 133% or less of self-cooled rating

A,B,C,D — short time loadings following 50% steady load

T — transformer damage curve for 3 phase fault; for parameter N see appendix I, A.D. 36-660

X — total clearing curve of 25E type DBA std speed fuse in relation to 17.5 amp full load transformer

transformer and fuse overload characteristics and coordination chart

curve no. 22

reference no. 459359

January, 1961

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division · East Pittsburgh, Pa.
printed in U.S.A.

recloser data: _____

fuse type and rating: _____

fuse speed ratio, S- _____

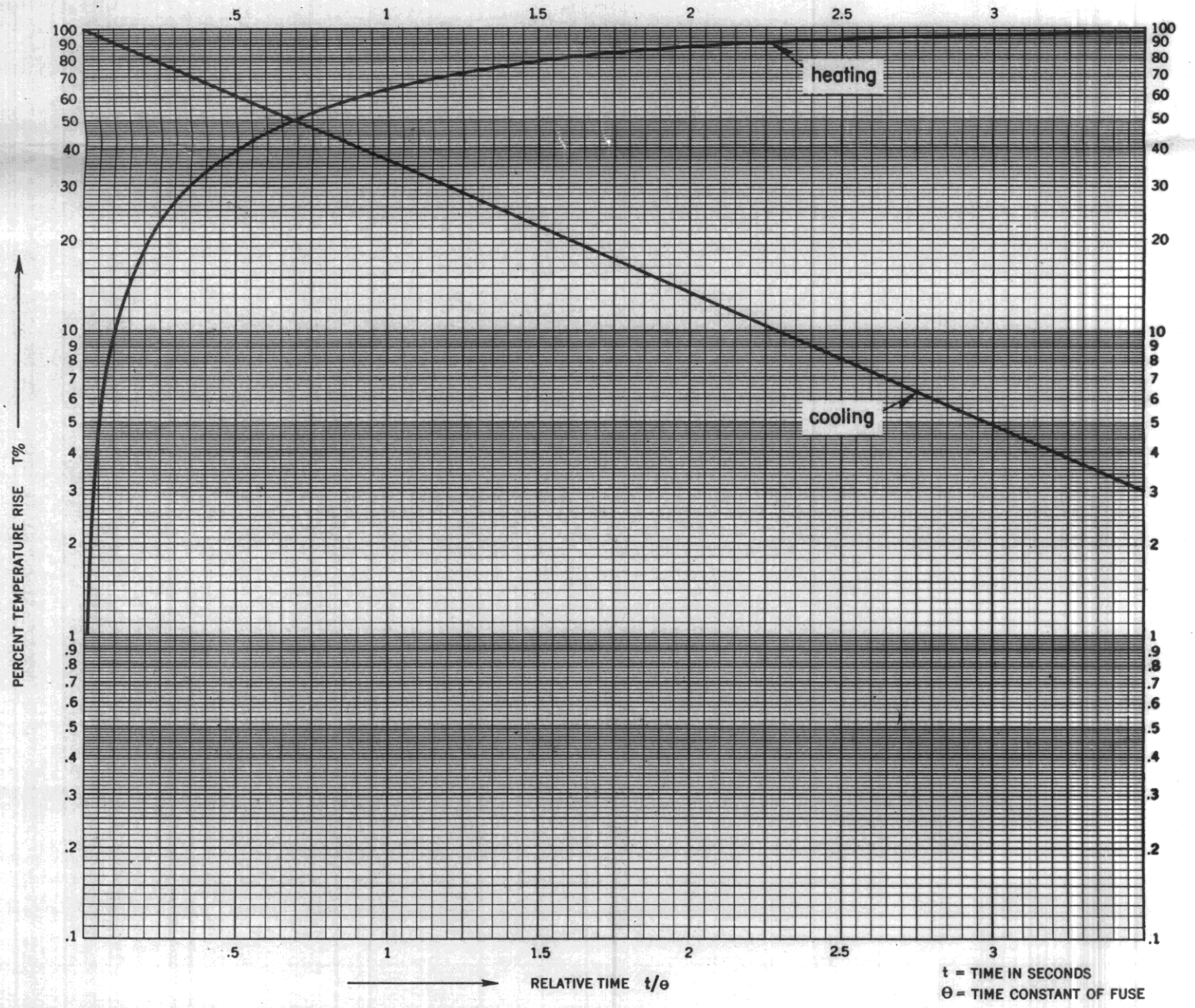
thermal time constant, $\theta = .10\ S^2$, _____ seconds

fault current _____ amps

period no.	recloser timing t seconds		total time t	relative time t/θ	resulting % temperature
	closed	open			
1▲					▲
2					
3					
4					
5					
6					
7					
normal melting time				M =	T_m =
q● x M					T_s =
total clearing time				N =	T_n =

▲ The first period may be so short that the intersection with curve A may be difficult to pinpoint. It should, therefore, be noted that, in Fig. 5, the initial portion of curve A coincides with the tangent which intersects the 100% level at the unit time constant. Consequently, the temperature level attained within such short times is determined simply by the formula $T\% = 100 \times t/\theta$.

● "q" is the coordination factor to take care of service variables. It is commonly estimated to be .75.



reclosing circuit breaker—fuse coordination chart

curve no. 23

Westinghouse Electric Corporation
Assembled Switchgear and Devices Dept.: East Pittsburgh Division • East Pittsburgh, Pa.
printed in U.S.A.

January, 1961