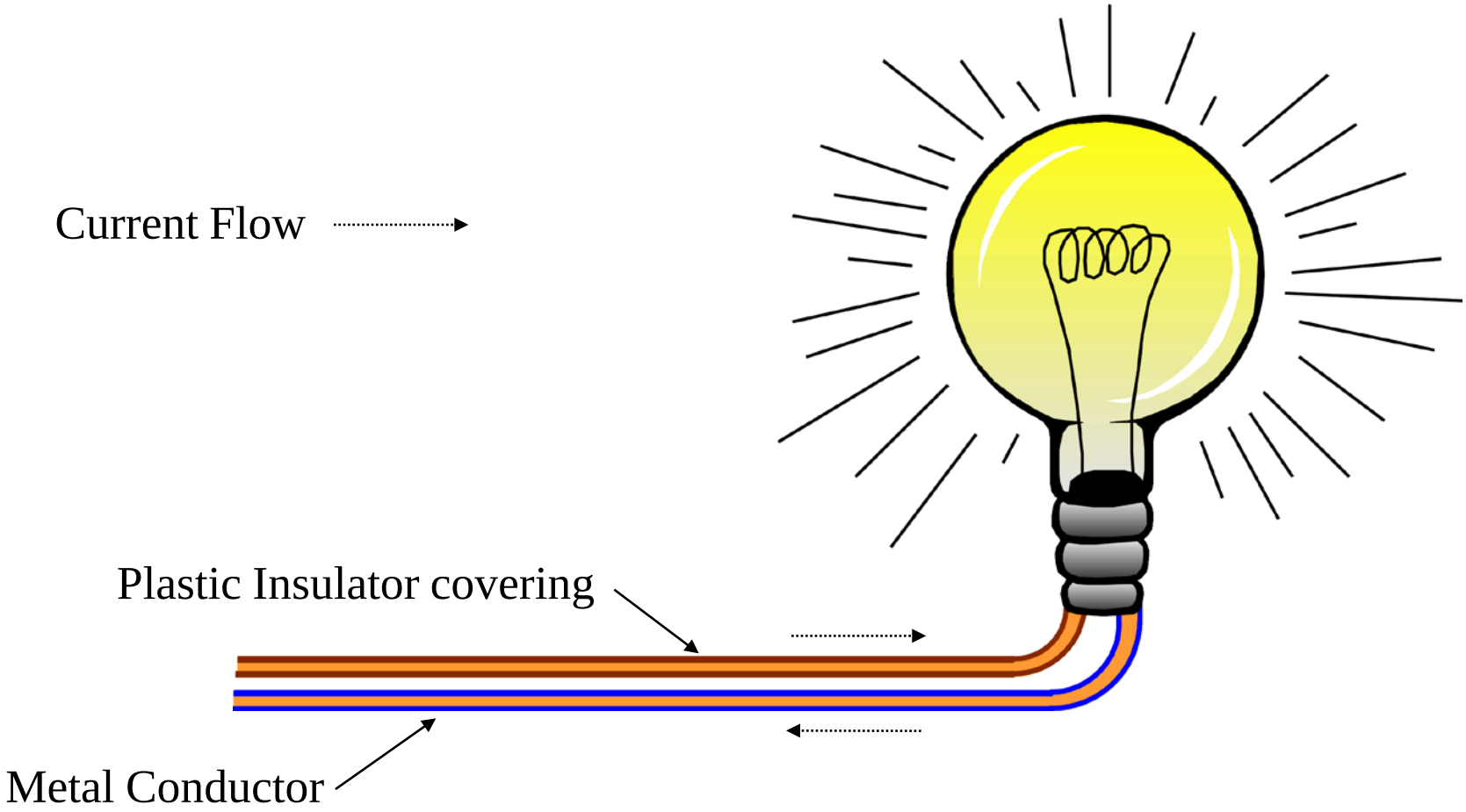
Fuse School
Module One

Introduction to electricity and fuse basics

COOPER Bussmann

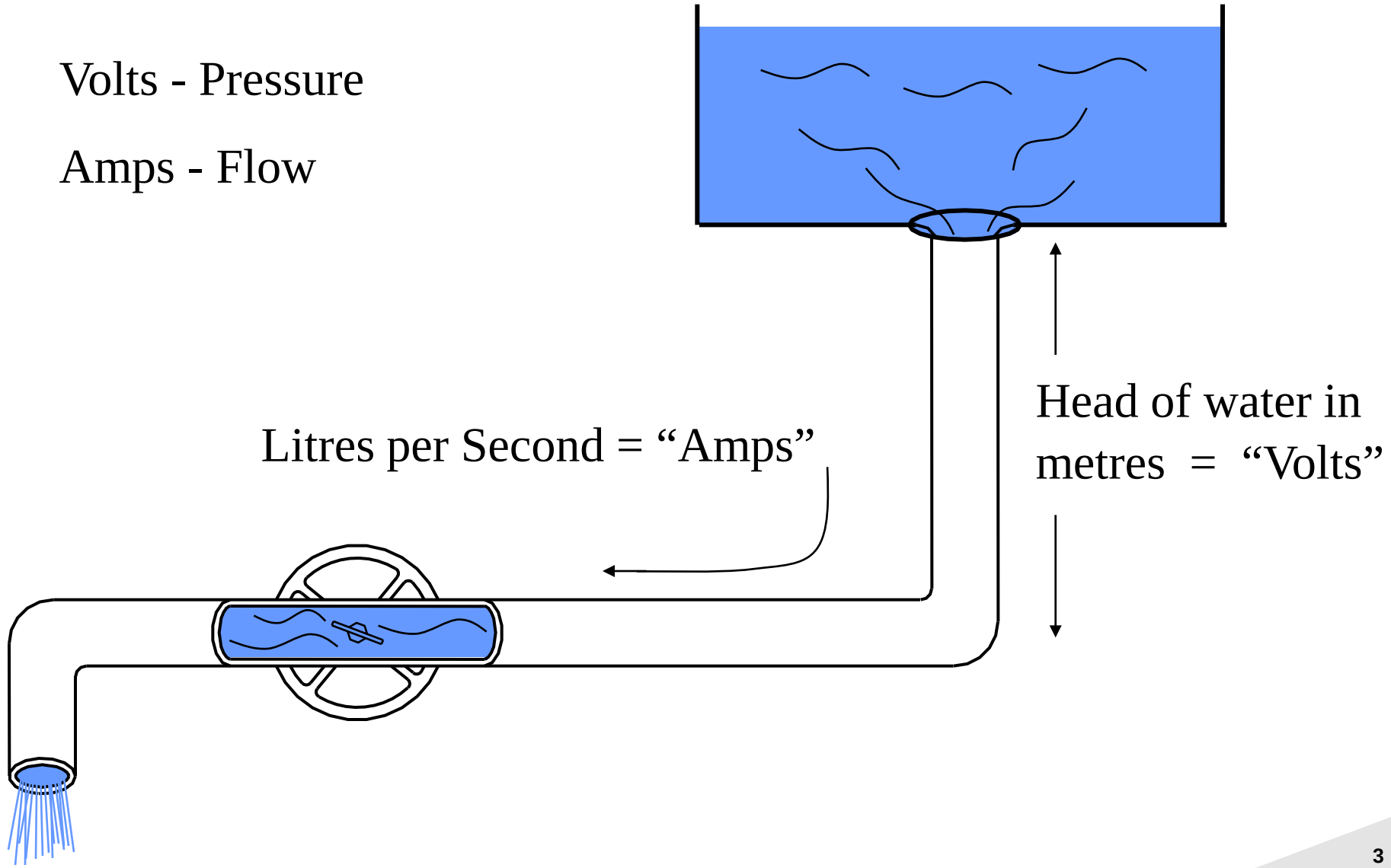
Conductors and Insulators



Volts and Amps

Volts - Pressure

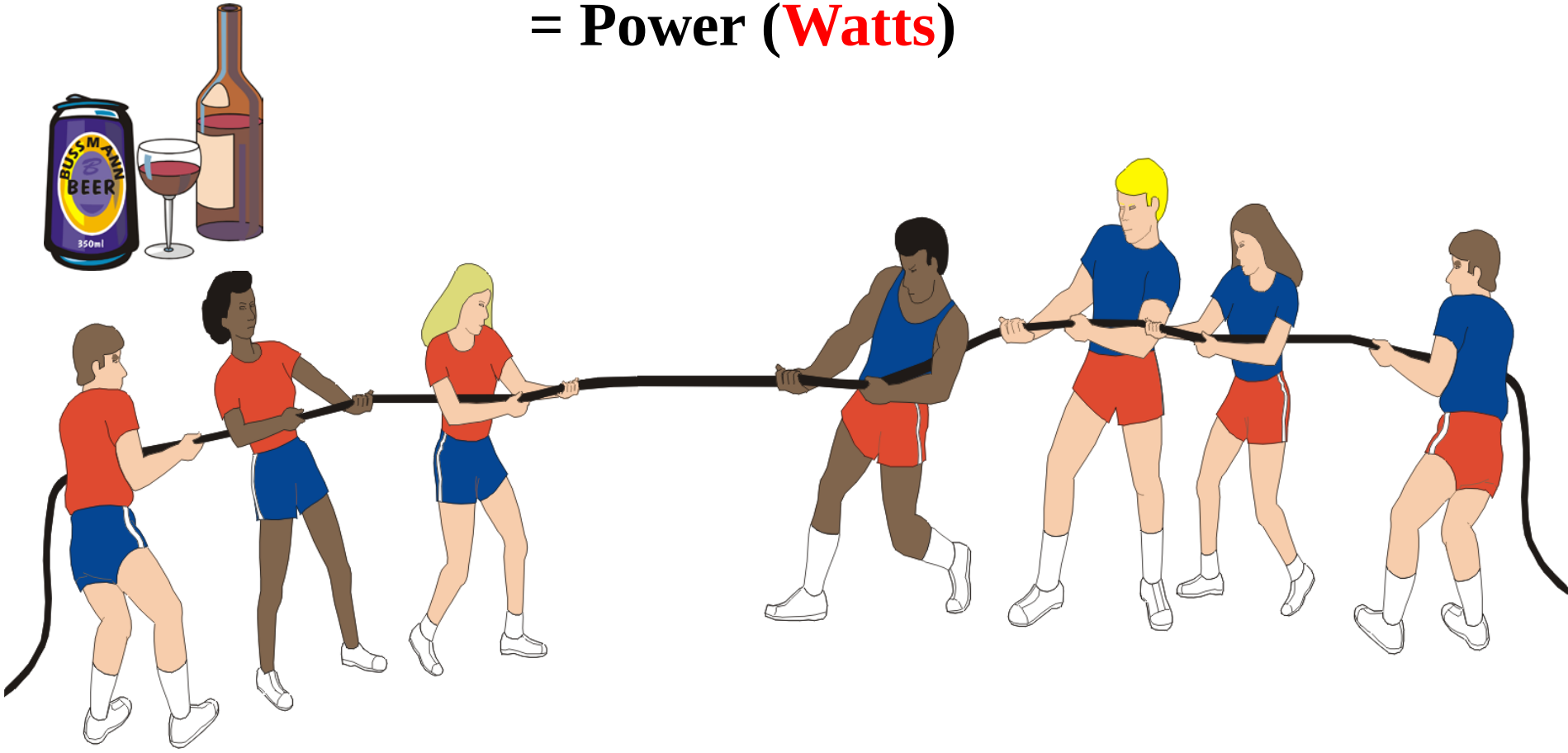
Amps - Flow



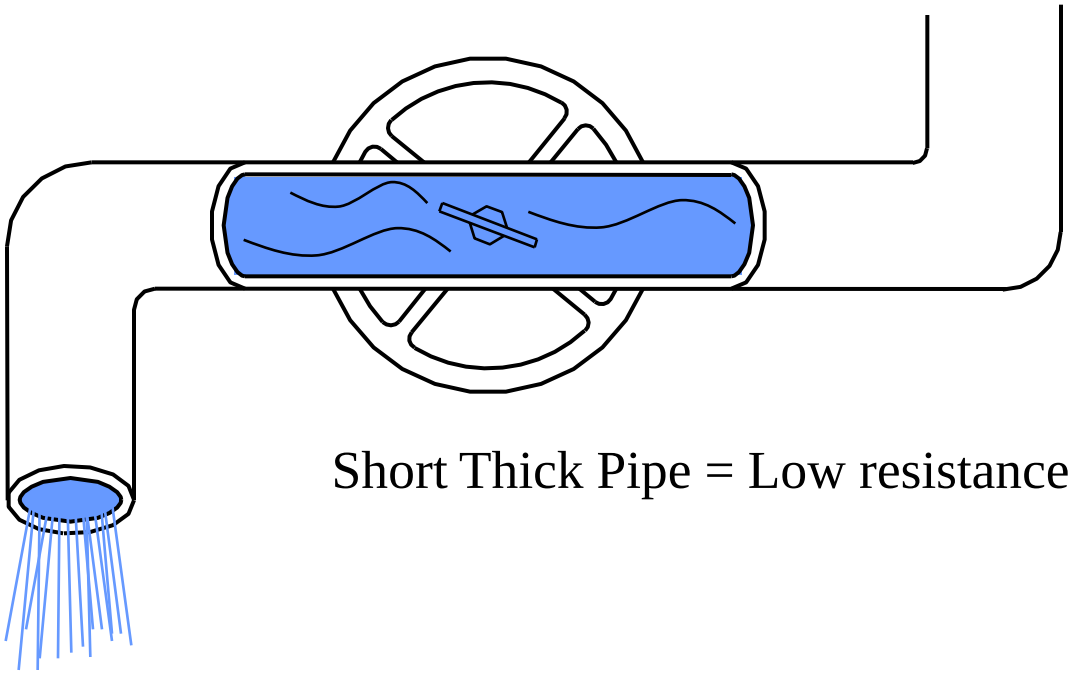
Watts

№ of Pullers (Amps) x Determination (Volts)

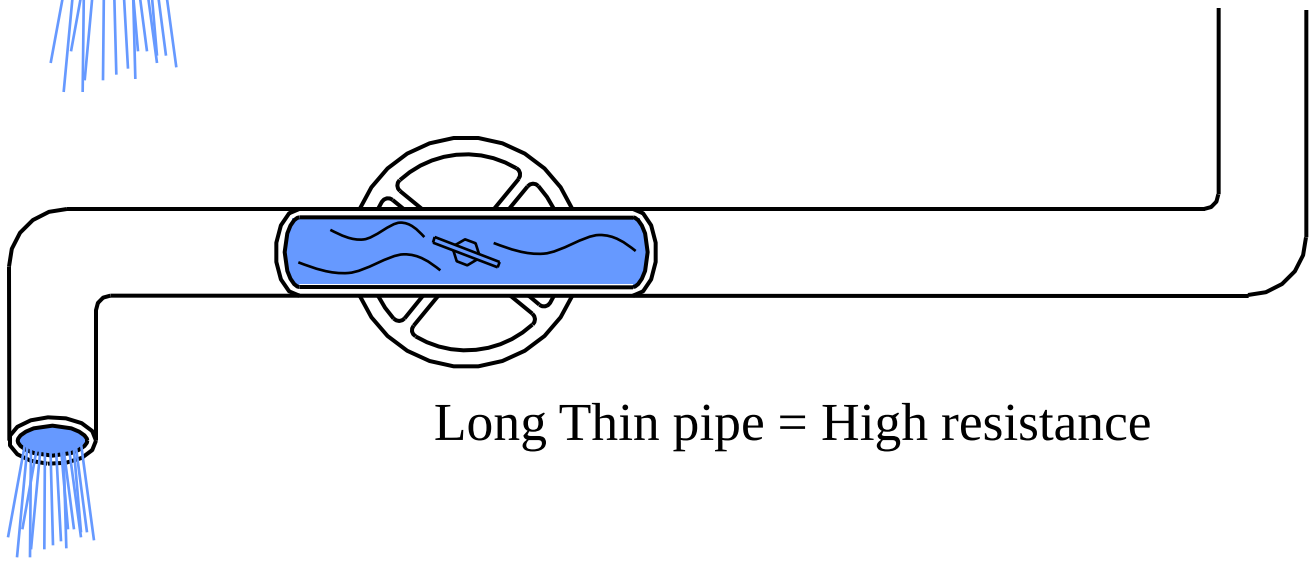
= Power (Watts)



Ohms

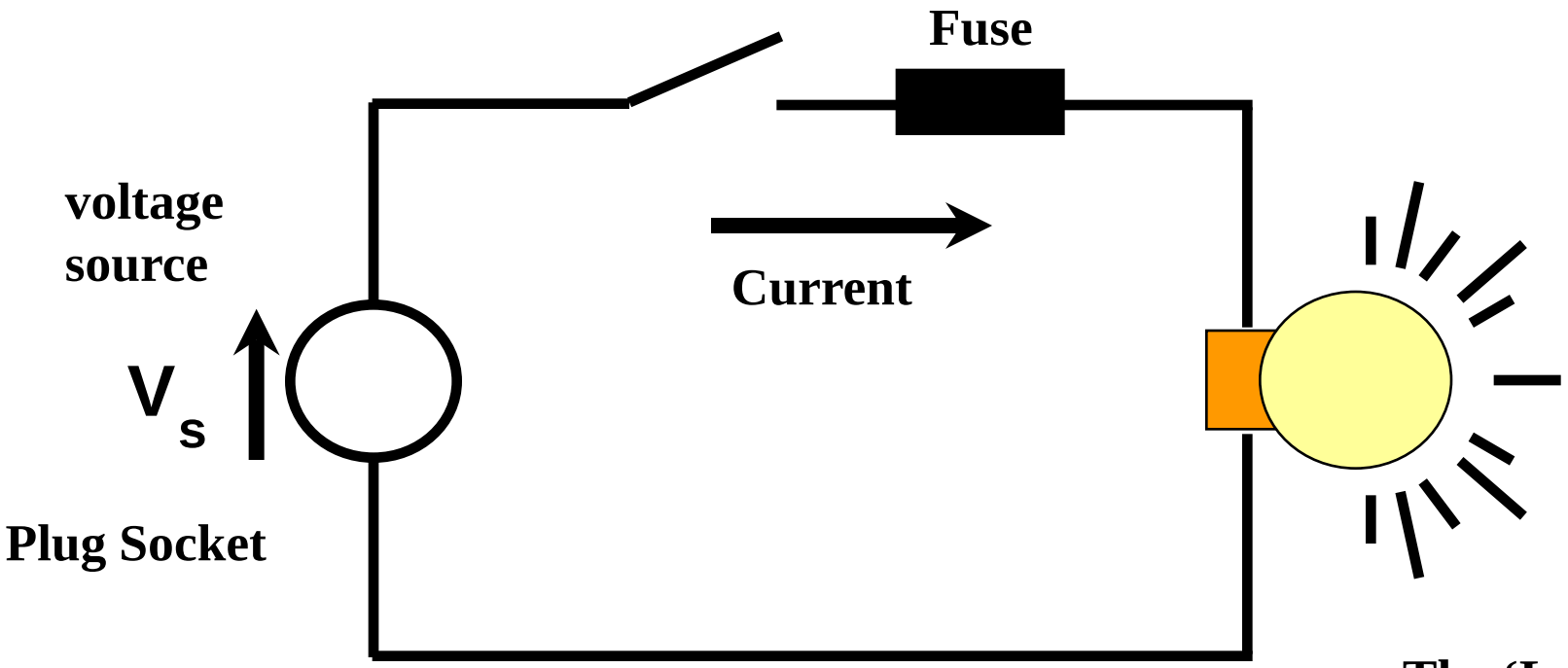


Short Thick Pipe = Low resistance



Long Thin pipe = High resistance

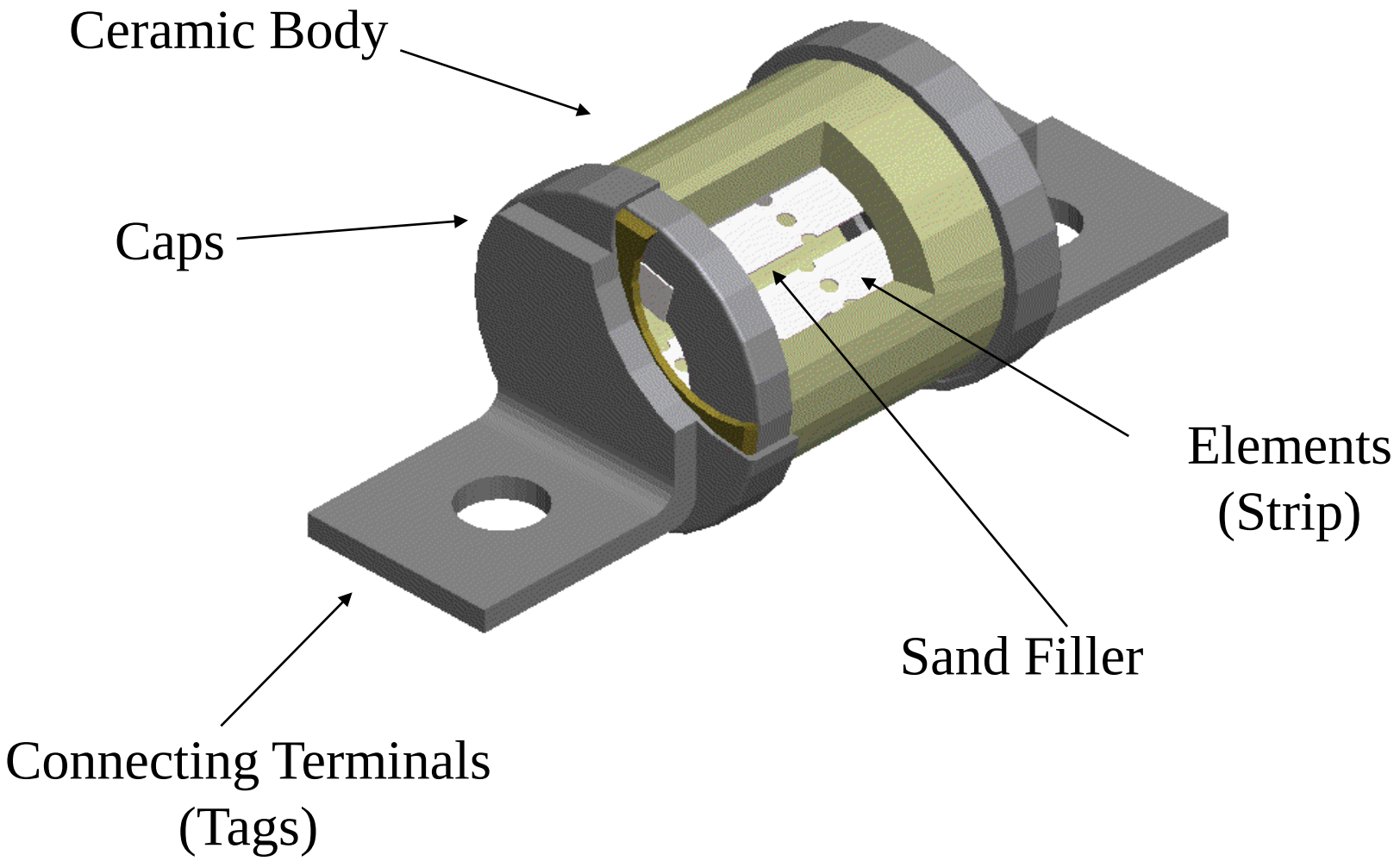
The Fuse as ‘Weak Link’



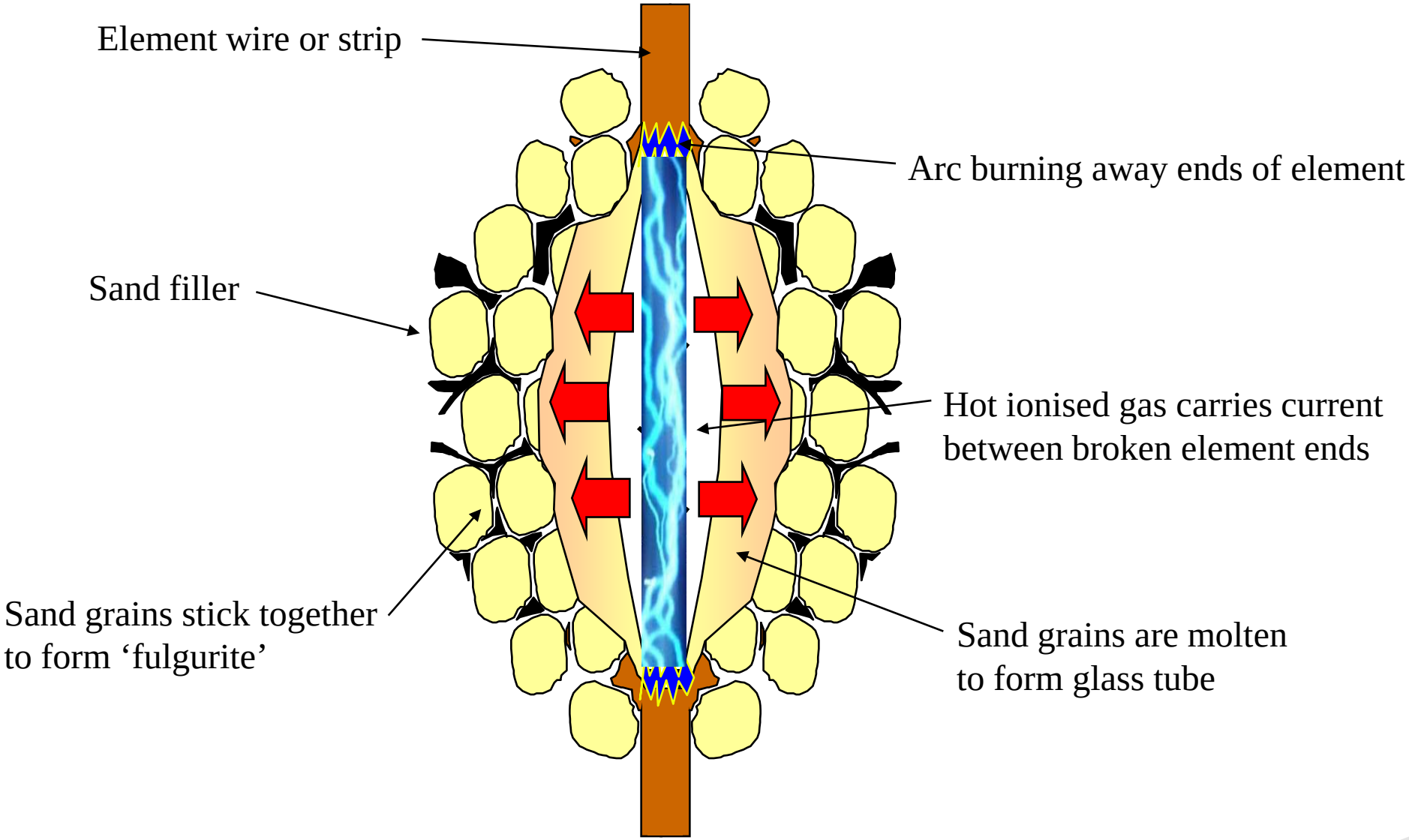
The ‘Load’

- **lamp**
- **Heater**
- **Radio**

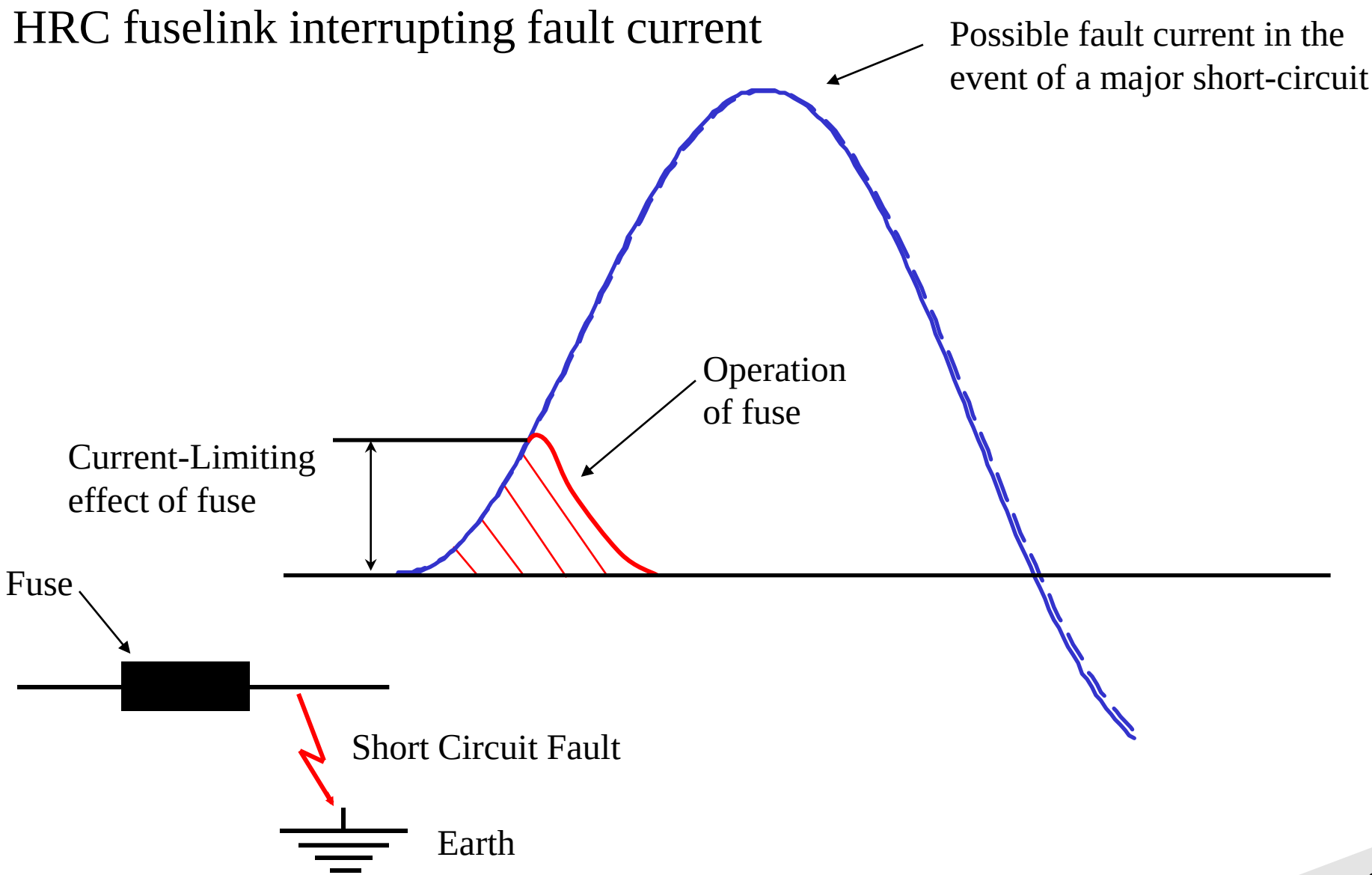
Basic Fuse Construction



Element Operation



Current-Limiting Effect



Fuse Rating

- Voltage Rating
- Current Rating
- Interrupting Rating
- Watts Loss

Common Units

Multipliers

- giga → G 1 000 000 000 (10^9)
- mega → M 1 000 000 (10^6)
- kilo → k 1 000 (10^3)
- milli → m 0.001 (10^{-3})

Measure

- Potential → Volts V
- Current → Amps A
- Resistance → Ohms Ω
- Power → Watts W

- MW MegaWatts
- mΩ milliOhms
- kV kiloVolts
- mA milliAmps

Characteristics

- Fuse Characteristics
  - Time Current Curves
  - Cut Off Curves
  - I^2t Values

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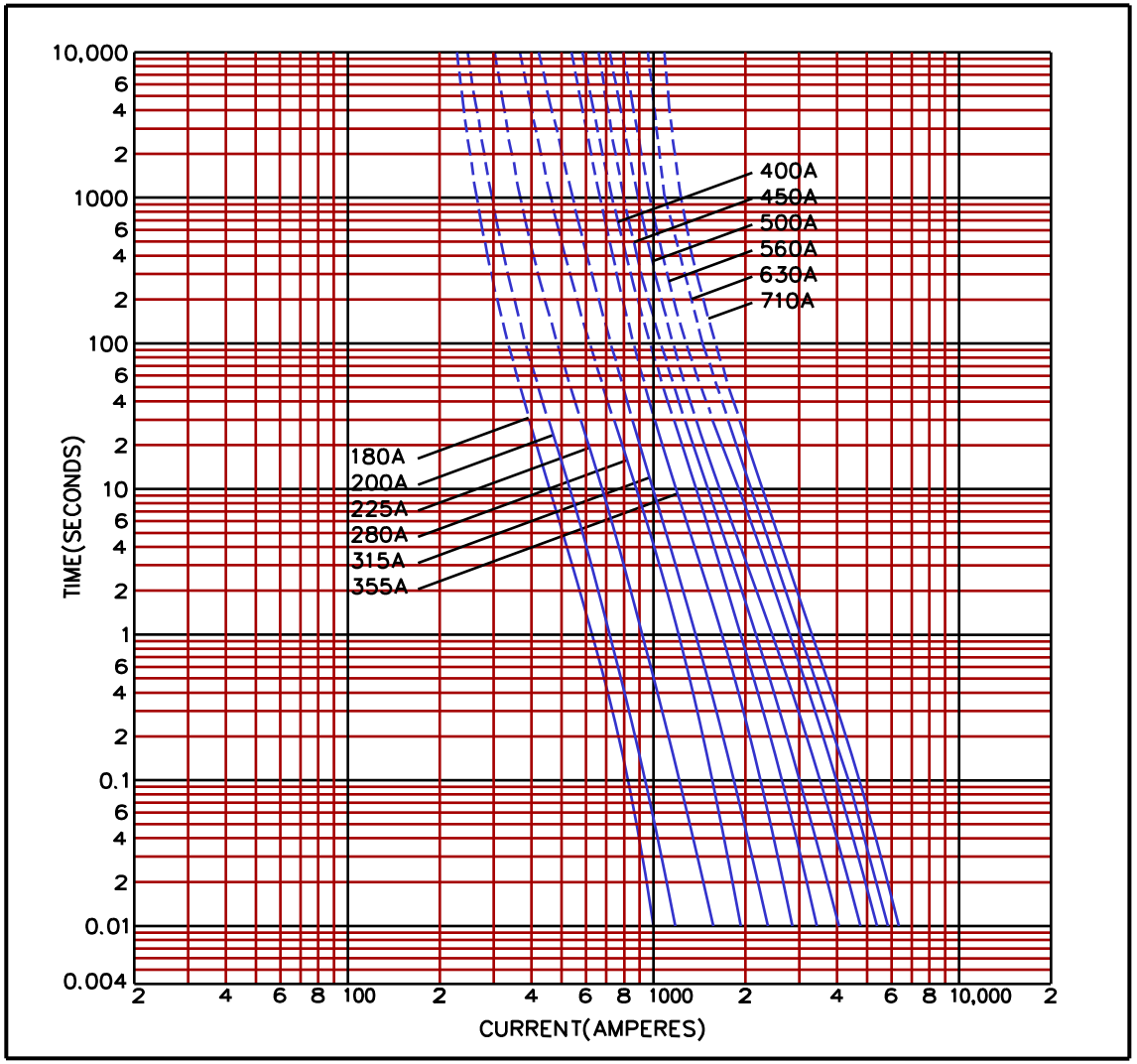
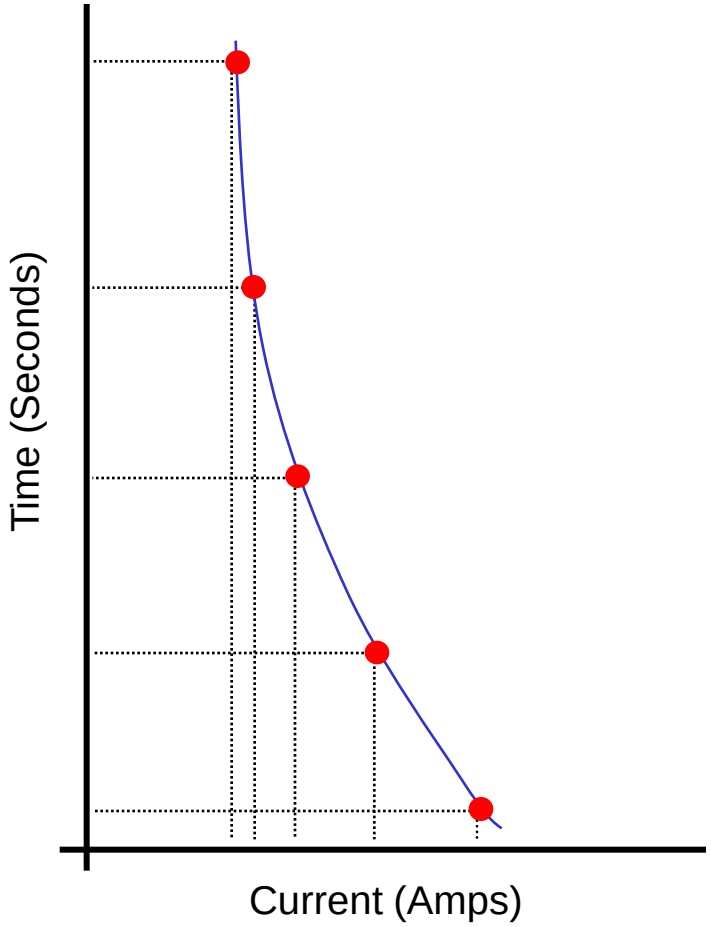
Time-Current Characteristics

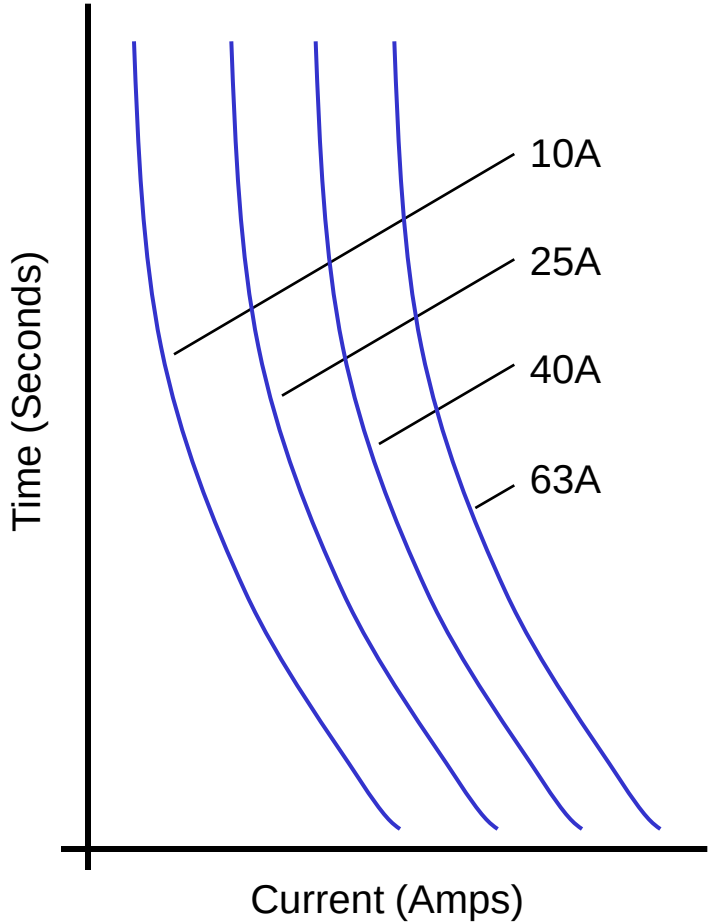


Time-Current Characteristics

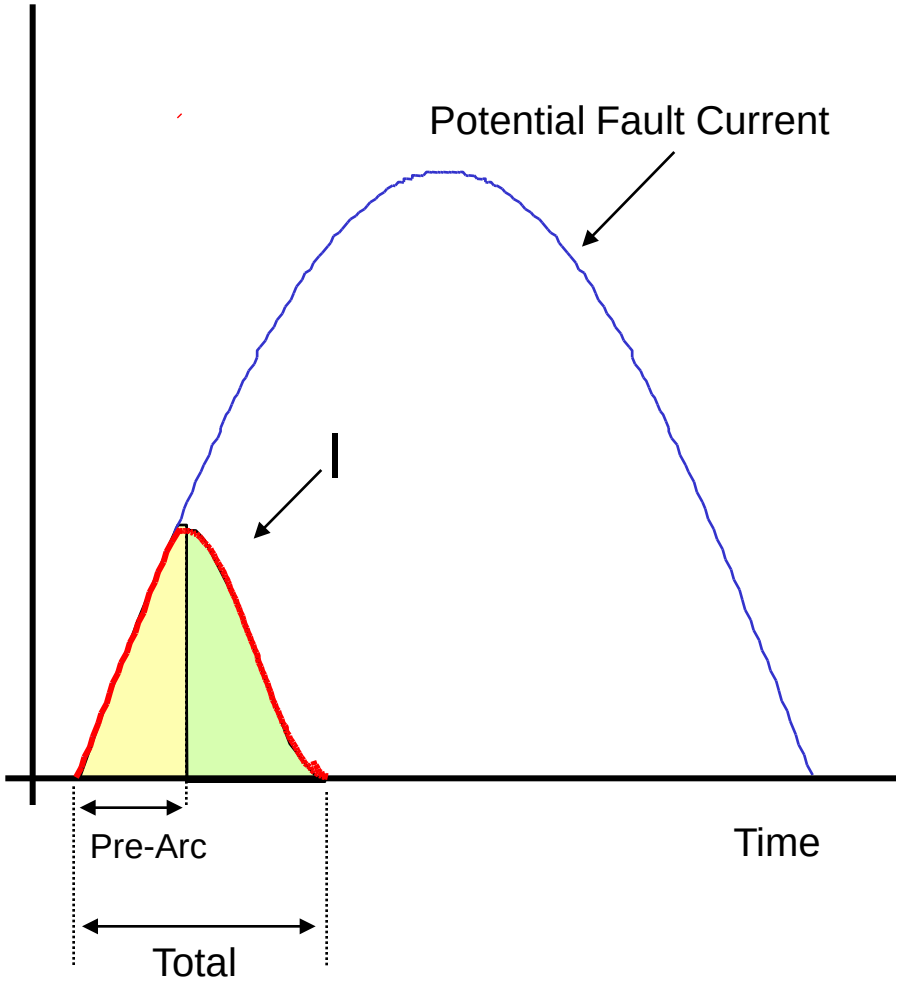
Derivation of
Time-Current Characteristic



Family of Time-Current curves for
Given fuse type



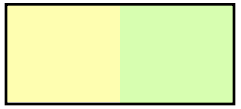
I^2t (Ampere^2 seconds) Characteristics



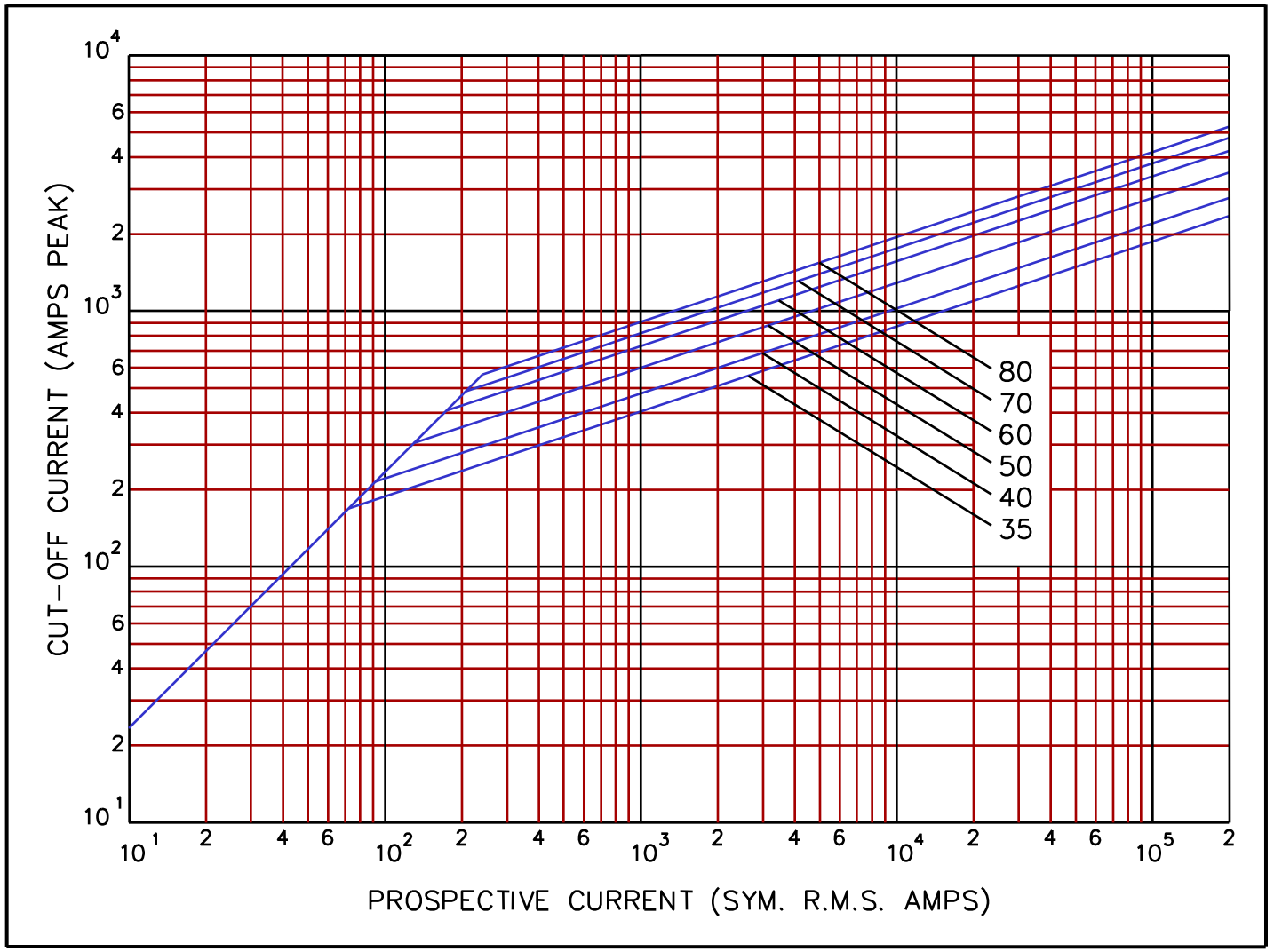
TECHNICAL DATA	RATING AND TYPE	I^2t (AMPERE^2 SECONDS) PRE-ARCING	TOTAL AT 415V	TOTAL AT 660V	NOM WATTS LOSS
	180MMT	1650	12000	18000	42
RANGE BRITISH	200MMT	2200	16000	23000	42
	225MMT	3700	26000	40000	42
REF. MMT	280MMT	6600	47000	70000	47
	315MMT	8600	62000	91000	51
CURRENT RATING	355MMT	13500	97000	140000	54
	400MMT	21000	150000	220000	60
180-710 AMPS 660Va.c/450Vd.c	450MMT	30000	220000	320000	57
	500MMT	42000	300000	450000	64
SPECIFICATION	560MMT	60000	430000	640000	64
	630MMT	68500	500000	720000	86
BS88: 5: 1988	710MMT	78000	600000	850000	105
DRG. No. 5781520					
DATE JUNE 82					

Pre Arcing I^2t 

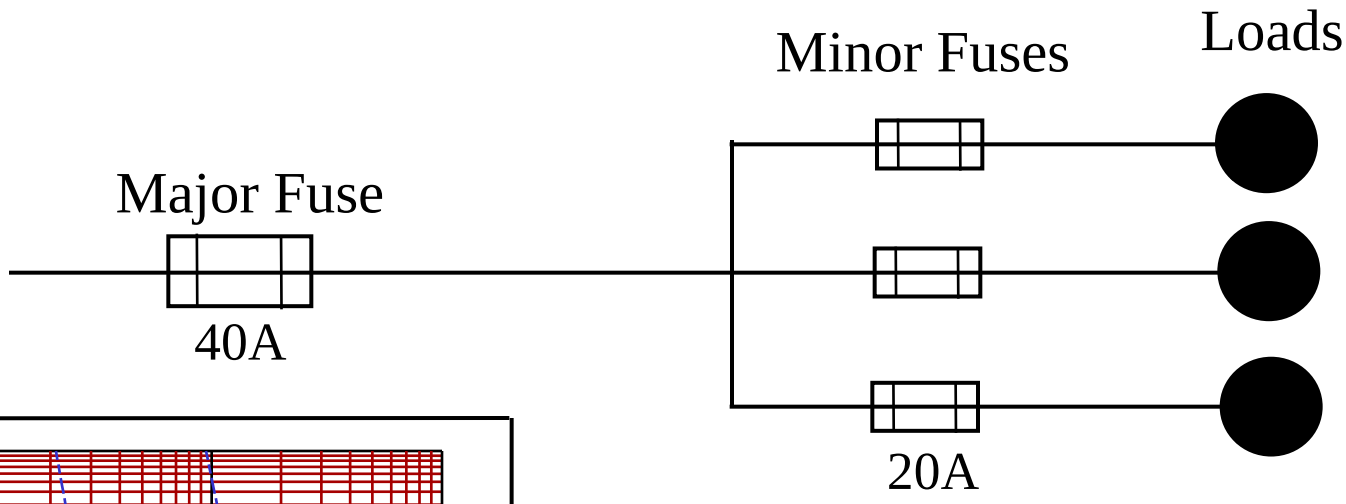
Areas

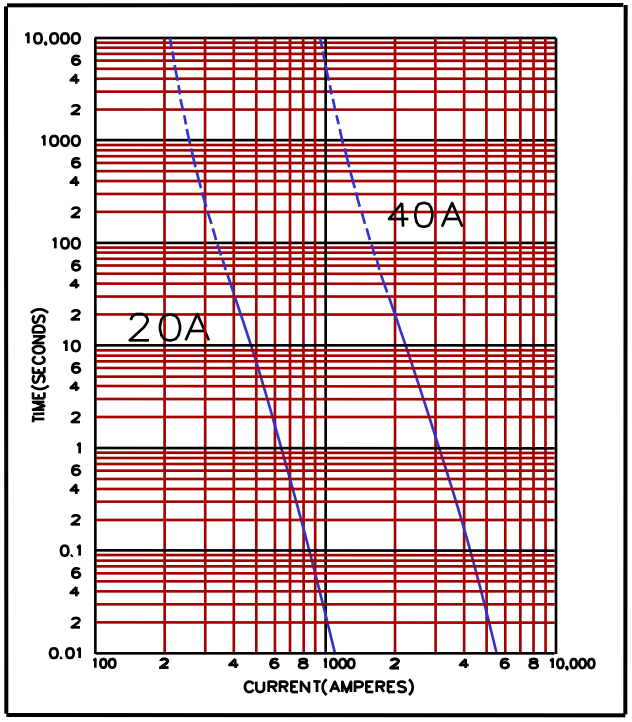
Total I^2t 

Cut-Off Current Characteristics



Fuse Discrimination





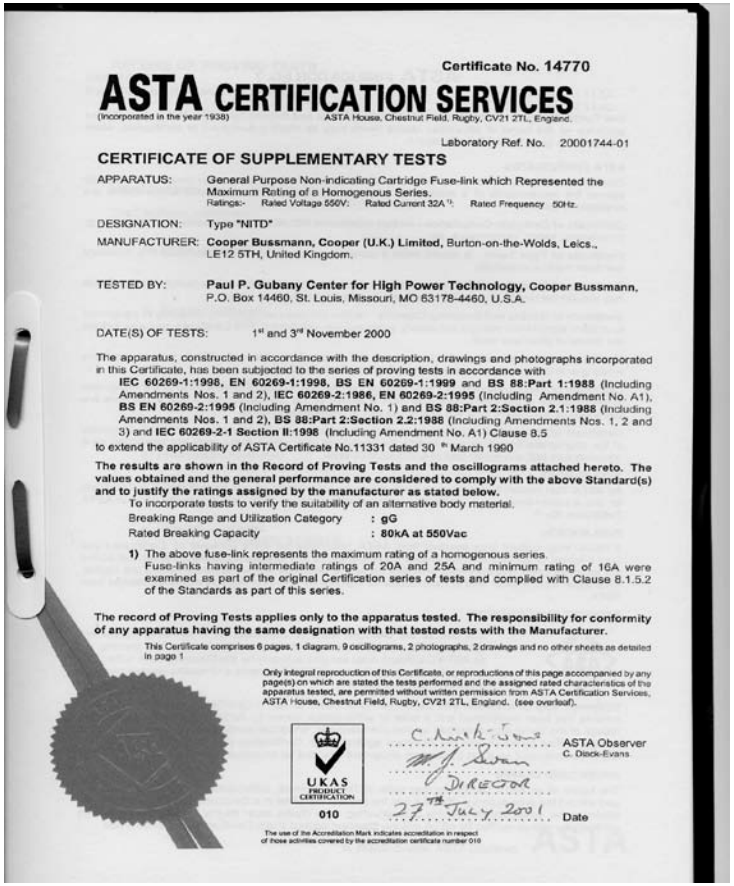
Total clearing I^2t of minor fuse should be less than pre-arcing I^2t of major fuse.

Certificates

Fuses tested by third party (ASTA, KEEMA, VDE SEMKO etc).

Fuses tested to relevant standard

Fuse the issued with certificate if all tests passed.



Certificate No. 14770

ASTA CERTIFICATION SERVICES

(Incorporated in the year 1938) ASTA House, Chestnut Field, Rugby, CV21 2TL, England.

Laboratory Ref. No. 20001744-01

CERTIFICATE OF SUPPLEMENTARY TESTS

APPARATUS: General Purpose Non-indicating Cartridge Fuse-link which Represented the Maximum Rating of a Homogenous Series.
Ratings:- Rated Voltage 550V: Rated Current 32A ½: Rated Frequency 50Hz.

DESIGNATION: Type "NITD"

MANUFACTURER: **Cooper Bussmann, Cooper (U.K.) Limited,** Burton-on-the-Wolds, Leics., LE12 5TH, United Kingdom.

TESTED BY: **Paul P. Gubany Center for High Power Technology, Cooper Bussmann,** P.O. Box 14460, St. Louis, Missouri, MO 63178-4460, U.S.A.

DATE(S) OF TESTS: 1st and 3rd November 2000

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this Certificate, has been subjected to the series of proving tests in accordance with **IEC 60269-1:1998, EN 60269-1:1998, BS EN 60269-1:1999** and **BS 88:Part 1:1988** (Including Amendments Nos. 1 and 2), **IEC 60269-2:1986, EN 60269-2:1995** (Including Amendment No. A1), **BS EN 60269-2:1995** (Including Amendment No. 1) and **BS 88:Part 2:Section 2.1:1988** (Including Amendments Nos. 1 and 2), **BS 88:Part 2:Section 2.2:1988** (Including Amendments Nos. 1, 2 and 3) and **IEC 60269-2-1 Section II:1998** (Including Amendment No. A1) **Clause 8.5**
to extend the applicability of ASTA Certificate No.11331 dated 30th March 1990

The results are shown in the Record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the ratings assigned by the manufacturer as stated below.
To incorporate tests to verify the suitability of an alternative body material.
Breaking Range and Utilization Category : **gG**
Rated Breaking Capacity : **80kA at 550Vac**

1) The above fuse-link represents the maximum rating of a homogenous series. Fuse-links having intermediate ratings of 20A and 25A and minimum rating of 16A were examined as part of the original Certification series of tests and complied with Clause 8.1.5.2 of the Standards as part of this series.

The record of Proving Tests applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designation with that tested rests with the Manufacturer.

This Certificate comprises 6 pages, 1 diagram, 9 oscillograms, 2 photographs, 2 drawings and no other sheets as detailed in page 1

UKAS PRODUCT CERTIFICATION 010

ASTA Observer C. Black-Evans

DIRECTOR

27th July 2001 Date

The use of the Accreditation Mark indicates accreditation in respect of those activities covered by the accreditation certificate number 010

Typical certificate issued by third party test laboratory

End Module 1

Any Questions?