

Asbestos Seminar

6 June 2017

Engineering evidence – Low Exposure cases



Low exposure cases

- **Significance of numerical limits and standards?**
 - *What were 'safe' or 'substantial' quantities of dust?*
 - *Relevance of numerical limits and standards?*
 - *How do we / can we convert between particle and fibre counts?*
 - *Pre-1970 – could/should/would employers have carried out airborne monitoring?*
 - *What published data was available on asbestos dust concentrations pre-1970s?*
 - *Hierarchy of control / when do limits become relevant?*
 - *What do the numbers represent?*

Substantial quantities of dust (including asbestos)

- *Factory Inspector would have to make a judgement based on what he/she saw, usually over a very short period.*
- *If it is dusty – do something about it! (Annual Reports)*
- *Airborne monitoring not widely available until when the Asbestos Regulations 1969 came into force*
- *Sampling was almost always unnecessary: just follow the guidance and comply with the law*
- *Experience as Factory Inspector – only had to fall back on dust monitoring on a very small number of occasions. Usually the risk was obvious enough to enforce.*
- *Numerical values used 1970 onwards to identify breaches of 1969 Regulations, not substantial quantities of dust at source.*
- *Pre-1970 only way most employers could have assessed was through visual assessments in air and on skin, clothing, hair and other surfaces*

Has there ever been a safe level of asbestos dust?

- **Annual Reports**

- *There seems no question that the asbestos fibre is of a kind likely to injure the lungs..... (1907)*
- *.... no doubt that dust if inhaled is physiologically undesirable..... It is not many years ago when the dust of asbestos was regarded as innocuous, while today it is recognised as highly dangerous. (1938)*
- *..... the necessity of preventing as far as possible the inhalation of asbestos fibre and dust. (1949)*
- *the only safe course is to eliminate the escape of asbestos dust into the air. (1966)*
- *..... In many instances [of mesothelioma], the exposure has been of a slight degree and without evidence of asbestosis. (1967)*

Has there ever been a safe level of asbestos dust?

- **Industry view (Annals of New York Academy of Sciences (Dec 65))**

- *We do not believe there is any safe limit. We have our ideas as to how low we can get and we are always striving to get right down to zero. (Dr C G Addingley)*
- *[following discussion on company's experience of 23 years of air monitoring and collating data on cases of ill health] as we began seeing what was happening in our own process, was that the only safe amount of asbestos dust exposure was zero and that the efforts in terms of achieving that lay basically in engineering, and, secondly, in education. (John Wells, US Rubber Co)*
- *I should like to say that the standards which we mentioned, four fibers per milliliter or 5 million particles per cu. ft., are simply standards, although I hope I did not use the word "safe." (Dr Roach)*
- *It is abundantly clear from the evidence presented at the Conference that in future much greater care must be taken to eliminate unnecessary exposure to asbestos dust wherever it occurs. (Dr Gilson)*

Relevance of numerical limits and standards

- **Five date ranges**

- *Pre-1970: 1960 Threshold Limit Value?*
- *1970 – 1976: TDN13*
- *1976 – 1983: EH10 + reduce to minimum that is reasonably practicable*
- *1983 – 1987: EH10 + Control Limit*
- *1987 onwards: Duty to prevent exposure or reduce to lowest level that is reasonably practicable*

1960 – Threshold Limit Value

- **Not a recognised limit in the UK**

“In the United Kingdom, the law has never embraced threshold limit values. The American authors of the list of values themselves declare that the values they give should not be incorporated into legislation” (1966 Annual Report on Industrial Health)

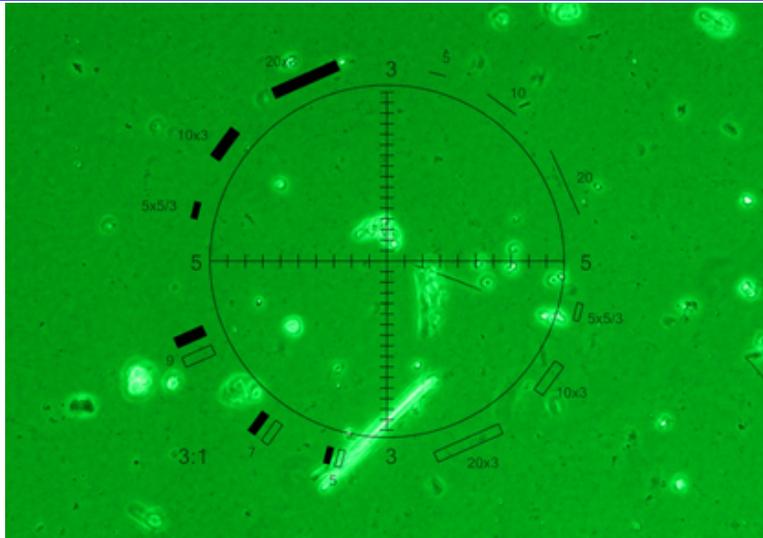
- **Should have been considered after other steps taken**

Elimination, substitution, enclosing processes, fume cupboard, dust extraction, personal protective equipment and then permissible concentrations “systems of control should be as effective as it is practicable to make them” (TSFA, 1960)

- **What was industry’s view of the TLV**

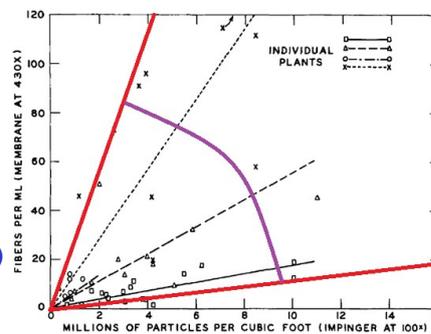
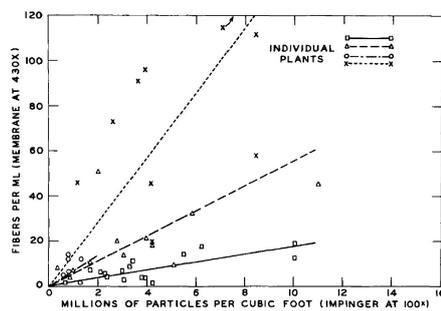
“We also have our ideas about the American limit as a safe limit. We know that there is no scientific basis for that limit whatever” (Dr Addingley)

Conversion between particle and fibre counts



1960 – Threshold Limit Value

- Cannot reliably convert particle to fibre counts

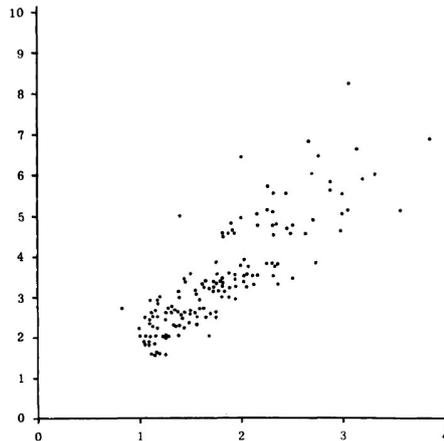


- Ayer et al (1965) (relied on by Defendants)
- 5th & 95th percentiles shown in red
- Wide range $1 \text{ f/ml} < \text{TLV} < 225 \text{ f/ml}$
- Same process (twisting) in four asbestos textile plants
- Note: scattered nature of results – no real pattern emerging

1960 – Threshold Limit Value

- If a relationship did exist, the pattern
- should look more like this.

Note: this graph is an unrelated example and does not show particle counts or fibre counts.



1960 – Threshold Limit Value

- **Cannot reliably convert particle to fibre counts**
 - TLV based on Midget Impingers – Never used in UK
 - TSFA did not specify use of impingers until 1965/66 **after** link between asbestos and mesothelioma
 - UK sampling equipment (Thermal Precipitators) yielded different results to Impinger (lower conversion rate)
 - 1960s sampling equipment – bulky and no standardised way of sampling (until 1968 BOHS standard)
 - Impingers and Thermal Precipitators counted all dust, not just asbestos fibres
 - Membrane filters counted fibres but not same as current legal definition of an asbestos fibre and at different levels of magnification
- **1960 TLV does not assist the Court to determine what was a substantial quantity of dust or what levels were likely to be injurious**

TDN13 (March 1970 – December 1976)

- **TDN13 was a recognised numerical limit/standard**
 - No issue in converting from unit to unit
 - Published in f/ml and g/m³
 - Used as an interpretation by Factory Inspectors as to what HMF1 considered to be liable to cause a danger to the health of persons employed
 - Based on 1968 BOHS Hygiene Standards for Chrysotile
 - Subcommittee – majority from asbestos manufacturing companies
 - Did not consider lung cancer or mesothelioma risk
 - Did not consider risk from amphiboles
 - Based on assumption that a 1% incidence of asbestosis was tolerable
 - Was **not** intended to be a safe or acceptable level of exposure
 - Present Evidence did not indicate that there was a safe level of contamination. It was clear a level [for enforcement purposes] had to be accepted but care would have to be taken to ensure the wording did not purport to indicate a safe level. (1968 meeting note)
 - **Hierarchy of control still applied**

EH10 (December 1976)

- **Replaced guidance in TDN13**
 - Reference made to Health and Safety at Work etc. Act 1974
 - Amended to include the need to reduce exposure to all forms of asbestos dust to the minimum level that is reasonably practicable and never exceed the numerical values
 - **Were the amendments relating to HSWA 74 of 1969 Regulations?**
 - **What was the function of Sections 2 – 7 of HSWA 1974?**
 - Introduce existing common law duty of care onto statute book
 - Robens Report (1970-72)
 - Selected written evidence to Advisory Committee on Health and Safety (1970-72)
 - Submissions from CBI and BIA
 - **Hierarchy of control still applied**

EH10 (April 1983) & 1987 Regulations

- **Standards re-named and became control limits**
 - *The control limits do not represent safe levels which once attained make further improvements in dust control unnecessary. They represent the upper limits of permitted exposure where there is still a statutory duty to reduce exposure to a lower level where this is reasonably practicable.*
- **Control of Asbestos at Work Regulations 1987**

Every employer shall—

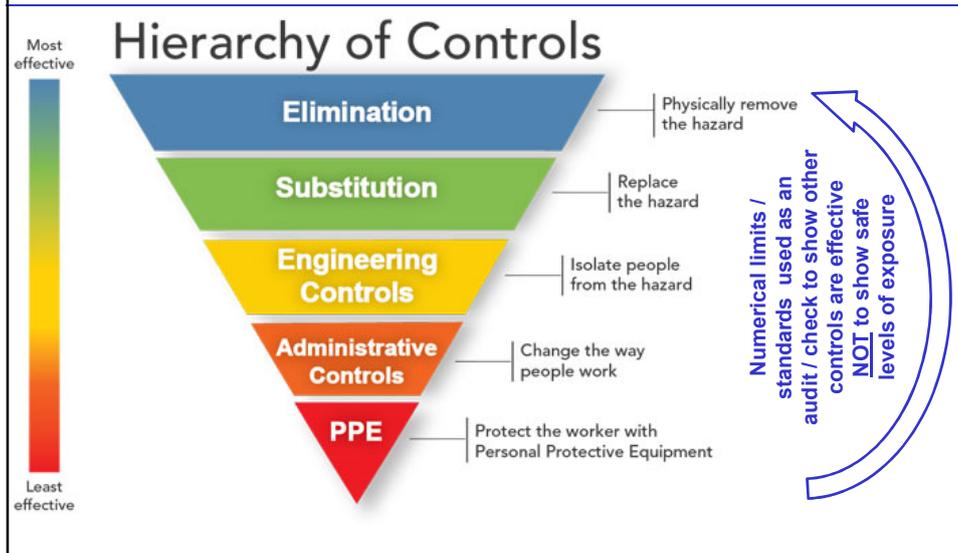
 - (a) *prevent the exposure of his employees to asbestos;*
 - (b) *where it is not reasonably practicable to prevent such exposure, reduce to the lowest level reasonably practicable the exposure of his employees to asbestos by measures other than the use of respiratory protective equipment.*

Numerical Limits and Standards

- **Is it unlikely that a numerical limit / standard would have lowered the standard?**
 - *Examples of where numerical limits have been relaxed over time:*
 - *TDN13 – Crocidolite 0.2 f/ml (10 min TWA) = 2 f/ml mins*
 - *2010 Control Limit for Crocidolite*
 - *0.6 f/ml (10 min TWA) = 6 f/ml mins; or*
 - *0.1 f/ml (4hr TWA) = 48 f/ml mins*
 - *As a dose, the Control Limit for Crocidolite in 2010 was 3 or 24 times lower than in 1970*
- **No requirement in EH10 to wear RPE where exposure below the numerical limits until 1984**
 - *EH64 (1993) “critical effect is cancer, for which no safe level of exposure has been identified..... Control Limits are the maximum fibre concentrations at which workers may be exposed without respiratory protective equipment.”*
- **Limits and standards arguments seem to be relevant predominantly to the period 1970 – 76, although in some circumstances up to 1983**

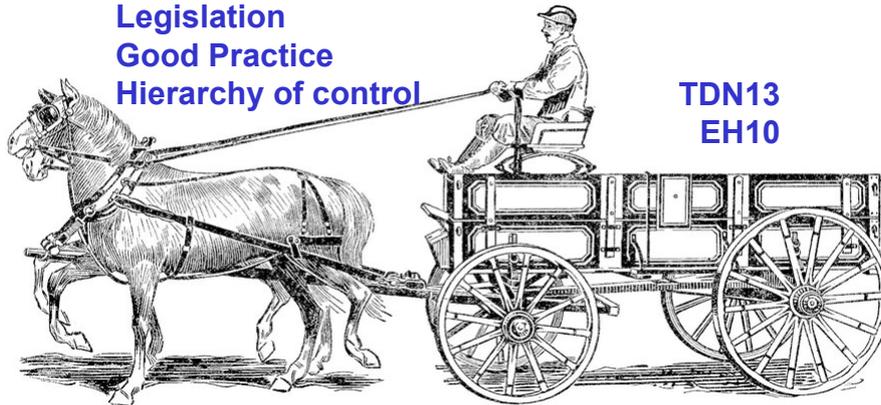
- **Would / could / should employers have carried out airborne monitoring pre-1970?**
- *No*
- **What published data was available pre-1970 detailing asbestos or other dust concentrations for work with asbestos materials?**
- *None (or very little)*

I am an employer: What do I need to do?



**The horse should go before
the cart**

**Guidance
Legislation
Good Practice
Hierarchy of control**



**TDN13
EH10**

**Putting the cart (limits) before the
horse (guidance, legislation and good
practice)**



**TDN13
EH10**

**Guidance
Legislation
Good Practice
Hierarchy of control**

What do the figures mean?

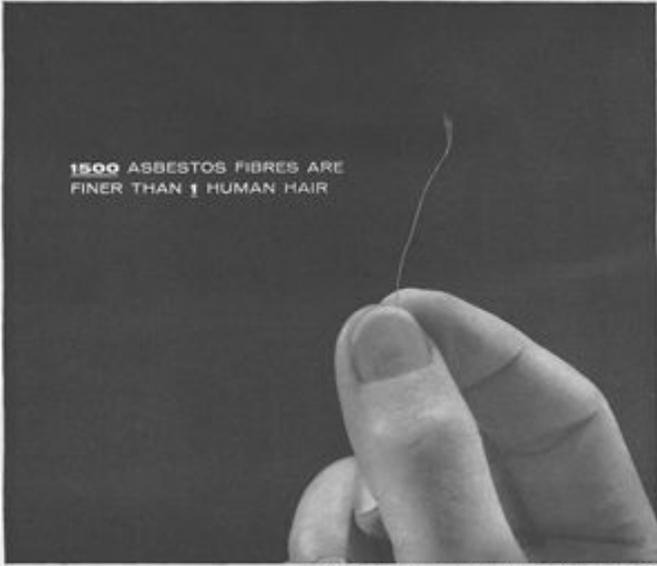
- **1 fibre/millilitre = 1,000 fibres/litre or 1,000,000 fibres / cubic metre**
- **25 f/ml years**
 - Same as exposure to 25 f/ml all day, every day for 1 work year; or
 - 10 f/ml, all day, every day for 2.5 years
- Average assumed respiratory rate is 8 litres / min (1997 MRC guidance)
- Therefore 25 f/ml years is approximately the same as
- 25 f/ml x 1000 (ml per litre) x 8 (litres/min) ~ 200,000 fibres inhaled every minute for 1 work year
- ~ 12,000,000 fibres per hour for a work year (96 million fibres/day x 240 days)

25 f/ml yrs ~ 23,040,000,000 asbestos fibres

What do the figures mean?

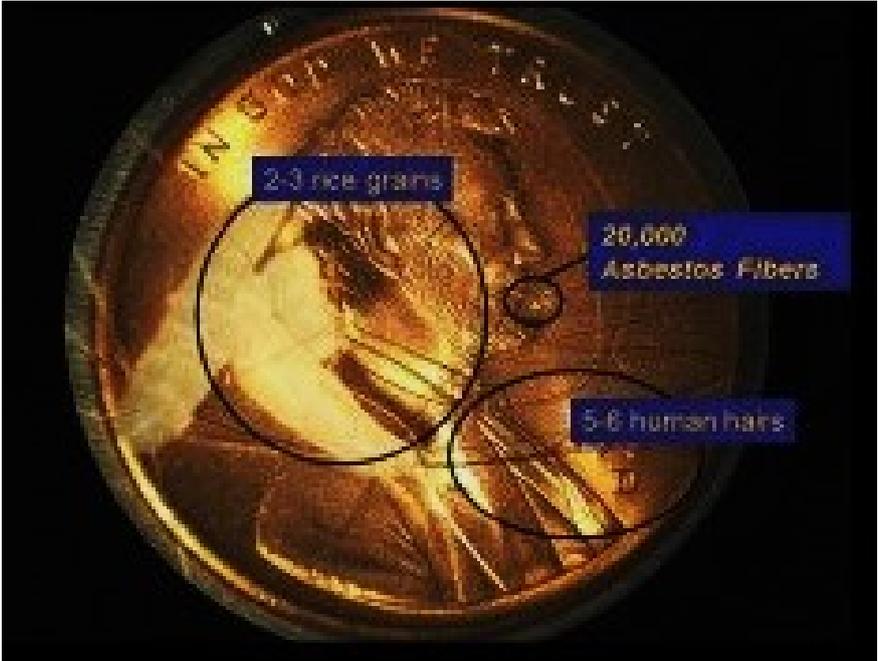
- **1 f/ml yr therefore ~ 922 million fibres**
- **0.01 f/ml years ~ 9.2 million fibres**
- **Asbestos fibres**
 - 1 x asbestos fibre weighs about 0.2×10^{-9} mg (Swartjes 2003)
 - Enough asbestos for 5 quadrillion (5×10^{15}) asbestos fibres ~ 1 g
 - Technically enough asbestos for approx 725 trillion asbestos fibres in a 1 cm³ section of AIB (0.145 g of amosite) (based on 20% content) (although most in bundles)
 - That's technically enough to result in 31,521 people being exposed to a dose of 25 f/ml years
 - **Highly unlikely as not all asbestos becomes airborne asbestos fibres** (i.e. fibres greater than 5µm in length with a length to width aspect ratio of at least 3:1)

1500 ASBESTOS FIBRES ARE
FINER THAN 1 HUMAN HAIR



*The diameter of asbestos fibers in inches ranges from 7.86 x 10⁻⁷ to 11.8 x 10⁻⁶.
Shown above is not just one but a number of strands.*

The **fineness** of J-M Asbestos Fibre assures higher loading,
greater strength for plastics and other products



2-3 rice grains

20,000
Asbestos Fibers

5-6 human hairs

What are key considerations in low exposure cases?

- Were the materials likely to contain asbestos?
- Could they have contained crocidolite? (*relevant to precautions after 1965 and TDN13*)
- Was there obvious and visible dust produced?
- If pre-1965, was the dust 'substantial'?
- If post 1965 – was it foreseeable to a reasonable and prudent employer that dust would be produced? (even if not substantial)
 - *i.e. were materials dusty?*
 - *What tasks were taking place? (drilling, sawing, etc)*
 - *Would those tasks be associated with the generation of dust?*
 - *Was there guidance at the time which should have prevented the allegations? (e.g. condition of lagging materials, buffing floor tiles, drawing pins in schools)*

Product - Turnabestos or Asbestolux Insulation Boards

Summary 1 - Lowest and Highest Concentrations - fibres per cc

Breathing Zone Tests

| <u>Operation</u> | <u>Lowest Concentration</u> | <u>Highest Concentration</u> | <u>Average of all Concentrations</u> | <u>No. of Sites</u> | <u>No. of Tests</u> |
|---|-----------------------------|------------------------------|--------------------------------------|---------------------|---------------------|
| Handling - open site | 11.2 | 150.0 | 75.7 | 2 | 5 |
| Handling - enclosed site | 2.3 | 78.6 | 26.3 | 4 | 10 |
| Sawing - hand saw | 2.9 | 92.3 | 36.4 | 4 | 6 |
| Sawing - power saw | 14.0 | 282.0 | 89.3 | 5 | 7 |
| Surforming | 27.3 | 27.3 | 27.3 | 1 | 1 |
| Drilling and Fixing to structures | 3.5 | 46.0 | 20.9 | 3 | 6 |
| Brushing up - dry | 19.4 | 19.4 | 19.4 | 1 | 1 |
| Bagging off dust from extractor cyclone | 21.6 | 21.6 | 21.6 | 1 | 1 |
| <u>Background Tests</u> | 0.1 | 51.2 | 10.5 | 6 | 8 |

OH! MY FEET!
ONE TRIAL OF



AND
"FOOT EASE ASSURED"

The effects of our antiseptic insoles are almost magical. They prevent rheumatism, and stop all soreness instantly. By wearing them, the feet feel so good that the whole nervous system is benefited. Callouses can be peeled right off, bunions are reduced and the inflammation drawn out, and the bad smelling of sweaty perspiring feet will disappear immediately.

BEWARE OF IMITATION!



INSIST ON
Albert's Asbestos Insoles

"NO MORE FOOT TROUBLES"

ASBESTOS INSOLES

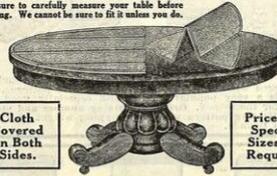
MAKE YOUR FEET FEEL HAPPY

Warming in Winter, Cooling in Summer

AS ASBESTOS IS A NON-CONDUCTING MINERAL.

ASBESTOS TABLE PADS AND MATS

Be sure to carefully measure your table before ordering. We cannot be sure to fit it unless you do.



Cloth Covered on Both Sides.

Prices of Special Sizes on Request.

Flannel Covered Asbestos Table Pads, correctly sized. Large pads are made in two pieces and fold up compactly when not in use. If the size desired is not quoted we will secure a pad in the size you want, specially for you. We require seven days to make up special sizes.

| | |
|---|--------|
| No. 36V2706 48-Inch Round. Shipping weight, each, about 10 1/2 pounds. | \$1.85 |
| Price, each..... | \$1.85 |
| No. 36V2707 48-Inch Square. Shipping weight, each, about 12 1/2 pounds. | \$1.85 |
| Price, each..... | \$1.85 |
| No. 36V27070 Extra Leaves, 12x48 inches. Shipping weight, each, about 3 1/2 pounds. | 57c |
| Price, each..... | 57c |
| No. 36V2709 48-Inch Round. Shipping weight, each, about 12 1/2 pounds. | \$2.23 |
| Price, each..... | \$2.23 |
| No. 36V2710 48-Inch Square. Shipping weight, each, about 14 1/2 pounds. | \$2.23 |
| Price, each..... | \$2.23 |
| No. 36V27100 Extra Leaves, 12x48 inches. Shipping weight, each, about 3 1/2 pounds. | 57c |
| Price, each..... | 57c |
| No. 36V2712 54-Inch Round. Shipping weight, each, about 14 1/2 pounds. | \$2.55 |
| Price, each..... | \$2.55 |
| No. 36V2713 54-Inch Square. Shipping weight, each, about 17 1/2 pounds. | \$2.55 |
| Price, each..... | \$2.55 |
| No. 36V27130 Extra Leaves, 12x54 inches. Shipping weight, each, about 3 1/2 pounds. | 59c |
| Price, each..... | 59c |
| No. 36V2715 6-Inch Round Mat. Shipping weight, each, about 4 ounces. | 6c |
| Price, each..... | 6c |
| No. 36V2716 5-Inch Oval Mat. Shipping weight, each, about 3 ounces. | 8c |
| Price, each..... | 8c |

Table Padding by the Yard.

Width, About 54 Inches.

35c No. 36V2703 Do not take any chance of injury to your table from hot dishes. A pad made of this table felt costs but very little and will pay for itself on its first use. This is a good weight felt, running about 15 ounces to the yard. Natural cream color. Similar goods are retailed freely at considerably more a yard. Shipping weight, per yard, about 1 1/2 pounds.

A fake advert (spot the typo)
But it would not surprise me if such
a suit existed.

Spilled that chip fat again mummy?

NO PROBLEM!

Thanks to:

Asbestos

Baby Suit!



I can play
with matches
YIPPEE!



No more
cigarette burns
on my skin when
I cry too much!



Questions

