

UKELG at 50 – Cardiff – July 2013

**Explosions caused by
contaminated nitric acid –
two case studies**

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HNO₃ in Loss Prevention Bulletin

- **LPB009: EtOH road tanker**
- **LPB074: Pump, Cu windings**
- **LPB116: Pump, ditto**
- **LPB124: Ar-NH₂ vapour**
- **LPB133: Lab waste**
- **LPB210: Tallow oil in tanker**

HNO₃ in Loss Prevention Bulletin

- **LPB210: Reactive chemical wastes**

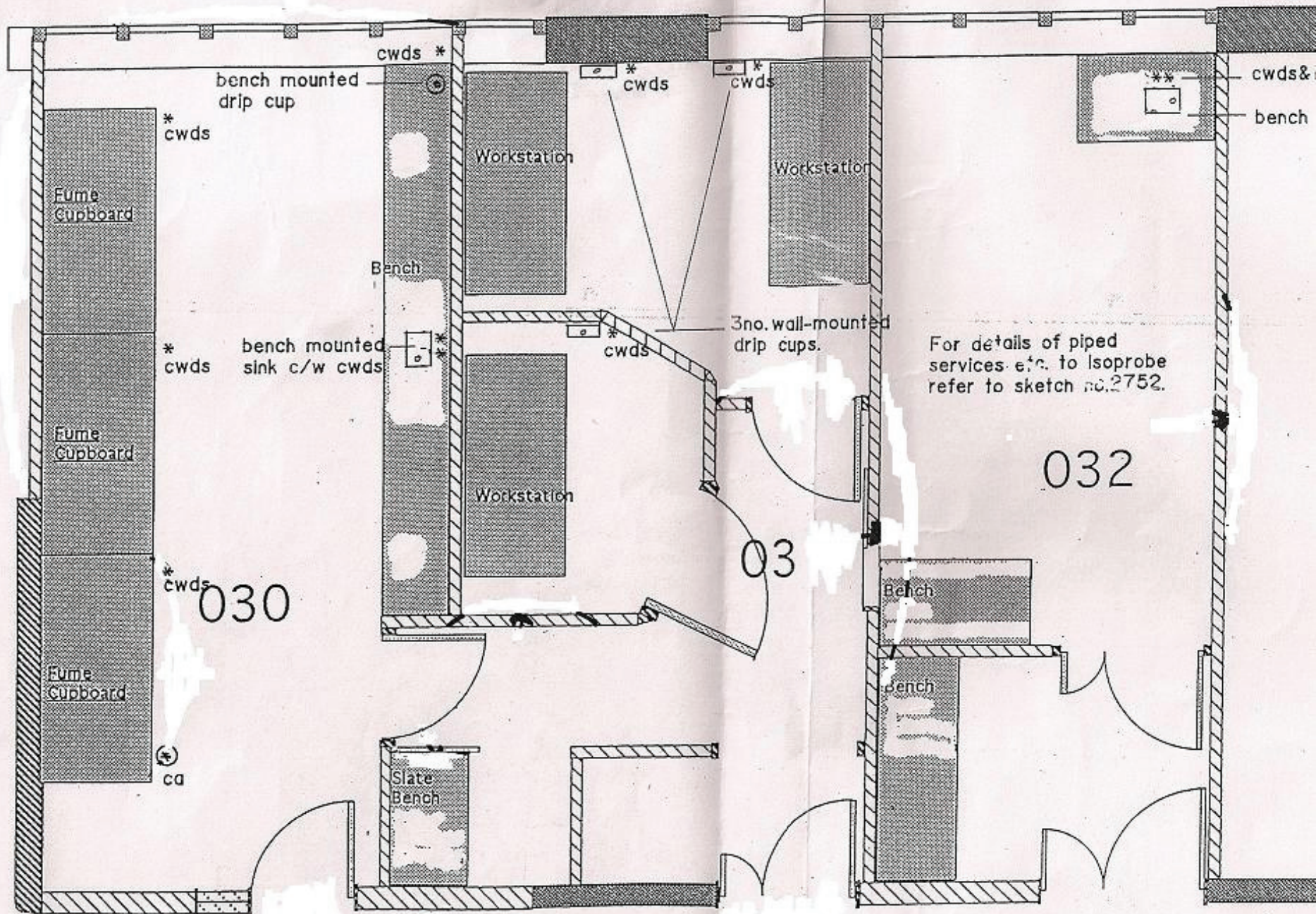
142 incidents

1 in 6 involved nitric acid –

various unstable nitrations

**1g C → min 540L gas
at 1atm, 120°C...**

...not counting NO_x



bench mounted drip cup

* cwds

Fume Cupboard

cwds *

Workstation

* cwds

* cwds

Workstation

Bench

bench mounted sink c/w cwds

* cwds

Fume Cupboard

Workstation

* cwds

3 no. wall-mounted drip cups.

For details of piped services e.t.c. to Isoprobe refer to sketch no.2752.

* cwds

030

03

032

Fume Cupboard

ca

Slate Bench

Bench

Bench

cwds &

bench

HNO₃

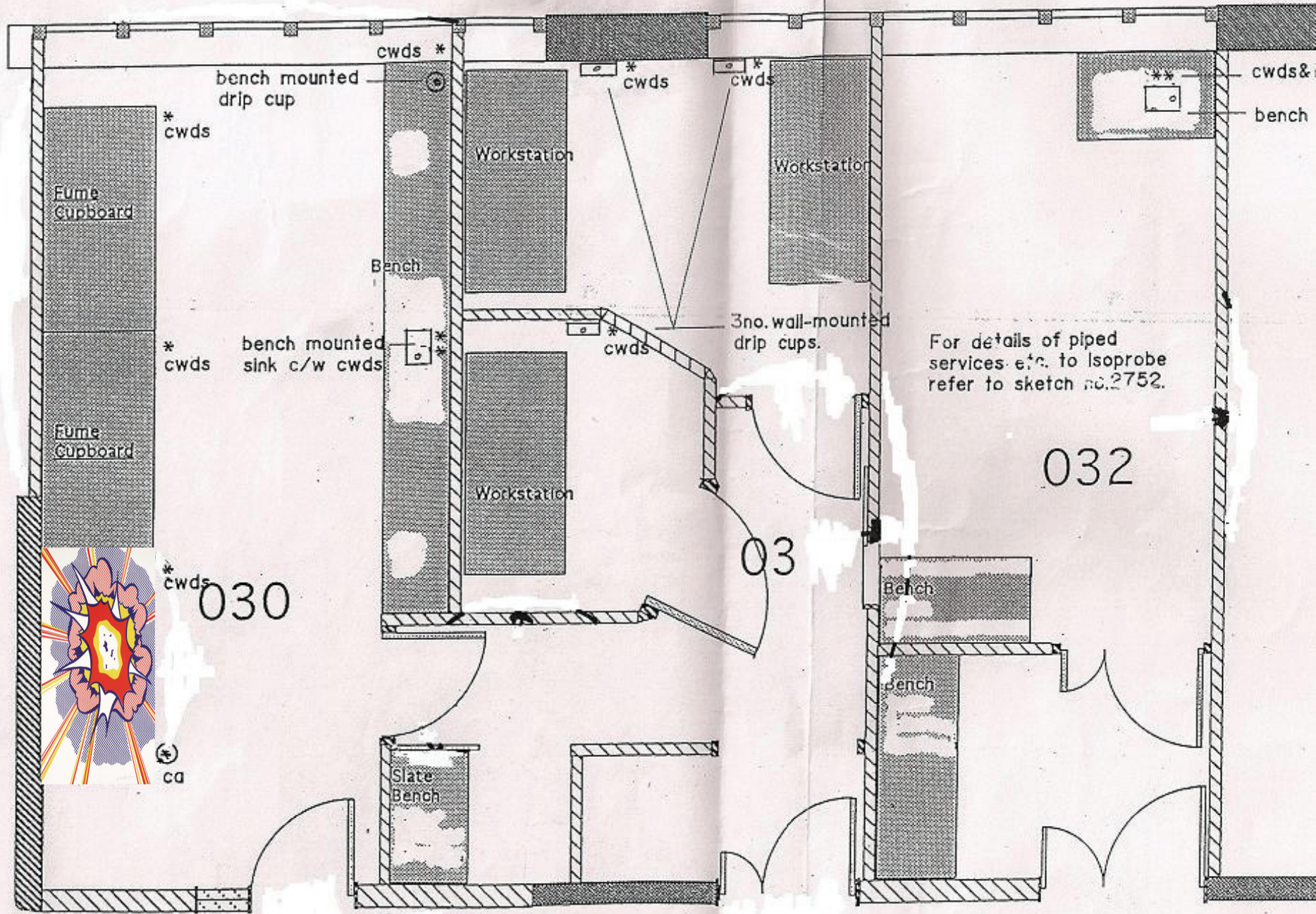
< 1 litre

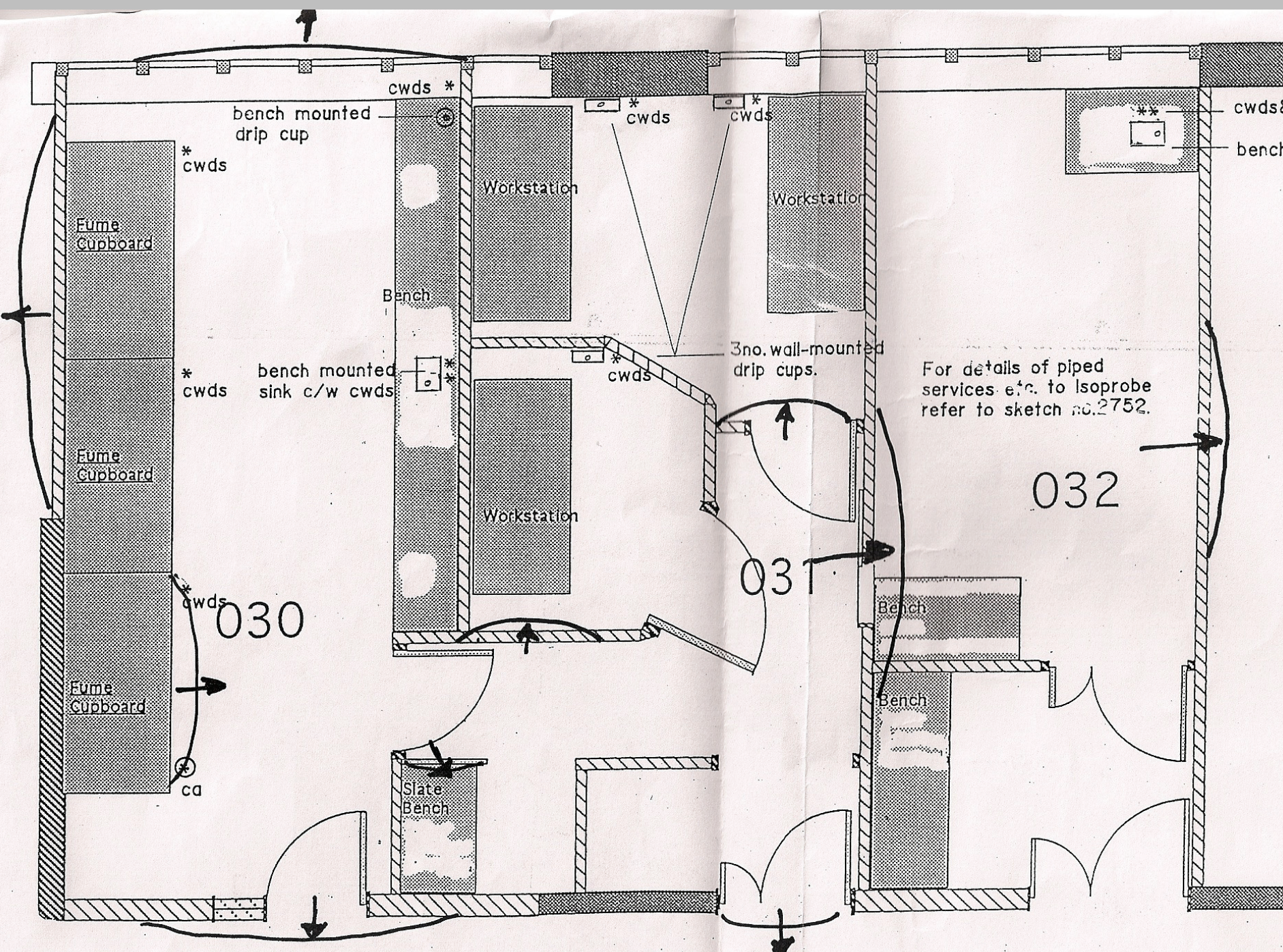
+

C_cH_hO_{?...?}

~ 100 g

→ ...





* cwds

bench mounted drip cup

Fume Cupboard

Fume Cupboard

Fume Cupboard

* cwds

bench mounted sink c/w cwds

Bench

Workstation

Workstation

Workstation

* cwds

3no. wall-mounted drip cups.

For details of piped services etc. to Isoprobe refer to sketch no.2752.

cwds &

bench

030

031

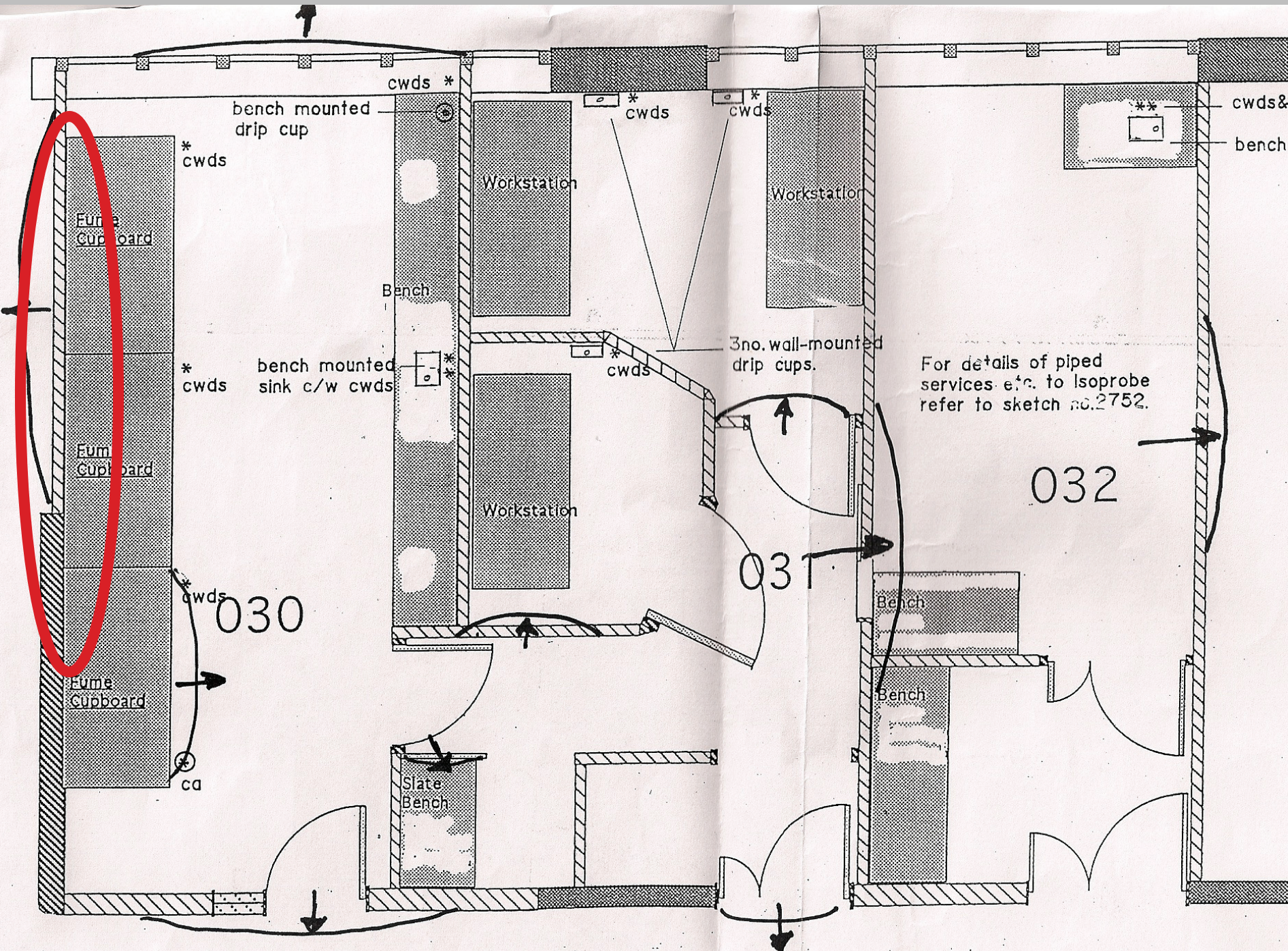
032

ca

Slate Bench

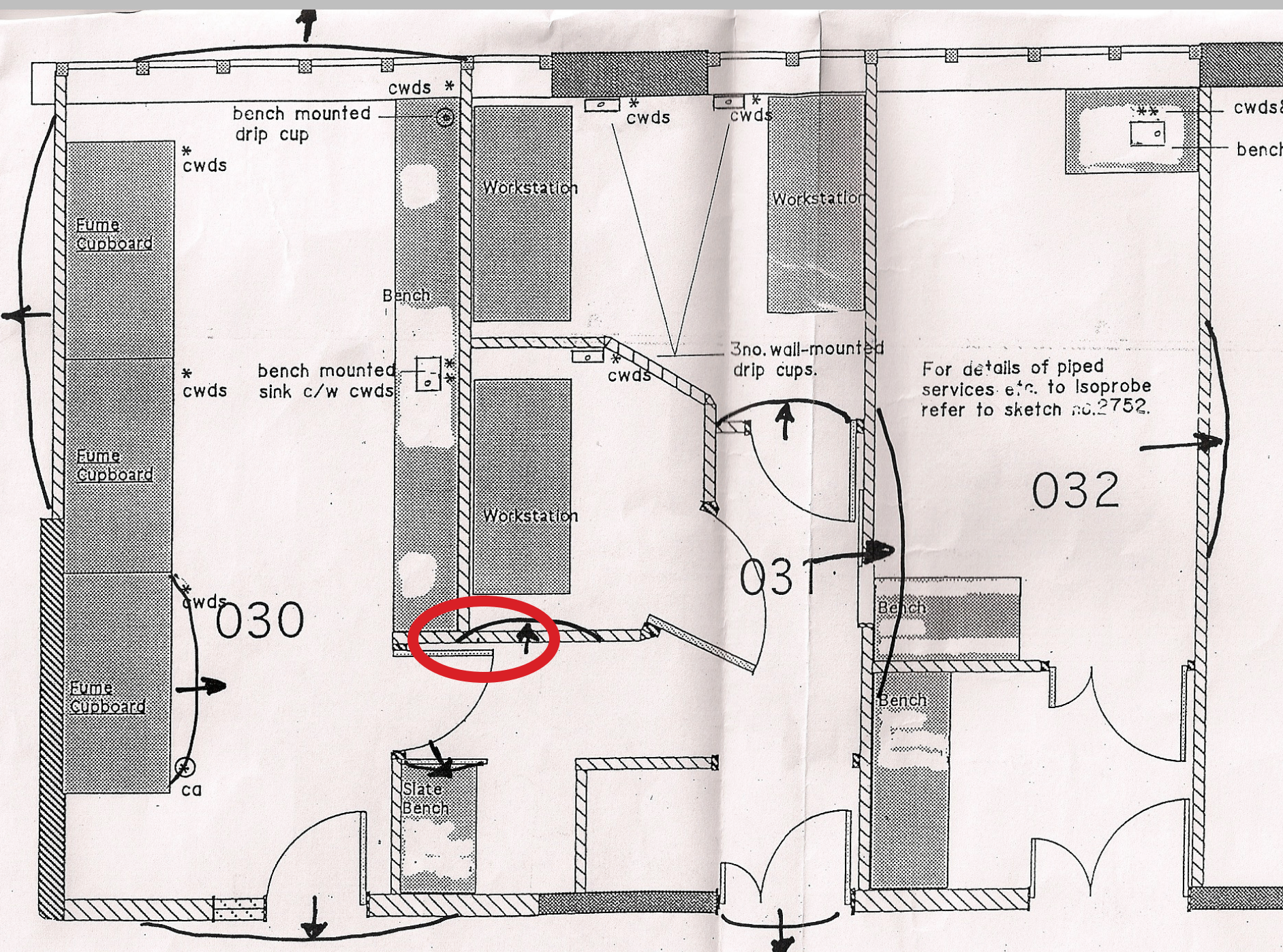
Bench

Bench





**Ruptured
extraction
ducting**



bench mounted drip cup

* cwds

Fume Cupboard

Fume Cupboard

Fume Cupboard

* cwds

bench mounted sink c/w cwds

Bench

Workstation

Workstation

Workstation

3no. wall-mounted drip cups.

For details of piped services etc. to Isoprobe refer to sketch no.2752.

030

031

032

Slate Bench

Bench

Bench

cwds &

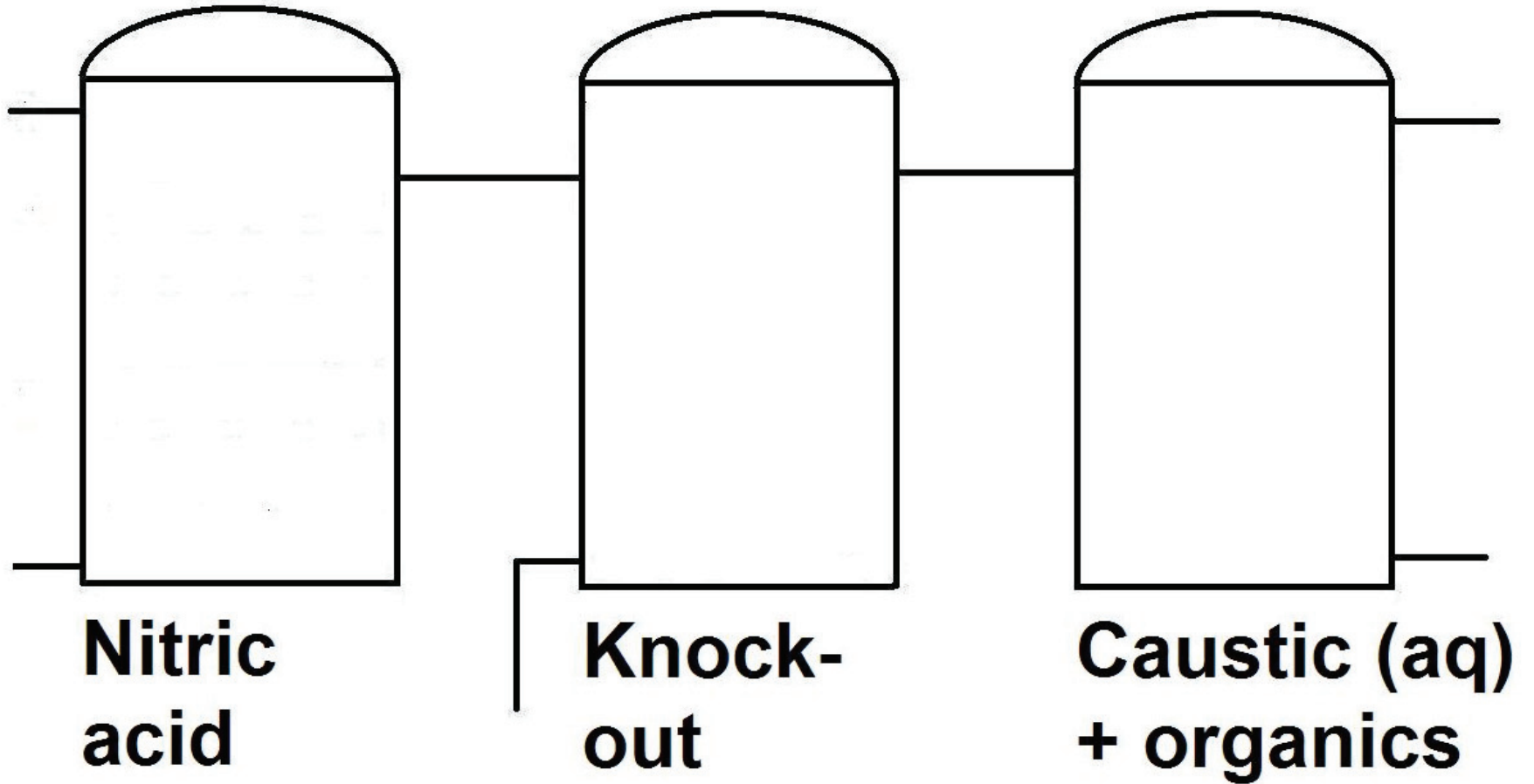
bench

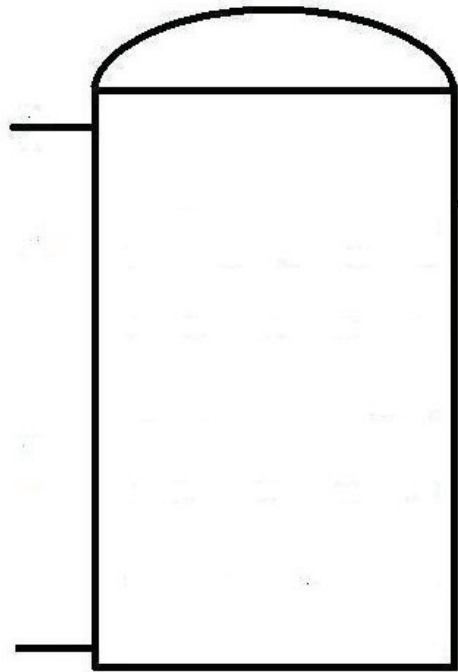
ca

Door-stop ineffective

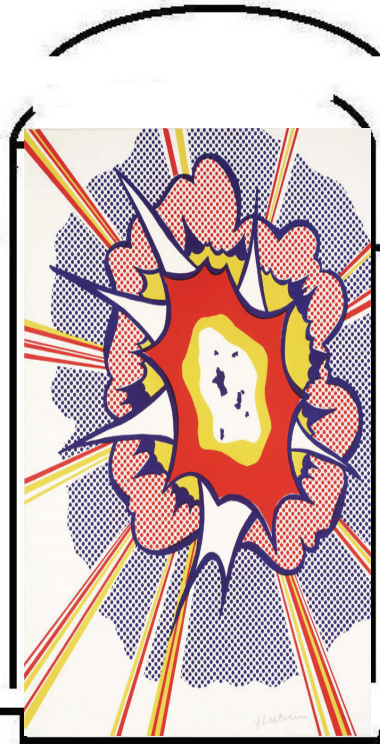




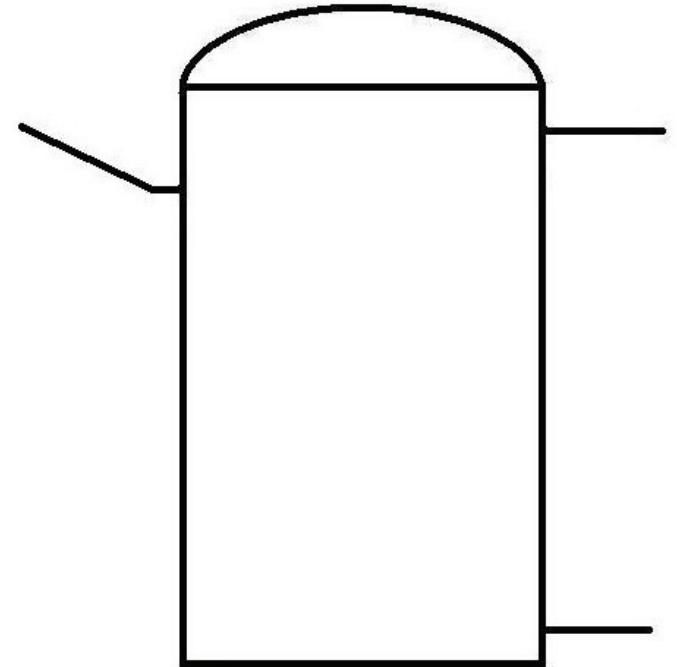




Nitric acid



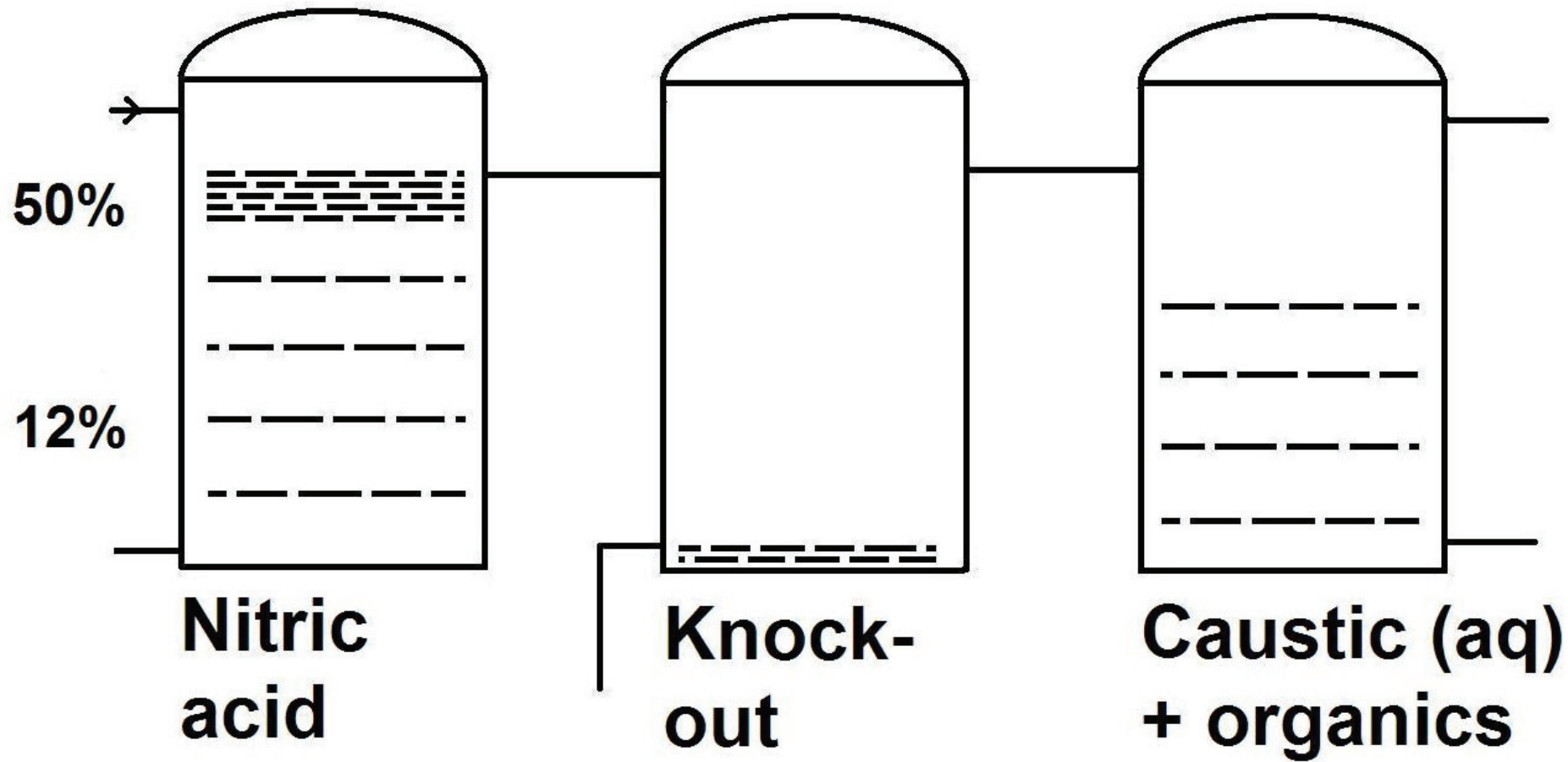
Knock-out



**Caustic (aq)
+ organics**

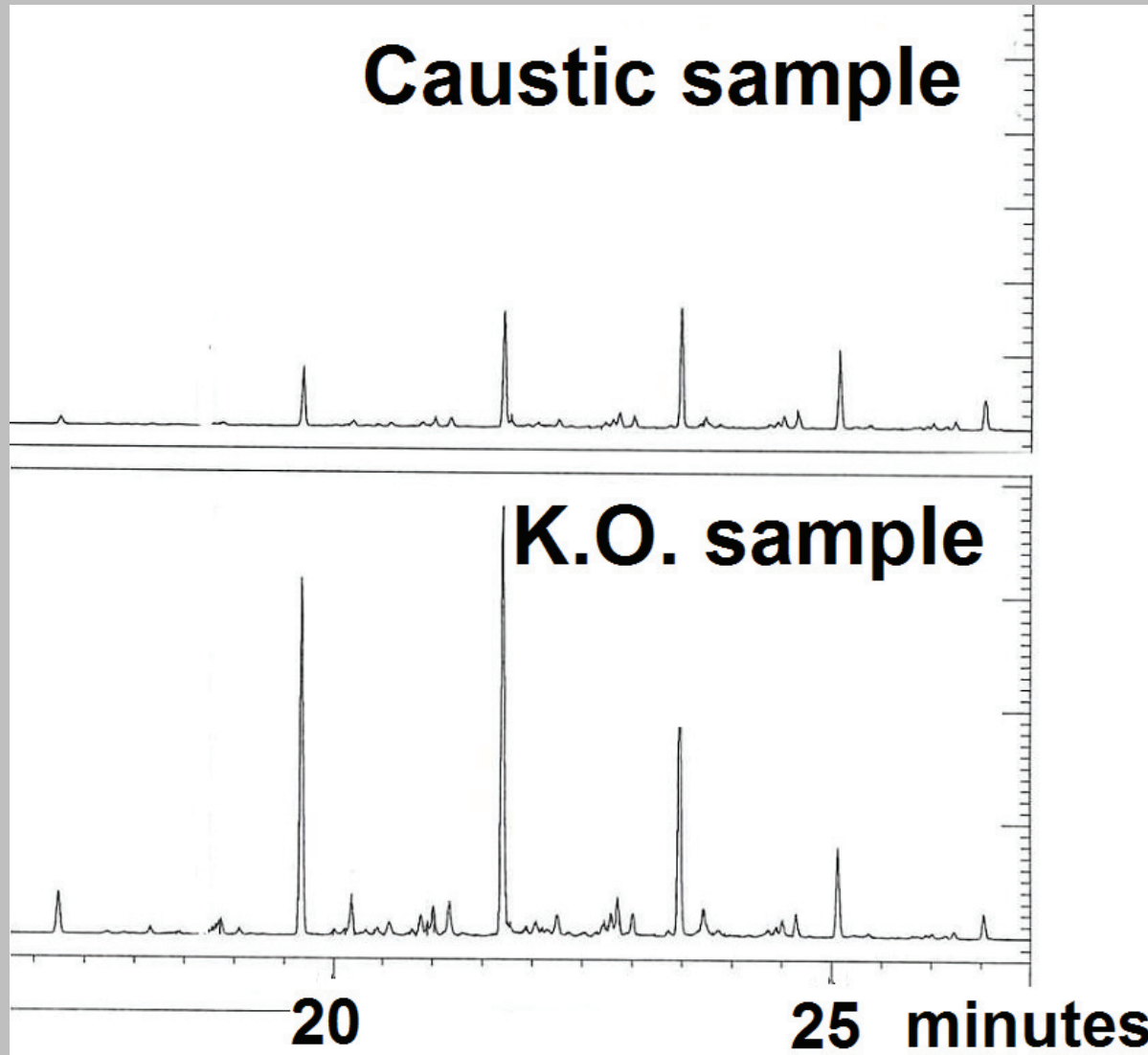
Acid + metal \rightarrow hydrogen ?

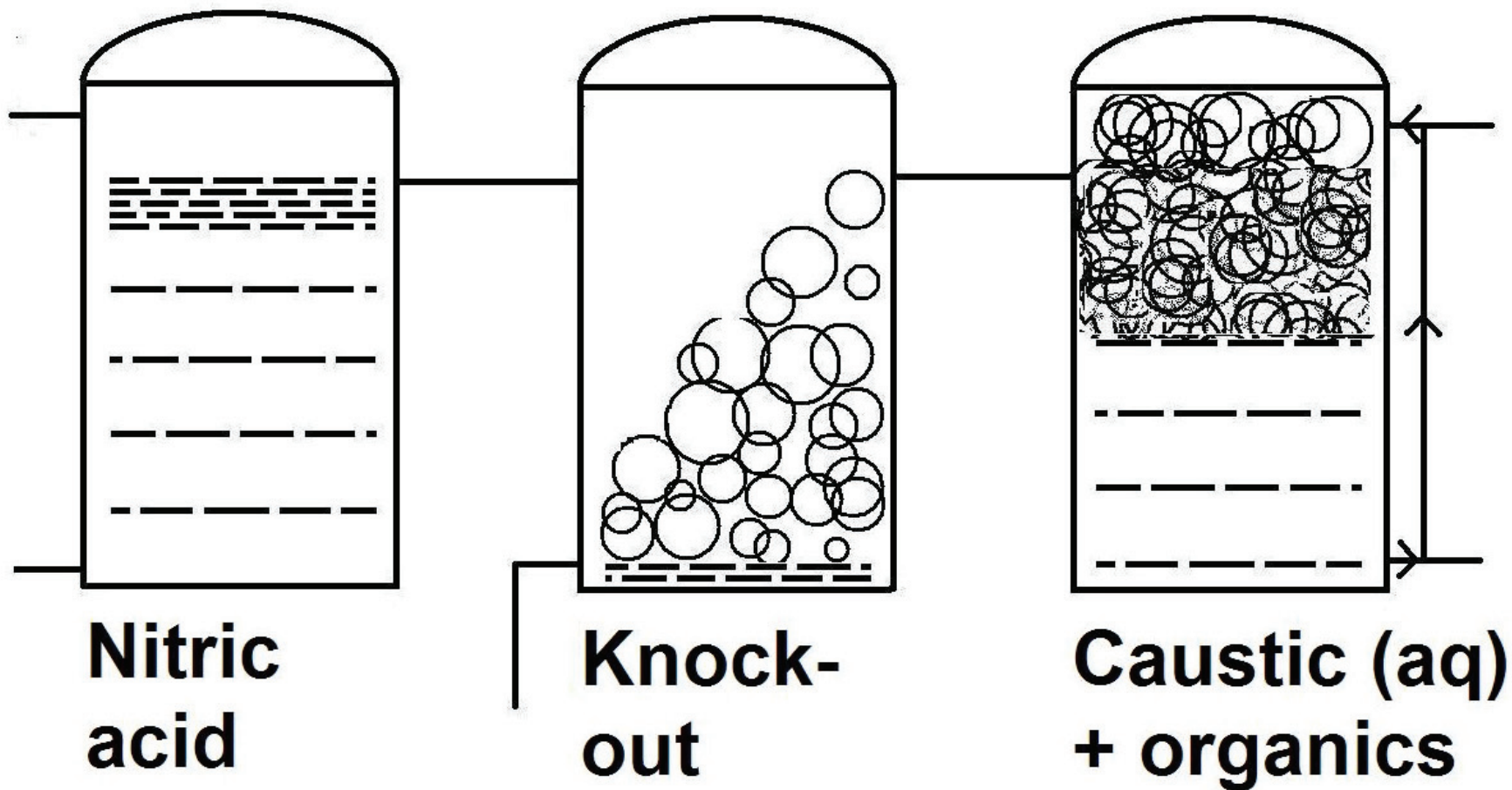


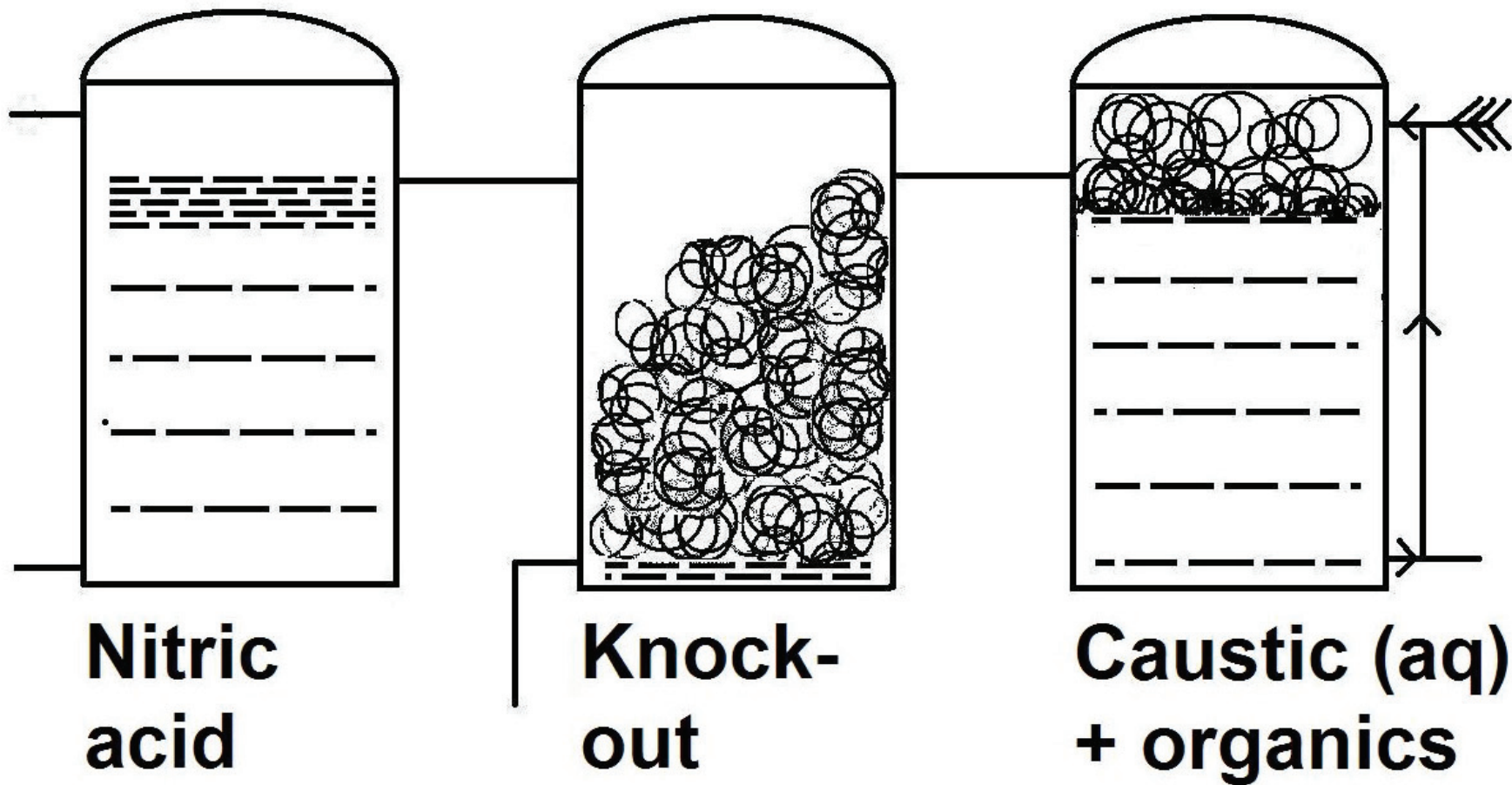


K.O. sample pH ~11

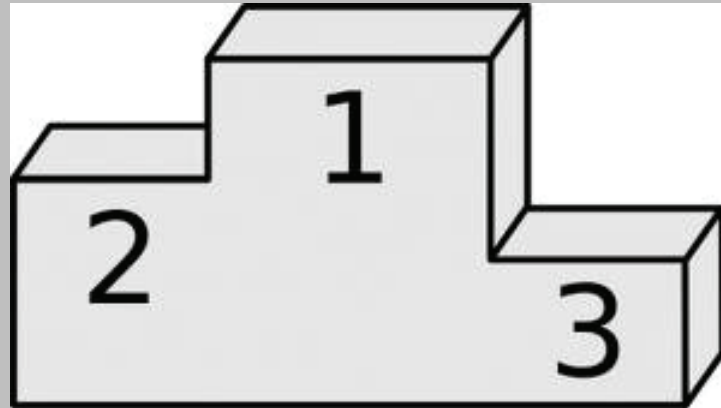
Head space analysis by GC



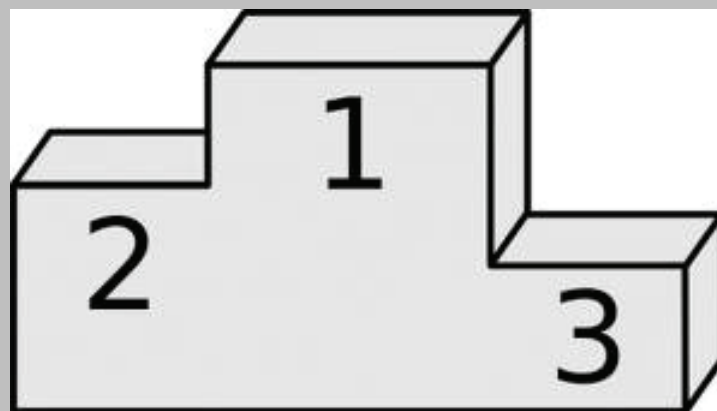


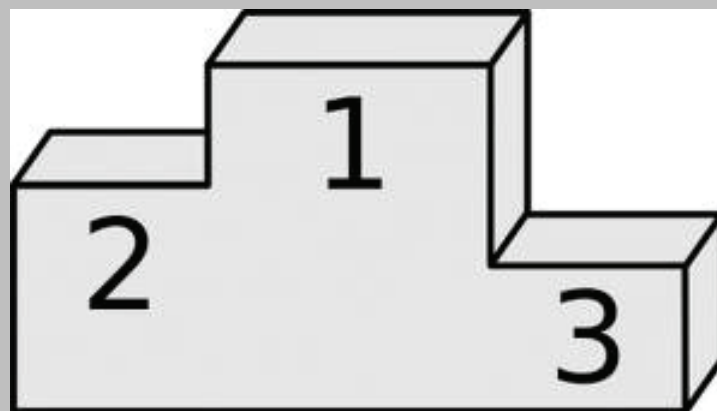


**Trace nitroaromatic detected
in K.O. sample**



HNO₃





References

Vince I, Patel M (2006) Explosion in fume cupboard damages several laboratories, Loss Prevention Bulletin 187, 6-8.

Vince I (2013) Explosion at a hazardous waste site caused by contaminated nitric acid, Chemical Engineering Transactions 31, 535-540.