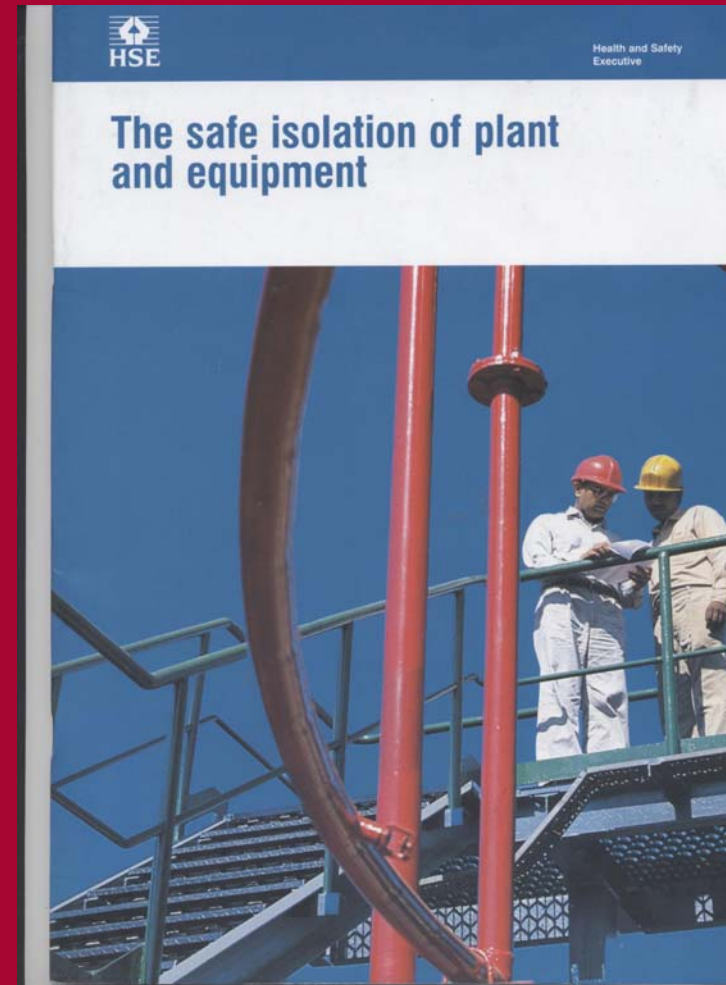


Key aspects of HS(G) 253

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Human Factors

- Human Failures can be grouped into:

Errors

And

Violations

Errors are not intended

Violations are deliberate

Examples of Human Failures

- Failure to complete or reverse isolations before restarting plant
- Failure to prove and monitor isolated valves
- Poor communication (Shift handover)
- Failure to check P&ID's against actual plant

Minimising Errors

- Establish adequate understanding of the hazard
- Provide good, clear, concise, available, up to date procedures
- Clear identification of P&E
- Clear system for tagging valves
- Good access and conditions
- Effective checking & supervision

Minimising Violations

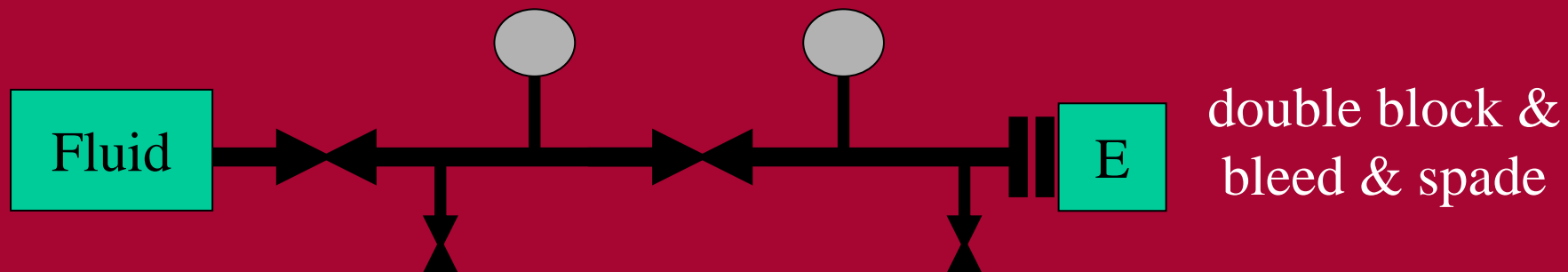
- Establish positive safety culture with clear expectations
- Plan realistic work schedules
- Well designed isolation tasks
- Good staff understanding of procedures
- Effective supervision
- Compliance checking
- Performance monitoring

Design – New Plant

- Isolations should be included within design considerations
- It will be expected that for new plant HS(G) 253 is followed
- For other new plant the selection tool in appendix 6 of HS(G) 253 should be used
- Any proposed deviation from the agreed design basis once plant is operational should be justified by formal risk assessment before new isolation procedures are used

Design – New Plant (2)

- The expected standard for new plant where there is to be entry, into areas containing toxics or where there is a high pressure source is positive isolation, with a suitable valve to allow the isolation to be made



Design – Existing Plant

- For existing plant the minimum standard is assessed using the tool in appendix 6
- For existing plant where HS(G) 253 cannot be met by current designs an ALARP demonstration should be made and a time bound action plan for improvements agreed

Plant identification

- All items required for safe isolation should be included within an isolation scheme
- Items of plant that are part of the isolation should be clearly marked as such
- Drawings should be produced to show how isolations should be made – these are not P&IDs but it may be suitable to modify P&IDs to clearly show isolation points

Pipework

- Pipework should be designed so as to limit the risk of trapped inventories and allow easy removal of fluids
- Isolation flanges or spool pieces should be easy to remove and replace but remain gas tight in service

*See also Energy Institute guidance
'Guidelines for the management of integrity of
bolted pipe joints'*

www.energyinst.org.uk/index.cfm?PageID=604

Valves

- Valves used for isolation must be designed for the isolation of the fluid involved
- Control valves are not generally suitable for isolations
- The best valves for isolation are ball valves and plug valves. Some needle valves are good if designed for isolation duty
- Valve position must be clearly indicated
- Valves must be capable of being locked in the closed position
- Isolation valves will require maintenance

Blanks and spades

- More leak tight than valves
- Provide positive isolation
- Need to be made to standards
- Need to be clearly marked
- Need to be compatible with fluid
- Need to be properly maintained and inspected before each use
- Need to be properly stored



Expected isolation standards for COMAH sites – **How to work it out**

- Use the tool in appendix 6 of HS(G) 253
1. Substance Category of fluid 1 – 5 very toxic to not harmful
 2. Release factor – size of line and pressure
 3. Location factor – numbers at risk. **You should include environmental considerations**
 4. Outcome factor – combination of release factor and location factor (2 & 3)

OUTPUT:

Use the Baseline Isolation Table using results at 1 (substance category) and 4 (Outcome Factor) above

Assessment output

- R – think again and see if you can do the job another way
- I – Positive isolation
- II – Proved isolation
- III – Non-proved isolation

Types of isolation are given on page 14 of HS(G) 253

- NOTE – for confined space entry and extended term isolations – DO MORE – Physical disconnection or insertion of spades

TABLE G - Isolation Baseline Standard

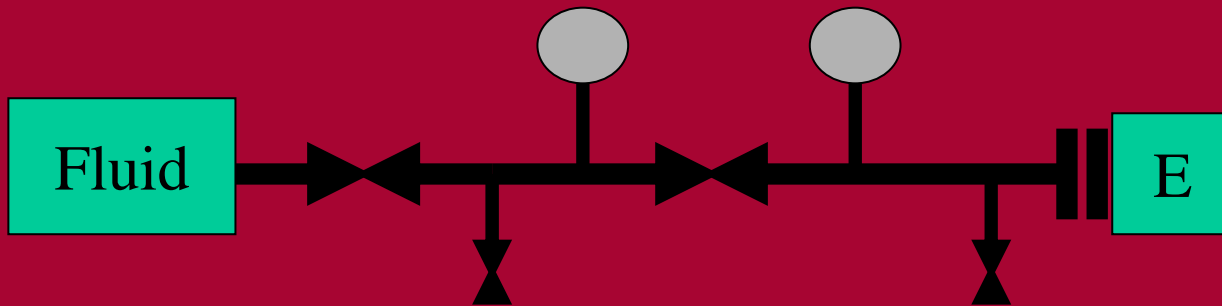
		Outcome Factor		
		A	B	C
Substance Category	1	R	I	I
	2	R	I	II
	3	I	II	II
	4	II	II	II
	5	II	III	III

Types of isolation - 1 Positive isolation:

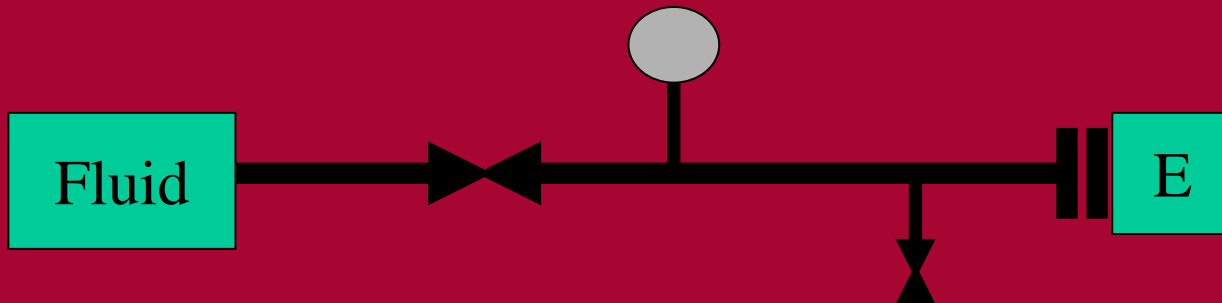
Complete separation of plant from other parts of the system



physical disconnection
e.g. spool removal

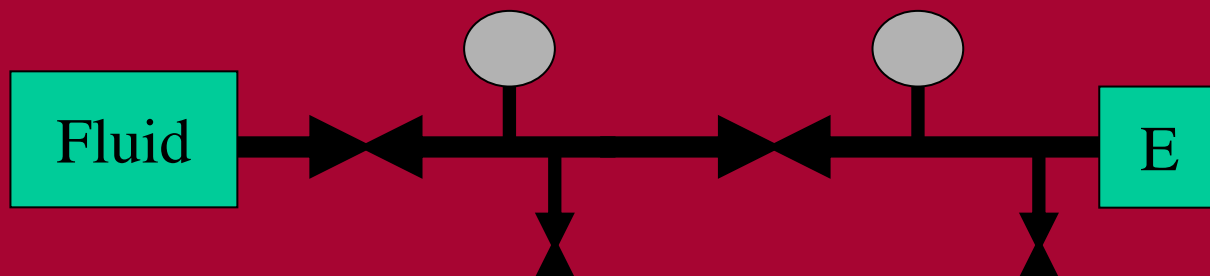


double block &
bleed with spade

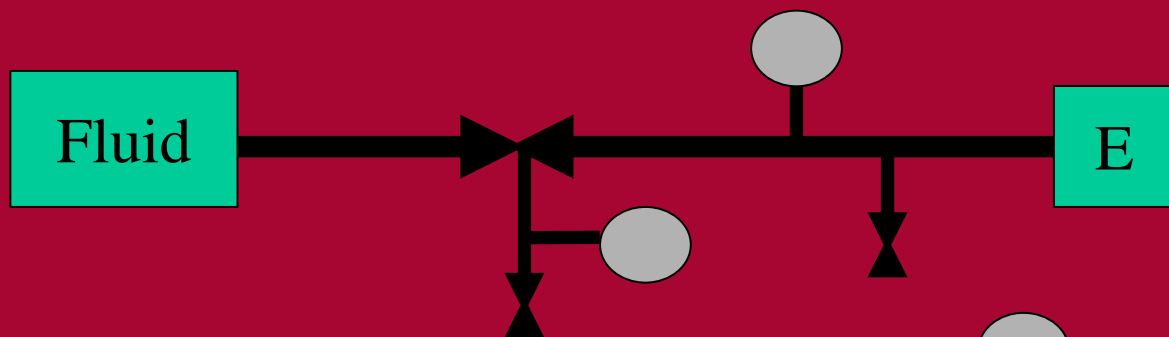


single block &
bleed with spade

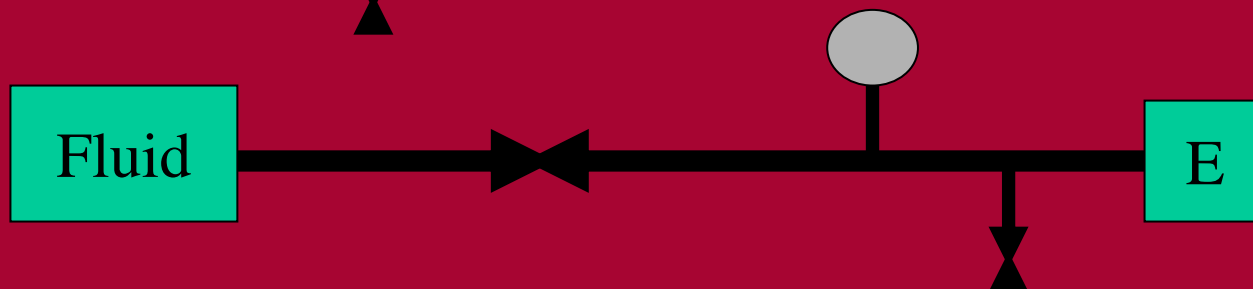
2 Proved isolation – Valved isolation with bleed to prove isolation effectiveness



double block
and bleed



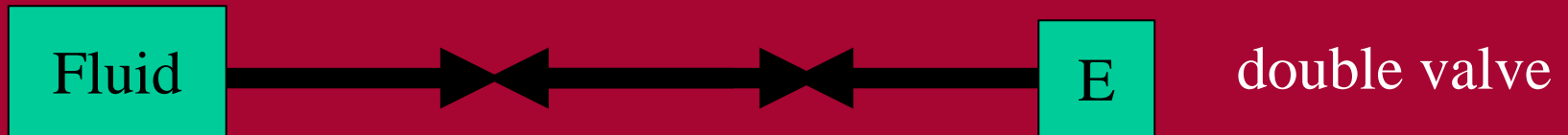
double seals in a
single valve body with
a bleed in between



single block
and bleed

*Note for COMAH substances a minimum of
double block and bleed is expected*

3 Non-proved isolation – Valved isolation with no provision to prove effectiveness



Worked Examples

Example 1 - 4" steam main at 12 bar.g protection required for two fitters.



Table C – Substance Category

Category	Description
1	Very Toxic, Toxic Carcinogenic, Sensitising, etc.
2	Flammables Petroleum Explosive Steam etc.
3	Corrosives, Harmful, Irritant
4	Flammable liquids stored below flashpoint and following release
5	Non-classified & not stored in a potentially harmful state

Release factor

Table D – Release Factor for 4” steam main at 12 barg

		Pressure		
		> 50 barg	≤ 50 barg >10 barg	< 10 barg
Line size				
	≥ 20cm	H	H	M
	Line >5cm <20 cm	H	M	L
	≤ 5cm	M	L	L

Location factor

Table E – Location Factor

Category	Description
H	Any of: numbers at risk > 10; congested equipment; potential for escalation; large fires with potential for damage and multiple fatalities
M	Typically: 3 – 10 at risk; uncongested plant, storage area or small number of items in open area; minor fire
L	Characterised by: 1 – 2 at risk; remote single items; easily contained minor fires

Remember to consider the environment

Outcome factor

Location Factor	Release Factor			
		H	M	L
H		A	B	B
M		B	B	C
L		B	C	C

So Isolation Baseline is II

		Outcome Factor		
		A	B	C
Substance Category	1	R	I	I
	2	R	I	II
	3	I	II	II
	4	II	II	II
	5	II	III	III

Requires proved isolation – SBB as minimum for each supply line into the isolation – DBB a must for COMAH

Example 2

6' water main protecting 2 fitters

- Substance Category 5
- Release factor M
- Location factor L
- Outcome factor C
- Baseline III
- Non-proved isolation – so could use a single valve but where possible double valve required

Example 3 - Process gas toxic at 0.3 bar.g 260C in a 450mm diameter pipe.



Substance Category for toxics is 1 from Table C

Category	Description
1	Very Toxic, Toxic Carcinogenic, Sensitising, etc.
2	Flammables Petroleum Explosive Steam etc.
3	Corrosives, Harmful, Irritant
4	Flammable liquids stored below flashpoint and following release
5	Non-classified & not stored in a potentially harmful state

Release factor **M**



Table D – Release Factor for 450mm dia pipe at 0.3 barg

		Pressure		
Line size		> 50 barg	\leq 50 barg >10 barg	< 10 barg
	\geq 20cm	H	H	M
	Line >5cm <20 cm	H	M	L
	\leq 5cm	M	L	L

Location factor **H** (off site risk)

Table E – Location Factor

Category	Description
H	Any of: numbers at risk > 10; congested equipment; potential for escalation; large fires with potential for damage and multiple fatalities
M	Typically: 3 – 10 at risk; uncongested plant, storage area or small number of items in open area; minor fire
L	Characterised by: 1 – 2 at risk; remote single items; easily contained minor fires

Outcome factor **B**

Location Factor	Release Factor			
		H	M	L
H		A	B	B
M		B	B	C
L		B	C	C

Isolation Baseline I

		Outcome Factor		
		A	B	C
Substance Category	1	R	I	I
	2	R	I	II
	3	I	II	II
	4	II	II	II
	5	II	III	III

- Positive isolation – spade or spool removal etc

Example 4

LPG pipe 75mm diameter.

- Substance Category 2
- Release factor M (hot day)
- Location factor H (offsite risk)
- Outcome factor B
- Baseline I
- Again positive isolation

Example 5

LPG 25mm diameter pipe

- Substance Category 2
- Release factor L
- Location factor L
- Outcome factor C
- Baseline II
- Proved isolation and as a minimum double block and bleed

Instrument isolation

- The most common need for isolation
- Should be treated the same as other isolations – see HS(G) 253 Appendix 9
- Instrument connections beyond the primary isolation may not be as robust as the plant-side isolation
- *Note also UKOOA guidance on vibration fatigue of small bore piping*

Recommended way forward

- List all fluids on your site
- Use appendix 6 to set isolation standard for each fluid and each diameter of pipe
- Write out the standard of isolation required for each pipe
- Survey all isolations on site and mark up P&IDs with isolation positions
- Create a time bound action plan to improve all isolations to the standard set

The way forward (2)

- Write down procedures to make and control each isolation – involve the work force
- Train all workers so that they understand the need and the application of the isolation standard
- Monitor and audit the use of the isolation standard and procedures
- Improve the standard and procedures based on the audit results

Ask Yourself ?



- Have you appropriate isolation procedures that fully address planning, draining venting purging & flushing activities and testing & reinstatement of plant
- Are your procedures reviewed and updated periodically?
- Have you adequate supporting documentation? P&ID's, GA's or piping isometric drawings, valve line ups, isolation certificates, etc?

Ask Yourselfs ?



- Have you trained and competent persons that perform and supervise isolations?
- Are roles and responsibilities defined and recorded?
- Do you audit and review isolations to ensure standards are achieved and maintained?
- Have you isolation KPI's?
- Do you have effective communication at all levels and particularly at shift handovers?

Ask Yourselfs ?



- Have you got all equipment necessary to perform isolations?
- Are your plant items identified and labelled appropriately?
- Have you got control of contractors and do they comply with your procedures and expectations?

Do you need to do more to improve your current practice?

If not – Address complacency

Thank You

Any Questions?

