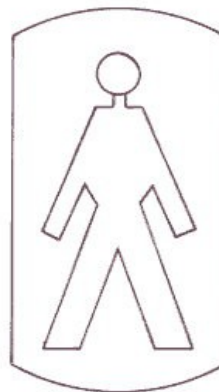


CAUTION

PREPARATION FOR MAINTENANCE AND ENTRY

No. 125

PREPARATION FOR MAINTENANCE AND ENTRY



- 125/1 You don't need to get right inside a confined space to be overcome — your head is enough.
- 125/2 A contractor entered a vessel without permission.
- 125/3 A slip-plate corroded.
- 125/4 How to isolate an all-welded line.
- 125/5 How do you make sure that relief valves are put back in the right place?
- 125/6 Two clearances were issued for the same plant item.
- 125/7 A leak from an open end on a new pump.
- 125/8 Should we tax risks?

An Engineer's Casebook — Slip-plates



IMPERIAL CHEMICAL INDUSTRIES LIMITED
PETROCHEMICALS DIVISION

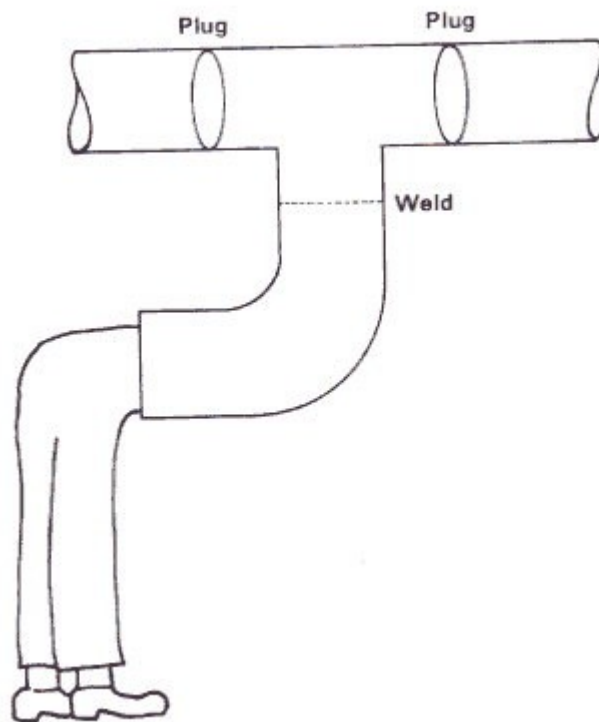
125/1 YOU DON'T NEED TO GET RIGHT INSIDE A CONFINED SPACE TO BE OVERCOME—YOUR HEAD IS ENOUGH

Earlier Newsletters (see 88/4 and 77/1) have described how men were killed or overcome because they entered confined spaces without carrying out the proper entry procedure. Two other companies have described unusual incidents of this type.

(a) When a plant was being leak tested with nitrogen after a shut-down, a leak was found on a man-hole joint on the side of a vessel. The pressure was blown off and a fitter asked to re-make the joint. While he was doing so, the joint ring fell into the vessel. Without thinking, the fitter squeezed the upper part of his body through the man-hole so that he could reach down and pick up the joint.

His mate saw his movements cease, realised he was unconscious and pulled him out into the open air where he soon recovered.

(b) A large pipe had been argon-arc welded in a workshop and two plugs had been inserted in the positions shown to save argon. There was also a plug in the open end. When welding was complete this plug was removed and a man reached into the pipe to inspect the welds and to remove the other plugs, and was asphyxiated.



Another man, passing by, gave the first man a playful pat on the behind. Later he saw the first man in the same position and realised that something was wrong.

The same company report that new vessels for cryogenic service have been delivered under nitrogen pressure — to keep out moisture — but without any warning.

During the last 20 years seven men have been asphyxiated by nitrogen or other inert gases in ICI; most of the incidents occurred in the 1960's.

125/2 ANOTHER CONTRACTOR ENTERS A VESSEL WITHOUT PERMISSION

Contractors and other visitors are particularly liable to take short cuts with entry procedures (See Newsletter 63/3).

Another Division report that a contractor's supervisor was found inside a tank which was disconnected ready for entry but not yet tested or certified safe for entry. He had been asked to prepare an estimate of the cost of cleaning the tank. The contractor's supervisor said that he did not realise that entry permits were needed just for an inspection. He had been given a booklet of Works Rules but had not read them.

It is not sufficient to give contractors working on our sites copies of our rules. They must be explained to them.

Some years ago an ICI supervisor entered a tank to see that it was alright for a laboratory assistant to enter it to sample the atmosphere! Since then some Works have put a grid or notice over open manholes on vessels that are not approved for entry.

125/3 A SLIP-PLATE CORRODES

The photograph shows a slip-plate which was removed from a pipe-line. A mild steel slip-plate had been fitted instead of a stainless steel one and then left in position for several months.



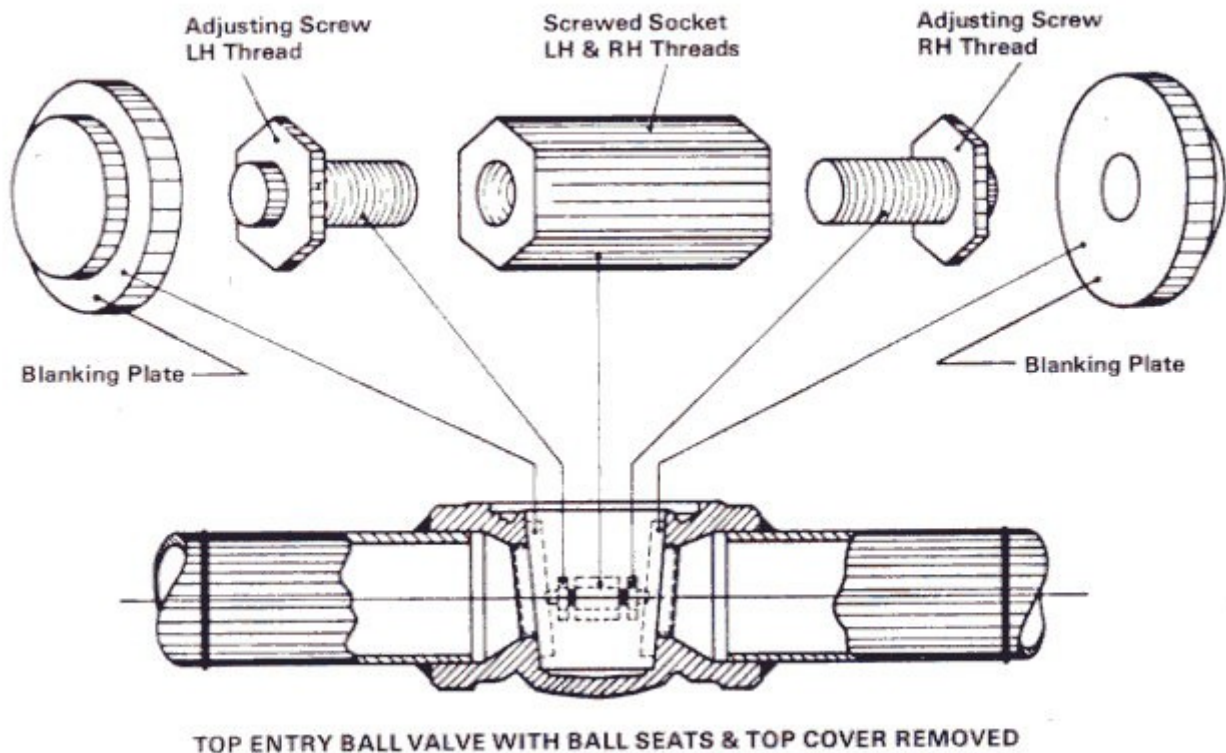
If a slip-plate which has been in position for a long time is to be used to isolate equipment for maintenance or entry, then **the slip-plate must be removed and its condition checked.**

You cannot tell what a slip-plate is made from by inspecting the tag because sometimes the tag is made from a different type of steel.

125/4 HOW TO ISOLATE AN ALL-WELDED LINE

Sometimes on all-welded plants, there is no way of slip-plating or disconnecting vessels which have to be entered.

The diagram below shows a method that can be used to isolate a line with a welded-in ball valve. The topwork is removed and replaced by two blanking plates, forced apart by the two adjusting screws and the screwed socket.



125/5 HOW DO YOU MAKE SURE THAT RELIEF VALVES ARE PUT BACK IN THE RIGHT PLACE?

Newsletters 54/2 and 41/9 described incidents which occurred because the wrong relief valves were replaced on a plant after a shut-down.

One of the Works in the Division has devised a simple method of reducing the chance that this will occur. When a relief valve is removed for examination and testing, a numbered tag is tied to it and another tag with the same number is tied to the flange to which the relief valve is fitted. When the relief valve is put back on the plant the man doing so checks that the tag numbers are the same. He then removes both tags.

Some Works stamp relief valve numbers on the mating flanges but these are not as easy to read as tags.

125/6 TWO CLEARANCES ISSUED FOR THE SAME PLANT ITEM

During a major shut-down in another Division, a plant appointed a special process supervisor to issue clearance certificates to the maintenance team. Four other supervisors, on shift, continued to operate part of the plant which was still running, and they continued to issue clearances on the running plant.

The line of demarcation between the day supervisor and the shift supervisors was not clearly drawn and they both issued clearances for work to be done on the same item of equipment. They used different clearance books kept in different rooms. Fortunately, someone spotted the mistake.

Appointment of special supervisors for a shut-down is a good idea. The maintenance team have only one supervisor to deal with and he understands their problems (See Newsletter 110/2). But the line of demarcation between the special supervisor and the shift supervisors must be clearly drawn and they should use the same clearance book and work from the same office or control room.

125/7 A LEAK FROM AN OPEN END ON A NEW PUMP

An operator cracked open the suction valve on a liquid ammonia pump which had been handed back from maintenance. He heard a roaring sound and immediately left the area. Looking back, he saw ammonia vapour escaping from the pump. The valve was closed by a man wearing breathing apparatus.

The pump had been replaced by a reconditioned one and the man who installed it did not notice that there was a ½ inch open end on the pump body, which had been covered with tape. On the pump which he had removed the corresponding hole had been plugged.

The report on the incident recommends that in future ammonia pumps should be leak tested with nitrogen after maintenance and that all equipment should be carefully checked for open ends.

Reminder Newsletters 68/6 and 4/1 described how a man was killed because he opened the suction valve on an ammonia pump which was partly dismantled. The valve was not locked shut and was not slip-plated.

125/8 OTHER MEN'S VIEWS No 13

“Economists are fond of using taxation to control human affairs. One suggestion, then, is to tax anyone who introduces a risk into society. This tax could pay for medical care, for compensating society for the loss of services, etc. The question arises: How much should the tax be? I suggest, as a basis for discussion, that this tax be at the rate of \$1 million for every life that is lost by this extra risk, or one dollar for a risk of one in a million. Conversely, anyone that can save a life by an expenditure of \$1 million must be encouraged to do so.

For example, the manufacturer who panders to the bad habit of cigarette smoking would pay an increased tax of 70 cents *per cigarette*. This is more than enough to pay the societal cost of cigarette smoking (hospital costs, fire hazards, reduced working time), which is variously estimated at from \$1 to \$2 per pack. Other taxes — five cents per diet soda — are less dramatic and might have to be accompanied by a tax of five cents on other sodas as well to prevent a switch to sugar.

These taxes might be earmarked to pay for risk reductions such as converting an existing sanitation system to using ozone instead of chlorine for sanitation, to avoid the production of chloroform.”

Richard Wilson, *Technology Review*, February 1979, page 41.

125/9 COMMENTS FROM READERS

(a) Newsletter 122/2 showed how liquid can be trapped in a Saunders valve. A reader points out that this can be avoided by locating the valves so that their spindles are horizontal.

(b) Newsletter 122/3 described how balls from ball floats have come loose and blocked overhead lines. A reader reports that a bottom line has also been blocked in this way.

125/10 UNUSUAL ACCIDENTS No 88

Brewer's Dictionary of Phrase and Fable quotes the following:

Aeschylus was killed by a tortoise, dropped on his bald head by an eagle.

Anacrea was choked by a grape stone.

Bacon died of a cold contracted when stuffing a fowl with snow as an experiment in refrigeration.

Chalchus, the soothsayer, died of laughter at the thought of having outlived the predicted hour of his death.

George, Duke of Clarence, brother of Edward IV, was drowned in a butt of malmsey.

125/11 RECENT PUBLICATION

There has been increasing interest in recent years in internal floating roofs for fixed roof storage tanks, as they reduce evaporation losses and pollution. In a recent paper, E C Sommer of Esso reviews the types available and the precautions necessary when they are used.

For a copy of this paper or for more information on any item in this Newsletter please 'phone ET or CJ (Ext P.2845) or write to them at Wilton. If you do not see this Newsletter regularly and would like your own copy, please ask E or C to add your name to the circulation list.

July 1979

An Engineers Casebook No 25

SLIP-PLATES

Use is sometimes made of 'thin' slip-plates which are $\frac{1}{8}$ inch or $\frac{1}{4}$ inch thick to back up valve isolations, unless full thickness plates designed to withstand the full upstream pressure are called for.

The adequacy of such plates to withstand the upstream pressure if the primary isolation is passing has been queried. I have never heard of a 'thin' slip-plate which had ruptured by pressure though I know of a number of cases where they have been dished and difficult to withdraw.

The behaviour of 'thin' plates under overload depends very much on the grip between the flange faces. A plate with truly fixed edges will fail before one which is merely supported. Plates between weld neck flanges will be stronger than those between slip-on flanges. Spiral wound gaskets probably allow higher pressures before serious deformation than CAF joints etc. Eventually when deformation starts the joint is encouraged to leak and in the case of hydraulically filled systems the release of a drop or two of liquid has a marked effect on lowering the pressure applied.

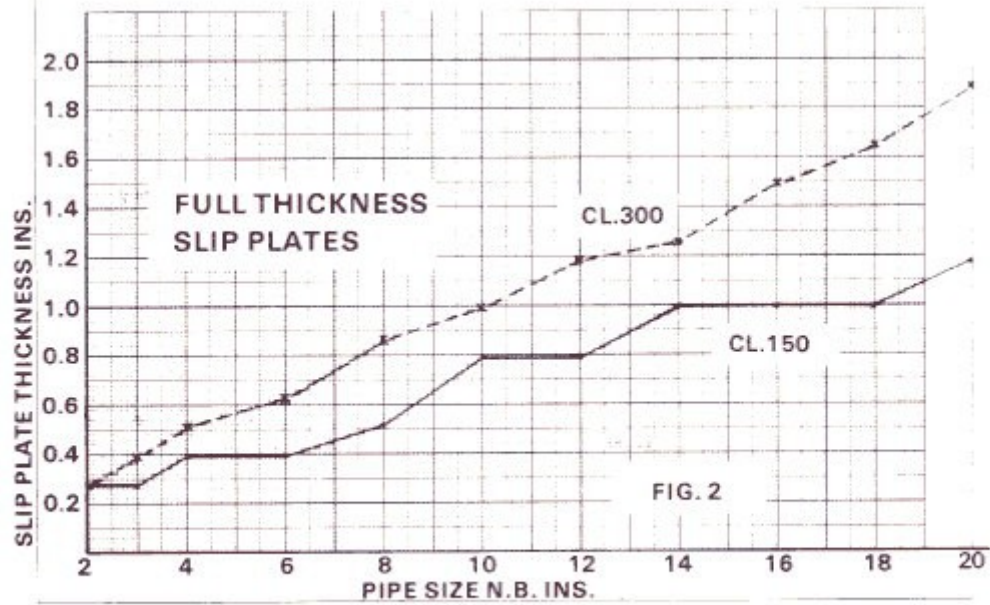
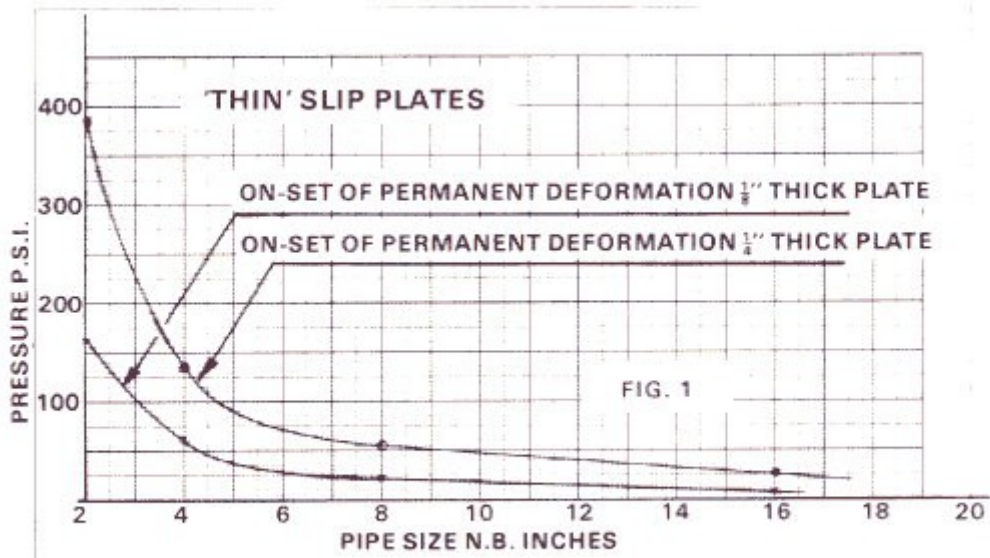
Bill Jones (Engineering Dept.) has calculated the theoretical pressures which may be applied to 'thin' slip-plates, $\frac{1}{8}$ inch and $\frac{1}{4}$ inch thick, at the onset of permanent deformation and these are shown in Fig. 1.

'Full thickness' plates for Class 150 and Class 300 are to be found listed in ICI standards 04 2400 and 2401. Calculations show that these are based on design to approximate yield stress and uncorroded thickness when subjected to the primary pressure ratings of 275 psi and 720 psi respectively at 38°C, the maximum allowable non-shock ratings for Class 150 and Class 300 flanges. Slip-plates to these ICI Standards are about 20% thinner than those designed to the formulae in ANSI B31.3, the American Piping Standard for Chemical and Refinery Piping.

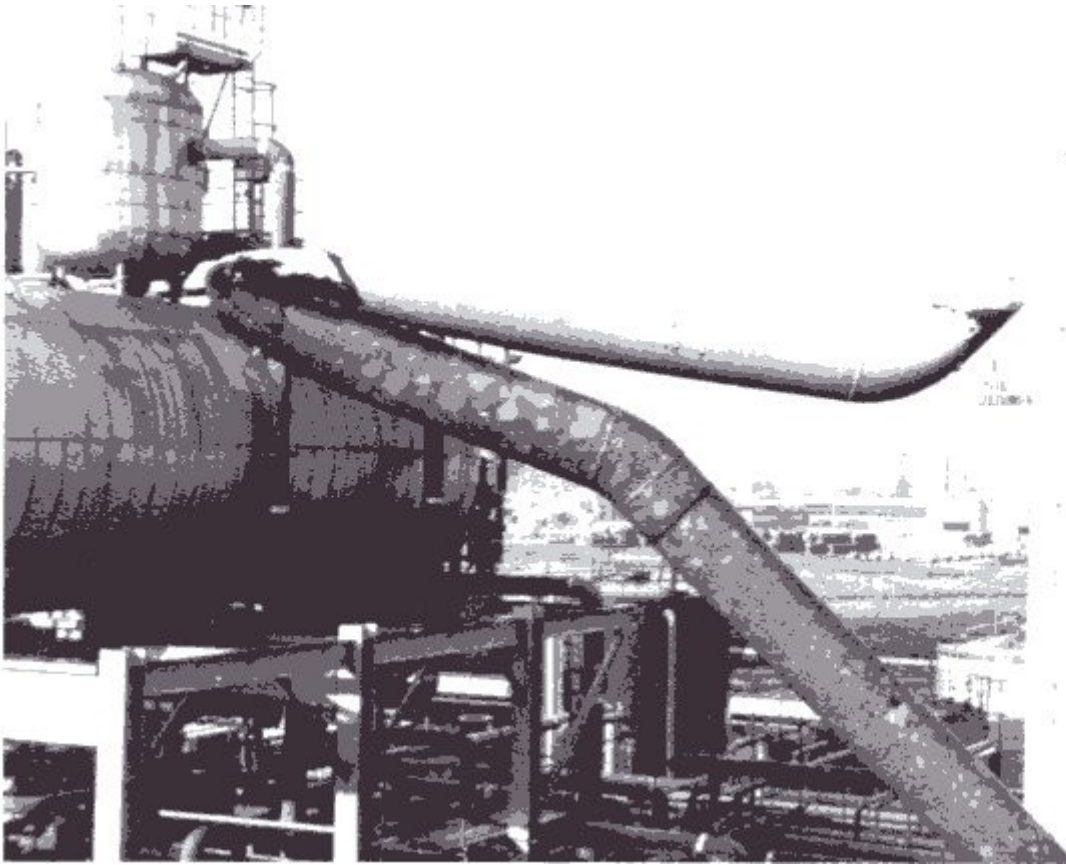
Fig. 2 shows the ICI full slip-plate thicknesses for sizes up to 20 inch Class 150 and Class 300.

E H Frank

Note On many Works thin slip-plates can be used only on the authority of an engineer.

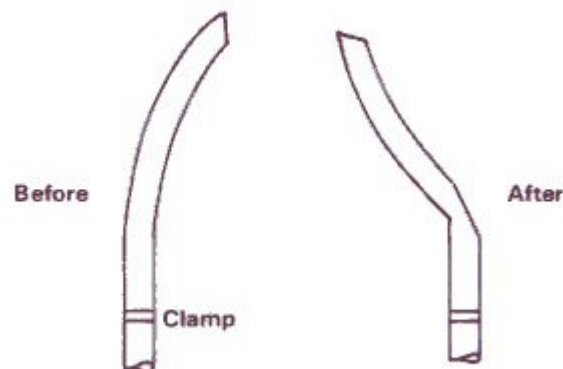


**Photographs from our Archives
No. 3**



This happened in 1969 when a steam relief valve lifted and the tail pipe was not supported adequately.

Another Company have reported a similar incident. A bursting disc in an oxygen line failed and the oxygen was discharged through a 4 inch copper pipe, which was curved to prevent rain getting in. The trust on the pipe bent it back, reducing the cross-section by 90%!



If you suspect that your relief valve tail pipes are not supported adequately, Piping Design Section can advise.