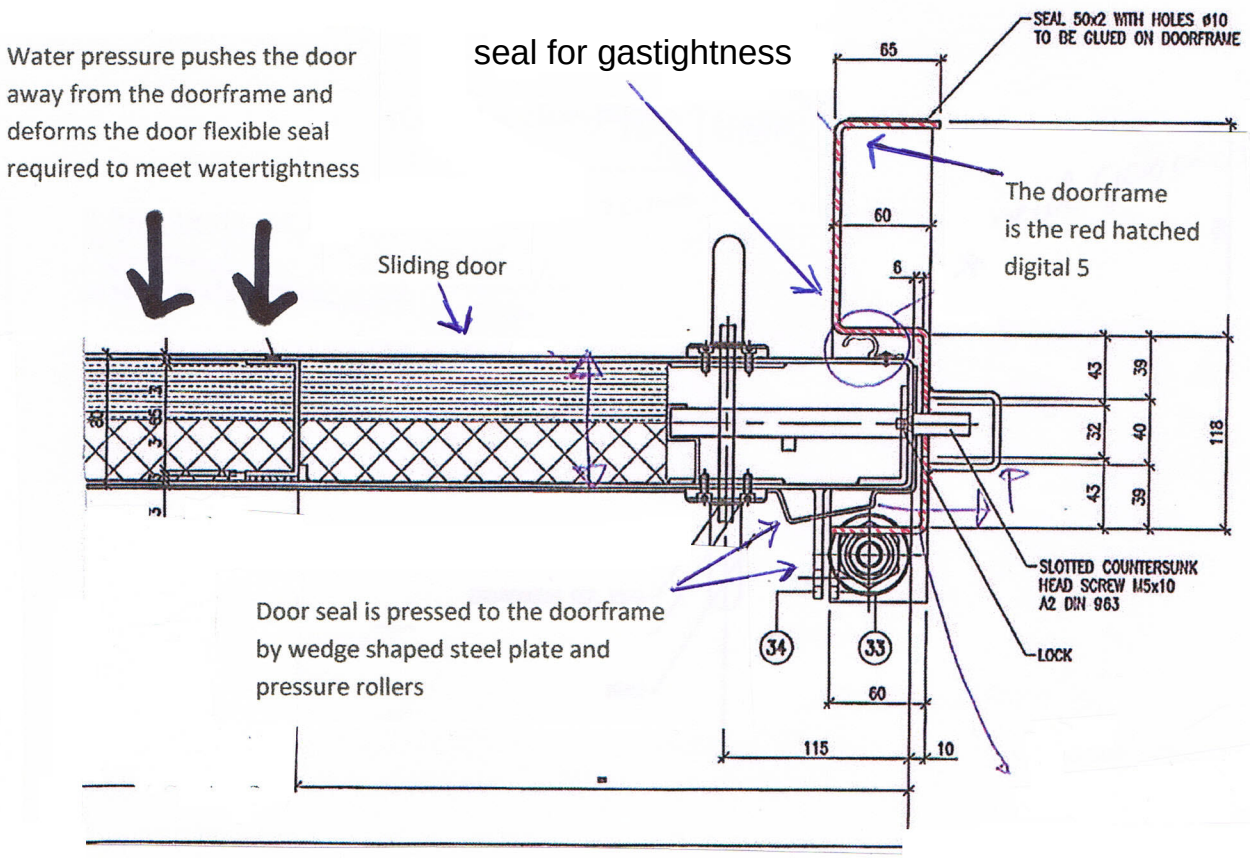
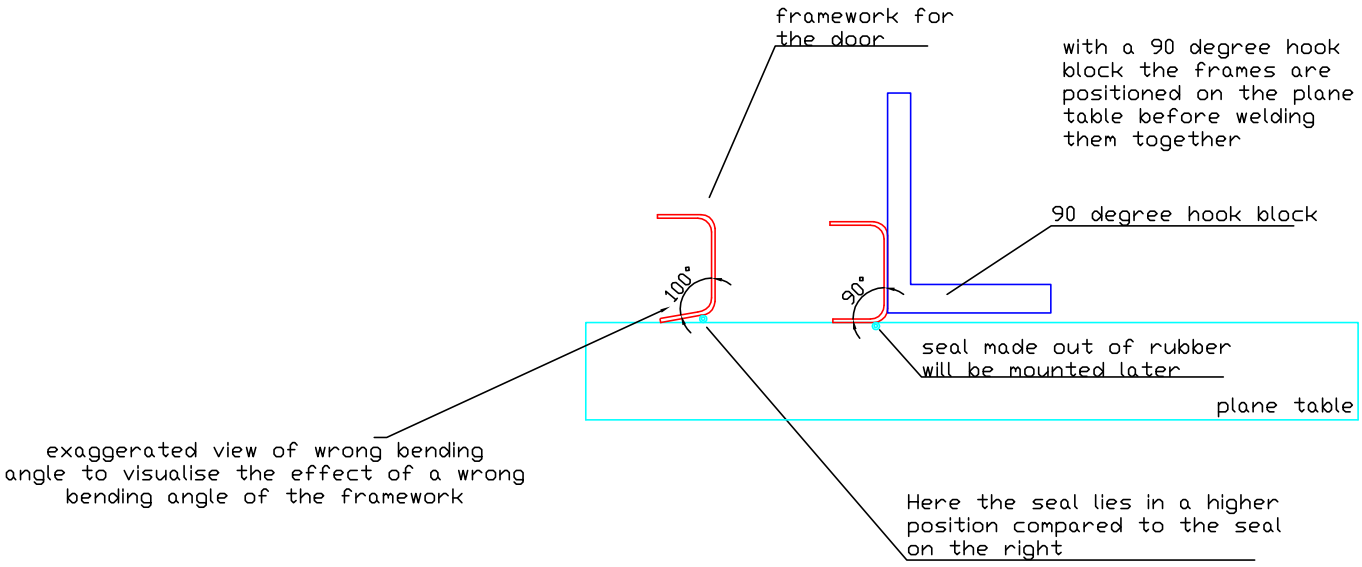
Drawing of a part of a sliding door with seal problems

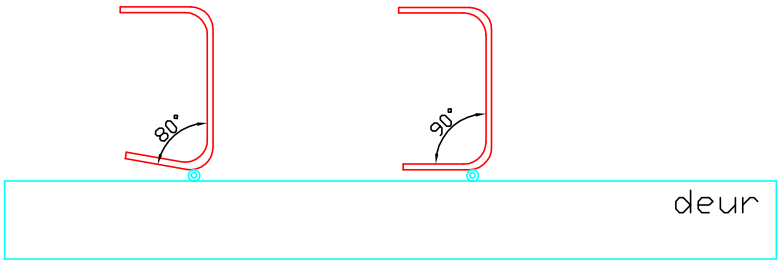


The sliding doors have problems with the seal. The seal is needed to meet Off Shore gas tightness requirements. The seal is placed all around on the door. Long tuning is necessary to meet good working conditions (opening force) and gas tightness. Long tuning times come from how the doorframe is produced (see next page) and from the stick slip effect of the soft seal. The seal has to be soft to be flexible. Due to its softness the seal wants to stick to the doorframe raising the opening force. The seal will curl when it sticks to the doorframe. Another customer wanted a sliding door that has to be two ways watertight at 10 meter water hight. For this customer a new seal was invented. This seal has no tendency to curl and can be used for all doors. The new seal can be seen on the next page. Tuning took 3 hours at the production site and 2 hours at the customer. This is reduced to 1 hour overall.

A small change in bending angle to produce the framework of Off Shore doors reduced the adjustment time by 2,5 hours to make these doors gastight (regulation)



The door can be seen as underneath plane table. Due to the fact that the door is a closed steel welded box this is a very stiff construction. it is very unflexible compared to the open framework. Underneath you see the exaggerated effect of a wrong bending angle of the framework that will not cause long adjustment times. The position of the seal when the door is closed will be close to the bend of the framework. This seal position is drawn underneath. The seal mounted on the door (see first page of this PDF) will be in underneath drawn position when the door is closed. Not the end of the flange of the frame will define the position of the seal. Now it is the bend of the frame which defines the possition of the seal. Due to the fact that all bends will be positioned on the plane table, all seals are in one plane. When the door is produced well adjustment times are reduced from 5 to 2 hours.

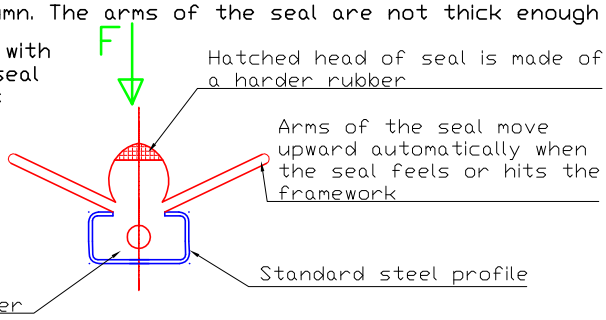


Dit soort branddeuren (schuif- en draaideuren worden binnen de Off Shore industrie geleverd vanwege hun brandwerendheid en gasdichtheid. Een detail van dit type schuifdeur vindt u in de TAB disciplines/Off Shore. Door deze gasdichtheidseis en Arbo eisen ten aanzien van openingskrachten kostte het stellen van het kader naar de deur telkens 5 uur. Deze steltijd kwam voort uit het gekozen productieproces en de manier van het in elkaar lassen van het kader. Door de zetter anders te instrueren konden steltijden tot 2 uur worden teruggebracht.

Due to problems with the current seal (also high opening force due to the curling of the rubber between the door and the framework when opening the door; see first page of this PDF) i invented a new seal that could also meet the demands of a customer who needed some sliding doors that could withstand 15 meters of water column on both sides. This new seal would preferrably also overcome the problems with the current seal. The working principle is as follows: The seal consists of a co extrusion of two rubber types. A hard toplayer will reduce friction forces between seal and framework (harder rubber has a lower friction coeefficient). So it will not stick on the framework. In the last part of the closing of the door the head of the seal is pressed downward in underneath drawing. To make this downward movement easy (this will lower opening/closing forces of the door) a hole is made in the extrusion of the rubber. Due to the vertical movement of the head of the seal the arms of the seal will move upward touching the framework of the door. The head is made reasonable thick to withstand high horizontal forces due to the 15 meter water column. The arms of the seal are not thick enough to withstand this water pressure.

Framework presses with a force F on the seal when door is almost closed

The thin arms of the seal can withstand high water pressure due to the help of the stronger center part of the seal



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