Development of a new secondary entrance for industrial gates

Student: Jonathan Schulz

For many businesses around the world, warehouses are an essential part of the daily operations. Large industrial gates are often used for deliveries and other functions, but to make the warehouses as effective, safe and controllable as possible, there is often a desire to separate pedestrian traffic from industrial veichles. This is the purpose of a Passdoor, which is a secondary entrance to industrial gates.

ASSA ABLOY Entrance Systems is today one of the global leaders in access solutions, especially in industrial applications. This Master Thesis has been performed in collaboration with the company, with the goal of designing a new fix panel Passdoor for the updated industrial gates launched in 2018.

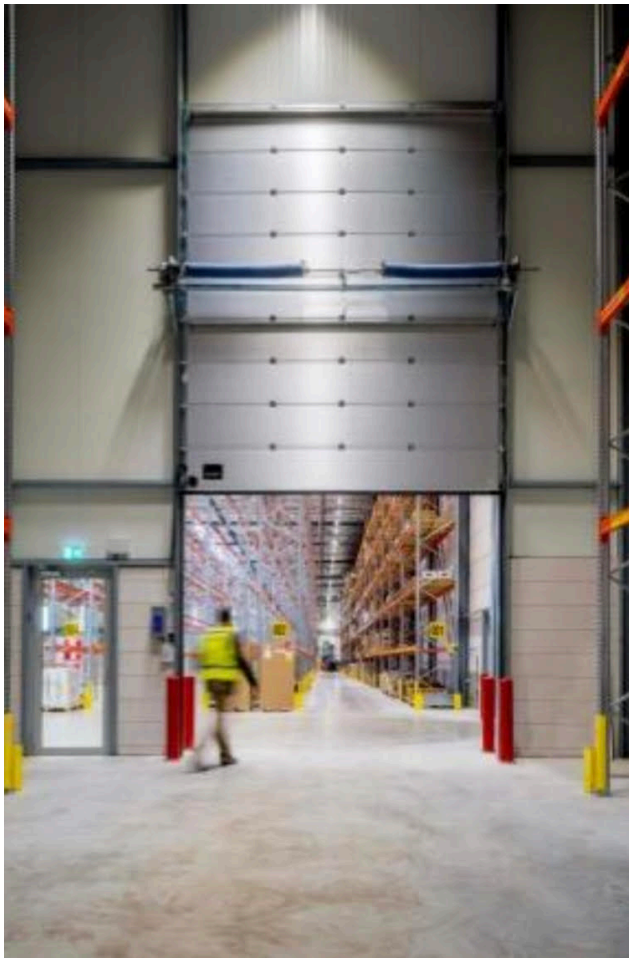

Fig. 1 – Industrial overhead gate produced by ASSA ABLOY Entrance Systems.

The scope of the project has been

- How can a Passdoor be designed for an industrial panel gate, to be as cost-effective, easy to assemble and integrated to the rest of the gate as possible?
- What are the mechanical requirements of such a Passdoor?
- Development of detailed drawings to the new Passdoor.

Methodology

The methdology for the project has been based on the theories presented by Donald Norman in the book The Design of Everyday Things, mainly circling around the Double Diamond Process Model of Product Development, splitting the design process into two parts of firstly giving room to develop a problem formulation and second solving the issue. Additionally inspiration has been taken from the Human Centered Design process, from the same book with focus on fast iterations to develop the best solution possible for a problem.

The project has been limited in terms of how far the New Passdoor has been taken in the product development process, due to limitations to the time frame of the Master Thesis.

Result

The result of the project is a fully functional development prototype of the New Passdoor, in two thickness variations to fit the current industrial panel gates by ASSA ABLOY Entrance Systems. The result includes a set of between 10 and 14 fully finished detailed drawings for the two Passdoor configurations, which provides the company with a good stepping stone to further development of the door.

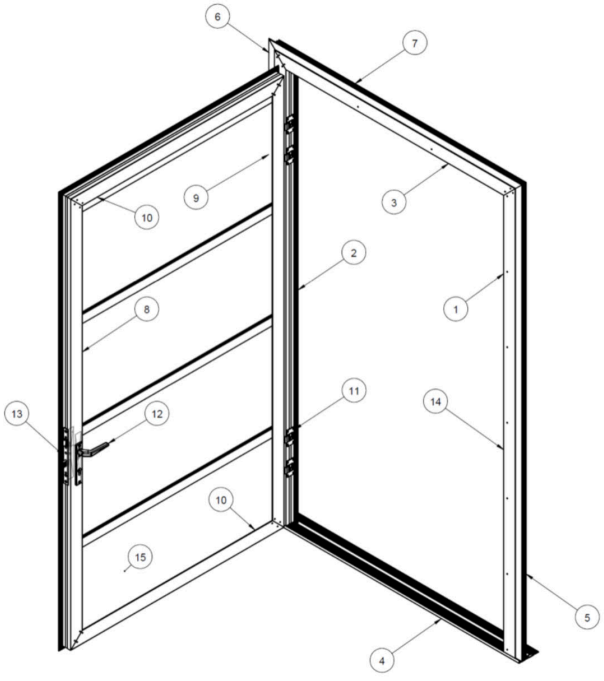

Fig. 2 – Finalized design of the New Passdoor.

After analyzing the current industrial gates by ASSA ABLOY, it was found that many of the parts included in those designs could be re-used and re-purposed for the new Passdoor. This includes making the gate panels into a door blade and surrounding stiles into the structure providing stability for the door. Parts not available from the rest of the gates were mainly hinges, handles and locks, but also a threshold to fit the Passdoor.

The two panel thicknesses offered for the industrial gates, meant that new stiles are needed for manufacturing of a Passdoor with an 82 mm thickness. To achieve this, a part inside of the metal stiles is the plastic broken cold bridge, which improves insulation prooperties of the industrial gates. By elongating the part, the parts can be applied for the thicker variation of the door as well. This though leads to an increased risk for warping deformation of the broken cold bridge, which has to be tested by the company.

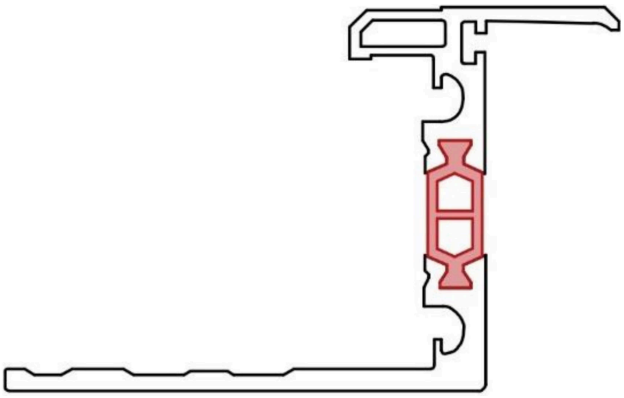

Fig. 3 – Cross sectional view of the frame stile with the cold bridge shown in red.

As the Passdoor will be sold in custom sizes depending on needs for the customer, there is a wide intrerval between the heaviest and lightest door. Both with a variable width of 42mm or 82 mm, but also with a heigh between 2 200 mm and 2 440 mm as well as a width between 800 mm and 1495 mm. This makes the need for hinges variable between different variations of the doors. After performing calculations on the rigidity of the hinges and weight of the door, it could be determined that the need for hinges for the New Passdoor was in fact four hinges for possible variation of the door. This simplifies customization of the Passdoors a lot and results in a substantial decrease in cost for design and manufacturing, but with the tradeoff of decreasing the maximum door width from 1 495 mm to 1 400 mm and slightly over-dimensioning the smallest possible variation of the door. This though was decided favourable, as cost of the door is an important parameter.

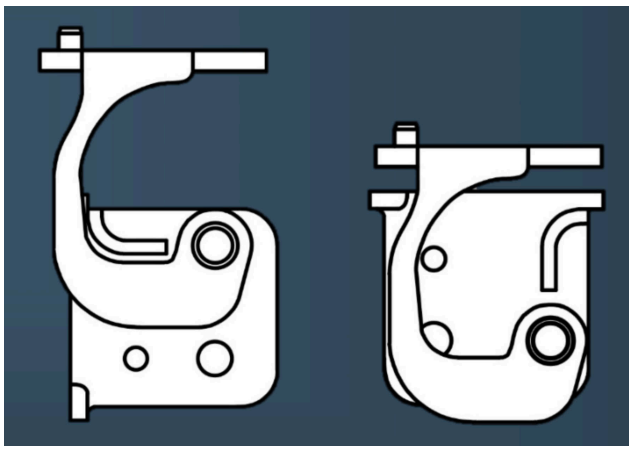

Fig. 4 – The hinges selected for the project, opened (left) and closed (right).

Conclusion

The two Passdoors designed in this Master Thesis, provides a good background to the future work with the industrial gates offered and sold by the company. The knowledge and conclusions about the hinges and cold bridges used in the door is also a good background for future endeavours by ASSA ABLOY Entrance Systems. The New Passdoor will most likely in the future be a very real addition to the industrial gate design offered to consumers all over the world.

Master Thesis finished 2021: New Passdoor for Fix Panel Industrial Gates
Supervisor: Glenn Johansson. In collaboration with ASSA ABLOY Entrance Systems.