# DESIGN MANUAL

# LIBERTA COR-TEN 600

FACADE CLADDINGS

## Basics

Before ordering panels project-specific plans should be made, considering the background structures, panel frame structures, panel installation direction, joint width, ventilation, thermal expansion and gaps as well as flashings and fastenings. The plans should be made by a structural design company familiar with facade planning or the structure planner of the building project.

Panel installation drawings are made based on the facade drawings. The panels are identified with unique ID numbers. Panel dimensions must match the architect's plan, which is complemented by detailed dimensions of the panel joints as well as details of any corner, window and door connections. Based on these plans the installer can report the panel dimensions as the work progresses.

At the same time the location, number and fastening method of the panel substructure should be specified. These are determined based on wind loads and panel dimensions.

Cor-Ten products can be delivered to the site pre-patinated. In this case, the patinated Cor-Ten steel surface is even-shaded and the majority of rust streaks have disappeared. Often, however, this alternative is ruled out by work schedule restrictions (the pre-patination takes at least six months). Installation is therefore usually performed using non-patinated products. In such cases the effect of initial surface blotchiness and rust on the building must be taken into consideration.

The risks involved in using Cor-Ten steel lie with possible prevention of the necessary alternate wetting and drying required for patination. Continuously wet surfaces will rust through. Building elements most open to risk include horizontal surfaces and surfaces which are positioned in too close proximity to each other. Horizontal surfaces easily accumulate rust through contact with run-off water. The moisture level beneath the resulting rust layer remains high, allowing rusting to continue unabated. Surfaces positioned in too close proximity to each other accumulate residual moisture in the narrow gap between the materials, thus leading to crevice corrosion.

Structures must be freely ventilated from all sides. Ventilation air channels must be at least 30 mm in depth. All Cor-Ten elements must be separated from each other and from other metal surfaces, for example with EPDM sealings to ensure sufficient ventilation.

Electrochemical incompatibility and the harmful effects of run-off water tend to perish unprotected materials used in conjunction with Cor-Ten steel. As a general rule, different types of metals may be used in conjunction with Cor-Ten steel. However, galvanised materials must not be used in direct contact with exposed Cor-Ten steel. Materials that are easily stained by run-off water and difficult to clean include e.g. concrete, plaster, unpainted galvanised steel, stone, wood and matt enamels. Materials which are more resistant to run-off water staining and are relatively easily cleaned include, e.g. semigloss or gloss enamel coatings, anodized or standard aluminium, stainless steel, neoprene, glass and ceramic tiles.

Structural elements which are not under direct exposure to weathering form a less even patina layer than elements exposed to regular wetting and drying. An uneven surface layer may also be formed in structures that are exposed to extreme local temperature differences or in structures where the flow of outdoor air onto different building elements is variable. The same also applies to continuously sheltered structural components such as steel surfaces located under eaves.

Key design principles for effective functioning of Cor-Ten surfaces:

- All horizontal surfaces should be tilted to facilitate water run-off.
- All Cor-Ten elements should be separated from each other and from other metal surfaces e.g. with EPDM sealings.
- All fastenings should be made of stainless steel and spacing pads positioned between all fastenings and Cor-Ten elements.
- Use of Cor-Ten steel should be avoided in the immediate vicinity of public walkways in order to eliminate rust streaking.
- The risk of rust streaking should be counterbalanced by using dark coloured and dirt repellent surrounding materials.
- Rust water must be channelled away in a controlled manner.
- Implementation of design solutions in practice must be ensured through work site supervision.

## Dimensioning

The width and height of the panels (A- and B-dimensions) are measured from the center of the joint to the center of the joint. The panel depth (C) is a standard and it is measured from the top of the support stud to the outer surface of the panel. Also the horizontal joint (Dh) is a standard. The width of the vertical joint (Dv) is expressed as the width of the visible joint.

The minimum and recommended maximum panel sizes are specified in separate panel size charts.

## Panel joints

In the panel system the support stud forms the base of the vertical joint between the panels.

The base of the horizontal joint between the panels consists of the turned panel flanges.

- **Fastening holes**

  The fastening holes are punched during panel manufacturing. The holes are round, with diameter 10 / 8 mm. A larger fastening hole is located on the upper edge of the panel, just above a smaller fastening hole. The larger of the hole is used to fastening a lead-in rubber (Separating piece EPDM CA3SP814). Standard fastening holes are located at each corner of the panel at a 40 mm distance from the centre of the vertical joint. Additional holes are made automatically or according to customer specifications. If the customer does not specify the positions of the additional holes, the holes are always made automatically as described below.
  The positions of the required additional holes depend on the dimensions of the panel. The positions of the holes are expressed in the following format:
  A-dimension / 2; A-dimension / 3, etc. where A is a dimension of the panel side and the divisor is a number indicating the number of equal-size parts the side should be divided into.
  Standard fastening holes:
  - A-dimension ≤ 700 mm;
    fastening at the panel corners.
  - A-dimension 701 – 1 400 mm / 2;
    fastening at the panel corners and in the middle.
  - A-dimension 1 401 – 2 100 mm / 3;
    fastening at the panel corners and in the middle with two equally spaced fastener.
  - A-dimension 2 101 – 2 800 mm / 4;
    fastening at the panel corners and in the middle with three equally spaced fastener.

- **Support studs**

  The panels are fastened in Cor-Ten steel sheet metal support studs by self-drilling screws. When the panels are over 700 mm wide, additional center support studs are required. Levelness of the substructure for the entire width of a panel is extremely important, so that fastening causes no deformation of the panel surface.

- **Special panels**

  **Corner panels**

  Corner panels can be made to extend around the external corner of the building. In addition to normal fastening holes in the panel is automatically included additional fastening holes on both sides at a 100 mm distance from the corner unless the customer requires otherwise.
  A single panel for the internal corner of a building cannot be manufactured – two separate panels and a flashing must be used.

  The possibility to produce other special panels must be determined case-specifically.

- **Facade flashings**

  The number of the flashings in a panel facade can be decreased significantly through good planning, as the panels can be ordered to the exact shape and dimensions. Typical applications include the corners of the building, such as corner panels, window frames, etc. Flashings are typically designed to be covered by the panels to improve the esthetic quality of the facade.
  The same basic rules must be taken into consideration in the design of flashings as in the design of the panels (intersections of the Cor-Ten parts).

- **Fasteners**

  The fastenings related to the panels can be generally divided into three categories: fastening the support studs to the frame, fastening the panels to the support studs and fastening the flashings.
  The panels must be fastened using self-drilling screws, which are manufactured of stainless steel. Also gasket screws are obligatory to use.
  Sizing of the screws according to the instructions by SFS intec, for example. The final type and number of fasteners for each purpose is always defined by the structural designer in charge.
  Fasteners can be painted to the same colour as patinated Cor-Ten. The final Cor-Ten colour can change, however, so choosing an exact colour match can be problematic.

- **Sealings**

  Usually used sealing materials in connection with Cor-Ten steel are manufactured of EPDM rubber.

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