Corian.

ENDLESS EVOLUTION

DUPONT™ CORIAN®
AS AN EXTERNAL CLADDING SOLUTION

Product bulletin
EMEA / English

www.corian.com

Lacq Community of Municipalities building, Mourenx, France; project by Gilles Bouchez, photo Arthur Péquin.


seekoo
HOTEL

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Left: Hotel Seeko'o, Bordeaux, France; project by Atelier King Kong; photo Arthur Péquin.

INTRODUCTION

This document provides an overview of DuPont™ Corian® solid surface in ventilated façade systems for the Europe, Middle East, and Africa (EMEA) region.

Building practices and codes vary throughout the world. The guidance provided in this document was developed for countries in EMEA as listed by DuPont at http://www.corian.com and should not be used in other regions. For guidance for other regions please check the appropriate region at **http://www.corian.com** or contact a local DuPont representative. Laws, building and safety codes governing the design, engineering and construction of installations vary widely. It is the responsibility of the purchaser to ensure that proper building practices and codes are followed for the location of the installation.

A. DUPONT™ CORIAN® SOLID SURFACE AS AN EXTERNAL CLADDING MATERIAL

DuPont™ Corian® solid surface is innovation through beauty, colour and depth. It is strength and purity, reliability and performance. But above all, it is inspiration - a maverick, seamless material that can transform any space, whether for interiors or exteriors, through unlimited possibilities. Corian® solid surface brings personality to virtually any type of environment, enhancing and facilitating the lives of those who use and enjoy its unique potential. Crafted into almost anything, in any place, for any purpose and in a wide palette of colours, it offers the freedom to design, explore and create. Long-lasting, hygienic, durable and elegant, DuPont™ Corian® solid surface has a three-dimensional formability that has been liberating inventive and artistic minds for over 40 years. It is an advanced blend of natural minerals and acrylic polymer. It is a synthetic material - born of human imagination and exploration - and the result of a reflection upon the demands of design. To make the most of Corian® solid surface in a world of changing environments, fashions and modes of communication, the invitation to architects is to transform this limitless material into a meaningful work of form and function.

DuPont™ Corian® solid surface is a solid, non porous, homogeneous surfacing material, composed of about ⅓ acrylic resin (also known as polymethylmethacrylate or PMMA), and about ⅔ natural mineral. The mineral is aluminium trihydrate (ATH) derived from bauxite, an ore from which aluminium is extracted. For more information on the composition of the material, please consult the Material Safety Data Sheets (MSDS) available via the msds.dupont.com site or via your local supplier. Supplied in sheets, it can be fabricated with conventional woodworking tools into virtually any design. Corian® solid surface is the original solid surface material made only by DuPont.

The construction guidelines in this document were developed specifically for use with the DuPont Building Innovation products and non-DuPont products recommended for use by DuPont that are referenced in this document. End-Users should not expect to get equivalent performance results when using products other than those products specified in this document.

Advantages of DuPont™ Corian® Solid Surface for exterior applications

DuPont™ Corian® solid surface offers quite some advantages in a ventilated façade application:

HIGH PERFORMANCE DURABILITY

- Great resistance to impact
- Resistant to humidity
- Resistant to salt fog and Sulphur Dioxide (SO_2)
- Resistant to fungus and bacteria
- Will not delaminate nor decompose

STRUCTURAL PERFORMANCE

- Lightweight for reduced structural load
- Flexural and tensile strength providing excellent resistance to wind loads
- Compatibility with typical building components, structural silicone and sealants

FIRE PERFORMANCE

- Low flame spread
- In the event of fire, Corian® solid surface will not melt and will not create burning droplets
- Low smoke generation
- When burned, it primarily releases carbon oxides and does not release toxic halogenated gases

WEATHERABILITY

- UV stable colour selections with excellent colour-fastness available
- Resistant to bulk water absorption
- Weather-resistant system minimizes leakage from wind-driven rain (ability to seam reduces the number of joints)
- Excellent freeze-thaw resistance
- Excellent resistance to chemicals, detergents and environmental pollutants

ENVIRONMENT - DURABILITY

- Ventilated façade allows for thicker insulation and therefore lower energy costs
- Is durable, long-lasting. Panels can be repaired, if necessary, rather than replaced (less material is needed or discarded over the life of the building)
- Ventilated façades can be used for cladding renovation to reach new insulation requirements
- Is inert, safe in use and has low VOC content
- Is non toxic

FABRICATION AND INSTALLATION

- Ease of shop fabrication using high-speed carbide tipped routing tools
- Ease of field fabrication and modification by simple machining methods
- Multiple widths available to adapt to façade layout, minimizing waste (e.g. window surroundings)
- Lightweight and easy to install
- High level of quality control provided by DuPont™ Corian® Authorised EC converters / DuPont-Certified Fabricators

MAINTENANCE

- There are no pores to trap dirt
- Neither the surface nor the edges need to be sealed, painted or protected
- Colours run through the entire thickness and cannot wear away or delaminate, making the product inherently robust
- Even covered with some of the most difficult dirt and graffiti, the panels can be restored to their original appearance through cleaning and sanding
- Under normal conditions, will require annual cleaning only, with standard agents such as water and detergents

REPAIRABILITY

- If excessive surface damage is incurred after installation, Corian® solid surface has unique repair possibilities. In most cases it can be repaired on site with little difficulty, using abrasive scouring pads and an orbital sander.
- In case of severe abuse, the damaged section can be cut out completely and replaced using Corian® replacement parts, DuPont™ Joint Adhesive and routing and sanding equipment. Repairs should always be done by DuPont™ Corian® Quality Network members.

RENEWABILITY

Corian® solid surface can be renewed at any time, using abrasive scouring pads and an orbital sander.

Design Flexibility with DuPont™ Corian® Solid Surface

LARGE PANELS

Large panels can be easily built up by adhering standard panels with reinforced inconspicuous seams. The main limitations are the ability of the substructure to accommodate movement due to thermal expansion, the weight capacity of the mounting system, and the necessary expansion gaps (revealed or open joint designs). Current mounting systems are limited to five meters maximum height. The maximum width is governed by the capability of the design to accommodate the anticipated thermal movement.

Colours run through the entire thickness, so edges are in the same colour as the rest of the sheet, and revealed joints will show no black gaps.

TRANSLUCENCY

DuPont™ Corian® solid surface will allow some diffused light transmission, depending on colour. In general, solid light colours such as white and beige are the most translucent, and dark colours are the least translucent. DuPont™ Corian® solid surface can also be fabricated to achieve different levels of light transmission by selectively back-cutting the material to different thickness. As the material is cut thinner, it allows more light to pass through.* The effect generated will depend on the combination of material and lighting system variables. The DuPont™ Corian® Illumination Series has been specifically designed with more translucency than the standard colours. Special considerations for these materials are described in the DuPont™ Corian® Illumination Series Fabrication bulletin.

SURFACE TEXTURING, PATTERNING AND ENGRAVING

There are many different surface treatments that can be applied to DuPont™ Corian® solid surface, including machining or engraving (sanding, routing, sandblasting, water jet, etc.), texturing (thermal moulds and presses), and layering (laminating). Different techniques can be used for surface finishing, partial surface cutting or full cutting for different shapes, patterns or inlays. These techniques enable high levels of customization for unique, one-of-a-kind designs.

Surface machining of DuPont™ Corian® sheet is typically done with high-speed routing tools to create desired features or shapes. Since DuPont™ Corian® solid surface is relatively easy to cut and finish, without the need for specialized diamond abrasives and saws, fabrication can be done quickly and with a high level of quality. High-speed routers can achieve a fine level of detail for surface cutting and can also be driven by CNC controls to achieve intricate patterns and textures. Different finishes (semi-gloss, mat or rough-textured) can be achieved with various sanding or polishing steps.

A broad range of geometric or natural patterns of differing textural depth and dimension can be moulded into the surface to achieve an unlimited variety of architectural finishes. Laminating multiple layers of DuPont™ Corian® sheet can be done with flat and thermoformed pieces.

THERMOFORMING

The techniques above can be combined with shape thermoforming to create a variety of two and three dimensional shapes by different forming, shaping and machining techniques into three- dimensional structures with texturing, patterning or engravings. The possibilities are almost unlimited.

Surface moulding and forming of DuPont™ Corian® solid surface is typically done with medium-temperature ovens and pressure moulds. A broad range of geometric or natural patterns of differing textural depth and dimension can be moulded into the surface to achieve an unlimited variety of architectural designs and finishes. Sheets of 12 mm thickness can be formed to as tight as a 75 mm inside radius.

Procedures for the fabrication of DuPont™ Corian® solid surface have been developed for many different forms and applications. *Please refer to the DuPont™ Corian® Fabrication Manual for further details.*

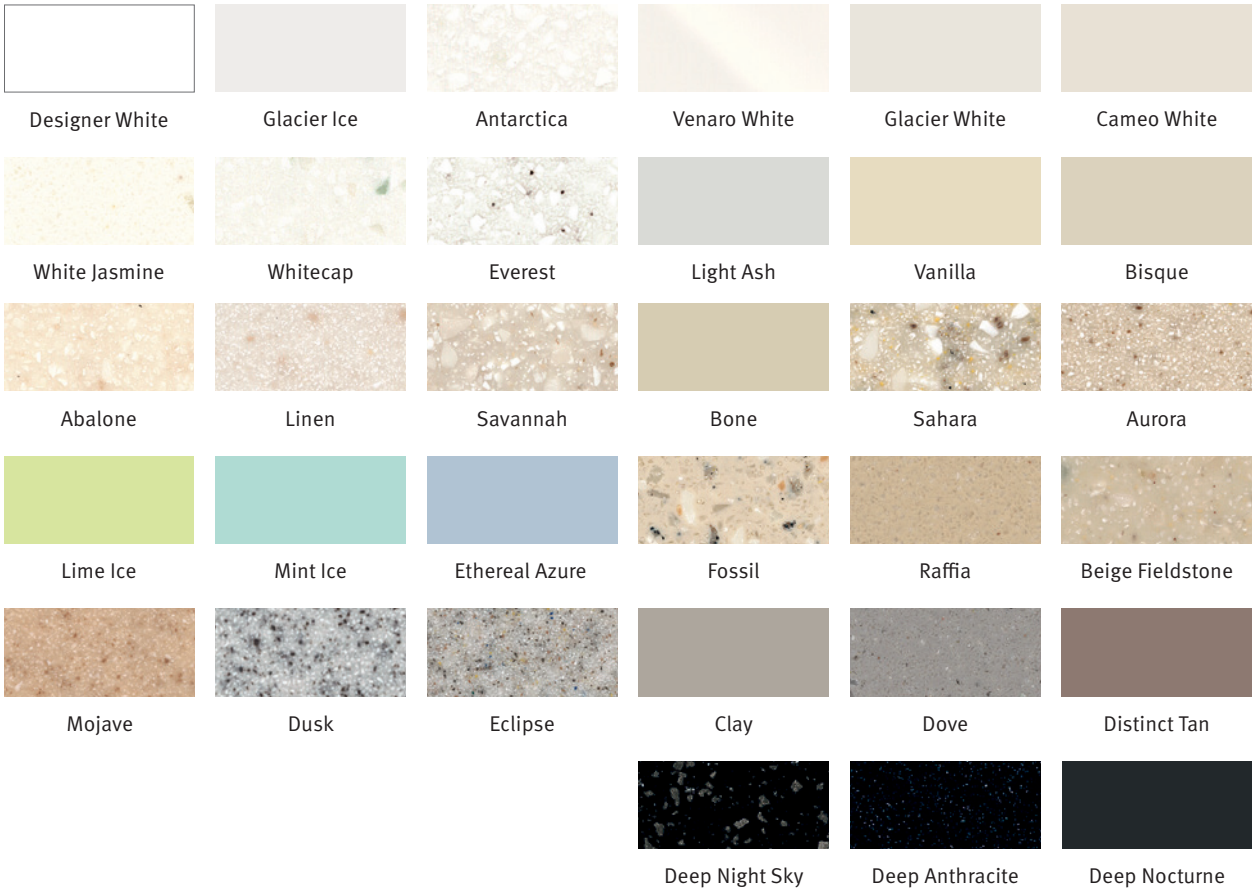
* Reducing the thickness decreases the mechanical properties. This must be accounted for in the design.

B. AVAILABLE COLOURS & DIMENSIONS

Many exterior cladding materials fade or discolour in time due to weathering, but in many cases the obtained natural patina may be acceptable or even desirable (e.g. copper roofing). Individual DuPont™ Corian® solid surface colours change differently and most often exhibit changes in gloss and whitening which can be renewed with cleaning and/or sanding. These changes are more obvious in saturated, chromatic and dark colours and least obvious in whites, lighter colours and many of the earth tones. Ultimately it is up to the end user to determine if these characteristics are acceptable in the application.

The following material usage recommendations are based on ASTM G7 and G155 standards. DuPont™ Corian® solid surfaces colours are grouped into different categories based on their colour stability in exterior cladding applications. The selection below represents colours that are expected to meet architectural guidelines for colour change of less than $5\Delta E^*_{ab}$ units over 10 years (ASTM D2244). Glacier White and Designer White are predicted to have colour change of less than $2\Delta E^*_{ab}$ units over 10 years.**

AVAILABLE COLOURS



UV Warranty: based on many years of practical experience and the high quality of DuPont™ Corian® solid surface, a 10 (ten) year UV warranty, guaranteeing that the colour will not fade or change by more than $5\Delta E^*_{ab}$ units and gloss loss will not exceed 40% on a matte finish, is available for the above sixteen colours.

The warranty herein does not cover DuPont™ Joint Adhesive, it covers only Corian® sheets products.

This warranty is subject to terms and conditions which will be delivered to the customer by the local DuPont office or representative.

** Please check with your DuPont™ Corian® solid surface representative for the latest updates on the recommended colours and dimensions available as a standard offering.

THE FOLLOWING DIMENSIONS ARE AVAILABLE:

				Standard Grade		Custom Grade
Colour	**Thickness**		**Length**	**Width**		
	12 mm	19 mm	3658 mm	760 mm	930 mm	1300 mm
Bisque	•		•	•		•
Bone	•		•	•		•
Cameo White	•		•	•	•	•
Designer White	•		•	•		•
Glacier Ice	•		•	•		•
Glacier White	•	•	•	•	•	•
Vanilla	•		•	•		•
All other EC colours	•			•		

Standard products can be ordered in different lengths, widths, or thicknesses when technically feasible. Special orders are available at a premium price. A minimum volume is required and delivery will have an extended lead time.

C. PERFORMANCE PROPERTIES OF DUPONT™ CORIAN® FOR EXTERIOR APPLICATIONS

DuPont™ Corian® solid surface has many desirable attributes for decorative exterior applications. These include good colour stability, low moisture absorption, and resistance to stains, environmental pollutants, detergents, humidity, and freeze-thaw conditions. Performance properties of DuPont™ Corian® solid surface for an array of industry standards relevant for outdoor use are summarized in the table below.

Property	Typical Result	Test
Structural		
Specific Gravity	1750 kg/m^3	
Areal Weight	21,5 kg/m^2 (12 mm sheet) 33,3 kg/m^2 (19 mm sheet)	
Impact	Category 1	ISO 7892
Flexural Modulus	8040 - 9220 MPa	DIN EN ISO 178
Flexural Strength	57 - 74 MPa	DIN EN ISO 178
Elongation at break	0,76 - 0,93%	DIN EN ISO 178
Tensile Strength	41 MPa (6000 psi)	ASTM D638
Tensile Modulus	10.4 MPa (1,5 x 10^6 psi)	ASTM D638
Tensile Elongation	0,4% minimum	ASTM D638
Izod Impact (Notched Specimen)	(0,15 N-m/cm) (0,28 ft.-lbs./in.) of notch	ASTM D256 (Method A)
Impact Test Resistance	15 N-m (130 in.-lb.)	ASTM D5420
Fire Performance		
Euroclass - Reaction to fire	B-s1, d0 - FR and custom grade C-s1, d0 - Standard grade	EN 13501-1
Weatherability		
Coefficient of longitudinal expansion	39 x 10^{-6} /°C	DIN 51045
Thermal Conductivity	0,77 W/(mK)	DIN 52612
Colourfastness	See exterior colour recommendations	ASTM G7 & G155
Water Absorption, Long-term; 30-days	0,6 weight%	ASTM D570
Freeze / Thaw Resistance	No observable changes	ASTM C666
Salt Fog (Concentrated effects of coastal environment exposure.)	Surface easily renewed	ASTM B117
Sulphur Dioxide (SO_2) Resistance	No effect	ASTM G85
Fungus Resistance	Does not support microbial growth	ASTM G21
Maintainability		
Hardness	>85 56	ASTM D785 (Rockwell “M” Scale) ASTM D2583 (Barcol Impressor)
Nitric Acid / Mortar Resistance (Acid rain and mortar resistance.)	Surface easily renewed	AAMA 605.2
Alkali / Acid Resistance	Surface easily renewed	ASTM D1308
High Temperature with 100% Relative Humidity	Surface easily renewed	ASTM D2247
Detergent Resistance (Resistance to commercial window cleaner solution.)	Surface easily renewed	ASTM D2248

D. VENTILATED FAÇADES

No matter what climate you find yourself in, moisture is always an issue and can seriously affect the overall performance of a building. The answer is a ventilated façade, which is designed to breathe. Ventilated façades have a space between the cladding and the outer wall - an ideal location for insulation materials.

DuPont™ Corian® external cladding is highly suited for ventilated façade systems. The "breathing" or envelope systems, combined with DuPont™ Tyvek® breather membranes, offer possibilities for high insulation values and contribute to a healthy indoor climate.

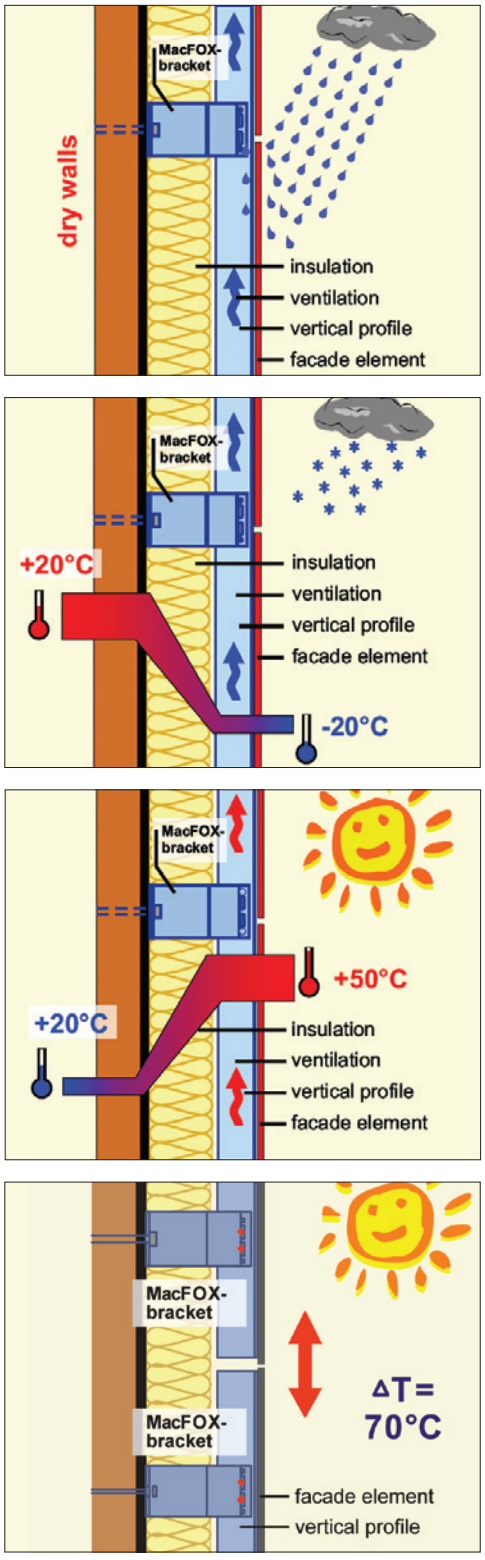
GENERAL GUIDELINES FOR DUPONT™ CORIAN® SOLID SURFACE VENTILATED FAÇADES

- For exterior wall cladding applications, Corian® exterior cladding is typically installed as a ventilated façade: the Corian® panels are mechanically fixed or bonded to a framework which is fixed to the external wall of new or existing (retrofit) buildings. An insulation layer is usually fixed on the external wall.
- The external wall can be made of masonry, concrete, or metal frame.
- Between the cladding and the insulation layer or the external wall, there is an air space which should be drained and ventilated.
- Ventilation requires a ventilated air cavity, at least 20 mm wide, and ventilation openings (gaps) at the top and bottom of the façade, as well as the top and bottom of windows and doors. Ventilation openings should be at least 5 mm, openings larger than 10 mm should be covered with ventilation profiles.
- Silicone should not be used to fill the gaps between the panels. Silicone can interfere with the movement of the panels and can collect dirt.
- When using a mechanical subframe and connection system, silicone should not be used to bond the panel to the substructure in addition to the mechanical fastening system as it will interfere with normal movement.

Important aspects for engineering a ventilated façade with DuPont™ Corian® exterior cladding:

- Panels should be attached to the substructure so that they are fully supported, yet able to move relative to the substructure to accommodate thermal movement.
- Strength and stiffness of the combination of panel and substructure must be enough to withstand wind load, panel weight, and impacts as described for the project, without damaging the façade.
- The cladding panels must not have any structural function.
- If heavy loads are to be connected to the panels, additional precautions should be taken.
- Before the installation of the panels, the building contractor and/or façade company should state the wall construction is strong, stiff, stable and flush in a durable way. The construction always has to meet the local and/or national legislation and guidelines as well as the project specifications.
- Dimensions of the panels should be checked by the façade company to ensure the panel size and fixing method is compatible with thermal expansion and contraction.
- Fixing panels, that have been fabricated or thermoformed into non-planar designs, to a support structure in different planes is not recommended. Properly designing the support to allow free movement of the shape in all directions is very difficult to obtain, if the panels are fixed in more then one plane.
- The behaviour of the system in seismic zones has not yet been evaluated.

Figure D 1 - Ventilated façade



RAIN / HUMIDITY / DEW PROTECTION

- Rain water and condensation are removed naturally by air flowing though the cavity - so that the insulation material remains in good condition and effective over time. Penetration of rain water is minimized and condensation is drained out through ventilation inlets and outlets. The ventilated air space serves multiple functions.

THERMAL INSULATION - COLD

- The air in the designed cavity will circulate due to air pressure differentials and thermal differentials over the height of the building. In a cold climate this causes the condensation moisture at the rear of the cladding to dry.

THERMAL INSULATION - HEAT

- In a warm climate the moving air will cool the inner layers of the construction, thus reducing the demand for cooling energy. The building occupants can enjoy a low-maintenance environment with dry and comfortable conditions that can make a positive contribution to wellness and overall comfort.

Source Eurofox

E. SUBSTRUCTURE FOR DUPONT™ CORIAN® PANELS

DuPont™ Corian® exterior cladding panels must be mounted on an adequate substructure with corrosion resistant fixings in such a way that panels are not subject to any kind of tension and can move freely.

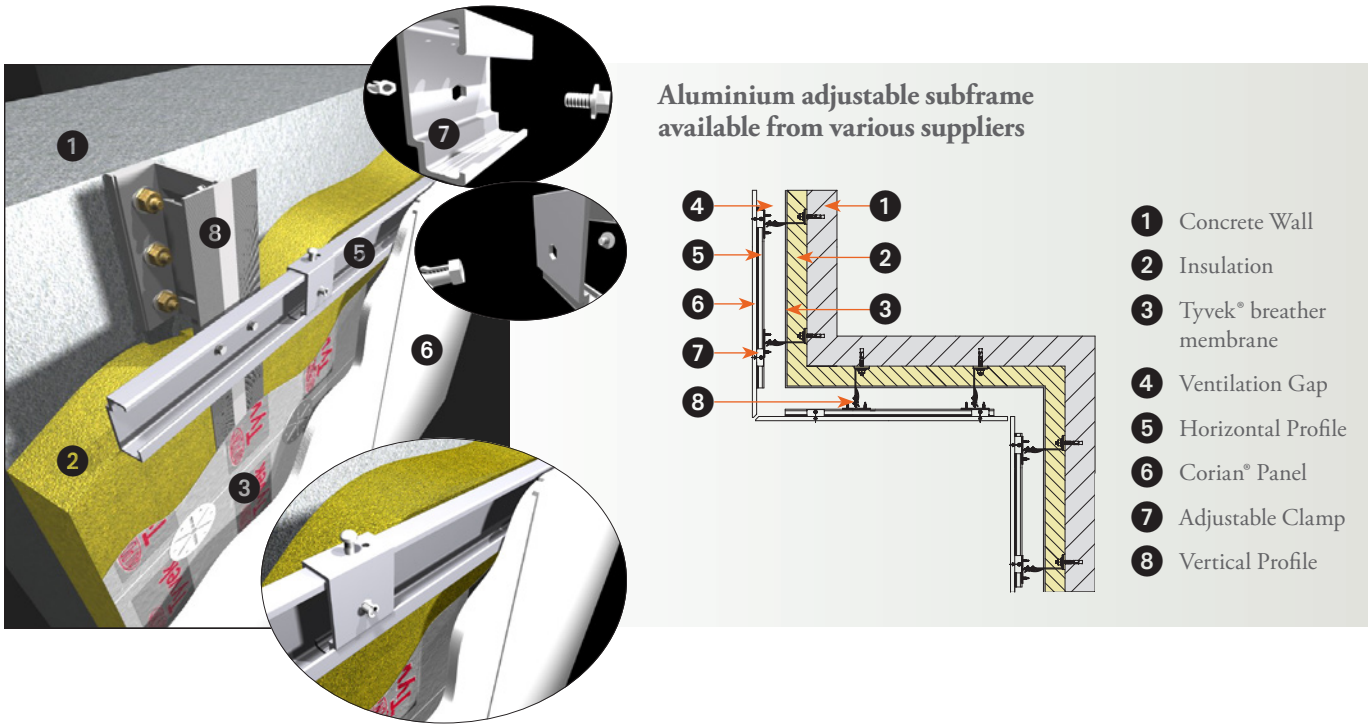
When engineering the substructure, the following aspects are important:

- Wind load
- Density and maximum distances between fixing points
- Ventilation requirements
- Freedom of movement of the panel
- Size of the panels
- Thickness of the insulation material
- Anchoring to existing structural wall
- Applicable legal requirements (local building codes)

The substructure (attachment system) usually used to mount Corian® panels is a mechanical attachment system. Based on an aluminium grid system, the substructure has vertical "T" or "L" shaped profiles that are mounted on aluminium brackets that connect to the wall. The substructure supplier must verify that the wall substrate is suitable for the intended substructure and that the substrate and substructure designs follow applicable building codes.

Cladding panels are hung on horizontal "C" shaped profiles by the brackets (or clamps) with reverse "C" shape that are attached to the panel with a specific connection method (See Section F for details).

Figure E 1 - Substructure for DuPont™ Corian® exterior cladding panels



F. INVISIBLE FIXING SYSTEMS

Invisible fixing systems hide the connecting hardware on the back of the Corian® cladding panel. These systems hold the panels securely, supporting the weight of the panel and providing stiffness to minimize wind deflection, while allowing them to move to accommodate thermal expansion and contraction.

It is important to institute a quality assurance program to insure that the attachment method selected is properly installed.

F.1. MECHANICAL

Mechanical fixing systems rely on an insert that rigidly attaches a metal clamp. The clamp and the underlying substructure are designed to allow the clamps to move relative to the substructure to accommodate thermal expansion and contraction.

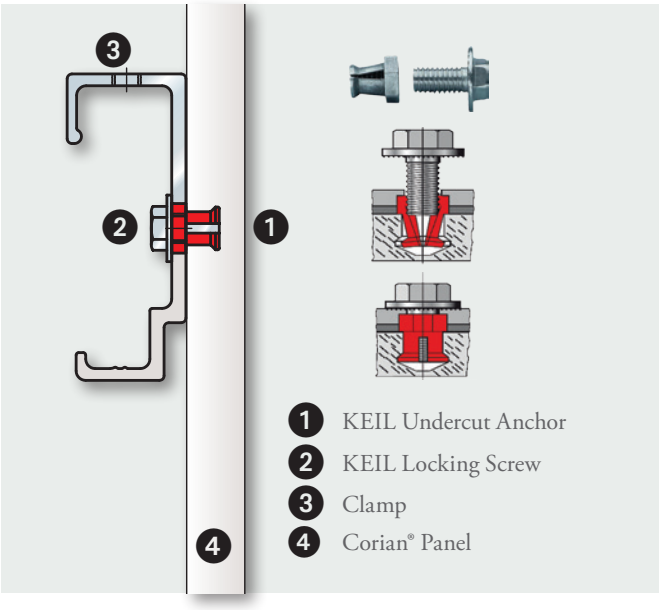
F.1.1 Undercut anchor

An undercut anchor is a mechanical attachment in which an insert is expanded within an undercut hole. An example of an undercut anchor is the KEIL system. The KEIL system uses a conical mechanical insert. When a bolt is installed in the insert it will expand, locking itself into the undercut of the hole. This mechanically fastens a clamp to the panel.

To properly install the fastener, it is very important that all details are precisely calculated for the project, taking into account the length of the insert, the length of the bolt, the thickness of the clamp and the depth of the undercut hole.

Contact DuPont for further information on the correct KEIL fasteners, tools, and technique required for a proper installation.

Figure F 1 - Invisible undercut insert (KEIL)



F.1.2 Squirrel® Fixing System

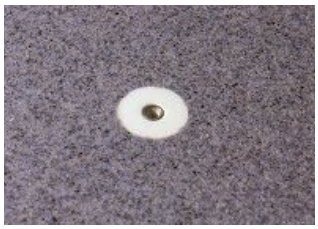
The Squirrel® fixing system is a mechanical connection. A stainless steel insert is secured in the back of the Corian® panel by adhering a machined piece of Corian® solid surface into the panel with DuPont™ Joint Adhesive. After sanding, a clamp can be connected to the panel by screwing into the insert. This connection method is more labour intensive, but may be a good alternative for smaller projects.

Figure F 2
Hole is drilled

DuPont™ Joint Adhesive applied

Squirrel® fixing system inserted

Result after sanding

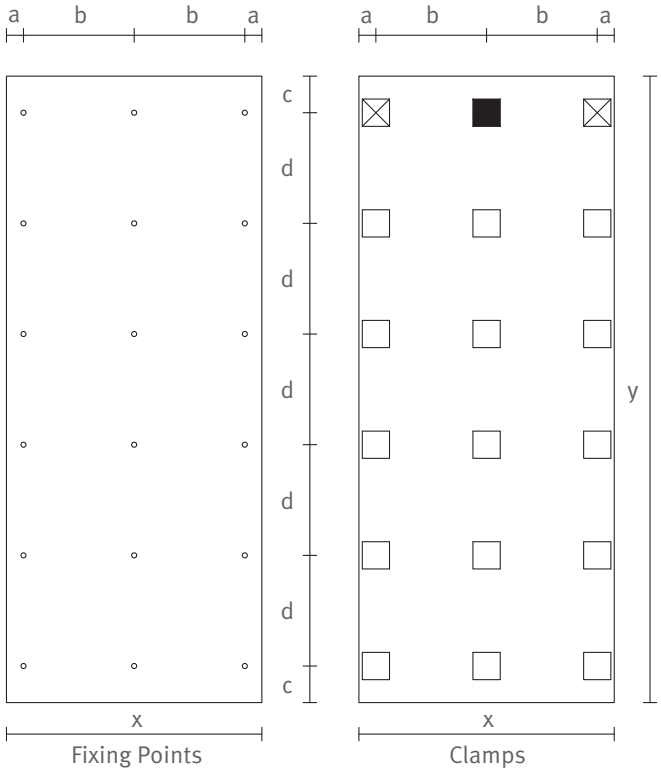


F.1.3 Clamp Fixing Distance

The number of clamps and their spacing is important to both provide sufficient support for the Corian® external cladding and to minimize wind deflections. Clamps should be placed no closer than 50 mm and no farther than 150 mm from any edge of the panel. The recommended maximum spacing between clamps is 650 mm both horizontally and vertically. These recommendations are based on tests, performed at CSTB (Centre Scientifique et Technique du Bâtiment - France) for a wind load up to 1140 Pa. If the anticipated wind load will exceed this value a tighter spacing of clamps will be required.

Figure F 3 - Fixing distance of the clamps

Single panels



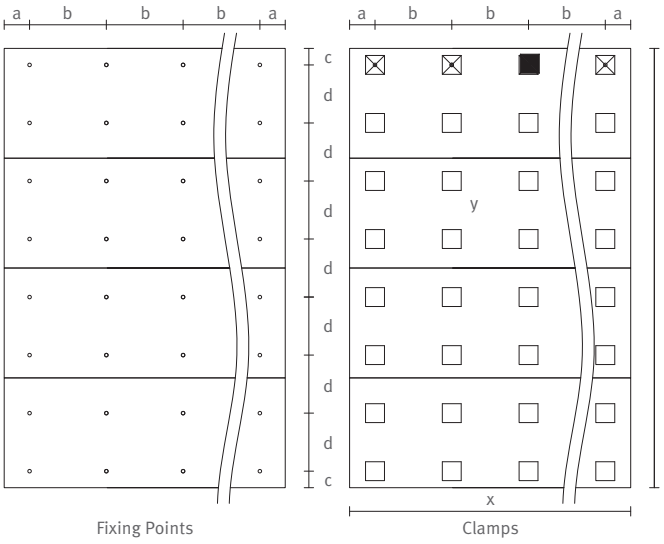
☒ Adjustable clamp
■ Fixed clamp
☐ Standard clamp
a = 150 max / 50 min
b = 650 max
c = 150 max / 50 min
d = 650 max
x = panel width, 1300 max
y = panel length 3658 max

DuPont™ Corian® solid surface can be inconspicuously seamed to form larger panels. The guidelines for clamp positioning and spacing remain the same. The clamp design and substructure must accommodate the greater mass of the panel as well as the larger movement due to thermal expansion and contraction. Estimates of thermal movement should not only consider seasonal temperature changes but also the colour of the cladding and the location on the building. A dark colour on a south facing exposure will reach higher temperatures than a light colour on a northern exposure.

Often the two outer clamps on the top rail are adjustable while the others are standard. Rows other than the top rail use standard clamps. One standard or adjustable clamp is converted to a fixed clamp by drilling a hole through the clamp and rail and fixing the clamp in place with a bolt.

Top clamps should be fixed with 2 inserts (fixing points), as they carry the weight of the full panel. All other clamps can be fixed with 1 insert.

Figure F 4 - Glued panels with hard seams and reinforcements in the back

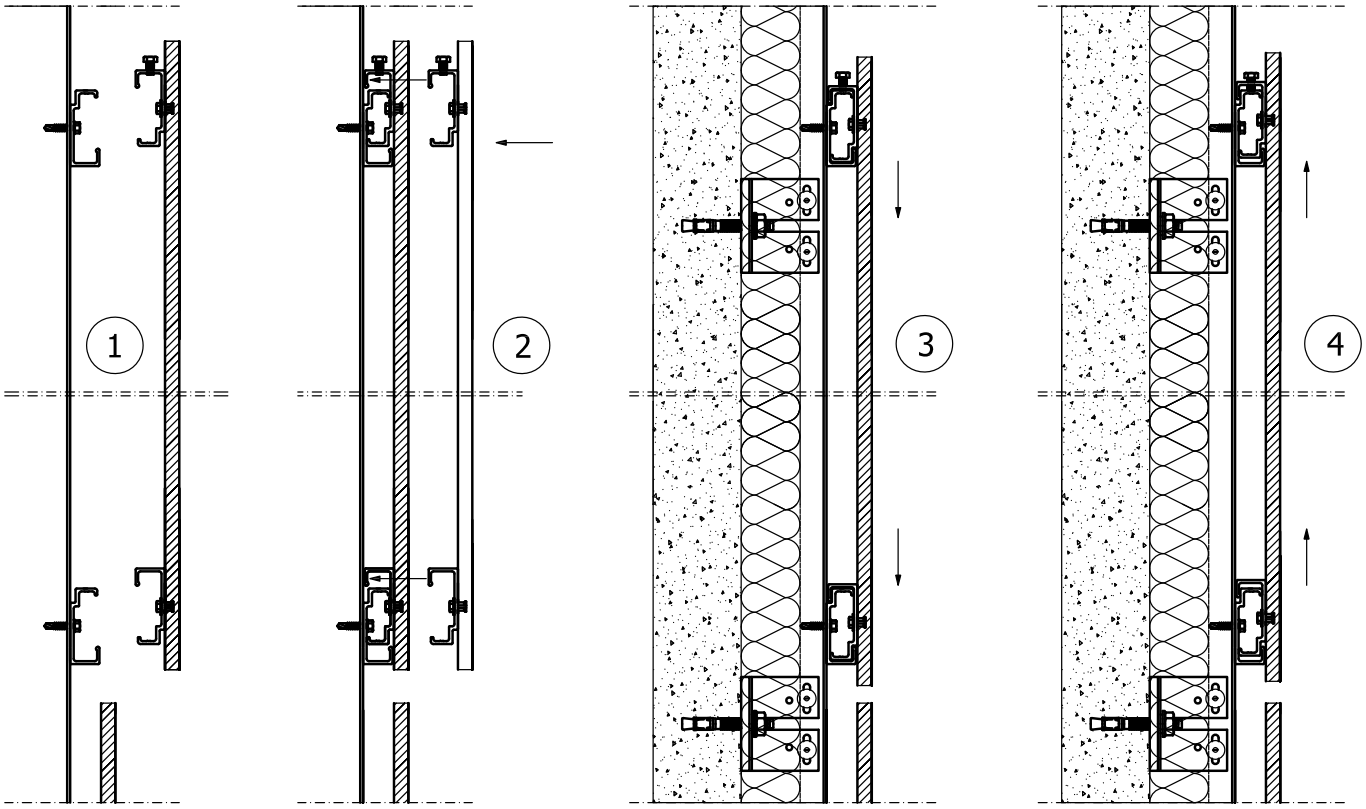


☒ Adjustable clamp
■ Fixed clamp
☐ Standard clamp
a = 150 max / 50 min
b = 650 max
c = 150 max / 50 min
d = 650 max
x = panel width
y = panel length, limited by substructure construction

Panels may be hung with the larger dimension oriented either horizontally or vertically. Horizontally hung panels may be easier to align, but ultimately it is the architects' decision.

It is important to work with the supplier of the support substructure as the panel design, substructure design and building construction must all be considered when making design decisions.

Figure F 5 - Installation of a panel



1. The panel is positioned in front of the aluminium structure.
2. The panel is pushed against the structure.
3. The panel is pushed down, connecting the panel to the structure by the clamps.
4. The panel is aligned with other panels and lifted by the screws of adjustable clamps on the top, allowing the vertical expansion of the panel. Finally, one of the clamps is fixed by a screw, to prevent the panel from moving along the horizontal rails.

F.2. FLEXIBLE ADHESIVES (CHECK LOCAL BUILDING CODE FOR SUITABILITY)

An alternative method of mounting DuPont™ Corian® exterior cladding panels is the use of a flexible adhesive to fasten the panel to the substructure. Due to variation in local regulations and building practices this method may not be universally acceptable. Please check local guidelines to determine acceptability. The adhesive selected must be able to bear the weight of the panel as well as accommodate movement between the panel and substructure due to differential thermal expansion. It is recommended to work closely with adhesive suppliers to ensure the adhesive is suitable for the project.

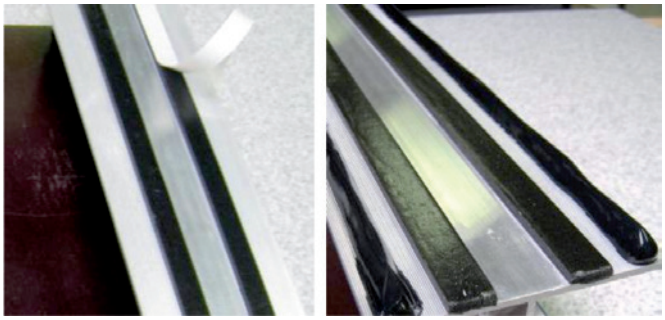
In a flexible adhesive mounting system, the panels are directly adhered to vertical rails. These rails should not be more than 600 mm apart.

Adhesive systems generally combine the use of a flexible adhesive with double sided tape. The double sided tape serves to:

- Hold the panel in place until the adhesive is fully cured
- Prevent flexible adhesive from flowing into the joint between the two panels.

The adhesive is applied in a triangular bead next to the tape and should be positioned away from the gap between the two Corian® panels.

Figure F 6



The panel is pushed against the adhesive, but not yet in contact with the tape. At this point the panel is already kept more or less in place (tack phase) but can still be moved around and aligned.

Once the panel is aligned, it's pushed down against the double sided tape.

Figure F 7

The panel sizes that can be attached with adhesive are limited because of the weight of the panels and the maximum elongation of the adhesive. In general this means that panel lengths are limited to approximately 2.5 m by the sheet width (maximum 1.5 m)

G. EXPANSION JOINTS & PANEL CONNECTIONS

DuPont™ Corian® solid surface, as any other material, will expand or contract with temperature changes. Therefore, expansion gaps and the fixings method should be designed in a way that the material can move freely. The thermal expansion coefficient of Corian® solid surface is 39 x 10^{-6} / °C. As rule of thumb, a variation in length and width of 3 mm/m (based on a temperature variation highest - lowest of 80°C) should be considered into the design. The expansion or contraction should be estimated using the installation temperature and the estimated minimum and maximum temperatures by calculating the difference between the installation temperature and the minimum/maximum temperatures.

The required expansion gaps can be carried out in different ways as shown below. The Open Joint method requires a minimal amount of fabrication, but will have joints that reveal the underlying structure. A typical overlap rebate with each panel rebated to ½ the thickness will leave gaps at the corners. Using a combination of overlaps and sliding strips requires additional fabrication, but the underlying structure is not visible at joints. To have all joints at the same depth, the overlap when using the strip method should be rebated with the rear portion at ⅔ thickness and the front portion at 1/3 thickness.

All routed parts shown below should have rebated inside minimum radius of 1,5 mm to avoid creating stress risers. It is also recommended to round all edges of outside corners to the same 1,5 mm radius. The rounded edges will be safer to handle and more damage resistant.

Figure G 1 - Open Joint

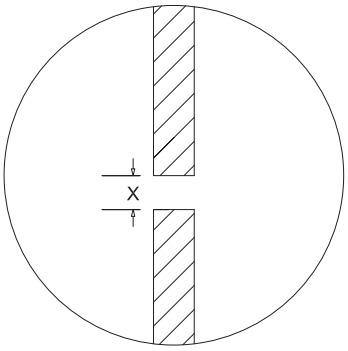


Figure G 2 - Overlap Joint (½ - ½)

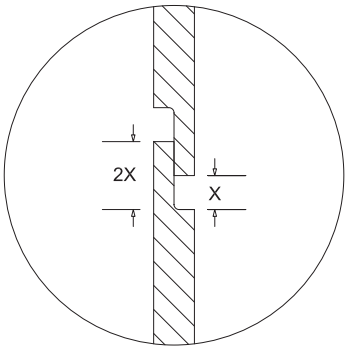


Figure G 3 - Sliding strip

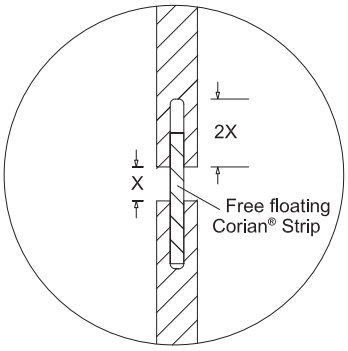
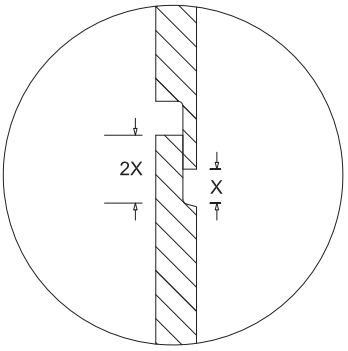


Figure G 4 - Overlap Joint (⅔ - ⅓)



Please note that an overlap system with half of the thickness of the sheet will always show small openings in the corners.

However if the overlap system is combined with the strip system, the number of openings in the façade can be reduced or eliminated for one story structures. In this case the horizontal overlap is done with 1/3 of the thickness of the sheet, so that the horizontal seam-depth is the same as the vertical seam-depth of the strip system.

The sliding strip is positioned vertically in the grooved panels. This strip may be longer than individual panels up to the length of Corian® sheets. The strip is either attached to one panel with silicone in the groove or pinned in place in one location. This allows a gap free façade up to one story high. In between each strip there must be a gap to allow for expansion. By raising the gap above ground level it becomes less visible.

Figure G 5 - Typical Overlap

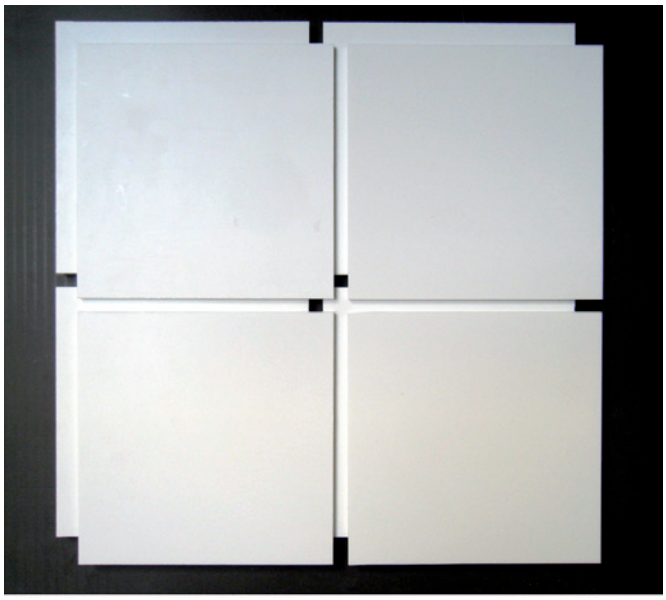
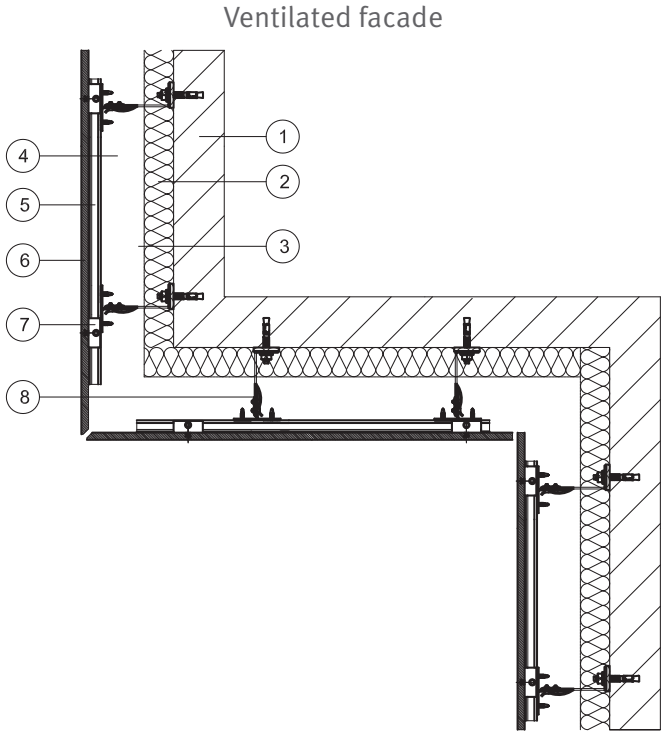


Figure G 6 - Overlap with Strip

H. DRAWINGS OF SEAMS, CORNERS AND WINDOW SOLUTIONS

Figure H 1 illustrates the general principles of a DuPont™ Corian® ventilated façade. The substructure has vertical profiles (8) that are anchored into the load bearing wall (1). This wall is generally insulated (2) and protected with DuPont™ Tyvek® breather membrane (3). The ventilation cavity (4) allows passive air convection that provides natural thermal and moisture management. The horizontal profiles (5) attach to the vertical profiles (8). The Corian® panels are mounted to clamps (7) prior to hanging on the horizontal profiles (5).

Figure H 1 - Horizontal Cross Section Demonstrating Design Principles



1. Load bearing wall
2. Insulation
3. DuPont™ Tyvek® breather membrane
4. Ventilation cavity
5. Horizontal substructure profile
6. DuPont™ Corian® panel
7. Adjustable clamp
8. Vetical substructure profile

Detail of clamps

There are three types of clamps: adjustable, standard, and fixed. Adjustable clamps are used on two or more of the fixture points along the top of the panel. These allow vertical alignment of the panel while allowing horizontal movement. One clamp in the top row is a fixed clamp (created by drilling a hole in the clamp and rail and inserting a bolt). This clamp restricts horizontal movement and is fixed after the panel is in place. It is important that only one fixed clamp is used per panel to allow thermal expansion/contraction. Standard clamps are used on the rest of the panel. These allow horizontal and vertical movement, while restricting any movement out of plane.

Figure H 2

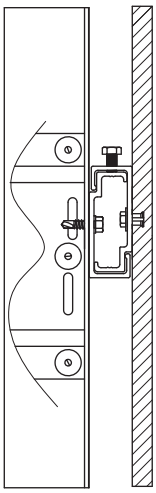


Figure H 3

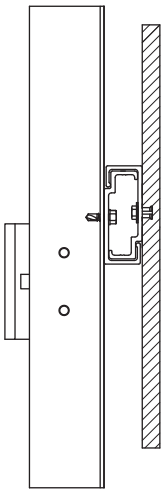


Figure H 4

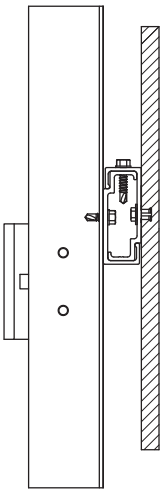


Figure H 2: Adjustable clamp on rail
Figure H 3: Standard clamp on rail
Figure H 4: Fixed clamp on rail

The following drawings illustrate a number of design details. It is important that the gaps (x) are properly sized to allow for thermal expansion of the panels. All measurements in the drawings are in millimetres.

Figure H 5 - Cross section (vertical) of open seam

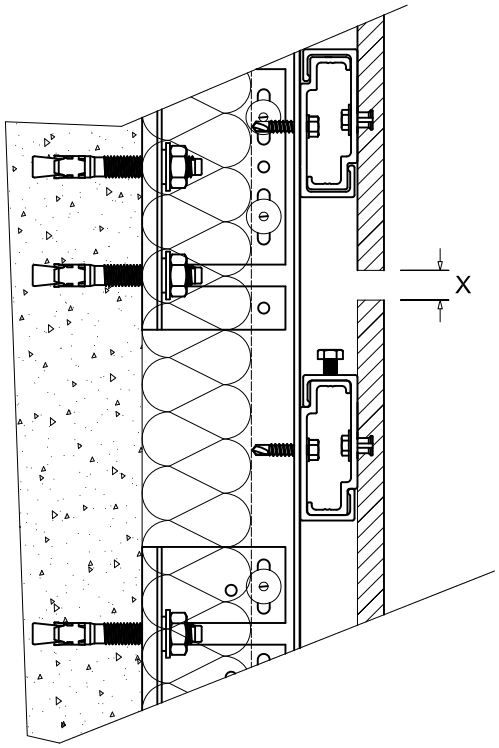
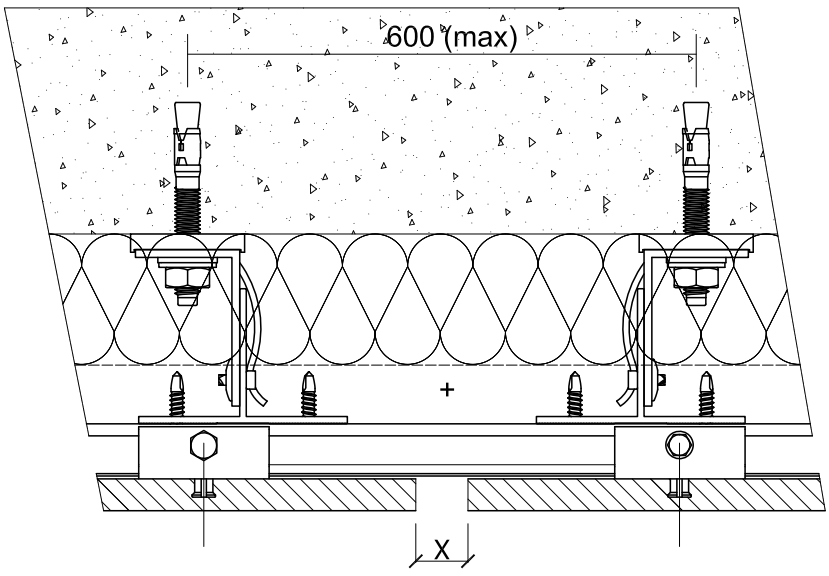
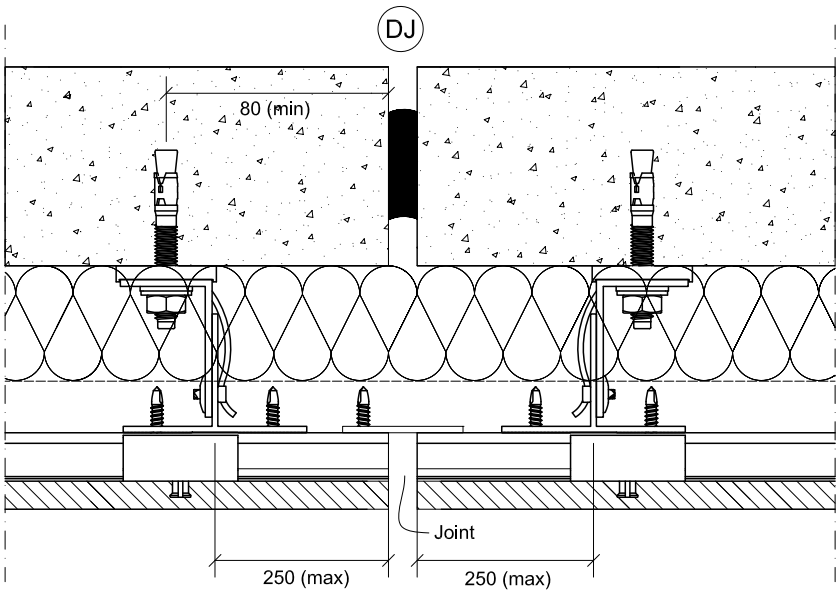


Figure H 6 - Cross section (horizontal) of open seam



Measurements indicated in Figure H 6 include the maximum separation for anchors for the substructure (value dependent on substructure design) and the expansion gap between panels.

Figure H 7 - section (horizontal) of open seam with concrete expansion joint



Measurements indicated in Figure H 7 include the maximum distance of an anchors for the substructure (value dependent on substructure design) from a break in the wall substrate and the maximum separation for the vertical profile from the end of a horizontal rail in the substructure (value dependent on substructure design).

Figure H 8 - Internal Corner

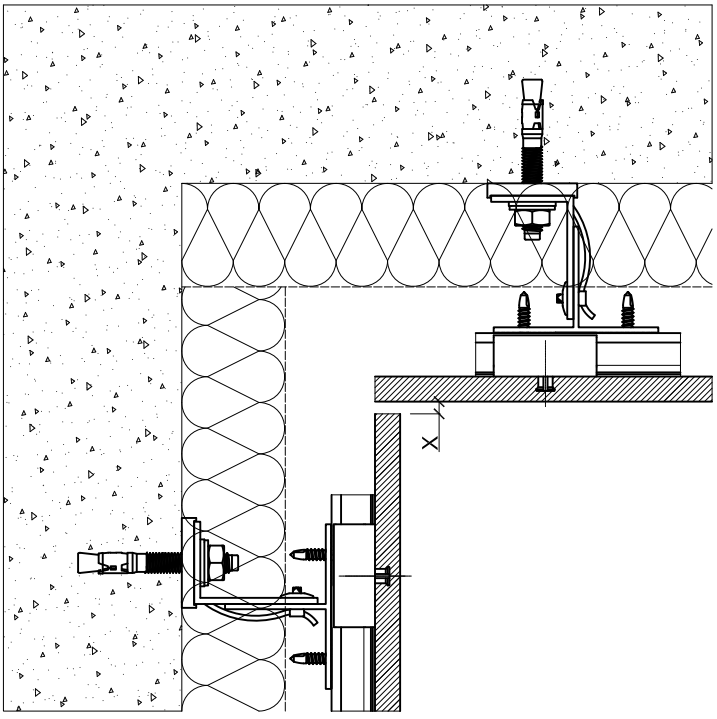
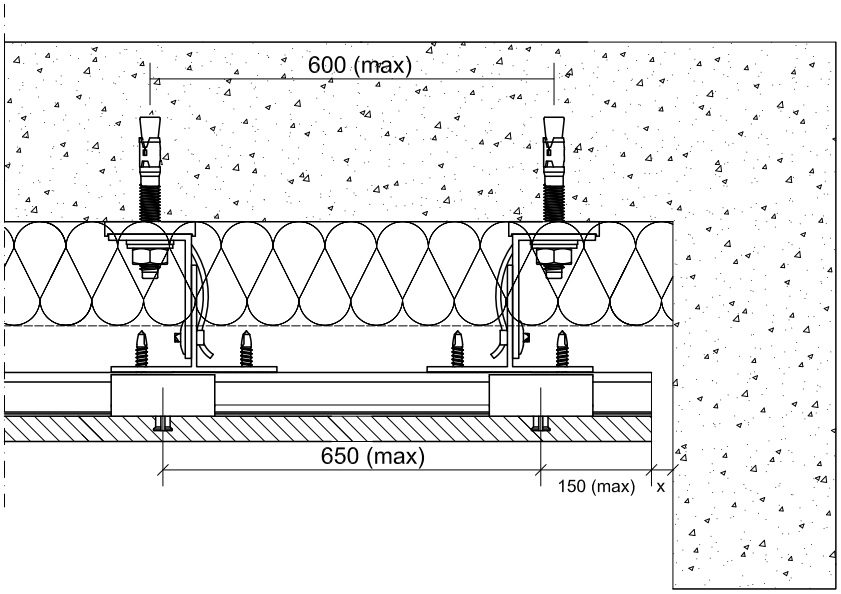
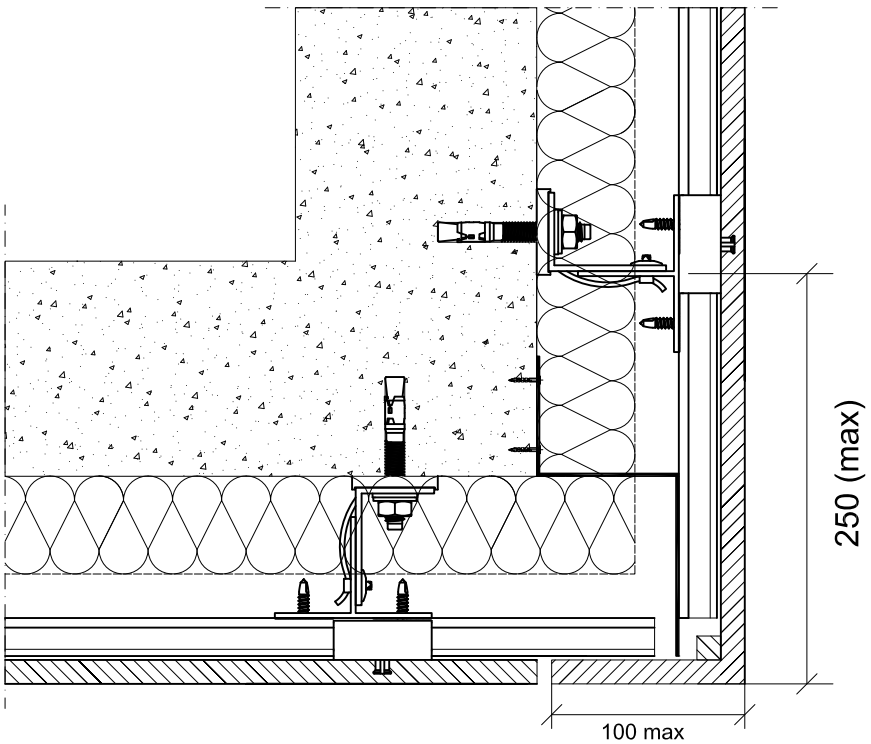


Figure H 9 - Internal corner end



Measurements indicated in Figure H 9 include the maximum separation for anchors for the substructure (value dependent on substructure design), the maximum separation for mechanical anchors for the Corian® panel (value dependent on wind load), maximum distance of a mechanical anchor from the edge of the panel, and the required expansion gap at the corner (value dependent on panel size and temperature range).

Figure H 10 - Outside corner



SOLUTIONS FOR CORNERS

The ability to inconspicuously seam Corian® solid surface creates a number of options for corners. A few of the possibilities are shown below.

Figure H 11 - Open 45° corner

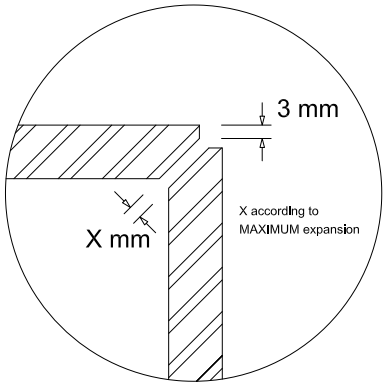


Figure H 12 - Open butt corner

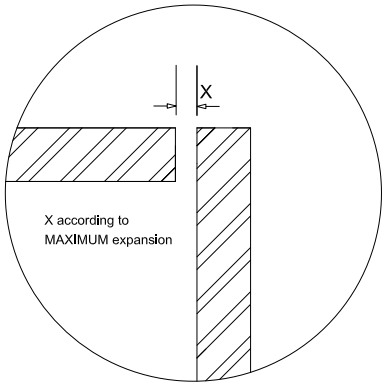


Figure H 13 - Angled (glued) corner

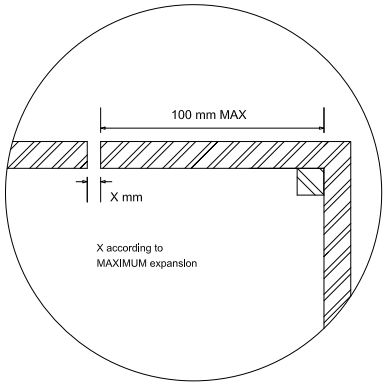


Figure H 14 - Angled (glued) corner with overlap

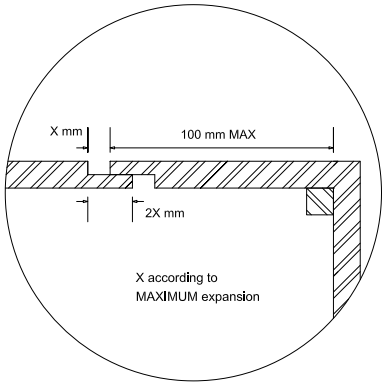


Figure H 15- Thermoformed corner

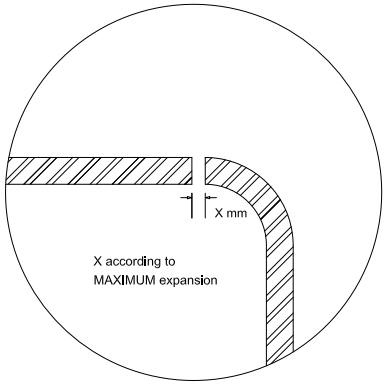
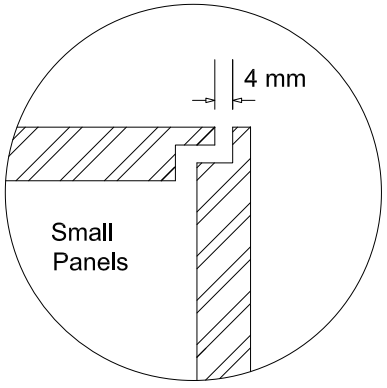


Figure H 16 - Rebate corner for small panels



As the name suggests, ventilation is an important aspect of a ventilated façade. There must be sufficient clearance behind the panels, as well as at the top and bottom to allow air flow.

Figure H 17 - Cross section (vertical) of the bottom panel

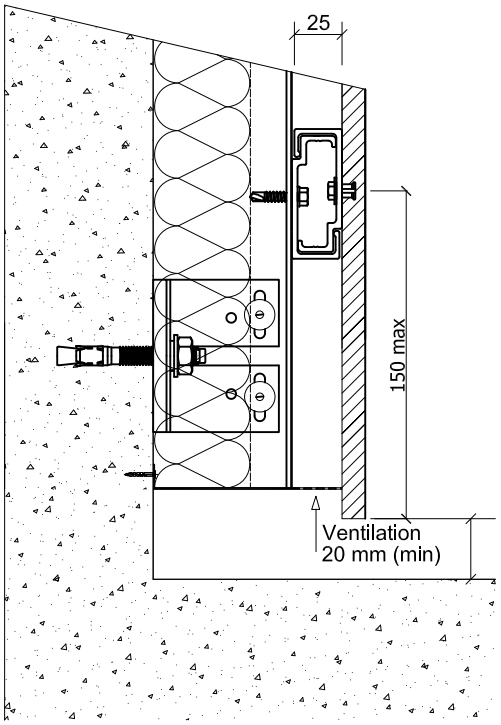


Figure H 18 - Cross section (vertical) cornice work

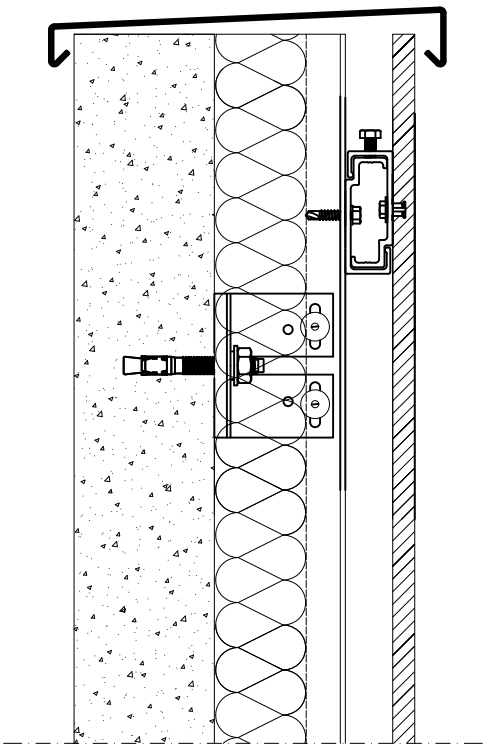
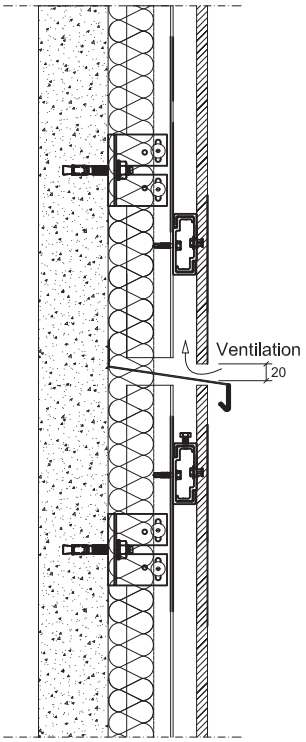


Figure H 19 - Joint at fragmentation substructure



SOLUTIONS FOR WINDOWS (OR DOORS)

Figure H 20 - Bottom of window

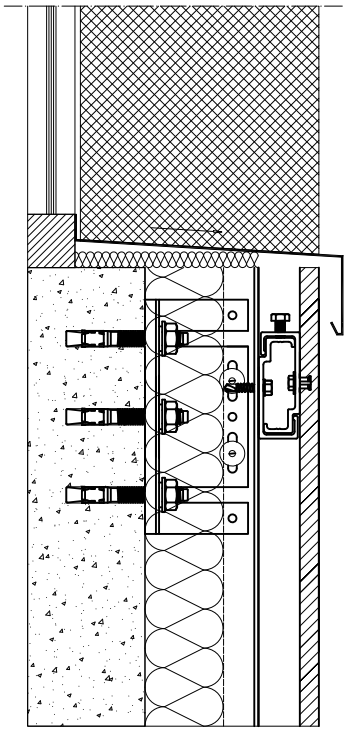


Figure H 21 - Bottom of window with Corian® cladding

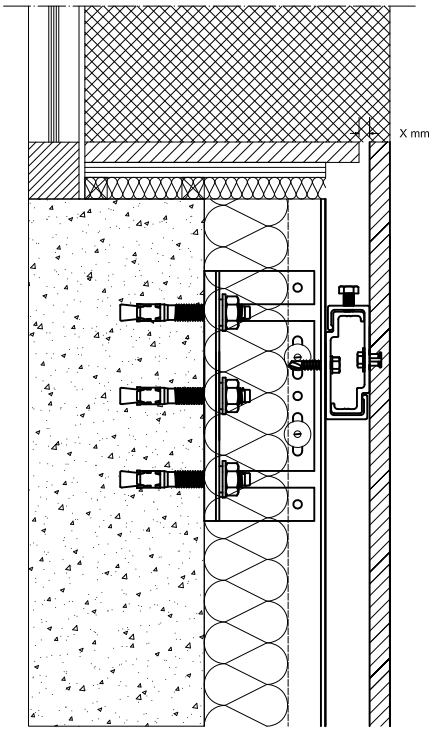
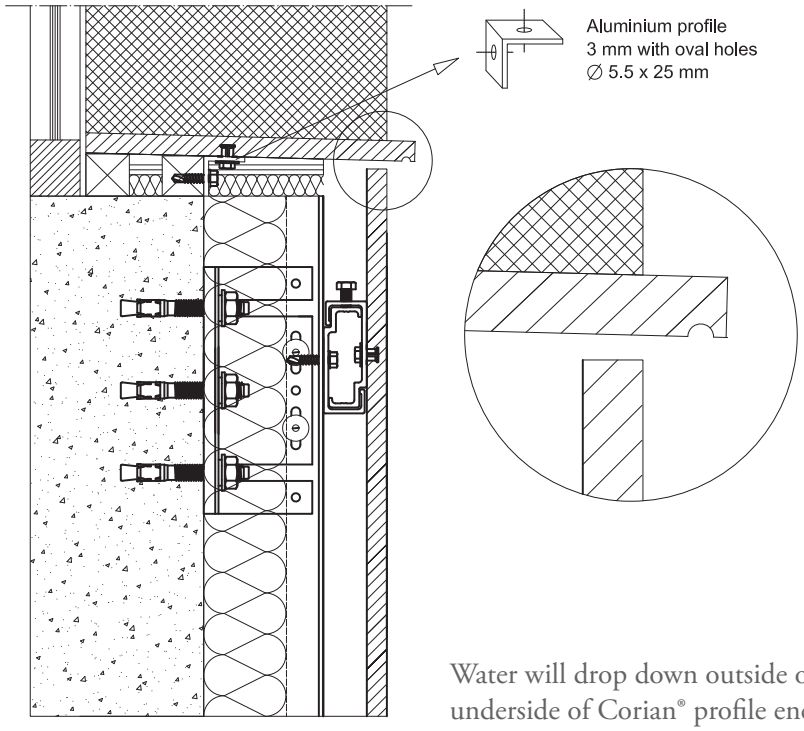


Figure H 22 - Bottom of window with Corian® cladding



Water will drop down outside of the cladding. Rebate on underside of Corian® profile encourages droplet formation.

Figure H 23 - Top of window

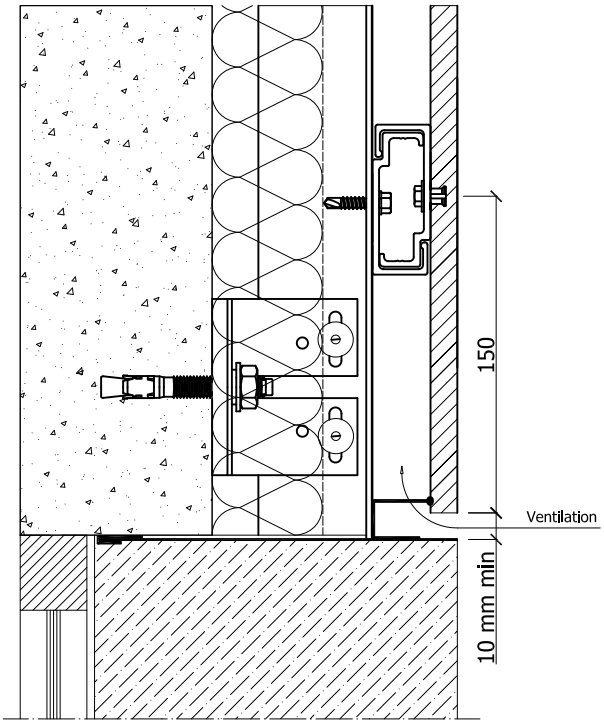


Figure H 24 - Top of window with Corian® cladding

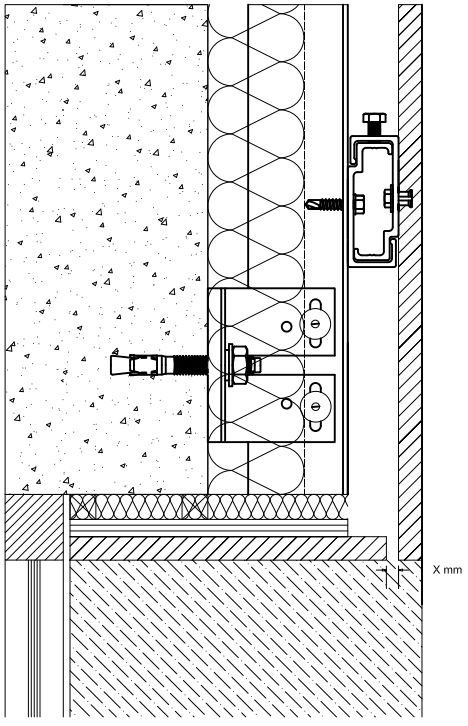


Figure H 25 - Side of window

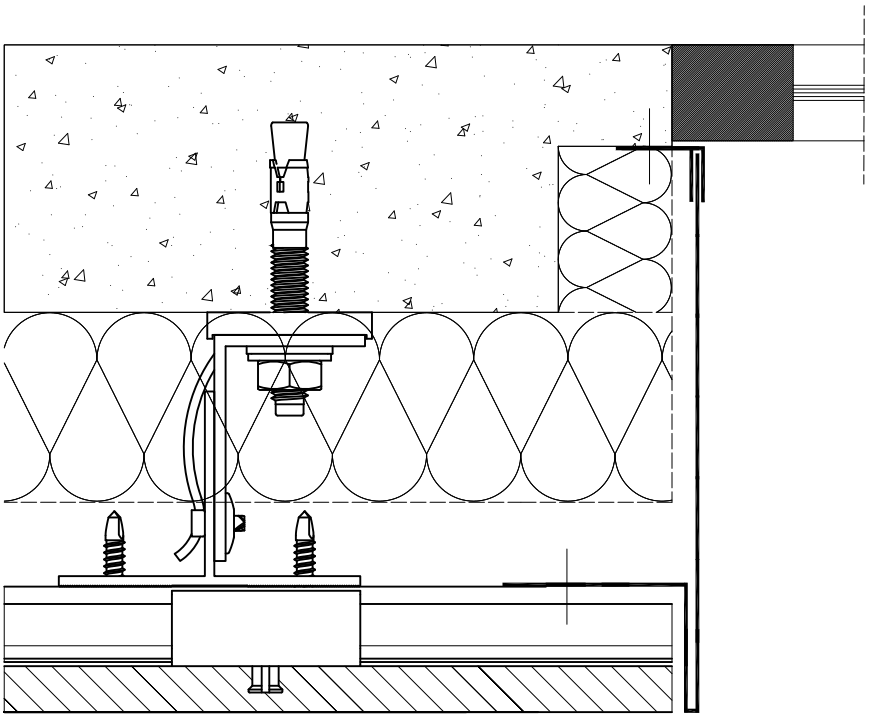
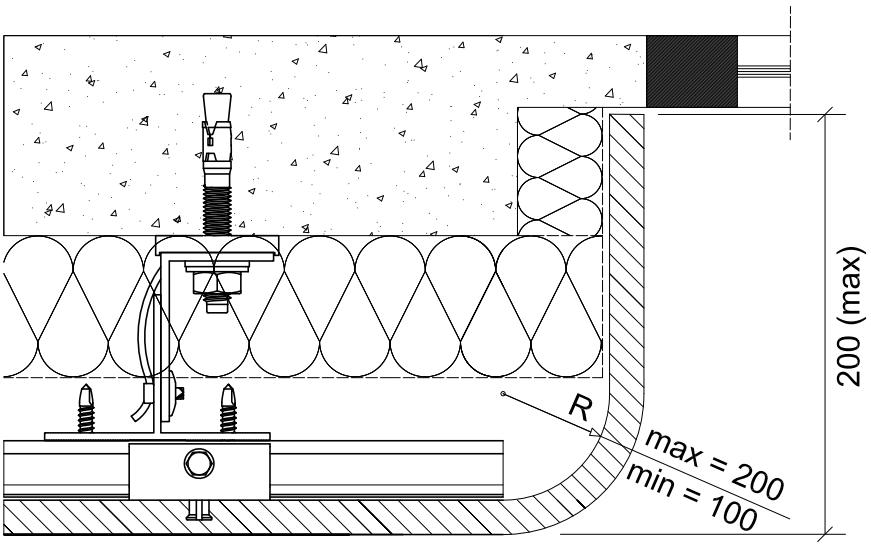


Figure H 26 - Thermoformed side of window



I. HANDLING AND PREPARATION OF CORIAN® SOLID SURFACE SHEETS

The list below highlights mandatory procedures.

TRANSACTIONAL

For sales and payment conditions, sheet tolerances or quality specaifications, please refer to our current price list.

INSPECTION - PRODUCT QUALITY CONTROL

Sheets received by the authorised fabricator should be visually inspected for material defects before proceeding.

Do not fabricate Corian® material that does not meet the basic product quality standards.

TRACEABILITY

It is the responsibility of the fabricator to have a traceability system in place to record batch numbers and sequence numbers of the sheets.

INSURANCE

The authorised fabricator must be insured against any risk of damage to the panels (including machining defects), by providing (or subscribing to) a suitable insurance policy, covering the civil liability of entrusted goods.

SAFETY MEASURES

It is the responsibility of the fabricator to ensure all employees follow the Health and Safety guidelines as set out in the fabrication and installation manual or by local Health and Safety regulations.

CUTTING CORIAN® SOLID SURFACE

The hardness of Corian® products requires machine tools in tungsten carbide. The use of high speed steel is not recommended. Diamond tools are also possible to use, they will last longer but won't give a better result. Always use sharp router cutters and saw blades.

Select router bits with the following characteristics:

- Tungsten carbide tipped bits (polycrystalline tipped bits may be suitable when using CNC machinery)
- Single, double or triple flute with a diameter of 6 to 12 mm
- Spiral router bits give a better finish
- Always use router bits with rounded points to avoid creating sharp inside edges.

Select saw blades with the following characteristics:

- Triple chip blades of tungsten carbide used only for cutting DuPont™ Corian® solid surface
- Negative hook (between -5° and -7°)
- Heavy stock (minimum 3,5 mm)
- 96 teeth for 300 mm diameter

Use the appropriate speed (between 3500 rpm and 4500 rpm) and a feed rate of about 3 m/min. All cut edges must be sanded for safety reasons.

Only make rebates with a sharp router cutter. Ensure that inside angles of rebates are rounded to a minimum 1,5 mm radius, to minimize stress risers and chipping danger.

Inside corners of cut-outs should be rounded with a 5 mm radius minimum.

SEAMS

All Corian® seams must be reinforced with a strip of Corian® sheet of the same thickness as the panel.
The reinforcing strip should be 50 mm wide and run over the full length of the Corian® seam. Only use approved DuPont™ Joint Adhesive to make seams.

Seaming corner pieces: please ensure that you only use this type of feature when the substructure and fixing method allow the free movement of the corner piece along both wall faces and in all directions. Reinforce the full length of the corner seam with a strip 12 x 12 mm for durability and mechanical stability.

SURFACE FINISH

The finish may vary according to the customer's requirement. However, to achieve a finish which is easy to maintain, a matte or semi-gloss finish is recommended.

Standard grade sheets have no directionality and can therefore be applied in different directions, which makes optimisation very easy. The sheets should be used straight from the pallet, without additional sanding or finishing.

Custom grade sheets (wide sheets) are sanded in the length direction, which causes directionality in the sheets. This means that those sheets might reflect light differently, if they are not cut in the same direction, causing a possible colour difference perception. When sheets are turned 180°, there's no difference noticeable. The sheets should be used straight from the pallet, without additional sanding or finishing.

FABRICATION

For special applications or Corian® solid surface fabrication techniques that are not covered in this document, please refer to the *DuPont™ Corian® Fabrication Manual* and additional Technical Bulletins for more details or ask your DuPont™ Corian® solid surface representative.

J. TRANSPORTATION, STORAGE, HANDLING & LIFTING, MAINTENANCE

TRANSPORTATION

- Avoid bending of the panels.
- Avoid putting tension on seams.
- Protect panels from impacts that could damage the surface or edges.
- For transportation, use solid flat pallets the same size as the sheets or larger.
- Always put sheets in vertical movement on the pallet, to avoid scratching the other sheets. Do not slide one sheet over another.
- Use protective layers between the sheets and on top of the sheets.
- Make sure the sheets are strapped firmly to avoid sliding during transportation.

STORAGE

- Always store the sheets in an enclosed area, at a normal ambient temperature and humidity.
- Panels need to be sufficiently supported to be flat. Improper support may cause warping of the panels.

HANDLING & LIFTING

- The equipment used for lifting and handling panels in the workshop should be designed in a way that it leaves no marks or stains on the surface of the panels. If panels are to be installed without sanding the surface, always try to avoid scratching, rubbing, staining or damaging the surface.
- Local rubbing or sanding might create spots with a different surface finish that will show up once the panel is installed. Sanding or cutting dust on the surface of the sheet should be cleaned with a clean, antistatic cloth or with water and a cleaning agent.
- The equipment used for lifting and installing the panels on site has to be designed in a way that avoids bending of the panels and does not put tension on seams.
- Always lift panels straight upwards from the pallet, to avoid scratching the other panels.
- Avoid putting pressure on rebated parts.
- Cut-outs (i.e. windows) in the panels are best made when the panels are installed.
- Remember that all internal corners have to be rounded: the recommended method to make cut-outs is using a router and router bit with minimum radius of 5mm.

Note: Light stains can easily be removed with a microfiber pad and just plain water.

MAINTENANCE

Although Corian® solid surface has an excellent resistance to chemicals and environmental pollutants, an annual cleaning with standard agents such as water and detergents might be considered.

K. DUPONT™ CORIAN® SOLID SURFACE PRODUCT WARRANTY FOR EXTERIOR (WALL) CLADDING APPLICATIONS (EMEA REGION ONLY)

DuPont de Nemours International Sàrl, CH-1218 Le Grand Saconnex, Switzerland (hereafter called 'DuPont') warrants hereby the following:

GENERAL TERMS AND CONDITIONS OF THE PRODUCT WARRANTY

DuPont warrants to an EC converter of the Corian® panels, supplied in connection with exterior wall cladding projects, that the product will be free from manufacturing defects, the colour will not fade or change by more than $5\Delta E^*_{ab}$ units, and the colour will not leach during the first 10 years after initial installation. In addition, DuPont warrants that the Corian® EC colour offering will remain free from: peeling, swelling and delaminating during the first 20 years from the date the application is completed and when the product has been stored, handled, applied and maintained in accordance with DuPont technical instructions and all applicable building codes. The warranty herein does not cover DuPont™ Joint Adhesive, it covers only Corian® sheets products.

This warranty is subject to terms and conditions, which will be delivered to the customer by the local DuPont office or representative.

DuPont™ Corian® panels should always be handled by authorized certified EC converters.

An "Authorized EC converter" certificate will be provided by DuPont technical staff in the following cases:

1. The customer has a QN-certification and:

Follows an additional training on the installation of the hanging system to the Corian® sheets (use and specifications of possible fixing systems such as KEIL or others).

2. The customer is not QN-certified and:

Follows a specific "EC-converter training".

The main topics of this training are intended to increase the knowledge on the use of Corian® solid surface in Exterior Cladding applications:

- Handling,
- Trimming
- Drilling
- Basic finishing
- Maintenance
- Traceability
- The use and specifications of possible fixing systems such as KEIL or others.

An additional workshop audit is required to evaluate if the required equipment is available.

L. REFERENCED DOCUMENTS

DuPont™ Corian® Illumination Series Fabrication

DuPont™ Corian® Fabrication Manual

ASTM G7, Standard Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials

ASTM G155, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

ASTM D2244, Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

DuPont™ Corian® Technical Bulletin -KEIL - general installation instructions

M. DISCLAIMER

The information contained in this Technical Bulletin is provided free of charge. It is based on technical data which DuPont believes to be reliable and is intended for use by persons having knowledge of this technical area at their own discretion and risk. The information provided herein corresponds to our knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The data provided fall within the normal range of product properties and relate only to the specific material designated; these data may not be valid for such material used in combination with any other materials or additives or in any process, unless expressly indicated otherwise. The data provided should not be used to establish specification limits or used alone as the basis of design; they are not intended to substitute for any testing you may need to conduct to determine for yourself the suitability of a specific material for your particular purposes. Since DuPont cannot anticipate all variations in actual end-use conditions DuPont makes no warranties and assumes no liability in connection with any use of this information or results obtained or damages incurred from the use of this Product Bulletin either in whole or in part by a buyer of Corian® solid surface. The construction guidelines in this document were developed specifically for use with the DuPont Building Innovation products and non-DuPont products recommended for use by DuPont that are referenced in this document. End-Users should not expect to get equivalent performance results when using products other than those products specified in this document. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent rights.

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