



NEW & REPLACEMENT HANGAR DOORS

Bespoke doors to complete, enhance or extend your hangar



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JOHN REID & SONS (STRUCSTEEL) LTD trading as REIDsteel, REIDglazing & REIDmarine • Company Registration No: 617773

REIDsteel

JOHN REID & SONS (STRUCSTEEL) LTD



Hangar Door Specialists . . .

Bespoke designs by REIDsteel

REIDsteel is a trading name of John Reid & Sons (Strucsteel) Ltd - Company Registration No: 617773.

We have pioneered the design and installation of aircraft hangar doors since we built the first hangar for Louis Bleriot back in the 1920s.

Since then, our innovative techniques and research have enabled our design & manufacturing capability to produce the safest and most economical doors available today.

Furthermore, our expertise in hangar extensions can transform your existing hangar and create taller sections for higher tails and wider openings to accommodate larger wingspans, without the need for a new build.

We tailor our designs to your architectural needs, so whatever the size, finish, location or features of your hangar doors, REIDsteel can offer a design, manufacture and installation service that meets all your requirements.

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This brochure includes information to help you consider your door choices. As every hangar door project is unique, please contact one of our sales engineers who can discuss your project in detail.

Tel +44 (0) 1202 483333

Email: sales@reidsteel.co.uk

www.hangardoors.com





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size, configuration and finish to suit • insulated/ventilated for any climate • designed to International design codes



Shared 26m high door leaves for a 90m clear opening - bottom rolling, multi-leaf doors opening within the hangar

This maintenance complex in Malta is 280 metres wide in three clear spans of 91.5 metres. A number of the electrically operated leaves feature our thresholdless personnel doors, glazing and louvres.

The two taller hangars are designed for wide body aircraft and have 26m high doors. They share a three track system with twelve door leaves which allow either hangar to achieve a 90m clear opening.



A third 90m clear span hangar was designed for narrow body aircraft and was fitted with 6 leaves on 3 tracks giving a clear entrance of 60m wide, left, right or centre, by 15m clear height.

This third hangar has recently been upgraded with an extension and new door to also allow maintenance on wide body aircraft (see page 15).





REIDsteel cascade doors

- the perfect answer when all the doors have to move at once towards out-riggers or door housings.



The Royal Malaysian Air Force purchase of their A400M transport aircraft, to supplement their existing C-130 fleet led to the requirement for two new MRO hangars, each 137m wide. These needed new doors of 108m wide by 18m high, opening into a slot between the outer two trusses.

Our client needed these doors to open rapidly with the minimum of manpower. The REIDsteel Cascade Doors provided the best and most affordable solution. We were able to give the contractor, Landasan, instantaneous and affordable prices and an acceptable delivery period.

Design, manufacture and shipment all went ahead as planned. Our supervisor, along with the contractor on the site, performed excellently in carrying out the erection, rigging and cladding of the doors which can open or close fully in approximately 90 seconds.



Every one of the six door slabs of each half-door open simultaneously, moving at speeds which vary exactly in proportion to the distance they have to travel, so that the trailing door moves six times more slowly than the master door and its operator.

One person can control all six door slabs on each 54m side and open them in the same time that it takes to walk the distance. Not only that but, in case of a power cut, one person can open them by hand by spinning the manual drive wheel.



60 metre clear opening

bottom rolling, multi-leaf doors contained within the hangar width



This 90m clear span maintenance hangar for Inflight Limited at Stansted Airport, UK, features six 15m wide by 13.7m high door leaves on three tracks.

The leaves are electrically operated giving a clear opening of 60 metres and are clad in horizontally laid, thermally insulated composite panels complete with preformed corners.

Inflatable fuselage sealing ring

within bottom rolling, multi-leaf doors, opening into outriggers



The nose of an Avro RJ85 aircraft can be inserted into the hangar and be ready for essential maintenance work to be undertaken from inside the hangar by closing the main hangar doors and inflating the seal against the aircraft fuselage.

As the majority of the aircraft body remains outside the hangar, the valuable space inside is free for other aircraft.

The seals create a perfect barrier against the weather, and what weather it is. Summer temperatures in Ulaanbaatar can go as high as +40°C, but during the Winter they can drop to as low as -40°C!

These doors are for a 50m clear span hangar in Ulaanbaatar, Mongolia, and feature six leaves on three tracks. The leaves are 8.4m wide by 14.2m high and open into outriggers on both sides to create an opening the full width of the hangar.

A number of the leaves feature our thresholdless personnel doors (see page 10), but it is the two in the centre that house the most unusual feature. Mounted on these leaves are two smaller top hung doors that, when opened, reveal our inflatable fuselage sealing ring that is bespoke designed for an Avro RJ85 aircraft.



85 metre clear span hangar

bottom rolling, multi-leaf doors, opening into a single outrigger

These electrically operated doors all open to one side, and have to 'jump the gap' where the tailgate entry interrupts the upper door guides and conductor power rails. The tailgate adds an extra 3m height in the centre of the hangar, and the 10m wide by 18m high door leaves feature our windows and personnel doors.





Tailgate door and 80m clear opening

- bottom rolling, multi-leaf doors, opening within the hangar

This hangar features an unusual tailgate door, in that it is placed towards one end, not the more usual central position.

Airport restrictions limited the height of the hangar to 13m and it was essential that any two of the hangar's three spans would be accessible at one time. Furthermore, the area on the left side needed to house a 12.5m high Boeing Business Jet.

Our solution was to use a 4.3m tall by 3m wide tailgate door in conjunction with a nine leaf hangar door (9.2m high) set on three tracks that covered the entire 121m length of the hangar.

Clever engineering allows the leaves to 'jump' the gap created in the top track by the tailgate opening. Although most of the weight of the doors is borne by the bottom track, the top track supplies stability and power to the door motors and warning systems.

The leaves are clad in microrib profile composite panels manufactured by Kingspan, and feature our thresholdless personnel doors complete with glazed ribbon windows. A vehicle access door for the tug/tow tractor and for deliveries is located in the rear elevation of the hangar.



The REIDsteel bottom rolling, multi-leaf hangar door system (Manual or powered)

REIDsteel design, manufacture, ship, erect and clad hangar doors worldwide. We have many years experience in designing and supplying a variety of hangar door types and we believe that bottom rolling, multi-leaf doors are usually the best choice.

Using a steel framed bolted construction, our doors can be configured in various combinations of tracks and leaves (slabs). They can be manual or electrically operated and we ensure that they are quick to install and easy to maintain.

We design our doors to suit your exact needs and to be a perfect match for your aircraft hangar. They can be clad in a range of finishes and colours and can be thermally insulated. We can also add windows, translucent panels, ventilation louvres, vehicle doors and thresholdless personnel doors.

Design

The door leaves have double flanged steel wheels which run on a ground track. This resembles a small railway line and takes the weight of the door leaves which, on large hangars, can each weigh up to 30 tonnes.

The number of tracks required depends on the clear opening width specified for the hangar (see pages 12 & 13).



Bottom rolling doors showing the track and a double flanged ground wheel



'Stacked' door leaves showing the pendant controls brush seals and towing eyes

In our standard REIDsteel electrical design, each door leaf has its own motor, independently driving the ground wheels via a reduction gear box. Electrical power is supplied by an enclosed conductor rail located above the doors and which runs the width of the door opening. Collection of electrical power is from a four wheeled trolley with spring loaded power pick-ups on each door leaf.

Standard operation & safety

Each door leaf has a fail safe opening and closing pendant system which is connected to the door leaf via an extendable coiled cable and

thus ensures that the operator is well clear of the door. Electro-mechanical brakes are applied automatically so, if the operator should let go of the button, the door will immediately stop.

For safety purposes the right-hand pendant should move the door leaf only to the right, and the left-hand pendant only to the left. This ensures that the operator is always walking ahead of the moving door leaf, which creates good all-round vision to see any obstacles or danger easily. The operator can see and be seen, and hear and be heard. Other people within the hangar are alerted that the door is moving



Inside view of the 26m high hangar doors for the Lufthansa Technik Maintenance Hangar, Malta. The same doors viewed from outside shown right.



by warning lights and audible sirens. Sensor mechanisms prevent collision with other door leaves on the same track, and also slow and stop the door leaf when it reaches the end of its track.

In the event of an electrical failure, doors can be declutched and easily pushed or towed because the low friction sealed ball-bearing system in the ground-wheel hubs makes them easy to move.



Manually operated doors can be designed to be pushed, moved with a turning handle or towed. They are strongly recommended where the

electrical supply is unreliable or for humid and saline locations where conductors can corrode. The ease of opening and closing means that powered operation is a luxury rather than a necessity.

Cascade System

Where bottom rolling doors open into outriggers, it is often convenient and economical to use the REIDsteel Cascade System for opening a set of linked doors all together. One 'Master' door leaf is the controller and is connected to the other door leaves in the set so that they all move together, at varying but proportional speeds, from closed to

open and back again. A typical door that opens both to the left and to the right of the centre will have two 'Master' doors and each set could have up to eight door leaves. Our cascade system can be either electric or manually operated.

When you need more than just doors

Choosing REIDsteel to design and build both your aircraft hangar and the door means the same design team working on the whole project, which prevents problems that can occur with interfaces between steelwork, cladding and the hangar doors.

Other types of doors available for incorporating into your new or existing hangar



Left to right: Top hung rolling doors; Insulated section up-and-over door; Thresholdless emergency exit doors; Arrival and departure doors

Top Hung Rolling Doors (Manual or powered)

The weight of these doors is carried on rails suspended from the structure above the door so these doors need to be small, or the structure needs to be very stiff to avoid deflection.

Vertical-Lift Solid Doors (Powered only)

In tall hangars, where a wider opening is needed, a thermally insulated, solid leaf door which lifts vertically up the inside or outside wall may be fitted. These doors will always need to be less than half the height of the hangar.

Roller Shutter Doors / Up-and-Over Doors (Manual or powered)

These small doors are suitable for workshops and stores. They can be manually operated, though most clients prefer electrical operation.

Up-and-overs have a slight advantage over equivalent roller shutters in that they can resist slightly stronger wind loads, and the taller panels can incorporate larger vision panels.

Our top hung, vertical lift, roller shutter and up-an-over doors can all be incorporated into our bottom rolling multi-leaf hangar doors for added flexibility of use.

Thresholdless Emergency Exit Doors

Although we can supply personnel and panic doors of any type, our thresholdless personnel/emergency exit doors are a specialist design that can often be incorporated within our bottom rolling hangar doors. There is no bottom beam to step over, which makes them much safer and they can then be classed as true emergency exit doors by Building Control.

Arrival & Departure Doors (Manual or powered)

We can supply and install a variety of architectural doors such as manual swing doors and automatic bi-parting, telescopic or revolving doors. Above is an example of automatic arrival and departure doors.



Inflatable sealing ring (Powered inflation)

Fitting an inflatable fuselage sealing ring within the hangar doors enables the main bulk of the plane to remain outside, while important maintenance on the aircraft nose can be achieved within the hangar. Once the plane is in position the ring can be quickly inflated to provide a perfect seal against the elements.



Tail-Gate/Rudder doors (Powered only)

We would always advise full height, full width doors, but sometimes site restrictions may limit the height of the hangar.

In this situation a tail-gate door above the height of the main rolling door is a good option. This door can be a roller shutter or an up-and-over door which must be electrically driven.

Our innovative system will permit leaves to 'jump the gap' when it is necessary for door leaves to cross-over. For example where there is only one outrigger to one side or where there is a multiple leaf/track system in a wide hangar.



Vertical lift fabric doors (Powered only)

Vertical lift fabric doors are usually more costly than bottom rolling doors, and must be electrically driven because of the weight to be lifted and the remoteness of the lifting positions.

However, they are essential when the full width opening of the hangar is needed and outriggers are not an option. The doors hang down from the front truss of the hangar, and need great precision in alignment and elevation. Because they cannot be built until the hangar is ready to accept them, fabric doors may add 5 or 6 weeks of time to the build programme.



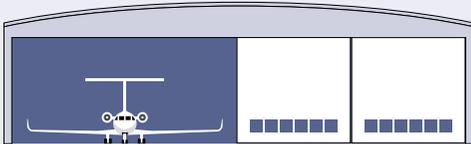
The maximum width for an individual panel of a fabric door is around 30m. Where wider openings or variable heights of doors are required, intermediate swing-up door mullions are needed. These are fitted to the front truss at the top, and slot into ground sockets in the floor. They are hinged at the top and are lifted by cables up into the front truss. Because of the complexity of the cabling and the lifting procedures, more maintenance is needed.

The fabric, though double skin, does not have the same insulation value as is achievable with a bottom rolling door. Fabric doors, however, are useful in paint hangars, where it is helpful to reduce the volume of air in the hangar and the openings.

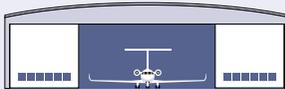
Typical door leaf & track combinations and how they affect the available opening

Although the complete door set becomes more expensive with each additional track and door leaf, the more tracks you have, the greater number of door leaves you can 'stack' behind each other and the larger the available opening can be. Before deciding on the best option, you should also consider whether the hangar may be used differently in the future. These are typical track and leaf configurations (with approximate opening percentages) but other options are available.

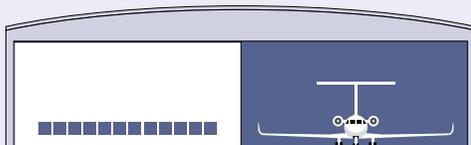
50% available opening two track system



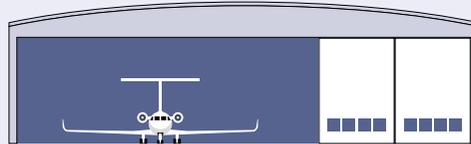
If you need only 50% of the available width open, **left or right or centrally**, then a 2-track, 4-leaf door (or more for a wider hangar) is the best solution.



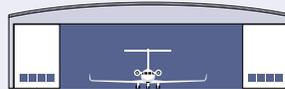
If you need the available width open, **left or right only**, then a 2-track, 2-leaf (or more) door is the best solution



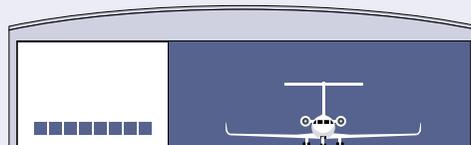
66% available opening three track system



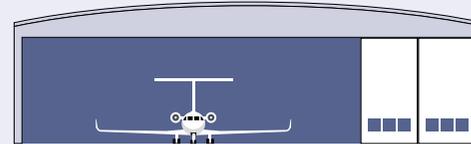
If you need only 66% of the available width open, **left or right or centrally**, then a 3-track, 6-leaf door is the best solution.



If you need the available width open, **left or right only**, then a 3-track, 3-leaf door is the best solution



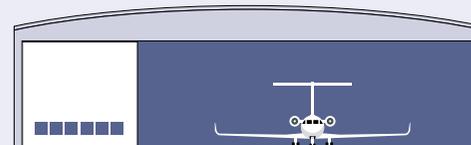
75% available opening four track system



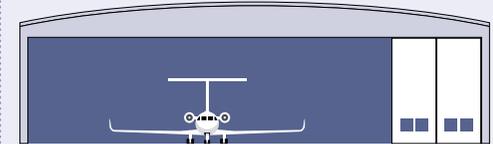
If you need only 75% of the available width open, **left or right or centrally**, then a 4-track, 8-leaf door is the best solution.



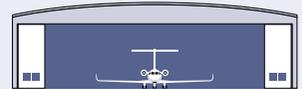
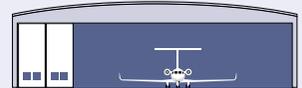
If you need the available width open, **left or right only**, then a 4-track, 4-leaf door is the best solution



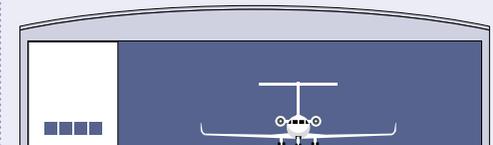
80% available opening five track system



If you need only 80% of the available width open, **left or right or centrally**, then a 5-track, 10-leaf door is the best solution.



If you need the available width open, **left or right only**, then a 5-track, 5-leaf door is the best solution

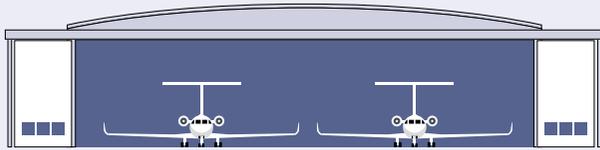


100% available opening multi track outrigger system

If you need the full 100% of the available width open, then you need **outriggers** (or *fabric lifting doors*).

Doors with outriggers on both sides:

The allowed width of the outriggers may determine the type of door you need. Typically, a door with 4 tracks and with 8 leaves, 4 each side, will need one eighth of the width either side for the outriggers.



Doors with outriggers on one side only:

Since all the doors have to open to only one side, each door leaf will need its own track and guide.

Fewer tracks will require wider doors and therefore require the outrigger to extend further beyond the hangar. If the outrigger is to be kept small, more tracks are needed. For example 4 leaves and 4 tracks need to open into a space one quarter of the span (a), while 8 leaves and 8 tracks need to open into a space only one eighth of the span (b).



What if your current doors aren't big enough?



If you have decided that there is a need to improve your existing hangar because the current door structure is no longer sound or because the size is too small for the aircraft you want to house then you could consider a **structurally independent extension** and new doors.

Such extensions can be small pods which take up 2m of apron space or larger buildings which can occupy a much more substantial area in front of the existing doors.

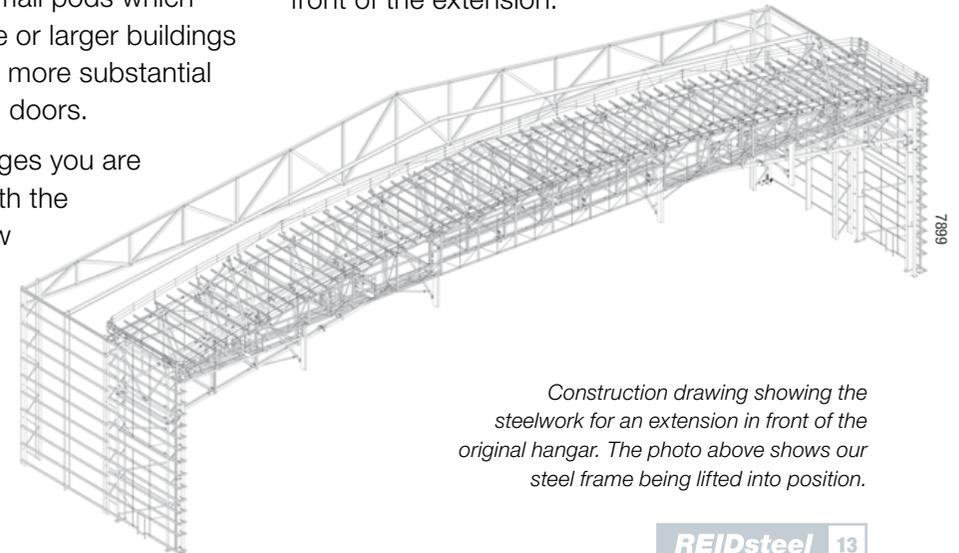
In carrying out these changes you are advised to liaise closely with the airport operator as the new location and height of the extension may impact on their safeguarding requirements.

Short 'Pod' Extension

These are suitable where the existing hangar can accommodate the larger aircraft but the current door is too small. For example, an old T2 hangar with 7.5m high doors can house executive jets (which are typically 7.9m to 8.6m high with tailplanes mounted on the fin) with the addition of a 2.2m deep extension with 9m high doors.

Longer Extension

These extensions are most suited to instances where neither the existing door nor the existing hangar will house the tail of a new taller and longer aircraft. Where this occurs we can construct an extension which is high enough and deep enough to house the tail fin and add new hangar doors to the front of the extension.



Construction drawing showing the steelwork for an extension in front of the original hangar. The photo above shows our steel frame being lifted into position.



New T2 hangar door & extension

to house two new aircraft



In order to house a BAe 146 with a 26.2m wing span and a Dassault Falcon 900 with a 19.3m wing span, new doors and an extension were required for this T2 hangar at Biggin Hill Airport.

The new bottom rolling, multi-leaf doors have six leaves on three tracks, giving an entrance 30 metres wide by 9.25 metres high. These doors are all electrically operated with a fail-safe system which allows each door leaf independent movement via a hand held control pendant. The system also allows manual operation when required. The doors are thermally insulated

with horizontally laid microrib composite panel cladding complete with preformed corners.

The steel frame of the door hood is constructed independently from the existing hangar steel frame. We erected the steel, fitted the cladding and wired and commissioned the electrically operated doors whilst maintaining access into the hangar for plant and concreting works.



New 42m housing & hangar door - bottom rolling, multi-leaf doors, opening to outriggers

Inflite Ltd wanted to increase the size of the hangar doors to enable larger aircraft to be maintained and repaired within their existing hangar. We designed, supplied and erected the steelwork and insulated cladding for the door housing as well as the hangar door itself.

The door housing is 42m wide, 2m deep and 12.5m high to offer clear door truss height to suit a 11.85m door.

The hangar doors have six leaves on three tracks, giving an entrance 38m wide, each door slab being electrically operated. There are 4.5m outriggers on either side.



100 metre span hangar extension with fabric lifting door

This extension has a clear span of 100m, is 12m deep and 22m high to the eaves.

Once the pre-assembly work had been carried out, the 140T truss was lifted into position using a 500T and a 1000T crane. Taking advantage of a perfectly still day, we were given the green light to go ahead with the lift, and erected the roof steel in one day.

Once all the steelwork and cladding was completed the fabric door was installed.



Hangar extension with fabric lifting door

In order to accommodate additional wide body aircraft in the smallest of its three maintenance hangars in Malta, Lufthansa Technik asked us to design a 20m deep extension with a height of 20m under the central door head of this 90m span hangar which we had previously designed and supplied.

The REIDsteel design team worked under the constraint that this new extension was to be constructed on top of the existing apron which could only accept shallow excavations. This led us to recommend the use of an electrically operated fabric curtain door from Megadoor - a five curtain design which, when raised, produced clear heights of 20m in the centre section, dropping to 18.5m and 15m in the outer sections.

Steelwork and cladding was designed, supplied and erected by REIDsteel and the end result is a very neat and hugely accommodating extension that incorporates translucent door fabric to allow diffused daylight into the hangar. A wall mounted louvre/ridge-vent combination helps to provide a comfortable and productive working environment.

Factors you may find helpful when considering new hangar doors



Bottom rolling doors are always the simplest to operate and most economical to buy and maintain. We recommend these for most standard hangar door usage.



If you only need, say, three quarters of the width open at any time, left, right or centrally, then avoid outriggers. **Apron width is valuable**; better not to waste it with outriggers.



Always **make the doors fill the entire width** of the hangar; otherwise there will be dead space behind the door posts which will be permanently detrimental to your hangar usage.



If you need to have the whole span open, then you will have to open multi-leaf doors outside into **outriggers** on a single side or both sides of the hangar.



If you can, always **make the bottom rolling doors the full available height** inside the hangar. If not you limit the way in which you can use the hangar and you reduce its value.



If you really need the whole hangar width open at the same time, and if you cannot use outriggers, then you will have to use **vertical lift fabric doors**.



Only if you cannot have the doors the full height for reasons beyond your control, should you use **tail-gate doors**. These always add complexity and cost to a project.



Other types of doors such as top-hung (shown left), roller-shutter, up-and-over, bi-fold and concertina doors should be restricted to small hangar door openings only.

Visit our dedicated website: www.hangardoors.com

REIDsteel are experts in the design, fabrication and construction of:

Aircraft hangars, hangar doors and hangar extensions

Bridges

Car parks

Church and community buildings

Cranes

Environmental structures

Grandstands and stadia

Housing, hospitals and schools

Hurricane and earthquake resistant buildings

Industrial and warehouse buildings

Leisure and sports buildings

Office buildings, commercial buildings and retail superstores

Security gates, barriers and defensive structures

REIDsteel

JOHN REID & SONS (STRUCSTEEL) LTD

Strucsteel House, 3 Reid Street,
Christchurch, Dorset BH23 2BT England

Telephone: + 44 (0) 1202 48 33 33

Facsimile: + 44 (0) 1202 47 01 03

E-mail: sales@reidsteel.co.uk

Website: **REIDsteel.com**

REIDsteel is a trading name of
John Reid & Sons (Strucsteel) Ltd
Company Registration No: 617773

