

Technical specifications



Building Systems



Rubb Buildings Ltd

Rubb designs and manufactures quality relocatable and permanent engineered fabric tensioned buildings. Highlights include our ground-breaking military hangars, sunshades, shelters, warehouses and workshops, custom designed specialist sport buildings and storage buildings for a variety of sectors including aviation, ports, emergency relief, energy, construction, bulk storage and environmental (waste and recycling). Projects range from basic buildings to full turnkey solutions.

1.0 Design criteria

Rubb buildings are designed in accordance with UK Building Regulations with respect to wind and snow loads. The design is in strict accordance with the relevant British Standards or Eurocodes. We can also offer buildings around the world designed to suit local conditions and code requirements. Our past projects have been designed to sustain wind speeds up to 135mph and snow loads up to 500kg/m². The building framework and cladding membrane are structurally analysed using appropriate non-linear techniques and software. All structures manufactured by Rubb Buildings Ltd are designed in strict accordance with the following British and European standards and codes of practice:

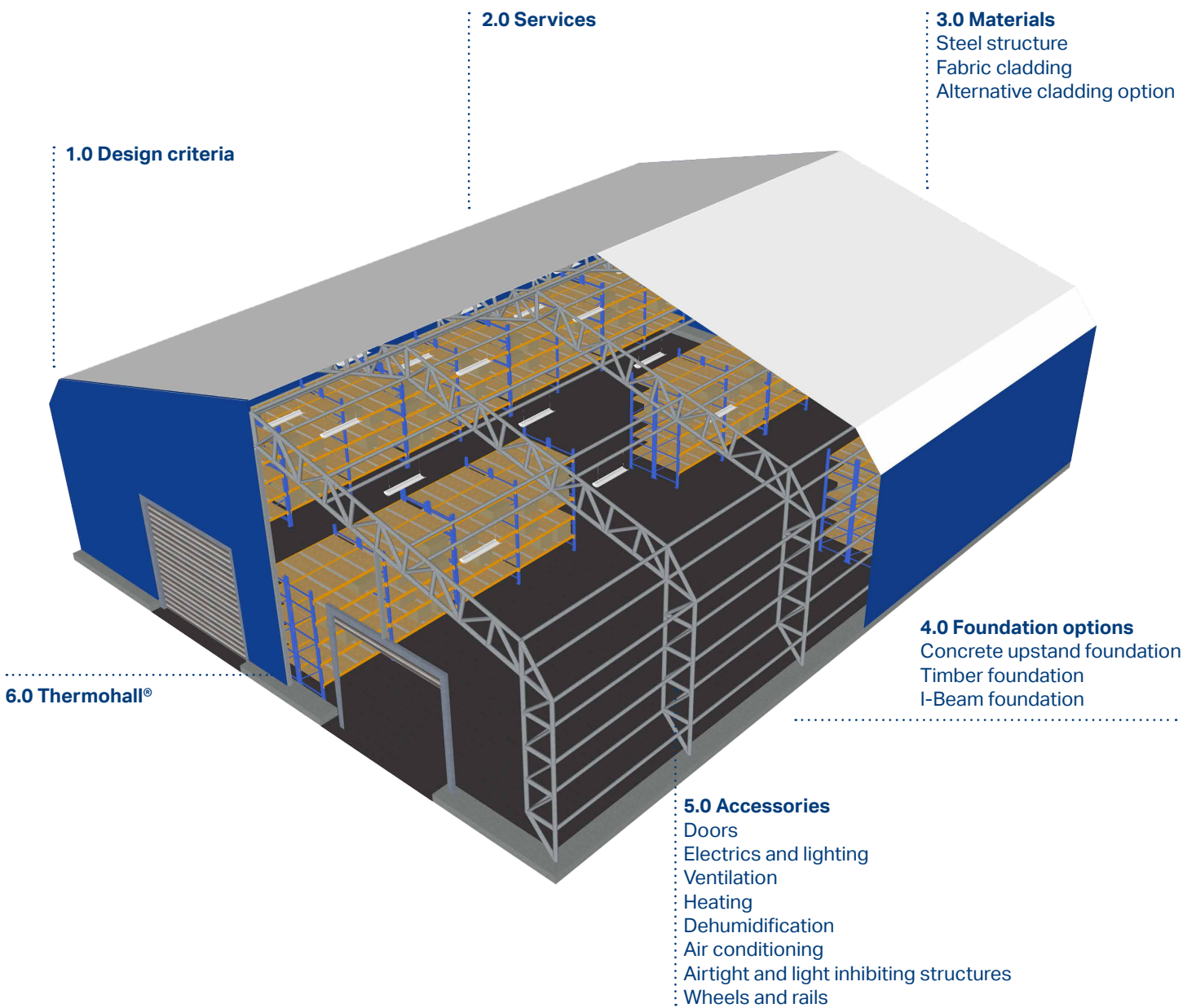
- **BS 648:** Schedule of weights of building materials
- **BS 4360:** Weldable structural steels
- **BS 4848:** Hot rolled structural steel sections
- **BS 5950:** Structural use of steelwork in building
- **BS EN 10219:** Cold formed welded structural sections
- **BS 6399:** Part 1 - Code of practice for dead and imposed loads
- **BS 6399:** Part 3 - Code of practice for imposed roof loads
- **BS EN 1990:2002:** Eurocode - Basis of structural design
- **NA to BS EN 1990:2002:** UK National Annex to Eurocode - Basis of structural design
- **BS EN 1991-1-1:2002:** Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self weight, imposed loads for buildings
- **NA to BS EN 1991-1-1:2002:** UK National Annex to Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self weight, imposed loads for buildings
- **BS EN 1991-1-3:2003:** Eurocode 1: Actions on structures – Part 1-3: General actions – snow loads
- **NA to BS EN 1991-1-3:2003:** UK National Annex to Eurocode 1: Actions on structures – Part 1-3: General actions – Snow loads
- **BS EN 1991-1-4:2005:** Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions
- **NA to BS EN 1991-1-4:2005:** UK National Annex to Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions
- **BS EN 1993-1-1:2005:** Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings
- **NA to BS EN 1993-1-1:2005:** UK National Annex to Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings
- **BS EN 1993-1-8:2005:** Eurocode 3: Design of steel structures – Part 1-8: Design of joints
- **NA to BS EN 1993-1-8:2005:** UK National Annex to Eurocode 3: Design of steel structures – Part 1-8: Design of joints
- **BS EN 1993-1-10:2005:** Eurocode 3: Design of steel structures – Part 1-10: Material toughness and through-thickness properties
- **NA to BS EN 1993-1-10:2005:** UK National Annex to Eurocode 3: Design of steel structures – Part 1-10: Material toughness and through-thickness properties
- **BS EN 1993-1-11:2006:** Eurocode 3: Design of steel structures – Part 1-11: Design of structures with tension components
- **NA to BS EN 1993-1-11:2006:** UK National Annex to Eurocode 3: Design of steel structures – Part 1-11: Design of structures with tension components

2.0 Services

Our service does not end with the product itself. If required, we can handle any project on a turnkey basis. We can provide all of the following services:

- Site surveys
- Design of virtually any shape of building required
- Design of foundations and floors
- Applications for building regulation approval
- Manufacture of buildings and shelters
- Construction of foundations and floors
- Electrical, heating, lighting, ventilation, dehumidification, air conditioning services, etc.
- Project management
- Transport
- Construction of Rubb structures
- After sales service

Built to last



3.0 Materials

Steel structure

The hot-dip galvanized steel structure of a Rubb building generally takes the form of a series of lattice tubular or box section steel frames at 3 to 7 metre centres. Tubular purlins span between each of the frames and provide the necessary support for the cladding. Each frame is composed of smaller more manageable sections, which bolt together on site. Buildings spanning up to 100m are available in any length.

The steel framework is protected from corrosion by hot dip galvanizing. Galvanizing is the process of metallurgically bonding a tough coating of zinc into the steel surface. Microscopic analysis shows that there is no demarcation line between the steel and zinc but a gradual transition through a series of zinc-iron alloys. The protected coating is fused into the metal and therefore will give much better protection than other coatings such as paint. Whereas protection by paint may have to be re-processed every 5 or 6 years, protection by galvanizing should last in excess of 30 years, even in exterior usage in coastal environments. All structural steelwork is hot dip zinc galvanized to BS EN ISO 1461. Prior to galvanizing, all surfaces are cleared of oil, grease, rust, and debris. An environment category C3 is typically adopted which achieves a minimum coating of 85µm. However, galvanizing coating can be adapted to suit specific environments by request.

Fabric cladding

All buildings are clad with tough PVC impregnated polyester fabric.

The sheets are sectioned in accordance with the length of the building and joined with special overlap joints. These joints are waterproof and able to withstand vibrations caused by high winds. The membrane is tensioned over the steel structure and anchored to the foundations.

The quality fabric has a life expectancy of up to 25 years depending on environmental conditions. Moreover, due to ease of erection and attachment, the cladding can be replaced easily if required. Rubb buildings erected more than 30 years ago still have their original cladding.

The fabric is tested with respect to tensile strength, elongation, tearing strength, bursting strength, coating adhesion and resistance to flexing according to BS 3424. The fabric is flame retardant and self-extinguishing to BS 5438 Test 2B (test certificates are available on request).

Alternative cladding option

Rubb offers other alternative cladding options in timber or traditional steel cladding for gables and sidewalls. We have adapted various cladding schemes on past projects to give alternative aesthetic effects to our buildings.

Traditional steel clad sidewalls are adopted as an alternative to the fabric.

4.0 Foundation

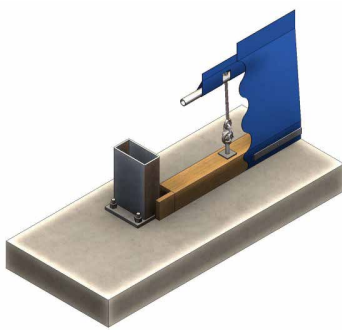
Standard arrangement

Foundation requirements vary depending upon the building size, intended period of exposure and ground conditions.

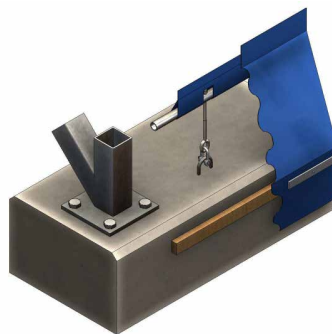
Smaller buildings may be fitted to a timber beam or a steel channel which can be bolted to a suitable existing concrete slab, fixed by ground anchors or secured with ballast weights. Larger buildings can be bolted to a purpose made concrete ring beam or fitted to a steel beam, which can be bolted to a suitable existing reinforced concrete slab.

For a more permanent solution, most buildings are secured to a concrete slab with ring beam, prepared by groundworks professionals. A concrete upstand can be either monolithic with foundation beams, or cast on top of an existing slab. Rubb buildings can be erected on an uneven surface or a sloping area and will accept high differential settlement of the foundations.

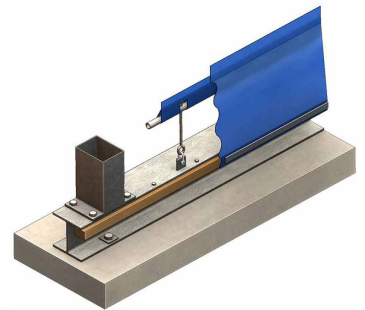
Timber



Concrete upstand



I-Beam



Lifting a building

When a building is to be lifted, a continuous steel foundation around the perimeter of the structure is essential. This can be an angle or U-channel for small units or I-beams for larger structures.

Buildings can be lifted using the correct sling arrangement and lifting beam.

Normally, 4 modules can be lifted using a 6 legged sling without the need for a lifting beam.

5.0 Accessories

Doors

Rubb buildings can be fitted with any door arrangement. Large doors are preferably located in the gable ends. Doors up to 4.6m width (depending on building configuration) can be fitted in the side of a building as standard. For customised projects, larger doors in the side are possible.

Our standard doors are as follows:

- Access door
- Roller shutter doors
- PVC folding doors
- Sliding aircraft doors
- Folding aircraft doors

We can also supply any door configuration required, building size permitting. We have supplied doors over 70m wide and up to 12m high.

Ventilation

Ventilation is required to:

- Reduce the affects condensation
- Maintain air quality
- Avoid unpleasant heat exposure

As standard, the Rubb building is supplied with vent openings in the gables to allow some natural ventilation. Other openings can be positioned in the sidewalls to provide a higher level of natural ventilation. These openings can be fitted with ventilation fans to provide the recommended number of air changes per hour, to suit the activity within the building. Special ventilation i.e. paint spray, fumes, soot and exhaust extraction can also be accommodated within our services.

Electrics and lighting

The white translucent roof provides a good level of natural light during day-light hours. However, we can design and install complete lighting and electrical requirements to suit the activity within the building. All types and standards of light fittings and installations are available ranging from the Fluorescent Batten, Hi-bay or Lo-bay type to the special purpose flame-proof and water-proof fittings. Our buildings can also be installed with emergency lighting to BS 5266 and Fire Alarms to BS 5839. The complete installation will be carried out in strict accordance with the current I.E.E. Regulations. Kit form lighting can be provided for connecting to generators. All fittings can be attached to, or suspended from the building structure.

Heating

As part of the service we also undertake a comprehensive heating installation designed to comply with individual requirements and locations. We can utilise existing sources on site, i.e. gas, LPG, electric etc. Heating units including the re-circulation type can be located either inside or outside the building and supplied with various types of ductwork to provide the correct environmental conditions for the activity within the building.

Airtight and light inhibiting structures

Rubb has extensive experience in designing, manufacturing and erecting structures which are required to be virtually airtight and at the same time must inhibit light ingress. Such structures are of particular use in the water treatment sector where air tightness prevents unpleasant odour escape, and algae growth is inhibited by providing lightproof conditions. Black out fabric is also available for military use.

Dehumidification

It is commonly held that storage structures must be heated to prevent moisture problems. This is not the case and savings of up to 75% can be made using dehumidification as compared to heating. Due to the fact that Rubb structures are covered in a virtually air tight fabric they are ideal for dehumidified storage. A ground sheet can easily be welded to the sidewalls to prevent rising damp from any existing floor slab. Rubb can supply complete dehumidified storage systems for use in existing warehouses and other buildings.

Air conditioning

Air conditioning can be provided for the whole or specific areas within the building to suit the clients' requirements. In general, all other pipe services, e.g. compressed air, water, gas or oil can be installed.

Buildings on wheels

Rubb buildings can be fitted with wheels using a continuous steel foundation. The larger structures are fitted with wheels and run on rails. Smaller shelters can be fitted with rubber tyred wheels.

6.0 Thermohall®

The benefits of Thermohall®

- Insulated panels include outer weather liner, integral glass wool insulation and inner liner
- System provides a full vapour seal, greatly reducing infiltration losses compared with other insulation systems
- U-value flexibility: Thermohall® can be provided in different levels of insulation value adaptable to customer needs and environmental conditions
- Insulated panels completely cover the structural frame to minimize thermal bridging. This greatly reduces the condensation on framing members and improves insulation efficiency
- The system leaves the structural frame exposed internally, allowing for more efficient installation and service of electrical and mechanical equipment
- Roof and interior surfaces are provided in high gloss white to reduce solar load on the outside and increase reflectance within the building
- Factory pre-fabrication offers significant labour savings on site and greatly reduces installation time
- Rubb Thermohall® buildings are fully and easily relocatable
- Vacuum packaging reduces shipment volumes

Technical data

Rubb's patented Thermohall® features a flexible insulated fabric system which offers major advantages over other insulating systems:

- Non-combustible glass wool is encapsulated in air and water tight pockets
- Insulation thickness from 50mm to 200mm
- No thermal bridges in the cladding
- No air gaps in the cladding, which reduces heat loss and helps eliminate condensation
- Buildings are fully relocatable

Development of Thermohall® started several years ago, with the goal of a new and eco-friendly insulation system. Thermohall® is now fully developed and patented. Thermohall® offers great energy savings and is environmentally friendly, both in fabrication and operation.

- We use a heavy duty PVC fabric with a long, useful life (20+ years), and high density, non-combustible glass wool insulation
- All the materials are recyclable. Steel can be recycled through various means and PVC can be recycled through Taxyloop, which is the Serge Ferrari operational recycling chain. The insulation material that Rubb uses is processed from recycled glass
- Rubb Thermohall® is a properly insulated building which combines the best properties of both conventional buildings and fabric buildings, high thermal insulation and full relocatability and all Thermohall® buildings can be delivered to suit our customers' insulation requirements.

Thermohall® specification

Outer layer

Flame retardant heavy-duty fabric

Core

High-density glass wool insulation

Inner layer

Self-cleaning PVC fabric

Thickness	U Value (SI) W/m ² K	R Value (US) ft-F-hr/BTU
50mm (2in)	0.67 W/m ² K	R11
100mm (4in)	0.36 W/m ² K	R19
150mm (6in)	0.25 W/m ² K	R27

Structure types

Rubb has the capability and experience to design, manufacture, deliver and install custom structures.

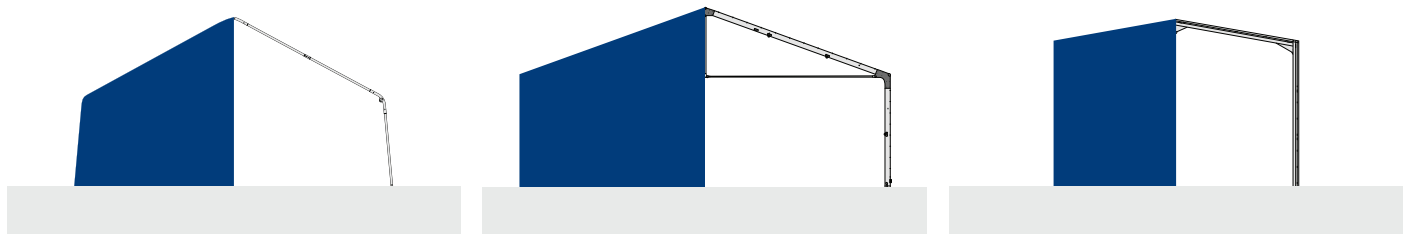
With Rubb, you can be sure everything is under control from concept to completion – including cost, quality and delivery.

While we generally have the right standard structure available to meet project needs, Rubb can also design custom solutions to meet special requirements. We have the in-house resources to provide a cost effective solution customised to our clients' needs.

Design - Using proven engineering software, we can tailor the project to the specific requirements of the site, type of cargo and logistical needs.

Production - Steel and membrane components are fabricated with the correct equipment and quality control.

Installation - Pre-engineered and pre-fabricated to make on-site installation by a Rubb crew, or your crew, go smoothly and efficiently.



THA Shelters

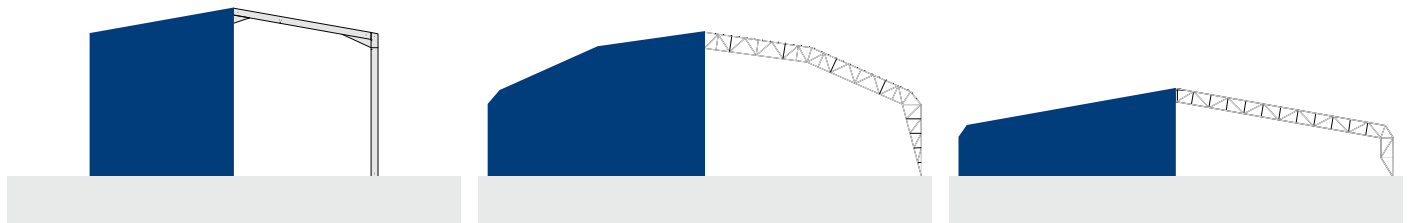
THA Rubb shelters are available in 6m, 8m, 10m, and 12m span widths with 3.3m high sidewalls. These industrial tents can be supplied by any length in 3m modules.

Rubb Hall

The Rubb Hall range is flexible, robust, portable, and is designed for fast delivery at a competitive price. Available in 10m and 12m spans by any length.

BVR Structure

The BVR structure type features rectangular leg and roof box sections. This takes up less space and therefore provides more overall internal clearance.



BVI Structure

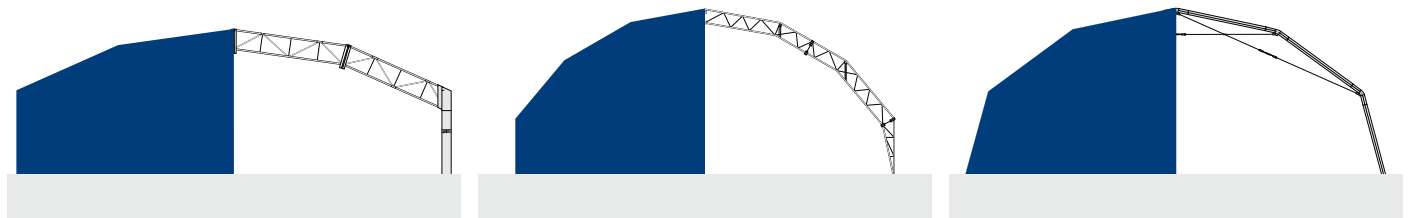
The BVI structure type features column leg sections and roof sections. The BVI is available from widths of 10m to 30m, by any length.

BVE Structure

BVE structures can be designed with single or multiple roof pitches per span. Span widths start from 20m to 40m, by any length.

BVL Structure

The BVL features vertical lattice frame sidewalls and single or multiple lattice roof pitches per span. Large spans starting from 50m to 100m in width.



BVC Structure

The BVC is designed with a vertical column leg and a lattice frame roof. This structure type is commonly used for sports halls. 40m to 100m width spans are available.

NV Structure

The NV was the first steel truss span building manufactured by Rubb. The design originated in Norway and has a vertical sidewall, giving it the acronym NV.

EFASS Structure

The EFASS hangar is designed for rapid deployment. Lightweight, robust and relocatable, these hangars are available in three widths (11m, 20.4m and 25m).

Rubb quality

Rubb Buildings Ltd was assessed by the UK MOD to the AQAP-1 quality standard in 1990 and registered to the ISO 9001 standard in 1995, achieving accreditation in January 1996. Through continual improvement, development and annual assessments,

Rubb is currently certified as meeting the requirements of ISO 9001:2008 for the design, manufacture, erection, dismantling, hire and servicing of modular prefabricated buildings, and similar structures, including the provision of customer training.

It is therefore company policy to:

- Establish and maintain a Quality Management System which satisfies the requirements of ISO 9001:2008 and any other Customer Specific Quality requirements
- Meet the legal requirements and comply as a minimum to the Construction Product Regulations 305/2011 and ensure products bear the CE Mark when placed on the market
- Consistently design, manufacture, erect, dismantle, hire, service and repair modular, prefabricated buildings, and similar structures, to satisfy customer requirements in every respect, and be in accordance with EN 1090
- Provide customer training or product familiarisation, as and when required, to satisfy customer requirements
- Strive to continually improve product quality and the quality management system, through the use of the Rubb quality policy, quality objectives, analysis of data, audit results, corrective and preventive actions and management review
- Set quality objectives throughout the company which will be measured and reported upon
- Maintain records as objective evidence to demonstrate compliance with the quality management system
- Review the quality management system at planned intervals to ensure it is effective and achieving the stated quality policy

Construction Products Regulations (CE Marking)

On July 1, 2013, under the European Construction Products Regulations 2011 (CPR), it became mandatory for Rubb Buildings Ltd to apply CE marking to any of our products, which are covered by a manufacturing harmonised European Standard (hEN) or European Technical Assessments (ETA).

CE marking enables Rubb Buildings Ltd's products to be placed legally on the market in any EU Member State.

CE marking indicates that a product is consistent with its Declaration of Performance (D.o.P) as made by Rubb Buildings Ltd or its suppliers. The declaration will vary according to the particular technical specification covering the product.

By making a D.o.P, Rubb Buildings Ltd and its suppliers are assuming legal responsibility for the conformity of the construction product with its declared performance. The information contained within any D.o.P is produced and handed over with the Building O&M Manual.

Rubb is currently certified as meeting the requirements of Annex ZA of the standards EN 1090-1:2009+A1:2011 for Factory Production Control in compliance with and regards to Regulation 305/2011/EU of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR).

Construction (Design and Management) Regulations 2015 (CDM 2015)

Since the introduction of the revised Construction (Design and Management) Regulations 2015 (CDM 2015), Rubb Buildings Ltd has been actively engaged in numerous projects, undertaking the roles and responsibilities of the various appointments and duty holders outlined within the regulations, and is coherent with the requirements of each role. These include:

Principle Designer

When appointed as Principle Designer by the client, Rubb will plan, manage and monitor all parts of the project from pre-construction through to completion and usage, and will coordinate all matters relating to health and safety during these phases to ensure that, so far as is reasonably practicable, the project as a whole is carried out without risks to health or safety.

Principle Contractor

When appointed Principle Contractor by the client, Rubb will plan, manage, monitor and coordinate the entire construction phase and take account of the health and safety risks to everyone affected by the work (including members of the public). Rubb will liaise with the client and principal designer for the duration of the project to ensure that all risks are effectively managed. We will prepare a written construction phase plan before the construction phase begins, implement, and then regularly review and revise it to make sure it remains fit for purpose.

Contractor

Generally, the appointment of Contractor (or Main Contractor) is placed when Rubb is to be the sole contractor on site. In such cases, Rubb will plan, manage and monitor the construction phase as if they were appointed Principle Contractor, producing all required documentation, including the Construction Phase Plan and Health and Safety File. For projects involving more than one contractor, Rubb will coordinate activities with others in the project team, in particular, complying with directions given to them by the principal designer or principal contractor.

Designer

As a designer, decisions can affect the health and safety of all those not only involved in the construction of the building, but also with those who use, maintain, refurbish and eventually demolish it. In this case Rubb will make sure the client is aware of the client duties under CDM 2015, before starting any design work. When preparing or modifying designs, Rubb will take account of any pre-construction information provided by the client (and principal designer).

We will eliminate foreseeable health and safety risks to anyone affected by the project (if possible) and take steps to reduce or control any risks that cannot be eliminated. Rubb will work with the client and principal contractor to help them comply with their duties, such as ensuring a construction phase plan is prepared. We will ensure all designs are compatible and health and safety guidelines are met, both during the project and beyond.

Rubb safety

The health and safety of our employees and everyone associated with our business is paramount to all processes at Rubb Buildings Ltd. Our aim is to raise health and safety standards and reduce risks and accidents.

We want to protect our colleagues, people in our supply chain and our customers and have implemented ongoing safety programmes, including regular health and safety risk assessments and external health and safety audits.

At Rubb we are focussed on:

Building safety standards

The initiative will focus on meeting, maintaining and improving H&S standards at Rubb's plant in Gateshead and on site. Rubb has Safe Contractor status and CHAS accreditation.

Building safety commitment

Managers will take the lead on the commitment to Building Safety and encourage staff to prioritise activities to support Building Safety Knowledge and Skills: It will look at labour practices and facilitate additional training and development for all staff.

Building on safety experience

Analysing past experiences to improve on successes and provide new solutions.

Building safety engagement

Engagement with all stakeholders.

Building safety systems

Working to enhance and improve current systems to ensure they facilitate and promote the Building Safety concept.

Building safety track record

Tracking and monitoring experiences through regular updates, meetings, focus groups and education sessions.



Rubb environmental

Rubb Buildings Ltd understands that our activities could have an effect on the local, regional and global environment. We are committed to reducing this impact by implementation of management controls and continuous improvement in our product designs and processes.

Environmental regulations, laws, and codes of practice will set the minimum standards of environmental performance. Our goal will be to foster a workplace where employees, suppliers and customers are committed to long term improvement in meeting environmental goals.

Sustainable systems

Rubb UK strives to ensure that our structures are fully reusable across the sectors we serve. We are also working on achieving 100 per cent recyclability for all materials used.

Rubb facilities, temporary or permanent, can be relocated, adapted, expanded or dismantled and stored for future operations to suit changing logistical needs. They can also be sold to new users if no longer required by the existing owners.

Rubb UK offers full refurbishment and recertification services. If necessary, materials used in the building construction can be disposed of or recycled to help protect the environment.

No materials from Rubb structures are considered to create any toxic or hazardous waste. Steel can be recycled through various means and PVC can be recycled through Texyloop, which is the Serge Ferrari operational recycling chain.

Items	Type
Steel	Mild steel to grades S355 and S275
Galvanizing	Standard hot dipped zinc galvanizing to BS EN ISO 1461:1999
Cladding	PVC coated polyester based fabric

PVC coating composition:

- Polyvinyl chloride
- Polyester textile
- Phthalate plasticizer
- Aluminatrihydrate
- Adipate plasticizer
- Antimony trioxide
- Pigments (Ti O2)
- Stabiliser
- Processing aids



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