



Cleancube
mobile cleanrooms

A division of

Guardtech
group



SUSTAINABILITY POLICY



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Author: **Mark Wheeler**

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Division: **CleanCube**



www.guardtech.com



0330 113 0303



sales@guardtech.com



Guardtech House, Unit 1A Homefield Road, Haverhill, Suffolk, CB9 8QP



Cleancube
mobile cleanrooms



CleanCubes are pre-fabricated facilities manufactured to a Cleanroom or Controlled Environment specification, UK designed and constructed, delivered for quick installation and connection on client sites worldwide.

Choose from a wide range of standard modules, ranging in size from 15m² to 240m², available in 3 grades of fit-out specification. Or create an entirely bespoke CleanCube to match your exact requirement with the CleanCube in-house design team. All standard CleanCube models are available with full customisation options to reconfigure layouts and to incorporate essential process services and utilities.



Click image to read the brochure

Units can be stacked as tall as 8 high so significant footprint facilities can be created utilising CleanCube modules. Facilities can be assembled externally or within warehouse spaces and the exterior can be clad to conceal the construction medium or painted and wrapped in graphics to celebrate it.

- Full range of Standard Models with customisation options or Bespoke 'Design Your Own' Service.
- Can be installed internally or externally, reconfigured & relocated, single storey or stacked.
- Complete utility integration for controlled environment operation and process equipment supplies.
- Ongoing consultancy and full bespoke commissioning and documentation service to support regulatory compliance, Including Validation and DQ, IQ, OQ if required.
- Large scale multi-disciplinary specialist design & delivery team.

Click play to watch video





INTRODUCTION

CleanCube is a division of the Guardtech Group that utilises offsite construction as its medium for producing critical environments for the life sciences and high tech engineering industries. The Guardtech Group have been producing Cleanrooms and Controlled Environments for over 25 years, and CleanCube embodies and utilises the years of intellectual property and engineering capability that has been built up within the group, and delivers it via a modern mode of construction. The business strategy behind this is based around manufacturing efficiency and improvement of the construction experience for the Guardtech clientbase, and supporting this aim is the significant benefits that offsite construction bring from a sustainability perspective.

This document outlines the significant benefits that should be a consideration when assessing the credentials of the CleanCube solution and it's positive effect on environmental sustainability:

- **ASSET LIFE:** CleanCube utilises shipping containers as it host module media, these are constructed as hard wearing steel structures that are designed to withstand continuous movement through vigorous and demanding environmental conditions. The expected lifetime of a shipping container when maintained is between 35 to 40 years, however there is no reason for them not to last longer if due care and attention is paid to treating the external steel structure. When considering CleanCube against other competitive module providers within this market place, their expected lifespan is around 25 years of active service.
- **EXPANSION, RECONFIGURATION, REFURBISHMENT, RELOCATION:** CleanCube is designed as a flexible building, that is pre-constructed offsite and delivered to client sites worldwide for connection and commissioning. The very nature of the solution means that the finished facilities can be disconnected, moved and relocated if clients decide to rehome their environments. In addition they are designed in such a way that a client can expand their footprint or reconfigure their space. The impact that this has on flexibility of use, means that the asset can outlast other environments because it can be adapted to meet the demands of the evolving business that it serves. This has significant benefits over traditional stick build construction, where perfectly good environments can be ripped down and sent to landfill, because the demands of the business have outgrown the capability of the facility or the building needs to be restored to original landlord condition. This isn't the case with CleanCube. CleanCube also has a residual value, and if no longer required at end of life, it can be sold back to the open market for re-use or refurbishment.
- **TRANSPORTATION:** As CleanCubes use shipping containers as their medium, they are able to be transported via the standard worldwide shipping infrastructure that already exists, meaning that they do not require special dedicated vessels and can be accommodated on transport links that already carry thousands of other containers. This reduces the overall CO² emission of transportation.
- **MANUFACTURING:** By it's very nature, manufacturing is significantly more efficient than construction. Manufacturing adopts repeatable processes and looks to optimise workflows and supply streams, onsite 'Stick Build' construction isn't as controlled due to its varying and changing delivery environments. Project timescales are therefore significantly quicker with offsite manufacturing, and this means that less energy is required to complete them, whether that be fuel required for a workforce to attend site or the energy resources used to construct. Research (below) suggests offsite construction or manufacturing can reduce CO² emissions by as much as 36% to 43% compared with traditional building methods. Waste management is also drastically improved, as unused materials are retained, recycled or re-used rather than scrapped.



- **INSULATION:** The CleanCube system adopts a double layer of insulation, improving U-Values drastically and reducing the burden on the heating or cooling system via condition retention. The internal steel face has a layer of closed cell spray foam applied, ranging from 25mm to 50mm, with U-Values of 0.22 to 0.27W/mK, there is then a small ventilated void space for services and air return and then the internal composite wall and ceiling panels with 100mm thickness of mineral wool with a U-Value of 0.4W/mK.
- **OPERATIONAL ENERGY:** CleanCube as a delivery mechanism challenges users to consolidate their process into the most condensed space possible, ensuring that no space is wasted. As the facilities can be extended at a later date by adding modules, there is no reason to build bigger than today's demand, so volumetrically they are always fit for purpose. This means that only the energy required to operate the usable space is expended. CleanCube designers have developed air change rates that keep facilities compliant to ISO and GMP standards, but that operate on the lowest possible rates with a factor of safety applied. Other significant considerations that can be factored into any build to support lower operational costs include:
 - **Efficient HVAC:** Air Handling Units (AHUs) with Low Global Warming Properties (GWP) can be selected, tight control can be achieved via chilled water rather than DX, and targeted cooling coils with dedicated sensors deliver tight control at point of delivery, rather than wasting energy in areas of the process where the conditioning is not required.
 - **Heat Recovery:** Typical designs ensure the lowest possible amount of fresh air is introduced for pressurisation and to meet HSE requirements for occupancy, so a significant amount of the conditioning is on a recirculation basis with just minimal trim conditioning. However, even the air exhausted can be put through a heat recovery mechanism, so although the air is expelled the energy is not wasted. This can be especially useful for critical environments that need to operate on 100% fresh air, either containment level 3 suites or challenging pharma applications.
 - **Intelligent Control Systems:** AHUs can include set back modes for periods where the facility need to maintain condition and compliance but account for lower heat output and less contamination risk. This can also be linked to particle counters, so even during operation, the filtration system is only working as hard as the environmental conditions demand.
 - **DALI Lighting Systems:** Standard lighting is on PIR controllers, however DALI systems can also be incorporated to programme usage and ensure energy is not wasted when rooms are not in use.
 - **Solar Power:** CleanCube can either have separate roofs applied with solar panels included, or the top surface of the flat roof can have solar installed on as much of the footprint is required. Generating energy and feeding back to the grid can be a good way to offset carbon if required and to conform to the latest more stringent building regulations, improving overall EPC rating.
 - **Additional Insulation:** If an additional roof is opted for, this can be manufactured from PIR insulated panels which will add a tertiary layer of insulation to the container top with U-Values of around 0.4W/mK. An alternative, Green option, is that a living roof can be installed, which will also support the insulation of the unit but will have a positive impact on bio-diversity when applied.



RESEARCH SPOTLIGHTS

North Ridge CO2 Analysis Report - Comparison between Modular and Onsite Construction - M. Al-Hussein, J.D. Manrique, D. Mah

This study, conducted by the University of Alberta, comparing modular and on-site construction noted significant advantages for modular construction, specifically noting a compressed site schedule, minimized waste, fewer workers on-site (and for less time), fewer materials stored on-site, and a tighter building envelope. The research found that by using modular construction, the overall schedule was shortened by four months on an 11-month project and CO2 emissions were reduced by 43 percent. The following pages detail the performance & component specification that relate to this outlined scope of works.

Comparison of the Embodied Carbon Emissions and Direct Construction Costs for Modular and Conventional Residential Buildings in South Korea - H. Jang, Y. Ahn, S. Roh.

This study analyzed the embodied carbon emissions and direct construction costs incurred during the production phase of a modular residential building and provides comparison to an equivalent conventional residential building. Major drawings and design details for a modular residential building in South Korea were obtained, and the quantity take-off data for the major construction materials were analyzed for a modular construction method and a conventional construction method using a reinforced concrete structure under the same conditions. Focusing on major construction materials during the production phase, the embodied carbon emissions assessment revealed that adopting a modular construction approach reduced the environmental impact by approximately 36%, as compared to the conventional reinforced concrete method. This result was significantly affected by the large input of ready-mix concrete, with high embodied carbon emissions in RC construction and not modular construction.

Quantifying the Waste Reduction Potential of Using Prefabrication in Building Construction in Hong Kong - L. Jaillona, C.S.Poon, Y.H. Chiang

As Hong Kong is a compact city with limited available land and high land prices, the construction of high-rise buildings is prevalent. The construction industry produces a significant amount of building waste. In 2005, about 21.5 million tonnes of construction waste were generated, of which 11% was disposed of in landfills and 89% in public filling areas. At the present rate, Hong Kong will run out of both public filling areas and landfill space within the next decade. The government is taking action to tackle the problem, such as by introducing a construction waste landfill charge, and promoting prefabrication to reduce on-site waste generation. This paper reports an ongoing study on the use of prefabrication in buildings and its impact on waste reduction in Hong Kong. A questionnaire survey was administered to experienced professionals, and case studies of recently completed building projects were conducted. The results revealed that construction waste reduction is one of the major benefits when using prefabrication compared with conventional construction. The average wastage reduction level was about 52%. This implies that a wider use of prefabrication could considerably reduce construction waste generation in Hong Kong and alleviate the burdens associated with its management.



Onsite vs. Offsite: Comparing Environmental Impacts - Quale, et. al.

The University of Virginia conducted a study (Quale, et.al.) using life cycle assessment to quantify the environmental impacts of constructing a typical facility using two methods, based on data from several modular construction companies and conventional construction companies. The study, peer-reviewed and published in the Journal of Industrial Ecology, included impacts from material production and transport, off-site and on-site energy use, worker transport, and waste management.

In terms of materials usage and waste, buildings constructed using a modular process were found to use about 20% less material overall. This included greater material use for modular mate lines and transportation but significantly less material waste for modular. In fact, the modular units sent about 75% waste to the land fill per project (1,380 lbs. for modular vs 5,500 lbs. for conventional). Worker transport to site daily had a negative impact for conventional construction while energy use in the factory reduced the environmental impact of modular construction projects.

Quantifying Advantages of Modular Construction: Waste Generation – L. Loizou, K. Barati, X. Shen ORCID, B. Li

This paper focuses on modular construction as an off-site production system, where a framework to compare waste generation of modular and conventional, in-situ construction methods is proposed. This paper aims to quantify these differences. The framework relies on a comprehensive literature review to estimate the waste rates of building materials, which are then applied to realistic case studies in order to determine the differences in waste generation. Overall, modular construction reduces the overall weight of waste by up to 83.2%, for the cases considered. This corresponds to a 47.9% decrease in the cost of waste for large structures.

Qualitative comparisons asserting that prefabrication reduces waste have also been verified. For quantitative comparisons, the results show greater waste reductions than most previous studies. Quale et al., Jaillon et al., Kim, Jaillon and Poon, and Hosseini et al., showed waste reductions of 20.1%, 52%, 60%, 65%, and 92%, respectively.

SUMMARY

Ultimately our responsibility as a society is to minimise our impact on the planet as much as we possibly can, and CleanCube represents the Guardtech Group's ambition to adopt a solution to best support this endeavour. The Group actively operate and encourage a culture of continuous improvement and have a shared ambition of adopting emerging lowest carbon technology coupled with solutions that facilitate lowest consumption behaviour. All whilst balancing value for money for clients, ensuring that the technology can be adopted in as widespread manner as is practically possible, ultimately enhancing the carbon reduction plans of our client base along the way.

Yours Sincerely,



Commercial Director



Guardtech cleanrooms

Guardtech Cleanrooms – catering specifically to the modular cleanroom market. Bespoke and standard configurations.



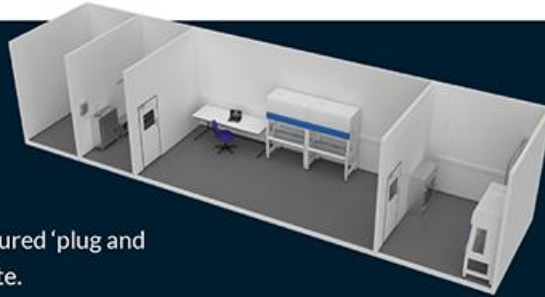

Cleanroom solutions

Cleanroom Solutions – large-scale turnkey construction projects with detailed design and documentation.



Isoblok pre-fab cleanrooms

Isoblok Pre-Fabricated Cleanrooms – pre-configured 'plug and play' cleanroom units and pods constructed off site.



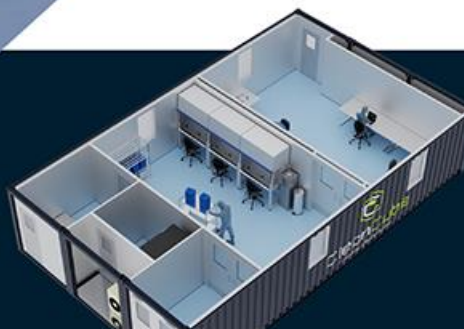

Isopod rapid cleanrooms

Isopod Rapid Cleanrooms – quick-assembly flat-pack cleanrooms, standard sizes available from stock.



Cleancube mobile cleanrooms

CleanCube Mobile Cleanrooms – portable controlled environment solutions for businesses all over the world.



TESTIMONIALS & CASE STUDIES

CLICK THE PLAY ICON to see a 550sqm ISO8 build case study and the Case Studies Brochure for projects.

Click on each hexagon tile below to read case studies on your web browser.



JEB Testimonial

"The cleanroom that Guardtech have built for us has exceeded our expectations for quality and time to delivery."

Sean Licence - Head of Medical at JEB Technologies Ltd

NOUMED Testimonial

"I would just like to say thank you and your team for all the hard work and dedication. Noumed have a fantastic facility and that is down to your team."

Rajat Mehta - Operations Director



Cignpost diagnostics Testimonial

"Guardtech have been a trusted partner and supplier. They've enabled us to deliver fast and accurate COVID-19 testing solutions to our elite Sports, Film, and Airport clients."

Edward Cockroft - Laboratory Implementation Manager at

Cignpost Diagnostics

