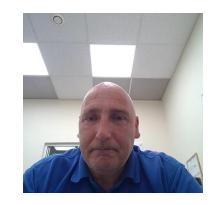
CLEANROOM TECHNOLOGY 2020

TRADITIONAL CONSTRUCTION VS NEW CONSTRUCTION TECHNIQUES, BENEFITS & CONSIDERATIONS FOR A NEW DESIGN APPROACH

Lee Harvey

Director Asgard Cleanroom Solutions UK





AGENDA

Overview Of Asgard Cleanrooms

Traditional Construction Techniques

New Construction Techniques

Summary

Questions



ASGARD CLEANROOMS OVERVIEW

EMEA + USA

2000







To service the modular cleanroom Biopharmaceutical (GxP) sector

"LIVE" Projects in 7 European Counties

Undertaking Design assist and cleanroom construction across 7 European countries.

2020 saw our entry into USA market

Over 5 Million man hours worked.

With over 250,000m² of Cleanrooms Designed & installed. Classification ranging from ISO 5 to ISO 9

Over 400 employees.

Employees are employed within UK, Ireland, Europe & North America

Over £120 million turnover.

Across 8 multidisciplined business units.
All business units are focused on GxP
Environments.

ISO & OHSAS Accreditations.

400 (+)

1st European Cleanroom Contractors to achieve ISO 45001:2018 (Health & Safety).

ISO 9001:2015 (Quality) accreditation

ASGARD MARKET PENETRATION

ASGARD CLEANROOM SOLUTIONS



2000: Ireland & UK

2010: Germany & Denmark

2015: Holland

2020: Finland, Sweden, Belgium, Switzerland, Iceland & USA





ASGARD GROUP OF COMPANIES



- Modular Cleanrooms.
- GxP environments only.
- Design & Construct.
- Design Assist.
- BIM LOD 100 500.



- Door automations & Controls.
- Interlocking systems.
- GxP Automations & controls; Particulate, heat, humidity, air pressure, interlocking.



- Irish based GxP LED lighting design & manufacturer.
- Walk on 1.5 2.5 kN/m².
- Emergency Lighting.
- Photometric design & calculations.
- CE & UL accreditations



- Irish Based off site Utility & Super skid manufacturer.
- Off site pipe racks.
- Off site facility superstructure fabricator.



- North America based.
- Modular Cleanroom.
- GxP environments only.
- Design & Construct.
- Design Assist.
- BIM LOD 100 500.



2000 2004

2005

2008

2013

2016

2018

2019

2020

- Modular Cold rooms, stability rooms, climate-controlled storage for GxP environments.
- Modular Data Centre's.
- Off site external GxP facilities.

- French based

 Modular Cleanroom
 system manufacturer.
- Wall's, ceilings, system doors, vision panels, BSL 3 – 4 inflatable sealed doors.
- Off site constructed Podular solutions.
- Asgard are EMEA based sales & Manufacturing Agent.
- <u>Irish Based</u> material only supplier for GxP environments.
- End-user FM material support.
- Group logistics & supply chain management.









ASGARD MANUFACTURING

ASGARD CLEANROOM SOLUTIONS

120,000 ft² Manufacturing Facility in Ireland





40,000 ft2 Pod Framework manufacturing area

50,000ft2 of Clean Pod Assembly

5,000ft2 Spray painting & prep area

25,000ft2 of Data Centre Pod assembly

TYPICAL CONSTRUCTION TERMINOLOGY

ASGARD CLEANROOM SOLUTIONS

Types Of Construction Traditional "stick built" (DRY WALL) - constructed from

- **Traditional** "stick built" (DRY WALL) constructed from individual parts onsite, such as brick-by-brick, frame-by-frame, wall by wall, etc.
- Modular construction (MONOBLOC) major room modules/parts (walls, floors, etc.) constructed off-site for onsite assembly.
- Pre-fabricated units, including PODs largely finished free-standing/autonomous rooms constructed and outfitted offsite, often including all electrical/automation/HVAC prequalified, sometimes with bioprocessing equipment installed. These are shipped either as finished single units or multi-blocks and installed at the facility.

| Traditional Stick Built (Dry Wall) | On site Construction Activities | | | | | | | | | | | | |
|------------------------------------|----------------------------------|--|--|--|--|--|--|--|--|----------|---|--|--|
| | | | | | | | | | | | | | |
| Modular Monobloc | On site Construction Ac | | | | | | | | | tivities | • | | |
| | | | | | | | | | | | | | |
| Pre-fabricated off site | Off site Construction Activities | | | | | | | | | | | | |



TRADITIONAL STICK BUILT

On Site Construction - Stick Built

Advantages

- Raw materials readily available
- Raw materials generally cost effective
- Layouts can be modified late in process
- Seamless smooth finishes for containment suites etc.
- Repairs by non specialist trades

Disadvantages

- Construction labour intensive
- Multiple trades required
- Particulate generating activities and wet trades
- Paper-based gypsum board has the potential to harbour fungi/mould
- Cost overrun



TRADITIONAL MODULAR

On Site Construction - Modular

Advantages

- Fabricated off site to controlled standards
- Installation times reduced
- Modular components, recessed base, windows, doors
- Controlled quality and standardized detailing
- No dirty trades
- Pre-formed apertures
- Can be fire rated

Disadvantages

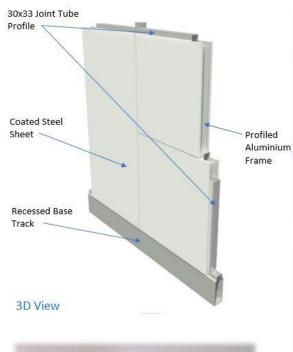
- Lead time 6 to 8 weeks from approval of designs
- Design needs to be frozen, as pre-manufactured sized panels
- Damage requires specialist attention



TRADITIONAL MODULAR

ASGARD CLEANROOM SOLUTIONS

Modular Systems

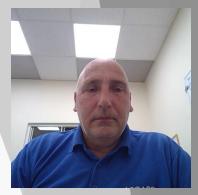












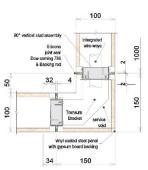
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TRADITIONAL MODULAR

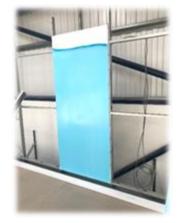
Modular Bi-Panel





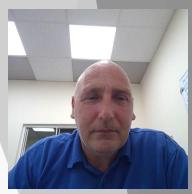












PRE-FABRICATED - PODS/MODULE BUILDINGS

On Site Construction - Pre-Fabricated

Advantages;

- Parallel construction = speed to market
- Predictable timelines.
- Experienced direct employee manufacturing teams.
- Controlled manufacturing environments. assured quality.
- Fixed Labour, materials, installation costs base. Giving Project Cost Reliability.
- Elimination of project cost overrun.
- Elimination of interruptions (e.g., weather).

Disadvantages

- Long lead times
- Changes during fabrication limited
- Spaces and access requirements to position units on site
- Remodeling at a later stage very limited



PRE-FABRICATED MID CONSTRUCTION

ASGARD CLEANROOM SOLUTIONS

Pre-Fabricated Module Buildings & PODS





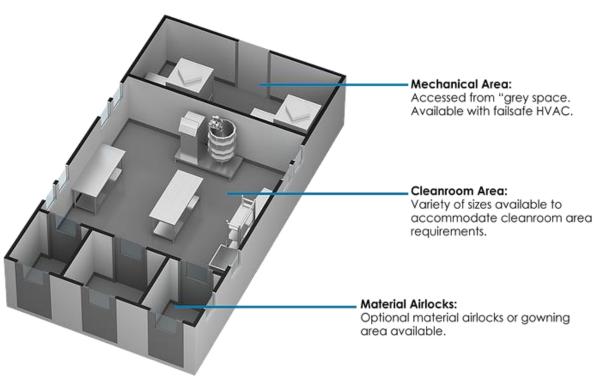


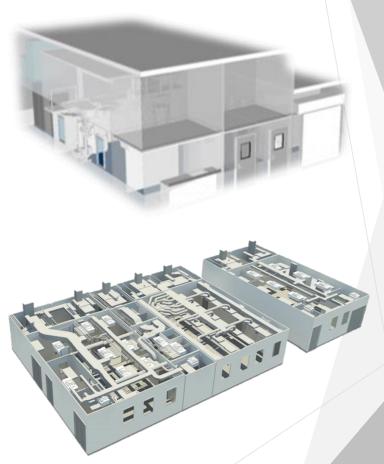


GCON PODS

ASGARD CLEANROOM SOLUTIONS

Prefabricated Buildings (PODS) - GCON Units





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GCON PODS





Project Timelapse



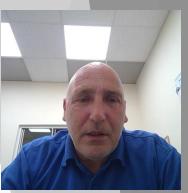
MODUBUILD PRE-FABRICATED - WUXI

ASGARD CLEANROOM SOLUTIONS

Pre-Fabricated Module Buildings For External Application



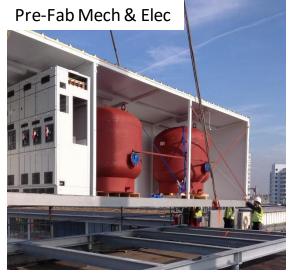




PRE-FABRICATED SKIDS & ENCLOSURES

ASGARD CLEANROOM SOLUTIONS

Examples of some of the pre-fabricated units built to date











SUMMARY

ASGARD CLEANROOM SOLUTIONS

Each of the construction techniques, whether it be stick built, modular of pre-fabricated has its advantages and disadvantages and there is no one solution that fits all.

Stick built is still very popular in some countries, and preferred by some clients too. This method of construction is commonly used and the preferred choice for containment and aseptic suites.

Modular panel solutions are a tried and tested method of construction, with pre-designed solutions and accessories that has been around for considerable time now, newer systems such as bi-panels also have advantages in terms of fire ratings and accessibility to void for introducing additional services or replacing panels due to damage.

Pre-fabricated PODS/modules and skids certainly have their advantages on new build projects due to parallel construction/manufacture being possible.

QUESTIONS AND ANSWERS

ASGARD CLEANROOM SOLUTIONS

TRADITIONAL CONSTRUCTION VS NEW CONSTRUCTION TECHNIQUES, BENEFITS & CONSIDERATIONS FOR A NEW DESIGN APPROACH

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