



The Hadley Steel Frame vs Blockwork

Hadley Group

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Notice

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1. Executive Summary

1.1. Overview

Faithful+Gould (F+G) have been engaged by Hadley Group to compare the cost and programme implications of using their Hadley Steel Frame as an alternative to traditional blockwork in the United Arab Emirates (UAE) construction industry.

The Hadley Steel Frame is used as a secondary structural steel framing system to create the inner leaf of an external building facade. It is an established and recognised product within the construction industry commonly referred to as a Steel Frame System (SFS). The framework can then be insulated and clad both sides with a multitude of other products including but not limited to brickwork, timber cladding, insulated render, rainscreen cladding.

The methodology outlined hereunder was followed to provide a like-for-like cost and programme comparison between The Hadley Steel Frame and traditional blockwork:

- A sample size of 2,000 m² external wall area was selected
- Tendered unit rates for The Hadley Steel Frame and blockwork were obtained from Contract Bills of Quantities (BoQ) and used as a basis for pricing and comparison
- CTBH were engaged by F+G to establish the productivity and programme implications for blockwork which was derived from their previous experience and in-house benchmark data
- The productivity levels of The Hadley Steel Frame were obtained from a recognised industry source, as referenced in Section 8 of this report [1]
- A daily rate of AED 40,000 for Main Contractor Time-Related Preliminaries was used as a basis to quantify the potential cost impact for overall programme implications
- A total cost was calculated which included the supply and installation of the façade as well as the potential cost implications for Main Contractor Time Related Preliminaries if works were on the critical path

1.2. Summary of Findings

The evaluation contained within the body of this report demonstrates that The Hadley Steel Frame is considerably quicker to install compared to blockwork. This may provide a more cost-effective alternative to traditional blockwork, especially on large scale projects where efficiencies increase, and cost savings maybe compounded over larger areas.

However, we note that the magnitude of any potential commercial saving (if any) is largely driven by a shorter overall construction duration rather than a cost per m² for the actual installation which is higher in cost than blockwork. This will vary considerably depending on the project and specific factors which should be taken into consideration when selecting either blockwork or SFS for construction projects.

Furthermore, based upon the research conducted for this report, the following arise as additional key project benefits by using The Hadley Steel Frame external wall solution:

- Reduction of site waste
- Light frame potentially decreases the cost of primary frame
- Assembly on site will be assist in sites with limited access
- Minimization of wet trades on site
- Reduction of embodied carbon
- Reduced delivery requirements
- HSE benefits / less labour





2. Purpose of this Report

The purpose of this report is to evaluate the cost and programme implications of using The Hadley Steel Frame external wall system compared to blockwork within the United Arab Emirates (UAE) construction industry.

3. What is The Hadley Steel Frame?

The Hadley Steel Frame is used as a secondary structural steel framing system to create the inner leaf of an external building facade. It is an established and recognised product within the construction industry commonly referred to as a Steel Frame System (SFS).

The Hadley Steel Frame makes use of C and U sections to form a lightweight steel structural framing solution. The framework can then be insulated and clad both sides with a multitude of other products including but not limited to brickwork, timber cladding, insulated render, rainscreen cladding.

The Hadley Steel Frame is suitable for a range of building types and is used across a range of sectors including; residential, healthcare, education, commercial and industrial.

The system is manufactured in factory conditions which can be delivered to site in as little as 5 weeks [2]. The Hadley Steel Frame is generally delivered on flatbed trucks as individual members and/or panelised frames which are then lifted in bundles directly to the loading bays at each floor level. The bundles would then be distributed to working areas at each floor level where most of the installation is done from the inside of the building.

A range of access strategies can be used for installation including tower cranes, mast climbers, scaffolding and mobile elevating work platforms (MEWPs).







4. Approach to Analysis

4.1. Methodology

The methodology outlined hereunder was followed to provide a like-for-like cost and programme comparison between The Hadley Steel Frame and traditional blockwork:

- A sample size of 2,000 m² external wall area was selected
- Tendered unit rates for The Hadley Steel Frame and blockwork were obtained from Contract Bills of Quantities (BoQ) and used as a basis for pricing and comparison
- CTBH were engaged by F+G to establish the productivity and programme implications for blockwork which was derived from their previous experience and in-house benchmark data
- The productivity levels of The Hadley Steel Frame were obtained from a recognised industry source, as referenced in Section 8 of this report [1]
- A daily rate of AED 40,000 for Main Contractor Time-Related Preliminaries was used as a basis to quantify the potential cost impact for overall programme implications
- A total cost was calculated which included the supply and installation of the façade as well as the potential cost implications for Main Contractor Time Related Preliminaries

4.2. Limitations of Analysis

It is important to note that this evaluation is a theoretical calculation and assumes that the external wall installation is on the critical path and only 1 crew of 3 men were deployed to erect the external wall system for both blockwork and The Hadley Steel Frame.

This evaluation methodology has its limitations and does not take into consideration the uniqueness of a construction project, which will impact the findings of this report and affect the direct comparison between the Hadley Steel Frame and blockwork. This may include but not limited to the following:

- Location
- Number of crews deployed for external wall installation
- Magnitude, shape, buildability and complexity of project
- Access constraints
- Supply chain capacity and availability of labour, plant and materials
- Skills of labour
- Programming and critical path
- Structural design
- Potential for repetition of panels
- Panel sizes

F+G's study has been based on data and information specific to the United Arab Emirates (UAE) which was current at Q4 2019. Our analysis does not consider any future inflationary pressures, changes in legislation, changes in manufacturing costs, regional price variances or the like which may have an impact on the supply and installation of The Hadley Steel Frame or blockwork.

This study also excludes the potential cost and/or programme impact to the wider structural design including impact to foundations for using The Hadley Steel Frame in lieu of blockwork. However, it should be noted that this may provide further commercial benefits to a project due to the light weight nature of The Hadley Steel Frame and potentially reduced load on the foundations and structure.





No specific consideration is given to any impact on the thermal and/or acoustic performance of The Hadley Steel Frame or blockwork and excludes any comparison in life cycle costs of each material component.

Our analysis does not consider the cost and/or the programme impact for the external leaf such as brickwork, timber cladding, insulated render, rainscreen cladding or the like. This report provides a direct comparison against The Hadley Steel Frame and blockwork acting as the inner leaf only.

5. Cost & Programme Analysis

5.1. Productivity Comparison

The data used for this study is summarised hereunder:

- The Hadley Steel Frame installation by 1 crew of 3 men 258 m² per week productivity [1]
- Block work installation by 1 crew of 3 men 90 m² per week productivity

In a typical week with 1 crew of 3 men, The Hadley Steel Frame is quicker to install compared to traditional blockwork and can offer up to 168 m² greater wall coverage. This may result in a reduced overall construction duration; however, this is project specific and largely dependent on the critical path.

As can be seen within Table 2, our findings show that The Hadley Steel Frame is 14 weeks quicker to install 2,000 m² external wall area compared to traditional blockwork.

Ref	Description	Weeks	Days	Variance (%)
А	The Hadley Steel Frame	8	54	187%
В	Blockwork	22	156	

Table 2: Productivity Table

Based on the above calculation and evaluation methodology the potential benefits of using The Hadley Steel Frame system in lieu of the traditional blockwork is summarised hereunder:

- Speedy weather tightness
- Early commencement of internal fit out works
- Increased float within tasks not on the critical path
- Early handover to the Employer who could start to generate income and/or occupy the building

5.2. Cost Comparison

F+G have used their in-house benchmark data and previous project experience to price The Hadley Steel Frame and 250mm thick external blockwork.

The number of days used to calculate Time-Related Main Contractor Preliminaries has been based on potential programme implications outlined within Section 5.1 of this report.





Our findings are summarised hereunder:

The Hadley Steel Frame						
Ref	Description	Unit	Quantity	Rate	Amount (AED)	
A	SFS system, including 2 layers of 15mm gypsum plaster board, 15mm cement board, 200mm thick sundry installation fitted between studs, rigid insulation boards fitted on concrete surfaces, compressible jointing filler, sealants and all necessary accessories to complete	m²	2,000	252	504,000	
В	B Time-related Main Contractor Preliminaries required to carry out associated Works		54	40,000	2,170,543	
С	Total Cost of The Hadley Steel Frame				2,674,543	

Table 3: The Hadley Steel Frame Cost Summary

Blockwork						
Ref	Description	Unit	Quantity	Rate	Amount (AED)	
А	250mm thick blockwork for external walls	m²	2,000	195	390,000	
В	Time-related Main Contractor Preliminaries required to carry out associated Works	day	156	40,000	6,222,222	
С	Total Cost of Blockwork System				6,612,222	

Table 4: Blockwork Cost Summary

5.3. Summary of Findings

The BoQ unit rate per square meter for the Hadley Steel Frame is 29.23% more than the blockwork unit rate. This is to be expected due to increased cost of material and skilled labour required to carry out the manufacturing, supply and installation of the system.

There is a potential saving in Main Contractor Time Related Preliminaries when using The Hadley Steel Frame compared to traditional blockwork. The magnitude of this potential cost saving (if any) is largely driven by a shorter overall construction duration. This will vary considerably depending on the project and specific factors including; overall size and complexity, access, site logistics, critical path and planning, availability of trained resource, number of crews. This should be taken into consideration when selecting either blockwork or SFS for construction projects.

In this study, based on the methodology outlined within Section 4.1, our findings show that only if the wall system is on the critical path does, The Hadley Steel Frame offer a more cost-efficient solution compared to blockwork. Result may be intensified on large scale projects where there is potential for improved efficiencies.





6. Further Considerations

6.1. Premable

This section of the report covers winder implications of using SFS in lieu of blockwork as the external wall system. The points raised within this section extend beyond the limits of our study and have been compiled using recognised industry sources as referenced throughout the report.

6.2. Wastage Performance

SFS can be repeatedly reused and recycled without losing its qualities as a building material. This unique characteristic gives all steel a high economic value at all stages of its life cycle which, unlike some other construction materials, ensures that it is routinely recovered and reused. [3]

Table 5 summarizes the findings of a study conducted in 2015 which compares the wastage amount by weight for blockwork and SFS:

Ref	Description	Amount of material used (kg)	Wastage (%)
А	Dense concrete blockwork	3295.44	20%
В	SFS Framing	112.11 / 126.85	1%

Table 5: Wastage Rates [1]

The results show that there is 95% less wastage for an SFS wall solution compared to traditional blockwork. The main reason being is that SFS is supplied already cut to length which minimizes wastage from offcuts. Offcuts can re-enter the production process rather than being cast away as waste.

6.3. Emodied Carbon

In very simple terms, embodied carbon assessments involve the multiplication of quantities of construction products and materials (generally on a weight basis) with embodied carbon coefficients or carbon emission factors. Quantities are generally derived from a 'take off' from construction drawings or directly from Bills of Quantities. [3]

Table 6 summarizes the findings of a study conducted in 2015 which compares the embodied carbon for SFS and blockwork:

Ref	Description	Carbon intensity (kg/CO ₂ /kg)	Weight (kg)	Embodied carbon of element (kgCO ₂)
А	Dense concrete blockwork	0.10	32.95	329.54
В	SFS Framing	1.37	112.11 / 126.85	153.59 / 173.78

Table 6: Carbon Intensity Results [1]

The results show that the SFS system has a higher carbon intensity by mass compared to dense concrete blockwork. However, SFS has much less mass of material compared to dense concrete blockwork resulting in a much less embodied carbon calculation.





6.4. Flexibility and Adaption

SFS external wall systems are easily adaptable if the configuration of the building needs to change. The steel frame itself can be easily adapted, with parts added or taken away, and its light weight means that extra floors can often be added without overloading existing foundations. [3]

6.5. Lorry Deliveries

The SFS wall solution is generally delivered to site in engineered component parts spanning long distances which means that lorries can be loaded much more efficiently and hold a greater area of material compared to blockwork. A recent study conducted in 2015 suggest that SFS requires up to 25 times less lorry deliveries to site compared to blockwork. This would inevitably have a positive impact on site logistics, traffic management, Health & Safety and the environment. [1]

7. Summary

The evaluation contained within the body of this report demonstrates that The Hadley Steel Frame is considerably quicker to install compared to blockwork. This may provide a more cost-effective alternative to traditional blockwork, especially on large scale projects where efficiencies increase, and cost savings may be compounded over larger areas.

However, we note that the magnitude of any potential commercial saving (if any) is largely driven by a shorter overall construction duration as a result of the work being on the critical path. This will vary considerably depending on the project and specific factors including; overall size and complexity, access, site logistics, critical path and planning, availability of trained resource, number of crews. This should be taken into consideration when selecting either blockwork or SFS for construction projects.

Furthermore, based upon the research conducted for this report, the following arise as key project benefits by using The Hadley Steel Frame external wall solution:

- Hadley Group | Faithful+Gould
- Competitive cost (subject to overall programme savings)
- Due to increase in speed of construction, building envelope can be closed quicker to protect against weather and early commencement of the fit-out (subject to number of crews and productivity levels)
- Suited to large scale projects, and/or high-rise developments Reduction of site waste
- Designed for fast construction
- Light frame potentially decreases the cost of primary frame Assembly on site will be assist in sites with limited access Minimization of wet trades on site
- Reduction of embodied carbon Reduced delivery requirements Improved HSE





8. References

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- [2] R. Marsh, Interviewee, Regional Sales Manager. [Interview]. 27 October 2019.
- [3] Steel construction info, "steel construction info," [Online]. Available: https://www.steelconstruction. info/Sustainability. [Accessed 30 October 2019].





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