



Corporate Presentation

July 2020

About FBR

- **FBR** designs, develops, builds and operates dynamically stabilised robots enabled by the Company's 100% owned and invented core **Dynamic Stabilisation Technology™ (DST™)**
- **DST™** combines unique spatial metrology laser technology with algorithms and mechanical componentry to compensate for dynamic interference and movement in real time
- FBR's first **DST™** enabled product is the **Hadrian X®** construction robot with proprietary digital construction software and optimised smart block and wall system using industrial adhesives rather than mortar
- Initial target market - low-rise construction sector to improve productivity, reliability, waste, safety, accuracy, reduce cost and address labour market trends. **Addressable market estimated to be in excess of AU\$500bn** per year with no direct robotic competition
- Additional **DST™** enabled products in development pipeline

Servitisation and digitalisation of the construction industry



Why FBR?

- **Hadrian X®** builds from a 3D CAD model with an exact bill of materials, **producing far less waste than traditional construction methods**
- **Hadrian X®** is an end-to-end solution, making construction sites **far safer** and allowing **operators to work to an older age**
- **Hadrian X®** is capable of **building the walls of a standard house in as little as a day**, with full transparency of the project plan before commencement to alleviate chronic delays and housing shortages
- **Hadrian X®** increases **productivity** of existing and future labour force



Why Now?

- **COVID-19** has accelerated the focus globally for countries to **cease relying on imported labour** and reduce their reliance on local manual labour
- There are 1.6 billion people **without adequate housing**
- The population will **grow by 2 billion** over the next 30 years
- **165 people are killed in an accident globally** every day in the construction industry, with 35 workers injured in Australia per day
- There has been **no developments in bricklaying technology** in the last 100 years
- The available **bricklaying labour force is decreasing** whilst the **cost of that labour is increasing**
- Improvements in lasers, computers and firmware have made **outdoor construction robotics now a reality**
- Building an average house by **traditional methods generates 17m³ of waste**. The world needs sustainable practices to reduce the environmental impact of construction
- There are **2.4 million robots operating commercially indoors** in manufacturing and **one robot operating commercially outdoors** in construction, the **Hadrian X®**

12 Month Highlights

- ✓ Built first walls of a residential house to be used as a display home in Dayton, Western Australia, using the **Hadrian X®** in July 2020
- ✓ Achieved commercial peak lay speed of over 200 blocks per hour (more than 2,200 standard brick equivalents per hour) with **Hadrian X®**
- ✓ Completed 12 demonstration house builds in pilot programs with Australian residential builders Archistruct and Summit Homes using the **Hadrian X®**
- ✓ Signed North American building pilot programme with **GP Vivienda**
- ✓ Obtained Australian National Construction Code certification for the Fastbrick Wall System™
- ✓ Completed cost rationalisation program in response to COVID-19, significantly increasing cash runway for commercialisation phase
- ✓ Entered commercialisation phase for **Wall as a Service® (WaaS®)** in Australia and globally in preparation for easing of COVID-19 restrictions in 2021



Hadrian X® completes its first house build in a residential development.



Core Proprietary Technology

DST™

- Traditionally robotics has been used indoors in controlled, stable and static environments to perform repetitive tasks. E.g. car manufacturing
- Outdoors, robots are exposed to unpredictable and continuously changing interference such as wind, vibrations, changing machine motions and thermal variation
- **Dynamic Stabilisation Technology™ (DST™)** is a highly accurate system that continuously adjusts the position of a robot's end effector to ensure it is always held stably at the correct point in 3D space
- Advances in computing and lasers over the last decade have enabled **DST™** to become technically and commercially possible
- **FBR** has developed proprietary software to calculate and extract block data from multiple building design file formats and sources and create wall data sets for the **Hadrian X®** robot
- **When FBR's DST™ is combined with FBR proprietary software it enables robots to work outdoors in unstable unpredictable environments and perform bespoke tasks, not just repetitive ones**

Sustainability and optimisation

Hadrian X[®] creates a positive impact in the construction industry

- Faster, cheaper, safer, less waste
- Drives more sustainable demand for masonry product
- Extends working life of manual bricklayers
- Lowers cost of sustainable, high quality brick housing, presenting a possible solution to reduce social issues like homelessness

Up to **10% of brick/blocks** are wasted in manual bricklaying from:

- Overordering
- Logistics and handling
- Cutting bricks onsite

This is equivalent to up to **A\$15 billion** waste in the A\$175 billion of global brick/blocks produced and sold per year

Hadrian X[®] could save **more than half** of this global brick/block waste per year

Highly accurate construction allows for parallel manufacture of house components such as door frames, window frames and roof trusses, assisting a structure to get to lockup stage much quicker than with traditional manual bricklaying methods where additional measuring is required

Automating the dull, dirty and dangerous job of bricklaying





Intellectual Property

- FBR’s proprietary Hadrian X[®], DST[®] and Fastbrick Wall System[™] technology is protected by a broad and expanding portfolio of intellectual property rights in key markets including Australia, USA, Europe and the GCC region
- FBR’s global IP portfolio comprises:
 - 29 patent families
 - 145 patent applications (16 granted)
 - 60 design applications/registrations
 - 85 trademark applications/registrations
- In 2019, FBR was the third highest resident corporate filer of patent applications in Australia
- FBR has recently secured grant of patents in the United States covering the Hadrian X[®] machine and associated boom delivery system
- New IP is currently being developed around advanced metrology solutions for outdoor robotics and enhancements to the Hadrian X[®]

First Display Home Build

- The first display home built by an end-to-end autonomous bricklaying robot anywhere in the world completed in Dayton, a residential suburb in Western Australia
- Site was bordered by seven occupied homes
- 3 bed x 2 bath – 2,991 Blocks measuring 390mm x 230mm x 90mm (13,759 Standard Brick equivalents (SBE))
- Average lay speed (during up time) was 146 blocks per hour or 671 SBEs per hour
- Repeated peak lay speed during Dayton display home build was 192 blocks per hour or 882 SBEs per hour, achieved several times over the course of the build
- If using FBR's double width external F Blocks, average lay rate would be equivalent to 1,620 SBE/hour, with peak lay speed equivalent to 2,130 SBE/hour
- Block wastage was less than 1/5 of a house built using traditional bricklaying methods
- Operated in light rain and in dark/low light conditions
- **One of the most significant and historic achievements in the field of construction robotics**



Example Hadrian X[®] Economics in Australia

The larger the block used, the more economical the Hadrian X[®] becomes and the greater the benefit passed on to WaaS[®] customers

Manual Bricklaying Metrics

	Standard clay maxibrick 305 x 162 x 90mm		
Manual maxibrick laying speed (blocks/hour/person)	Times faster than a manual individual bricklayer	Cost of wall (laying only) \$/sqm	Standard double brick houses built per year
42	1x	\$24 - \$48	10

Hadrian X[®] Metrics

	Concrete block used in Dayton Build 390 x 230 x 90mm		
Example Average Hadrian X laying speed (blocks/hour)	Times faster than a manual individual bricklayer	Cost of wall (laying only) \$/sqm	Standard double brick houses built per year
125	5x	\$48	59
250	10x	\$25	119
500	20x	\$14	237
1,000	41x	\$8	474

	Fastbrick Wall System External F Block - 490 x 230 x 240mm Internal F Block - 490 x 230 x 115mm		
Times faster than a manual individual bricklayer	Cost of wall (laying only) \$/sqm	Standard double brick houses built per year	
9x	\$26	109	
19x	\$14	219	
38x	\$8	438	
76x	\$5	877	

These costs are direct laying costs and exclude all the other ancillary benefits delivered to the customer by the Hadrian X[®] relating to safety, speed, accuracy and waste improvements

Key assumptions:

Hadrian X[®] manufacturing cost at scale: \$1 million

Hadrian X[®] crew: 2 people per 12 hour shift

Hadrian X[®] useful life: 12 years

Number of 12 hour shifts per year for Hadrian X[®]: 252

Hadrian X[®] maintenance and fuel cost per year: \$175,000

Hadrian X[®] laying cost excludes corporate overheads

Standard double brick house has 351 vertical sqm of wall (237m² internal facing and 114m² external facing)

Manual bricklayers work in a crew of three (two bricklayers and one labourer). Crew lays 1,000 maxibricks per eight-hour day. Equivalent to 108 standard bricks per hour per person

Manual maxibrick laying cost, taking one to two weeks (laying only) would be \$24-\$48/sqm wall laid, with the range dependent upon at which point in the supply and demand cycle the laying occurs

Hadrian X[®] average laying speeds are examples only

Hadrian X[®] Example

- An Australian builder wants to build a single storey double brick house comprised of 351 vertical square metres of wall (237m² internal facing and 114m² external facing)
- The builder can choose between a manual bricklaying crew consisting of two bricklayers and a labourer, or a Hadrian X[®] laying an average of 250 F Blocks per hour
- The job starts on a Monday and there is no work on weekends
- Manual bricklaying cost is at the midpoint of the cycle

	Manual bricklaying crew	Hadrian X [®]
Elapsed time	11 days	1 day
Cost (laying only)	\$12,632	\$4,861
Blocks wasted	500 (one skip bin)	<20 (removed from site by Hadrian X [®])

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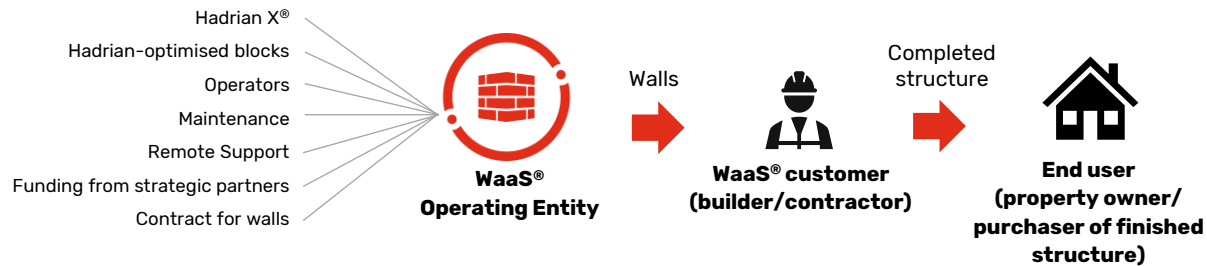
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Commercial Strategy



- FBR's commercial strategy is to create **Wall as a Service® (WaaS®)** operating entities around the world that deliver erected walls on demand to customers (builders, contractors, government bodies etc)
- Global WaaS® operating entities will be rapidly scaled by allowing strategic partners to buy in to the WaaS® operation in that region. Funds from strategic partners will be used to procure more Hadrian X® robots
- 100% ownership and control of global intellectual property and global commercial opportunity gives FBR monopoly position as the only enabling technology for autonomous brick and block wall construction
- WaaS® Operating Entities to utilise FBR's IP and Hadrian X® to supply and build digitally designed wall structures for customers onsite, quickly, safely and economically
- Limited FBR shareholder dilution and minimal FBR capital requirements through access to external capital and strong balance sheets via strategic partnerships
- FBR has initial control over Hadrian X® product, supply chain, operation, maintenance and brand reputation during scaling period

How does WaaS® Work?

- WaaS® is the servitisation and digitalisation of the old way of selling bricks and bricklaying labour separately
- WaaS® is sold as a fixed price single delivered service to customers
- The WaaS® operating entity supplies the blocks and robotically constructs walls onsite to the precise specification of a digital architectural plan
- WaaS® allows customers to access the benefits of robotic construction such as improvements in speed, accuracy, safety and waste, without having to build robotics capability into their businesses
- The benefits of the Hadrian X® methodology and output improve commerciality of brick and block structures, helping manufacturers to sell more blocks and compete against alternative building products and methodologies
- WaaS® provides a digitalisation and software driven pathway for house construction and completion, and enables more efficient and certain scheduling for customers, who can organise subsequent trades based on single data source service provision
- The end user (e.g. a homebuyer) receives delivery of higher quality structure quicker, as well as other flow-on benefits of digital construction

Hadrian X®

The world's first fully autonomous, end-to-end bricklaying robot

Operators

Trained in operation of the Hadrian X® construction robot

Maintenance

Regular check-ups to ensure Hadrian X® is operating at peak efficiency

Remote Support

*Ability to offer **support off-site** to assist with scalability of global operations*

Hadrian-optimised blocks

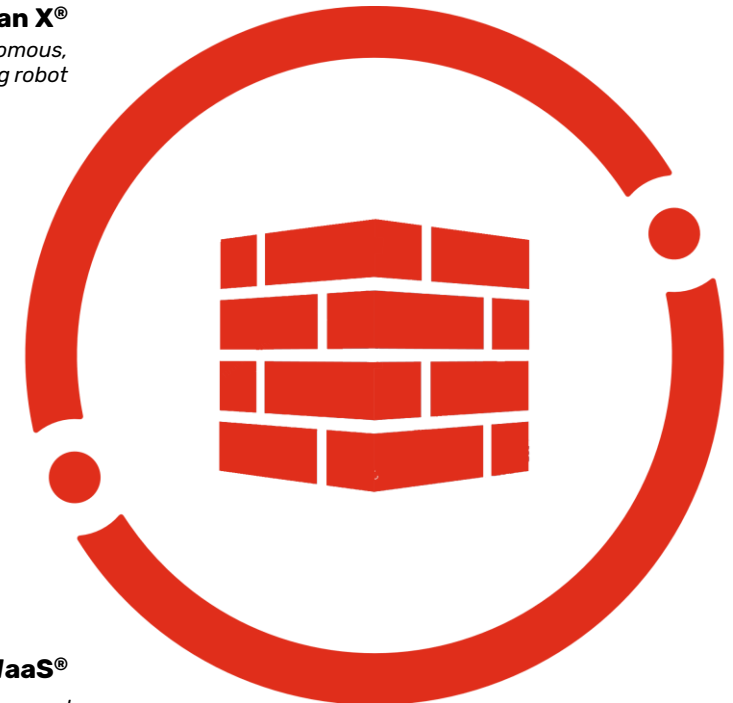
Provided by brick and block manufacturers, designed to maximise the benefits of Hadrian X®

Funds from Strategic Partners

Funding in regional WaaS® operating entities used to procure Hadrian X® robots

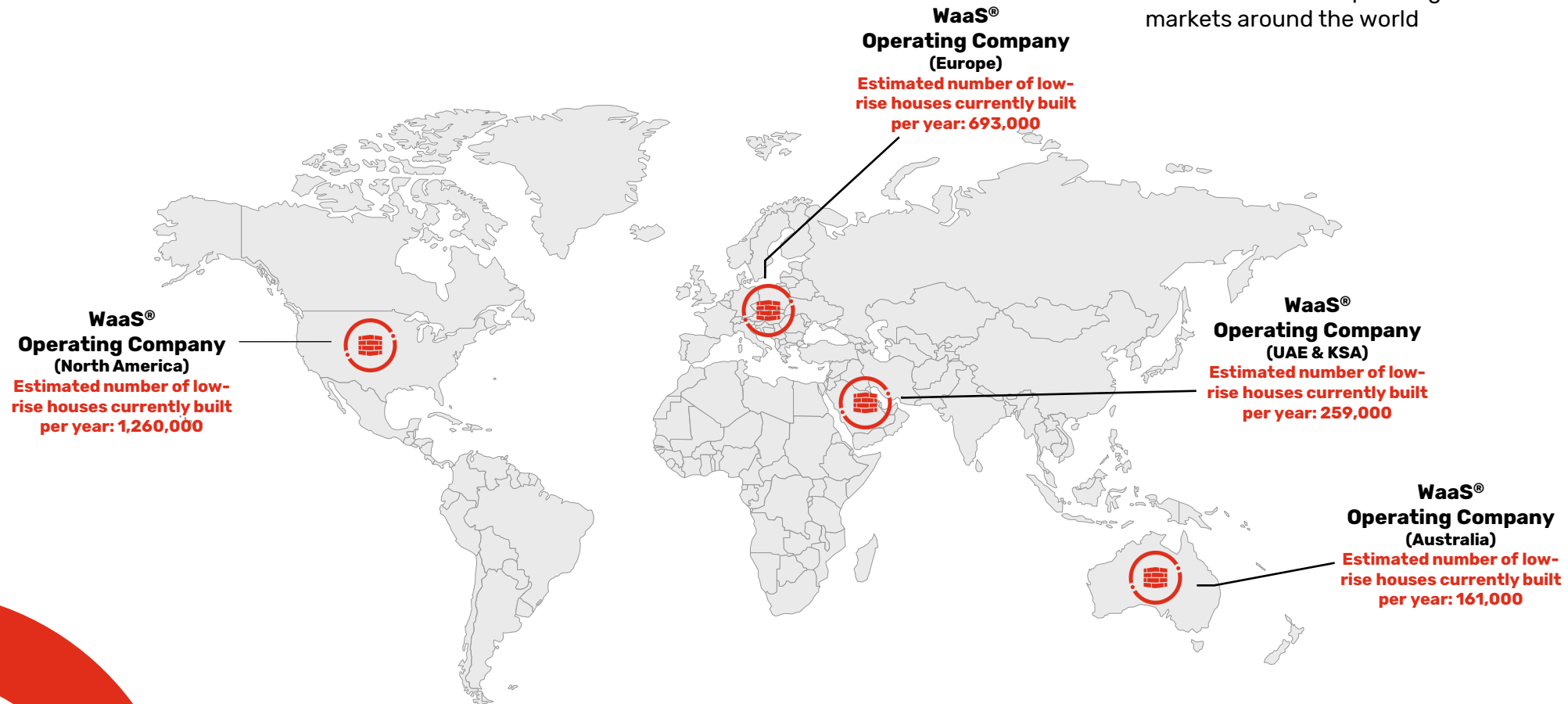
Contract for WaaS®

*Agreed with **WaaS® customers** to supply square metres of wall at a fixed rate*



Wall as a Service® Target Markets

Wall as a Service® operating entities to be established in key target markets around the world



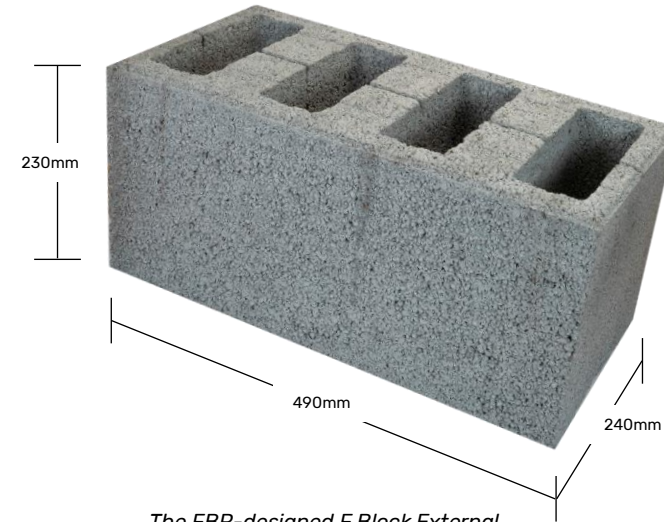
Global Brick/Block Construction Market

Global brick/block construction market is approximately 1,400 billion bricks per year which FBR estimates is in excess of A\$1,500 billion per year to supply and lay

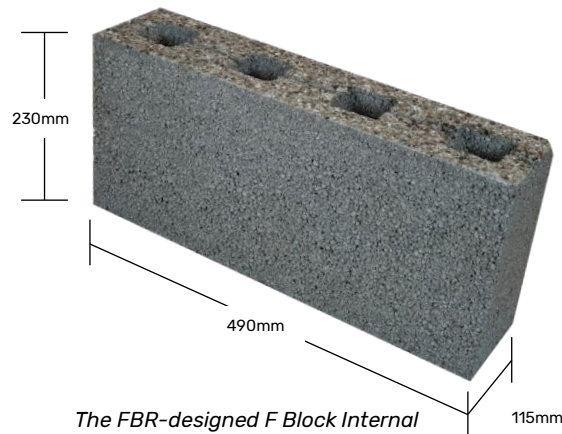
The global brick/block low-rise construction market is approximately 525 billion bricks per year which FBR estimates in excess of **A\$500 billion per year** to supply and lay

To address this low-rise market, an independent study indicated a market size equivalent to approximately **90,000 Hadrian machines**

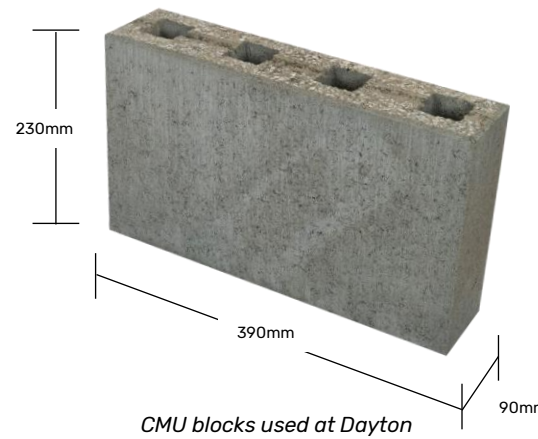
An estimated 875 billion bricks per year are used in medium and high rise construction



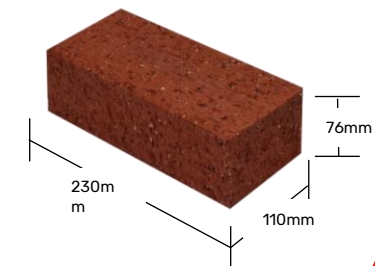
The FBR-designed F Block External



The FBR-designed F Block Internal



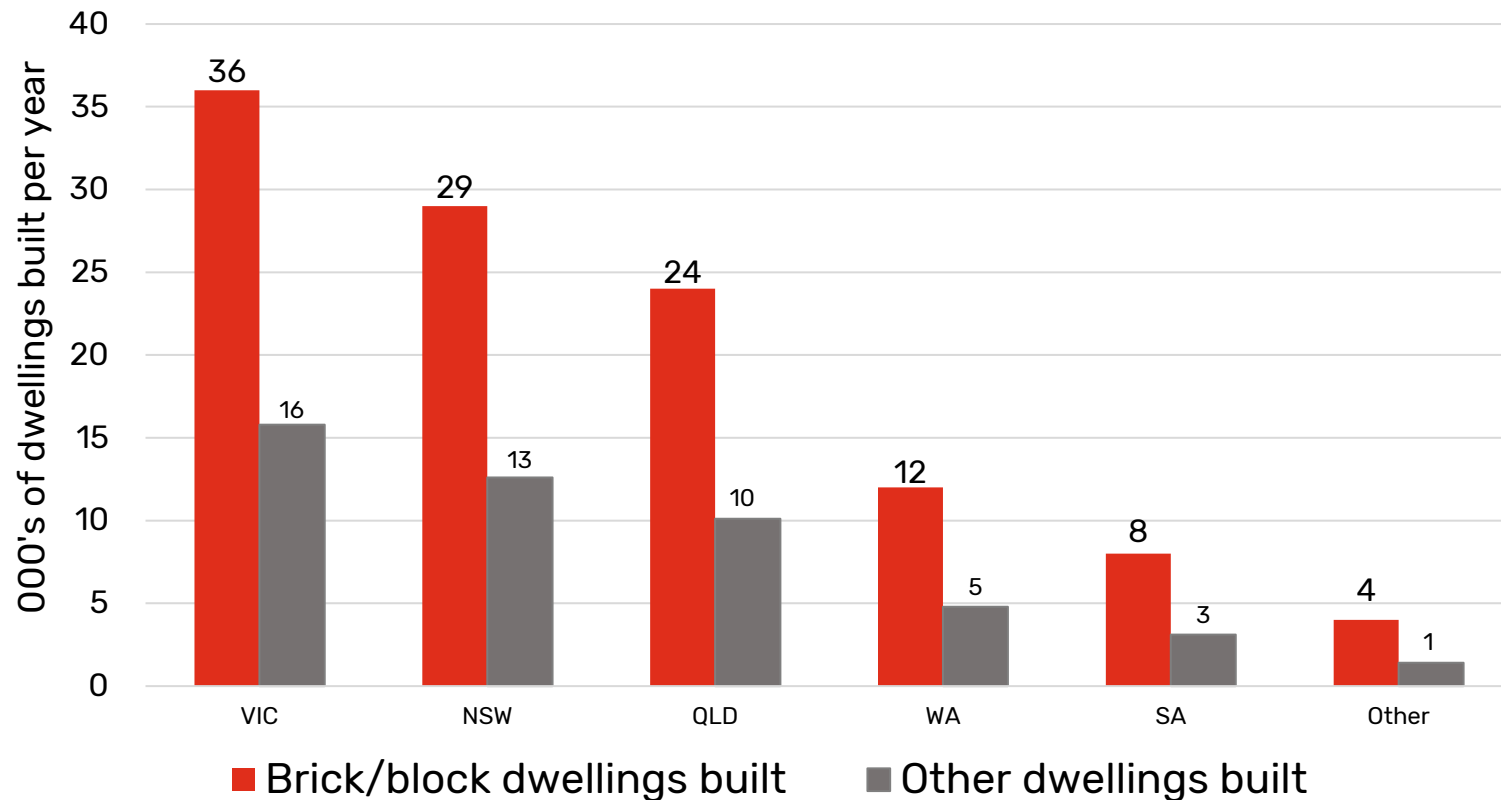
CMU blocks used at Dayton



A standard brick

Australian Market - Existing

Australians dwellings built per year: ~161,000 (pre COVID-19).
Of these, 113,000 are built fully or partially with brick/blocks.



The total value of all Australian low rise residential construction each year is approximately \$2 billion, more than three quarters of which relates to brick and block construction

Next 12 Months for FBR

- First build of a commercial (non-residential) structure for an end user in Australia using current **Hadrian X® 109**
- Build further residential homes for builders in Western Australia using **Hadrian X® 109**
- Continue to improve the base model **Hadrian X® 109** to achieve maximum productivity and therefore commercial competitiveness from existing architecture
- Complete Pilot Programs for overseas customers
- Prove commercial competitiveness of the next upgraded iteration of Hadrian X®, the **Hadrian X® 109+**, in the real world by:
 - Completing first testing of **Hadrian X® 109+** in Q1 2021
 - Demonstrating a commercial sustained lay speed of over **200 blocks per hour** over the course of a complete residential house build and a peak laying rate of over **240 blocks per hour**
 - Reducing team size on site down to **three people**
 - Completing Human Machine Interface (**HMI**) to simplify operation
 - Establishing **remote support** centre
- Establish WaaS® operating entities in Europe, North America, United Arab Emirates & Saudi Arabia in preparation for deployment
- Achieve certification of Fastbrick Wall System™ in Europe, North America, United Arab Emirates & Saudi Arabia
- Complete design for next **Hadrian X®** model, the **Hadrian X® 110**, in preparation for scalable manufacture
- Establish manufacturing plan and confirm **Hadrian X® 110** manufacturing supply chain
- Initiate market entry strategy in Europe, North America, United Arab Emirates & Saudi Arabia, including selection of strategic partners, in anticipation of COVID-19 situation easing



FBR Corporate Snapshot

Current capital structure

Ordinary shares on issue	1,798m
Average volume (last 3 months)	9.67m
Gross cash (30 June 2020)	\$5.1m
Net R&D tax refund receivable after \$2.8m advance	\$1.2m+
Market capitalisation (31 July 2020)	\$119m
Shareholders (31 July 2020)	13,608

Corporate

\$100 million invested into technology over 10+ years
44 employees over 4 continents
Engineering facilities established in Western Australia
Global commercial opportunity – 100% owned
Global IP – 100% owned, no royalty obligations

Directors & Key Executives

Richard Grellman	Non-Executive Chairman
Grant Anderson	Non-Executive Director
Mike Pivac	Executive Director – MD & CEO
Mark Pivac	Executive Director – CTO
Aidan Flynn	CFO
Jonathan Lawe-Davies	General Counsel
Harald Apfelthaler	Engineering Manager

Top Shareholders

Mark Pivac (Founder)	15.8%
FIL Limited	9.3%
Mike Pivac (Founder)	4.3%
M&G	4.0%
Brickworks	1.7%

Video Resources

Display Home Build Series

FIRST OUT THE GATE



<https://youtu.be/QPqC0IVnl38>

HADRIAN X ARRIVES ON-SITE



<https://youtu.be/jiP04nMnbeE>

FUTURE OF THE CONSTRUCTION INDUSTRY



https://youtu.be/_2myP3tvvGM

UNLEASHING HUMAN POTENTIAL



https://youtu.be/UI_wL5zdGCc

HADRIAN X COMPLETES WALLS OF FIRST DISPLAY HOME



<https://youtu.be/37MMpZ0ea3I>

Display Home Build Overview

A DIGITAL CONSTRUCTION JOURNEY



<https://youtu.be/HYsWbDA0xlc>

FBR Technology Series

THROWBACK THURSDAY with Mark Pivac



<https://youtu.be/2sESnCm9p64>

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