PPVC & DfMA as a game-changing opportunity for residential projects in Romania

INDEX

Why PPVC? Benefits

TIME:

MANPOWER:

SAFETY ON SITE:

QUALITY:

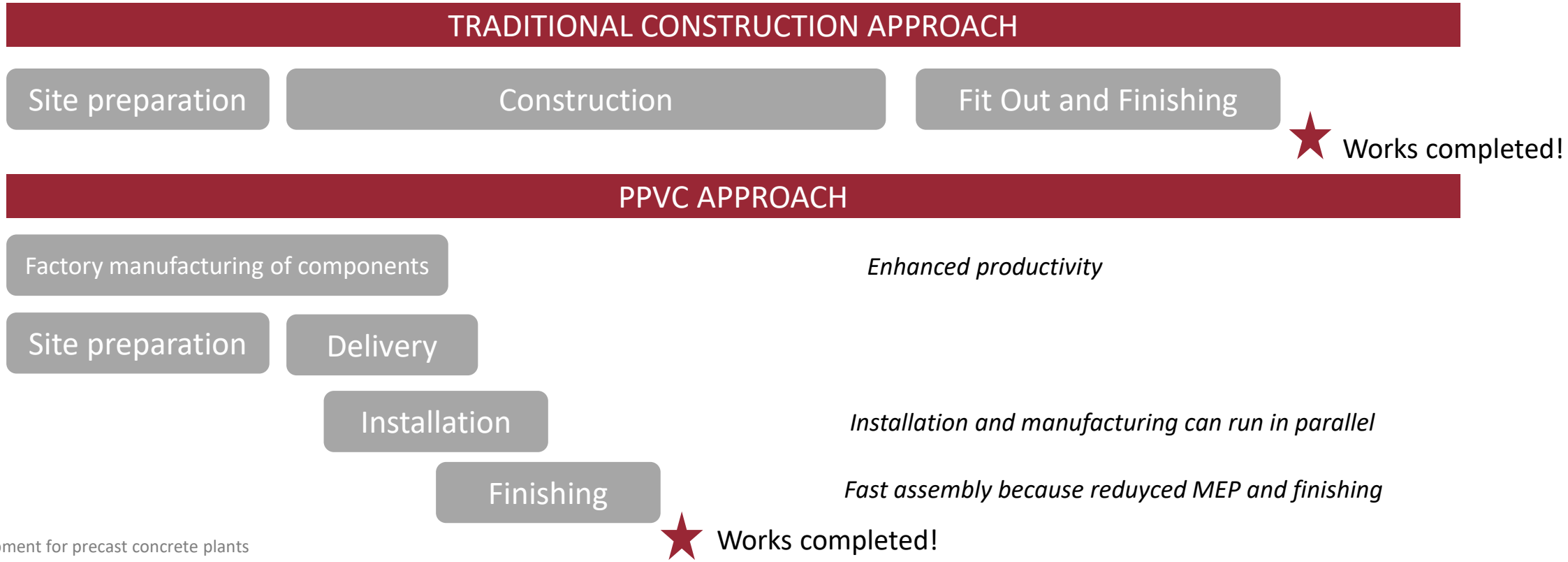
ENVIRONMENT FRIENDLY:

FLEXIBILITY:

Although there is a limited experience in PPVC projects demolition it is expected that these modules can be ‘easily’ detached and demolished. The flexibility also enables a building to undergo future addition and alteration works with ease.

Why DfMA and PPVC?

- The combination of DfMA and PPVC is nowadays one of the most game-changing technologies in construction.
- Complete modules made of multiple units with internal finishes, fixtures and fittings are manufactured in factories, and are then transport to site for installation in a leg-like manner.



Projects where DfMA and PPVC are not applicable technologies

- 10:80:10 principle states that for any project:
  - 10% relates to anomalies (site layout, ground conditions, etc)
  - 80% of the project can be standardised in some way
  - 10% related to enhancements over and above the standard specification.

Before stating that your residential Project is not suitable for DfMA and PPVC are not applicable technologies stop and remember the 10:80:10 principle.

PPVC Technological Benefits

Welded mesh

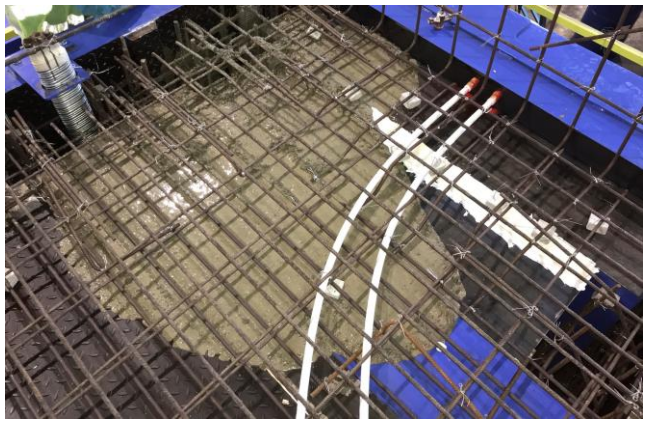
welded mesh

- Reduced Steel usage
- Reduce wastage in Steel
- Precise dimensions
- Standardization

PPVC Technological Benefits

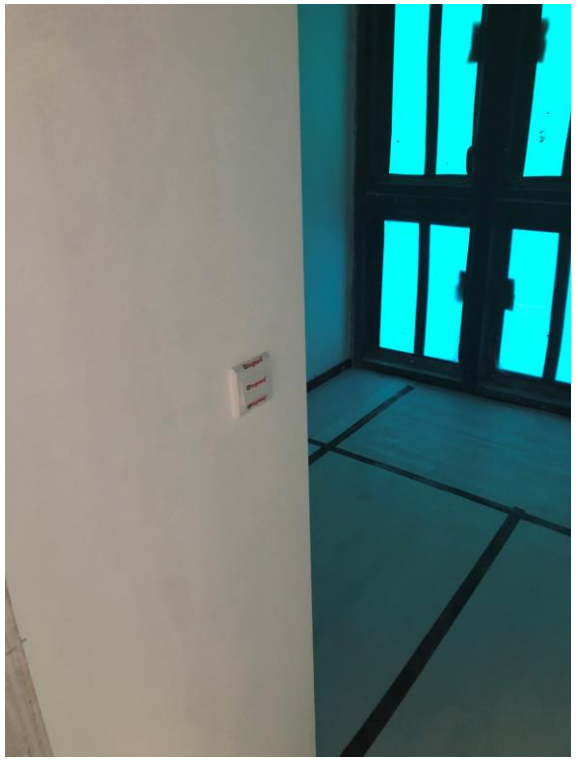
Welded mesh

MEP conduits & installation



MEP conduits & installation

- Standardization of design
- Reduces labour cost
- No cutting & chasing
- Accurate tapping points



PPVC Technological Benefits

Welded mesh

MEP conduits & installation

window & door

window & door

- Precise dimension
- Anticipated procurement during design
- Off-site installation

PPVC Technological Benefits

- Welded mesh
- MEP conduits & installation
- window & door
- pouring & casting

pouring & casting

- Finishing
- No plastering needed
- No screeding required

PPVC Technological Benefits

- Welded mesh
- MEP conduits & installation
- window & door
- pouring & casting
- moulding

moulding

- Reconfigurable
- Adjustable
- Digital Mock-up

PPVC

CRITICAL SUCCESS FACTORS	PPVC AND DfMA ANSWER
Economies of Scale • Single Large Project or • Standardized multi-location projects	• Scalable • Minimal dependency on Labour
Standardized • Modular Units • Modular Building Footprint • Modular Approvals	• Modular Technology made for Standardization • Can do large Projects fast • Can do Multi-location with relocatable Casting Yard.
Repeatable Quick Turnaround	• Manufactured Product Approach • Guaranteed Delivery
Minimum inventory	Can be adjusted to Sales Velocity

DfMA

Finance / Progress Payment

- Traditional approach in the form of Progress Payment by mean of invoicing by percentage of completion is probably not an option for PPVC as a big amount of the investment is done in advance before erection on site.

- To overcome this situation advance payment and subsequent full payment when the modules are delivered on site and installed. This arrangement should help alleviate downstream payment issue.

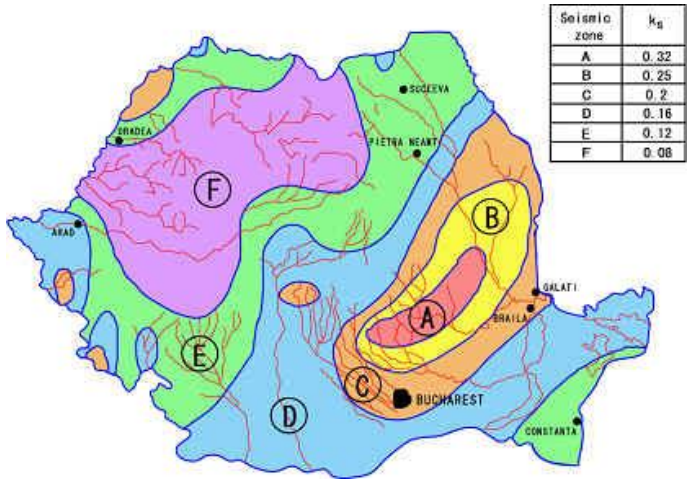
    - Owners will need to be more financially prepared and ready in the early stages of the project.
    - The contactor should be ready to provide appropriate insurances and indemnity against any loss or damages to the PPVC modules.

Seismic improvement

- Singapore seismic requirements are satisfied by using PPVC as a construction methodology.

- PPVC buildings seismic behaviour is to be controlled by mean of proper design of the joints between modules.

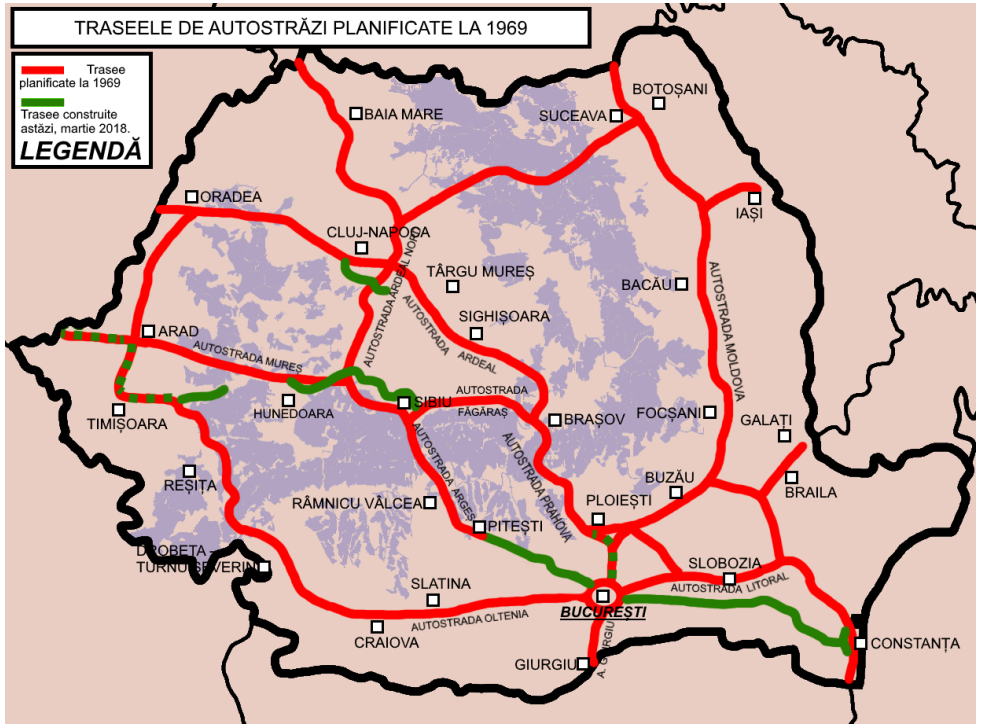
- Possibility to adapt the behaviour of the building by controlling the ‘stiffness’ of the joints achieving different modes for buildings constructed with the same modules but with different joints.



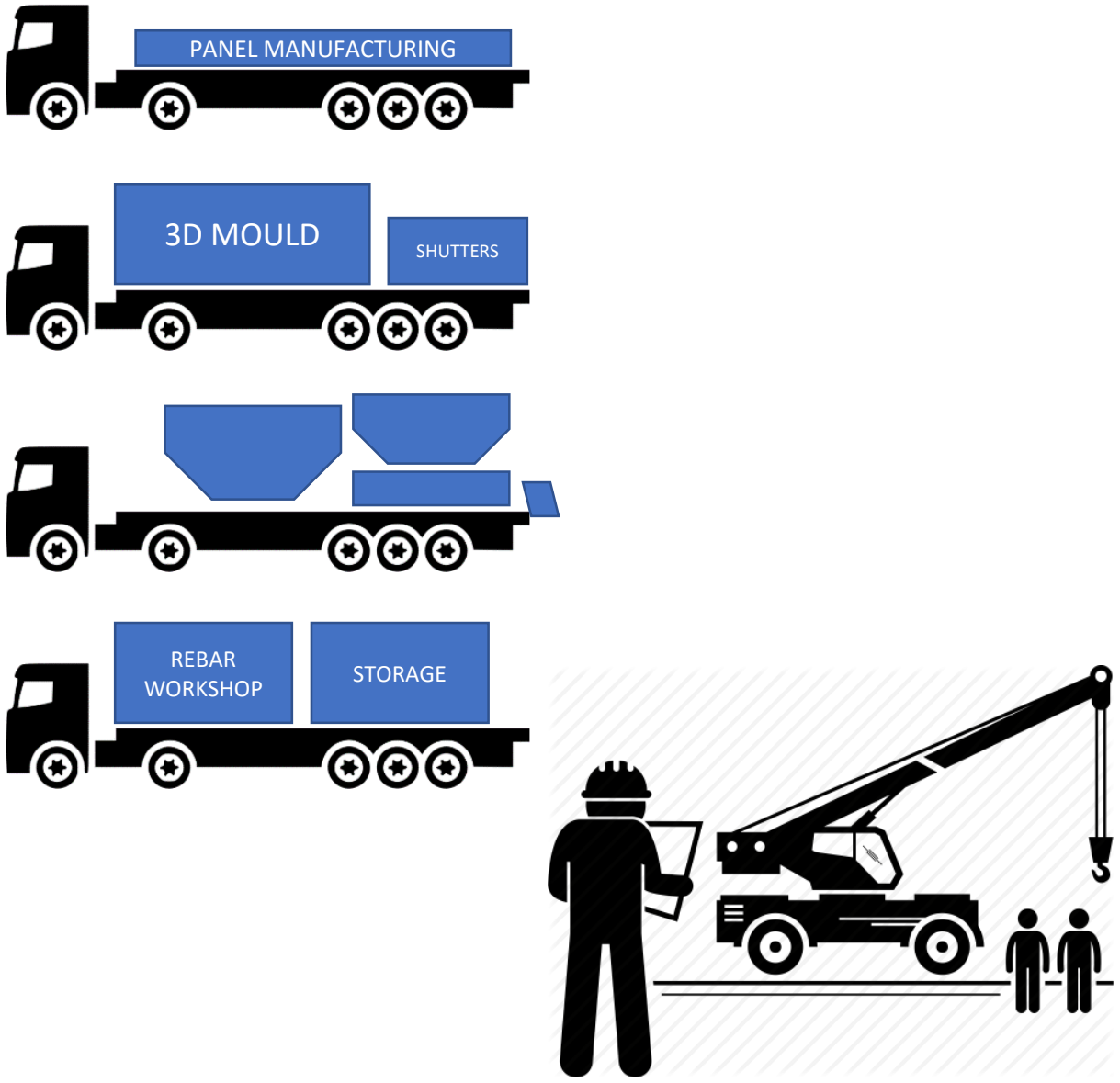
Decentralized manufacturing

- In remote locations with difficulties to transport the PPVC modules through road there are options to ‘decentralize’ the offsite manufacturing.

- Instead of organizing the transport of the finished modules lets install the production factory into the vicinities of the construction area.



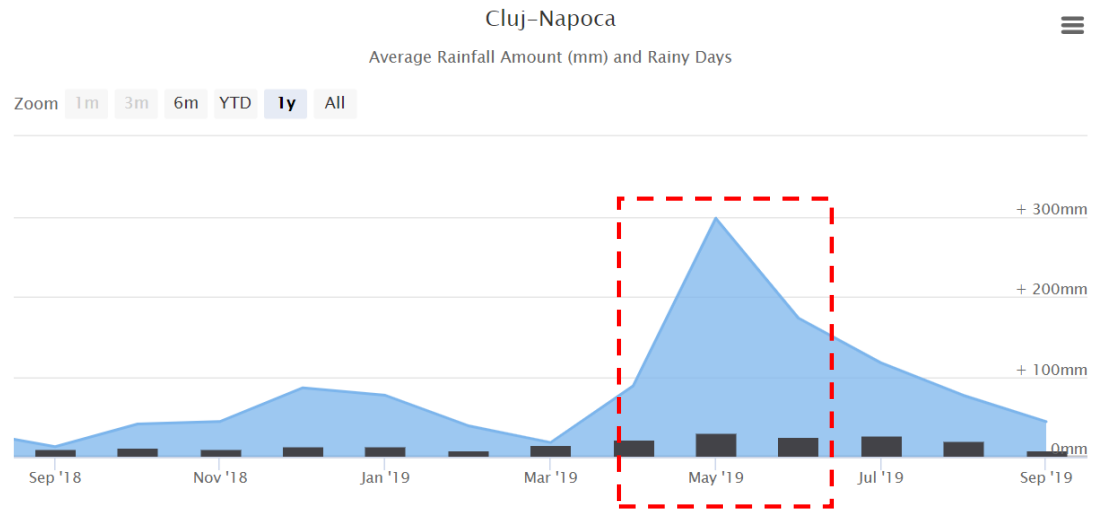
Mobile casting yard concept

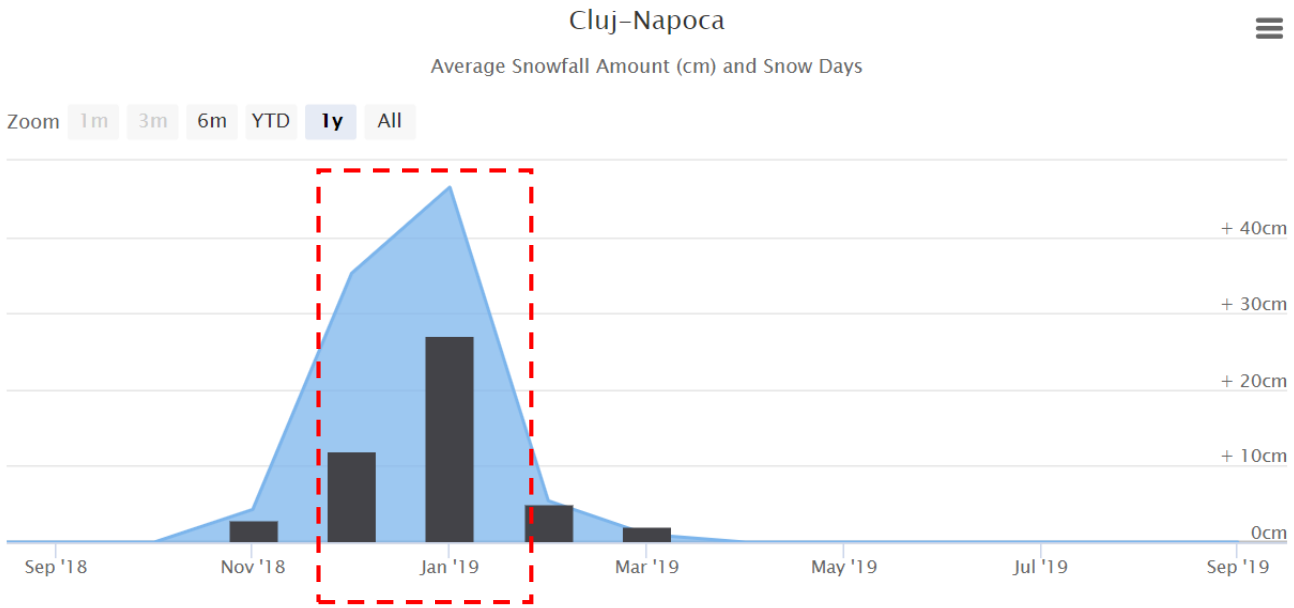


STAFF:

- 3D Mould operation
  - 3 captains
  - 9 crew
- 2D mould
  - 2 person
- Reinforcement Jig
  - 4 person
- Welder/Mason/Helper
  - 7 person
- Mobile RMC
  - 2 person
- Crane + Trailer
  - Driver
  - Helper

‘Construction’ period enhancement





- Offsite construction allows to ‘extend’ the workable period during the year as the PPVCs modules can be manufactured all along the year without weather restrictions.

BUCHAREST WEATHER BY MONTH // WEATHER AVERAGES

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	-2.1	0	4.9	11.3	16.7	20.3	22.1	21.5	17.4	11.3	5.3	0.3
Min. Temperature (°C)	-5.5	-3.7	0	5.3	10.5	14	15.6	14.9	10.8	5.4	1.2	-2.8
Max. Temperature (°C)	1.4	3.7	9.9	17.4	22.9	26.6	28.6	28.2	24	17.3	9.5	3.4
Avg. Temperature (°F)	28.2	32.0	40.8	52.3	62.1	68.5	71.8	70.7	63.3	52.3	41.5	32.5
Min. Temperature (°F)	22.1	25.3	32.0	41.5	50.9	57.2	60.1	58.8	51.4	41.7	34.2	27.0
Max. Temperature (°F)	34.5	38.7	49.8	63.3	73.2	79.9	83.5	82.8	75.2	63.1	49.1	38.1
Precipitation / Rainfall (mm)	40	38	36	49	71	82	60	54	43	36	46	43

Industrialization

- Stop thinking in the traditional way and start thinking in the ‘industrial approach’:

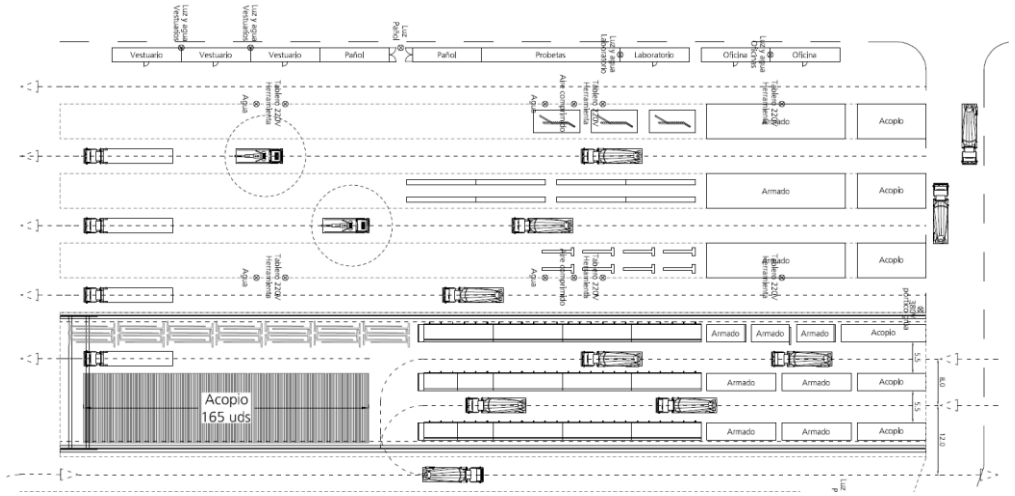
  - Increase of the efficiency of the production processes and methods
  - Elimination / reduction of working hours lost due to inclement weather
  - Elimination / reduction of weather-related fluctuations in performance
  - Increase of efficiency by clear work flow processes
  - Elimination / reduction of searching for material
  - Elimination / reduction of rearranging material
  - Reduction of loss of material

A survey of cost structures in building construction shows that the total construction costs account for only approx. 50 % of the total investment costs of a residential building.

What can Moldtech provide for PPVC construction?

MOLDTECH can support in the complete life cycle of the project

- Structural engineering for precast elements
- Manufacturing designs and connection details
- Design of any type of tailor-made mould system
- Shutters
- Design and supply of all connection elements, lifting anchors and any needs for the correct assembly



Moldtech solution

- From the engineering to the production and manipulation of the PPVCs.

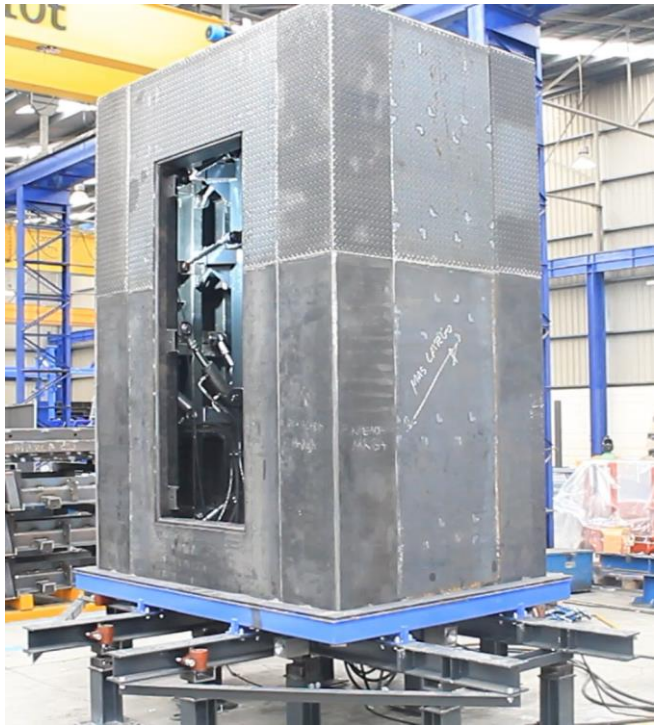
- PPVC equipment:

  - Robust, flexible, precise and reconfigurable moulds.

    - Shrinking core and actuated outer walls concept.
    - Various technologies available: from manual to fully hydraulically.
    - Heating system incorporated when required.

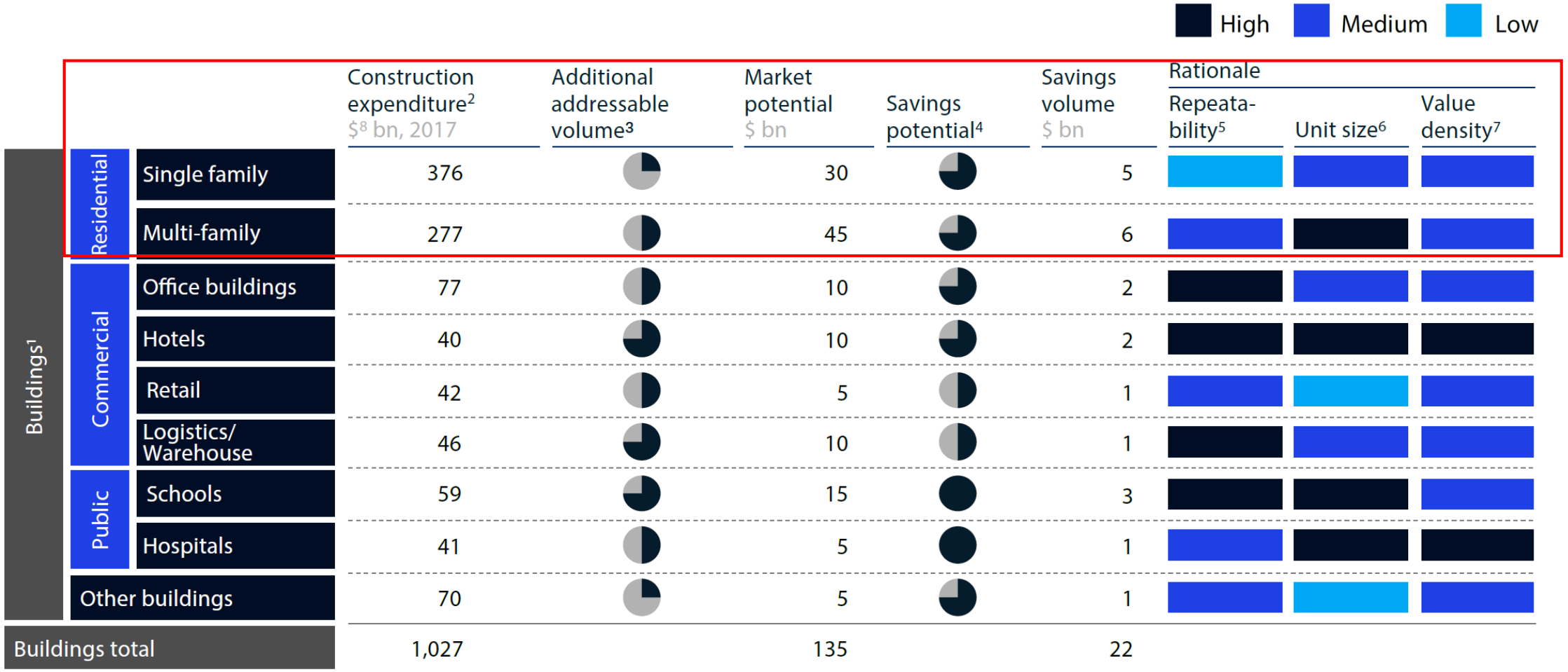
  - Other equipment aimed for circulation of the PPVCs in the factory.

Moldtech shrinking core



MOLDTECH hydraulic shrinking core allows easy and quick demoulding of the PPVC.

Opportunities in residential projects



		Construction expenditure[2] $[8] bn, 2017	Additional addressable volume[3]	Market potential $ bn	Savings potential[4]	Savings volume $ bn	Rationale: Repeata-bility[5]	Rationale: Unit size[6]	Rationale: Value density[7]
Buildings[1]	Residential: Single family	376		30		5			
	Residential: Multi-family	277		45		6			
	Commercial: Office buildings	77		10		2			
	Commercial: Hotels	40		10		2			
	Commercial: Retail	42		5		1			
	Commercial: Logistics/ Warehouse	46		10		1			
	Public: Schools	59		15		3			
	Public: Hospitals	41		5		1			
	Other buildings	70		5		1			
Buildings total		1,027		135		22			

Extracted from McKinsey & Company report: Modular construction. From projects to products

Opportunities in residential projects

Moldtech

precast concrete equipment

Thanks for you attention