

3D buildings casting

**StoneHome**

(Patented in Russia, China)

November 2019

**We already know about 3D construction printing technologies using extrusion of concrete with a mixture of various authoring additives (USA, China, Russia, Italy).**

**In our case, it is proposed to use quartz sand melt for printing (casting) a house, and a glass melting furnace as a print head.**

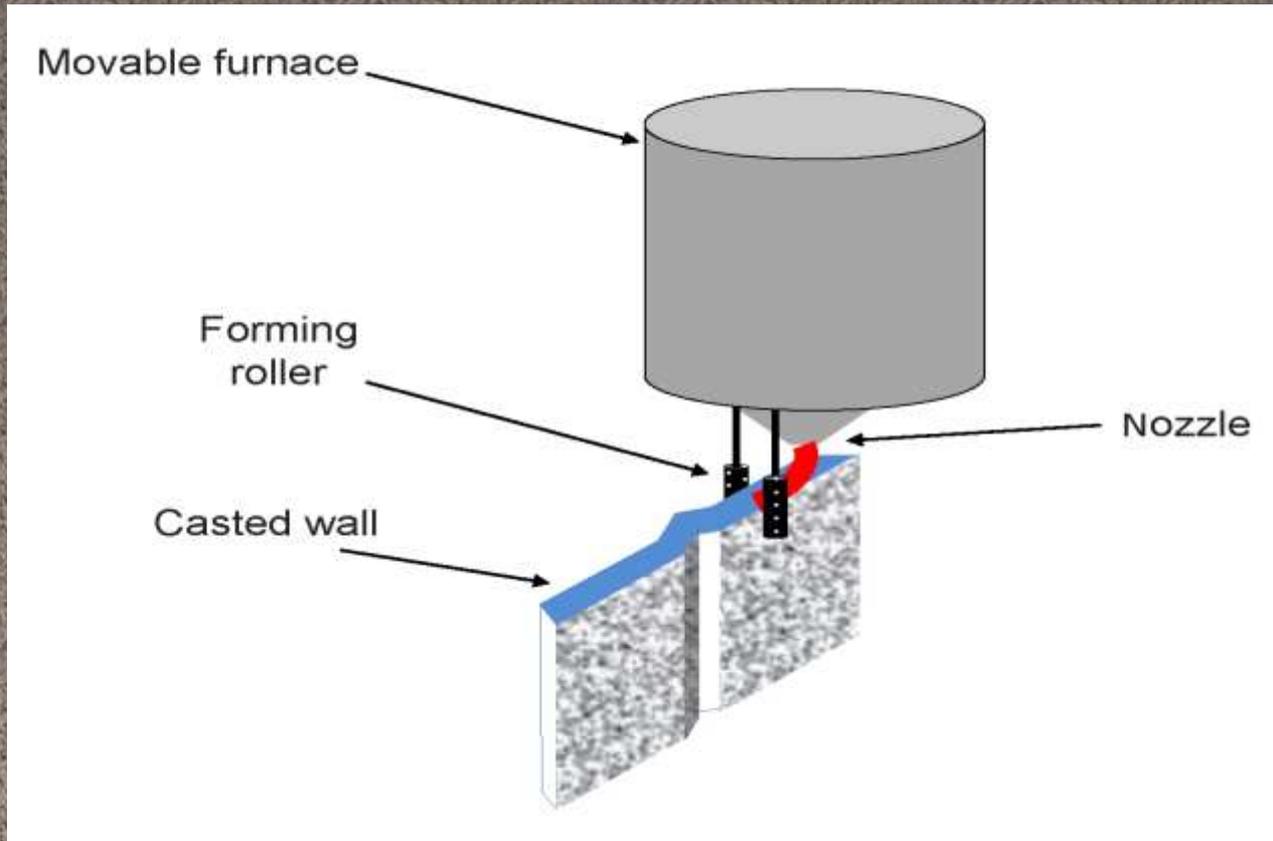
# Project



Glass furnace is used as a print head which is moved along the 3D coordinates. The liquid glass melt flows from the furnace and is used to cast the walls of the building. The picture shows an example of such glass melting furnace consisting of an internal

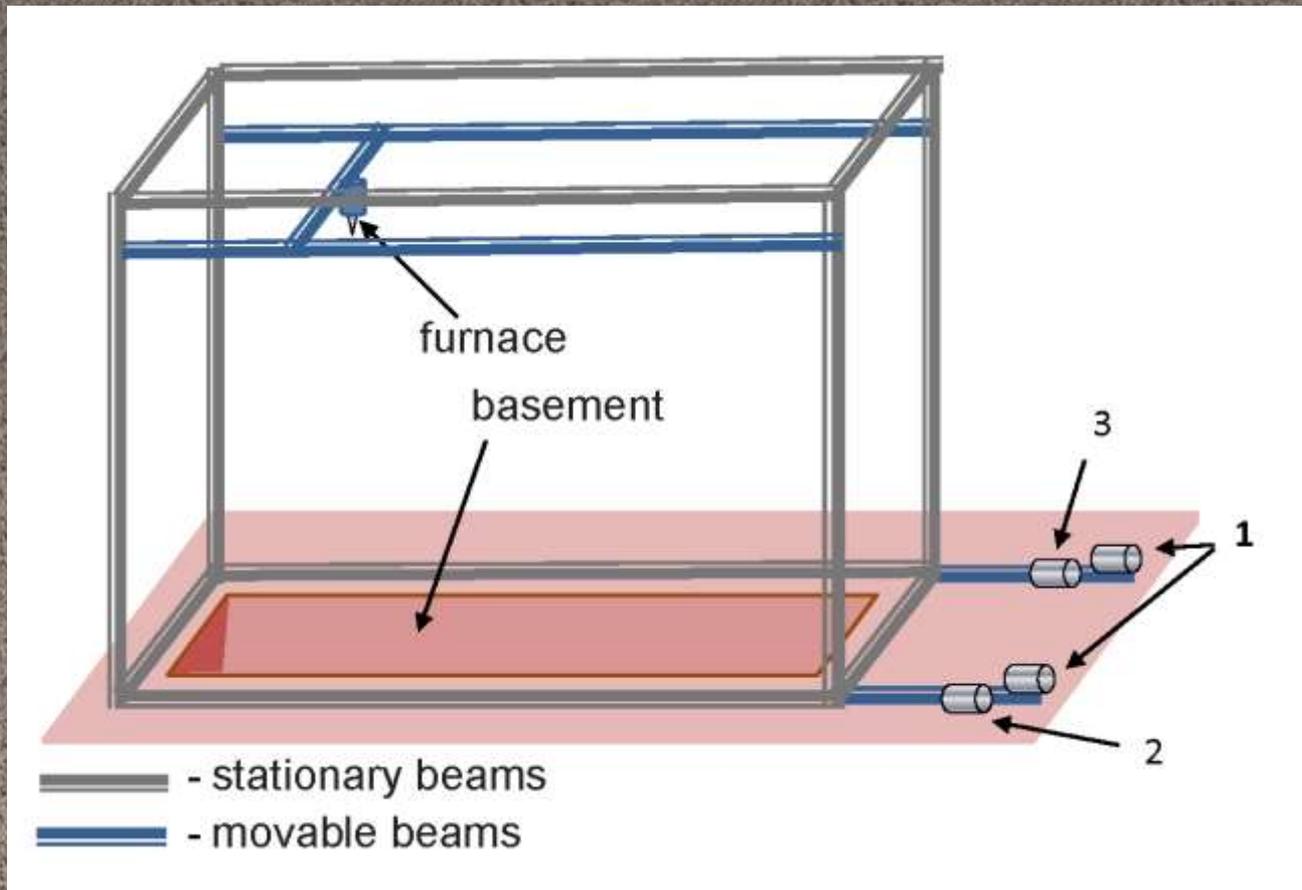
container and electrodes as heating elements, charge and electric power supply systems. The melt flown from the furnace is forcefully formed. A system of annealing of the casted walls is provided. Building is casted without the use of cement and concrete.

# Example of the wall



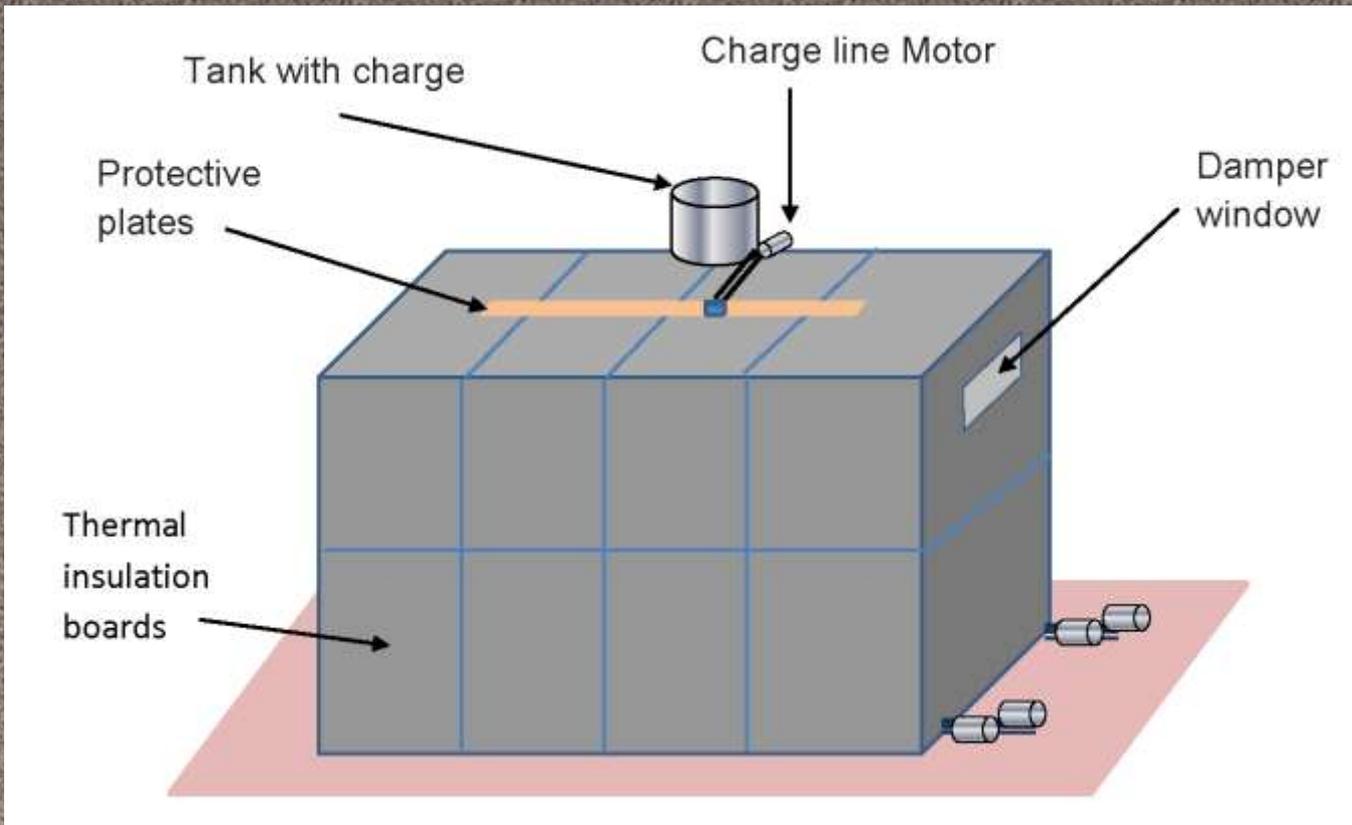
Porous carbon forming rollers with air supplied through pores. Glass batch is continuously fed into the furnace. The melt is poured to cast the wall.

# 3D furnace movement system



**Motors:** 1 – vertical lift, 2 – horizontal, 3 – movement of the furnace along the cross beam.

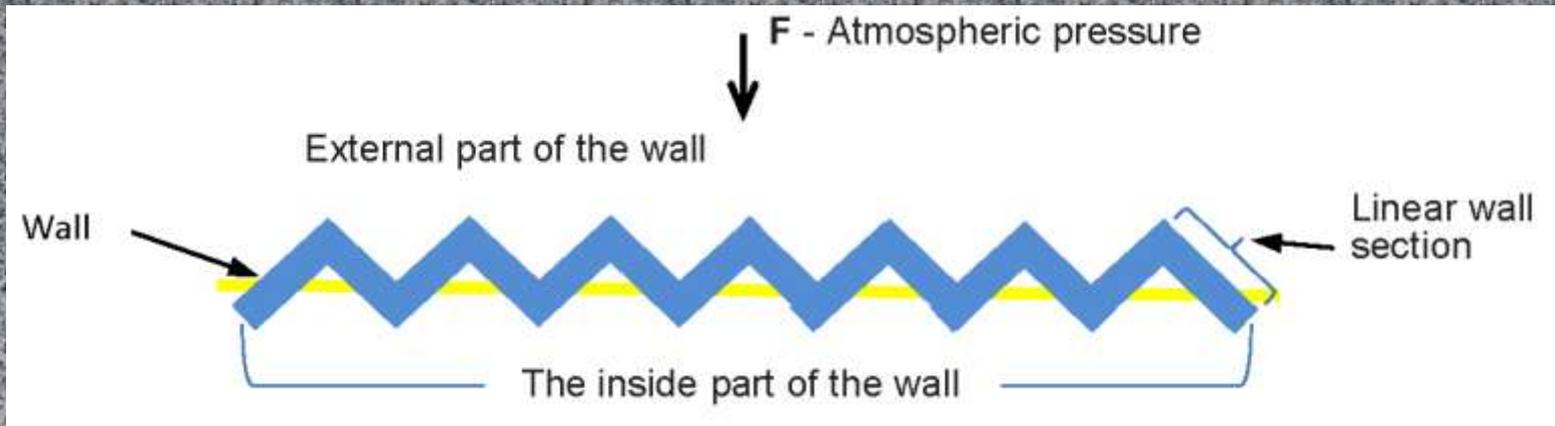
# The working area is insulated with insulation boards



General view of the heat-insulating cover of the site (independent computer-controlled reversible furnace motors are outside the cover boundaries and lowered down)

# Wall structure

The wall with the vacuum area withstands the external pressure of the atmosphere as the transverse direction of force is redirected to the longitudinal one.



To prevent thermal rupture of the glass melt canvas, it is important that all linear sections not to be in line (conditional yellow line). In this case, the compressive / expansion breaking stresses in all linear sections are not summed up and do not lead to wall destruction (expansion and compression of the linear section entails a slight non-destructive bending / deflection of the adjacent linear section)

## **Raw materials for 3D construction**

Quartz sand is the main raw material for the construction melt. It is environmentally friendly, non-polluting and commonly spread material. Depending on the required technological purposes of the casted wall various additives are possible. Today, a wealth of experience has been accumulated in melting of glass with various aesthetic and physicochemical properties.

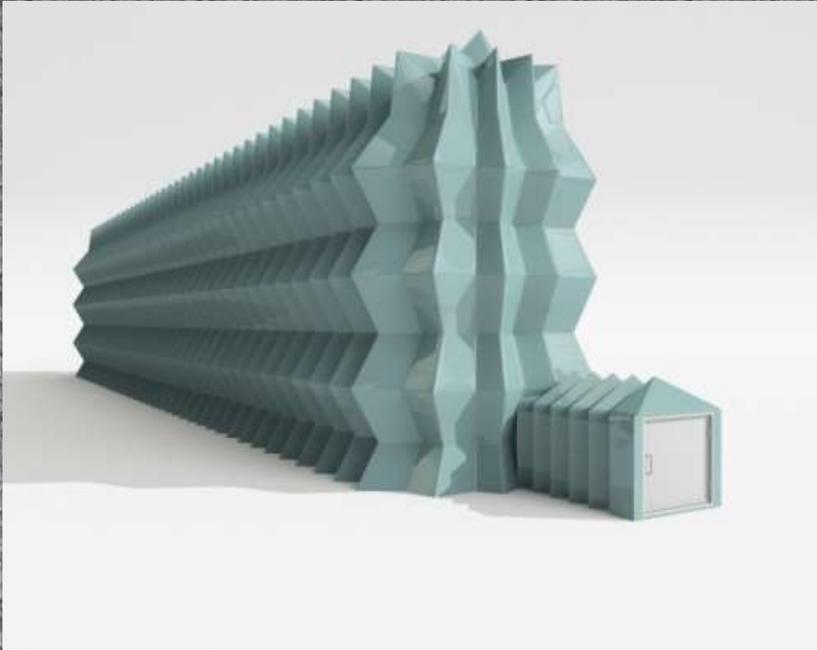
## **Glass melting**

**Glass melting is carried out in a mobile glass melting furnace at temperatures around 1400 °C - 1600 °C. In order to produce glass melt only the first stages - silicate formation and glass formation - out of five standard stages of glass melting are required. The molten glass material used for construction should not be held to high standards of transparency and general glass requirements. Technologically, walls can be casted from foam glass of different densities.**

# Walls

In the 3D pouring process, it is possible to obtain walls with various heat-conducting and strength characteristics and wide range of purposes: residential premises, blocks with high radiation protection, refrigerated warehouses, etc. Low thermal conductivity walls are casted with a density of 150 to 600 kg / m<sup>3</sup>, high density walls - of 500 to 4000 kg / m<sup>3</sup>. It is possible to cast multilayer walls with increased density of outer layers and with reduced thermal conductivity of inner layer.

# Example of wall structure



**Vacuum warehouse.** Large part of it can be submerged. Containers are received and given automatically through the gateway.



**House.** There are a huge number of wall structures can be created featuring their beauty, aesthetic design and unrivaled consumer properties.

# The advantages of casted constructions

- 1 . Durability.
2. Acids, mold and fungi resistance.
3. Low thermal conductivity (the ability to build vacuum walls and rooms).
4. High strength.
5. Highest environmental standards.
6. Easy to disinfect (pathogens resistant to antibiotics will not settle on the walls)
7. A wide range of components can be casted in parallel with the walls, such as floor with higher performance than granite, windowsills, bathtubs, water pipes, sewers, etc.

# Thank you

**Contact:**

**Kulmagambetov Anuar, PhD**

**an5225498@gmail.com**

**PS. Developments in this direction:**

- Glass Lab MIT (US) – 3D casting (circular) of small vases by extruding a pre-cast melt.
- Cambridge (US), Medford (US) – Patent “Methods and Apparatus for additive manufacturing of Glass”. 3D Injection of small objects in a muffle furnace with a pre-loaded charge.