Innovative construction system - prefabrication of construction elements and building of large span objects

Summary

An innovative Serbian company developed a unique construction system based on prefabrication of structural ferrocement, insulated, sandwich elements. Elements and the buildings constructed of the same have no thermal bridges providing high energy efficiency. It enables very short time of construction (app 1000m² in 15 days with 12 labourers), savings of the raw materials (min 30%), significantly reduced maintenance and exploitation costs etc. Company seeks partner for licensing and joint venture.

Creation Date 25 June 2014
Last Update 03 July 2014
Expiration Date 03 July 2015
Reference TORS20140625001

Details

Description

With tradition since 1990, company is a registered Entity of innovation activity at the Ministry of Science. R&D and production center has since 2009. Continual development and innovation of its employees resulted in patenting of new construction system. Prefabricated elements are three layered, first layer is structural ferrocement layer only 3cm thick with structural ribs on all edges, second is insulating layer and third protective layer made of ferrocement 2,5cm thick. Elements are fireproof without any thermal bridge. In such elements can be embedded insulating layer of desired thickness (say 30cm) enabling construction of “A” energy grade large span objects. Insulating layer is made of very lightweight polystyrene concrete (180kg/m³, k=0.044W/m²K) since insulating layer have no structural function and in the same polystyrene boards (k=0.041 W/m²K) are dipped in and fully enclosed providing fire resistance. Even elements are all cement based they are very lightweight, compact and in the same time they shows great strong and resiliency. Since elements and entire building is lightweight, all pressure is equally distributed on ground so foundations come down to the two strips. Using such construction system at least 30% less cement and 31% less steel is used in comparison with state of the art RC hollow slab prefabricated objects. Subsequently all finishing and internal works are performed in closed space disregarding out weather conditions prolonging the construction season. Interior design is separate static system and architects have full freedom in designing and partitioning the internal space providing various purposes of constructed objects. Polygonal and arched shape provide more favorable ratio of floor area to volume minimizing external surface of an object enabling energy savings for heating and cooling. Surface area of external walls is 21% smaller, which reduces heat loss by the same percentage. Windows considerably smaller, by its position (on slope) provide the same brightness compared to larger...
windows on the vertical walls. Reducing the glass surfaces, which have a high level of thermal conductivity, heat losses are additionally reduced. Such reduced heat losses by half compared with rectangular objects with the same insulation properties. Since all elements are in standard transport overall additional savings are realized in transportation and installation according to significantly less dead weight (about 50%). Construction system provides energy savings throughout the every phase of buildings life cycle: Construction 30%, Exploitation 50% and Maintenance 50%. Essentially, described innovative construction system is quick, easy and cost effective innovative construction system of building high quality, energy efficient, durable, buildings with a positive attitude towards the environment. Such objects are ideal for sports halls, indoor pools, production plants, breeding farms, warehouses, ice rinks, saloons, exhibition space etc. By described patented system company constructed 7 objects (more during development). First object with only 15cm thick insulation layer, during 3 year monitoring shows <50kWh/m2 annually energy consumption for all energy needs what is 8 times lower than EU average according “energy efficiency guide 78”. Company made all manuals and training programs. Know how transfer is simple and easy replicable. Initial investment for adopting of construction system, procurement off all production moulds and construction tools is low. All equipment needed for production of elements and construction is low demand, a small car crane and concrete plant. Market opportunities for such product are high and technology provides comparative market advantages for licensing partners (company offers completed buildings starting from 229€ w/o VAT on Serbian market) what confirms possible high profit gain. For Joint Venture partners in company provides elements and its assembling on site.

Advantages and Innovations

Innovative construction system (prefabricated elements, construction system and constructed objects) is patented. Prefabricated elements are three layered, sandwich, insulated and fireproof without any thermal bridge. All layers are cement based providing excellent adjoining, strength and compactness of elements. First layer is structural, made of ferrocement with structural ribs on all edges. Second layer is combination of very lightweight polystyrene concrete (180kg/m3) and polystyrene boards dipped in mixture. Third and final layer is protective ferrocement layer. Elements present unique mixture of construction materials and additives. Insulation layer is made in any desired thickness. Prefabricated construction elements are both structural and infill elements. Structural members of elements eliminate the need of horizontal beams in building. Only one type of elements is needed for construction of buildings making this system unique and very simple. Elements with RC polygonal arch are making spatial structure with extraordinary static properties (earthquake proof). An internal separation of such large span object is separate static system. Architects have full freedom of designing internal space for which construction works are performed in controlled climate conditions (already closed space). Constructed buildings are fireproof, earthquake proof and buildings can sustain any snow load. Entire buildings don’t have any thermal bridge making them high energy efficient objects. Thanks to unique static system all installations and equipment are easy installed. Wind simply slides over the object while there are no tiles or metal sheets that could be separated from the structure. All maintenance of buildings comes down to painting. Construction system provides significantly faster building on the site, example, hall of 1000m2 indoor floor space can be build in just 15 working days with 12 workers on prepared floor slab.

Stage of Development

Already on the market

Comments Regarding Stage of Development

Materials, elements and constructions are certified (all construction system). Customs tariff numbers are provided for export of elements in EU.

IPR Status

Patents granted
Comment Regarding IPR status

Profile Origin
Private (in-house) research

Keywords

Technology
002006016 Materials, components and systems for construction
002007002 Building materials
002007005 Composite materials
004008 Energy efficiency

Market
009007004 Distribution of building products and systems
009007008 Manufacture of construction materials, components and systems

NACE
F.41.2.0 Construction of residential and non-residential buildings

Dissemination
Send to Sector Group
Sustainable Construction

Client

Type and Size of Organisation Behind the Profile
Industry SME 11-49

Year Established
1990

Turnover
1 - 10M

Already Engaged in Trans-National Cooperation
Yes
Experience Comments
It is a complete new approach to construction of large span buildings. Prefabricated construction elements are structural and infill elements, ferrocement based, three layered, insulated, sandwich, fireproof without any thermal bridge. They are certified on the load of 600kg/m2 showing only 25% of allowed curving, with maximum crack of less than 1mm. Such construction of elements eliminates the need of horizontal beams during the construction of objects providing different construction approach. All constructions systems first forms main supporting structure (columns, beams, floor panels...) and then by coating of such structure (walls, panels, glass...) space is being closed were all the elements are forming unique static system. Innovative elements provide different approach in construction where at the same time is closed whole desired space. Construction is easy by stacking of elements one on another with reliance on auxiliary scaffold. Space in-between the stacks of elements is reinforced, reinforcement protruding from the elements is pinched and concrete is poured in such shuttered space and polygonal RC vertical beam or arch is formed. In this way the spatial structure obtained by cross linked RC arches and the beams (ribs in elements) forms a permanent, safe, durable and earthquake resistant construction. This concludes the whole process of construction of object (roof and walls) and does not need any plastering.

Certification Standards
ISO 9001
ISO 14001

Languages Spoken
English

Client Country
Serbia

Partner Sought

Type and Role of Partner Sought
Type of partner sought: Construction company, Licensing is negotiable, can be agreed by terms, territory and fees (annually, royalty, etc). Licensing can be arranged for construction works only, while Serbian company would supply elements and know how. Joint venture can be starting a new legal entity ground up where Serbian company would provide intangible assets (IPR) while partner should provide tangible assets and market share. Joint Venture can be also for specific project where Serbian company can carry out construction works.

Type and Size of Partner Sought
>500

Type of Partnership Considered
License agreement
Joint venture agreement
Preventing tree roots from damaging the underground infrastructure

Summary

A German SME has developed a simple, cost-effective and environmentally-friendly technology preventing tree roots from damaging underground pipelines and posing risks to their safety. The company seeks partners for license agreement, commercial agreement with technical assistance or joint further development.

Details

Description

Expansion of the underground infrastructure in cities leads to problems with tree roots in pipeline zones. They damage underground pipelines as well as stoneware pipes or gas tubes by growing into the sealing elements of pipe connections (regardless of their pipes' materials) or by changing the position of the lines (by physical pressure). The solutions proposed to date have been rather inefficient: cutting down trees contradicts the idea of a "green city"; relocation of underground lines is expensive; plastic panels are only an interim solution as the roots grow around them. A German SME has found a simple and permanent solution to prevent unwanted interactions between tree roots and underground pipes/infrastructure. It has developed a root-resistant mineral filling material that has very few pores, which prevents the growth of roots across its layer. The process can be described as follows: an expert controls root penetration in the pipe route and determines which roots can be removed in order not to influence the vitality and stability of the tree. Then the pipeline trench must be filled with the root-resistant filling material, so that the pipe route is protected from future root intrusions. The technology has been awarded the environmental prize in Germany.

Advantages and Innovations

- the technology is ecological and cost-effective - experts' reports have confirmed root-resistance of the material even after 15 years - mineral mix that is ready to use - the filling material is fully recyclable - sustainable - easy to apply - broad range of applications, covers all kinds of underground infrastructure

Stage of Development

Already on the market

Comments Regarding Stage of Development
Completely developed for applications described, adaptations to other environments / applications possible in joint research.

**IPR Status**
Secret Know-how

**Profile Origin**
Private (in-house) research

---

**Keywords**

---

**Technology**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>002006016</td>
<td>Materials, components and systems for construction</td>
</tr>
<tr>
<td>002007002</td>
<td>Building materials</td>
</tr>
<tr>
<td>010002004</td>
<td>Environmental Engineering / Technology</td>
</tr>
<tr>
<td>010004007</td>
<td>Municipal Water Treatment</td>
</tr>
<tr>
<td>010004010</td>
<td>Underground infrastructure</td>
</tr>
</tbody>
</table>

**Market**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>009003001</td>
<td>Engineering services</td>
</tr>
<tr>
<td>009007004</td>
<td>Distribution of building products and systems</td>
</tr>
<tr>
<td>009007007</td>
<td>Engineering and consulting services related to construction</td>
</tr>
<tr>
<td>009007008</td>
<td>Manufacture of construction materials, components and systems</td>
</tr>
<tr>
<td>009007009</td>
<td>Construction companies</td>
</tr>
</tbody>
</table>

**NACE**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.42.1.1</td>
<td>Construction of roads and motorways</td>
</tr>
</tbody>
</table>

---

**Dissemination**

---

**Send to Sector Group**
Environment

---

**Client**

---

**Type and Size of Organisation Behind the Profile**
Industry SME <= 10

**Year Established**
0
Already Engaged in Trans-National Cooperation

Yes

Languages Spoken

English

German

Client Country

Germany

Partner Sought

Type and Role of Partner Sought

- Type of partner sought: industry, municipalities, private households, ecologists
- Specific area of activity of the partner: Construction industry, esp. road construction/civil engineering, Reconstruction and Environmental renovation, Conservation of cultural heritage
- Task to be performed by the partner sought: Interest in taking over the technology, testing further applications (the technology is completely developed, adaptations to other environments/applications are possible in joint further development). German company is looking for a reliable partner to transfer the relevant know-how connected with the root control (the expert controls initial root penetration in the pipe route and determines which roots can be removed) as well as with the installation of the filling material that will be delivered by German company.

Type of Partnership Considered

- License agreement
- Commercial agreement with technical assistance
- Technical cooperation agreement