Autoclaved cellular concrete contractors' favourite material

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Abstract: The article gives reasons why contractors choose cellular concrete. ACC has unique features making it contractor-friendly and enabling easy and quick construction. As well as material properties, the article presents construction methods and structural details which constitute proof that CC based construction is easy. The article is based on practical knowledge and long experience of construction using various technologies. It also takes into account experience gained on the Polish market.

Keywords: autoclaved cellular concrete, CC based construction, construction system, system-based construction, structural details

1. INTRODUCTION

Latest technologies and materials enable construction of durable and energy-efficient buildings which meet applicable requirements and follow current trends. An additional criterion such materials should satisfy is the ease of construction. Simple technologies enabling easy, defect-free and quick construction provide possibilities appreciated by contractors, investors and designers. This is possible owing to the advantages of ACC resulting from its properties.

2. ACC – ADVANCED MATERIAL

There are many features determining that a given construction material can be termed user-friendly. As far as contractors are concerned, the most important in this respect is the simplicity and quick execution of construction. From the point of view of structural material, the simplicity of construction means not only the ease of erection, but the transparency and ease of execution of structural details. All details should be easy to make and properly planned so that contractors, once they have made sure they follow relevant guidelines, can be certain that what they built is free of defects. Cellular concrete offers such possibilities. The use of ACC enables construction of energy-efficient and durable buildings easily and quickly.

3. PROPERTIES THAT MAKE CONSTRUCTION EASY

Cellular concrete has properties that make it easy to use. Such properties are multiple. Below are several features making easy ACC based construction.

3.1. Uniform and porous material

Cellular concrete is a uniform material. It means that all its physical parameters (e.g. thermal and acoustic insulation properties, compression strength) are the same in all directions. It is of considerable importance when it comes to re-laying of wall elements and maintaining wall parameters.

Along with uniformity, another significant feature of ACC is its porosity. Porosity makes ACC easy to form. Owing to uniformity and porosity it is possible to freely form elements made of ACC both at the production stage and when wall elements are finished. It does not take much to produce blocks with tongue and groove interlocking or profiled mounting handles. Finished ACC products are easy to cut and mill. Even complex shapes of elements can be obtained without major difficulty. Moreover, the porosity of ACC has an effect on many other features, the most important of them being small bulk density and good thermal insulation properties.

Photo 1. Material uniformity and porosity are among the most important features of ACC

Photo 2. ACC elements are very easy to cut

Photo 3. Blocks can be easily cut and fitted to every shape

3.2. Wall elements

No doubt an important porosity-related feature is low weight. Small bulk density enables manufacture of large-size wall elements allowing the principles of ergonomics to be followed. Maximum regulation-complaint weight of blocks (manual transport in continuous work) should not exceed 30 kg. As a result, one 590x240x420mm block replaces several ceramic, silicate or concrete elements. Handy ACC wall elements are appreciated by contractors as they enable quick execution of construction works. The laying of 7 ACC blocks takes less time than laying several wall elements with the same weight, but made of different material. In the case of ceramic material, it would be necessary to use 13 hollow bricks and not less than 15 silicate elements, which means double work. Moreover, small weight of ACC results in the optimisation of logistics related costs. Transport of ACC enables using means of transport to the fullest extent. It means in practice that, by volume, much more ACC wall material can be loaded on the lorry than it is in the case of e.g. silicate materials while maintaining the same weight. This makes transport possible and cheaper and allows material to be delivered to every place in the country making it widely accessible.

Photo 4. Small weight enables manufacture of large and ergonomic ACC wall elements

3.3. Easy execution

ACC wall elements manufactured today are characterised by dimensional accuracy which results in precise and quick erection of walls. Accurate wall elements can be fixed using thin-layer mortar. Contrary to what is generally thought, thin-layer bricklaying is not difficult. It is sufficient to observe several bricklaying rules and work will go quickly, smoothly and free of defects. One of the conditions is the use of basic tools. A set of such tools will not be a major cost for a contractor and the tools will ensure, if used properly, that all construction works are done properly. Correct putting of the thin layer mortar is only possible with the use of an appropriate trowel. Using improper tool will result in mortar being unevenly distributed and in the wrong amount (too thick or too thin). Where it is necessary to cut blocks in order to bring them to desired dimension or shape, it can be best done using a special saw. Blocks should be cut with precision so angle guide can prove useful. If, for thin joints, small unevenness of the upper surface of laid blocks occurs, blocks should be ground slightly using grinding float. As can be seen, using basic tools is necessary and makes work much easier for a contractor.

Photo 5. Basic tools for ACC system bricklaying

Photo 6. It is necessary to use basic tools for thin layer bricklaying

Photo 7. Thin layer bricklaying is very easy to perform

Photo 8. Precisely manufactured wall elements perfectly fit to one another

Photo 9. ACC based construction works are easy to perform

3.4. ACC system based construction

System based construction is a higher level of building execution. The ACC based construction systems ensure correct execution of building works. Wall elements comprise a wide selection of blocks, slabs, lintels and U blocks. All elements are made of cellular concrete. It is a transparent and easy-to-use system allowing employment of any given construction method (single layer walls, insulated walls, sandwich walls etc.). It is also important to remember that ACC does require too many elements. The ease of element cutting makes redundant a wide range of customised products (e.g. no need for corner elements, wall complementing elements, levelling elements etc.) Furthermore, system based construction resolves all problems related to structural elements. Correct execution of details from a point of view of structure and the physics of a structure ensures defect-free construction.

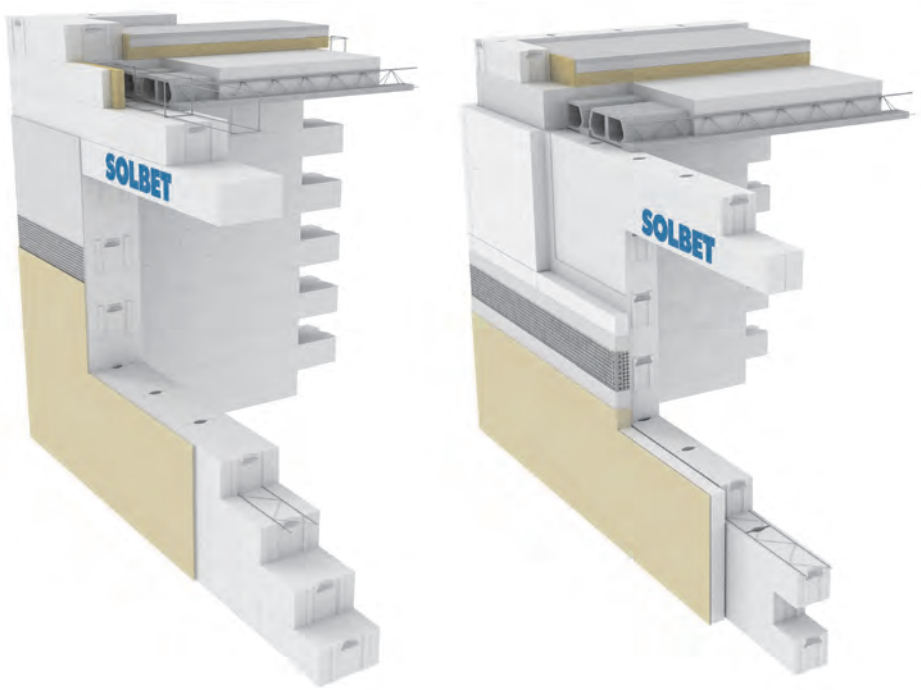

Photo 10. Example of system based approach to construction

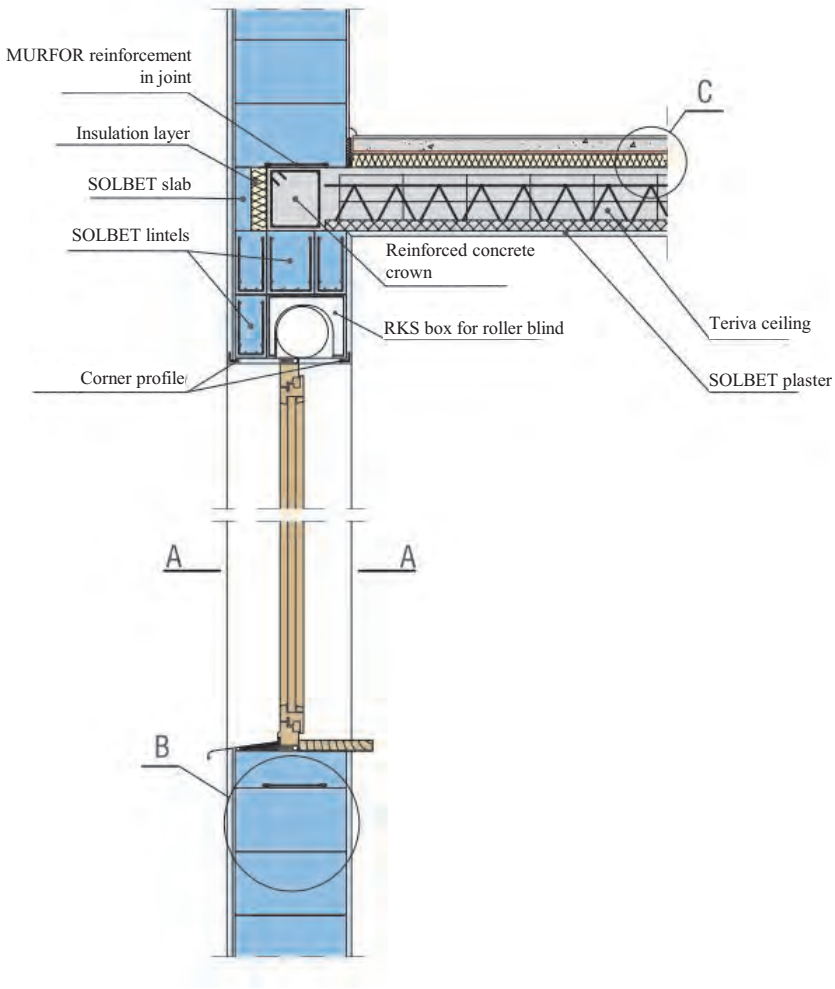

Photo 11. Example of an architectural detail. ACC system based construction is defect-free

3.5. Ease of shaping

Ease of forming and uniformity enables making walls that have complex shapes. Blocks can be laid and joined regardless of the direction of an element being laid. Arch-shaped walls or walls laid at an angle other than 90 degrees pose no technical problems. Walls in places with complex shapes retain the same parameters as in any other place. It is a great advantage.

Photo 12. ACC enables making any given shape

Photo 13. Detail in a uniform ACC wall made of precisely cut blocks. No other material can equal ACC

Photo 14. ACC wall can be fitted to every shape

4. ACC BASED CONSTRUCTION IS EASY – EVIDENCE

Ease of ACC construction is best evidenced by completed investments. Experience shows that even unqualified persons, if properly supervised and on condition they follow basic rules, are able to build a structure using ACC. This is confirmed by buildings erected by volunteers of the international organisation "Habitat for Humanity". Habitat for Humanity is a non-governmental charity organisation. The organisation's task is to provide assistance to families with limited means in building their homes. The selection of construction technology for works executed by the Habitat for Humanity is not a coincidence. ACC based construction uses simple technologies which is of much importance given the fact that people working on the Habitat for Humanity sites comprise mainly volunteers who perform bricklaying and finish works. These are unqualified people who do not have any experience of construction. Despite the fact, as can be seen, ACC enables these people to built even one storey in a day. The Habitat's volunteers are living proofs that ACC construction technology is simple and precise and allows construction to be performed by unqualified persons. The confrontation between the theory and practice is very interesting for builders. What they usually find surprising when using ACC is that building can be that easy and that it does not require any formal qualifications.

Photo 15. Building being erected by Habitat for Humanity

Photo 16. „Women build" campaign by Habitat for Humanity

Photo 17. Building built by Habitat for Humanity using ACC located in Warsaw

5. SUMMARY

The use of ACC makes building easy. ACC wall elements result, in effect, in savings both for the investor and contractor. As far as the former is concerned, these include work time and construction costs savings. For the latter, quick and precise execution of a house. There is one more observation to be made: theory is only a theory no matter how detailed. It is best to see it for yourself whether a given theory works in practice. To verify whether ACC based construction is really easy, you need to cut several blocks, lay mortar and build a fragment of a wall. Therefore, I encourage you to tray it out. I can assure you that once you have tried there will be no doubts that ACC is a material which ensures easy and quick execution of construction works.

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