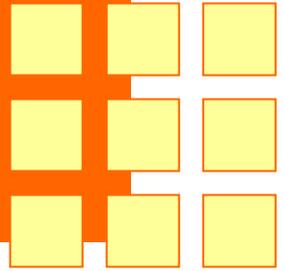


The solid in-situ concrete method with a continuous formwork system



Foreword

Housing standards and construction methods are by no means static. They are, in fact, constantly evolving to reflect diverse and changing economic conditions, social values, traditions and technological advances. The solid in-situ concrete method with a continuous formwork system is Kayson's integrated solution to the problem of large-scale residential housing development. It is widely recognized as one of the most practical, economically and technically feasible solution to the problem of building cost-effective, descent, durable and earthquake-proof housing on a mass scale, quickly and efficiently. Indeed, Kayson's unremitting efforts over the past thirty years to adapt the system to varied topographical and climatic conditions has resulted in the development of a unique method for building large scale housing faster, better and at a lower cost, in virtually any corner of the globe.



Prior to describing in detail Kayson's mass housing system, it is appropriate to briefly outline some of the main features of industrialized housing construction:

- Industrialized construction is not necessarily synonymous with prefabrication.
- The most important characteristic of industrialized construction is the use of advanced machinery and equipment and trained workers to increase the speed of construction, improve quality and optimize the utilization of resources.

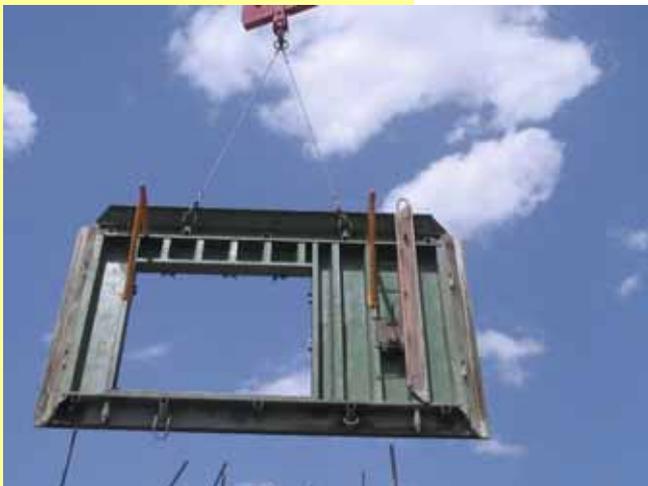


- Since in industrialized construction the builder has to use extremely expensive types of equipment and machinery, he has to make a much larger initial investment than is the case in traditional construction methods. It is obvious that such a big investment only pays off in large-scale, mass production.



Major Characteristics of Kayson's Formwork System

- The solid in-situ concrete method utilizes a large metal formwork system.



- Notwithstanding their size, the forms are easy to install, more durable, more precise and produce higher quality structures. What is more important is that Kayson's formwork system enables the builder to repeat the entire construction cycle within a period of merely 24 hours- an attribute which no other formwork system, metal or otherwise, possesses.

- The forms are lighter than most other formwork systems. The weights of wall and ceiling forms are 68 kg and 40 kg per square meter respectively. The average weight of a complete set of forms used in constructing two 84-meter residential units is about 298 kg per square meter of floor space.

- The wall forms can be removed within merely five to eight hours. Each set of forms can be used up to two hundred times, provided it is properly maintained and serviced. This cycle can be repeated following a thorough overhaul of the formwork system. One of the main difficulties encountered by other in-situ concrete systems is the deformation of window frames after the concrete is poured. This problem has been totally resolved, thanks to an innovative method developed by our engineers.



- Ceiling forms are made up of light steel panels with spans of less than 3.5 meters. They are mounted on two rows of rail supported by steel piles.

- In Kayson's formwork system, the problem of fitting the window frames into the forms prior to pouring concrete and the leakage of concrete have been fully solved by developing a unique formwork design which sums up years of experience and practice.



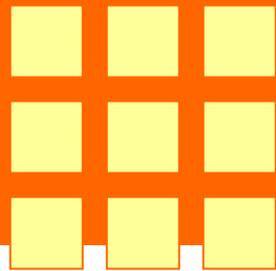
- Due to the forms considerable strength and flexural rigidity fewer nuts and bolts are used to join the constituent parts of the formwork system.

- Kayson's formwork system has substantially less joints compared with other methods. For example, spaces of up to 20 square meters are often covered with a single monolith form.

- The large, yet light, exterior and interior wall forms are quickly mounted by a tower crane and fixed in place and fastened to each other by nuts and bolts specially made for this purpose. In general, a complete set of forms encompassing two 84-meter apartments are installed within five hours.



Design and Construction Stages



- The foundation, the wall, and ceiling formwork systems are designed in strict compliance with the architectural plan.



- The components of the formwork system are manufactured in the fabrication plant in accordance with the design specifications.

- The construction site is leveled and compacted according to the project's technical requirements.



- A layer of lean concrete is applied to the foundation site.



- Sewerage pipes are laid.

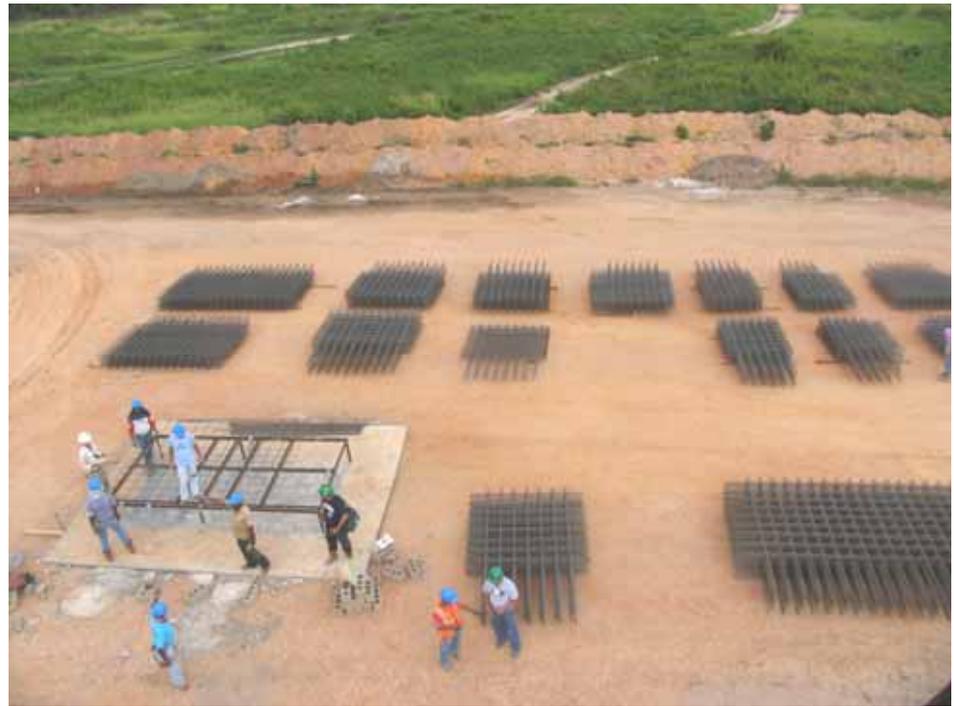
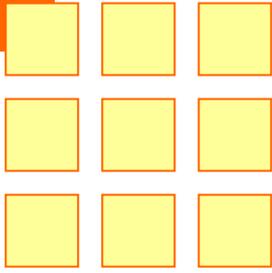
- Reinforcement bars of the foundation are installed after the lean concrete gains sufficient strength.



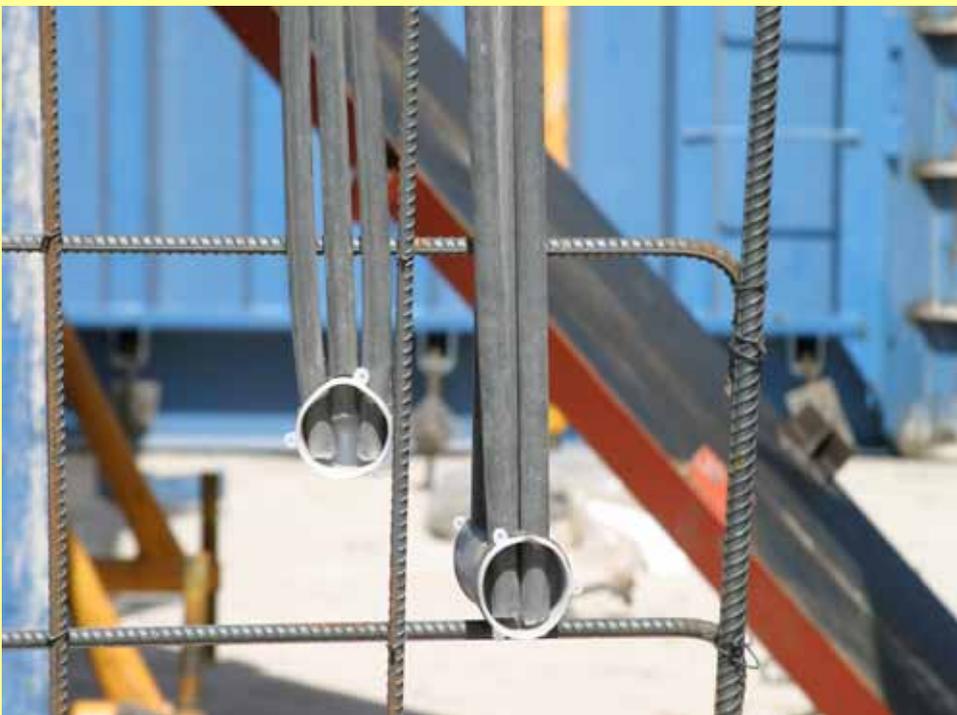


- The foundation forms are installed and concreted.





- The wall reinforcement bar grillage which has already been put in place is connected to the starter bars of the foundation.



- The window and door frames, electrical conduits and sockets, water pipes and sewer ducts are all built into the forms, thereby eliminating the need for drilling, boring and excavation work.
- Ventilator and chimney conduits are also pre-fitted into the forms. There is, therefore, no need to use precast concrete pipes, as is the case in traditional methods, for ventilation and the chimney.

- The wall forms are then installed and concreted.



- After removing the wall forms, first the ceiling bar grillage and then the ceiling forms are installed.

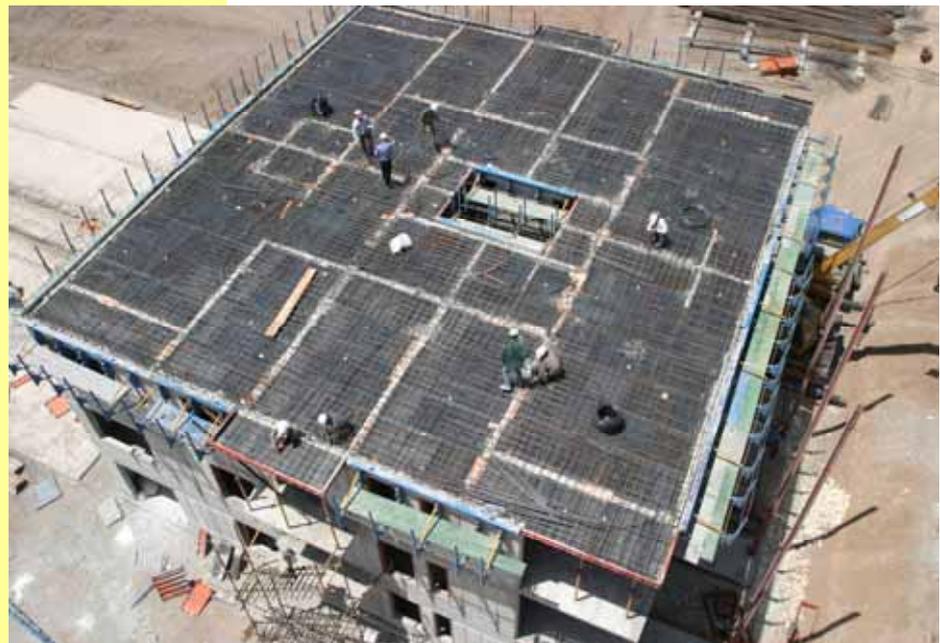
- The ceiling reinforcement bars are joined to the wall by means of starter bars. At this stage, junction boxes, electrical conduits and water pipe ducts which pass through the ceiling are built into the forms.



- The ceiling forms of the ground floor are concreted.



- In order to avoid noise nuisance to residents, prior to pouring the final concrete layer of upper floors, a 5-centimeter layer of propylene is applied to the concrete floor of each apartment.
- Then the ground floor ceiling is prepared for the installation of the walls of the first floor. This cycle is repeated in the same manner for other floors.



Structural and Architectural Features

- The entire structure, including the foundation, the walls and the ceilings functions as an integrated whole.



- Since all the constituents of the structure are load bearing, the overall weight of the building is nearly 300 kg per square meter less than steel structures.

- The walls, 10-20 cm. thick, are joined to the foundation and the ceiling slabs by means of dowel bars. Some partition walls can be built using materials other than concrete.

- Due to the overall integrity of the structures, problems arising from the use of low-quality materials, such as cracks and foundation settlement, are avoided.

- Since the plan design closely conforms to architectural requirements, it eliminates the need for using traditional load-bearing or modular systems.

- To achieve greater architectural flexibility, some internal partition walls can be built with gypsum boards, panels or masonry materials.

- If so required, all outer walls can be equipped from the inside with gypsum boards or from the outside with other suitable materials to achieve optimal thermal insulation.



- The system creates no restrictions as far as finishing work is concerned.

- Although the system is only utilizable in large scale construction, it gives us the freedom to build a variegated assortment of architectural designs and facades.

Savings in Men, Material, Equipment, Transportation Cost, and Time

- The reinforcement bars used in this system on average weigh 33 kg per square meter, as compared with about 50 kg in conventional methods.
- Not only the speed of construction in Kayson's system is substantially greater than traditional methods, the overall speed of construction can be doubled or tripled simply by adding one or two more sets of forms.



- Since all precast elements are built on the spot and only the forms are manufactured in the factory, there is no need to transport prefabricated parts to the project site.

- In Kayson's system a set of forms is used two hundred times but is transported to the site only in a single trip, whereas in the case of prefabricated panels, for instance, they would have to be transported to the project site in 200 trips.

- Construction materials, instead of being transported to the factory where they are turned into prefabricated parts, are shipped directly to

the site.

- Our system affords further savings in time and material since it enables us to paint directly on concrete immediately after removal of the forms.
- Overall, Kayson's housing construction system costs far less per square meter than conventional methods.

Principal Advantages

- Shorter site preparation and establishment.
- Provides better protection against natural hazards such as windstorm and earthquake, as well as against fire and explosion.
- Extraordinary speed of execution and more effective and precise schedule control.
- Less manpower, particularly unskilled labor, and more efficient personnel management.
- Easily adaptable to diverse topographical and climatic conditions.



- Produces greater savings in men, material, equipment, transportation costs and time.



- Offers more possibilities for variety in architectural design.
- Readily lends itself to quality control and assurance.
- Ensures a longer useful life.
- Costs substantially less than conventional methods.
- Easier cost control, and more accurate cost forecast.

Integrated Total Quality Management

In Kayson's system, all phases of construction process are controlled with exacting accuracy by implementing an integrated total quality management system. Indeed, without such system it is impossible to integrate and industrialize the construction site. This system encompasses design, engineering, procurement, construction, quality assurance and quality control, value engineering, human resource management, logistics, as well as environmental protection and occupational health and safety. Such comprehensive integrated approach to mass housing construction radically improves the quality, durability, safety, environmental performance, energy efficiency and affordability of homes built by Kayson. We also evaluate the efficiency of our quality management system through regular audits, the results of which become part of our continuous improvement systems.



A key element of our total quality management is customer satisfaction. Shortly after construction begins, a strategic communication plan is drawn up which includes such action items as distributing project brochures and newsletters about the project, holding informational events, launching an information-packed website, and inviting clients, local people and potential end-users to visit the site.