

About Construction and Construction Law - Productivity, Buildability and Constructability

This is part of a series of articles written by engineer, Audrey PEREZ, the author and presenter of SCL's Engineering 101 series of seminars.



By now, in this section of the SCL Newsletter, published for more than two years, quite a few building features most commonly associated with contemporary constructions, including associated defects and/or related disputes have been

introduced: Building Defects' definition and limitations, Waterproofing, Stone, Building Enclosures, Curtain Walls, various Facades' finishes, related maintenance and defects.

There are a plethora of features yet to be explored and equally numerous areas of potential disputes. Contemporary constructions are mostly constructed in reinforced concrete, steel structures, bricks, light partitions and finishes which would vary in substance and appearance infinitely, regardless of the nature of the building. Common finishes are timber (for instance parquet floors, timber laminates on walls, doors, trimmings, furniture), tiling, stone, paint, glass (doors, shop fronts, claddings and railing, ceilings and even glass floors), steel, upholstery, fabric, gold, silver, platinum leaves, fiber optic inserts in all the above and other more noble and mixed finishes to achieve a new, different, outstanding, trendy and/or luxurious appearance to a given place (and all of them very common in history): whether a house, a shopping center, a theatre, a hospital, a worship place, institutional buildings, housing developments, etc. Some of these features will be selected and be looked at in future publications with, as always, a focus on related challenges, pitfalls and disputes. Related issues of concept, design, procurement, appropriate specifications, materials sourcing, their transport, suitability of use in a given environment, installation, protection and maintenance will be equally pointed out for their importance and to show how neglecting any of them could lead to serious issues such as defects, delays and other consequential losses.

However, in this article, an exception will be made in order to take a short break from technicalities and materialistic considerations of construction. This article shares thoughts about concepts which are very prevalent in the Singapore construction sector today.

Construction productivity is the latest concept getting the attention of the entire construction sector as mandatory obligations are coming into force on 1st September 2011. It's the talk of the town! Closely related concepts are buildability and constructability. This article will deal with these concepts. Earlier in time and less than 5 years ago, sustainability, green designs and green construction trends flooded the industry

not only in Singapore but worldwide while such concepts are still today and internationally under definition!

DEFINITIONS FIRST!

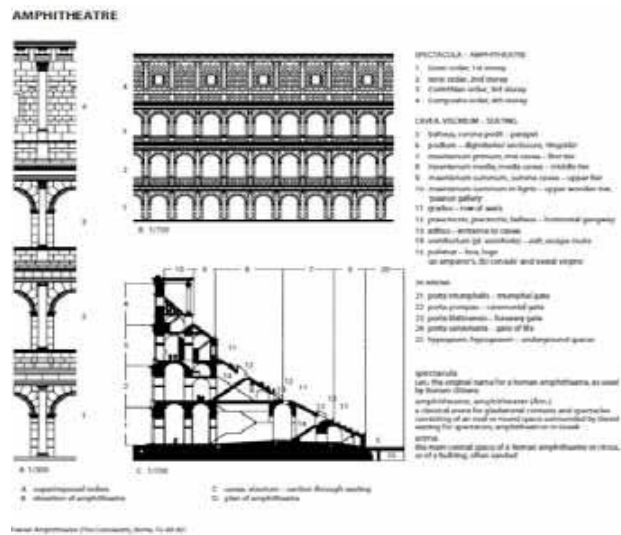
Whether in the construction context, in other sectors or nationwide, productivity is, in a nutshell a ratio made between a performance versus the resources deployed to achieve a given output. In a layman's words, this means what one spends versus what one gets! Therefore, it is easily understandable that there is not one common or international definition of productivity, even less in construction! Its definition varies depending on the environment in which it is considered, policies set in place and governments' initiatives to trigger progress and emulate healthy and durable competition that benefits a nation, a region or internationally. Its definition will obviously vary depending on the country, the industry or sector in question and the particular perspective and views taken on resources, performance and the output expected!

As such, the approach taken in Singapore with regards Construction Productivity is specific and hardly comparable to other sectors' and/or countries' definitions. The definition is clearly spelt out by the Building Construction Authority ("BCA"). It aims at making construction in Singapore more innovative, efficient and very much labour conscious. Indirectly, such initiative from the BCA undoubtedly invites various stakeholders to cooperate and objectively innovate in their own construction methods and organization to improve their performances and not just be content with past achievements. It is highly recommended, in order to properly understand productivity in the Singapore construction sector, to go onto BCA's website and read the accurate definition provided. Productivity related performance measurements, computations and incentives in place in Singapore are described accordingly.

Historically, the concept of productivity in construction is as old as construction itself! Each time man sought to progress and improve, innovations were brought to ease construction while achieving new challenges and therefore improving performance and raising productivity. Construction technology, methods and techniques, materials, equipment, labour required (including labour skills, know-how, experience, reliability), have been continuously studied and analyzed to make construction progress over the centuries. Surprisingly as it may seem, productivity was a concern to builders as early as the Antiquity, the Egyptian times, as well as for the Greeks and the Romans. New challenges, resource considerations and efficiency in constructing without compromising quality were undoubtedly what drove major discoveries and progress from Antiquity till today. Shocking as it may seem, the Middle Ages were a major reference point in technological progress in many sectors and mostly in construction. Prefabrication and the introduction of repetitive features for a more efficient and productive construction started when the first cathedrals were

built and later the race for the tallest cathedral took France and thereafter Europe in the Middle Ages. Once again, the underlying reason for such great inventions and progress related to sharpened resources for a faster and more efficient construction process!

It seems, to the construction professional, that nothing's new! Even earlier in Antiquity, the Egyptians faced similar issues as faced today in modern times when it comes to productivity improvement: sourcing, materials supply, human resources, equipment, standardization, costs, time, etc. are still issues at the heart of construction. It seems that policies set up to improve productivity changed over time but not the key areas of study that remain unchanged! In other words, construction principles and concepts are untouchable while construction technologies and methods may progress or not. In Antiquity, art, beauty and a strong spirituality drove ancient civilizations to progress such as the Egyptians and the Greeks.

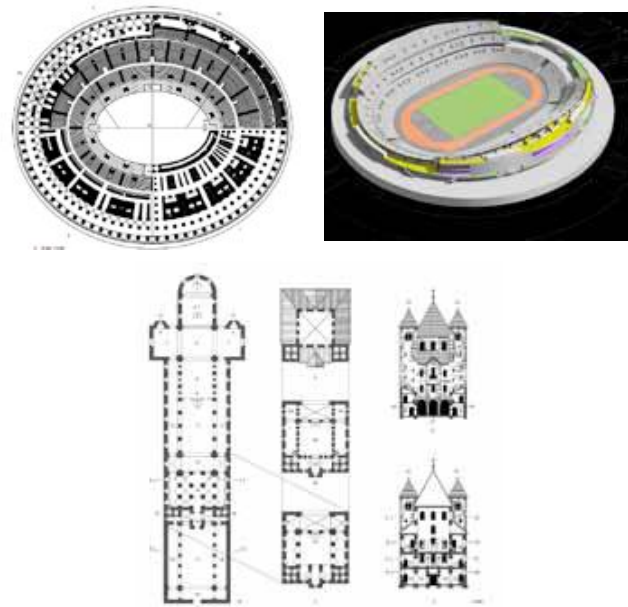


Above: Illustration of standardization and construction productivity excellence from the Romans – Amphitheatre; 72-80 AD



Above: Greek and Roman walling systems showing standardization in designing repetitive features together with a practical concept design that allows an efficient construction process.

The Romans were rather pragmatic and therefore noticeably revolutionized construction to make it the most innovative and productive ever! While inheriting outstanding and breathtaking innovations from past civilizations, the Romans, in their conquest rage, strived to be efficient in construction to develop and effectively maintain their Empire. The Romans' success resides in respecting and taking on board what they have inherited from the Greeks yet they strived to improve it for their contemporary interests: construct and develop colonies and make them flourish for Rome's benefit. This allowed them to spread tremendously and maintain their empire for more than 700 years! It is only excessive expansion and excessive success and wealth that led the Romans to neglect their development, led by decadence over a few generations and their inevitable fall. The Romans created new, revolutionary, construction techniques (the arch, high rise constructions such as aqueducts, theatres and other circular covered arenas, infrastructures and highways, bridges, new lifting equipment, prefabrication). They systemized standardization and set the base of our professions: architects, engineers, clients, contractors. They were probably the fathers of construction law and the founders of a very useful profession in maintaining peace by assisting the commoner in resolving disputes in appropriate forums according to set rules and codes: Lawyers!



Upper left: Roman Arena; Amphitheatre; 72-80 AD; upper right: 21st century Sports Arena productive concept design; above: Exemplary productive design! Productivity principles such as standardization are old concepts that have led and still lead to major progress in construction.

In the Middle Ages, various stakeholders became more structured and shared tasks to be able to face orders made by the new major developer of that time, the Church! Construction stakeholders had no choice but to improve their performances: Architects produced design concepts and managed the works, Engineers calculated and resolved technical issues to face higher expectations (higher cathedrals to display higher powers of a given diocese) and professionals built with skilled, specialized and organized workforce. Breathtaking structures, beautiful architectures requiring progress for realizing them were mainly driven by spiritual considerations and the passion of builders. Productivity improved through a better organization and creativity. Technical challenges, immaterial dreams and spirituality once again led to major improvement in construction productivity.

The first and second industrial revolutions respectively in the 18th and 19th centuries introduced more new concepts for systematically improving productivity such as: Anticipation, Standardization (Gutenberg), Regulation (Colbert), dividing the work process into small repetitive simple tasks (A. Smith) to list a few only. These have heavily influenced the construction sector as well as many other sectors. Mechanization was introduced and led all and everything: With Watt's steam machine invention, productivity has remarkably progressed once more in a very short period of 50 years in all sectors including construction.

Several inventions came along in modern days. Intelligent Technologies and/or computerized calculations and simulations once again revolutionized constructions by allowing more complex, thinner and/or taller and/or larger designs in construction, yet these did not have much effect on productivity. Today's productivity's progress is more related to a "just in time" concept, with no stocks, maintenance free, better quality, more flexibility and adaptability to customers with more controlled and stronger processes. Putting it differently, two centuries ago, what was produced was sold and then, what was produced had to be sold, and so on... Today, we produce what is already sold! Productivity evolved in this manner since the first industrial revolution regrettably neglecting, and leaving to the past, essential concepts to human kind progress such as the art, beauty and a sense of spirituality necessary to any lasting civilization. No major breakthrough came along in productivity improvement for the past half a century to change the world!

Understandably, in Singapore, productivity is very much connected to driving the industry in employing, more efficiently, foreign labour and skilled labour. However, it is very much focused as well on creativity and technological progress through respectively buildability and constructability.

The definition of "Buildability" in Singapore is, in a nut shell, the encouraging of architects and engineers or design and build contractors to conceive efficient and standardized structures and be able to incorporate prefabricated feature to demonstrate labour efficient and good quality results. Buildability performance in Singapore is objectively measurable and incentivized.

Constructability in Singapore focuses more on material resources such as equipment and construction methods connected to labour savings. Construction projects are attributed, against an objective score sheet a C-Score (constructability score) for each project for benchmarking.

In the next article, issues faced by construction productivity will be shared, including conflicts of interests between various stakeholders when it comes to making a noticeable progress in construction productivity.

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LIST OF NEW MEMBERS WHO HAVE JOINED SCL (SINGAPORE) IN APRIL – AUGUST 2011

- | | | |
|----------------------------|--------------------|----------------------------|
| 1. Lay Theng Kua | 10. Wee Siong Khor | 19. Liang Ren, Tricia Tang |
| 2. Lim Ek Heng | 11. Scott Ramsden | 20. Simon Silbernagl |
| 3. Vimalan Sivasubramaniam | 12. Yu Yen Wee | 21. Shemane Chan |
| 4. Ramana Boyani | 13. Wye Liam Kam | 22. Guat Moi Lee |
| 5. Blaise Mark Pearce | 14. Wooi Sin Teoh | 23. A.J. Tan |
| 6. Yi Peng Ong | 15. Helen Waddell | 24. John Baker |
| 7. Terence Ng | 16. Ben Bury | 25. Stephen Wright |
| 8. Kee Hwee Tan | 17. Stephen Evans | 26. Kevin Ong |
| 9. Koon Fat Ecomy Mou | 18. Paul Antliff | |

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