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Quality, Erection Speed, Cost Reduction : Keys for the Future of Civil Engineering

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Summary

Structures of the Future will be impressive, light and heavy, deep and high, wide and long. They will be challenging major issues, mitigating natural disasters, fighting the power of the wind, of the sea, of the earth, but linking people, countries, continents. The way this is going to be achieved can be seen from the most recent progress made in construction methods. Gigantism is a new tendency ; it is a need to erect major structures, quickly, economically, and safely.

But this progress has been made possible by taking into account the way the structures are going to be built at the design stage. Strong interaction between design and construction methods is the only way to get simultaneously both efficiency and a high quality level of the final structures.

Quality, Erection Speed, Cost Reduction will be the keys for the Future of Civil Engineering if and only if these objectives are taken in the right order.

1. Introduction

The past ten years will mark undoubtedly the history of Civil Engineering with an impressive series of prestigious projects. High Rise Buildings, Towers, Stadiums and Bridges, have broken successively a lot of world records, in terms of height, slenderness or span length.

These new structures would not exist yet without the fantastic development of unusual and spectacular construction methods using the power of engines and all the latest refinements of a modern technology. Moreover, perfection in construction methods leads to Quality in terms of Feasibility, Erection Speed as the result of an Integral Design Process, Efficiency in terms of Cost-Savings. This can be illustrated by examples coming from trends in the field of large foundations or from the recent construction of the largest immersed tunnel in the world.

2. Quality in terms of Feasibility

Generally speaking, Quality means aesthetics, comfort, structural serviceability, structural safety and durability which apply mainly to the final structure. From this point of view, Quality means Sustainability.



But the quality of the completed structure highly depends on the quality of the fabrication process and therefore the quality of the works.

This is what the Search for Quality means, in terms of Construction Methods to be used in the future, and this is the reason why prefabrication of steel and concrete components has been developed and intensively used for more than 40 years in all fields where it was applicable.

Challenges for the next millennium will lead unavoidably to the construction of long links. In this context, Quality of structures to be built in a difficult environment will generally be the result of a Search for Feasibility.

3. Erection Speed as the Result of an Integral Design Process

Erection Speed has more and more become a major objective in important projects as the whole decision process, which involves many components of various authorities, takes a long time when the design and construction period is reduced to a challenging minimum.

But the Search for Erection Speed could lead to the worse results in terms of Quality if considered as a priority. It should not be anything else than the result of an Integral Design Process where production and work are organised with the aim of simplicity and efficiency; in other words with the aim of reaching regularly perfection, without any deficiency along the whole production line of the Design and Construction Process.

4. Cost Reduction in terms of Efficiency

It has to be emphasised that the Search for Feasibility, in terms of Quality and Construction Speed, lead to the design and erection of heavy and costly temporary site installations. As a result labour efficiency compensates the investment and time spent at the earliest stages of the allocated construction period and leads to important savings.

Efficiency means Cost-Control and even more Quality. It is the result of a long preparation period, whatever the extra cost can be, because finally it has to be understood that extra costs are the path to cost reduction and therefore to Competitiveness without neglecting Quality.

5. Conclusion

The way the structure is going to be built is therefore a fundamental aspect of the Design Process.

This is not new and should not be surprising as large Engineering Structures have always been designed taking into account a certain number of parameters of which, geographical location, available materials, known and practicable or proven construction methods, are the most usual.

But this should apply to any structure and the design phase should never be limited to the selection of a Concept, of the Materials to be used, of adequate Design Criteria, on the basis of a fit for purpose approach, without taking into account construction methods.