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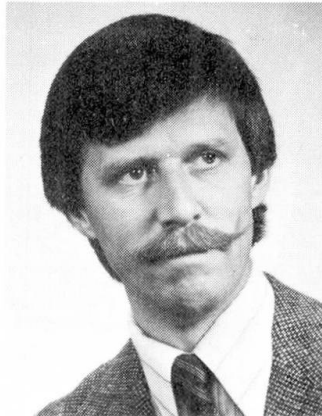
## **Supervisory Control and Suggestions on Quality Improvement**

Contrôles de fabrication et idées pour une amélioration de qualité

Überwachung der Produktion und Anregungen zur Qualitätsverbesserung

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Klas Torberger, born 1941, got his degree in civil engineering at the Royal Institute of Technology, Stockholm, Sweden. For seven years he was involved in the design of bridges and industrial buildings followed by four years of marketing of prefabricated concrete structures. He is now responsible for the design of prefabricated concrete structures.

### **SUMMARY**

This paper gives a brief description of the organization of the supervisory control of concrete element prefabrication. It presents some results from the control, as well as dealing with some ideas on how to improve the quality of production.

### **RESUME**

Cette communication donne une brève description de l'organisation des contrôles exercés lors de la préfabrication d'éléments en béton. Quelques résultats de ces contrôles sont présentés ainsi que quelques idées concernant l'amélioration de la qualité des produits fabriqués.

### **ZUSAMMENFASSUNG**

Der Vortrag enthält eine kurze Beschreibung der Organisation für Güteüberwachung in der Produktion von Betonfertigteilen. Es werden auch einige Resultate dieser Überwachung nachgewiesen sowie Hinweise gegeben, wie sich die Qualität der Produkte verbessern lässt.



The manufacturing of concrete elements as well as most concrete products in Sweden is subject to supervisory control by a control organization. This organization is formed and managed jointly by state and municipal authorities, state and private customers (contractors) and by the manufacturers of concrete elements. The aim of the organization is to carry out a control based on specific competence, thus limiting the need for control by each customer or by each municipal authority. Their right of control is not, however, restricted hereby.

The supervisory control is executed on randomly chosen visits to the factories. No prior warning of the visits is given. The number of visits made to the factory depends on the scope of the production.

During the supervisory visits the main functions subject to checking are shown below together with the results for four consecutive years. [1-4].

<u>Function</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
- drawings	152	167	138	178
- basic materials	19	8	16	13
- personnel	48	69	69	36
- equipment for control and production	21	14	17	11
- labeling	109	79	98	111
- execution of the products	355	444	382	408
- handling	10	14	6	5
- completed products	38	19	17	20
- internal control	197	207	187	207
- basic materials, testing reports	8	26	20	12
- pre-tensioning	13	8	13	5
TOTAL	970	1055	963	1006
Number of control visits	458	507	534	528

Each function comprises different checking points. On checking, each notation is documented. The seriousness of the error is then judged and given a grade of 1, 2 or 10, where 1 stands for minor errors and 10 for very serious errors. To assess the capability of the factory a weighted sum of the reported errors is used.

During the four years the notations given the grade of 1 vary between 79 and 85%, the grade of 2 between 13 and 19% and the grade of 10 between 1.7 and 2.5%. The volume of production has increased yearly by 5 to 10%.

High proportions of errors are shown for the functions, drawings, labeling, execution and internal control. Drawings are in most cases subject to checking by authorities before distribution to the factory.

Execution and internal control have also high proportions of notations.

What conclusions can be drawn from these figures and what steps can be taken to provide better quality? Can it be possible that the control is so effective that the ultimate level of quality has been reached? An affirmative answer to the last question means that no further knowledge and improvement can be obtained from the results.

The relatively high level of notations with regard to drawings is astonishing. The reason may be that municipal authorities in many cases are without specific competence. They trust the designers - some kind of unofficial authorization. Type approval of design and products is one method of improvement. Another way might be authorization. To improve the competence of the municipal authorities would be a third way but this seems to be a bit costly.

The proportion of notations is high for the execution and internal control of the functions. This leads one to believe that the comment in the Introductory Notes, page 59, "someone else will look at this work and will find out if anything goes wrong so therefore I can leave it as it is" is valid.

It would not be correct to assume that the best possible level of quality has been reached. Rather, I think, that the goal of a better quality cannot be achieved by applying the present system.

One solution could be to strengthen confidence in the ability of the producer and to reinforce his responsibility. This could be attained by setting up a supervisory organization that would impose the following requirements on the producer:

1. An organization plan with clear allocation of responsibilities.
2. A plan for control that puts the responsibility for the internal control on the manufacturing units.
3. A control unit that can handle the control equipment. Their responsibility is to serve the producing units.
4. A control programme for each production unit that describes the necessary checking points and how often checking has to be done (differs depending on the seriousness of a mistake).

The task for the supervisory organization should primarily be to check that the organization works according to the plan for control, secondly to check that the control programme has been implemented, and thirdly to execute its own spot checks. The number of supervisory checks by each producer should be related to the results of the checks. Bad performance could lead to extra visits involving much higher costs.

By integrating control and manufacturing it will be possible to learn from mistakes and it will also contribute to the development of better methods of production. The consciousness of quality will penetrate the whole organization. Costs may appear to increase, but this will be compensated for by fewer errors, i.e. lower costs.

#### REFERENCES

- 1-4 Kontrollrådet för Betongvaror, Bulletins. Stockholm 1979, 1980, 1981, 1982. ISSN 0075-6776.

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