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1. INTRODUCTION

1.1 The concept of quality assurance

The following principles of quality assurance for structures aim at ensuring that the structural performance requirements are fulfilled in an economical manner. In this document the main requirements are related to safety, serviceability and durability.

The principles apply to the entire building process, viz. planning, design, construction, control and use of structures.

> Thus this document could also be regarded as a description of a way to rationalize the building process.

This document is in principle directed to every participant in the building process. However, it is intended mainly for international and national code writing committees and national authorities dealing with codes and recommendations concerning the quality assurance of structures.

The document is not intended to be operational but conceptual.

The function of quality assurance is to ensure that all activities influencing the final quality of a structural system

- are based on clearly defined fundamental requirements together with operational, environmental and boundary conditions.
- are correctly carried out by competent personnel and in accordance with previously elaborated plans.
- are executed by a systematic adherence to written instructions

and that this is verified by means of objective documentary evidence.

To a large extent, quality assurance consists of strategies against human errors. Experience shows that these are often the main cause of structural failure.

> In this document the concept of quality assurance is taken in a fairly broad sense but with the restriction that it is limited to safety, serviceability and durability. An outline of the components of the quality assurance concept is given in section 2. This is followed in sections

3 - 6 by a presentation of the aspects which are considered to be of most importance in structural engineering. These concern utilisation and hazard scenarios, tasks and responsibilities and quality control.

1.2 The building process

The building process is assumed to start with decisions concerning the desired performance requirements and with establishing boundary and environmental conditions. It is assumed to end when the use of the building ceases.

The building process is assumed to be made up of a sequence of events eg. planning, design, fabrication, etc., the details of which are dependent on the type of structure. The process can be subdivided into a number of stages between which either major decisions and/or interactions occur.

In order to make the content of this document somewhat more concrete it is assumed to be applied to some building process of a common type.

FIG 1 shows an example of a simplified flow chart of a building process. If another type had been chosen it might have affected the details and the examples in the following but not the principles.

The small cirkels on the chart are associated with interactions between individual persons or organizations and a need for one or more decisions. The chart is simplified to a great extent. In a building process there are normally several decision occasions every day; those given in the chart should only be regarded as examples of major decision occasions.

1.3 Feedback from experience

According to 1.1 the requirements for safety, serviceability and durability should be fulfilled in an economical manner. One of the measures that should be taken to reach this aim is to use experience obtained during execution of a project and subsequent maintenance of the structure.

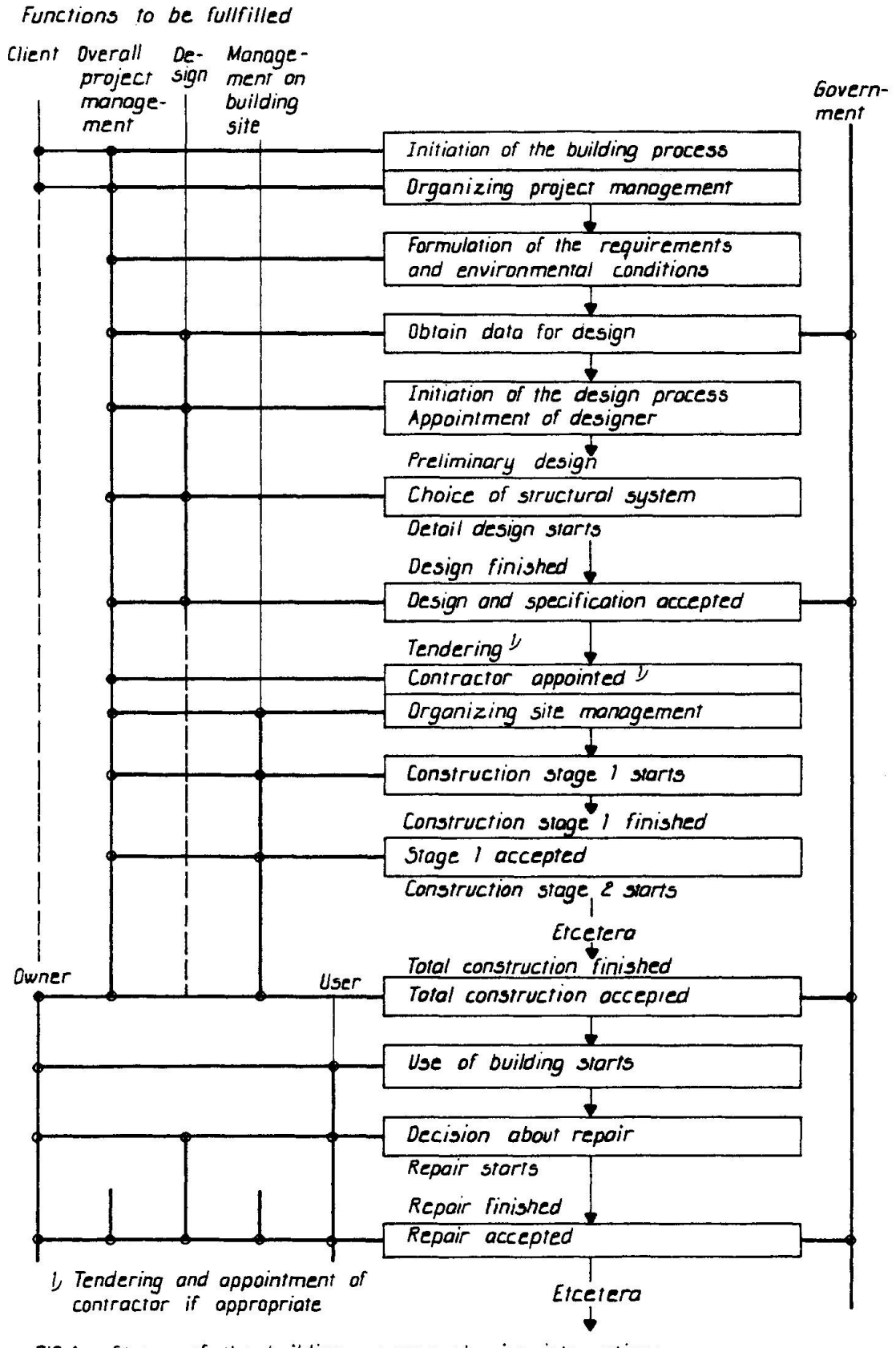

FIG 1 Stages of the building process showing interactions

In some cases experience obtained during one stage of the building process can be used for a later stage of the same project. For example, this is common for tunnel projects in rock where experience from the site is often a basis for the design.

The results of control activities can be regarded as experience that increases the knowledge (compare 5.1) about, for example, material and production processes.

The experience from building failures (severe or of minor importance) also form a valuable background for increasing the general level of knowledge. Thus code drafting and similar organizations should evaluate structural failures occurring during the execution of projects and the maintenance of structures.

2. COMPONENTS OF THE QUALITY ASSURANCE CONCEPT

2.1 Performance requirements

The performance requirements set out during the first phase of the building process concern the formulation of the specific requirements for the building and the requirements given in building regulations and codes.

See stage 2 in the flow chart shown in FIG 1.

These performance requirements have to be translated into technical terms for the loadbearing structure.

See stage 3 in the flow chart shown in FIG 1.

Thus, for example, stage 2 could be the specification of the intended use for the building and stage 3 the specification of the corresponding restrictions regarding deformations.

The performance requirements for a structure generally concern safety, serviceability and durability which, in this document, are defined in the following way