Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 70 (1993)

Artikel: Automatic monitoring of buildings deterioration
Autor: Almesberger, Dario / Rizzo, Antonio / Fabbro, Federico / Tonicich, Milenko
DOI: https://doi.org/10.5169/seals-53303

Automatic Monitoring of Buildings Deterioration

Surveillance automatique de la détérioration de bâtiments

Automatische Überwachung der Schadensbildung an Bauten

Dario ALMESBERGER
Eng.

Antonio RIZZO
Eng.

Federico FABBRO
Arch.

SER.CO.TEC
Trieste, Italy

Milenko TONICICH
Eng.

SUMMARY

The time control of structural failures should be accomplished by monitoring systems which can provide data in real time. Using such a system we are able to follow the evolution of structural cracking , thermohygrometric conditions, structural yielding and other sources of material and structural deterioration occuring within a time domain.
The data acquisition unit connected to the measuring transducers is based on an intelligent system endowed with a programmable microprocessor which received analogic signals transformes into digital values. This unit, using a modem, submits the data by phone to a central control point where the received data are read and processed by a personal computer. The central control point can be located in a designer office or any other place where monitoring data are required. This acquisition data system is fully automatic permitting remote control of data readings. The system, once installed, permits monitoring continuously in time without staff assistance at the control point both for receiving and processing of data.
Autors examine the real possibility of monitoring today and present the last significant applications they made in Italy.

1. INTRODUCTION

Step 1. Find the Deterioration

In practise, this apparently obvious and simple statement may present a very subtle problem when defects are not visible. For example, timbers and timber pilling can be damaged by insects or other organisms, virtually to the point of collapse, without exhibiting any external evidence; corrosion of steel can be difficult to detect because it occurs, principally, in the most inaccessible parts of the structure.

Step 2. Determining the Cause

This is, by far, the most difficult and important step. There are no rules or procedures for determining the cause or causes of deterioration, each case is an individual problem. However the analysis of cracks, the appearance of the surface of concrete, the inspection of timber and steel structures, furnishes an idea for further investigations. It is important to study the structure in bad weather as well as in good. Also it is important to investigate the problem sufficiently deeply to discover any hidden or latent defect.

Step 3. Evaluating the Strength

Usually, the building being investigated is in active use, and it is necessary to determine, as quickly as possible, if it is safe to continue to use it, or if the facility should be restricted to some less severe usage.

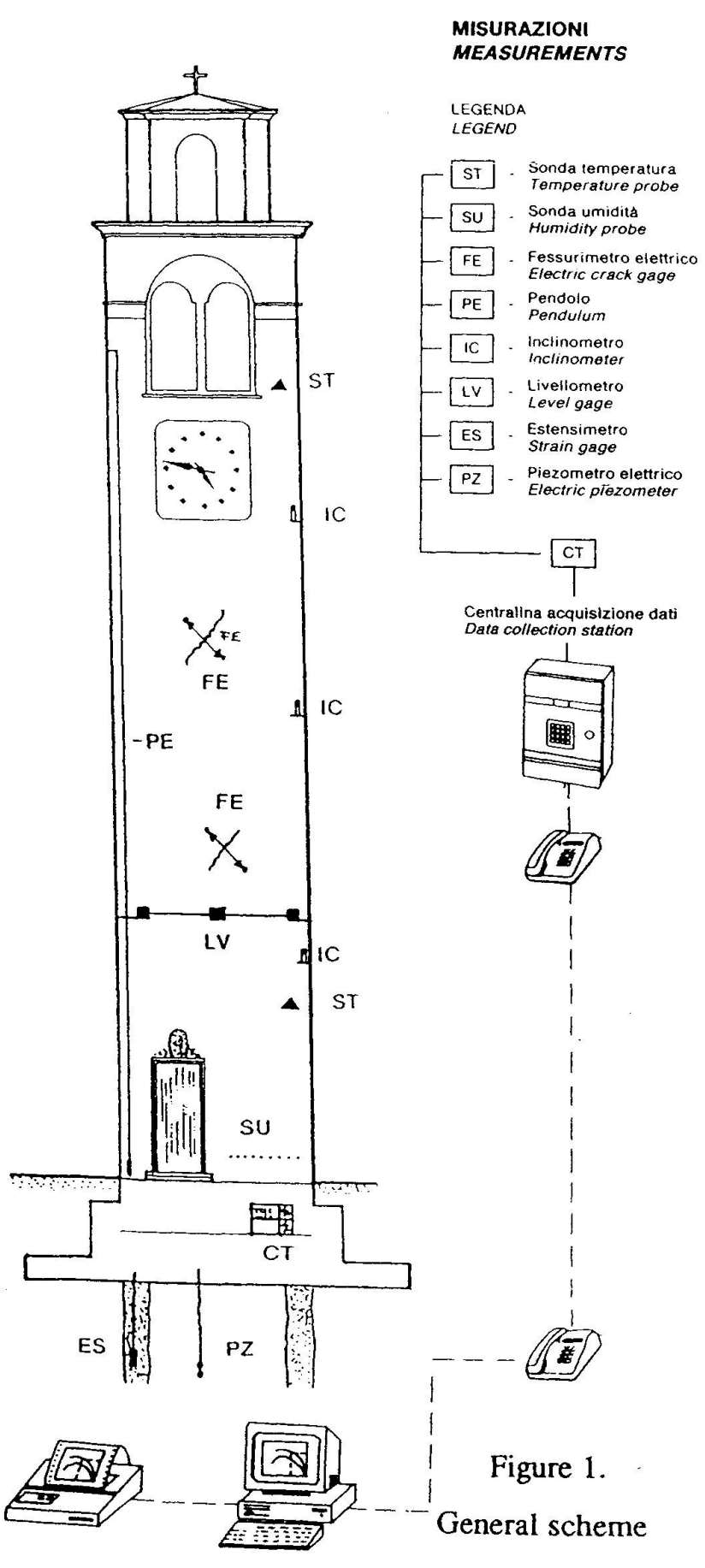

Figure 1.
General scheme

All the difficulties encountered in the steps for detection and diagnostic can obtain a powerful aid by monitoring the main parameters of the structure with non destructive techniques.

The modern technique and technology of measurements made the controls and monitoring easy. Electrical transducers transform every important parameter in numeric digital signal, data-loggers can retain for further manipulation, computers and suitable software elaborate data in real time, modems diffuse every information or data requested all over the world.

This acquisition data system is fully automatic permitting remote control of data readings.

The system, once installed, permits monitoring continuously in time without staff assistance at the control point both for receiving and processing of data.

Although this system and the corresponding software are very sophisticated they are permanently upgraded and further developed.

In the example (Figure 1) we examine the actual possibilities to control a church tower. Transducers continuously measure the variations of: width of cracks, temperature, moisture content, global and partial verticality, stresses, strains, relative displacements. All the transducers are connected to a central controller that by modem release actual values of measured parameters.

This arrangement of instrumentation allows to evaluate the evolving of deterioration in the time and also to study the importance of the cyclic variation of temperature and moisture content of the walls and foundations.

The last application we made in Italy concern the evolution of cracks in the upper part of Castel S. Angelo in Rome, Chiesa S. Paragorio in Noli and Chiesa S. Lorenzo Maggiore in Naples.