

## Committee Report: JCI-TC173A Technical Committee on Delayed Ettringite Formation

### 委員会報告：JCI-TC173A エトリンタイトの遅延生成（DEF）に関する研究委員会

Shunsuke HANEHARA, Ph.D. (engineering): Iwate University

羽原 俊祐, 博士 (工学) : 岩手大学

Yuichiro KAWABATA, Dr. Eng.: Port and Airport Research Institute

川端 雄一郎, 博士 (工学) : 港湾空港技術研究所

Shoichi OGAWA, Dr. Eng.: Taiheiyo Consultant

小川 彰一, 博士 (工学) : 太平洋コンサルタント

Hikotsugu HYODO, Dr. Eng.: Taiheiyo Cement Corporation

兵頭 彦次, 博士 (工学) : 太平洋セメント

Natsuki YOSHIDA, Dr. Eng.: General Building Research Corporation of Japan

吉田 夏樹, 博士 (工学) : 日本建築総合試験所

**Contact:** jci-web@jci-net.or.jp

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### Abstract

When moisture is supplied after hardening of high-temperature cured concrete, the concrete has a risk to expand owing to re-formation of ettringite (delayed ettringite formation: DEF). Presently, findings for DEF have not been fully organized, and the risk of deterioration due to DEF in structures in Japan, in particular, remains unclear. In this technical committee, regarding expansion due to DEF and the resulting deterioration in structures, we comprehensively summarized the mechanisms and diagnosis procedures, comparisons between overseas structures and domestic structures, and preventive measures for structures. Although domestic examples of DEF-related deterioration in structures are limited, regarding the risks thereof, we report the results of discussions from the viewpoints of material science and structures.

### 1. Introduction

Ettringite (Ett) re-formation is a phenomenon in which concrete expands when moisture is supplied after hardening to high-temperature cured concrete. Examples of this have been recently reported in mass concrete and other structures overseas. This phenomenon is referred to as delayed ettringite formation (DEF), and although no cases of structures that have deteriorated considerably due to DEF have been reported in Japan, the possibility of such deterioration has been indicated. Expansion due to DEF is assumed to involve large expansions due to an alkali-silica reaction (ASR), which is a similar expansion phenomenon, and thus, it is possible that when expansion occurs due to DEF, it may negatively affect structural performance, causing cracks and excessive deformation. However, presently, findings on DEF have not been organized systematically,

and in Japan, the risk of expansion due to DEF and the resulting deterioration in structures (DEF-related deterioration) remains unclear. On the other hand, in the “Guidelines for Control of Cracking of Mass Concrete” (hereinafter, the Mass Concrete Guidelines) of the JCI, the verification of DEF cracking has been added, so it is possible that actual cases requiring preventive measures for DEF will increase in future.

Against such a background, the JCI-TC173A “Technical Committee on Delayed Ettringite Formation” was established to organize the latest information on DEF and re-discuss the risk of deterioration in structures due to DEF. Over a 2-year activity period, four working groups (WGs) were organized to discuss four points: mechanisms of expansion due to DEF, diagnosis based on material science, comparison of real cases between overseas structures and structures in Japan, and.....