



FUGRO-SUHAIMI

FIRE-DAMAGED CONCRETE: ASSESSMENT AND REPAIR

We offer a professional evaluative consultancy with allied technical services for determining the extent and severity of damage caused by fire, whilst providing advice on repair strategies.

Concrete is ostensibly fire-resistant, and concrete structures are usually capable of being repaired, even after a severe fire. Assessing fire-damaged structures allows us to identify appropriate repair methods, or decide whether it is more appropriate to demolish structural elements. This process requires a systematic approach.

OUR SERVICES INCLUDE:

- **Specialist site teams** for non-destructive and semi-destructive testing (NDT and SDT).
- **Petrographic examination**, to examine the mineralogical changes

within the concrete and determine the maximum temperature attained; deduce the depth to which the concrete has been damaged; and estimate residual strength.

- **Physical laboratory** for compressive and flexural strength testing.
- **Reinforcement bar analysis** to determine hardness, yield, elongation and tensile strength.
- **Chemical laboratory** equipped to test concrete characteristics, including depth of carbonation.



Core sample extracted for laboratory testing.

IMMEDIATE AND THOROUGH APPRAISAL

Fugro-Suhaimi's experts can help to plan and execute a complete fire-damaged concrete assessment for a range of structures, including infrastructure elements, such as bridges, and commercial and private premises. With any assessment, the three principal concerns in evaluating the effects of a fire on a concrete structure are:

- Depth of damage (spalling) or loss in strength of the concrete
- Loss in strength of steel reinforcement or embedded structural steel elements
- Damage or distress to the structure from movement, settlement or imposed loads

SITE INVESTIGATION TECHNIQUES

The spalled and blackened concrete surfaces typically observed after a fire may appear to indicate widespread damage, when in fact, the damage could be much less severe. An assessment will require a combination of complementary investigative techniques to determine the severity and extent of the fire damage and to qualitatively and quantitatively describe the remaining concrete. A variety of NDT and SDT tests, used in conjunction with laboratory testing, are available to determine the extent and severity of the fire damage, such as:

- Visual survey and assessment
- Rebound hammer survey
- Ultrasonic Pulse Velocity (UPV)
- Coring and breaking out
- Tapping survey
- Load testing of structural elements
- Reinforcement bar testing, including hardness, natural frequency and stress relaxation testing.



Spalled surface affected by heating exposing pre-stressed tendons.

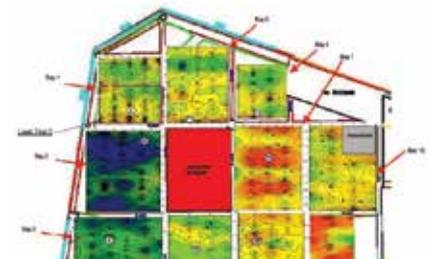
ADVICE ON REPAIR STRATEGIES

Remedial measures are likely to be based on a comparison of the cost of removal and the need for reinstatement. Our assessment will delineate the areas required to be repaired. Upon completion of the investigation, our experts can discuss a range of cost-effective repair options and determine the most appropriate solution depending on the service life of the structure. Repair advice includes:

- Preparation of repair strategies
- Supervision of repairs
- On-site testing and QA of repair materials and their application
- Strengthening measures
- Protective coatings
- Decorative treatments



Photomicrograph of concrete subjected to heating, showing induced microcracks.



Visual assessment of the extent of fire damage to a commercial property.



Visual assessment of the extent of fire damage of a commercial property.

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