



## **Work Theme A: Sustainable Infrastructure Development**

### **A1: Atmospheric Corrosivity of Exposed Structural Steelwork**

#### **Project Title:**

#### **a) Atmospheric Corrosivity on Infrastructures in Hong Kong**

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#### **Project Outline:**

To confront potential durability problems in infrastructure in Hong Kong, it was essential to investigate and understand various controlling mechanisms in corrosion in exposed structural steelwork. Hence, it is necessary to examine atmospheric corrosivity of exposed structural steelwork under local environments in Hong Kong. The project aims to study atmospheric corrosivity in local areas in Hong Kong, and to collect local data in different areas of Hong Kong. Moreover, corrosion resistances of steel plates with different corrosion protection systems will be assessed through field site tests. Once sufficient quality data on various corrosion rates on different test samples across various locations in Hong Kong have been acquired, a corrosion map for the entire Hong Kong will be developed to establish annual corrosion rates for durability assessment of existing structures as well as for durability design of new structures. In general, the longer the duration of field testing, the more reliable testing results they are. Although a research period of 25 years is the optimal investigation period in practice, a research period of 5 to 10 years is also desirable. While a research period of 1 to 3 years may be adopted, interpretation on the test results should follow closely to established practice given in relevant international standards.

Once sufficient quality data on various corrosion rates on different test samples across various locations in Hong Kong have been acquired, a corrosion map for the entire Hong Kong will be developed to establish annual corrosion rates for durability assessment of existing structures as well as for durability design of new structures. This will bring tremendous economic benefits to Hong Kong as a whole in the long run as this will provide scientific guidelines in designing next building and civil engineering structures against atmospheric corrosion. Savings on maintenance expenses on newly built residential buildings, commercial offices and public buildings as well as roads, highways, railways, tunnels, bridges and port facilities will have then be reduced on the long run.

It should be noted that:

- a) According to expected degrees of atmospheric corrosion and importance of infrastructure, a comprehensive field test programme was devised to be conducted at selected locations in Hong Kong. A total of 12 to 15 sites have been selected in different kinds of locations: rural, urban, industrial and coastal areas etc. Bare steel plates, galvanized steel plates with different galvanization chemistry and protection systems are then exposed outdoors for a period of 1 year while inspection on these specimens will be made regularly.
- b) It should be emphasized that the proposed field tests will be supplemented with periodic measurements and regular monitoring of the environmental conditions, so that the presence of various atmospheric chemicals may be scientifically related to the corrosion rates of different test samples.
- c) Some of the field tests are located in secondary schools, and both teachers and students will participate and carry out simple inspection and recording on the states of corrosion of these steel plates. Hence, student education in Science, Technology, Engineering and Mathematics will also be integrated in the field tests.

Hence, the finding of this project will have significant impacts on infrastructure developments in Hong Kong with huge socio-economic consequences. Moreover, the proposed field tests may be considered as pilot studies for China, in particular in other maritime cities in the Pearl River Delta Region. For inland cities, it is necessary to examine the presence of other atmospheric chemicals which are produced in large quantities locally from different industries which may cause severe corrosion.

Furthermore, the Hong Kong Branch is collaborating with a number of global and bilateral partners, and research institutes in the field of corrosion and corrosion protection of materials in the world, such as French Corrosion Institute in France, Swedish Research Institute (SWEREA) in Sweden, the Singapore Institute of Manufacturing Technology (SIMTech) in Singapore, and the Corrosion Technology Laboratory at the NASA Kennedy Space Center of the U.S.A. The Hong Kong Branch will collaborate with the French Corrosion Institute to conduct the atmospheric corrosivity field tests in Hong Kong in 2017. Specimens delivered from France will be exposed in some of the sites of the project, and the results will be assessed and compared with other corrosion rates obtained in Dubai and France.