

# Hong Kong International Airport



## INTRODUCTION

Hong Kong International Airport (HKIA) was one of the world's largest civil engineering projects and is now one of the world's busiest airports in terms of international passengers and cargo volume. Atkins has been responsible for virtually all the airfield pavements at Hong Kong International Airport since design work commenced in 1993.

The first major design package Atkins undertook for the HKIA was the design of the pavements for the Southern Runway and associated taxiways and aprons. This contract was completed on time in 1998 with the cost savings of hundreds of millions of dollars as a result of the value engineering implemented by Atkins. Following the success of the Southern Runway contract, Atkins was awarded a second major contract for the Northern Runway and North West Concourse, which opened in 1999 and 2000 respectively.

Other services provided by Atkins include the design of the aviation fuel jetty and pipeline and the secondment of specialists on the airport systems integration and claims resolutions.

Since its opening in 1998, the airport has experienced substantial growth in both passengers and air cargo traffic and Atkins has continued to provide professional services to the Airport Authority for its airport expansion projects. To meet the growth in air cargo business, Atkins were awarded the design of new cargo aprons, involving four cargo stands, in 2000 and an additional eight cargo stands a year later. Further expansion of the cargo apron with three new stands and a taxi lane was implemented in 2004 under Atkins' construction supervision.

In 2005 Atkins undertook the design of a major maintenance apron expansion to provide for the expansion of the aircraft maintenance business. This involved the realignment of an existing taxiway and three new maintenance stands. Following on from this, in 2006, Atkins was awarded more design work to provide an

additional two maintenance stands and the associated taxi lane and construction for this is currently underway and scheduled for completion in early 2008.

The growth in budget airlines prompted the implementation of five low fare carrier stands located adjacent to the control towers. Again, Atkins was the first choice to undertake the design and construction supervision of the works in 2005.

One of the current projects at the airport is the North Satellite Concourse which is part of a HK\$4.5 billion expansion and improvement programme implemented by the Airport Authority in 2006. Atkins is undertaking the design of the apron modifications and new aircraft stands for the terminal.

In addition to undertaking the full design and construction supervision of new projects, Atkins have continued to provide consultancy services and experienced staff secondments to the Airport Authority for the construction supervision of airfield works, geotechnical term consultancies and safety advisory services.



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## OUR SOLUTION

The airport was constructed principally on reclaimed land, and a major consideration was the allowance for settlement in the design of the pavements. A number of different pavement types were designed depending on location and functional requirements. These included aircraft grade rigid PQC pavement for the stands, blockwork pavement for stand areas subject to high differential settlement and flexible asphalt pavement for the runways and taxiways. Through value engineering studies, the traditional solution of cement or bitumen stabilized base and sub-base layers was replaced with un-stabilized material for the flexible and blockwork paved areas including the runways. This was found to be possible due to the availability of high quality locally sourced aggregate for the sub-base, which provided the necessary mechanical interlock, whilst allowing for the predicted settlements. The solution eliminated the need for 1.4 million cubic metres of cement / bitumen bound material, resulting in significant cost savings.

Another area of value engineered design was in the development of alternative design widths for the taxiways, which had been specified to accommodate ICAO Code F aircraft (such as the Airbus A380). As it was expected that these aircraft would not be in service until about ten years after project opening, we proposed to provide the full width to Code F requirements for the main taxiway pavement, whilst providing the lesser width requirements of code E for the shoulders. The basis of this design approach was that with the expected settlement the pavements would require major maintenance before the introduction of the Code F aircraft. Widening of the shoulders could then take place at this time and the delay in implementation would also allow for the Code F criteria to be finalized. This resulted in a reduction of over 150,000 square metres in the initial pavement construction area.



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## OUR APPROACH

Value engineering studies at an early stage of scheme design can result in significant savings in design time, materials and out-turn costs. Atkins design philosophy took into account the Airport authority's development strategy as well as practical engineering requirements. Constructability was increased by rationalization of the total number of different pavement sections. Atkins also undertook simulation studies of airfield movements using the forecast growths in aircraft types and traffic movements, to determine the point at which the planned second runway would be required, and to determine the optimum number and layout of holding areas, rapid exit taxiways and taxiways. This simulation produced savings in the total area of pavement required.

## OUTCOMES

Hong Kong International Airport opened in 1998 and the design solutions provided by Atkins have been very successful with the pavements now handling over 45 million passengers and 3.6 million tonnes of cargo a year. Atkins, through their unrivalled experience and capability, continues to provide cost effective and robust solutions to assist the Airport Authority in meeting the unprecedented growth at Hong Kong International Airport.



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