Toyota Elephant Passage at Denver Zoo

Denver, Colorado

Denver Zoo was originally constructed in 1896, so when the new Toyota Elephant Passage exhibit was in its conceptual stage, 116 years of knowledge and experience went into every aspect of the new feature, from the main structures to the smallest details. The opportunity for a zoo to build such an advanced, state-of-the-art exhibit seldom comes around, and careful consideration was given to the planning and decision-making for a facility that would house the largest land-based mammals on the planet.

In this day and age, the challenges are numerous for constructing an environmentally-sensible facility that will provide a humane environment for the animals, as well as a safe experience for visitors. A decade of planning went into this $50 million, 10-acre exhibit, designed with over two miles of interconnected trails and more than one million gallons of filtrated pools. Due to its strength and versatility, steel was the logical choice as the primary building material for the numerous outdoor and indoor structures required to create this inviting, Asian-themed facility.

All the steel structures, cages, fences, and 136 massive steel gates are perpetually exposed, both to environmental and weather conditions as well as the corrosive waste produced by elephants and rhinoceroses. Most protective coatings in these harsh, high-traffic areas would be scratched and scraped away within a short time by these massive animals.

Fortunately, Denver Zoo has extensive experience with hot-dip galvanizing (HDG), through the Predator Ridge exhibit and expansion. Completed in 2004, Predator Ridge houses over 50 species including South African lions, spotted hyenas and African wild dogs and contains hundreds of tons of HDG steel. The coating's superior performance made the decision to protect future exhibits a simple one.

Hot-dip galvanizing is the safest coating option, as zinc is an essential element for all living creatures. HDG is also the most durable option, thanks to the zinc iron alloy coating layers that are harder than the base metal. The metallurgical bond strength of HDG also minimizes the flaking and peeling prevalent with other coatings. A well-adhered HDG coating will eliminate the possibility of animals ingesting potentially harmful flakes or chips prevalent with other coatings, while withstanding the routine power washing necessary to remove the animal waste products.

Many of the steel cages, gates, doors, guard rails and other miscellaneous steel components were designed and fabricated using hollow tubes and pipes susceptible to internal corrosion. The galvanizer worked closely with the designers and the fabricator

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Owner
Denver Zoo

General Contractor
Kiewit Building Group, Inc.

Engineer
Monroe & Newell Engineers, Inc.

Architect
CLR Design

Fabricator
Guiscardus LLC

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to determine the proper locations for venting and drainage openings. As a result, the HDG process will coat all internal areas, providing complete and equal protection for all surfaces — both inside and out.

Aesthetics for the new display were very important, as Asian-themed colors and designs are prevalent throughout the exhibit. Versatile HDG coatings can be easily profiled to accept a secondary color coating. The resulting synergistic effect of the duplex system will greatly extend the life of both the galvanized coating and the color coat. Once the HDG coating is in place, the color options for these themed structures are endless.

Environmental considerations were a primary concern throughout this project, and the zoo went to great lengths to incorporate energy efficiencies and the latest sustainable design practices. The exhibit's most notable innovation is a revolutionary biomass gasification system which will convert the zoo's 1.5 million pounds of animal waste and human trash into usable energy. This system will produce up to 20% of the zoo's total energy requirements while preventing 1.5 million pounds of annual waste from being transported to local landfills.

A state-of -the-art water filtration system will recycle the 1,000,000 gallons of water needed to maintain the exhibit's animal pools and drinking water while bolstering the zoo's decade-old water conservation efforts. These advancements, along with natural lighting via skylights and windows, independent heating, cooling and lighting systems, radiant-heated floors and sunlight-reflective colors on the roofs and buildings all play a role in this dynamic, energy-efficient exhibit.

Galvanizing was a perfect candidate to compliment the green philosophies at the core of this project. Recent studies have shown HDG coatings will attribute approximately 16% of the total energy demand of an exposed steel structure over a 60-year life, where a painted coating would account for approximately 69% of the total. This is an energy savings of over 50% for the HDG coating. In addition, when considering global warming potential, acidification potential and photo chemical ozone creation potential, the HDG coating attributes only a fraction of the environmental impact compared to that of a typical paint coating.

Denver Zoo's sustainability efforts have not gone unrecognized. The Toyota Elephant Passage recently became the first zoo exhibit in the country to attain LEED® Platinum Certification, the highest level awarded by the U.S. Green Building Council. This accolade is just one of many recent awards recognizing the zoo's green design and construction practices. The future looks bright-green for Denver Zoo, and hot-dip galvanized coatings will continue to play a vital role in this sustainability movement.

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