

# ANNAPOLIS™ BOLLARD: FOCUS ON SECURITY

Landscape Forms' customized computer analysis helps clients assess the ability of Annapolis bollards to meet project-specific security criteria.

## SECURITY SOLUTION = THREAT ASSESSMENT + RISK MANAGEMENT + DESIGN

Security is in the spotlight. It's a major issue in the design of buildings and outdoor venues, in public and private arenas, at high profile and business-as-usual locations all over the world.

While security concerns are often driven by fear, effective security solutions are based on realistic assessments of threat. Threat levels and appropriate solutions are typically defined through a process of probability-based risk management. Many security experts propose holistic security solutions that include physical barriers, technology, building infrastructure and education and training as integrated parts of a total systems approach.

In addition to risk calculation, design professionals have become vocal advocates for a community value design process that includes aesthetics, accessibility, and the impacts on street life and the quality of public spaces in security solution design.

## BOLLARDS ARE PART OF A TOTAL SECURITY SOLUTION

Bollards are key components of safety and security plans. The outstanding design and engineering of Landscape Forms' Annapolis bollards have made them a popular choice among design professionals and facility managers alike. Fixed and removable 6" and 12" Annapolis bollards are used to perform a variety of functions, from separating vehicular and pedestrian traffic, to creating permanent security standoffs and disabling trespassing vehicles.

## FINITE ELEMENT ANALYSIS EVALUTES BOLLARD PERFORMANCE

While the U.S. Department of State (DOS SD-STD-02.01, Revision A) anti-ram standards evaluate bollards for high-risk applications against impact by a 15,000 lb. vehicle, many commercial projects identify smaller vehicle types and weights as more probable threats.

To assess the performance of Annapolis, Landscape Forms engineers have conducted Finite Element Analysis (FEA) of bollard components under controlled conditions. The results of these software analyses, (see charts on reverse side) help customers make informed decisions about bollard applications in relation to their assessed needs.

## ANNAPOLIS ANTI-RAM ANALYSIS FOR YOUR PROJECT

Landscape Forms can provide project specific assessment of the ability of Annapolis bollards to deter vans, pick-ups and SUV's using criteria supplied by the customer or derived from anti-ram standards established by the U.S. Department of State (DOS SD-STD-02.01, Revision A).

Many commercial projects have written specifications for security that include bollard criteria. Providing a copy of these criteria to your Landscape Forms sales representative is the first step in requesting anti-ram analysis for your project. When written specifications are not available and the data presented in this technical sheet is not pertinent, the following basic information is required to evaluate Annapolis for your project:

- Make/Model or Gross vehicle weight rating of vehicle
- Speed of vehicle
- Design layout of bollards
- Also required if applicable: preferred size and spacing of bollard, limits to depth of footings or other site requirements

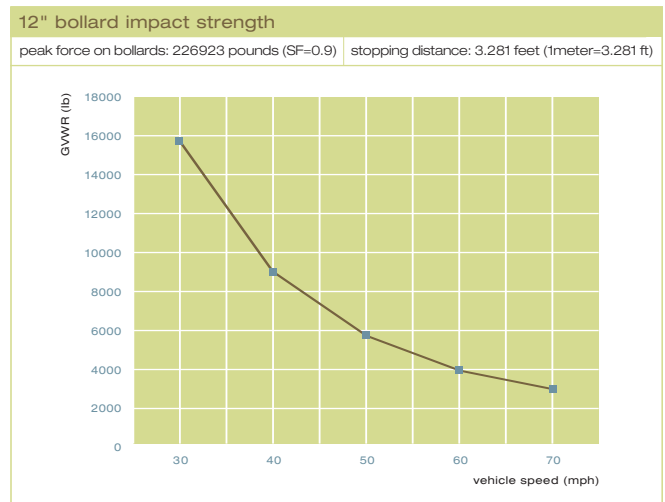
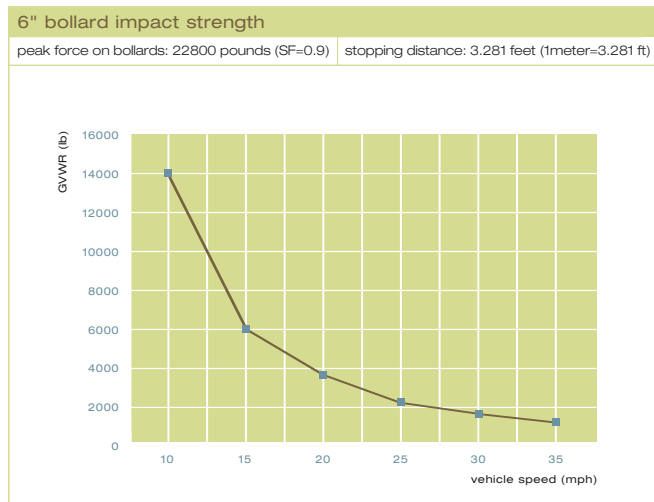
When project specific FEA analysis is completed, Landscape Forms will recommend the appropriate Annapolis bollard and provide installation drawings to detail spacing and footings required to meet the project criteria.

**Contact your Landscape Forms sales representative to discuss your specific project criteria and request customized FEA analysis.**

## ANNAPOLIS ANTI-RAM ANALYSIS CHART

Landscape Forms' analysis of Annapolis bollards installed with special footing and internal concrete/steel reinforcement returned the results shown below. For this simulation, we chose to space the bollards 3' apart (on center) to assure the vehicle would strike 3

bollards when impact is at 90 degrees. For example: a 6" Annapolis bollard will stop a 14,000 lb. vehicle travelling at 10 mph and a 2,000 lb. vehicle at 25 mph. A 12" Annapolis bollard will stop a 16,000 lb. vehicle travelling at 30 mph and a 6,000 lb. vehicle at 50 mph.



*Note: Pass rating for maximum penetration is based on U.S. Department of State Anti-Ram guidelines, which is one meter of maximum penetration of the vehicle's cargo bed past the bollard location. Contact Landscape Forms for installation drawings and instructions.*

For trucks, vans and sport utility vehicles gross vehicle weight rating (GVWR) is the sum of the vehicle weight including driver, passengers, cargo, fuel, coolant and any options or accessories.

GVWR (lbs.)	vehicles types
> 10,000	AMC Hummer Dodge Ram 3500 Pickup Ford Econoline E350 Van
6,000~10,000	Chevy Tahoe (half ton) Dodge Ram 2500 pickup Cadillac Escalade
< 6,000	Chevy S-10 Blazer Ford Explorer GMC Jimmy

### WHAT IS FEA?

Finite Element Analysis is a powerful mathematical tool for analyzing mechanical components and systems. The software-based tool, which is integrated with CAD, accurately predicts and evaluates the performance of components subjected to thermal and structural loads. FEA is used by NASA, aircraft manufacturers, and the automotive industry to ensure that design components meet deformation, stress, vibration and temperature specifications for defined worst-case scenarios.