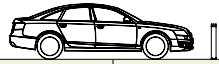


Security-Rated Bollards Guide



| | | | | | | |
|---|--|--------------------------|--------------------------|-----------------------|-----------------------|--------------------------|
| Threat Level | Low | Low | Moderate | Moderate | High | High |
| Security Rating | S10-P1 | SC30-P1 | PU30-P1 | M30-P1/K4* | M40-P1/K8* | M50-P1/K12* |
| Minimum Bollard Diameter | 6" | 6" | 9.25" | 9.25" | 11.5" | 11.5" |
| ASTM Standard | F3016/F3016M – 19 | F2656/F2656M – 20 | F2656/F2656M – 20 | F2656/F2656M – 20 | F2656/F2656M – 20 | F2656/F2656M – 20 |
| Vehicle Impact Rating | S10 | SC30 | PU30 | M30 | M40 | M50 |
| Vehicle Impact Speed | 10 mph | 30 mph | 30 mph | 30 mph | 40 mph | 50 mph |
| Vehicle Weight Payload | 5,000 lbs | 2,430 lbs | 5,070 lbs | 15,000 lbs | 15,000 lbs | 15,000 lbs |
| Penetration Rating | P1 | P1 | P1 | P1 | P1 | P1 |
| Penetration Distance | < 0.3 meter (1') | < 1 meter (3.3') | < 1 meter (3.3') | < 1 meter (3.3') | < 1 meter (3.3') | < 1 meter (3.3') |
| Bollard Recommended Spacing | Cores are independently rated, with a recommended 40" – 60" center-to-center spacing to prevent vehicle access | | | | | |
| Embedded Security Core Above-ground height | 24" | 24" | 36" | 36" | 36" | 36" |
| Embedded Security Core In-ground depth | 24" | 24" | 36" | 36" | 36" | 42" |
| Foundation Requirement Deep Set | 48" L x 18" W x 36" D | 30" L x 30" W x 48" D | 30" L x 30" W x 54" D | 56" L x 56" W x 60" D | 60" L x 60" W x 60" D | 72" L x 72" W x 60" D |
| Foundation Requirement Shallow Mount | N/A | 48" L x 48" W x 13.25" D | Contact | 60" L x 72" W x 16" D | Contact | 60" L x 84" W x 17.25" D |
| Concrete Requirements | Minimum 28-day compressive strength of 5,000 psi & provide 6% (+/- 1.5%) air entrainment | | | | | |
| Minimum Soil Bearing Capacity | 3,000 psf | 2,000 psf | 2,000 psf | 2,000 psf | 2,000 psf | 2,000 psf |
| Compatible F+S Bollards | Series 600: Cyrca, Helio, Knight, Light Column | | Series 900: Cyrca, Helio | | Series 1200: Helio | Series 1200: Helio |

Forms+Surfaces' security bollards have been tested using a Finite Element Analysis (FEA) by a professional engineering consultant. FEA is a software-based tool commonly used in the automotive industry and used extensively for crash test simulations. All of our bollards with a security solution option were tested and passed a very demanding set of impact criteria. Tests were performed using a bollard set in permanent concrete footings and struck by a vehicle at a 90-degree impact.

*While K-ratings were once commonly used, the U.S. Department of Defense (DoD) has since transitioned to the M30, M40, and M50 designations as the most current and accurate standards for anti-ram vehicle barrier performance.



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