SECTION 32 39 13

MANUFACTURED METAL BOLLARDS

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\*\* NOTE TO SPECIFIER \*\* Shaw Stainless LLC; manufactured metal bollards, bollard covers.  
This section is based on the products of Shaw Stainless LLC, which is located at:  
3275 Florence Rd.  
Powder Springs, GA 30127  
Toll Free Tel: 800-282-9694  
Tel: 678-290-9211  
Email: [request info (rob@shawfab.com)](https://arcat.com/rfi?action=email&company=Shaw%252BStainless%252BLLC&message=RE%253A%2520Spec%2520Question%2520(02840ssc)%253A%2520&coid=52565&spec=02840ssc&rep=&fax=)  
Web: <https://stainlessandalloy.com>   
 [ [Click Here](https://arcat.com/company/shaw-stainless-llc-52565) ] for additional information.  
One of our most coveted product lines is our stainless steel security bollards and protective barriers. The need for vehicle stopping protection and demand for security of facilities all over the world has become increasingly important. Shaw Stainless works with clients to develop bollard sleeves and covers to make these security barriers aesthetically pleasing. Shaw can manufacture bollard skins and covers in most alloys or finishes required for your application. While we do not offer installation services, we work closely with contractors to build virtually any custom bollard requested and package to protect in transit to the jobsite to make installation run as smoothly as possible.  
This type of security feature is designed to protect commercial, industrial and high-security areas. Common bollard clients include military bases, airports, stadiums, store fronts, parks, banks, corporate buildings, other high pedestrian traffic areas and more specific featured projects like Staten Island, SunTrust Park and One World Trade Center.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Manufactured Metal Bollards of the Following Types:
       1. C40 crash rated (ASTM F2656): Fixed. (BDS-C40FB-ST)
       2. C40 crash rated (ASTM F2656): Removable. (BDS-C40RB-ST)
       3. M30 crash rated (ASTM F2656): Fixed. (BDS-M30FB-ST)
       4. M30 crash rated (ASTM F2656): Fixed; shallow. (BDS-M30FB-SH)
       5. M30 crash rated (ASTM F2656): Removable. (BDS-M30RB-ST)
       6. M30 crash rated (ASTM F2656): Removable; shallow. (BDS-M30RB-SH)
       7. M50 crash rated (ASTM F2656): Fixed; shallow. (BDS-M50FB-SH)
       8. M50 crash rated (ASTM F2656): Removable; shallow. (BDS-M50RB-SH)
       9. PU40 crash rated (ASTM F2656): Fixed. (BDS-PU40FB-ST)
       10. PU40 crash rated (ASTM F2656): Removable. (BDS-PU40RB-ST)
    2. Bollard covers.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 05 50 00 - Metal Fabrications.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Welding Society (AWS):
       1. AWS D1.1 Structural Welding - Steel.
       2. AWS D1.6 Structural Welding - Stainless Steel.
    2. ASTM International (ASTM):
       1. ASTM A36 - Standard Specification for Carbon Structural Steel.
       2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
       3. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
       4. ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
       5. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
       6. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
       7. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
       8. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
       9. ASTM F2656 - Standard Test Method for Crash Testing of Vehicle Security Barriers.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data:
        1. Manufacturer's data sheets on each product to be used.
        2. Preparation instructions and recommendations.
        3. Storage and handling requirements and recommendations.
        4. Typical installation methods.

\*\* NOTE TO SPECIFIER \*\* Delete if not applicable to product type.

* + 1. Verification Samples: Two representative units of each finish.
    2. Shop Drawings: Include details of materials, construction and finish. Include anchorage details and relationship with adjacent construction.
  1. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
     2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
     3. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
     4. Welding: Conform with AWS D1.1 standard.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up on might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
       1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
       2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
       3. Retain mock-up during construction as a standard for comparison with completed work.
       4. Do not alter or remove mock-up until work is completed or removal is authorized.
  1. PRE-INSTALLATION CONFERENCE
     1. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, and critical path items.
  2. DELIVERY, STORAGE, AND HANDLING
     1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
     2. Protect from damage due to weather, excessive temperature, and construction operations.
  3. PROJECT CONDITIONS
     1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
  4. WARRANTY
     1. Manufacturer's Standard Limited Warranty: 1 year. (see "Manufacturer Warranty" for full details)

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Shaw Stainless LLC, which is located at:  
         3275 Florence Rd.  
         Powder Springs, GA 30127  
         Toll Free Tel: 800-282-9694  
         Tel: 678-290-9211  
         Email: [request info (rob@shawfab.com)](https://arcat.com/rfi?action=email&company=Shaw%252BStainless%252BLLC&message=RE%253A%2520Spec%2520Question%2520(02840ssc)%253A%2520&coid=52565&spec=02840ssc&rep=&fax=);Web: <https://stainlessandalloy.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there is not a removable bollard requirement. Bollard height above finished grade should remain at 30 inches (762 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, FIXED - ASTM C40 CRASH RATED
     1. Basis of Design: Standalone Fixed Bollard Assembly, BDS-C40FB-ST; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 30 inches (762 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 bar.
        2. Compliance:
           1. ASTM F2656: C40 P1, 2430 lbs (1102.2 kg) at 40 mph (64.4 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 30 inches (762 mm) or 36 inches (914 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there IS a removable bollard requirement. Bollard height above finished grade shall remain at 30 inches (762 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, REMOVABLE - ASTM C40 CRASH RATED
     1. Basis of Design: Standalone Removable Bollard Assembly, BDS-C40RB-ST; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 30 inches (762 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 bar.
        2. Compliance:
           1. ASTM F2656: C40 P1, 2430 lbs (1102.2 kg) at 40 mph (64.4 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 30 inches (762 mm) or 36 inches (914 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there is NOT a removable bollard requirement. Bollard height above finished grade shall remain at 39 inches (991 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, FIXED - ASTM M30 CRASH RATED
     1. Basis of Design: Standalone Fixed Bollard Assembly, BDS-M30FB-ST; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 30 inches (762 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 bar.
        2. Compliance:
           1. ASTM F2656: M30 P1, 15000 lbs (6804 kg) at 30 mph (48.3 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 39 inches (991 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there is NOT a removable bollard requirement. Bollard height above finished grade shall remain at 39 inches (991 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, FIXED, SHALLOW - ASTM M30 CRASH RATED
     1. Basis of Design: Standalone Fixed Bollard Assembly, BDS-M30FB-SH; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 9 inches (229 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 and No.8 bar.
        2. Compliance:
           1. ASTM F2656: M30 P1, 15000 lbs (6804 kg) at 30 mph (48.3 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 39 inches (991 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there IS a removable bollard requirement. Bollard height above finished grade shall remain at 39 inches (991 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, REMOVABLE - ASTM M30 CRASH RATED
     1. Basis of Design: Standalone Removable Bollard Assembly, BDS-M30RB-ST; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 30 inches (762 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 bar.
        2. Compliance:
           1. ASTM F2656: M30 P1, 15000 lbs (6804 kg) at 30 mph (48.3 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
           3. Bollard Height Above Finished Grade: 39 inches (991 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication..
           4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank below with RAL color.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there IS a removable bollard requirement. Bollard height above finished grade shall remain at 39 inches (991 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, REMOVABLE, SHALLOW - ASTM M30 CRASH RATED
     1. Basis of Design: Standalone Removable Bollard Assembly, BDS-M30RB-SH; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 12 inches (305 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 and No. 8 bar.
        2. Compliance:
           1. ASTM F2656: M30 P1, 15000 lbs (6804 kg) at 30 mph (48.3 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 39 inches (991 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there IS a removable bollard requirement. Bollard height above finished grade shall remain at 39 inches (991 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, FIXED, SHALLOW - ASTM M50 CRASH RATED
     1. Basis of Design: Standalone Fixed Bollard Assembly, BDS-M50FB-SH; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 9 inches (229 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 and No.8 bar.
        2. Compliance:
           1. ASTM F2656: M50 P1, 15000 lbs (6804 kg) at 50 mph (80.5 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 39.5 inches (1003 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 58 inches (1473 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there IS a removable bollard requirement. Bollard height above finished grade shall remain at 39 inches (991 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, REMOVABLE, SHALLOW - ASTM M50 CRASH RATED
     1. Basis of Design: Standalone Removable Bollard Assembly, BDS-M50RB-SH; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 14 inches (356 mm)
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 and No. 8 bar.
        2. Compliance:
           1. ASTM F2656: M50 P1, 15000 lbs (6804 kg) at 50 mph (80.5 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 39.5 inches (1003 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 58 inches (1473 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, FIXED - ASTM PU40 CRASH RATED
     1. Basis of Design: Standalone Fixed Bollard Assembly, BDS-PU40FB-ST; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 30 inches (762 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 bar.
        2. Compliance:
           1. ASTM F2656: PU40 P1, 5070 lbs (2299.7 kg) at 40 mph (64.37 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
           3. Bollard Height Above Finished Grade: 36 inches (914 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication .
           4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* A minimum of a 3 bollard array is required. If a smaller array is desired, engineering review and approval is required from manufacturer in order to validate prescribed crash rating. To be installed in areas where underground interferences are not a concern. Typically installed into sidewalks, roadways or other areas requiring perimeter defense where there IS a removable bollard requirement. Bollard height above finished grade shall remain at 39 inches (991 mm) unless otherwise approved via written consent from the manufacturer. All carbon steel bollards may have decorative stainless steel or aluminum bollard covers available from bollard manufacturer. Delete article if not required.

* 1. MANUFACTURED METAL BOLLARDS, REMOVABLE - ASTM PU40 CRASH RATED
     1. Basis of Design: Standalone Removable Bollard Assembly, BDS-PU40RB-ST; as manufactured by Barrier Defense Systems, a Shaw Stainless Company.
        1. Foundation Requirements:
           1. Depth: 30 inches (762 mm).
           2. Concrete: 4500 psi (31026.4 kPa) concrete.
           3. Rebar: No. 5 bar.
        2. Compliance:
           1. ASTM F2656: PU40 P1, 5070 lbs (2299.7 kg) at 40 mph (64.37 kph), less than 39.37 inch (1.0 m) penetration.
           2. Welding: Conforms with AWS D1.1 standard.
        3. Bollard Height Above Finished Grade: 36 inches (914 mm); pavers or other concrete topper is acceptable up to an additional 4 inches (102 mm). Notify manufacturer of requirement in advance prior to fabrication.
        4. Maximum Bollard Spacing: 48 inches (1219 mm) on center; meeting ADA handicap accessibility provision after decorative covers are installed.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat cap.
      2. Bollard Tops: Domed cap.
      3. Bollard Tops: Custom, decorative tops as scheduled and indicated on Drawings.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete finish options not required. Fill in blank with RAL color designation.

* + - 1. Finish: Standard zinc rich primer.
      2. Finish: Hot dip galvanized bollard pipe.
      3. Finish: Exterior powder coat, \_\_\_\_\_\_\_\_\_\_\_.
      4. Finish: Exterior powder coat, color as scheduled and indicated on Drawings.
      5. Finish: Optional decorative cover.

\*\* NOTE TO SPECIFIER \*\* If a custom design, other than what is specified below please contact manufacturer directly. Delete article if not required.

* 1. BOLLARD COVERS
     1. Basis of Design: Bollard covers as manufactured by Barrier Defense Systems, a Shaw Stainless Company:
        1. Compliance: Welding conforms with AWS D1.1 standard.

\*\* NOTE TO SPECIFIER \*\* Delete options for materials and associated subparagraphs not required.

* + - 1. Materials: Type 304/304L stainless steel.
         1. Finish: No. 4 circumferential brush finish.
         2. Finish: No. 6 circumferential brush finish.
         3. Finish: As scheduled and indicated on Drawings.
      2. Materials: Type 316/316L stainless steel.
         1. Finish: No. 4 circumferential brush finish.
         2. Finish: No. 6 circumferential brush finish.
         3. Finish: As scheduled and indicated on Drawings.
      3. Materials: 6061-T6 grade aluminum.

\*\* NOTE TO SPECIFIER \*\* Delete finish option not required. Fill in blank with RAL color designation.

* + - * 1. Finish: Powder Coat: RAL \_\_\_\_\_\_\_\_\_.
        2. Finish: As scheduled and indicated on Drawings.
      1. Materials: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete bollard tops options not required.

* + - 1. Bollard Tops: Flat.
      2. Bollard Tops: Domed.
      3. Bollard Tops: Slanted.
      4. Bollard Tops: As scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete bollard cover height options not required.

* + - 1. Bollard Cover Height: 30 inches (762 mm).
      2. Bollard Cover Height: 36 inches (914 mm).
      3. Bollard Cover Height: 40 inches (1016 mm).
      4. Bollard Cover Height: 42 inches (1067 mm).
      5. Bollard Cover Height: Custom, \_\_\_\_\_\_\_\_\_\_.
      6. Bollard Cover Height: Custom, as scheduled and indicated on Drawings.
      7. Bollard Cover Height: From manufacturer's standard range, as scheduled and indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete outer dimensions options not required.

* + - 1. Outer Dimensions: 12-3/4 inches (324 mm), fits up to a 10-3/4 inches (273 mm) pipe bollard.
      2. Outer Dimensions: 10-3/4 inches (273 mm), fits up to 8-5/8 inches (219 mm) pipe bollard.
      3. Outer Dimensions: 8-5/8 inches (219 mm), fits up to 6-5/8 inches (168 mm) pipe bollard.
      4. Outer Dimensions: 6-5/8 inches (168 mm), fits up to nominal 4 inch pipe bollard.
      5. Outer Dimensions: As scheduled and indicated on Drawings.
      6. Bollard Cover Retention: Set screws located 3 inches (76 mm) from bottom of cover.
      7. Spacers: Factory welded.

1. EXECUTION
   1. EXAMINATION
      1. Do not begin installation until substrates have been properly constructed and prepared.
      2. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Clean surfaces thoroughly prior to installation.
      2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   3. INSTALLATION
      1. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction. Protect all surfaces from concrete pour, debris, etc. during installation
   4. CLEANING AND PROTECTION
      1. Clean products in accordance with the manufacturers recommendations.
      2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION