

2.1.6 Finish. The foundation and underside of the Bollard shall be asphalt emulsion coated for corrosion protection. The roadway plates shall have a non skid surface. Bollard shall be white and have yellow/black diagonal stripes (or alternately Bollard shall be yellow with black vertical stripes).

2.2 HYDRAULIC POWER UNIT (HPU)

2.2.1 Hydraulic Circuit. Circuit shall incorporate the design concepts as described by U. S. Patent # 4,490,068. Unit shall consist of an electrically driven hydraulic pump which shall pressurize a high pressure manifold connected to a hydraulic accumulator. Electrically actuated valves shall be installed on the manifold to allow oil to be driven to the up and/or down side of a double acting hydraulic cylinder to raise and lower the Bollard. The hydraulic circuit shall include all necessary control logic, interconnect lines and valves to override and lock out the normal speed control valve(s) for emergency fast operation of the Bollard(s).

2.2.2 Main Power. The electric motor driving the hydraulic pump shall be fed from (specify actual sit voltage, phase and frequency, i.e. 230/3/60). Motor shall be sufficiently sized for the expected number of barricade operations.

2.2.3 Power Off Operation. The accumulator shall be sized to allow three full cycle operations of a single Bollard in the event of a power outage. Enhanced power off capability can be selected as an option. The bi-directional control valves shall be manually operable in the event of a power outage.

2.2.4 Manual Operation. A hand pump shall be furnished to allow the Bollards to be raised manually in the event of a prolonged power interruption.

2.2.5 Construction. The hydraulic power unit and accessories shall be mounted and wired on an integral steel skid. The HPU shall fit in a envelope 60 inches W x 36 inches D x 60 inches H (1524 mm W x 914 mm D x 1524 mm H). The HPU shall be mounted indoors or in an optional weather resistant enclosure.

2.3 CONTROL AND LOGIC CIRCUITS

The following circuits and control stations shall be furnished:

2.3.1 Control Circuit. A control circuit shall be provided to interface between all Bollard control stations and the pneumatic power unit. This circuit shall contain all relays, timers and other devices necessary for the Bollard operation.

2.3.1.1 Voltage. The control circuit shall operate from a 120 volt, 50/60 Hz supply (optionally 240 volt, 50/60 Hz or 24 VDC). An internally mounted transformer shall reduce this to 24 VAC (24 VDC) for all external control stations.

2.3.1.2 Power Consumption. The control circuit power consumption shall not exceed 250 watts basic load, plus 200 watts for each Bollard in the system.

2.3.1.3 Construction. The control circuit shall be mounted in a general purpose enclosure. All device interconnect lines shall be run to terminal strips.

(The following control station(s) can be specified)

2.3.2 Remote Control Panel. A remote control panel shall be supplied to control the Bollard operation. This panel shall have a key lockable main switch with "main power on" and "panel on" lights. Buttons to raise or lower each Bollard (or sets of Bollards) shall be provided. Bollard up and down indicator lights shall be included for each Bollard (or set). The emergency fast operate (EFO) feature shall be operated from a push button larger than the normal controls (optionally a covered toggle switch). The EFO shall also be furnished with EFO active light and reset button.

2.3.2.1 Voltage. The remote control panel shall operate on 24 VAC (optionally 24 VDC).

2.3.2.2 Construction. The remote control station shall be a standard 19 inch electronics rack type surface mount panel with all devices wired to a terminal strip on the back.

2.3.2.3 (Option) Panel shall be equipped with a timer circuit to notify the operator via an annunciator "squealer" that the Bollard has been left in the down position for too long a time period. The time interval shall be customer selectable.

(Select Control Panel 2.3.3 instead of 2.3.2 if Slave Panel 2.3.4 is desired.)

2.3.3 Remote Control Master Panel. A remote control master panel shall be supplied to control Bollard function. This panel shall have a key lockable main switch with "main power on" and "panel on" lights. Buttons to raise and lower each Bollard (or set) shall be provided. Bollard "up" and "down" indicator lights shall be included for each Bollard (or set). The emergency fast operate circuit (EFO) feature shall be operated from a push button larger than the normal controls (optionally a covered toggle switch). The EFO shall be furnished with EFO active light and reset button. The remote control master panel shall have a key lockable switch to arm or disarm the remote slave panel(s). An indicator light shall show if the slave panel is armed.

2.3.3.1 Voltage. The remote control panel shall operate on 24 VAC (optionally 24 VDC).

2.3.3.2 Construction. The remote control station shall be a standard 19 inch electronics rack type surface mount panel with all devices wired to a terminal strip on the back.

2.3.3.3 (Option) Panel shall be equipped with a timer circuit to notify the operator via an annunciator "squealer" that the Bollard has been left in the down position for too long a time period. The time interval shall be customer selectable.

2.3.4 Remote Control Slave Panel. A remote control slave panel shall also be supplied to control the Bollard operation. This panel shall have a "panel on" light that is lit when enabled by a switch on the remote control master panel. Buttons to raise or lower each Bollard (or set) shall be provided. Bollard "up" and "down" indicator lights shall be included for each Bollard (or set). The emergency fast operate (EFO) feature shall be operated from a push button larger than the normal controls (optionally a covered toggle switch). When the slave panel EFO is pushed, an EFO "active" lamp will light and operation of the Bollard(s) will not be possible until reset at the master panel.

2.3.4.1 Voltage. The remote control panel shall operate on 24 VAC (optionally 24 VDC).

2.3.4.2 Construction. The remote control station shall be a standard 19 inch electronics rack type surface mount panel with all devices wired to a terminal strip on the back.

- 2.3.4.3 (Option) Panel shall be equipped with a timer circuit to notify the operator via an annunciator "squealer" that the Bollard has been left in the down position for too long a time period. The time interval shall be customer selectable. The alarm is reset when the Bollards are returned to the up position.
- 3.0 Accessory Equipment (Any or all of the following may be selected):
- 3.1 Auxiliary Emergency Fast Operate Circuit. A separate hydraulic circuit consisting of a pressure reserve source, operating control logic and interconnect lines and valves shall be supplied. This circuit shall provide an available source of power to operate the Bollard(s) at emergency fast speed (as specified in 4.4.2), even after power off or manual operation or high frequency operation has depleted the normal reserve capacity. This system will operate in conjunction with and from normal EFO controls.
- 3.2 Electro-Mechanical Signal Gate. A electrically operated wood arm signal gate shall be supplied to alert vehicle drivers of the Bollard position. The gate operate shall interface with the Bollard at the control circuit. The control circuit shall close the gate at the Bollard "up" command and remain closed until the Bollard is fully lowered. The wood arm shall be ___ foot (6, 8, 10 or 12 foot can be specified) long and be striped with reflective yellow/black tape. The gate assembly shall be mountable directly to the roadway surface.
- 3.3 Stop/Go Traffic Lights. Red/Green 8 inch traffic lights shall be supplied to alert vehicle drivers of the Bollard position. The green light shall indicate that the Bollard is fully down. All other positions shall cause the light to show red. Brackets shall be supplied to allow light(s) to be located on a (3.5 inch OD post) (wall) (3.5 inch OD post - back to back). The light operating voltage shall be 120 volts (alternately 240 volts), power consumption 40 watts per light.
- 3.4 Sump Pump. A self priming sump pump shall be supplied to drain water collected in the Bollard foundation. The pump shall have the capacity to remove ___ inches per minute of rainfall a distance of _____ feet to customer supplied discharge drain. Pump operating voltage shall be 120/1/50-60 (alternately 240/1/50-60).
- 3.5 Safety Interlock Detector. A Bollard vehicle detector safety loop shall be supplied to prevent the Bollard from being accidentally raised under an authorized vehicle. The detector shall utilize digital logic have fully automatic tuning for

stable and accurate long term reliability. The output of the detector shall delay any Bollard rise signal (except for EFO command) when a vehicle is over the loop.

3.6 Enhanced Power Off Capability. The hydraulic accumulator shall be sized to provide ____ full cycle operations of a single Bollard (or sets of Bollards).

3.7 Weather Resistant HPU Enclosure. A lockable weather resistant enclosure shall be provided for the HPU. The design shall provide for easy access to the HPU for maintenance and emergency operation of the hydraulic system. Enclosure shall be provided with a corrosion resistant coating and shall be 60 inches W x 36 inches D x 60 inches H (1524 mm W x 914 mm D x 1524 mm H).

4.0 PERFORMANCE

4.1 EXPERIENCE. Bollard and auxiliary equipment shall be of proven design. Manufacturer shall have over 200 Bollard type vehicle barriers in field operation for a minimum of 5 years with documented field experience for all major components and design features.

4.2 QUALIFICATION TESTS. Bollard design shall have successfully passed actual full scale crash tests conducted by a qualified independent agency.

4.3 STOPPING CAPACITY.

4.3.1 Normal Operation. Bollard(s) shall provide excellent security and positive control of normal traffic in both directions by providing an almost insurmountable obstacle to non-armored or non-tracked vehicles. The Bollard system shall be designed to stop a vehicle attacking from either direction and continue to operate when the vehicle is within the weight and velocity characteristics as defined in paragraph 4.3.1.1, minor repairs excepted.

4.3.1.1 Dual (two) Bollards shall be fully operational after successfully stopping vehicle(s), in the priority direction, weighing:

10,000 pounds at 49 mph (44,4 kN @ 79 kph)
13,200 pounds at 46 mph (58,7 kN @ 74 kph)

4.3.2 High Energy Attack. Bollard(s) shall be designed to stop and immobilize non-armored or non-tracked vehicles with weight and velocity characteristics as defined in paragraph 4.3.2.1. The Bollard system shall be designed

to destroy the front suspension system, steering linkage, engine crank case and portions of the drive train. Significant damage to the Bollard system is probable at these levels.

4.3.2.1 Dual (two) Bollards shall be capable of stopping and destroying a vehicle(s) weighing:

10,000 pounds at 60 mph (44,4 kN at 97 kph)
18,000 pounds at 45 mph (80,0 kN at 72 kph)

4.4 SPEED OF OPERATION.

4.4.1 Normal Operation. Each Bollard (or set) shall be capable of being raised or lowered in 3 to 15 seconds (customer adjustable) when operated at a repetition rate not greater than specified in paragraph 4.5. Bollard direction shall be instantly reversible at any point in its cycle from the control stations.

4.4.2 Emergency Fast Operation. Bollard shall rise to the guard position from fully down in 1.5 seconds maximum when the emergency fast operate button is pushed provided the system has not previously been exhausted by power off or manual operation or high speed cycle rates exceeding that specified in paragraph 4.5. Bollard shall remain in the up and locked position (normal up/down buttons inoperable) until the EFO condition is reset. (See 3.1 for auxiliary emergency fast operate system option.)

4.5 FREQUENCY OF OPERATION. Bollard shall be capable of _____ (specify up to 200 cycles per hour) complete up/down cycles per hour.

5.0 ENVIRONMENTAL DATA (Please supply the following):
Bollard shall operate satisfactorily under the following environmental conditions:

5.1 Extremes in temperature
Yearly maximum drybulb temp _____ f/c
Yearly minimum drybulb temp _____ f/c

5.2 Rainfall
Yearly average _____ inches
Maximum expected hourly rate _____ inches/hour

5.3 Snowfall
Maximum expected hourly rate _____ inches/hour
Roadway will be (mechanically/manually/chemically) cleared _____.

6.0 QUALITY ASSURANCE PROVISIONS

6.1 Testing. Upon completion, the Bollard system will be fully tested in the manufacturer's shop. In addition to complete cycle testing to verify function and operating speeds, the following checks shall be made:

6.1.1 Identification. A nameplate with manufacturer's name, model number, serial number and year built shall be located within the maintenance access area.

6.1.2 Workmanship. The Bollard and subsystems shall have a neat and workmanlike appearance.

6.1.3 Dimensions. Principal dimensions shall be checked against drawings and ordering information.

6.1.4 Finish. Coatings shall be checked against ordering information and shall be workmanlike in appearance.

7.0 PREPARATION FOR SHIPMENT

7.1 The Bollard system shall be crated or mounted on skids as necessary to prevent damage from handling. The shipping container(s) shall be of sufficient structural integrity to enable the assembly to be lifted and transported by overhead crane or forklift without failure.

8.0 MANUFACTURER'S DATA

8.1 Drawings and installation data. The Bollard system drawings and installation, maintenance and operating manuals shall be sent to purchaser within 4 weeks of order. ___ additional copies shall be supplied (1 copy supplied at no cost).

9.0 DISCLAIMER

Please note - careful consideration must be devoted to the selection, placement and design of a Bollard installation. Just as in the case of any Barricade system, perimeter security device or security gate that blocks a roadway or drive, care must be taken to ensure that approaching vehicle as well as pedestrians are fully aware of the Bollards and their operation. Proper illumination, clearly worded warning signs, auxiliary devices such as semaphore gates, stop-go signal lights, audible warning devices, speed bumps, flashing lights, beacons, etc. should be considered. Delta has

information available on many such auxiliary safety equipment not specifically listed herein. It is strongly recommended that an architect and or a traffic and or safety engineer be consulted prior to installation of a Bollard system. Delta will offer all possible assistance in designing the operating equipment, controls and the overall system but we are not qualified nor do we purport to offer either traffic or safety engineering information.

10.0 PROCUREMENT SOURCE

The Model TT203 Bollard Barricade System shall be purchased from:

DELTA SCIENTIFIC CORPORATION
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Valencia, California, 91355, USA
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