

## **ARMR SERVICES CORPORATION**

### **SPECIFICATIONS FOR MODEL 712 CABLE CRASH BEAM**

The model 712 cable crash beam shall be designed to contain a low to medium vehicle impact and prevent that vehicle from entering a restricted access control area. The cable crash beam will consist of a hinge post, aluminum rectangular cross beam with wire rope to span the roadway, and a receiver post. The entire assembly will be designed to meet or exceed US Navy specification OR098-09-88 (CRASH TEST-STOPPED 10,000 LB VEHICLE @ 18. MPH). The system will require no above grade concrete as part of the installation. The model 712 can be configured as a manual only unit (designated model 714) with a manually operated hydraulic cylinder designed to allow operation by a single person.

The hinge side assembly will be constructed of structural steel posts with internal serviceable bearings on a single stainless steel axle allowing the aluminum beam free movement in an arc up to 89 degrees. The hinge post assembly will be designed to accept manual or hydraulic operation of the arm.

The arm will be constructed of an aluminum rectangular extrusion, which will support the integral steel cable. The cable will be restrained in the arm with the use of stainless steel rods, which will act to hold the cable during impact. One rod will be contained through the hinge assembly. The other rod will be contained by the receiver post.

The receiver stanchion will be constructed of two steel weldments, which are designed to direct the landing of the arm and securely contain the arm during impact. The receiver, like the hinge, will be cast in a subterranean pour. The impact energy will first be absorbed by the stretching of the cable then transmitted to the foundation through the hinge and receiver assemblies. The receiver will contain a security-latching pin, which can accept most pad locks to prevent unauthorized operation during unattended times.

The unit is recommended to be operated with a hydraulic unit which has a self contained pumping unit, control logic, and can be equipped with custom control panel(s), safety loops, and automatic operation. The hydraulic unit and receiver can be equipped with an electrically operated magnet.

The unit will have a self contained exterior mounted automatic damping devise which will allow the arm to raise and stop in the full up position without whipping of the crash beam. There shall be little or no whipping allowed with the barrier operating at normal speed.

All units will be designed with elevation grade locators to aid in the installation. The imbedded steel will be coated to prevent deterioration from contact with the cement while the exposed steel will be primed and finished painted black. The aluminum arm will be natural mill aluminum finish and provided with yellow and black safety tape.

## **INSTALLATION OF THE MODEL 712 CABLE CRASH BEAM**

The model 712 is designed to allow a quick and easy installation. The site should be inspected before any excavation is started to ensure there are no underground utilities or over head obstructions. The placement of the hinge side is normally determined by the location of the electrical and controls conduits, but in all cases, safety is the most important consideration. The unit should not be used where pedestrian traffic is present. It is recommended that pedestrians be separated from both the hinge post and receiver post to prevent injury from the cable crash beam arm. The receiver and hinge post are equipped with metal brackets, which defined the grade elevation. These grade markers, if set at the same elevation, will position the arm so that it is horizontal and at the proper location to contain unauthorized vehicles from proceeding into the secure area.

The site work should proceed from locating a proper location to excavating the hinge post hole as shown on the installation drawing. The foundation may need to be modified for your specific application, if so, please contact ARMR Services Corporation for further information. If your site allows a normal installation, excavate the hole and install the hinge post assembly. The grade locators have holes with 3/8" nuts welded in place so you can insert all-thread through supported timbers supplied by the installers to span the excavation parallel to the roadway and adjust the assembly so it is plumb and level. The side to side location in the excavation should also be adjusted so the clear opening will fit your requirements as dictated by the roadway. Once the hinge post is set, the receiver foundation can be excavated based on string lines placed on each side of the hinge post and pulled across the roadway. If the string lines are kept parallel, the exact location of the receiver will be defined based on your clear opening length. The clear opening refers to the space from the roadside (inside) face of the hinge post to the roadside (inside) face of the receiver post. The receiver post should be set plumb and level. At this point the hinge and receiver should be plumb, level and inline with each other so that a string line pulled from the center of the hinge perpendicular to the axle falls directly in the center of the receiver post, and the distance from the hinge post to the receiver post are exactly as specified by the clear opening length, you can start the conduit installation. Each installation will be slightly different depending on the exact location of the hydraulic pumping unit in relation to the hinge post and options, which were ordered. The minimum conduit required will be one 2" electrical PVC for the hydraulic hose, a 3/4" for the power and a 3/4" for the control. In addition to that minimum, additional conduit may be required to support traffic lights, magnetic locks, heaters, or safety loops. All conduits should be in place before the concrete is poured. After installing the conduits, re-check the conditions of the assemblies to assure they were not moved out of plumb during the conduit installation process. Conduits from the model 712 should be run to the hydraulic pumping unit pad for final termination inside the pumping unit. Please note that all conduits entering the hydraulic pumping unit are accessed through a common 6 inches round opening in the pumping unit which is slightly offset from the center of the pumping unit.

The standard layout will have the center line of the hydraulic pumping unit 4 feet from the back of the hinge weldment as shown in the installation drawing named "model 712 suggested conduit layout". ARMR has supplied a length of hose, which is the proper length for this layout. If your site conditions or other reasons require you to place the pumping unit further than 4 feet, you will

need to contact our office and provide us with the measurements of your installation as shown on drawing number 712-900.

Once the steel assemblies are set and the hydraulic pumping unit pad is poured, the pump can be placed over the exposed conduit in the pumping unit pad. The electrical conduits can be terminated in the electrical box while the hose needs to be terminated onto the JIC fittings. Note the correct connections are shown on the installation drawings. The hydraulic cylinder should be located and connected to the hinge side using the clevis pins provided. The stainless steel axle shaft should be located and used to secure the arm to the hinge side stanchion sliding the axle through the flange mounted bearing through the bronze bushings of the arm and into the second bearing. Set screws are provided on the flange bearings to lock the axle shaft into place. With the arm resting in the receiver, and the axle shaft mounted, the top of the cylinder can be connected to the arm using the supplied clevis pin. The system can now be filled with oil and turned on. The pumping unit was tested before shipping and signs of oil may be visible.

Oil should be filled through the oil vent assembly by unscrewing the assembly. The tank will hold a nominal 4 gallons. If the motor is three phase, check rotation to assure the motor is spinning correctly before issuing an up command. The motor and pump assembly is factory set to deliver the proper flow and pressure for your application, however if field adjustment is necessary, please consult the electrical section for details. Once hydraulic oil (see maintenance section for details) and the motor rotation are visually verified, the system can be put into operation. The motor will spin and start the arm moving up. The arm will stop when the controller times out or contacts the upper limit switch. The first up operation should be monitored **VERY CAREFULLY** to assure the arm is operating correctly and will contact the limit switch. If the arm does not make contact to the limit switch, or appears to have other interference, turn the power switch off to stop the pump. Repair or adjust as necessary the limit switch to assure the lever arm of the limit switch activates (closes the set of contacts and turns on the X2 LED on the PLC) before the arm reaches straight up. The speed of the arm should be 8-10 seconds for a nominal 12 feet arm and longer for a longer arm. The arm may experience a jumping type motion for the first several activations until the air is pushed out of the system. The up and down speed can be adjusted by turning the speed control valves, clockwise to slow the unit and counter-clockwise for faster movement. The damping plunger should be adjusted so that it hits the plastic mounted on the crash beam arm when the arm is still in motion but does not bottom out when the arm is fully up. The purpose of the damping device is to stop the arm in a slow linear action so the head does not continue to whip when the arm stops. The damping device can be screwed in or out to meet the arm sooner and control the stop. It is important to be sure the plunger does not bottom out and stop the arm.

## **THEORY OF OPERATION MODEL 6120 HYDRAULIC PUMPING UNIT**

**SAFETY IS VERY IMPORTANT. THIS DEVICE SHOULD ONLY BE OPERATED AND MAINTAINED BY QUALIFIED INDIVIDUALS WITH EXPERIENCE. SAFETY IS VERY IMPORTANT, THEREFORE THESE UNITS SHOULD NOT BE REPAIRED WITH VEHICLE OR PEDESTRIAN TRAFFIC IN THE VICINITY, AFTER BEING SERVICED, ALL REQUIRED SAFETY TESTS MUST BE COMPLETED BEFORE IT IS RETURNED TO OPERATION.**

The model 6120 hydraulic pumping unit is designed to operate a single acting hydraulic system, which requires relatively low pressure and low flow. The electric motor is connected directly to a vane hydraulic pump, which operates only when a signal command is given to operate the cylinder. The oil from the pump is drawn through a filter and directed into a speed control valve, which monitors the operational speed of the vehicle barrier. The operating logic controls a series of pop-it valves to ensure the correct position of the vehicle barrier based on input controls from any set of dry contacts. The electrical control and hydraulic circuits are discussed in detail in their specific sections.

The pumping unit is designed to operate continuously with very little maintenance. The unit is equipped with a heater and cooling fan to ensure proper operating conditions. The strainer should be replaced as part of normal maintenance whenever the oil is serviced. ARMR recommends the use of environmentally friendly oil such as Mobil EAL 224 in all of our hydraulic systems. The oil should be replaced whenever it appears to contain contaminants such as water or dirt. All applications vary due to site conditions and temperature, so the amount and type of contamination will need to be monitored at each site. The oil should be replaced whenever a hydraulic part is replaced due to a mechanical failure, or there is a failure of the heating element.

The tank is constructed of a steel plates rolled and welded together. The nominal capacity of the tank is 3 gallons. The hydraulic hoses are constructed with JIC fittings to allow removal and installation without sealant. Care should be used when disconnecting the pressure side of the house to insure the pressure has been released prior o disconnecting the fitting. The pressure can be relieved by activating the down control button and visually watching the cylinder extend. If the hydraulic cylinder does not fully extend, the hose is still under pressure and must not be serviced until the pop-it valve has been manually released and the cylinder can be verified to be in the fully extended position.

The hydraulic pumping unit should be securely fastened prior to operation. The feet are designed to accept a standard concrete anchor for mounting. If the unit is put on a steel structure, it should mechanically connected to prevent unnecessary vibration. The unit is designed with a large open center area to allow the positioning of conduits. Normal construction sequence would have the electrical, control and hose conduit running together before turning up out of the concrete slab. The pumping unit is then positioned over the conduits and anchored into place. The power and control conduits terminate into the electrical box. The hydraulic conduits should not extend beyond the height of the internal ring. This conduit elevation will allow the

hose freedom to move during the application of pressure, without scraping the sides of the hose against a sharp top edge of the conduit.

The speed of operation can be controlled by adjusting the flow control valves. The flow control valves are mounted to the cylinder. The upper flow control valve controls how fast the arm will raise, while the lower control valve will restrict the down speed. The proper speed can best be determined by watching the motion of the arm. For most short applications (less than 13 feet) normal operating times are 12-18 seconds. The longer the arm, the slower the unit should operate. Normal expected operating times for units up to 20 feet could be 20-30 seconds in each direction. When operating at the proper speed, the arm will not oscillate when reaching the full up position and when landing in the receiver, the unit should not “clank”.

The hydraulic pumping unit is a complete assembly, which not only contains the mechanical components, described above, but also the electrical components and logic necessary to make the unit operate. The electrical components are lodged in a metal box, which include a motor starter, motor overload protector, and a programmable logic controller. The program installed in the computer will vary based on the barrier style and application. If the controller should ever need replacing, please be sure to specify the model, location and type of application.

The control circuit box has a switch mounted externally which, when turned off, will disconnect power to the programmable logic controller. The switch should be turned off any time the unit is serviced. Do not restore power to the unit until all traffic and pedestrians have been cleared from the area. The purpose and operation of the controller is discussed in the Programmable Controller Section.

In case of electrical failure, the arms can be raised manually by placing a speed wrench on the screw head located on top of the electric motor and turning in the direction of the arrow. This motion will drive the hydraulic pump and raise the arm. To lower the arm, the down cartridge valve must be opened. To speed the raising of the arm during power out operation, a cordless drill with a socket can be attached to the screw head. Do not spin the motor backwards, it will cause damage to the pump.

**IMPORTANT: WHEN YOU FIRST START UP THE SYSTEM, OR CHANGE THE HYDRAULIC PUMP, YOU MUST PERFORM THE FOLLOWING START UP PROCEDURES.**

The hydraulic pump must be tuned to your specific installation by adjusting the pressure relief valve on the hydraulic pump. The pumps are adjusted at the ARMOR factory based on normal and expected conditions, however many factors can influence the performance and may require field adjustment. Care must be used not to fully remove the pressure relief valve assembly.

Normally the pump will be set on the low or conservative side of the normal operating range, therefore any field adjustments will require the turning in of the pressure relief valve by turning the screw clockwise. The following describes the normal adjustment techniques.

There are two ways of adjusting the pressure relief valve, the first is by using an electrical amp meter and adjusting the pressure until the relief opens at the FLA (full load amps) rating found on the side of the motor. The second method is to adjust the pressure switch so that the arm just

starts to move as the motor is running. The pressure switch is built into the hydraulic pump under a hex shaped cap near the top of the pump. The hex cover is removed by turning counter clockwise which will expose a hex lock nut and an allen head set screw. The hex nut must be turned counter clockwise to allow for the adjustments of the allen screw. The allen screw controls the pressure relief and can be turned counter clockwise to lower the pressure and clockwise to raise the pressure. The screw should be turned slowly to achieve the desired relief setting using either the meter or movement procedure. After the relief is set, hold the allen screw stationary and tighten the lock nut. Check the operating system to confirm that the motor does not exceed the FLA rating.

## MAINTENANCE OF THE MODEL 712 CABLE CRASH BEAM

**SAFETY IS VERY IMPORTANT, DO NOT ATTEMPT TO REPAIR THE MODEL 712 CABLE CRASH BEAM IF YOU HAVE NOT BEEN PROPERLY TRAINED TO DO SO. THIS DEVICE CAN CAUSE SEVERE DAMAGE AND BODILY INJURY IF ALTERED OR MAINTAINED IMPROPERLY. PLEASE CONSULT THE SAFETY SECTION OF THIS MANUAL BEFORE PERFORMING ANY SERVICE.**

The model 712 cable crash beam is designed for long life with very little required maintenance. The shafts are stainless steel and ride in 2" sealed ball bearings. The bearings are accessible through the top of the 4x8 inch tubes. The bearings should be greased as required with multipurpose bearing grease using the zerkl fittings provided. The white nylon wear pads on the aluminum arm and on the receiver post should be inspected and replaced when they have visible signs of deterioration or wear patterns which indicate loss of function. The upper and lower clevis pins should be lubricated with bearing grease and replaced when they show signs of wear. The clevis mountings have bronze bushing press into the steel, which are replaceable if the clevis pin should cause excessive clearance. Oil level and general cleanliness should be checked with each scheduled maintenance. Any leaks should be repaired before a major leak develops. Hoses should be checked for signs of abrasions and replaced if necessary. If leaking oil is visible, the filler cap should be removed and the level should be verified. Normally the oil should be within 2 inches of the tank top. All fittings are set screws should be checked and tightened as necessary. The speed of operation should be checked. The normal operating speed of the unit should not produce rocking motion at the top of the travel and should not slam down when closing. Adjust the speed as necessary to provide smooth operation.

The aluminum arm is designed to bend during a high energy level impact and may need to be replaced. The arm is designed with an integral steel cable, which transmits the load to the hinge, and to the receiver buttress. The arm can be replaced by turning off the hydraulic pumping unit and control voltages, removing the buttress covers, disconnecting the upper clevis pin, removing the axle and bearing set screws, and sliding the axle through the buttress. The tube should be ordered based on the distance between the inner faces of the buttress. The axle shaft, bearings and clevis bushings are also field replaceable.

The cushioning cylinder is designed to prevent whipping from a sudden stop in the full up position. The tensioning is factory set and can not be field adjusted. If the arm suddenly begins to whip or have excessive motion when it reaches the open state, the cushioning cylinder should be checked. A load gauge can be used to verify the performance of the cylinder, however the stopping capacity increases as the plunger is compressed to a minimum of 3500 pounds. The first 1/4-inch can usually be compressed by hand, however as the plunger continues, the pressure will increase and without mechanical assistance, you should not be able to collapse the plunger. The contact point on the arm has been factory set and should not need adjustment. If the cylinder is replaced, it should be aligned so that the plunger head contacts the arm at 80 degrees. Because the cylinder is sealed, no maintenance is required.

The brushes, which guard the hinge side of the model 712, are replaceable. There is no maintenance required. Parts should be ordered by actual length. The brushes are held in place with rivets, which must be removed during replacement.

The only other maintenance issues are with the coating. The unit is covered with a rubberized coating, which is designed, for a long durable life. If the coating is ripped, it needs to be repaired to provide a tight water seal. The coating can be sealed using a two-part epoxy and then painted to match the color of the surrounding material.

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