Manual Drop Arm Barrier

Manufacture, Installation & Operation Guide

1. Performance Ratings

This barrier is designed to be a manually operated drop arm barrier and has been tested in accordance with PAS 68:2004. To date, the barrier has been impact tested twice, with the results of each test described below:

- *Test 1 (3,500kg vehicle travelling at a maximum speed of 80km/h):*
  The barrier restrained the vehicle impacting at 90º, with a penetration beyond the rear face of 2.23m and there was no dispersion of the load. Post test the vehicle was not driveable and no other vehicle would have been able to pass through the barrier.

  PAS 68:2004 designation for this barrier is:
  V Manual Drop Arm Barrier 3500 80/2.23/0/90

- *Test 2 (7,500kg vehicle travelling at a maximum speed of 48km/h):*
  The barrier restrained the vehicle impacting at 90º, with a penetration beyond the rear face of 0m and there was no dispersion of the load. Post test the vehicle was not driveable and no other vehicle would have been able to pass through the barrier.

  PAS 68:2004 designation for this barrier is:
  V Manual Drop Arm Barrier 7500 48/0/0/90

2. Manufacture

The manufacture of the Manual Drop Arm Barrier is in accordance with the drawings and material details specified, as shown in *Appendix A* of this document.

3. Installation

The following steps describe the recommended method of installation of the barrier.

a. Excavate the foundations to the dimensions specified *(see Appendix A).*

Figure 1: Excavated foundations.

b. Attach guide rails to stanchion “A” at 900mm from the top of the base plate.

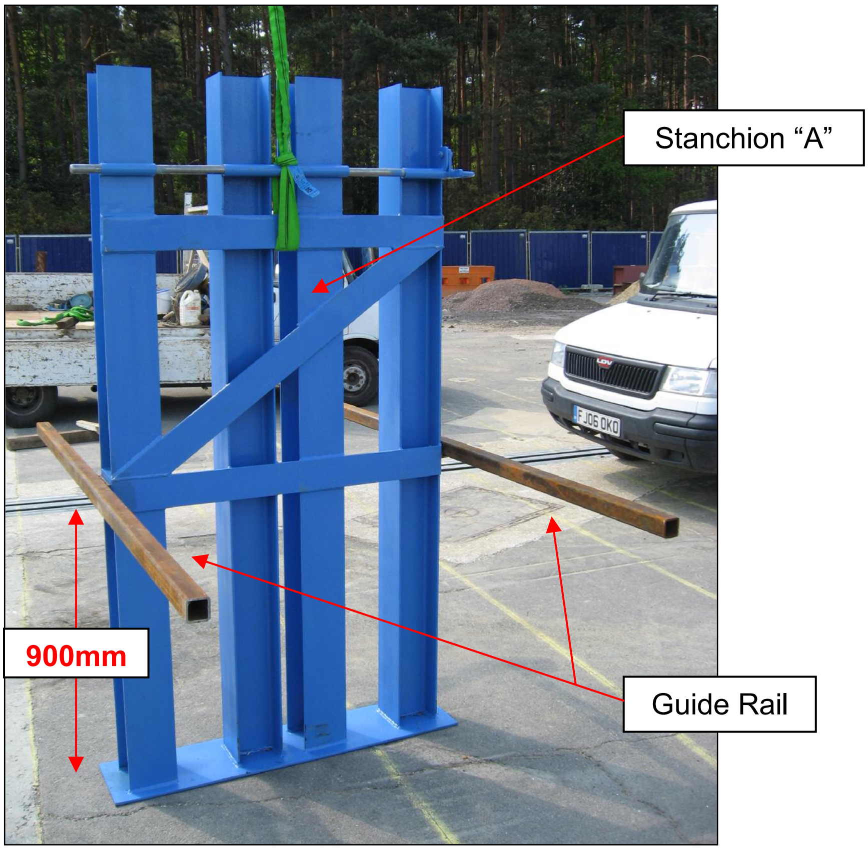

Figure 2: Guide rails are bolted to the foundation posts.

c. Place stanchion "A" in to the corresponding foundation. The rails should act as an aid to sit the barrier square, level and at the correct height above ground.

Figure 3: The guide rails sit across the excavated foundation.

d. Attach guide rails to stanchion "B" and place into the corresponding excavated foundation.

**Note: This can be done either with the barrier arm already attached OR alternatively the stanchions can be positioned first, then the arm attached once the location of each stanchion is fixed.*

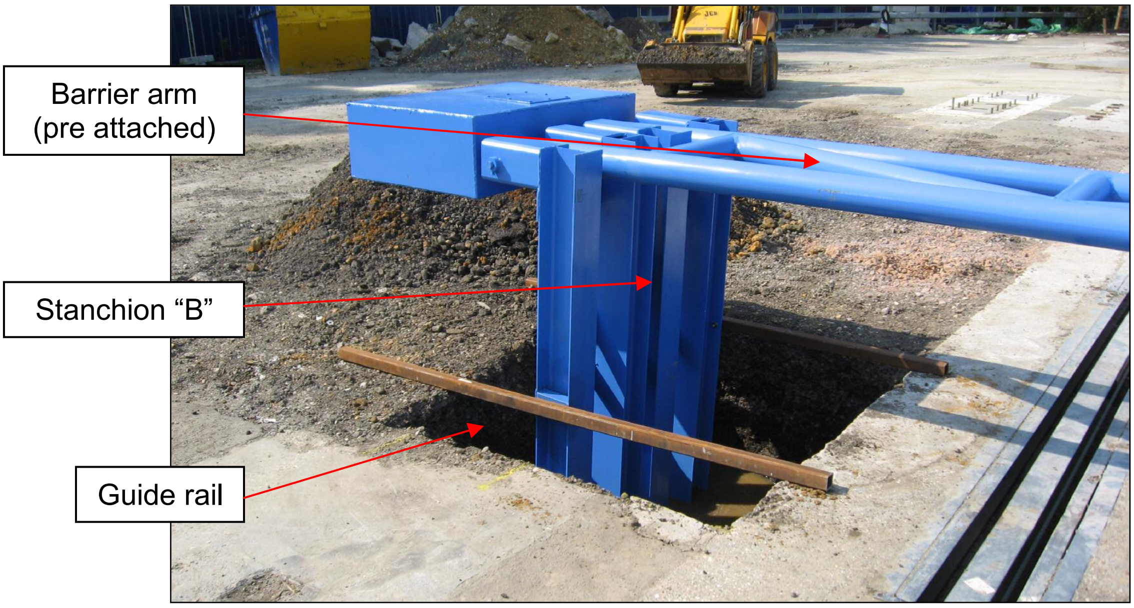

Figure 4: Repeat stage "b" and "c" for the second foundation post.

e. Once both stanchions are positioned and the arm attached, small adjustments can be made to provide the 3m aperture width and ensure that the barrier arm is parallel to the ground.

**Note: Check that the barrier arm does not foul against the posts of stanchion "A", or at the ground beneath the ballast box when operated.*

Figure 5: Once orientated, adjust the barrier position and levels.

f. Remove any groundwater from the excavated foundations and pour the concrete around each stanchion. The mixture should spread evenly using a concrete poker vibrator to ensure a consistent filling of each excavation.

Figure 6: Remove water from foundations and fill with concrete.

g. Level the concrete and wait for it to set before removing the guide rails. See local site guidance for concrete curing time.

Figure 7: Barrier positioned and set in concrete.

h. Once the barrier is in position, ballast is added to the ballast box. See *Appendix A*, "manual operation and ballasting criteria" for a guide to ballasting. In the example case, approx 550 kg of steel ingots were used as ballast and stacked up from bottom to top in the ballast box.

**Note: it is important that the ballast is arranged correctly to keep the canter of gravity of the barrier arm in the correct place. See "manual operation and ballasting criteria".*

Figure 8: Steel ingots used for ballast, stacked up inside ballast box.

i. A cord is attached to the barrier arm at the lock end as an aid to controlling the opening and closing of the barrier.

Figure 9: Cord used to control the opening & closing operation.

j. Undertake post-installation inspection and commissioning before the barrier is operational.

4. Operational Instructions

a. To open, unscrew lock bolts and hold down barrier while pulling out both locking bars. The barrier should fully open under the mass of the ballast.

b. If needed, use the cord attached to the "lock-end" of the barrier arm to pull the barrier fully open or hold open while the vehicle passes through.

c. To close, walk to the “lock-end” and use the cord to pull the barrier closed.

d. To lock, hold the barrier down while pushing both locking bars back in then re-tighten the lock bolt to hold each bar in place.

Appendix A

5. **Parts List** *(see Figure 10 to relate parts numbers)*

List of Parts & Materials

No. Off	Description	Part No. (see drawings)	Section (mm)	Length (mm)	Material Specification	Notes
4	Short stachion post	1	152 x 152 x 23	1,900.0	Steel: EN10025-2 : S275JR +AR. U-Column 152 x 152 x 23 As rolled.	Universal column.
4	Long stanchion post	2		2,150.0		
4	Cross flat	3	75 x 10	1,104.8	Steel: EN10025 S275JR +AR	10mm flat.
2	Cross flat (diagonal)	4		1,304.0		
2	Brace flat	5	240 x 10	1,200.0		
2	Barrier arm	6	114.3 x 6.3	4,629.4	Cold formed welded strongbox 235 Circular hollow section to Corus specification TS 30 (Rev.1) Jan.02. Mill finish. Mill cut ends.	Circular hollow section.
4	Cross beam	7		600.0		
2	Cross beam (diagonal)	8		1,477.3		
2	Ballast box (Top/Bottom)	9	700 x 5	1,000.0	Steel: EN10025 S275JR +AR	5mm flat.
2	Ballast box (Front/Back)	10	300 x 5	1,000.0		
2	Ballast box (Side)	11		700.0		
1	Access cover	12	240 x 5	240.0		
4	Pivot supports	13	150 x 150 x 10	270.0		Square hollow section.
2	Bushing	14	-	200.0	Steel with phosphor bronze bushing insert.	Ø25mm inner, Ø50mm outer. Esure a suitable lubrication method is used depending on the operating environment.
2	Collar lock	15	-	20.0	Steel	Ø25mm inner, Ø50mm outer.
1	Bolt tube (Mid)	16	-	400.0	Steel	3mm thick tube. Advise allowing room for some movement for the lock bar as it can become very tight against the tube.
2	Bolt tube (End)	17	-	152.4		
1	Pivot bar	18	Ø25mm bar.	1,145.0	Steel	Solid bar.
2	Lock bar	19		540.0		
2	Lock plate	20	45 x 5	55.0	Steel	5mm flat.
2	Angle	21	50 x 50 x 5	138.0	Steel	-
1	Return cord	22	-	≈ 5150	-	-
2	Handle	23	-	-	Steel	Reasonable size handle welded to end of lock bolt.
4	Lifting eye	24	-	-	Steel	Minimum lifing capability of 2x eyes combined of 1 tonne to carry a ballasted barrier arm. Otherwise use higher rated eyes if lifting more mass.
2	Foundations	25	1000 x 1000	1,800.0	Concrete: EN206-1 C40/50 (GB) CL 0.40 Dmax20 Slump50.	Advise a minimum concrete strength of C25.

Total lengths (mm):	Part no.	Length (mm)
Universal column (152x152x23):	1, 2	16,200.0
Cross flat (75x10):	3, 4	7,027.2
Circular hollow section (114.3x6.3):	6, 7, 8	14,613.4
Square hollow section (150x150x10):	13	1,080.0
Ø25mm bar:	18, 19	2,225.0

Welding Details:
MIG Weld
Rod: SG-Drahtelektrode / wire electrode for GMAW. Boehler EMK 6/S. EN 440-G 42 2 C G3Si1/G 42 4 M G3Si1
Gas: FERROMAXX7 (90.5% Argon, 7% Carbon dioxide, 2.5% Oxygen).

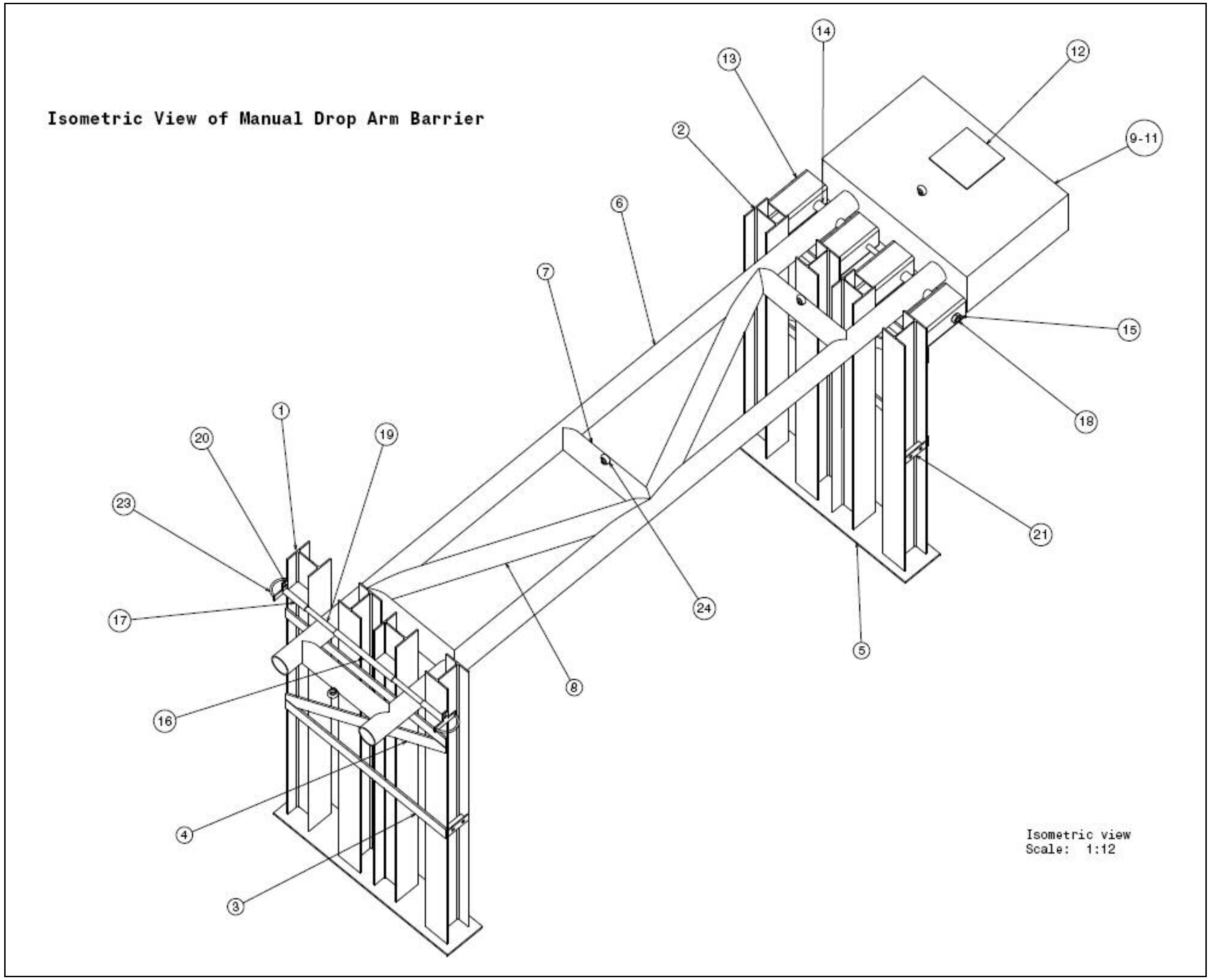

Figure 10: Parts labelled ISO drawing.

6. Manual Operation and Ballasting Criteria

- *Figure 11* shows the moment diagram to balance the manual drop arm.
- *Figure 12* shows how the ballast should ideally be positioned within the ballast box.

Balancing the moments it can be calculated that the mass required: $M = \frac{1,031 \times 317}{485}$ = **674 kg**[1]

[1] *This value is the mass of ballast required assuming that the barrier arm and ballast box are constructed as drawn and that the entire ballast box is filled.*

Calculating the maximum volume of the ballast box gives: $V_{box} = 990 \times 690 \times 290$ = 198,099,000 mm³ or 0.198 m³

The volume inside the ballast box taken up by the barrier arms is: $V_{arm} = 2\pi \times 57.15^2 \times 990$ = 20,316,436 mm³ or 0.0203 m³

Therefore the actual volume available is: $V_{total} = 0.198 - 0.0203$ = **0.1777 m³**

Therefore, the approximate density of material required to fill the ballast box is: $\rho = \frac{674}{0.1777}$ = **3,793 kg/m³**

Note: *Using the current ballast box dimensions, it is recommended that a combination of metal and some loose sand be used as ballast. The metal used to make up the majority of the ballast mass, with sufficient capacity remaining in the ballast box to fine tune with sand.*

The approximate total weight of the barrier arm, including the ballast box and ballast is: **991 kg**

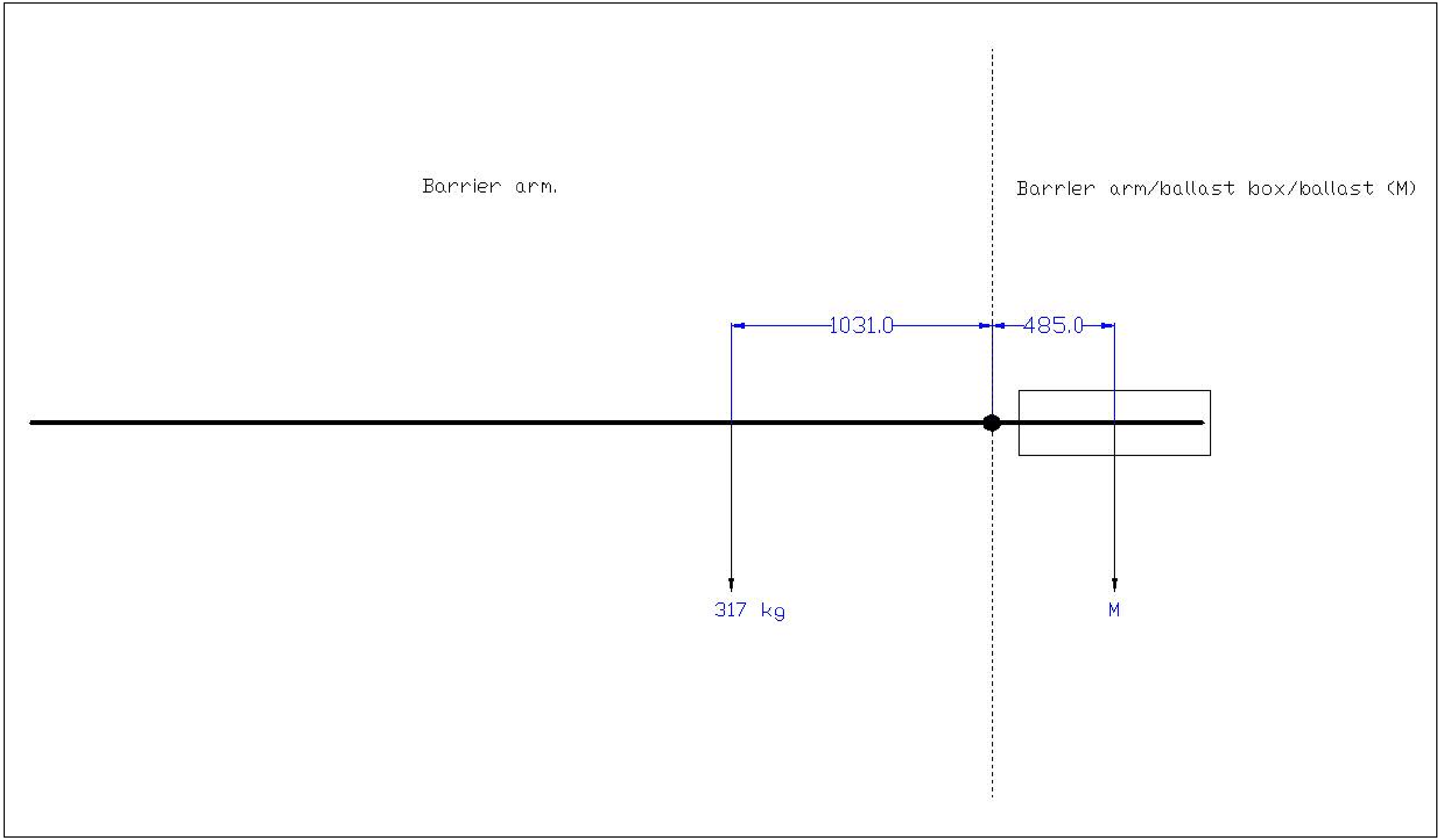

Figure 11: Moment diagram to balance barrier arm.

In the example case, the metal ballast was arranged as in *Figure 12* below, from bottom to top of the ballast box. The centre of gravity of the system is kept along the centre of the barrier arm, thus allowing the arm to open fully when unlocked.

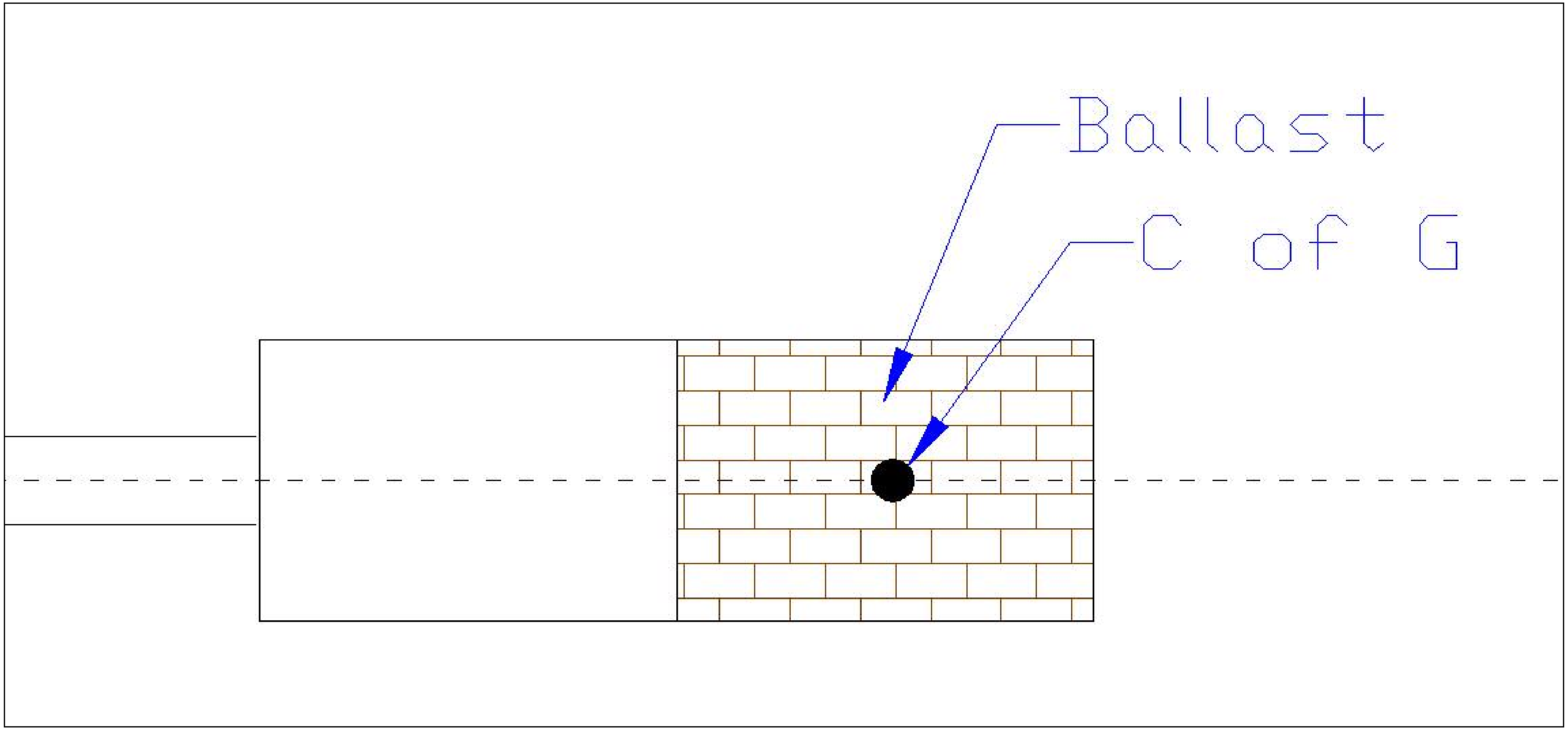

Figure 12: Recommended arrangement of ballast within ballast box.

Engineering Drawings