MODIFIED SOP
FOR TESTING OF
EXPLOSIVES & ACCESSORIES

SOP FOR TESTING OF BULK EXPLOSIVES

SOP FOR TESTING OF BULK EXPLOSIVES

1. PRE TESTING REQUIREMENTS

a. Digital/Electronic VOD meter for measuring the VOD of Bulk Explosive.
b. Scale (measuring tape) for marking distance.
c. Marker for making reference points on sample.
d. Break-wire/ Bobbin wire.
e. Weighing machine.

2. STEPS TO MEASURE VOD OF BULK EXPLOSIVES WITH DIGITAL/ ELECTRONIC VOD METER

a. Take the Bulk Explosives of unknown VOD into the 83 mm poly lay flat tube in a cartridge form.
b. Take a pair of twisted cables (Preferably Green and Red). Green cable as Start Probe and Red Cable as Stop Probe and keep both the probes (Start & Stop Probe) in open circuit as shown in figure. (enclosed)
c. Now tie two of these cables to bulk explosives cartridge at a distance of 10cm/15 cm/20 cm (Probe Distance) as per given figure.
d. After Binding cables on Explosive sample, measure the distance between the cables and make sure that the distance should not increase or decrease as per the distance set for the Explosive sample to be tested.
e. There will be 2 ends for Start Probe (Green) and 2 ends for Stop Probe (Red) as shown in Figure.
f. Take a 3 core (Preferably one green, one red and one black) Cable (1.5mm Square copper wire) in required length to safeguard Operator and instrument (Preferably 100m)
g. One end of the Start Probe (Green) and One End of the Stop Probe (Red Cables) are to be joined and make 4 cores to 3 core
h. The Probes taken from cartridge (Start, Stop and Common) are to be connected to 100m, 3 core cable (Green to Green, Red to Red and remaining Green and Red to Black)
i. Other end of the 3-core cable has to be connected to the Digital/ Electronic VOD Meter, Start probe to Start Pin, Stop Probe to Stop Pin and Common Probe to Common Pin. By this, the total circuit will be in open condition.

j. Now put on the unit by pressing “ON” button and input the required data to the Digital/ Electronic VOD meter.

k. Finally, the Bulk Explosive Sample has to be connected with the Nonel /Detonating Fuse with cast Booster to initiate it.

l. The cast Booster has to be inserted into the Bulk sample towards the start probe (Green Probe) and to be inserted in such a fashion that the Cast Booster should not be very near to the start probe (a little far from it) and the other end of the detonator will be connected to Exploder.

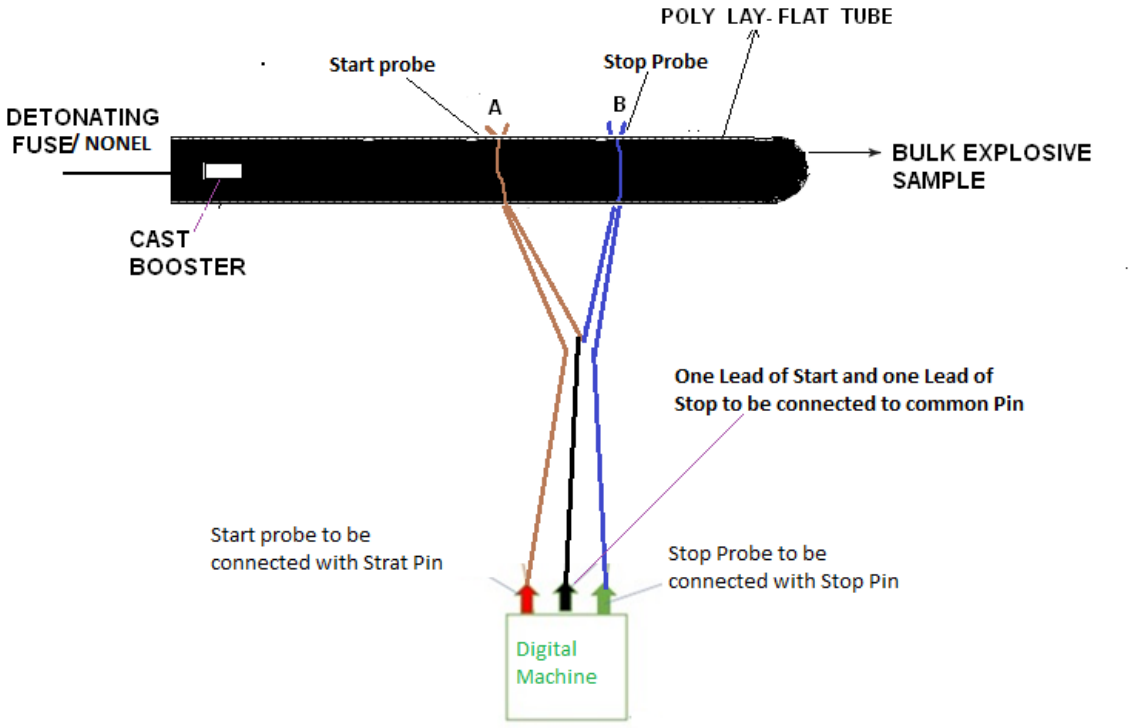
m. Now, press the Test Button on the unit.

n. After taking proper shelter, blaster shall initiate the sample.

o. After blasting the result will be displayed on the screen.

p. Note down the reading of measured VOD shown in the screen in presence of Manufacturer’s Representatives and subsidiary’s representatives.

q. After testing of VOD by Digital/Electronic VOD meter, the display result shall be captured by screenshot.



3. PRECAUTIONS

a. In case of misfire wait at least for 10 min.
b. In case of incomplete detonation, collect all fragments of the explosives.
c. In case of no reading or error in the instrument, repeat the VOD measurement exercise.

4. MEASUREMENT OF DENSITY OF BULK EXPLOSIVE BY WATER DISPLACEMENT METHOD

a. Take a well graduated beaker of 500-1000 ml volume preferably.
b. Fill the water up to the 100 ml mark preferably in the beaker.
c. Measure the weight of beaker plus water by a reliable and duly calibrated weighing machine.
d. Take a pinch of Bulk explosives sample and measure the mass using duly calibrated weighing machine and drop the explosives sample into the beaker containing water.
e. Also measure the volume of water displaced by explosives sample. Divide the mass of explosives sample (in gm) by the volume of explosives sample (in ml) to obtain density. The generalized formula is mentioned below.

Density of explosives sample (ρ) in gm/cc = m / v

Where,

m= mass of explosives sample (in gm)

v= volume of explosives sample (in ml)

5. MEASUREMENT OF BOOSTER/CAP SENSITIVITY (BS)

The explosive sample was collected in poly lay flat tube of 83mm dia. from the BMD vehicle in field. The Bulk explosive sample should fire with 100 gm cast booster (PETN)/ 150gm cast booster (Emulsion) in bulk explosive sample encapsulated in cartridge form.

SOP FOR TESTING OF CARTRIDGE EXPLOSIVES

SOP FOR TESTING OF NON PERMITTED LARGE DIAMETER (NPLD) (COLUMN), CARTRIDGE EXPLOSIVES

1. PRE TESTING REQUIREMENTS

a. Digital/Electronic VOD meter for measuring the VOD of NPLD column explosives.
b. Scale (measuring tape) for marking distance.
c. Marker for making reference points on sample.
d. Break-wire/ Bobbin wire.
e. Weighing machine.

2. STEPS TO MEASURE VOD OF NPLD COLUMN WITH DIGITAL/ ELECTRONIC VOD METER

a. Take the NPLD (COLUMN) of unknown VOD and one Booster/Prime NPLD explosives for initiation of NPLD column explosives
b. Take a pair of twisted cables (Preferably Green and Red). Green cable as Start Probe and Red Cable as Stop Probe and keep both probes (Start & Stop Probe) in open circuit as shown in figure. (enclosed).
c. Now tie two of these cables to NPLD Column explosives cartridge at a distance (Exactly) of 10cm/15 cm/20 cm (Probe Distance) as per given figure.
d. After binding cables on NPLD Column cartridge, measure the distance between the cables and make sure that the distance should not increase or decrease as per the distance set for the explosive sample to be tested.
e. There will be 2 ends for Start Probe (Green) and 2 ends for Stop Probe (Red) as shown in Figure.
f. Take a 3 core (Preferably one green, one red and one black) Cable (1.5mm Square copper wire) in required length to safeguard Operator and instrument (Preferably 100m).
g. One end of the Start Probe (Green) and one end of the Stop Probe (Red Cables) are to be joined and make 4 cores to 3 core.
h. The Probes taken from NPLD Column cartridge (Start, Stop and Common) are to be connected to 100m, 3 core cable (Green to Green, Red to Red and remaining Green and Red to Black).
i. Other end of the 3-core cable has to be connected to the Digital/ Electronic VOD Meter, Start Probe to Start Pin, Stop Probe to Stop Pin and Common Probe to Common Pin. By this, the total circuit will be in open condition.

j. Now put on the unit by pressing “ON” button and input the required data to the Digital/ Electronic VOD meter.

k. Finally, the NPLD Column cartridge has to be kept in close contact with NPLD Booster/ Prime to initiate it.

l. The Nonel/ detonating Fuse has to be inserted into the NPLD Booster/ Prime cartridge.

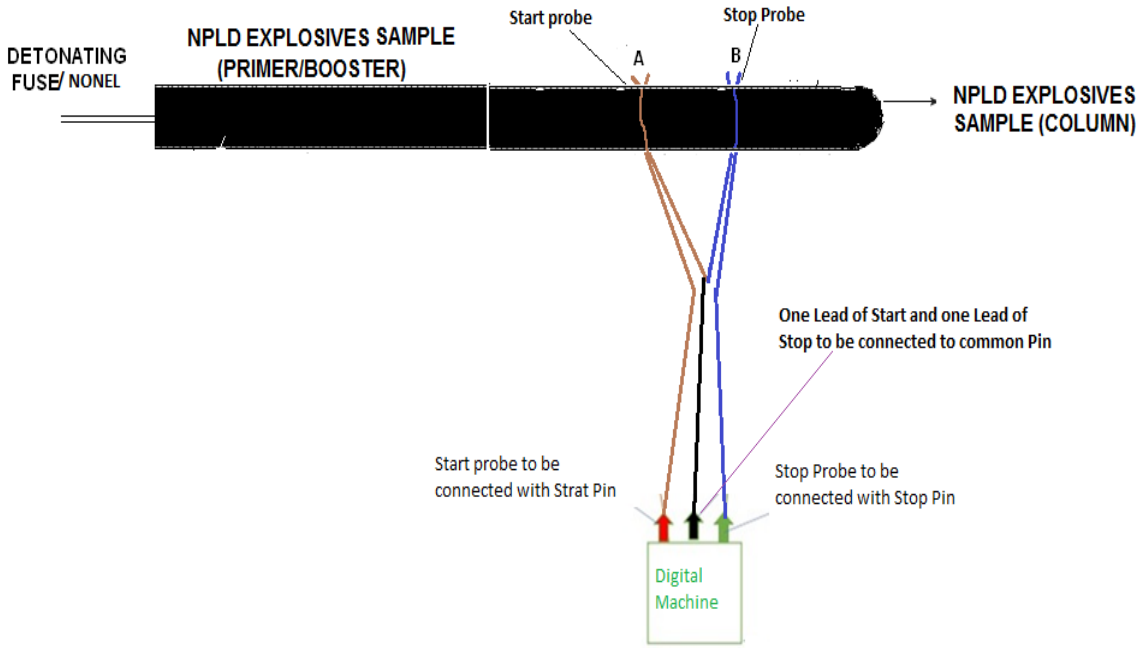
m. Now press the Test Button on the Unit.

n. After taking proper shelter, blaster shall initiate the sample.

o. After blasting, the result will be displayed on the screen.

p. Note down the reading of measured VOD shown in the screen in presence of Manufacturer’s Representatives and subsidiary’s representatives.

q. After testing of VOD by Digital/Electronic VOD meter, the display result shall be captured by screenshot.



3. MEASUREMENT OF DENSITY OF NPLD (COLUMN) EXPLOSIVE BY WATER DISPLACEMENT METHOD

a. Take a well graduated beaker of 500-1000 ml volume preferably.
b. Fill the water up to the 100 ml mark preferably in the beaker.
c. Measure the weight of beaker plus water by a reliable and duly calibrated weighing machine.
d. Take a pinch of NPLD column explosives sample and measure the mass using duly calibrated weighing machine and drop the explosives sample into the beaker containing water.
e. Also measure the volume of water displaced by explosives sample. Divide the mass of explosives sample (in gm) by the volume of explosives sample (in ml) to obtain density. The generalized formula is mentioned below.

Density of explosives sample (ρ) in gm/cc = m / v

Where,

m= mass of explosives sample (in gm)

v = volume of explosives sample (in ml)

4. MEASUREMENT OF AIR GAP SENSITIVITY

Air gap sensitivity was checked by maintaining a gap of 2 cm for emulsion explosives between the donor and receiver cartridge. In order to pass the AGS the receiver cartridge should get initiated in the specified gap of 2 cm for emulsion explosives from the donor cartridge.

SOP FOR TESTING OF NON PERMITTED LARGE DIAMETER (PRIMER/BOOSTER) CARTRIDGE

1. PRE TESTING REQUIREMENTS

a. Digital/Electronic VOD meter for measuring the VOD of NPLD BOOSTER/ PRIME explosives.
b. Scale (measuring tape) for marking distance.
c. Marker for making reference points on sample.
d. Break-wire/ Bobbin wire.
e. Weighing machine.

2. STEPS TO MEASURE VOD OF NPLD BOOSTER/ PRIME WITH DIGITAL/ ELECTRONIC VOD METER

a. Take the NPLD BOOSTER/ PRIME of unknown VOD.
b. Take a pair of twisted cables (Preferably Green and Red). Green cable as Start Probe and Red Cable as Stop Probe and keep both probes (Start & Stop Probe) in open circuit as shown in figure (enclosed).
c. Now tie two of these cables to NPLD BOOSTER/ PRIME explosives cartridge at a distance (Exactly) of 10cm/15 cm/20 cm (Probe Distance) as per given figure
r. After binding cables on NPLD BOOSTER/ PRIME cartridge, measure the distance between the cables and make sure that the distance should not increase or decrease as per the distance set for the explosive sample to be tested.
d. There will be 2 ends for Start Probe (Green) and 2 ends for Stop Probe (Red) as shown in Figure.
e. Take a 3 core (Preferably one green, one red and one black) Cable (1.5mm Square copper wire) in required length to safeguard Operator and instrument (Preferably 100m)
f. One end of the Start Probe (Green) and one end of the Stop Probe (Red Cables) are to be joined and make 4 cores to 3 core.
g. The Probes taken from NPLD BOOSTER/ PRIME explosives (Start, Stop and Common) are to be connected to 100m, 3 core cable (Green to Green, Red to Red and remaining Green and Red to Black).

h. Other end of the 3-core cable has to be connected to the Digital/ Electronic VOD Meter, Start probe to Start Pin, Stop Probe to Stop Pin and Common Probe to Common Pin. By this, the total circuit will be in open condition.

i. Now put on the unit by pressing “ON” button and input the required data to the Digital/ Electronic VOD meter.

j. Finally, the NPLD Booster/Prime cartridge has to be connected with the Nonel/ Detonating Fuse to initiate it.

k. The Nonel/ Detonating Fuse has to be inserted into the NPLD Booster/ Prime cartridge towards the start probe (Green Probe) and to be inserted in such a fashion that the Nonel/ Detonating Fuse should not be very near to the start probe (a little far from it) and the other end of the detonator will be connected to Exploder.

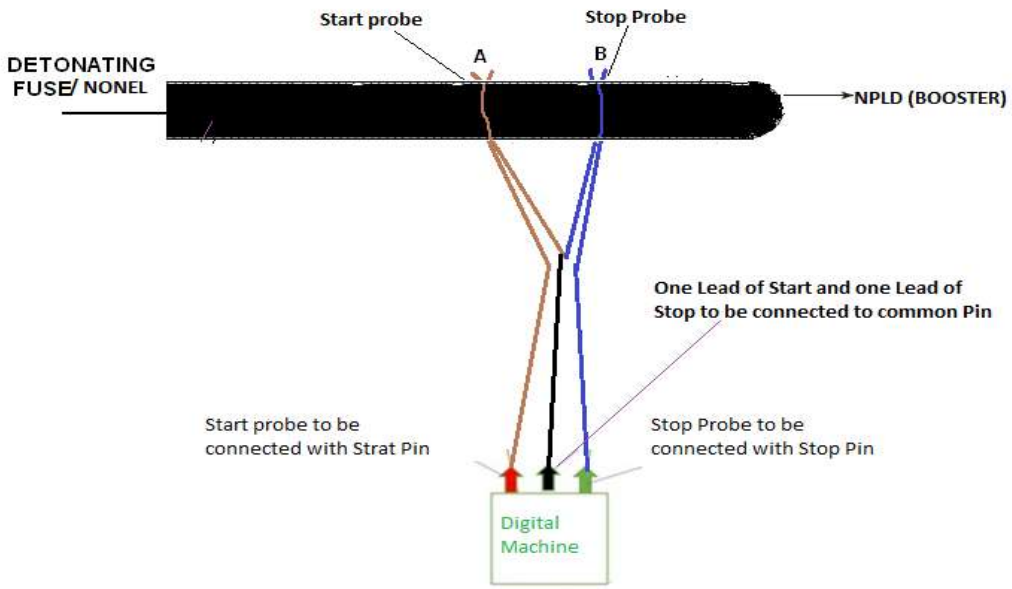
l. Now press the Test Button on the Unit.

m. After taking proper shelter, blaster shall initiate the sample.

n. After blasting, the result will be displayed on the screen.

o. Note down the reading of measured VOD shown in the screen in presence of Manufacturer’s Representatives and subsidiary’s representatives.

p. After testing of VOD by Digital/Electronic VOD meter, the display result shall be captured by screenshot.



3. MEASUREMENT OF DENSITY OF NPLD BOOSTER/ PRIME EXPLOSIVES BY WATER DISPLACEMENT METHOD

a. Take a well graduated beaker of 500-1000 ml volume preferably.
b. Fill the water up to the 100 ml mark preferably in the beaker.
c. Measure the weight of beaker plus water by a reliable and duly calibrated weighing machine.
d. Take a pinch of NPLD BOOSTER/ PRIME explosives sample and measure the mass using duly calibrated weighing machine and drop the explosives sample into the beaker containing water.
e. Also measure the volume of water displaced by explosives sample. Divide the mass of explosives sample (in gm) by the volume of explosives sample (in ml) to obtain density. The generalized formula is mentioned below.

Density of explosives sample (ρ) in gm/cc = m / v

Where,

m= mass of explosives sample (in gm)

v = volume of explosives sample (in ml)

5. MEASUREMENT OF AIR GAP SENSITIVITY

Air gap sensitivity was checked by maintaining a gap of 2 cm for emulsion explosives between the donor and receiver cartridge. In order to pass the AGS the receiver cartridge should get initiated in the specified gap of 2 cm for emulsion explosives from the donor cartridge.

SOP FOR TESTING OF PERMITTED SMALL DIAMETER (PSD) CARTRIDGE

1. PRE TESTING REQUIREMENTS

a. Digital/Electronic VOD meter for measuring the VOD of PSD explosive
b. Scale (measuring tape) for marking distance.
c. Marker for making reference points on sample.
d. Break-wire/ Bobbin wire.
e. Weighing machine.

2. STEPS TO MEASURE VOD OF PERMITTED SMALL DIAMETER (PSD) CARTRIDGE WITH DIGITAL/ ELECTRONIC VOD METER

a. Take the PSD explosives of unknown VOD and roll the PSD explosive samples inside a manila paper and make a train of 1 m length of PSD explosive of unknown VOD to the testing site.
b. Take a pair of twisted cables (Preferably Green and Red). Green cable as Start Probe and Red Cable as Stop Probe and keep both probes (Start & Stop Probe) in open circuit as shown in figure (enclosed).
c. Now tie two of these cables to PSD explosives at a distance (Exactly) of 10cm/15 cm/20 cm (Probe Distance) as per given figure.
d. After binding cables on PSD explosives, measure the distance between the cables and make sure that the distance should not increase or decrease as per the distance set for the explosive sample to be tested.
e. There will be 2 ends for Start Probe (Green) and 2 ends for Stop Probe (Red) as shown in Figure.
f. Take a 3 core (Preferably one green, one red and one black) Cable (1.5mm Square copper wire) in required length to safeguard Operator and instrument (Preferably 100m)
g. One end of the Start Probe (Green) and one end of the Stop probe (Red Cables) are to be joined and make 4 cores to 3 core.
h. The Probes taken from PSD explosives (Start, Stop and Common) are to be connected to 100m, 3 core cable (Green to Green, Red to Red and remaining Green and Red to Black).

i. Other end of the 3-core cable has to be connected to the Digital/ Electronic VOD Meter, Start Probe to Start Pin, Stop probe to Stop Pin and Black to Common Pin. By this, the total circuit will be in open condition.

j. Now put on the unit by pressing “ON” button and input the required data to the Digital/ Electronic VOD meter.

k. Finally, the PSD explosives has to be connected with the Nonel/ Detonating Fuse to initiate it.

l. The Nonel/ Detonating Fuse has to be inserted into the PSD explosives towards the Start probe (Green Probe) and to be inserted in such a fashion that the Nonel/ Detonating Fuse should not be very near to the start probe (a little far from it) and the other end of the detonator will be connected to Exploder.

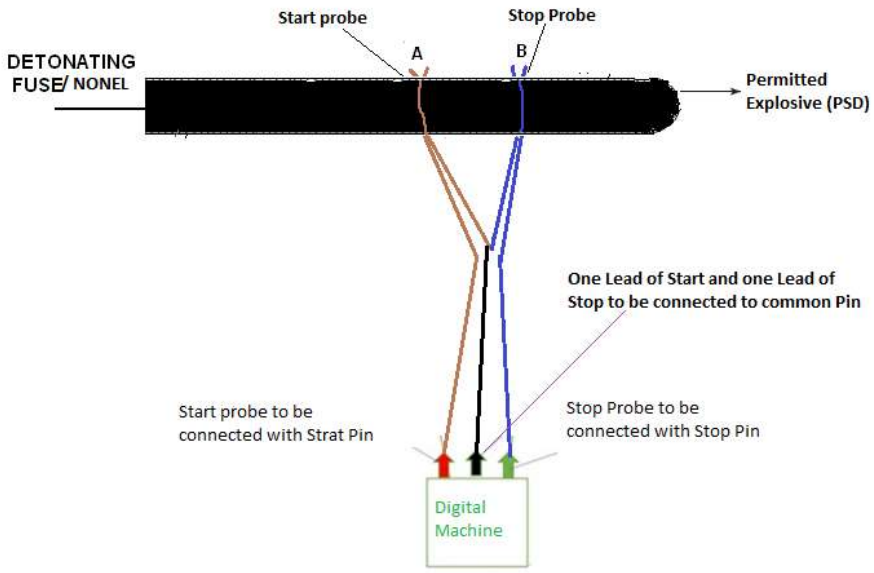
m. Now press the Test Button on the Unit.

n. After taking proper shelter, blaster shall initiate the sample.

o. After blasting, the result will be displayed on the screen.

p. Note down the reading of measured VOD shown in the screen in presence of Manufacturer’s Representatives and subsidiary’s representatives.

q. After testing of VOD by Digital/Electronic VOD meter, the display result shall be captured by screenshot.



3. MEASUREMENT OF DENSITY OF PSD EXPLOSIVE BY WATER DISPLACEMENT METHOD

a. Take a well graduated beaker of 500-1000 ml volume preferably.
b. Fill the water up to the 100 ml mark preferably in the beaker.
c. Measure the weight of beaker plus water by a reliable and duly calibrated weighing machine.
d. Take a pinch of PSD explosives sample and measure the mass using duly calibrated weighing machine and drop the explosives sample into the beaker containing water.
e. Also measure the volume of water displaced by explosives sample. Divide the mass of explosives sample (in gm) by the volume of explosives sample (in ml) to obtain density. The generalized formula is mentioned below.

Density of explosives sample (ρ) in gm/cc = m / v

Where,

m= mass of explosives sample (in gm)

v = volume of explosives sample (in ml)

4. MEASUREMENT OF AIR GAP SENSITIVITY

Air gap sensitivity was checked by maintaining a gap of 2 cm for emulsion explosives between the donor and receiver cartridge. In order to pass the AGS the receiver cartridge should get initiated in the specified gap of 2 cm for emulsion explosives from the donor cartridge.

5. MEASUREMENT OF CONTINUATION OF DETONATION

Take the PSD explosives and roll the PSD explosive samples inside a manila paper and make a train of 1 m length of PSD explosive. 1m of Permitted sample should be initiated with No. 6/8 strength Detonator.

SOP FOR TESTING OF EXPLOSIVE ACCESSORIES

SOP FOR TESTING OF CAST BOOSTER (PETN/ EMULSION)

1. PRE TESTING REQUIREMENTS

a. Digital/Electronic VOD meter for measuring the Cast Booster.
b. Scale (measuring tape) for marking distance.
c. Marker for making reference points on sample.
d. Break-wire/ Bobbin wire.
e. Weighing machine.

2. STEPS TO MEASURE VOD OF CAST BOOSTER WITH DIGITAL/ ELECTRONIC VOD METER

a. Take the Cast Booster of unknown VOD and roll the Cast Booster samples inside a manila paper and make a train of 1 m length of Cast Booster of unknown VOD to the testing site.
b. Take a pair of twisted cables (Preferably Green and Red). Green cable as Start Probe and Red Cable as Stop Probe and keep both probes (Start & Stop Probe) in open circuit as shown in figure (enclosed).
c. Now tie two of these cables to Cast Booster at a distance (Exactly) of 10cm/15 cm/20 cm (Probe Distance) as per given figure.
d. After binding cables on cast Booster samples, measure the distance between the cables and make sure that the distance should not increase or decrease as per the distance set for the sample to be tested.
e. There will be 2 ends for Start Probe (Green) and 2 ends for Stop Probe (Red).
f. Take a 3 core (Preferably one green, one red and one black) Cable (1.5mm Square copper wire) in required length to safeguard Operator and instrument (Preferably 100m)
g. One end of the Start Probe (Green) and one end of the Stop Probe (Red Cables) are to be joined and make 4 cores to 3 core.
h. The Probes taken from Cast Booster (Start, Stop and Common) are to be connected to 100m, 3 core cable (Green to Green, Red to Red and remaining Green and Red to Black).
i. Other end of the 3-core cable has to be connected to the Digital/ Electronic VOD Meter, Start Probe to Start Pin, Stop Probe to Stop Pin and Black to Common Pin. By this, the total circuit will be in open condition.

j. Now put on the unit by pressing “ON” button and input the required data to the Digital/ Electronic VOD meter.

k. Finally, the Cast Booster has to be connected with the Nonel/ detonating Fuse to initiate it.

l. The Nonel/ Detonating Fuse has to be inserted into the Cast Booster towards the start probe (Green Probe) and to be inserted in such a fashion that the Nonel/ Detonating Fuse should not be very near to the start probe (a little far from it) and the other end of the detonator will be connected to Exploder.

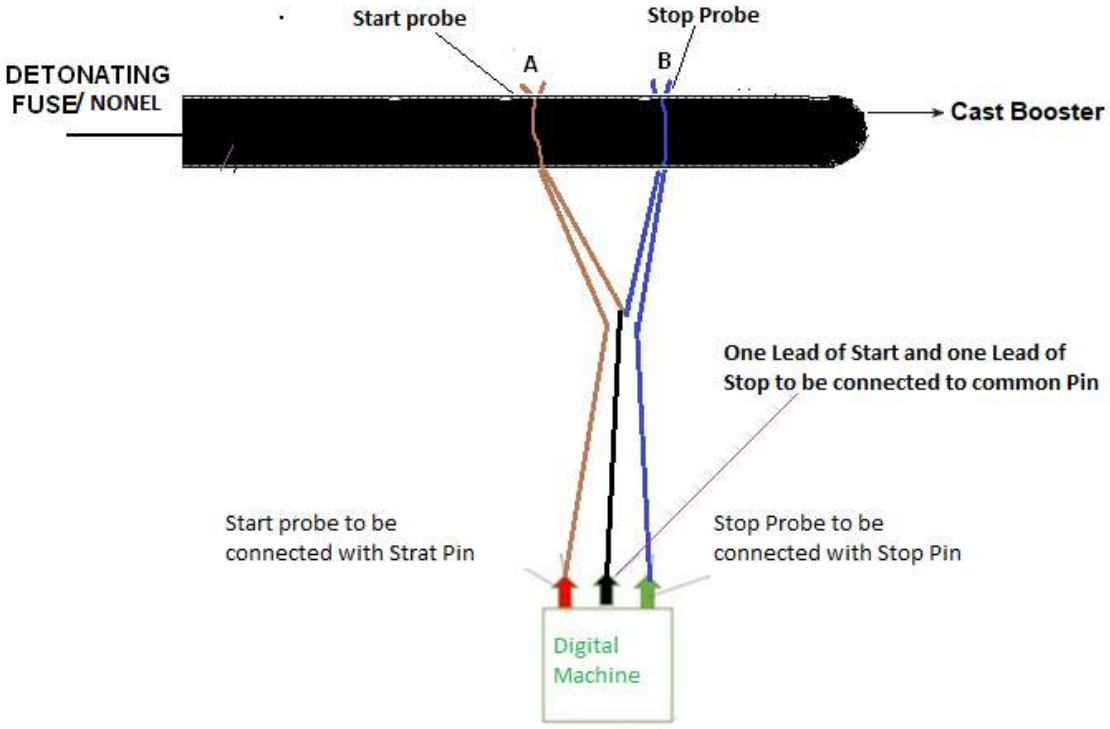
m. Now press the Test Button on the Unit.

n. After taking proper shelter, blaster shall initiate the sample.

o. After blasting the result will be displayed on the screen.

p. Note down the reading of measured VOD shown in the screen in presence of Manufacturer’s Representatives and subsidiary’s representatives.

q. After testing of VOD by Digital/Electronic VOD meter, the display result shall be captured by screenshot.



3. MEASUREMENT OF DENSITY OF CAST BOOSTER BY WATER DISPLACEMENT METHOD

a. Take a well graduated beaker of 500-1000 ml volume preferably.
b. Fill the water up to the 100 ml mark preferably in the beaker.
c. Measure the weight of beaker plus water by a reliable and duly calibrated weighing machine.
d. Take a pinch of Cast Booster sample and measure the mass using duly calibrated weighing machine and drop the explosives sample into the beaker containing water.
e. Also measure the volume of water displaced by explosives sample. Divide the mass of explosives sample (in gm) by the volume of explosives sample (in ml) to obtain density. The generalized formula is mentioned below.

Density of explosives sample (ρ) in gm/cc = m / v

Where,

m= mass of explosives sample (in gm)

v = volume of explosives sample (in ml)

4. MEASUREMENT OF WATER RESISTANCE

Water resistance is ascertained by firing the cast booster with detonator after immersing it in water.

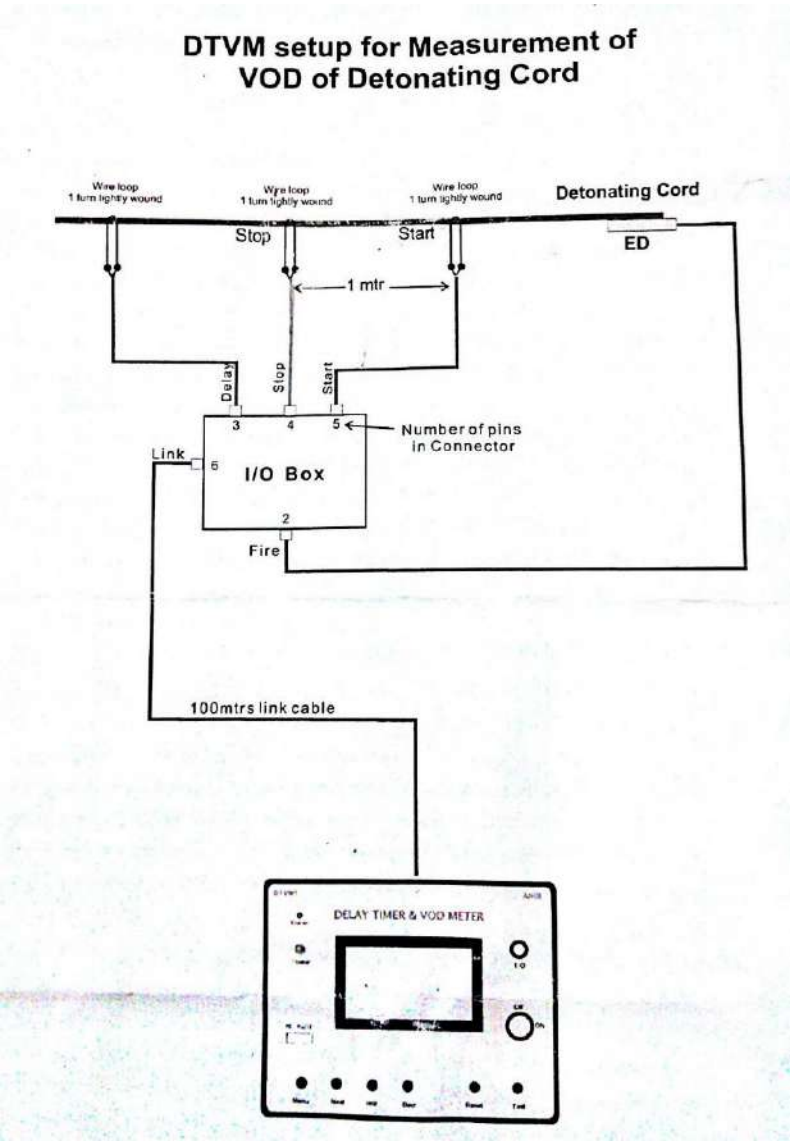
SOP FOR TESTING OF DETONATING FUSE

1. PRE TESTING REQUIREMENTS

a. Digital/Electronic VOD meter for measuring the detonating Fuse.
b. Scale (measuring tape) for marking distance.
c. Marker for making reference points on sample.
d. Break-wire/ Bobbin wire.
e. Vernier caliper.

2. STEPS TO MEASURE VOD OF DETONATING FUSE WITH DIGITAL/ ELECTRONIC VOD METER

a. Take Detonating Fuse of minimum length of 2 meter of unknown VOD.
b. Take a pair of twisted cables (Preferably Green and Red). Green cable as Start Probe and Red Cable as Stop Probe and keep both probes (Start & Stop Probe) in closed circuit as shown in figure (enclosed).
c. Mark two points on the detonating fuse at the distance of 1 meter with the help of a measuring tape and marker.
d. Now tie two of these cables to Detonating Fuse at a distance (Exactly) of 1m (Probe Distance) as per given figure.
e. After binding cables on Detonating Fuse samples, measure the distance between the Probe and make sure that the distance should not increase or decrease as per the distance set for the sample to be tested.
f. Tie the break-wire/ Bobbin wire at these two marked ends separately in such way that start loop is near the detonator end.
g. Crimp the No. 6/8 detonator (CDD/CED/AED) to the detonating fuse as shown in figure and end of the detonator wire shall be connected with Fire cable.
h. After making sure the site is ready for blasting, Power ON the main unit by putting the key switch to ON. Press Reset (Green) button. Confirm ready message is display on the screen. If not attend to the problem as shown on the display. Refer Error message. Once all OK, recheck site is ready for test. Press the Test (Red) button. Within 3-4 second firing impulse would be given to ED which will initiate the shock tube and subsequently the delay detonator. VOD of detonating fuse will be display on the screen.
i. Note down the reading of measured VOD shown in the screen in presence of Manufacturer's Representatives and subsidiary's representatives.



3. MEASUREMENT OF DIAMETER

The nominal diameter of the detonating fuse was measured by Vernier caliper. The Dia. Of Detonating fuse should be lie within limit as per RC of CIL.

4. MEASUREMENT OF TRANSMISSION OF DETONATION

The Detonating Fuse is laid down as a main line and branching is laid at different angles from the main line by making a loop (as prescribed in 3.7 of IS-6609 (Part I-1972)). When fire, there shall be no failure in DF either in the main line or in the branch line**.**

SOP FOR DELAY DETONATOR TESTING

1. PRE TESTING REQUIREMENTS

Lead Plate

Fevi-quick

Lead plate holder

2. TESTING PROCEDURE FOR MEASURING STRENGTH OF THE DETONATOR

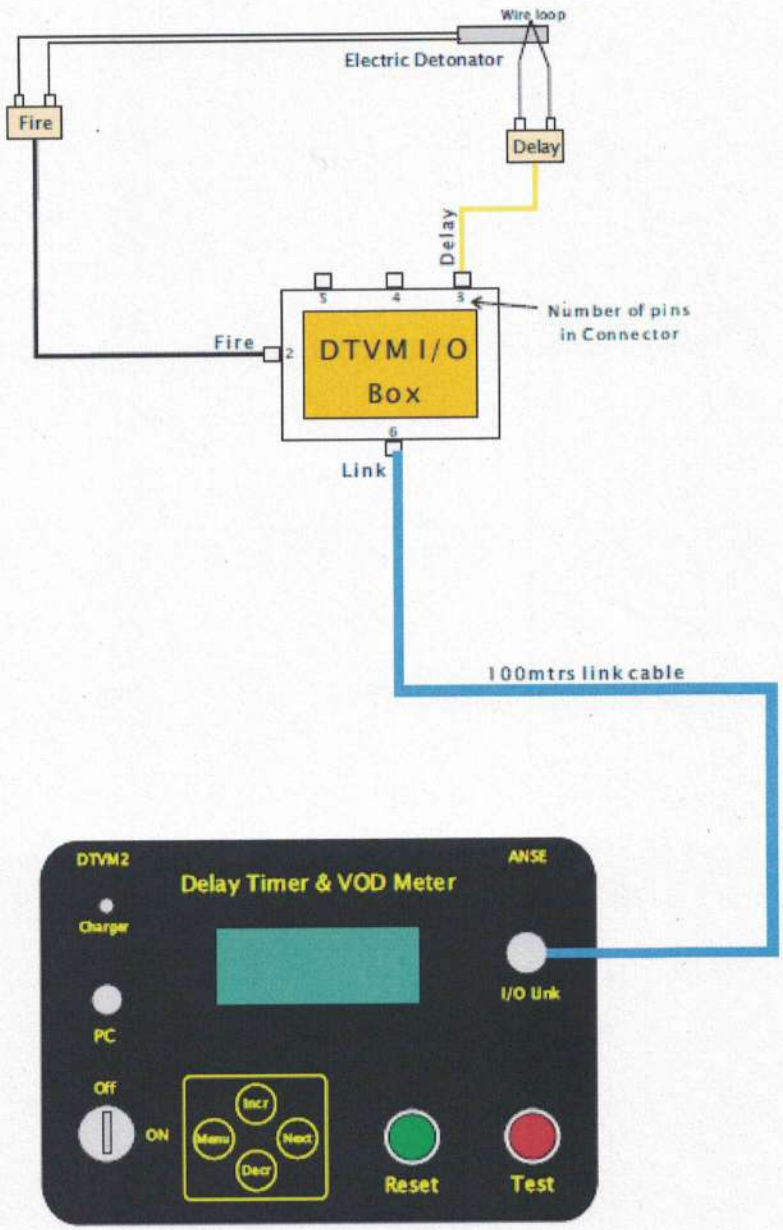
a. Take a sample of detonator.
b. Take a lead plate of dimensions 3.5cm length, 3.5cm breadth and 0.5cm thickness.
c. Take a drop of fevi-quick on the lead plate.
d. Place the detonator perpendicularly on the lead plate so that it gets stick to the plate.
e. Connect the detonator to the Exploder and fire it.
f. After the blast collect the lead plate and check dent/crater produced on the lead plate corresponded to C3 class.

3. TESTING PROCEDURE FOR SERIES FIRING OF DETONATOR

a. Take a 10 number of detonators.
b. Connect all the detonators in series.
c. Connect the first detonator to the exploder.
d. Fire the detonator.
e. To pass the test, all the detonators should be fired successfully.

4. PROCEDURE FOR MEASURING DELAY TIMING OF DELAY DETONATOR

DTVM setup for Measuring Delay Timing of Delay Detonator



a. Place the DTVM Main unit at a safe place (atleast 100mtrs) away from the blasting site keep the unit in power off mode and key switched off. Connect the link cable.
b. Lay the 100mtrs. Cable as per the site layout.
c. Place DTVM I/O Box at about 2 to 5 mtrs. Away from the sample under test. Connect the link cable.
d. Connect the Yellow cable with splitter box to 3 pin connector labeled as Delay. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box attachment with push connectors for loop wire.
e. Connect the black cable to 2 pin connector labeled as Fire. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connector for the ED wires.
f. Take a piece of single strand wire about 2 mtrs. long. This wire could be lead wire of used ED. Wrap tightly a turn of this wire around the tip of the delay detonator shell and make sure that it does not slip off the shell. Connect the two ends of this wire loop to Delay splitter box push connectors. Ensure proper electrical contact.
g. Connect the ED wires to fire cable splitter box push connectors. Ensure proper electrical contact.
h. Lay all the cables as straight and as far away from detonator as possible.
i. After making sure the site is ready for blasting, power ON the main unit by putting the key switch to ON. Press Reset (Green) button. Confirm Ready message is displayed on the screen. If not attend to the problem as shown on the display. Refer Error Messages. Once all OK, recheck site is ready for test. Press the Test (Red) button. Within 3-4 seconds firing impulse would be given which will cause the delay detonator to initiate and delay time of detonator will be displayed on the screen. Note the readings and Power Off the Unit. Turn the key switch to OFF position.
j. Repeat steps f to i if further samples are to be tested.

5. TESTING PROCEDURE FOR MEASURING ELECTRIC RESISTANCE OF DELAY DETONATOR

a. The electric resistance was determined by stretching the lead wire and connecting an ohmmeter across the base lead wires.
b. The range of Electric Resistance of delay detonator shall be 5.5 ± 1.0 Ω.

6. GENERAL PRECAUTIONS

a. All blasting operations shall be done under the direct personal supervision of Blasting Officer / Assistant Manager in charge of blasting.

b. Only those persons who are fully trained in random sampling & testing shall be deputed for these operations.

c. Provisions of statute regarding blasting shall be strictly complied.

d. The test procedure shall be followed in accordance with requirements as laid down in IS: 6609(part II/sec I) of 1973.

e. Delay Detonator shall be used/ tested in the order of their dates of manufacture.

f. Explosives when transported in vehicles shall be carried in an explosive van approved by the Petroleum and Explosives Safety Organisation (PESO). Explosive vans used for transport of explosives shall be in safe operating condition and should be driven by the competent licensed drivers. The explosive van shall be kept in isolated locations while loaded which shall be properly guarded and attended.

g. No smoking or open flame shall be permitted in or near the explosive van containing explosives.

SOP FOR MS CONNECTOR/CORD RELAY TESTING

1. PRE TESTING REQUIREMENTS

Plastic Tape

2. PROCEDURE FOR TRANSMISSION TEST OF MS CONNECTOR/CORD RELAY

a. Take a 10 pieces of MS Connector or Cord Relay.

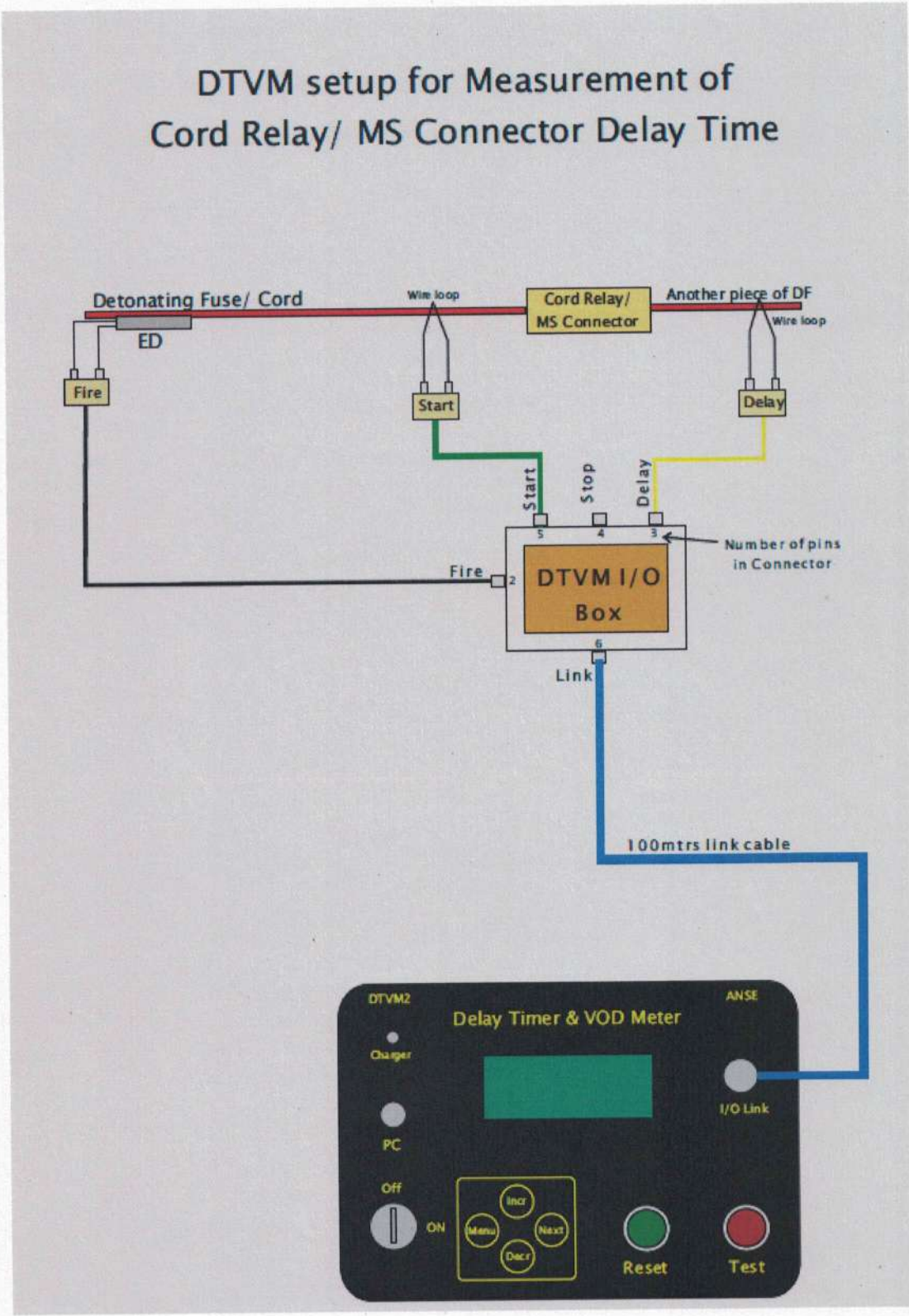
b. Connect the 10 pieces in series with detonating chord acting as the couple. Each coupling joint should be covered with plastic tape.

c. Connect the first piece with detonating chord and tie detonator with the chord.

d. Fire the detonator.

e. To pass the test, the entire 10 pieces of MS Connector or Cord relay should fire.

3. PROCEDURE FOR MEASUREMENT OF DELAY TIME OF MS CONNECTOR / CORD RELAY



a. Place the DTVM Main unit at a safe place (at least 100meters) away from the blasting site. Keep the unit in power off mode and key switched off. Connect the link cable.
b. Lay the 100meters cable as per the site layout.
c. Place DTVM I/O Box at about 2 to 5 meters. Away from the sample under test.
d. Connect the Green cable with splitter box attachment to 5 pin connector labeled as Start. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connectors for wire loop.
e. Connect the Yellow cable with splitter box attachment to 3 pin connector labeled as Delay. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connectors for wire loop.
f. Connect the black cable to 2 pin connector labeled as Fire. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connectors for the ED wires.
g. Take a piece of single strand wire about 2 mtrs. long. This wire could be lead wire of used ED. Wrap tightly a turn of this wire around the detonating cord about 1-2mtrs.from the ED initiating end. Connect the two ends of this wire loop to Start splitter box connectors. Ensure proper electrical contact.
h. Take another piece of single strand wire about 2 mtrs. long. This wire could be lead wire of used ED. Wrap tightly a turn of this wire around the detonating cord/fuse attached to other end of Cord Relay/ MS Connector. Connect the two ends of this wire loop to Delay splitter box connectors. Ensure proper electrical contact.
i. Tie the initiating ED to the detonating cord and connect the ED wires to Fire splitter box connectors.
j. Lay all the cables as straight and as far away from detonators as possible.
k. After making sure the site is ready for blasting, power ON the main unit by putting the key switch to ON. Press Reset (Green) button. Confirm Ready message is displayed on the screen. If not attend to the problem as shown on the display. Refer Error Messages. Once all OK, recheck site is ready for test. Press the Test (Red) button. Within 3-4 seconds firing impulse would be given which will initiate the ED and hence DF. Delay time of Cord Relay/ MS Connector will be displayed on the screen. Note the readings and Power off the Unit. Turn the key switch to OFF position.
l. Repeat steps g to k if further samples are to be tested.

m. The permissible limit of scattering in Cord Relay/MS Connector Shall be **±5 m/s**.

n. Calibration of DELAY TIMER & VOD METER (DTVM) shall be done once in year or interval recommended by manufacture.

4. GENERAL PRECAUTIONS

a. All blasting operations shall be done under the direct personal supervision of Blasting Officer / Assistant Manager in charge of blasting.

b. Only those persons who are fully trained in random sampling & testing shall be deputed for these operations.

c. Provisions of statute regarding blasting shall be strictly complied.

d. The test procedure shall be followed in accordance with requirements as laid down in IS: 6609.

e. Cord Relay/MS Connector shall be used/ tested in the order of their dates of manufacture.

f. Explosives when transported in vehicles shall be carried in an explosive van approved by the Petroleum and Explosives Safety Organisation (PESO). Explosive vans used for transport of explosives shall be in safe operating condition and should be driven by the competent licensed drivers. The explosive van shall be kept in isolated locations while loaded which shall be properly guarded and attended.

g. No smoking or open flame shall be permitted in or near the explosive van containing explosives.

SOP FOR ELECTRONIC DETONATOR TESTING

1. PRE TESTING REQUIREMENTS:

Lead Plate

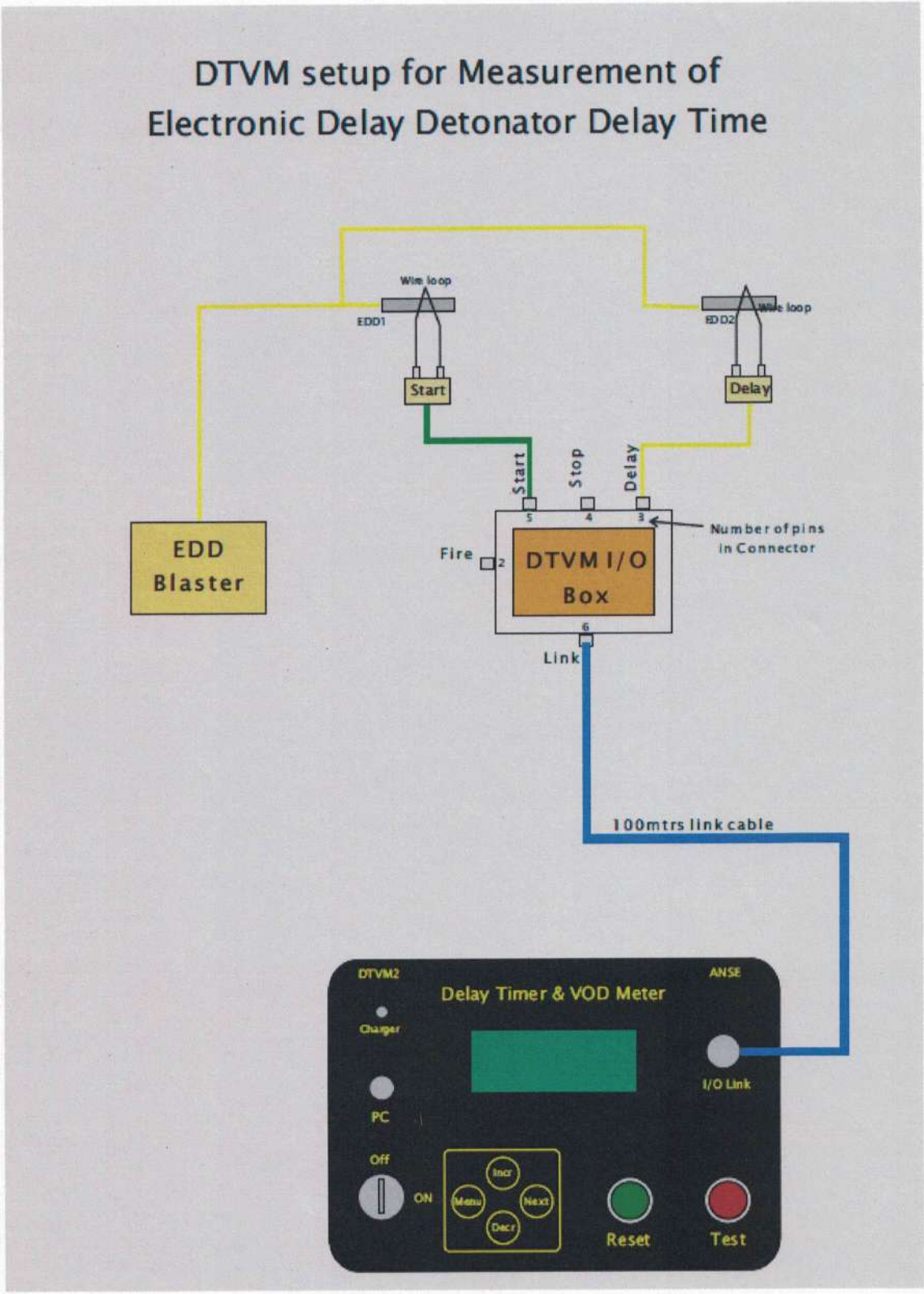
Fevi-quick

Lead plate holder

2. TESTING PROCEDURE FOR MEASURING STRENGTH OF THE ELECTRONIC DETONATOR

a. Take a sample of electronic detonator.
b. Take a lead plate of dimensions 3.5cm length, 3.5cm breadth and 0.5cm thickness.
c. Take a drop of fevi-quick on the lead plate.
d. Place the electronic detonator perpendicularly on the lead plate so that it gets stick to the plate.
e. Connect the electronic detonator to the Exploder and fire it.
f. After the blast collect the lead plate and check dent/crater produced on the lead plate corresponded to C3 class.

3. TESTING PROCEDURE FOR MEASURING DELAY TIME OF THE ELECTRONIC DETONATOR



a. Place the DTVM Main unit at a safe place (at least 100 meters) away from the blasting site. Keep the unit in power off mode and key switched off. Connect the link cable.

b. Lay the 100 meters' cable as per the site layout.

c. Place DTVM I/O Box at about 2 to 5 meters away from the sample under test.

d. Connect the Green cable with splitter box attachment to 5 pin connector labeled as Start. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connectors for wire loop.

e. Connect the Yellow cable with splitter box attachment to 3 pin connector labeled as Delay. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connectors for wire loop.

f. Take a piece of single strand wire about 2 mtrs. long. This wire could be lead wire of used ED. Wrap tightly a turn of this wire around the first EDD. Connect the two ends of this wire loop to Start splitter box connectors. Ensure proper electrical contact.

g. Take another piece of single strand wire about 2 mtrs. long. This wire could be lead wire of used ED. Wrap tightly a turn of this wire around the second EDD. Connect the two ends of this wire loop to Delay splitter box connectors. Ensure proper electrical contact.

h. Lay all the cables as straight and as far away from detonators as possible. Keep the electronic Detonator Blaster and DTVM unit side by side.

i. After making sure the site is ready for blasting, power ON the main unit by putting the key switch to ON. Press Reset (Green) button. Confirm Ready message is displayed on the screen. If not attend to the problem as shown on the display. Refer Error Messages. Once all OK, recheck site is ready for test. Get the Electronic Detonator Blaster in ready to fire position. Press the Test (Red) button. Within 3-4 seconds the screen will show countdown mode. Press Fire button on the Blaster. EDD1 has to initiated first and then EDD2. Delay time of EDD2 with respect to EDD1 will be displayed on the screen. Note the readings and Power Off the Unit. Turn the key switch to OFF position.

j. Repeat steps (f) to (i) if further samples are to be tested.

k. The permissible limit of scattering in Electronic Detonator Shall be as specified by manufacturer ± 0.1% for above 1000ms and +/- 1ms upto 1000ms

l. Calibration of DELAY TIMER & VOD METER (DTVM) shall be done once in year or interval recommended by manufacture.

4. GENERAL PRECAUTIONS

a. All blasting operations shall be done under the direct personal supervision of Blasting Officer / Assistant Manager in charge of blasting.

b. Only those persons who are fully trained in random sampling & testing shall be deputed for these operations.

c. Provisions of statute regarding blasting shall be strictly complied.

d. The test procedure shall be followed in accordance with requirements as laid down in IS: 6609.

e. Electronic Detonator shall be used/ tested in the order of their dates of manufacture.

f. Explosives when transported in vehicles shall be carried in an explosive van approved by the Petroleum and Explosives Safety Organisation (PESO). Explosive vans used for transport of explosives shall be in safe operating condition and should be driven by the competent licensed drivers. The explosive van shall be kept in isolated locations while loaded which shall be properly guarded and attended.

g. No smoking or open flame shall be permitted in or near the explosive van containing explosives.

(HONEL)

SOP FOR NON ELECTRIC DETONATOR TESTING

1. PRE TESTING REQUIREMENTS

Lead Plate

Fevi-quick

Lead plate holder

2. TESTING PROCEDURE FOR MEASURING STRENGTH OF THE DETONATOR

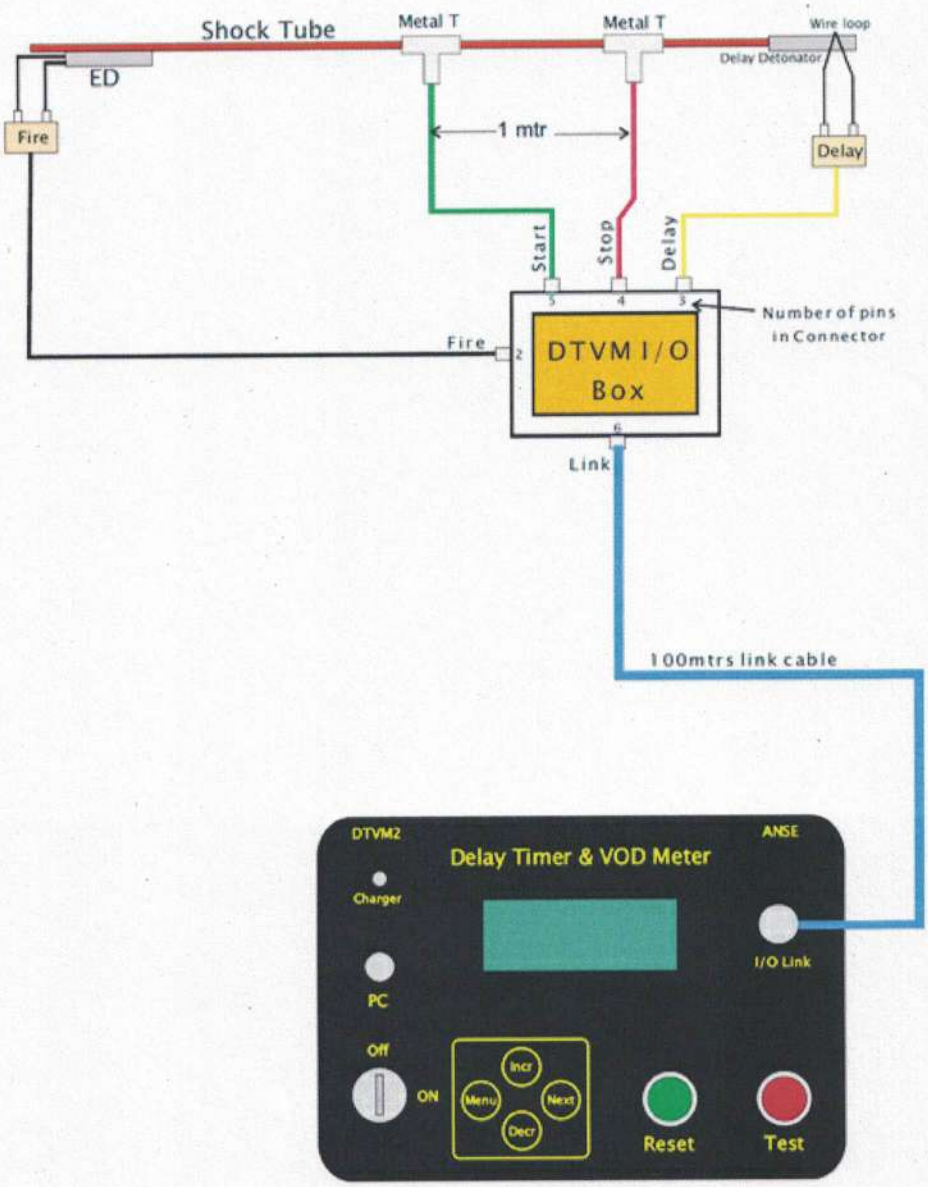
a. Take a sample of non electric detonator.
b. Take a lead plate of dimensions 3.5cm length, 3.5cm breadth and 0.5cm thickness.
c. Take a drop of fevi-quick on the lead plate.
d. Place the non electric detonator perpendicularly on the lead plate so that it gets stick to the plate.
e. Connect the non electric detonator to the Exploder and fire it.
f. After the blast collect the lead plate and check dent/crater produced on the lead plate corresponded to C3 class.

3. TESTING PROCEDURE FOR SERIES FIRING OF NON ELECTRIC DETONATOR

a. Take a 10 number of non electric detonator.
b. Connect the entire non electric detonator in series.
c. Connect the first non electric detonator to the exploder.
d. Fire the detonator.
e. To pass the test, the entire non electric detonator should be fired successfully.

4. PROCEDURE FOR MEASURING DELAY TIMING OF NON ELECTRIC DETONATOR

DTVM setup for Measurement of
Delay Time of Shock Tube (NONEL)



a. Place the DTVM Main unit at a safe place (at least 100mtrs) away from the blasting site. Keep the unit in power off mode and key switched off. Connect the link cable.
b. Lay the 100mtrs. Cable as per the site layout.
c. Place DTVM I/O Box at about 2 to 5 mtrs. away from the sample under test.Connect the link cable.
d. Connect the Green cable with metal T connector to 5 pin connector labeled as Start. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has metal T for inserting shock tube.
e. Connect the Red cable with metal T connector to 4 pin connector labeled as Stop. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has metal T for inserting shock tube.
f. Connect the Yellow cable with splitter box to 3 pin connector labeled as Delay. The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connector for wire loop connection.
g. Connect the black cable to 2 pin connector labeled as Fire.The connector has key slot and would mate in only one position/ orientation. The other end of the cable has splitter box with push connector for the ED wires.
h. Thread the free end of shock tube from the Stop metal T through start metal T in a way so that the detonator is about 1to 2 mtrs. away from stop metal T. The distance between start and stop attachment is fixed at 1 mtrs.
i. Take a piece of single strand wire about 2 mtrs. long. This wire could be lead wire of used ED. Wrap tightly a turn of this wire around the tip of the delay detonator shell and make sure that it does not slip off the shell. Connect the two ends of this wire loop to Delay splitter box push connectors. Ensure proper electrical contact.
j. Tie the shock tube initiating ED to the shock tube and connect the ED wires to fire cable splitter box push connectors. Ensure proper electrical contact.
k. Lay all the cables as straight and as far away from detonators as possible.
l. After making sure the site is ready for blasting, power ON the main unit by putting the key switch to ON. Press Reset (Green) button. Confirm Ready message is displayed on the screen. If not attend to the problem as shown on the display. Refer Error Messages. Once all OK, recheck site is ready for test. Press the Test (Red) button. Within 3-4 seconds firing impulse would be given to ED which will initiate the shock tube and subsequently the delay detonator. VOD of shock tube and delay time of detonator will be displayed on the screen. Note the readings and Power Off the Unit. Turn the key switch to OFF position.

m. Repeat steps h to l if further samples are to be tested.

n. The permissible limit of scattering in Nonel shall be ± 10 m/s for long delay and ±5 m/s for short delay.

o. Calibration of DELAY TIMER & VOD METER (DTVM) shall be done once in year or interval recommended by manufacture.

5. GENERAL PRECAUTIONS

a. All blasting operations shall be done under the direct personal supervision of Blasting Officer / Assistant Manager in charge of blasting.

b. Only those persons who are fully trained in random sampling & testing shall be deputed for these operations.

c. Provisions of statute regarding blasting shall be strictly complied.

d. The test procedure shall be followed in accordance with requirements as laid down in IS: 6609(part II/sec I) of 1973.

e. Nonel shall be used/ tested in the order of their dates of manufacture.

f. Explosives when transported in vehicles shall be carried in an explosive van approved by the Petroleum and Explosives Safety Organisation (PESO). Explosive vans used for transport of explosives shall be in safe operating condition and should be driven by the competent licensed drivers. The explosive van shall be kept in isolated locations while loaded which shall be properly guarded and attended.

g. No smoking or open flame shall be permitted in or near the explosive van containing explosives.

SOP FOR COPPER ELECTRIC DETONATOR TESTING

1. PRE TESTING REQUIREMENTS

Lead Plate

Fevi-quick

Lead plate holder

2. TESTING PROCEDURE FOR MEASURING STRENGTH OF THE DETONATOR

a. Take a sample of detonator.
b. Take a lead plate of dimensions 3.5cm length, 3.5cm breadth and 0.5cm thickness.
c. Take a drop of fevi-quick on the lead plate.
d. Place the detonator perpendicularly on the lead plate so that it gets stick to the plate.
e. Connect the detonator to the Exploder and fire it.
f. After the blast collect the lead plate and check dent/crater produced on the lead plate corresponded to C3 class.

3. TESTING PROCEDURE FOR SERIES FIRING OF DETONATOR

a. Take a 10 number of detonators.
b. Connect all the detonators in series.
c. Connect the first detonator to the exploder.
d. Fire the detonator.
e. To pass the test, all the detonators should be fired successfully.

4. TESTING PROCEDURE FOR MEASURING ELECTRIC RESISTANCE OF DETONATOR

a. The electric resistance was determined by stretching the lead wire and connecting an ohmmeter across the base lead wires.

b. The range of Electric Resistance of detonator shall be 5.5 ± 1.0 Ω.

5. GENERAL PRECAUTIONS

a. All blasting operations shall be done under the direct personal supervision of Blasting Officer / Assistant Manager in charge of blasting.
b. Only those persons who are fully trained in random sampling & testing shall be deputed for these operations.
c. Provisions of statute regarding blasting shall be strictly complied.
d. The test procedure shall be followed in accordance with requirements as laid down in IS: 6609(part II/sec I) of 1973.
e. Detonator shall be used/ tested in the order of their dates of manufacture.
f. Explosives when transported in vehicles shall be carried in an explosive van approved by the Petroleum and Explosives Safety Organisation (PESO). Explosive vans used for transport of explosives shall be in safe operating condition and should be driven by the competent licensed drivers. The explosive van shall be kept in isolated locations while loaded which shall be properly guarded and attended.
g. No smoking or open flame shall be permitted in or near the explosive van containing explosives.