



CM/L - 8800097117

# D L MILLAR AND COMPANY LIMITED

DR MILLARS COMPLETE WATER PROOFING TURNKEY SOLUTIONS, HEAVY DUTY INDUSTRIAL  
ESD ANTISTATIC/CONDUCTIVE FLOORING & PROMATT24 (COMFORT MAT)



Bureau of Indian Standards (BIS) introduced a new standard (IS 15909:2020) for Geomembrane in December 2020. They discontinued the use of dark or black colour in membranes to discourage use of recycled materials.



- Make in India product as per Prime Minister's Vision
- Significant price advantage in comparison to similar quality imported products
- JIT - Just in Time quick delivery (Manufactured in India)
- Membranes as per IS : 15909 : 2020 Category B











## **DL MILLAR AND COMPANY LIMITED**

Established since 1929, we are pleased to introduce ourselves as a reputed manufacturer for various infrastructure projects and have been serving various Govt Departments and private projects to meet their requirements for a variety of works. Under our brand name Dr. Millars, we are supplying PVC Geo-membranes, High Voltage Insulating mats, Promatt & PPE Kits & Coveralls. Dr. Millars PVC Geo-membranes are used for Tunnel Waterproofing. These PVC sheets are normally of 1.5 MM & 2.00 MM, produced in India as per a special formulation provided by our technical experts which meet the latest RVNL, IRCON, NHAI & are also as per BIS (IS:15909:2020) specifications.

Our factory is having modern calendaring lines and we have a well equipped laboratory meeting at the testing requirements of BIS, RDSO and RITES etc. which are international standards.

The special features of PVC Geomembrane are that it conforms to uneven ground surface. enhancing life & can be easily repaired. This is most suitable product for tunnels as the PVC membranes have excellent flexibility & elongation which will not fail in case of earthquakes. The PVC Geomembrane supplied by us meet all standard quality parameters and can be a safe economical option for water proofing applications.

“Dr.Millars” brand PVC Geomembrane used for water proofing/ seepage control of concrete structures, Building roofs, foundations, Basements, tunnels, underpasses and sealing of expansion joints and for lining of reservoirs, water bodies, canals etc. for seepage control.

We Provide turnkey based projects i.e. Supply & Installation of PVC Geomembrane. We have complete range of Water Proofing Product.

### **About Dr. Millars Waterproofing membranes:**

“Dr.Millars” PVC Geomembrane is 100% Indian under Make in India program meets the specification as per international standards (ASTM & EN) as well as IS: 15909:2010 (BIS specification for PVC Geomembrane lining).

### **Salient Features:**

1. Products are 100% made in India under the prestigious “Make in India” program which replaces 100% imported products & dependency on foreign companies.
2. Possibility to produce & supply PVC membranes for tailor made specifications of large infra projects.
3. Quick & on time delivery as goods are produced by a reputed PVC processing factory located near New Delhi under the supervision of Dr. Millar’s engineers.
4. Geo Textiles for tailor made requirement is got produced from OEM manufacturers & all installation accessories is sourced from reputed & approved suppliers along with test certificates.
5. Test reports from reputed labs like M/s. Spectro Labs conforming to all properties meeting international ASTM & DIN Standards.



## WHAT IS GEOMEMBRANE ?

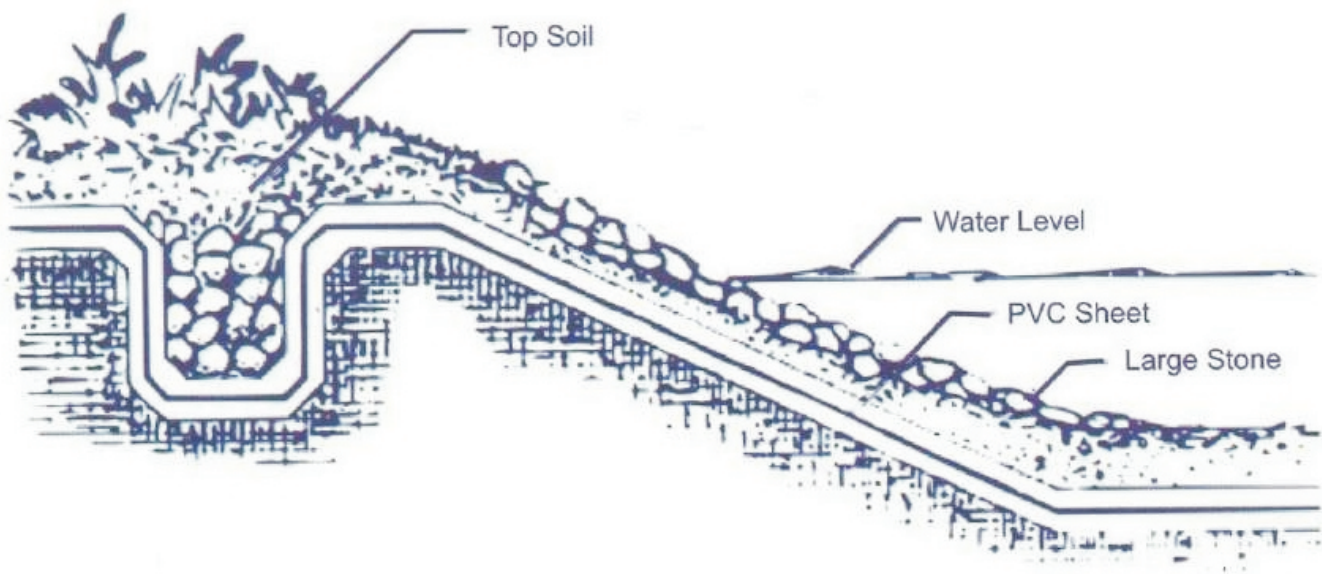
"PVC Geomembranes are relatively thin sheets of flexible polymeric materials that are naturally impermeable thus providing barrier to movement to Newtonian & Non Newtonian Liquids.

## AREAS OF APPLICATION

Water Proofing of Building Roofs and Foundations, Underground Concrete Structures like Basement Foundations etc.  
Waste Containment for Industrial Effluents & Solid Waste Management to prevent contamination of Ground Water Aquifer.  
Landfill Capping to prevent fluid flow into the land fill and to trap and properly vent the gases.  
Lining of Lakes/Reservoirs/Water Bodies for 100% Seepage Control including aquaculture reservoirs for Fish Farming.  
Lining of Canals for Imigation/Agricultural Purpose and many more.

## INSTALLATION PROCEDURE (LAKE / RESERVOIRS / WATER BODIES)

- The Liner is available in 2 meter width and 30 meter length.
- Large Panels can be fabricated of 30 meter wide and 100 meter long to minimize the field seams.
- The above panels are joined with the help of a thermo welding machine on side dimensions. The welding is very strong and 100% sag proof.
- The laying and fixing of PVC Liner is done on a dry and compacted Surface. We have an experienced and skilled team to carry out the job of laying and fixing on the site.
- Installation by Anchoring method. In this method a trench is constructed around the reservoirs and liner is anchored in the trench by back filling the trench as shown in the below sketch.



***The Installation Procedure & Preparation varies on account of site conditions & application. Our installation team is well experienced to give you the water proofing solution required.***





### Why Geomembrane is recommended ?

D.L. Millars & Company Ltd. Supplier a complete range of PVC Geomembranes in response to a wide variety of applications. Experience has shown that PVC-Geomembrane is most suitable for waterproofing of tunnels due to its excellent mechanical properties and its durability in accordance with the expected lifetime of the : applicable area.

In addition, this geomembrane can be laminated with a geotextile of polypropylene (up to 700 g/m<sup>2</sup>) for bonded applications.

The waterproofing system with PVC-Geomembrane, **Dr. Millars** offers maximum security against differential settlements, and risk of perforation due to concrete reinforcement.

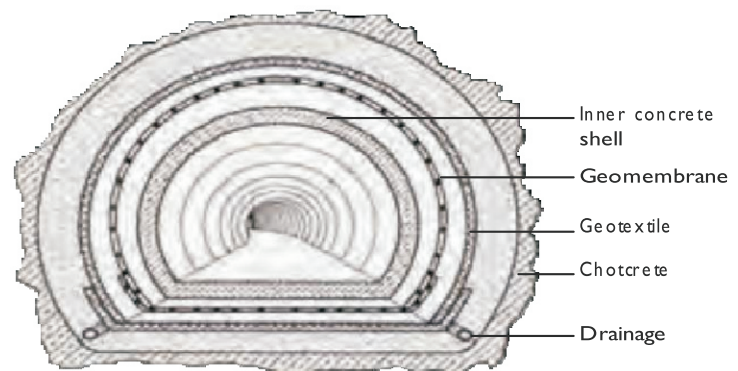
In addition, in the event of any damage occurred to the geomembrane, it offers the possibility to achieve a system to repair any leaking, with no perforation of the concrete shell.

### Concept of the waterproofing system

#### Components

The waterproofing of a tunnel is a loose laid system. In case of a leakage, the water is able to enter between the geomembrane and concrete shell and will look for the weakest point of the concrete structure. In general it is the joint between 2 concrete blocks.

In the complexity of the waterproofing, membrane the possibility of leaks occurring after installation of the waterproofing system must be considered. Therefore we plan the waterproofing system in such way that a repair is possible after finishing the construction, without perforating the concrete and damaging the waterproofing system.



This can be achieved through the two Jointing methods:

- The first one is to create compartments with water stops to limit the spreading of infiltrating water over an important length of the tunnel.
- The second one, is to place injection devices to have the possibility to repair leakages after having poured the concrete.

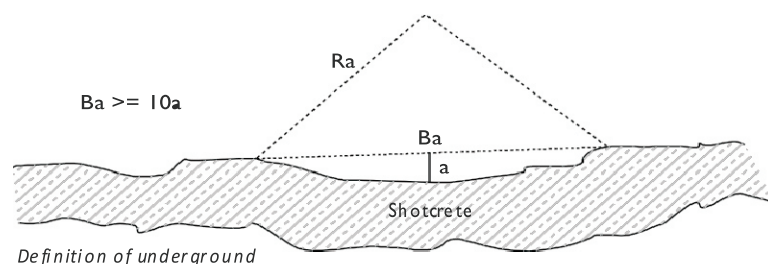
Components of the waterproofing system:

- Geotextile minimum 500 g/m<sup>2</sup> Polypropylene (no Polyester), depending on the surface.
- Geomembrane of homogenous thermoplastic material like PVC-P, TPO, min 2,0 mm, transparent (French prescription) or with signal layer.
- Fixing elements.
- Reinforcement strips to protect the geomembrane in the area where shuttering for concrete shell finishes.
- Protection geomembrane (French prescription)
- Anchors if necessary to hold the reinforcement of the inside concrete shell.
- Water stops
- Injection device

#### Support

The surface of the support has to be even the granulate should not be greater than 16 mm. The geometry of the surface ( $B_a \geq 10a$ ) should be followed to avoid possible folding of the geomembrane after the concrete is poured (see drawing of the geometry recommended by Austrian standard HEFT 3659).

An uneven surface of the support can lead to folds of the geomembrane during concreting of the inside shell which could damage the waterproofing.





# Installation of the lining systems to the bottom of the tunnel

## Installation of the Geotextile

After inspection of the shotcrete surface the geotextile will be placed on the bottom area . The overlap has to be sufficient to assure protection of the geomembrane at any place of the tunnel (minimum 10 cm).

## Installation of the Geomembrane

The geomembrane will be placed and welded together with an automatic welding machine. Wherever a T-cross occurs, the geomembrane has to be adapted at the edges to guarantee a correct welding. The geomembrane should be cut in an inclined way to allow the welding machine to produce welding without failure. When laying out the geomembrane T-crosses should be avoided as much as possible as there is the danger of capillaries.



*Installation of membrane*

## Water Stops

The water stop divides the lining system in to compartments which limits the spreading of the infiltrating water.

In combination with an injection system a repair of a leaking compartment can be carried out without damaging the geomembrane as well as keeping the cost at a reasonable level.

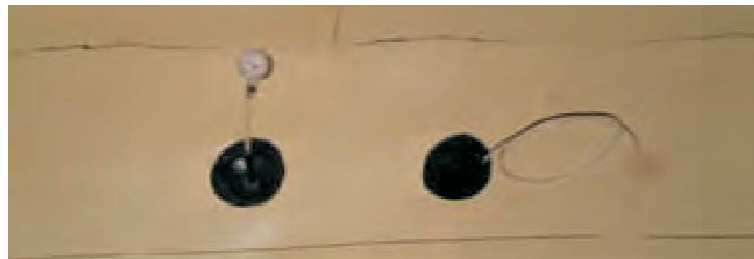
To install the water stop, the best way is to weld it directly to the geomembrane outside of the tunnel under good conditions with a welding automate for roofing (single welding). This prefabricated geomembrane is then welded onto the next geomembrane with an automatic welding machine with double seam. This technology allow for a perfect welding of the system.



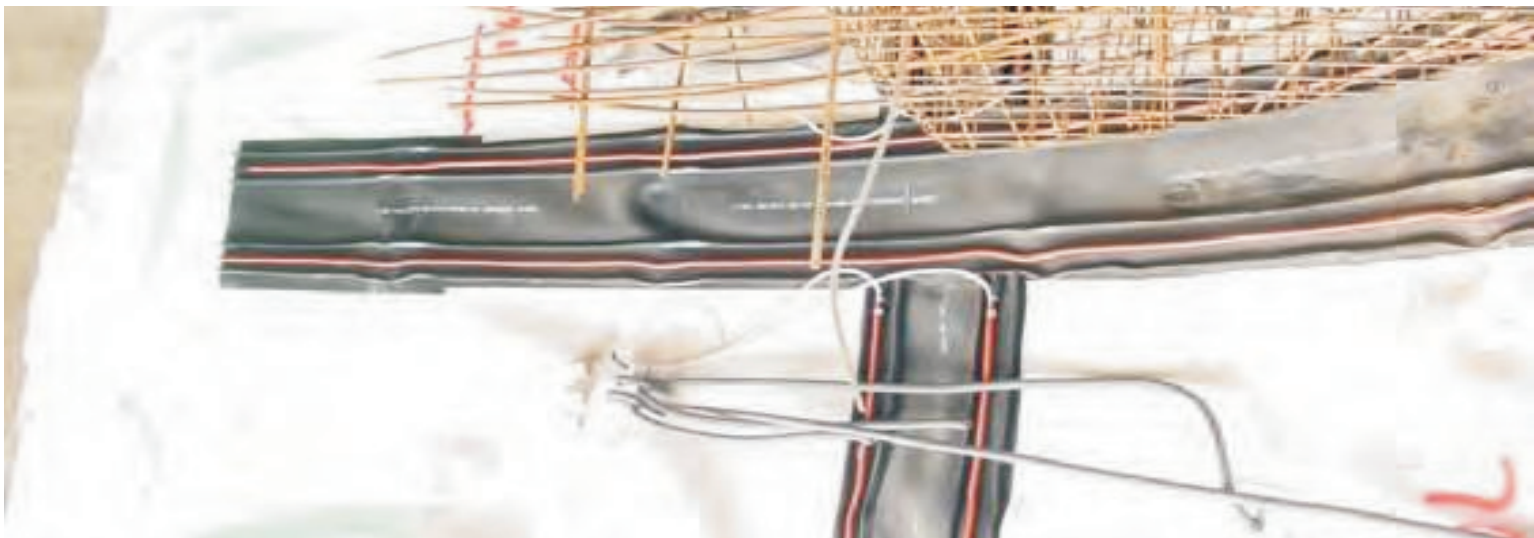
*Geomembranes with welded water stops produced in prefabrication*

## Injection pipes

The injection pipes can be placed in the corners of the compartment and, depending on the size of the compartment also in the middle. It is recommended to use water stops with an integrated injection tube as it is important to ensure the water tightness in the joints. The injection pipes also fulfill the task of a detection system. In case of a leakage the water will exit at the injection pipes, therefore they are also very helpful as control devices after having poured the concrete on the slab.



*Vacuum*



*Water stops with integrated injection tubes*



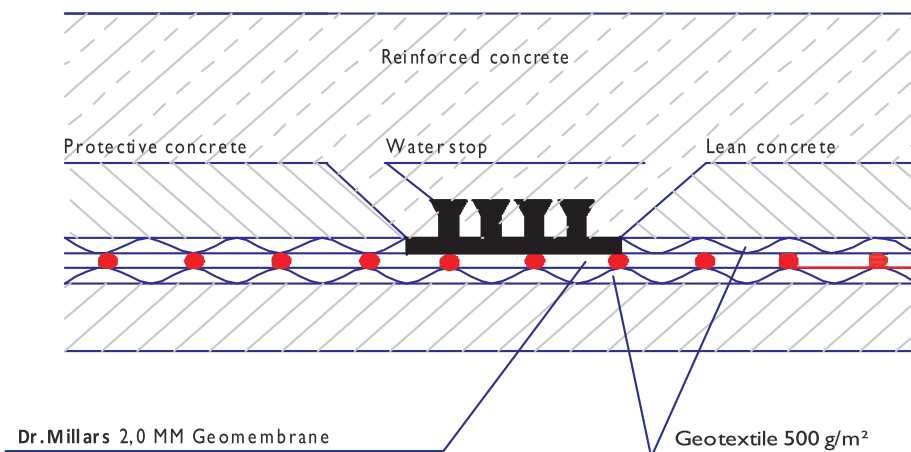


## Pending connection to the vault

The waterproofing system at the bottom must overpass the construction of the bottom concrete far enough to guarantee a safe connection with the waterproofing of the vault. The geomembrane and the geotextile will be provisionally fixed to the shotcrete. It is very important to protect this area very carefully. The reinforcement bars - sticking out of the slab are then connected with the reinforcement bars for the vault which endanger the waterproofing system.

## Protection of the waterproofing system on the bottom slab

When the waterproofing system is installed, it has to be covered with a geotextile and a protective layer of concrete of about 10 cm. The areas with water stops must stay free to be embedded in the concrete of the slab to be able to fulfill their task.



*Water stop of bottom slab*

## Concrete of slab

There in for cement works can be executed and pouring of concrete of the slab. The protective concrete should ensure that no damage can harm the waterproofing system through the shuttering of the concrete slab.



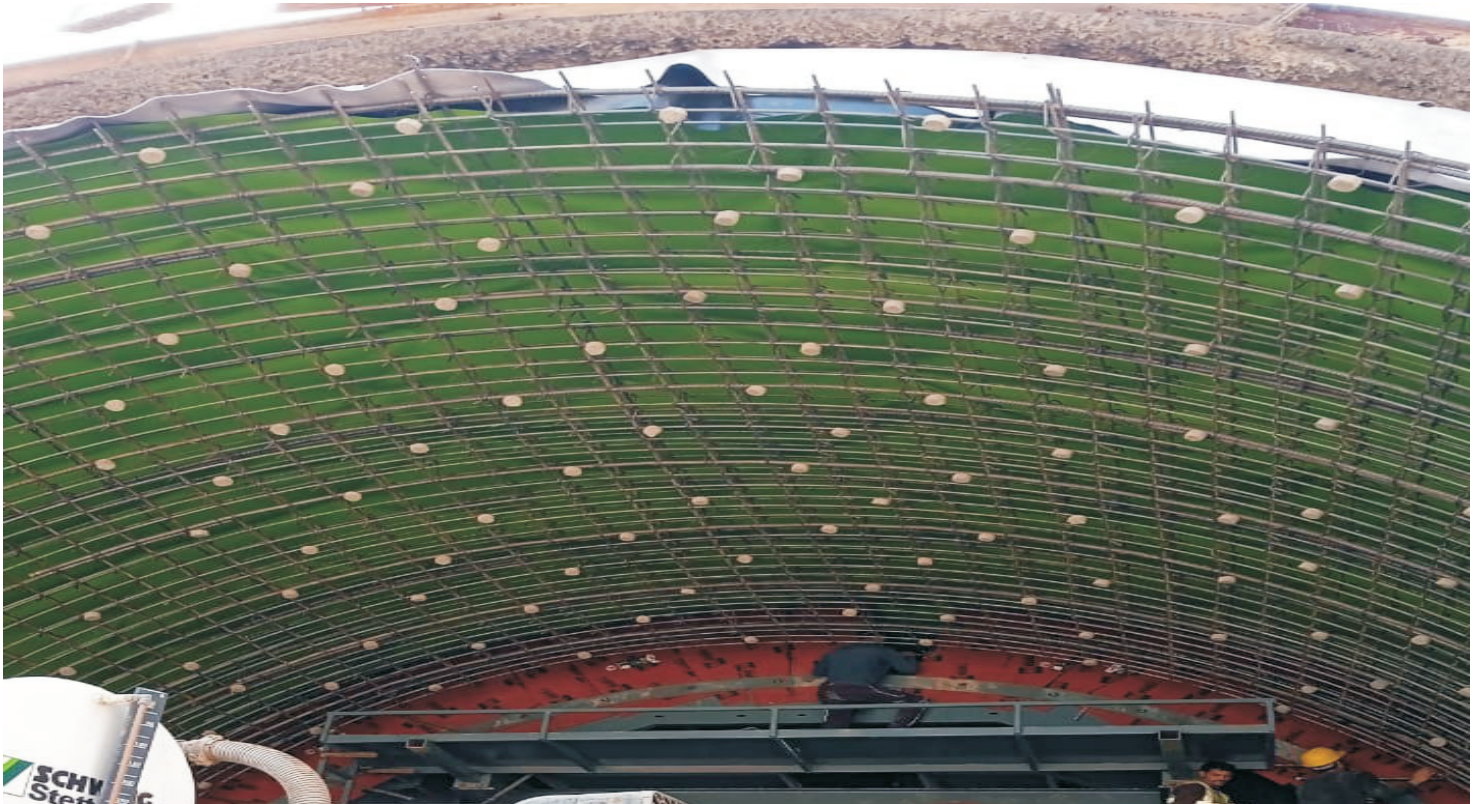


## Installation of the lining system to the vault of the tunnel

Before starting the installation, the installer has to confirm that the surface of the support follows the specifications.

### Scaffolding

The scaffolding for the installation of the lining system can be placed on the slab of the tunnel. Depending on the type of scaffolding used the geotextile and the geomembrane will be installed from one side of the tunnel to the other (use of hydraulic scaffolding) or from the highest point of the tunnel to both sides (manual scaffolding).



Hydraulic scaffolding

The hydraulic scaffolding is costly but of course allows for a more comfortable working condition for the installer. It has to be adjustable following the geometry of the tunnel.

The geotextile will be positioned on the steel bar of the moving basket, where it will be unrolled automatically with the lifting of the basket. The geotextile will be fixed with the fastening roundels to which the geomembrane will be welded in the second turn of the basket.

After having fixed both items the scaffolding can move on to get into position for the next placement of the waterproofing system.

The use of conventional scaffolding means hard work. First the rolls of geotextile are brought to the highest level of the scaffolding, and fixed to the shotcrete surface with the roundels. Then the geomembrane is unrolled on top of the scaffolding, and spot welded to the fixation roundels starting at the highest point of the vault.



The geomembranes are welded together with automatic welding machines producing a seam with testing canal.



## Installation of the Geotextile

The geotextile will be fixed with fixation roundels: in the wall area about 2 pieces per m<sup>2</sup>, on the vault 3 pieces per m<sup>2</sup>. The fixation elements have to be fixed on the deep spots of the shotcrete surface to avoid elongations of the geomembrane during pouring of the concrete shell (the geomembrane will be welded to these fixing roundels).

The geotextile is lifted to the scaffolding, unrolled and fixed with the fixation roundels to the shotcrete surface. The geotextile has to have an overlap of minimum 10 cm. The geotextile will be fixed completely over the surface of the daily planned work.

In areas of important irregularities it is recommended to double the geotextile.



*Fixation of the geotextile*

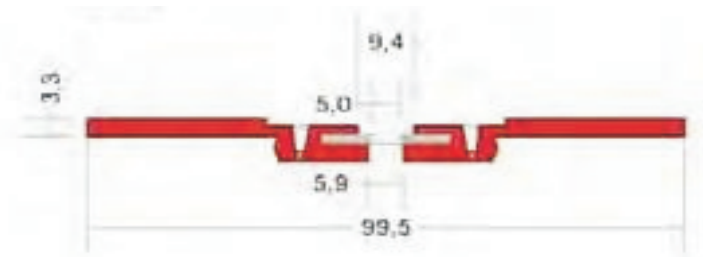


*Fixation of the geomembrane by spot welding*

## Fixation roundels

The task of the fixation roundel is on one hand to fix the geotextile to the shotcrete surface by shot nails, on the other hand to serve as a welding surface in order to fix the geomembrane to the tunnel. The roundel is made out of the same material as the geomembrane to assure compatibility between the materials.

In case of high pressure behind the geomembrane, the knock-out zone of the roundel prevents the fixation to fall down behind the geomembrane, which could lead to damage of the waterproofing. Example of flat PVC-P roundel with knock-out system, with steel washer:



*Section*

## Installation of the Geomembrane

The producer of geomembrane has to produce the geomembrane in the correct length following the indications of the installer, which corresponds to the perimeter of the tunnel to be waterproofed. Besides the indicated length a middle mark will be applied as well as a line on one side of the membrane at a distance of 5 to 8 cm.

The middle mark shows the installer where he has to fix the membrane to the highest point of the vault (manual scaffolding), the side line indicates the necessary overlap for the welding.

The installer unrolls the geomembrane from the top of the scaffolding, welds it to the fixation roundels on the highest point of the vault and proceeds with this work downwards till the whole geomembrane is attached to the fixation roundels.

In this way the daily quantity of geomembrane will be attached to the tunnel surface.

Coming back with the scaffolding to the beginning of the newly fixed membranes, the welding procedure may start.

With the help of welding machines, producing a seam with testing canal, the geomembranes are welded together.

The installer has to take care that the machine is well adjusted concerning temperature, speed and pressure. Therefore it is crucial to adjust the machine through trial welding every day before starting the initial welding works.







## Water stops

As for the slab, it is preferable to weld the water stops during prefabrication onto the membrane strips. Having brought all geomembrane into position, the connection to the prefabricated strips of geomembrane with water stops has to fit with the necessary overlap for the welding.

## Injection pipes

The injection pipes have to be placed on the correct positions, on both sides of the vault.

## Reinforcement strip

Shuttering units for the inside concrete are, in general, between 8 to 12 m. At the end of the shuttering unit, a head shuttering has to be placed. The placement of this shuttering, consisting of small boards, is a danger for the waterproofing system. During the fixing of the boards the geomembrane can get damaged. Therefore a protecting strip of about 50 cm is placed onto the geomembrane at the end part of the shuttering unit in order to strengthen the lining system.



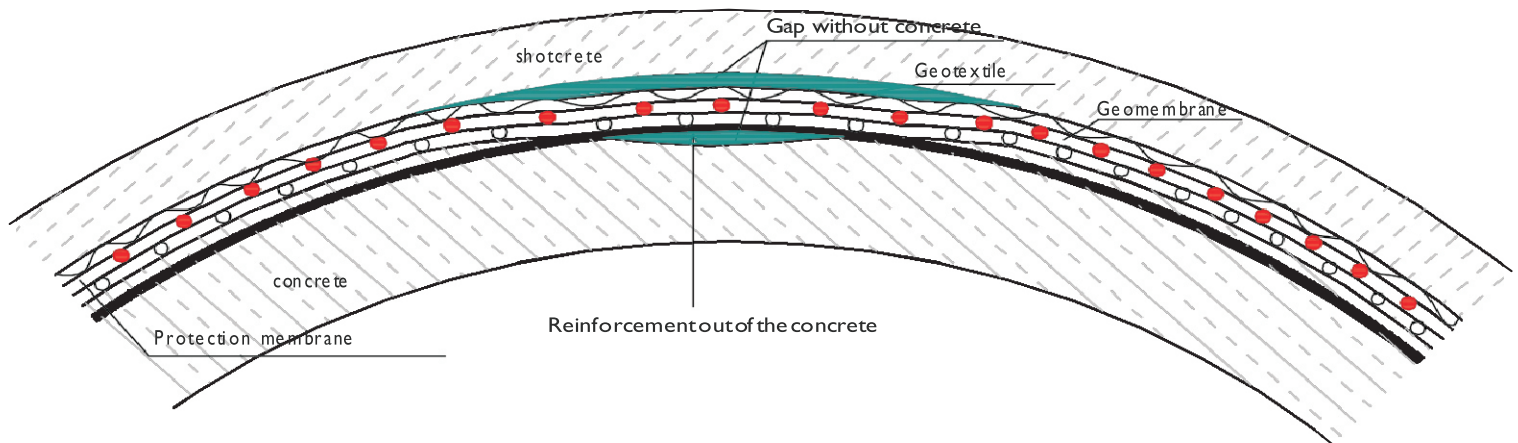


## Concrete for the vault

Through out the concrete procedure, a strain will be applied to the geomembrane, provoking a slight elongation due to the weight of the concrete. Depending on the surface of the shotcrete and the way of installation of the lining systems, folds can appear due to the pouring of the concrete.

A smooth surface of the shotcrete guarantees less folds in the geomembrane

The peak of the vault has to be done with great care. After having poured the concrete, it starts to settle and leaves a gap on top of the vault. Precautions have to be taken to close this gap by injecting cement after the concrete has settled. The steel bars have to be embedded completely in the concrete as well as the anchors of the water stop (if present).



Top of the Vault  
French Waterproofing System

## Anchors for reinforcement bars

The installation of the reinforcement steel is one of the most important dangers to the lining system. In the vault the geomembrane is usually not protected and therefore exposed to the danger of being perforated during the reinforcement works. The steel bars have to be placed at a certain distance to the lining system. In case of a not self carrying reinforcement it is recommended to use anchors on which the reinforcement bars are fixed at a correct static distance. Such anchors are able to hold loads of over 30 kN depending on the quality of the shotcrete.

This type of anchor is a complete closed system, water is unable to enter between the lining system and the inside concrete shell. The anchor consists of a hard PVC-P tube with a flange, on which the PVC-P geomembrane is welded on.

After having installed the geomembrane, a hole is drilled into the shotcrete through the geomembrane. The PVC-P tube is bonded into the borehole. The soft PVC-P flange is welded to the geomembrane. Into the PVC-P tube a steel pin is introduced in order to fix the reinforcement steel of the inside concrete shell.

## Bonded system

The latest development in waterproofing is the employment of bonded waterproofing systems. Tunnels become longer with the development of the high speed trains. These tunnels are constructed with TBM machine where the geology allows it and the profile of the excavated zone is regular. Tunnings are placed to the shotcrete and make a perfect surface to bond the geomembrane onto them.

For such applications, a geomembrane with a laminated PP fleece is the correct material to achieve a water tightness of the construction. Special machine for the installation of the geomembrane. Which have a cleaning, brushline and a bonding unit and can be directed with only 3 men. The performance with such an installation machine is much higher as with the conventional installation method.

**D.L. Millars & Co. Ltd** is able to offer the right geomembrane for this application.



Installation geomembrane with glue



## Scaffolding

### Simple Scaffolding

In general, simple scaffolding is used, running on rails or on wheels. The scaffolding consists of stable elements which can be transported easily and allows adaption throughout the dimensions of the tunnel.

### Hydraulic Scaffolding

A more sophisticated scaffolding is one with a hydraulic basket turning from one side to the other.

## Welding tools

### Automatic hot wedge welding machine

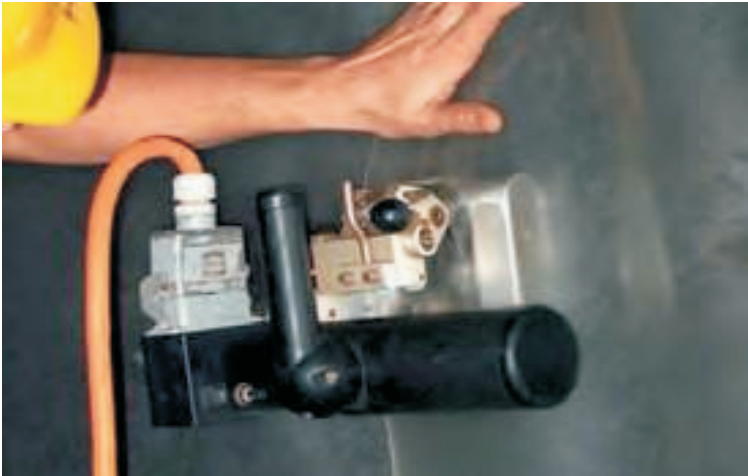
This kind of machine works with an electric heated wedge. Above and underneath the wedge there are two pressure rolls which are both independently motorized. The hot wedge is guided between the overlapped geomembranes; the two pressure rolls advance the machine at the determined speed. Temperature, pressure and speed are adjusted before executing the final welding. The machine is completely electronically guided. By changing outside temperature the electronic guidance adjusts the temperature following the conditions.

### Automatic hot air welding machine

The machine is a combination hot wedge / hot air automatic welding machine. The hot air temperature, the pressure, and the speed of the welding machine are adjustable and are electronically controlled.

### Hand welder

The hand welder works with hot air and is indispensable on an underground project. All details have to be done with this well known device.



Automatic hot wedge welding machine



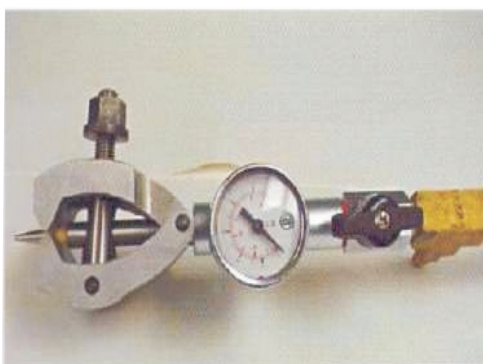
Automatic hot air welding machine



## PVC AIR CHANNEL SEAM BOND TEST



Air Pressure Testing



Dual Track Welds on PVC

### ADVANTAGES OF PVC GEOMEMBRANE

There are distinct advantages that set **PVC** apart from the **REST**.....

1. PVC is the only material that can be engineered to adapt and perform according to Usage and Environments of extreme nature i.e. from the tropics to the desert and to the mountains.
2. In case of breach, the system can be repaired very fast by unskilled workmen without special equipments etc.
3. PVC remains elastic through its elongation. The minimum elongation at break for 0.76 mm is 380% for this reason PVC conforms to subgrade soil better.
4. 30 mil PVC Geomembrane is equivalent to 60 mil HDPE Geomembrane. While the thickness of PVC Geomembrane is half that of HDPE Geomembrane the tensile strength is only 18% less than the HDPE Geomembrane.
5. PVC Geomembrane is amorphous material & is not subject to environmental stress cracking, whereas HDPE Geomembranes are crystalline structure in Nature. Stress cracking of a car windshield. A minuscule stone chip can create a shattering effect.
6. High Flexibility & Elongation till the balance in favour of PVC.
7. PVC has excellent chemical resistance to most of the chemicals, acids & alkalies

### Flexibility = Durability

HDPE Liner  
Max 12%  
elongation

PVC Liner  
Max > 300%  
elongation

### WATER IS PRECIOUS !

Water Loss due to Percolation

<i>Infiltration Rate cm per hr.</i>	<i>Water Loss Per Hect. per Hr. (min.)</i>
<b>High</b> (3.0 to 8.0+) <b>Sandy Loam, Sandy Clay Loam</b>	<b>300,000 Ltrs. per Hr.</b>
<b>Medium High</b> (1.5 to 3.0) <b>Loam Sit Loam</b>	<b>150,000 Ltrs. per Hr.</b>
<b>Medium Low</b> (0.5 to 1.5) <b>Lay Loam Sit Clay Loam</b>	<b>50,000 Ltrs. per Hr.</b>
<b>Low</b> (0.2 to 0.5) <b>Clay</b>	<b>20,000 Ltrs. per Hr.</b>



## Comparative Specifications of “DR Millars” 2.0 mm PVC Geomembrane

Sl. No.	Properties	Unit	Test Method	DLM1	DLM2	DLM3
1	Thickness	mm	EN 1849-2	2.0, ±10%	≥2.0	2.0, -0/+10%
2	Specific Weight	Kg/m <sup>2</sup>	EN 1849-2			2.6 ± 5%
3	Tensile Strength	N/mm <sup>2</sup>	EN ISO 527-3	15 ±2	≥15	
			EN 12311-2			L: ≥17 T: ≥17
4	Elongation at failure	%	EN ISO 527-3	L:250, -10% T:250, -10%	L: ≥280 T: ≥280	
			EN 12311-2			L: ≥300 T: ≥300
5	Tear Strength	KN/m	EN ISO 34	≥40		
			DIN 53363		≥80	
6	Tear propagation strength	N	EN 12310-2			≥100
7	Behavior during perforation test Height of fall without perforation	mm	DIN 16726	≥ 1100	≥ 1100	No perforation at 1100 mm height of fall
8	Cold folding resistance	°C	EN 495-5	No cracks at – 20°C	No cracks at – 20°C	No cracks at -35°C
9	Hydrostatic pressure resistance		EN 1928-B			Waterproof at 5 bar for 24 hours
10	Dimensional Stability after accelerated ageing (6h/80°C)	%	EN ISO 1107-2	≤2%	≤2%	≤2%
11	Change of dimensioning after heating at 70 °C for 2 hours		EN 1110			Stable
Sl. No.	Properties	Unit	Test Method	DLM1	DLM2	DLM3
12	Root resistance		EN 14416	Resistant	Resistant	No penetration
13	Resistance to acid and alkaline at 28 days		DIN 16726			20 % maximum elongation
14	Resistance of welded seam shear resistance	N/mm <sup>2</sup>	EN 12317-2			≥13.5 Break out of the joint
15	Resistant to static puncturing (24h/20kg)	Kg	EN 12730-B			≥ 20
16	Behaviour in fire		B2 ON B 3800/1	B2	B2	Class E
			SIA 280	IV.2	IV.2	
			DIN 4102	B2	B2	
			EN ISO 11925	Class E	Class E	







FRESH CERTIFICATE OF INCORPORATION  
CONSEQUENT ON CHANGE OF NAME

In the Office of the Registrar of Companies West Bengal,  
[ Under the Companies Act, 1956 ( 1 of 1956 ) ]

IN THE MATTER OF \*D. L. Millar & Company (Pr.) Limited  
3, Netaji Subhas Road, Calcutta-1.

I hereby certify that D. L. Millar & Company (Pr.) Limited, which was originally incorporated on 14th day of August, 1929, under the † Indian Companies Act 1913 and under the name D. L. Millar & Company Limited, having duly passed the necessary resolution in terms of section 21 of Companies Act, 1956, the name of the said company is this day change to D. L. Millar & Company Limited and this certificate is issued pursuant to section 23 (1) of the said Act.

Given under my hand at Calcutta this day of 13th June, 1980  
(One thousand-nine hundred eighty).

Sd/- Illegible  
Asstt. Registrar of Companies,  
West Bengal.

\*Here give the name of the company as existing prior to the change.

†Here give the name of the Act(s) under which the company was originally registered and incorporated.



ICT AIAPL JV LLP

Consultancy Services as Authority's Engineer of Supervision of Construction of (i) Connecting Road from Z-Morh Tunnel to Zojila Tunnel and (ii) 14.150 km long bi-directional tunnel across Zojila Pass on Sonamarg-Kargil Section of NH-01 on EPC Mode in the Union Territories of Jammu & Kashmir and Ladakh

ICT/Zojila/MEIL/2022/ 582

12 August, 2022

Project Manager  
M/s Megha Engineering and Infrastructure Ltd.  
Hotel Grand Hayatt,  
Gangangar-Sonamarg,  
District: Ganderbal,  
UT of J&K  
Email: [metplanning.zojila@gmail.com](mailto:metplanning.zojila@gmail.com)

Subject: "Construction of (i) Connecting road from Z- Morh Tunnel to Zojila Tunnel and (ii) 14.150 Km long bi-directional tunnel across Zojila pass on Sonamarg Kargil section of NH-01 on EPC mode in the Union Territories of Jammu & Kashmir and Ladakh". Reg - "Source Approval of PVC-P, Membrane - Source D.L. MILLAR & Company Ltd".

REFERENCE: MEIL/ZOJILA/SITE/2022-23/544 dated 13.07.2022

Dear Sir,

With reference to above cited caption regarding submission of PVC- P membrane source approval of M/s D.L. Millar & Co Ltd.

The credential of M/s D.L. Millar & Co Ltd for PVC-P waterproofing membrane has been reviewed as per Contract Agreements of schedule-D and other relevant European standard guidelines and found in order. Hence, approval of source M/s D.L. Millar & Co. Ltd for PVC-P water proofing membrane is hereby accorded to procure the consignment of PVC-P waterproofing membrane in the project as per letter no NHIDCL/PMU-SHG/Zojila/ 2021-22/78 dated 21/06/2022.

After arrival of consignment PVC-P waterproofing membrane at site and further jointly samples shall be collected in presence of our representative and to be sent to approved NABL laboratory for testing as per Technical Specification of Contract Agreement schedule D.

PVC-P waterproofing membrane shall be used only after confirmation of satisfactory test result.

Thanking you.

Yours Truly,  
For ICT- AIAPL (JV) LLP,

Yousef Es'hagpoor  
Team Leader

Copy forwarded to:

1. General Manager (P) PMU- Sonamarg for kind information. [nhidcl.sonamarg@gmail.com](mailto:nhidcl.sonamarg@gmail.com)
2. Authority Engineer ICT AIAPL Head Office for kind information. [ap.misra@ictonline.com](mailto:ap.misra@ictonline.com)
3. RE Tunnel/Highways for Information.
4. Mr. K.K. Gupta, SO&E, for information.

Regd. Office:-  
P Shivrajani Shopping Centre on 132  
Feet Ring Road Near Shivrajani Crest  
Road, Satellite Ahmedabad-380015  
Tel : 079-26702598 Email : [info@ictaiapl.com](mailto:info@ictaiapl.com)

Site Office:-  
Hotel Iqbal, Near PDD Water Pond,  
Kullian, Sonamarg,  
Jammu & Kashmir 191202  
Email : [zojila@ictaiapl.com](mailto:zojila@ictaiapl.com)



No.: YPH -1857-PMC-GDN-2205

09 July 2022

To,  
Mr. Yashpal Singh Rathore, Project Manager  
M/s Navayuga Engineering Company Ltd.,  
RVNL Camp, Package-5 Village & Post: Malettha,  
Dist: Tehri Garhwal, Uttarakhand - 249161

Contract: CONSTRUCTION OF SINGLE BG TUNNEL T-9 (2800 m), T-10 (4140 m)  
WITH PARALLEL ESCAPE TUNNEL, STATION YARD AT SRINAGAR AND MALETHA, MINOR  
BRIDGES AND OTHER ANCILLARY WORKS IN BETWEEN CH: 63+460 km TO 73+018 km  
UNDER PACKAGE - 5 IN CONNECTION WITH NEW SINGLE BROAD-GAUGE RAIL LINK  
BETWEEN RISHIKESH AND KARANPRAYAG (125KM) IN THE STATE OF UTTARAKHAND,  
INDIA.

Subject: Approval for PVC Water Proofing Membrane and Non-Woven Geotextile  
(D L Millar and Company Ltd.)-Reg.

Reference: (1) C.A. No. RVNL / RKSH -KNPG/ Tender/ Tunnels/PK-5/ CA-45 dated 18.10.2019  
(2) Contractor Letter No. NEC/RVNL/PACKAGE-5/22-23/758 of dated 17.06.2022

Dear Sir,

With above mentioned reference Contractor had submitted the Technical Specification and Credential of "D L Millar and Company Ltd." for Engineer's review and initiating the procurement process with following reference documents and Samples,

1. Technical Specification.
2. MTC reports.
3. Samples as listed hereafter:
  - A) Membrane: One square meter of each type membrane (3 Nos.)
  - B) Protective felt: One square meter of each type of felt (3 Nos.)
  - C) Welded splice: One meter of welded membrane splice for each type of membrane (3 Nos.)

Engineer have reviewed the submitted technical specification and Credential of D L Millar and Company Ltd. as per C 2.1 and C 2.2 of Bill Quantities and in conformance with Sub clause 4.2.5. Annexure A of Work's requirement and found to be meeting the requirements.

Therefore, the above-mentioned products are hereby **Provisionally Approved** for construction with the condition that below mentioned points must be completed:

- 1) Manufacturer Test Certificates (MTC) are required for each LOT.
- 2) Before using, third party test to be conducted at **NABL approved Laboratory** for joint Sample collected at site.
- 3) The test result should satisfy with Contract Agreement and relevant codal provisions.
- 4) Shop drawing showing treatment of projections, connections to water stops, connection to waterproofing of structures in open cut, local reinforcement etc.



Imagine it.  
Delivered.

AECOM India Pvt Ltd.,  
9/F, Infinity Tower C,  
DLF Cyber City, Phase II,  
Gurgaon 122 002  
India  
[www.aecom.com](http://www.aecom.com)  
CIN : U74210HR2008FTC038183

91 124 483 0100 tel  
91 124 483 0108 fax

Ref No: AECOM/GEO/RVNL/PMC/RKSH-KNPG/PKG-7A/MAX-HES(JV)/1745 Date: 30.09.2022

M/s Max-HES (JV)  
Plot No. 319 & 320,  
4th Floor East Avenue Building,  
Ayyappa Society, Madhapur,  
Hyderabad - 500081,  
E-mail- [tenders@maxinfra.in](mailto:tenders@maxinfra.in)

(Kind Attention: Mr. Vinay Khetarpal, Authorized Signatory)

Subject: CONSTRUCTION OF TUNNELS & BRIDGES WORKS FROM CHAINAGE 83+899 to 91+228 UNDER PACKAGE-7A IN CONNECTION WITH NEW BG LINE BETWEEN RISHIKESH AND KARANPRAYAG (125KM) IN STATE OF UTTARAKHAND, INDIA."

Reg: Reply of submission of third-party test report of make - M/s D L Millar and Company Ltd.

- Ref:
- (i) CA No. RVNL/RKSH-KNPG/Tender/Tunnels/PK-7A/51 Dated: 26.08.2020
  - (ii) Contractor Letter: MAX-HES (JV)/RVNL/Tunnels/RKSH-KNPG/PKG-7A/2021-22/752, Dated 17.04.2021
  - (iii) Our Letter No: AECOM/GEO/RVNL/PMC/RKSH-KNPG/PKG-7A/MAX-HES(JV)/571, Date:20.04.2021
  - (iv) Contractor Letter: MAX-HES (JV)/RVNL/Tunnels/RKSH-KNPG/PKG-7A/2021-22/1622, Dated 24.03.2022
  - (v) Our Letter No: AECOM/GEO/RVNL/PMC/RKSH-KNPG/PKG-7A/MAX-HES(JV)/1589, Date:08.07.2022
  - (vi) Contractor Letter: MAX-HES (JV)/RVNL/Tunnels/RKSH-KNPG/PKG-7A/2021-22/1982, Dated 29.07.2022
  - (vii) Our Letter No: AECOM/GEO/RVNL/PMC/RKSH-KNPG/PKG-7A/MAX-HES(JV)/1644, Date:02.08.2022
  - (viii) Contractor Letter: MAX-HES (JV)/RVNL/Tunnels/RKSH-KNPG/PKG-7A/2021-22/1994, Dated 03.08.2022
  - (ix) Our Letter No: AECOM/GEO/RVNL/PMC/RKSH-KNPG/PKG-7A/MAX-HES(JV)/1654, Date:04.08.2022
  - (x) Contractor Letter: MAX-HES (JV)/RVNL/Tunnels/RKSH-KNPG/PKG-7A/2021-22/2057, Dated 30.08.2022

Dear Sir,

The Engineer is in receipt of the contractor's letter dated August 30, 2022, regarding the submission of third-party test reports for **water proofing membrane 2 mm and geotextile 500 GSM**. We have reviewed the awaited results of the resistance to acidic and alkaline solutions and the resistance against acids and alkaline solutions third party test report and

Site Office:- The Engineer, RVNL Office, (Behind Rudrakol Hotel), Village - Khankra, Dist. - Rudraprayag, Uttarakhand, Pin - 248171



## TEST REPORT

DTRL-2022-2681

Issued to:  
M/s HCC DBL JV  
RVNL Project, Package-9, Gauchar  
Distt. Chamoli, Uttarakhand-246429

Report No. : DTRL/GEN/10122219422/NN  
Report Date : 19/12/2022  
Your Ref. No. : DRL EXT 0503\_01,  
Dt. 10/12/2022  
Date of Receipt : 10/12/2022  
Period of Testing : 10/12/2022 - 17/12/2022



Sample Description : PVC Waterproofing Membrane (2mm thick) (Source:- M/s. DL Millar and Company Ltd.)

S. No.	Test	Units	Test Method	Results	Requirement As Per Customer	Conformity
11.	Change of Dimension after heating at 70°C for 2 hours	-	EN 110	Stable	Stable	Yes

\*Test has been carried out in the presence of Mr. Gagan deep(PMC) & Mr. Vikash (DL Millar) through Google Meet App.

\*\*End Report\*\*

Reviewed By:  
*Reetish*

Roushan Kumar  
Sr. Analyst  
Roushan  
Authorized Signatory

- (1) The results listed refer only to tested samples and applicable parameters. Endorsement of product is neither inferred nor implied.  
(2) Total liability of our Lab is limited to the invoiced amount.  
(3) Samples will be destroyed after 30 days from the date of test report unless otherwise specified.  
(4) This report is not to be reproduced wholly or in part and cannot be used as an evidence in the court of Law and should not be used in any advertising media without our special permission in writing.  
(5) Report refer to the sample submitted to us and not drawn by us unless mentioned otherwise.

AN ISO 9001:2015 / BIS RECOGNISED LABORATORY

HG

Page 2/2



**HCC** DILIP BUILDCON LIMITED  
INFRASTRUCTURE & BEYOND  
Date: 23rd Dec. 2022

Letter No. DBL\_PMC\_0519\_01

To,  
**Project Manager - Team Leader,**  
M/s Turkish Engineering Consulting & Contracting-  
Tumas India Pvt Ltd-  
ALTINOK MUSAVIRLIK MUHENDISLIK A.S.-JV  
Package-9.  
Email-Id: [ufuk.akgun@tumas.com.tr](mailto:ufuk.akgun@tumas.com.tr)

Attention: Mr. Ufuk Akgun

**Project:** - Construction of tunnels, bridges, and formation works from chainage 117+365 to 125+320 (FLS) under **Package-9** in connection with new BG line between Rishikesh and Karnprayag (125km) in the state of Uttarakhand, India.

**Subject:** - "Submission of Third-Party test report of PVC Waterproofing Membrane for final approval."- regarding

**Reference:**  
1) LOA No: 2020\_RVNL\_CORP-PROJ-PK-9/TUNNEL/CONST/TENDER/RKSH-KNPG/Pt-1 dated 18.08.2020

Dear Sir,

With reference to the above cited subject, please find the attachment for the third-party test report of PVC Waterproofing Membrane to be sourced from supplier as tabulated below:

Sl. No.	Product Name	Source	Reference Number	Remarks
01.	PVC Waterproofing Membrane (2mm)	M/s DL Millar and Company Limited	TC74142200005576F	For Final Approval

Accordingly, we in advance anticipate that you will find the above to be in order and request to accord final source approval at the earliest.

Thanking you and assuring our best services as always.

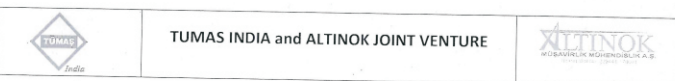
For & on behalf of M/s HCC-DBL (JV)

*Authorized Signatory*  
*Ufuk Akgun*

Enclosures: As Above

**Copy to:-** 1) **Mr. Hemendra Kumar**, GM/ Project/ RVNL -RKSH, RVNL, Office of Chief Project Manager, Rishikesh, PU - 249 201

HCC-DBL JV  
Plot No-5, Inside Govind Narayan Singh Gate, Chuna Bhatti, Kolar Road, Bhopal - 462 016, Madhya Pradesh, INDIA  
Tel. No.: +91 0755-4029999, Fax No.: +91 0755-4029998



DBL\_PMC\_0519\_02

Date: 26.12.2022

To

**The Authorized Signatory**  
M/s. HCC-DBL (JV)  
Hindustan Construction Company Limited  
Hincon House, LBS Marg, Vikhroli (W), Mumbai - 400 083  
Tel No. 022-2575 1000  
Fax No. 022-2578 7568  
Email: [hccdbi.rvnk@dilipbuildcon.co.in](mailto:hccdbi.rvnk@dilipbuildcon.co.in)

**Sub:** CONSTRUCTION OF TUNNELS, BRIDGES AND FORMATION WORKS FROM CHAINAGE 117+365 TO 125+320 (FLS) UNDER PACKAGE-9 IN CONNECTION WITH NEW BG LINE BETWEEN RISHIKESH AND KARNPRAYAG (125KM) IN STATE OF UTTARAKHAND, INDIA: **Request for final source approval of PVC waterproofing membrane make M/s D L Millar and Company Ltd.- Reg.**

Ref.

- Your Letter No. DBL\_PMC\_0519\_01 dated: 23.12.2022
- Our letter No. DBL\_PMC\_0480\_02 dated: 30.11.2022
- Your letter No. DBL\_PMC\_0480\_01 dated: 24.11.2022

Dear Sir,

This has reference to your letter under ref. (i), vide which you have submitted third party/independent test report pertaining to PVC waterproofing membrane make M/s D L Millar and Company Ltd. In this context, it is to state that the submitted test report has been reviewed at our end and found satisfactory. Accordingly, final source approval is hereby accorded for procurement of **PVC waterproofing membrane make M/s D L Millar and Company Ltd.**

Please note that this approval is subjected to the following conditions:

- MTC to be furnished/ submitted for each lot,
- The first consignment as well as the following consignments shall be tested in NABL accredited independent laboratory, as per the frequency stated in the Contract Agreement, QAP or as directed by the Engineer. In case, none of the labs have valid scope of accreditation for carrying out tests pertaining to water proofing membrane, test shall have to be carried out in NIT(s)/IIT(s), as per the requirement. Waterproofing membrane shall be tested in accordance with the tests prescribed by DIN-854, DIN 53855/3, DIN 53857/2, DIN 54307 and any other applicable standard,
- Only fresh lots shall be delivered at site,

**Segmental Consulting & Infrastructure Advisory Pvt. Ltd.**  
In Joint Venture with

**SA Infrastructure Consultants Pvt Ltd**

Address: C/o Anand Laxmi (Bore S/O Late Chhawal Nahi for Masjid Taqee, Lower Nagri Doda, Tehsil & District Doda Jammu & Kashmir-182202  
Email: [scia@13bhillan2segmental.in](mailto:scia@13bhillan2segmental.in)

Project: Authority's Engineer for Supervision of (1) Construction of Uni-Directional Khellani Tunnel of length 1.574 Km & its approach Road from Km 29.030 to Km 31.449 of total length 2.419 Km on N-244 in Union Territory of Jammu & Kashmir on EPC Mode, & (ii) Construction & Implementation of 7 kms with paved shoulder from Design Km. 31.449 (Khellani) to Km 44.140 (in Km 51.780 from Nagri) (i.e. Km 6.6 in 17 of 20.251 Km length on Khellani - Kishtwar - Castrol section of NH-244 in the Union Territory of Jammu & Kashmir on EPC Mode & (iii) Construction & Implementation of 2 kms with paved shoulder from Design Km. 51.780 (from Nagri) to Km 56.535 (New Theater) of 14.84 Km length on Khellani - Kishtwar - Castrol section of NH-244 in the Union Territory of Jammu & Kashmir on EPC Mode (Pkg-II).

Ref: SCIA-SA/21-22/HO/832

Date: 26.08.2022

To,  
Project Manager  
APCO Infratech Pvt. Ltd.  
J&K  
Email: [planning.ktp@apcoinfra.com](mailto:planning.ktp@apcoinfra.com)

Kind Attention- Sh. Praveen Kumar, Project Manager

**Subject:** Consultancy Services for Authority's Engineer for Supervision of Construction of Uni-Directional Khellani Tunnel of length 1.574 Km & its approach Road from Km 29.030 to Km 31.449 of total length of 2.419 Km on NH-244 in Union Territory of Jammu & Kashmir on EPC Mode, Submission of Manufacturers Credential for Source Approval of Materials - PVC Membrane for D L Millar and Company Limited.

Ref. (1). Your letter no. APCO/CO/Khellani/SCIA/536 dated 08.08.2022

Dear Sir,

We refer to your cited ref. letter no. (1), EPC contractor has submitted the Credentials of regarding Submission of D L Millar and Company Limited. Manufacturers Credential for Source Approval of Materials - PVC Membrane to be used in tunnel has been reviewed by Authority Engineers and found in order, hence accorded for provisional Approval.

However, an inspection of manufacturing unit as well as ongoing project site is required to be arranged in the representation of AE to ascertain available facilities for quality testing of PVC membrane in accordance to the requirement of relevant codes & MoRTH specification of sampling for third party testing and NABL certified Laboratory & final approval shall be accorded after reviewing the third party test results.

Please note that material shall be procured for project after the inspection & reviewing the third party test results conducted at NABL certified laboratory.

This is for information & necessary action.

For  
Segmental Consulting Infrastructure Advisory Pvt. Ltd  
In Joint Venture with  
SA Infrastructure Consultants Pvt. Ltd

*Authorized Signatory*  
Rajendra Singh  
(Team Leader Cum Senior Tunnel Expert)

- General Manager (P) The Project Monitoring Unit (PMU) National Highways & Infrastructure Development Corporation Ltd. Doda for information
- Regional Director (SCIA for information)





# कोंकण रेलवे कॉर्पोरेशन लिमिटेड

Konkan Railway Corporation Limited

(भारत सरकार का उपक्रम) (A Government of India Undertaking)

www.konkanrailway.com

No. KR/PD/J&K/AGE-PATEL (JV)/Tunnel T2/102

Date: 24.02.2020

M/s AGE-Patel (JV)  
USBR Tunnel - T2 PROJECT,  
Village & P.O. Bhaga, Tehsil-Reasi  
District - Reasi (J&K) 182311  
E-mail - usbrt2@pateleng.com

Mr. Prasad / Mr. Ravi / Site Incharge  
24/02/2020

(Kind Attn: Shakeel Chauhan, Project Manager)

Sub: Construction of Tunnel T-2 (between Km 33.212 to Km 38.375 approx.) on Katra-Banihal Section of Udhampur-Srinagar-Baramulla New BG Railway Line Project (Package T-2)  
- Approval of Vendors.

Ref: (1) C.A. No. IRCON/J&K CELL/JAT/14/1014/K-B/T-2/327/1017 dtd 14.05.2016.  
(2) KRCL Letter No. KR/PD/J&K/AGE-PATEL (JV)/Tunnel T2/47 dtd 21.02.2019  
(3) KRCL Letter No. KR/PD/J&K/AGE-PATEL (JV)/Tunnel T2/60 dtd 22.05.2019  
(4) KRCL Letter No. KR/PD/J&K/AGE-PATEL (JV)/Tunnel T2/65 dtd 01.06.2019  
(5) KRCL Letter No. KR/PD/J&K/AGE-PATEL (JV)/Tunnel T2/69 dtd 18.06.2019  
(6) KRCL Letter No. KR/PD/J&K/AGE-PATEL (JV)/Tunnel T2/92 dtd 12.12.2019

M/s APJV has submitted the vendors profile tabulated below for approval of KRCL. The details of construction materials are tabulated as under:

S.No	Material Description	Source	Remarks
1	Hydrophilic Water stopper seal	Maruti Techno rubber	
2	Geotextile 700 GSM	Virendera Textile	
3	Water Proofing Membrane - 2mm	MYK Armentent	
4	Water Proofing Membrane - 2mm	DR Millars	
5	SDA - 32mm Dia	Sup Anchor	
6	Swellex Rock Bolt - 32mm Dia	Argentum	
7	Steel Fiber	Stewols	
8	River Sand	Kanhan - Reasi	
9	Geotextile 700 GSM	Manas Geotextile	
10	Water Proofing Membrane - 2mm	Gayatri	

The samples of the material were sent to approved laboratory for third party testing vide ref (2) to (6) above. Based on the test reports received from testing laboratory, which are found satisfactory in all parameters, the approval is hereby accorded for vendors for supply of corresponding construction materials as mentioned above.

Please note that this approval has been accorded on the condition of maintaining of quality of product intact. In case of any negative feedback and deterioration in quality, this approval will stand cancelled automatically. Mandatory checks for ensuring the quality will also be

ई-मेल (E-mail): [general@konkanrailway.gov.in](mailto:general@konkanrailway.gov.in), कॉर्पोरेट पहचान संख्या (Corporate Identity Number): U33201MH1998OIC123738

फोनेमिक एन फोर वॉर पुणे (F) / Suburban & Paid-up Share Capital: 4885.9642 Cr.

कॉर्पोरेट ऑफिस : बंगलुरा रोड, बंगलूर - 56, जे. बी. रो. बंगलूर, जे. बी. रो. - 400014

Regd. Telangana Branch, Sector 11, GPO Telangana, New Mumbai-400014, Tel: 91-22-2777015-18, Fax: 022-27773420

## Segmental Consulting & Infrastructure Advisory (P) Ltd

SOWIL Limited

Office: Segmental Consulting & Infrastructure Advisory (P) Ltd, J1A1 Bunglow, PO - Wale, Taluka - Wai, District - Satara, Maharashtra - 415517  
E-Mail: [SCIA@sciaadvisory.com](mailto:SCIA@sciaadvisory.com)

Project: CONSULTANCY SERVICES FOR AUTHORITY'S ENGINEER FOR SUPERVISION OF CONSTRUCTION OF NEW TWIN TUBE 6-LANE TUNNEL AT KHAMBATKI GHAT SECTION OF NH-4 AND ITS APPROACHES FROM EXISTING KM. 771.730 TO EXISTING KM. 782.000 IN THE STATE OF MAHARASHTRA UNDER NHDP PHASE-V ON EPC MODE.

SCIA CIN: U41400D2009PTC188591SOWIL CIN: U45202MH1996PLC102855

Date: 09/02/2022

To,  
The Project Manager,  
Gayatri-Crescent (JV)  
GF2, Indraprast Building,  
Balaji Nagar, Near Spandan Hospital,  
Khandala-412802

(Kind Attention: Mr. Arvind Kulkarni - Project Manager)

Subject: Credentials of D.L. MILLARS & COMPANY Ltd - Manufacturer for Water Proofing Membrane to be used in Tunnel.

Ref: 1. GAYATRI - CRESCENT (JV): PIU: Khambatki/2021-22/660, Dated: 02/02/2022

Dear Sir,

With reference to subject mentioned above & reference no. (1), EPC contractor has submitted the Credentials of D.L. MILLARS & COMPANY Ltd - Manufacturer of Water Proofing Membrane to be used in Tunnel has been reviewed by Authority Engineers & found in order, hence accorded for Provisional Approval.

However, an inspection of manufacturing unit as well as ongoing project site is required to be arranged in the representation of AE to ascertain available facilities for quality testing of Water Proofing Membrane in accordance to the requirement of relevant codes & MoRTH specification of sampling for third party testing at NABL certified laboratory & final approval shall be accorded after reviewing the third party test results.

Please note that material shall be procured for project after the inspection & reviewing the third party test results conducted at NABL certified laboratory.

This is for information & necessary action.

For Segmental Consulting & Infrastructure Advisory Pvt. Ltd.

SOWIL Limited

Rajesh Kumar  
Team Leader cum Sr. Tunnel Expert

Cc.

- The Project Director, NHAI, PIU Pune for information.
- Project Coordinator Segmental Consulting & Infrastructure Advisory Pvt. Ltd- for information.

1



Plot No. C-5, Block-C, Main Kanjawa Road  
Rajiv Nagar, Delhi-110086  
MO: 9910596777, 9810479889, 9811037450, 9310843393  
E: [dtinfo@gmail.com](mailto:dtinfo@gmail.com), W: [www.deltatestinglab.com](http://www.deltatestinglab.com)

## TEST REPORT

Issued to:  
M/s HCC DBL JV  
RVNL Project, Package-9, Gauchar  
Distt. Chamoli, Uttarakhand-246429

Report No. : DTRL/GEN/10122219422  
ULR No. : TC741422000005576F  
Report Date : 19/12/2022  
Your Ref. No. : DBL\_EXT\_0503\_01,  
Dt. 10/12/2022  
Date of Receipt : 10/12/2022  
Period of Testing : 10/12/2022 - 17/12/2022

DTRL-2022-2681

Sample Description : PVC Waterproofing Membrane (2mm thick) (Source:- M/s. DL Millar and Company Ltd.)  
Name of Project : Construction of Tunnels, Bridge, yard, and formation work chainage 117+365 to 125+320(FLS) under Package-9 in connection with new BG line between Rishikesh and Karanprag (125 km) in the state of Uttarakhand, India.  
Location : HCC-DBL JV

S. No.	Test	Units	Test Method	Results	Requirement As Per Customer	Conformity
<b>Discipline : Mechanical</b>						
<b>Group : Plastics And Plastic Products</b>						
1.	Thickness	mm	EN 1849-2	2.02	> 2.0	Yes
2.	Tensile Strength	N/mm <sup>2</sup>	EN 12311-2	21.0	> 17.0	Yes
	a) Along Direction			20.1		
	b) Across Direction			317		
3.	Elongation at Break	%	EN 12311-2	324	> 300	Yes
	a) Along Direction			177		
	b) Across Direction			173		
4.	Tear Resistance	N/mm	EN 12310-2	177	> 100	Yes
	a) Along Direction			173		
	b) Across Direction			173		
5.	Static Puncture Test	kN	EN ISO 12236	3.074	> 2.5	Yes
6.	Water Tightness (24 hours at 0.5N/mm <sup>2</sup> )	-	EN 1928	Water tight	Watertight	Yes
7.	Cold Bending (-35°C)	°C	EN 495/3	No Crack	No Crack	Yes
8.	Resistance to Acid and Alkaline at 28 days	-	DIN 16726/ EN 12311-2	No Crack	No Crack	Yes
I.	Tensile Strength	%		Awaited	20.0 Max.	
	a) Along Direction			Awaited		
	b) Across Direction			Awaited		
II.	Elongation at Break	%		Awaited	20.0 Max.	
	a) Along Direction			Awaited		
	b) Across Direction			Awaited		
9.	Fire Reaction Classification	-	EN 13501-1	Class E	Class E	Yes

Reviewed By: *Roushan Kumar*

Authorised Signatory: *Roushan Kumar*

- The results listed refer only to tested samples and applicable parameters. Endorsement of product is neither inferred nor implied.
- Total liability of our Lab is limited to the invoiced amount.
- Samples will be destroyed after 30 days from the date of test report unless otherwise specified.
- This report is not to be reproduced wholly or in part and cannot be used as an evidence in the court of Law and should not be used in any advertising media without our special permission in writing.
- Report refer to the sample submitted to us and not drawn by us unless mentioned otherwise.

AN ISO 9001:2015 / BIS RECOGNISED LABORATORY

Page 1/2



PIONEER TESTING LABORATORY

Plot No. 9/A, Street No. 4, Mundra Industrial Area  
New Delhi 110041, Ph: +91 981040136  
9910876896, 9910881155, 9667522141, 9650158135  
Email: [pioneerestinglab@gmail.com](mailto:pioneerestinglab@gmail.com)  
Web: [www.pioneerestinglab.com](http://www.pioneerestinglab.com)

F.No. F(01) 7.8

## TEST-REPORT

Issued to: M/S AECOM India Pvt Ltd PMC Office BKA-BNI 3 <sup>rd</sup> Line Project, New Toll Plaza, Hosangabad Road, Near Shalimar Hotel, Oberoi Nagar, Disa-Raisen M.P India-464993			Report No. :- PTL/GEN/94793 Letter Ref. No. :- PMC/BPL/BKA-BNI/MAX/174, Dt. :- 31/07/2021 Date of Receipt :- 05/08/2021 Period of Testing :- 06/08/2021 - 28/08/2021 Date of Report :- 28/08/2021			
Sample Description:-PVC Waterproofing Membrane (2.00mm thick) "Source:- Dr. Miller" Name of Work:-Construction of five tunnels Cut & Cover with Ballast less track in connection with 3 <sup>rd</sup> Electrified Broad Gauge Railway Line Between Barkhara-Budni on Bhopal-Itarsi Route on Bhopal Division of West Central Railway in Sehore and Raisen Districts of Madhya Pradesh State, India 3 <sup>rd</sup> Line Between Barkhara-Budni (26.5km)" (CA No. RVNL/Bhopal/BKA-BNI(Tunnel) Date:-27.02.2019) Ref:-Vide M/s Max Letter's No. MIL/RVNL/Tunnels/Bhopal/2020-21/424, dtd 31.07.2021 Name of Agency :- M/s Max Infra Pvt. Ltd. Sample ID:-Max/PVC/Mem-05/364 / Max/PVC/Mem/05/364 Welded						
S. No.	Test	Units	Test Method	Result	Requirement As per customer	Conformity
1.	Thickness	mm	DIN 53170	2.04	2 Min.	Yes
2.	Tensile Strength	N/mm <sup>2</sup>	DIN 53455	20.11	15 Min.	Yes
	a. Longitudinal direction			17.20	15 Min.	Yes
	b. Transverse direction			356	250 Min.	Yes
3.	Elongation at Break	%	DIN 53455	379	250 Min.	Yes
	a. Longitudinal direction			8.15	2.5 Min.	Yes
	b. Transverse direction			125.57	115.02	Yes
4.	Compressive Strength at 20% Strain (10mm cube)	N/mm <sup>2</sup>	DIN 53454	1175.2	-	Yes
5.	Tear Propagation Strength	N/mm	DIN 53163	0.06	100 Min.	Yes
	a. Longitudinal direction			125.57	115.02	Yes
	b. Transverse direction			1175.2	-	Yes
6.	Strength of Welded Seam	N/20 mm	DIN 16726	1175.2	-	Yes
7.	Dimensional Stability after accelerating aging	%	DIN 16726	0.06	+/-2 Max.	Yes
8.	Material Characteristics during and after storage at 80 °C		DIN 16726			
	General Appearance			No Blisters	No Blisters	Yes
	Dimensional Stability			0.09	-3% Max.	Yes
	a. Longitudinal direction			0.07	-3% Max.	Yes
	b. Transverse direction			0.07	-3% Max.	Yes
	Variation of Tensile			+2.4	+10% Max.	Yes
	a. Longitudinal direction			+3.1	+10% Max.	Yes
	b. Transverse direction			+3.1	+10% Max.	Yes

Lab Incharge

Authorised Signatory

- The results listed refer only to tested samples and applicable parameters. Endorsement of product is neither inferred nor implied.
- Total liability of our Lab is limited to the invoiced amount.
- Samples will be destroyed after 90 days from the date of test report unless otherwise specified.
- This report is not to be reproduced wholly or in part and cannot be used as an evidence in the court of Law and should not be used in any advertising media without our special permission in writing.
- Report refer to the sample submitted to us and not drawn by us unless mentioned otherwise.

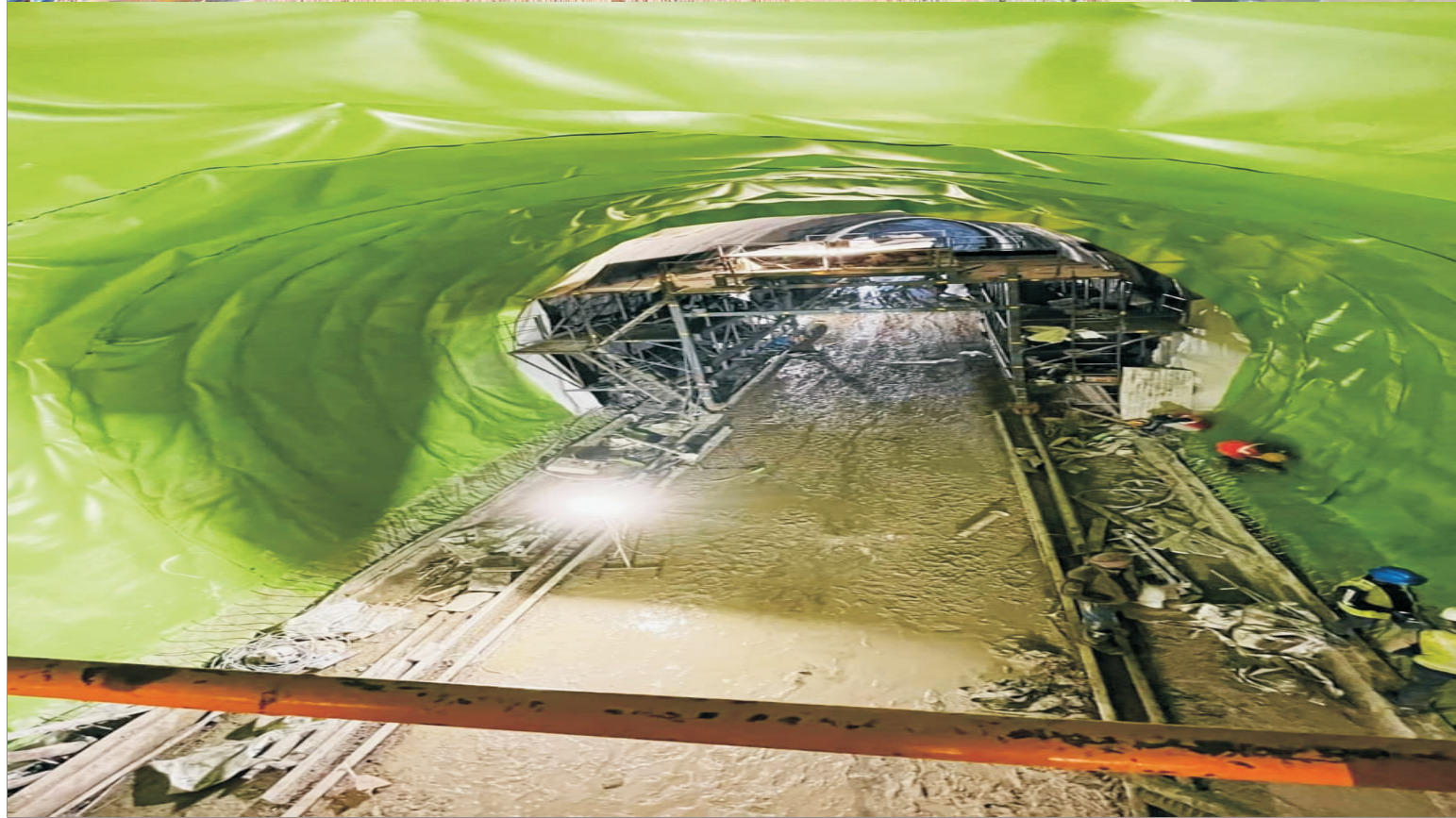
AN ISO 9001:2015 CERTIFIED LABORATORY

Page 01 of 02













# D L MILLAR AND COMPANY LIMITED

Regd. Office : Flat No. 303, 3rd Floor, Elite House-36, Community Center, Zamroodpur, New Delhi-110048

CIN No. : U51491DL1929PLC389839

GSTIN : 07AABCD1032H1Z8

Fax No. 011-26226482 | Mobile : +91 8700518400

E-mail : dlmillars@gmail.com



ISO 9001-2008  
Certificate No. 01-100058473

