Critical Equipment and Technologies Developed by DRDO for Combating COVID-19 Pandemic

09/06/2020
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1 INTRODUCTION

DRDO has been tracking the alarming spread of COVID-19, since the world media started reporting its devastating impact in China’s Wuhan Province. DRDO has been on alert since the detection of the 1st case of COVID-19 in India, reported on 30th January 2020. DRDO Laboratories working under life sciences cluster and many other labs with the possibility of producing spin-off technologies geared to support national mission to combat COVID-19.

By first week of March 2020 the number of affected people in India had crossed 30. DRDO then took a decision to accelerate and enhance products and countermeasures to combat the spread of COVID-19 in India. Efforts were focused on creating required solutions without losing time, within the given constraints and available resources.

As a result of this approach, DRDO is ready with technologies which can be utilized for combating COVID-19. DRDO is working with industry for volume production of some of the products which are applicable for containment of COVID-19. We are providing information about the products developed for combating COVID-19 and innovative interventions for specific applications. The information about products and industries is provided on DRDO website. Many products and services are being provided to the city administrations on request. The industry working with DRDO has been activated to produce the DRDO developed products. The list of industries producing DRDO developed COVID-19 combat items and solutions are enclosed for your reference and use. These are also provided on our website https://drdo.gov.in. List of industries manufacturing and supplying DRDO designed products is provided as Appendix ‘A’ as ready reference.

2 HAND & SURFACE SANITIZER

- To address the need of WHO compliant and certified hand sanitization solution for personal and surface decontamination, DRDO has prepared hand sanitizer compliant to WHO guidelines for local production.
It is an Ethyl alcohol based formulation and process is shared with industries and production in bulk has been initiated.

- Cost – Approx. Rs 120/- per litre (including GST).
- M/s Gwalior Alco, Gwalior and M/s Shreenath Ji Chemicals, Bhopal have been given ToT.
- Details of other industries working with DRDO in Hyderabad, Kochi, Jodhpur etc. are given on DRDO Website.

3 HERBAL SANITIZER

- Alcohol is main ingredient of widely available sanitizers; however alcohol has harsh drying effect on skin. Prolonged use of hydrogen peroxide causes peeling and loosing of the skin.
- Keeping this in view a HERBO-SAFE herbal sanitizer, is developed containing 70% Isopropyl alcohol that helps in killing 99.9% microbes and 2% aloe vera extract to neutralize harsh drying effects of alcohols on skin.
- Hydrogen peroxide has been replaced with natural bio-active extracts such as neem extract, lemon extract, tree tea oil etc. exhibiting anti-microbial and anti-viral effects owing to presence of bio-actives compounds.
- This is produced in gel form also.

4.1 HERBAL SANITIZING WIPES, HAND TOWELS AND HERBAL SHWAS

- The herbal sanitizer described above has been infused in Wipes (Box Packing) and Towels (Individual Packing) products for usage by doctors and as travel prevention
- Liquid Infusion per wipe of size 100 x 50 mm is about 4-5 ml until completely wet
- Liquid Infusion per towel of size: 170 x 190 mm is about 6-7 ml until completely wet
- Small circular wipes 70-100 per container are 60-100 mm in diameter and are infused with 20–25 ml or until completely wet
- Herbal Shwas is a Spray used for disinfecting masks for immunity boosting
4 ADVANCED FACE MASKS

- DRDO has developed two flat and fold masks with valves for the protection of medical personnel (N-99 and N-97 equivalent) as per international standards. The tests are carried out at SITRA Coimbatore, DRDE, Gwalior and CLI, Mumbai.
- Being developed by many industry partners.

5.1 ADVANCED FACE MASKS WITH NANO-WEB (BIO-PROTECTIVE)

- A five layered N-99 masks using a nano web filter layer is designed, developed and tested in bio threat mitigation project.
- Filter media for the face masks are made up of silver impregnated nano fibre of nylon multilayers which offer a much higher surface area and very fine pores to trap viruses and bacteria.
- Filter media was indigenously developed in collaboration with ATIRA, Ahmadabad and it offers >99.00 % efficiency against 0.3 µm particulates matter.
- This material is able to prevent spread of viruses and other respiratory infections. These masks are developed in flat & fold shape with exhalation valve to facilitate longer wear/donning. These masks are very cost effective, light weight and comfortable to wear.

5.2 ADVANCED FACE MASKS WITH MELT BROWN FILTER (BIO-PROTECTIVE)

- Filter media for the face masks are made of polypropylene melt blown multi layers which offer >97 % efficiency against 0.3 µm particulates matter. This is N-97 equivalent.
- Other design parameters are similar to the N-99 Masks.

5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE include equipment used by medical professionals for protecting themselves while treating patients. This include coverall suits, protection
enclosures, face shields etc. This coverall suits are improvised DRDO products for protection of medical professionals and paramedics handling COVID-19 patients. Materials for suits are developed and have undergone all certifications and testing. Industries for production of all PPE coveralls have been identified and production is ramped up to meet the emerging demand.

5.1 PERSONAL PROTECTIVE EQUIPMENT (PPE) TYPE A

- PPE Type A is made from the material used for parachute
- The material is PU coated Nylon/Polyester
- Production of the PPE Type A is done by two of the industry partners - M/s Gokuldas, Bengaluru and M/s Kusumgarh, Mumbai

5.2 PERSONAL PROTECTIVE EQUIPMENT (PPE) TYPE B

- PPE Type B is made up of Tri-Laminate highly breathable material
- Breathable Polyethylene Film laminated on both sides of poly propylene SS type Non-Woven fabric of total 52 GSM
- It is lightest weight PPE which has passed the highest level of Synthetic Blood Penetration test and is qualified for dry test for bacterial resistance
- M/s Pioneer Hygiene, Surat is identified as the industry partner for production of material as well as manufacturing of PPE
- M/s Alok Industries is also manufacturing PPE with the same material

5.3 PERSONAL PROTECTIVE EQUIPMENT (PPE) TYPE C

- PPE Type C has limited breathability
- The material is TPU film laminated poly propylene non-woven fabric 90 GSM
- M/s Entremonde Polycoaters, Nashik is identified as the industry partner for production

* A total of 35 Lakhs units have been ordered on these new designs by DRDO.*
5.4 TWO PIECE COVERALL

- An advanced personal protective gear is designed for healthcare personnel and security forces which has easy donning and doffing feature without compromising the functionality of PPE.
- The Two-Piece breathable coverall is designed in two body pieces (parts) but has one-piece functionality. It is to be worn with Head and Shoe covers for full protection. It consists of following components to work as a whole unit:
  - Head Cover to be worn with 3-ply Mask & Polycarbonate Face shield
  - Upper Part (Jacket) to be worn with Nitrile Gloves
  - Lower Part (Trouser) with good adjustable waist elastic
  - Shoe Cover with fastening strips for good coverage
- This PPE is non-woven, non-laminated breathable coverall made by the 65-70 GSM fabric.
- Available in Medium and Large sizes.
- Industry partner based at Delhi has been enabled for large scale production and contact details have been published on DRDO website.

5.5 FULL FACE SHIELD

- A face protection mask for health care professionals handling COVID-19 patients is developed. Its light weight construction makes it convenient for comfortable wear for long duration.
- The holding frame is manufactured using Fused Deposition Modeling (3D printing). Polylactic Acid filament is used for 3D printing of the frame. This thermoplastic is derived from renewable resources such as corn starch or sugarcane and is biodegradable.
• The face mask is mass produced using injection molding technique.
• Approximate Cost: Approximately from Rs 75-120/-
• Industry: Various Industries in Chandigarh, Hyderabad, Delhi - Contact and address details are available on DRDO Website.

5.6 ENCLOSEMENT FOR INTUBATION PROCEDURE – AEROSOL CONTAINMENT BOX

• This is developed to protect doctors and medical healthcare providers from the aerosol released during intubation of the patients.
• It consists of a transparent acrylic/perspex cube which covers patient’s head up to chest and act as a safety barrier against transmitting droplets from patients while giving treatment.
• The two circular ports allow the health worker’s hands to pass and perform the airway procedures. The material used here is 50 percent lighter thermoplastic compared to glass making it easy to handle.
• This Box is useful while taking samples from a suspected patient during intubation, observation or during treatment to completely avoid droplets and aerosols emanating from them due to cough & sneeze. Two sizes of Aerosol Box are designed and developed by DRDO for use by adult patients and child patients.
• The use of Aerosol Box can safeguard against spread of viral contamination of COVID-19 to reach to gown, gloves, face mask, eye shield, shoes and also on the floor of the hospitals effectively safeguarding our health care workers.
• Approximate Cost: Size 1 Rs 6350/- + GST; Size 2 Rs 5950/- + GST

6 SAMPLE TESTING FOR COVID-19

• DRDE, Gwalior is functioning as a center for detection of COVID 19 positive cases from samples provided by Madhya Pradesh Health Service.
• Daily testing is being done positive cases are being reported to the referring hospitals.
• INMAS and DIPAS, Delhi of DRDO are also being equipped with COVID-19 testing and are notified as test centers for detection. These laboratories can undertake 700 tests per day.
DRDO has been at the forefront of testing of various PPEs due to its expertise at DRDE, Gwalior. DRDE has standard and approved test facilities for three items.

7.1 SYNTHETIC BLOOD PENETRATION TEST FACILITY

- DRDE has ‘Synthetic Blood Penetration Test’ facility for testing and certifying for PPEs as per ISO 16603. This facility is supporting testing of PPEs as per standards.
- The testing for PPE suits was carried out at DRDE Gwalior. The facility has now been shifted to INMAS, Delhi to meet the emerging requirements.
- Following are proposed to be tested when the test capacity is enhanced:
  - Resistant to liquid penetration
  - Mechanical parameters (Tensile & elongation)
  - MVTR for breathability

7.2 FACE MASK TESTING

- DRDO is engaged by GoI in testing face masks as per standards. Particulate Filtration efficiency (PFE) for masks is being conducted at DRDE as per IS 9473:2002. Other parameters have been done at other Nationalized Laboratories, NABL accredited labs & other approved test facilities.
- Following facilities are being established at DRDE Gwalior for Masks Testing:
  - Flammability Test, IS 9473:2002
  - Breathing (Inhalation) Resistance IS 9473:2002
  - Exhalation Resistance, IS 9473:2002
  - Exhalation Valve Leakage, IS 9473:2002 (Already Present)
  - Synthetic Blood Penetration resistance (Splash resistance Test) IS 16289 & ASTM F 1862
  - Bacterial Filtration Efficiency (BFE), IS 16289 & ASTM F 2101
- These will be notified on the DRDO website after commissioning
7.3 SANITIZER TESTING

- Quality check as per standards is carried for the sanitizers by DRDE Gwalior

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<th>IS2302:1989/WHO method</th>
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<td>2</td>
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8 HANDS-FREE SANITIZATION UNITS

8.1 AUTOMATIC MIST BASED HAND SANITISER DISPENSING UNIT

- Using its expertise in mist technology for fire suppression, DRDO has developed automatic mist based sanitiser dispensing unit. It is a contactless sanitiser dispenser which sprays alcohol-based hand rub sanitiser solution for sanitisation of hands while entering the buildings/office complexes, etc.
- It is based on water mist aerator technology, which was developed for water conservation. The unit operates without contact and is activated through an ultrasonic sensor. A single fluid nozzle with low flow rate is used to generate aerated mist to dispense the hand rub sanitiser. This sanitises the hands with minimum wastage. Using atomiser, only 5-6 ml sanitiser is released for 6-8 seconds in one operation and it gives the full cone spray over both palms so that disinfection operation of hands is complete.
- It is a very compact unit and bulk fill option makes it economical and long-lasting product. It is easy to install system as wall-mountable or on a platform. As an indication of operation an LED illuminates the spray.
- The unit can be used for sanitisation of hands at entry and exit to hospitals, malls, office buildings, residential buildings, airports, metro stations, railway stations, bus stations and critical installations. The product is also expected to be very useful for entry/ exit of isolation and quarantine centers.
Later, few more versions have been brought out with various capacities and stainless configuration with the initiatives of HPO-I (Named as Sumeru).

8.2 CONTACTLESS SANITIZER DISPENSING UNIT

Another indigenous device for touch free disinfection of hands is developed to deliver sanitizer mist as long as hand(s) are kept below the delivery nozzle. A single fluid nozzle with low flow rate is used to generate aerated mist, which provides full coverage to both hands with few milli liter (ml) quantity of sanitizer.

The quick response of the sensor not only ensures timely delivery of sanitizer mist but also reduces the wastage to almost zero. More than 1000 persons can sanitize their hands in one refill.

Two variants of 2 and 5 liter capacity have been developed and tested.

Presently one industrial partner i.e. M/s Fortuna Star has been identified for mass production and the tentative cost of the equipment (5 liter) is Rs. 5000 per unit.

9 SAMPLE COLLECTION ENCLOSURES

9.1 COVID-19 SAMPLE COLLECTION KIOSK (COVSACK)

COVID Sample Collection Kiosk (COVSACK) has been developed in consultation with the doctors of Employees' State Insurance Corporation (ESIC), Hyderabad.

COVSACK is a kiosk for use by healthcare workers for taking COVID19 samples from suspected infected patients. Patient under test walks into the Kiosk and a nasal or oral
swab is taken by health care professional from outside through the built in gloves.

- The Kiosk is automatically disinfected without the need for human involvement, making the process free of infection spread. The shielding screen of kiosk cabin protects the health care worker from the aerosols/droplet transmission while taking the sample. This can reduce the requirements of PPE change by health care workers.
- After the patient leaves the Kiosk, four nozzle sprayers mounted in the kiosk cabin disinfect the empty chamber by spraying disinfectant mist for a period of 70 seconds. It is further flushed with water & UV light disinfection. The system is ready for next use in less than two minutes.
- Voice command can be given through two-way communication system integrated with the COVSACK. It is possible to configure COVSACK to be used either from inside or outside as required by the medical professionals.
- DRDO has developed two units and handed over these to ESIC Hospital and Area Hospital, King Koti, Hyderabad after successful testing
- Other hospitals have shown keen interest in this Kiosk
- The COVSACK costs nearly Rs. one lakh and the identified industry based at Belgaum, Karnataka can support the production of 10 units per day.

9.2 WALK-IN SWAB COLLECTION KIOSK (WISK)

- The WISK caters to physical and psychological security for personnel involved in swab collection and also saves the amount of PPE consumption.
- After detailed discussions with GMC, Ernakulam, WISK was developed as a
cost effective solution for affordability by small PHCs / rural clinics.

- The Econo-WISK is designed as an assembly of a plastic sheet (durable rexine and transparent UPVC sheet) over an easy-to-assemble frame made of 1” square tube of mild steel. There is a wooden base with linoleum sheet, as well as detachable tables both within and outside the kiosk. The cost-effective and low cost materials configured as “knock-down kit” are easy to transport as multiple units, requiring lower transit space envelopes.
- The product is easy to assemble at site, has better internal air circulation scheme and can be installed outdoors also.
- The amenities provided include exhaust fan, air inlet with N95 mask filters, lighting, 5A power plug, sanitizer for glove decontamination, glove box outside the kiosk (for disposable gloves) and a collection tray for ‘swab vials’.
- High end and mobile WISKs are being worked out

10 BODY TEMPERATURE PROBE (CONTACT TYPE)

- A cost-effective body temperature measurement probe is developed using miniature high resolution thermometer. The product is a spin-off from the Expendable Bathy Thermograph (XBT) developed by the laboratory
- The Body Temperature Probe, consists of a very small thermistor on a pen-like attachment which can detect the body temperature by placing the tip on the mid-arm or forehead region. A hand-held processing unit displays the temperature, and based on the same, highlights whether the person is normal or feverish.
- The kit has high accuracy with a very short response time
- This cost-effective product is designed as two variants
- The first variant is for industrial use, in which the probe and display-cum processing unit are separate units connected by a cable. Both the persons, the one whose temperature is measured and the one noting the measurement, are thus separated apart.
- This unit draws power from the general 230 V AC mains.
• The probe is inserted in a holder which contains sanitizing medium
• In the second variant, the probe and the display-cum processing unit are integrated in a single casing. This variant draws power from a small battery and can be used for domestic purposes also

11 BODY TEMPERATURE PROBE (NON - CONTACT TYPE)

• An indigenous version of the IR-based thermal scanner has been designed.
• Small infrared sensors are used as the sensory elements. The requisite electronic circuitry has been designed for the data acquisition and processing. A small display screen is provided to show the value of temperature and also indicate whether the person is feverish or normal. The device is light in weight.

12 VENTILATORS

Ventilator is one of the most crucial medical equipment to be used under COVID-19 pandemic situations. Almost all the countries are facing shortage of ventilators for their citizens. DRDO laboratories have perceived the importance of a ventilator in covid-19 combat and started working on indigenous manufacturing of critical components and mass production support to industry since last one month.

12.1 VENTILATOR

• DEBEL, Bangalore a DRDO laboratory and Society for Biomedical Technology (SBMT) - A DRDO funded and managed initiative) have developed a ventilator.
• Technology is transferred to Industry
• Defence PSU, M/s BEL has joined with M/s Scanray, Mysore for large scale production of ventilators.
• Initiative is undertaken to develop the critical components of the ventilators which are not available in the country. These are produced with the help of industry.
• Production can reach a capacity of 10,000 ventilators per month.
• About 30,000 ventilators will be produced

12.2 DRDO LOW COST PORTABLE VENTILATOR (DEVEN)

• A low cost portable ventilator is developed named “DEVEN” (DRDO Economic VENTilator)
• DEVEN is a micro-controller based design with electronically controlled solenoid valves. It has CMV (continuous mandatory ventilation) as well as pressure support modes of operation
• There are no mechanically moving parts in this ventilator and hence high reliability is ensured in comparison to other low cost AMBU (artificial manual breathing unit) bag-based ventilator designs
• It has features to adjust parameters like Breathe Rate, I:E Ratio i.e. ratio of Inspiration time to Expiration Time, Fraction of Inspired Oxygen (FiO2), Inspiration Pressure, Tidal Volume etc. All these parameters are displayed on an LCD display in real time. Alarms for designated values are also incorporated.
• A proto-unit is developed in consultation with five Doctors from across India. The functionality of DEVEN has been demonstrated to Apollo DRDO, ESI Medical College and Other Hospitals at Hyderabad. The model matches the functionality of a high-end ventilator and is optimal in size, weight and cost.
• Suggestions given by doctors are being implemented to harness its full capability. Presently, limited number of these ventilators are being realized through M/s. Sigma Microsystems, Hyderabad for further testing and approvals.
• Cost of the model is only Rs. 40,000 and the design has been matured with successful testing within a short time of 10 days.

12.3 SINGLE OUTLET AUTOMATED RESUSCITATOR (SOAR)

• An Assistive Breathing Device is developed called Single Outlet Automated Resuscitator (SOAR) based on the device developed for Indian Army for use in NBC containment environment.
• The device is tested and in various user trials and can provide respiratory support to COVID-19 patients in the hospital, in transit or COVID-19 patients at home.
• The system works with the blower/turbine as the source of the breathing air.
• It is a standalone system which can run on AC/DC/external battery and also by direct pneumatic supply.
• Features:
  • Breaths per Minute (BPM) : 8-40
  • Minute Volume (MV) : 3-14 lit/min
  • Airway pressure : 20-60 cm wc
  • Weight : 7.5 Kg
  • Battery back up : up to 6 hr
  • Alarms for High Pressure/ Low pressure / Mask Disconnect / Patient Breathing.
• M/s ITI, Bangalore will be given the technology for production.
13 PERSONNEL, VEHICLE AND AREA SANITIZATION EQUIPMENT

13.1 PERSONNEL SANITIZATION ENCLOSURE (PSE)

- Full body disinfection chambers have been developed called as Personnel Sanitization Equipment. This walk through enclosure is designed for personnel decontamination, one person at a time. Approximate size is 9 X 7 x 9 feet (floor area 60 square feet)

- Decontamination action is started using a foot pedal or automatic at the entry. On entering the chamber, electrically operated pump creates a disinfectant mist.

- The mist spray is calibrated for an operation of approximately 25 secs and stops automatically indicating completion of operation.

- As per procedure, personnel undergoing disinfection will need to keep their eyes closed while inside the chamber.

- This system can be used for disinfection of personnel at the areas of controlled ingress and egress such as entry and exit to hospitals, malls, office buildings and critical installations.

- Industry capacity: Can be scaled as per demand

- Various models have been configured based on the features and special fittings. From Rs 50000/- + GST to Rs 3,50,000/- + GST. Basic model costs Rs 50,000/- and cost varies based on the features fitment.
• Industries have been identified for manufacturing. Details have been provided on DRDO website.

13.2 PERSONNEL DISINFECTION ENCLOSURE (FOG BASED)

• A sanitization enclosure called PerSan comprising of a Chamber and a Fog generator is developed

• The chamber is made from skeleton of steel pipes coated with epoxy or acrylic paint/powder or of UPVC pipes. The structure is covered except the openings for entry and exit portions, using polythene film of 200 - 240μm, those normally used in poly-houses

• The two openings, for entry and exit, are closed with either strip curtains or shower curtains

• The assembly of the chamber is such that, the base of the chamber is 1m x 1m and the height is 7 ft

• The design enables assembly of the chamber in few hours. It is equipped with two fog generators of capacity of about 3L/hr. or single fog generator of capacity 5 – 6L/hr.

• The fog generator is an ultrasonic transducer-based humidifier that generates fog of 1 to 5 μm aerosols

• The system has following features:
  o In-built reservoir tank for storage
  o Solenoid valve with liquid level sensor for replenishment of liquid in fog generation tank from the reservoir tank
  o IR (proximity) sensor in the power supply circuit of fog generator
  o The time selector for setting of time for fog generation from 15s to 1 minute
  o Optimised fog generation tank dimensions to produce maximum fog
  o Uses More than 95% indigenous components
• Ease of maintenance and servicing.
  • Cost is about Rs 35,000/- + GST

### 13.3 PORTABLE BACKPACK AREA SANITIZATION EQUIPMENT

- CFEES, Delhi with the help of its industry partner has developed portable sanitization equipment for spraying decontamination solution consisting of 1% Hypochlorite (HYPO) solution for sanitization of open areas.
- The portable system can be mounted as a backpack and carried by the operations personnel.
- This system incorporates low pressure twin fluid (air & disinfectant liquid) technology to generate very fine mist. The system is capable of disinfecting an area of up to 300 m².
- The application areas can include hospital reception, doctor chambers, office spaces dealing with general public, corridors, pathways, metro and railway stations, bus stations etc.
- Approximate Cost: Rs 1,50,000/- + GST
- Production capacity: About 200 numbers per month

### 13.4 TROLLEY MOUNTED LARGE AREA SANITIZATION EQUIPMENT

- CFEES, Delhi with the help of its industry partner has also developed a larger area sanitization equipment for with higher capacity tank which is carried on a trolley.
- It has a tank capacity of 50 Litres and has a lancing (throw) distance of 12-15 m.
- This system incorporates low pressure single fluid (disinfectant liquid)
technology generating very fine mist. The system is capable of disinfecting an area up to 3000 m$^2$.

- This is useful for disinfecting hospitals, malls, airports, metro stations, isolation areas, quarantine centers and high-risk residential areas.
- Approximate Cost: Rs 1,80,000/- + GST
- Production Capacity: About 200 numbers per month

### 13.5 VEHICLE SANITIZATION ENCLOSURE

- Vehicle Sanitization Enclosure is conceptualized using locally available material based on the existing 4-men tent (Ordnance Supply). Since it is a very light weight system with portable canopy, it can be made operational in less than 3 hours.
- An electrically operated positive displacement pump is utilized to create a disinfectant mist inside the tent canopy through which the vehicles are passed. A separate tank of 500 Ltr capacity for storage of disinfectant is used which requires refilling after 200 number vehicles are disinfected. The system is noise free and needs 10 minutes break every 4 hours operation.
- The system can be utilized at any location including entry location for Sanitization of vehicles. Hospitals, army units and administrative offices having high ingress and egress can deploy this system.
- Approximate Cost – Rs 1,00,000/- + GST
- Production rate can be scaled as per requirement

### 13.6 VEHICLE SANITIZATION SYSTEM (FOG BASED)

- Another vehicle sanitization enclosure is developed, comprising of a fog generator and a Flexible hose with adapter.
- The fog generator is basically an ultrasonic transducer-based humidifier that generates fog of 1 to 5 μm aerosols.
- The fog generator is operated for 30s to 60s depending on the volume inside the vehicle.
- The fog generator is operated using a foot switch. It takes 3 – 4s for fog to start accumulating in the vehicle and within 30s the vehicle gets filled with the fog.
- The fog generator has the following features:
  - In-built reservoir tank for storage of disinfectant
  - Solenoid valve with liquid level sensor in fog generation tank from the reservoir tank
  - IR (proximity) sensor in the power supply circuit of fog generator
  - The time selector for setting of time for fog generation from 15s to 1 minute
  - Optimised fog generation tank dimensions to produce maximum fog
  - Uses More than 95% of the components are indigenously available.
  - Ease of maintenance and servicing.
- Cost is About Rs 25,000/- + GST

13.7 MOBILE AREA SANITIZATION SYSTEM

- Based on the experience of dust suppression systems for use in deserts, a ‘Mobile Area Sanitization System’ is developed. It uses Sodium Hypochlorite solution to sanitize larger areas.
Two variants have been developed, one for outdoor use mounted on a ‘B’ class vehicle and another for indoor use mounted on a battery operated cart. The former can spray to a distance of 6-7 m distance and the later to 2-3 m distance.

13.8 LMV MOUNTED AREA SANITIZATION UNIT

- To sanitize large areas, a scheme is conceptualized where in the disinfectant is sprayed on the outdoor surfaces using a kit that is mounted on light motor vehicles (LMV) like cars, SUVs etc.

- The product consists of a tank of 50 to 100 litres (depending on size of vehicle), mounted at the back, and two sprinkler devices attached at the sides of the vehicle. The power for the sprinkler devices are drawn from the 12V DC available in the vehicle.

- This is a simple and affordable solution since the kit can be easily assembled and disassembled on to the LMVs

- Outdoor areas can be sanitized in the lab campus, defence units or industrial establishments etc., besides frequented locations like bus stops, railway parks, roads etc.

13.9 SHOE AND DRIVEWAY SANITIZER

- Shoes have high potential of spreading virus from one place to another. In COVID wards 65% of shoes are found to be infected by Corona Virus. Similarly, car tyres are also be potentially highly infective.

- To prevent the spread of corona virus through shoes and car tyres a threading based PVC Mat based solution is made. Artificial grass is the second choice. Rubber & Coir mats are not suitable.

- 150ppm sodium hypochlorite gel used as the disinfectant has advantages of enhanced stability, better moisture retention and non-chlorine composition. This leaves minimum footprint which can be wiped off easily. For cars 200ppm solution can be used.

- Continuing bacteriology tests has shown 2-log scale kill effect and is safer to handle compared to alternative solutions.
• Operating precaution - It is recommended that gel should be stored in glass/HDPE grade plastic bottles. 50ml gel is to be applied per sqft using gloves and hands to be washed immediately after handling the gel. One application is applicable for 15 cars/two hours. The mats may require running water wash every 2 hours.
• No damage is observed to shoes or tyres for 20 hrs. dip
• Sunlight may decrease the efficacy
• These can be deployed at the entrance of main office buildings, door of office rooms, rooms frequented by crowds like cafeteria and meeting Rooms, home entrances.

13.10 SHOE AND DRIVERWAY SANITIZER – BENZALKONIUM CHLORIDE BASED

• An alternative to the gel based design is developed, in which the product comprises of a trough made of stainless steel and a mat. The chemical used for disinfection is Benzalkonium chloride which has been recommended for disinfection against SARS-COV-2.
• The detailed specifications for Driveway Sanitizer are:
  • Dimensions of trough and mat: 20’ (L) X 21” (W) X 1.4” (D)
  • Material of Trough: Stainless steel (304), 1.5 mm thick
  • L Angle: 40 mm X 40 mm X 4 mm
  • Thickness of mat: 16 mm
  • Material of mat: PVC
  • Chemical: 2% Benzalkonium chloride
  • Volume: 6 lts for each trough (120ml diluted to 6000ml)
  • Standard Operating Procedure: Trays should be leveled properly before fixing on the surface so that the liquid spreads equally in the whole tray. Pour the 6 lt mixture over the mat in the tray so that it spreads properly. Thus, a total of 12 lts solution is required for both the trays.
• The detailed specifications for Shoe Sanitizer are as follows:
  • Dimensions of the trough: 4’ X 4’ X 1”
  • Material of Trough: Stainless steel (Grade 304)
  • Material of the mat: PVC
  • Thickness of the mat: 16 mm
  • Area to be covered with mat after shoe sanitization tray: 6 X 4 ft
• Sanitizer absorbing foot mat: Cotton mat (30 inches X 20 inches). To be placed just after the long mat (6ft X 4 ft).
  • Volume: 2.5 L (50ml diluted to 2500ml)
  • Standard Operating Procedure: Pour the mixture over the mat in the tray so that it spreads properly.
• The mats should be washed thoroughly fortnightly or depending upon the usage.
• An appropriate concentration of this compound needs to be replenished on daily basis.

13.11 FOSSANITIZER – DISINFECTION OF ROOM/CHAMBER

• Disinfection with Hydrogen Peroxide \( \text{(H}_2\text{O}_2) \) is a low-pressure, low-temperature, nontoxic process that uses vaporized Hydrogen Peroxide to reduce the level of infectious agents. \( \text{H}_2\text{O}_2 \) is strong oxidant and can be used as potent broad-spectrum germicide. \( \text{H}_2\text{O}_2 \) belongs to the category of High-Level Disinfection (HLD). Disinfectants of this level kill all vegetative microorganisms, mycobacteria, lipid and nonlipid viruses, fungal spores, and some bacterial spores. It is safer than chlorine.
• The rooms/closed chambers may be disinfected as per the validated protocol.
• The specifications:
  • Volume of the chamber/room: -1500 cubic feet
  • Concentration of \( \text{H}_2\text{O}_2 \): -5.5% + 0.01% Silver nitrate
  • Volume: 600ml
  • Fogging time: 10–12min
  • Time of dwell: 60–70min
  • Temperature: 30º ± 3ºC

13.12 OTHER SANITIZATION ACCESSORIES

• A few small innovative accessories are developed to enable safe day to day work with respect to COVID-19 prevention
• A pocket sanitizer is developed so that it is easy to carry in pocket or purse. It has a protection cap that prevents its accidental usage and a
press based control is provided for the dispensing of the sanitizer product. The device can be refilled by the user through the refilling site. This pocket spray device is cost effective, easy to handle and has leak-proof refillable mechanism.

- A touch sanitizer pen is developed to prevent the spread through touch of lift buttons, electric switches etc. This touch sanitizer pen is easy to carry in pocket or purse. This touch sanitizer pen is cost effective, easy to handle and has refillable mechanism.

14 UV BASED SANITIZATION AND THERMAL IRRADIATION EQUIPMENT

- Ultraviolet-C (UV-C) light consists of a shorter but energetic wavelength of light. It is particularly good at destroying genetic material in COVID-19. The radiation warps the structure RNA which prevents the viral particles from making more copies of themselves. UV-C kills microbes quickly. Sanitization of the items by employing UV-C light avoids the harmful effects of the chemicals used for the disinfection.
- Objects like N-95 Masks, Mobile phones, iPad, Laptop, Currency Notes, Cheque leafs, challans, Passbooks, Paper, envelopes and many more items can be sanitized using UVC box.
- Thermal heating in another way to disinfect papers, which is an essentialsity for office works
- These are environment friendly and contact free effective sanitization methods.

14.1 UV SANITIZATION BOX AND HAND-HELD UV DEVICE

- DRDO has designed & developed Ultraviolet C Light based sanitization box and hand held UV-C (ultraviolet light with wavelength 254 nanometers) device.
The UV-C box is designed for disinfecting personal belongings like mobile phone, tablets, purse, currency, cover of office files, etc. COVID-19 virus gets deactivated by using UVC lamps in one minute. The box is designed to deliver 100mJ/cm\(^2\) UV-C dose equidistantly.

The UV lamps used in the sanitization box also emits 185 nm which produces ozone and is able to take care of the unexposed area on the surfaces of the objects placed in the box.

The hand held device having eight watt UV-C lamp disinfects office and household objects like chairs, files, items delivered by post and food packets with an exposure of 45 second at a 100 mJ/cm\(^2\) irradiance placed at a distance of less than two inches. This measure can reduce the transmission of Coronavirus in office and public environment which is required to be operational in all conditions.

14.2 DEFENCE RESEARCH ULTRAVIOLET SANITIZER (DRUVS)

- A UV-C Sanitizer cabinet called DRUVS (Defence Research Ultraviolet Sanitizer) is developed for sanitizing objects without using chemicals.
- It has Fail safe design in which UV cannot be switched on if cabinet drawer is in open condition.
- Touch free automatic operation
- Total Irradiation: 9000 µWatt/cm\(^2\) (Calculated value)
- Gives 360 Degree Exposure
- It is Ozone Free

14.3 UV SANITIZATION VERTICAL BOX FOR MASKS

- UV-C Sanitization Vertical Box is developed for specific purpose of sanitizing the masks.
- The system is automatic and as the door is opened UV-C light is switched off.
- This will enable disinfection of masks and enable the re-use

14.4 PAPER DISINFECTOR

- To meet the imminent need to disinfect daily paper-based items entering an establishment, a product called Paper Disinfector is developed.
- Paper / envelopes up to A4 size can be disinfected using the device
- The device consists of two foldable halves - an upper lid and a lower lid
- To disinfect various paper-based items entering the establishment at the security office or the central registry, like entry passes, DAK, tender documents, currency notes etc., the operating person lifts the upper lid and asks the incoming visitor to place the item on the lower lid. He then closes the upper lid. The paper-based item is heated in between the two lids.
- Heating is done by means of Nichrome wire of selected resistivity which is placed inside a glass wool / mica sleeve, and sandwiched on a conductive cloth, and further wrapped in velvet for retention of heat. Two such sets of heating pads are used, one fixed on the bottom of the upper lid and the other on the top surface of the lower lid.
- The system draws electrical power of approximately 120 Watts, and has controls including ON/OFF switch & Indicators, fuse and timer control. There are different operation modes for the type of item like paper, currency, envelope etc. depending on the settings for temperature and exposure time.
14.5 AUTOMATED LUGGAGE DISINFECTOR USING UV-BATH

- A kiosk using UV bath is developed, which can disinfect the baggage or other objects being carried inside. This system can be used for sanitization of luggage entering the campus of industrial establishments / defence units etc. The same system is planned to be used for disinfection of items being carried onto naval ships and submarines.

- The system consists of a roller based conveyor carriage moving inside a chamber which is configured with UV bath of calibrated dosage.

- The type of UV used for the purpose is Far-UVC, which according to literature is effective against Corona virus.

- The items to be disinfected are carried on the conveyor to the chamber such that there is scanning and sanitization of the item all around the object surface.

- For maintaining the required exposure of the item to the UV rays on all areas as per required intensity and time for the sanitization process, the movement of the conveyor is automated, along with necessary electrical and mechanical safety interlocks.

- Although Far-UVC is claimed to be harmless to human beings, sufficient precautionary measures are introduced to prevent leakage of UV beyond the chamber.
An Automated System for Decontamination of Face masks is developed based on ‘Ultraviolet (UV–C) germicidal irradiation for killing the bacteria’ and Virus.

This unit comprises of two subsystems. One is the Air Sterilization Unit (ASU) and the other is Automated Feeding Supply of face masks configured as per time required for sterilization of every mask. Very high intensity radiation is achieved inside the ASU to the tune of 69.07 J/s/cm² which ensures the high Sterility Assurance Level (SAL).

The sterilization efficacy of the unit conducted through virus challenge studies. The studies are being carried out in Bio Safety Cabinet (BSC) class II-b in a contained environment.

The prototype is realized and it is able to meet the US-FDA requirement of “viricidal activity of at least 3 log reduction”. The face masks thus treated in this system can be reused for many cycles.

The system is very effective for commonly used face masks i.e. 3-ply masks, N-95 masks etc. The prototype unit cost is approximately Rs. 35,000 and the system is presently deployed with Govt hospitals for feedback and product improvement.
14.7 UV BLASTER – AREA UV DISINFECTION SYSTEM

- A UV Disinfection Tower called as “UV Blaster” is developed.
- The equipment may be used for rapid and chemical free disinfection of office spaces and buildings. As stated earlier, UV treatment is proven to reduce air and surface contamination up to 99.99%.
- Based on the studies of the UV dose on COVID-19 is not available. However, from the studies of effect of UV-C radiation on other Corona family of viruses like SARS & MERS, the UV-C dose for 99.9% disinfection of COVID-19 is deducted as 30 mJ/cm².

- It is remotely operated through laptop/mobile phone using wi-fi link
- UV-C Power:
  - 6 lamps each with 43 Watts of UV-C power at 254 nm wavelength arranged for 360 deg. Illumination.
  - UV intensity at 2 m distance = 0.4 mW/cm².
- Disinfection Time:
  - ~10 minutes for a room of ~ 12 ft x 12 ft dimension.
  - ~30 minutes for 400 ft² (by positioning equipment at different locations within the room).
- Safety Feature:
  - Automatic switch off on accidental opening of room/human intervention.
  - Key to arm operation.
- It costs around Rs. 1.5 Lakh per unit for an order quantity of two units, the cost may come down to less than Rs. 80,000/- for reasonable numbers.

14.8 NOTESCLEAN

- An Automated UVC Currency Sanitizing Device called NOTESCLEAN is developed.
• In this sanitizing technique one has to just place the loose currency notes at the input slot of the device. It picks the notes one by one and makes them pass through a series of UVC lamps for complete disinfection.

15 MEDICAL OXYGEN PLANT (MOP)

• The Medical Oxygen Plant (MOP) is a technology which is an offshoot of the On Board Oxygen Generation System (OBOGS) project for medical grade oxygen generation on board Tejas, fighter aircraft. It utilises Pressure Swing Adsorption (PSA) technique and molecular sieve technology to generate oxygen directly from atmospheric air.
• This is approved by safety certification agency CEMILAC. The oxygen generator components have been developed by DRDO and technology has been transferred to industry.
• The technology is being used to install oxygen plants on some of the army sites on North East and Leh-Ladakh Region. The first plant is operational since 2017. The plant complies with international standards like ISO 1008, European, US and Indian Pharmacopeia.
• This oxygen plant will be useful to provide oxygen supply during corona pandemic in hospital in urban and rural areas. The installation of medical oxygen gas plant helps in avoiding hospital dependency of scarce oxygen cylinders especially at high altitude and inaccessible remote areas. Benefits include reduced logistics of transporting cylinders to these areas, low cost, continuous and reliable oxygen supply available round the clock.
• The facility can be used for filling the cylinders in addition to direct installations at the hospitals.

Salient Features
• High Reliability, full independency and automation
• Reduced Logistics, low cost, minimum maintenance
• Absolutely Oil free and safe
• 24/7-365 days operation, Onsite production of oxygen instantaneously from ambient air
• Electric Oxygen compressor to charge the cylinders up to 200 bar(g)
• High Performance molecular sieve (Li-LSX: Lithium based Low Silca X-Type zeolite)
• Stored oxygen supply for transient power failures
• Compliance with European/Indian Pharmacopeia and ISO 1008
• Low Energy consumption
• Frame Built, Skid Mounted design
• High Quality Touch screen control unit and remote control access

• **Industry Capability** - The industry M/s Trident Pneumatics Coimbatore, needs to be enabled to produce numbers.
• 20 plants can be installed in 5 weeks

Industry can ramp up the production with support.

*Approximate cost is about Rs 66,00,000/-*

• **Patient Handling Capacity** - The Oxygen plant is designed for a capacity of 18 NM3/hr. The system caters for 60 patients at a flow rate of 5 LPM and can charge 60 cylinders per day as per the calculation given below. The capacity can be varied as per hospital requirement, if required.

• No. of persons = Plant Capacity/Flow rate per person = 300/5 = 60

• **Cylinder Charging Capacity**
  • The oxygen capacity depends on the pressure of filling, which is about 150-200bar.
  • Capacity of standard jumbo cylinder = 47 litres
  • Cylinder pressure = 150 bar
  • Volumetric capacity of cylinder = 150×47 = 7,050 litres (at NTP)
  • Oxygen capacity of plant for 24 hours = 18000×24 = 4, 32, 000 (at NTP)
- No. of cylinders that can be charged in 24 hours= $\frac{432000}{7050} \approx 60$

- **Cylinders** - Apart from the standard cylinders available in the market, the details of Oxygen Cylinders designed by DRDO are:

**Type-I: Aluminum cylinder (6061-T6)**

- Service Pressure: 150 bar
- Burst Pressure: 400 bar
- Cost (2.3 to 5 liters capacity): Rs. 5,000/ to 6,000/ unit
  (10 liters capacity): Rs. 11,000/ unit
  (21 liters capacity): Rs. 16,000 to 18,000/unit
- Production Capacity: 3000 cylinders/month
- Development partner: M/s Alcan Exports, Mumbai

**Type/ Design-II: Aluminum cylinder**

- Max. Operating Pressure: 150 bar
- Proof pressure: 225 bar
- Burst pressure: 400 bar
- Cylinder volume (Water Capacity): 2.3±0.2 Liter
- Volumetric expansion at proof pressure: < 10 %
- Empty weight of the cylinder: Max. 1.5 Kg

**Type-III: Carbon fibre based composite cylinder**

- Service Pressure: 200 bar
- Burst Pressure: >600 bar
- Cost (2.3 to 5 liters capacity): Rs. 25,000/ to 30,000/ unit
- Max Weight: 1.65 Kg
- Production Capacity: 1000 cylinders/month/ industry
- Development partner: M/s Allen Reinforced Plastics and M/s CNC Techniques Hyderabad

16 ANYWHERE ERECTABLE ISOLATION SHELTERS

- Various shelters, green power sources, chemical toilets, quick erectable medical complex have been developed under various projects related to field-defence and CBRN protection. These products with minor modifications / customisation, can be utilized for activities pertaining to containment of COVID 19.
Industry partners are developed, who are capable and willing to take up productionisation of these products to meet the emergent requirements.

These products will be useful especially in the remote locations, where there is no medical/electrical facility available. The details of these products in standalone mode and as integrated system are given below.

16.1 STANDALONE SHELTER

- Three Bed Quarantine Shelter
- Quick erectable 3 bed shelter with power connection. Accessories (optional): Fan, Light, 3 Beds & Buckets
- Can be used as extension of city hospital to accommodate patients
- Approximate Cost: Rs 1 Lakh/
- Production Capability: 10 Per day

16.2 MEDICAL EXAMINATION SHELTER WITH GREEN POWER SOURCE

- This metallic structure with water proof fabric shelter is of size 12’x12’x9’ and can be utilised for medical examination and check up of suspected COVID19 patients.
- This shelter can be erected within 1 hr with 4 persons.
- Up to 1.5 KW green energy power source for 24x7 operations is in-built. It is a ready to use setup along with all essential electrical devices and gadgets.
- One bed, table chair and other essential accessories will be housed in this shelter.
- This can be easily used in remote and field areas. This can also be used as remote monitoring and control center.
- Approximate Cost: Rs 4.5 Lakh/-
• Production Capability: 10 Per day

16.3 TWO BED QUARANTINE MODULE

• Shelter of size 14’x14’x9’ can be utilized as a quarantine shelter for two patients.
• This shelter will have essential electrical gadgets, 2 beds, tables and other minimum accessories.
• This total facility can be deployed within 2 hrs. time with 6 persons
• Approximate Cost: Rs 1.5 Lakh/-
• Production Capability: 10 Per day

16.4 FOUR BEDS QUARANTINE MODULE

• Shelter of size 20’x20’x9’ can be utilised as quarantine shelter for four patients.
• This shelter will have essential electrical gadgets, 4 beds, tables and other minimum accessories.
• This total facility can be deployed within 3 hrs. time with 6 persons.
• Approximate Cost: Rs 2.5 Lakh/-
• Production Capability: 10 Per day

16.5 INFLATABLE SHELTER MODULE

• The shelter can be utilized as quarantine center ward for 10 patients.
• It can be erected in one hour with team of 10 personnel.
• This has inbuilt toilet module.
• Approximate Cost: Rs 10 Lakhs
• Production Capacity: 5 per month

16.6 INTEGRATED MEDICAL COMPLEX

• This will be a genset-powered, quick deployable, air conditioned medical facility suitable for remote locations
• It has the capacity to accommodate 16 patients
• This has inbuilt toilet modules
Approximate Cost: Rs 30 Lakhs
In this way many combinations of these shelters can be worked out to scale the facilities

**17 NEGATIVE PRESSURE INFLATABLE ISOLATION SHELTER FOR TEN OCCUPANTS**

A Negative Pressure Shelter is developed for isolating and treating the patients without the risk of spreading the contamination to others.

This system is suitable for isolating COVID 19 patients since the system is based on negative pressure and the materials used have passed Synthetic Blood penetration Test.

The system consists of Negative pressure based Air Handling Unit, and Inflatable Multiple Chambers.

The system has five numbers of Air Sterilizer Units and ducts are uniformly distributed to provide filtered air.

It covers a total area of approximately 1000sft and is manufactured out of two layer water-airproof fabric.

The structure has separate rooms for decontamination & medical waste.

The structure is equipped with modular rest rooms and is illuminated with sufficient light throughout.

Production Industry: M/s Sure Safety (India) Ltd., Vadodara

Production Capacity: 20 to 25 Units per month

Cost:
- 4-men capacity: Rs. 21 lakhs with Air Sterilizer Unit, Modular Rest Room and Negative Pressure Air Handling Unit.
10-men capacity: Rs. 26 lakh with Air Sterilizer Unit, Modular Rest Room and Negative Pressure Air Handling Unit.

18 PACKED FOOD TECHNOLOGY

- DRDO has expertise in preparing long lasting food for armed forces. The food products are prepared in stringent hygienic conditions while following applicable standard protocols.
- The Ready to Eat (RTE) food products are packed in multi layer retort pouches and processed in a special retort as per internationally accepted food standards. After processing, the food products are tested for their microbiological quality and cleared for supplies. The shelf life of these products is one year under room temperature.

19 CONTAINERISED TEST LAB MODULE

19.1 MOBILE VIROLOGY RESEARCH AND DIAGNOSTICS LABORATORY (MVRDL)

- RCI, DRDO developed first of its kind mobile lab called MVRDL in India to speed-up the COVID-19 screening and R&D activities. It was conceptualized on April 06 and the all activities have been completed by 20 April i.e. 15 days.
- One number of MVRDL has been dedicated to the Nation by Honorable Raksha Mantri on 23rd April’2020
- DRDO in consortium with ESIC Medical College, Hyderabad team configured a combination of two modules. One Bio-Safety Level 3 (BSL-3) lab and another one Bio-Safety Level 2 (BSL-2) labs are connected to carry out the virology research and diagnostic activities.
- The test laboratories are expected to carry out the following activities:
  - Conduct diagnostic test for COVID-19, real-time Reverse Transcription Polymerase Chain Reaction (rRT-PCR) Test
  - Virus culturing for drug screening, convalescent plasma derived therapy
- Aid in development of vaccine
- Development of diagnostics kits

- This can be positioned anywhere due to mobile shelter based configuration
- The entire area is conditioned with HVAC system with a design of 100% fresh air ensuring no re-circulation. Room temperature of 24±4°C is maintained, relative humidity is maintained less than 60% as per specifications of BSL-3 and BSL-2 labs. The labs are built as per WHO and ICMR bio-safety standards to meet the international guidelines.
- The system is equipped with access control, LAN, telephone cabling and CCTV. Fire alarm system is provided to ensure fire safety. The system has built-in furniture and is equipped with pass boxes for transfer of samples from container to other container. Personnel protective equipment is provided for personnel to cross over box.

- Other applications of the laboratory
  - It can enable the test services at remote places
  - The laboratory will enable extensive research on identification of viruses and identification of other agents causing morbidity significant to public health
  - It will enable the researchers and medical practitioners to undertake research activities and develop diagnostics assays and therapeutics
  - To understand and conduct surveillance of existing as well as new viruses.
  - To develop diagnostic kits

- The laboratory is designed to carry out following activities:
  - The laboratory screens 1000-2000 samples per day
  - Drug screening
  - Therapeutics - Convalescent Plasma therapy, Therapeutic value of milk exosomes for COVID-19, Stem cell therapy to reduce inflammation and fibrosis
  - COVID-19 Diagnostics - Covid i-Chip, IgG/IgG, Single Tube PCR test, Direct sequencing of corona viruses from clinical specimens
• Vaccine Development - Comprehensive immunity profiling of COVID-19 patients towards vaccine design and early clinical trials specific to Indian population.

• Industry Partners
  • M/s iCOMM, Hyderabad identified for building shelters
  • M/s iClean, Hyderabad, a company with years experience in building the containment facilities augmented the laboratory with required safety levels

19.2 PARAKH: MOBILE BSL 3 LABORATORY FOR COVID SAMPLES TESTING

• Defence Food Research Laboratory (DFRL) Mysore, pursuing the mission to support corona warriors, has developed this quick response asset to deal the situation arising due to contagious diseases including Covid-19 pandemic.

• The Laboratory stationed on mobile platform has been named PARAKH. It provides for unidirectional airflow and gradient negative room pressure with class III Biosafety cabinet (BSC) for entry and safe processing of clinical samples. The viral inactivation and first 2 steps of viral lysis of RNA extraction are performed inside the BSC assuring personnel protection.

• The lab facility is built on ISO 20 feet dry container and mounted on a chassis for mobility. The exhaust air being HEPA (high efficiency particulate air) filtered, satisfies Class 10,000 or ISO7 air quality. Complete Heating Ventilation Air Conditioning (HVAC) is used to maintain
desired unidirectional airflow and room pressure gradients of negative pressure as compared to the ambience.

- The ingress of the samples is done in a safe way through a specifically designed dynamic pass box (as shown in the picture above) for direct delivery inside the Class III bio-safety cabinet for safe sample processing.
- The facilities in the Lab include clean air work station, cold chain for storing the reagents and samples, Provision for treatment of liquid effluents, safe storage of solid biohazard wastes and decontamination by autoclaving. Further provision for storing and donning PPEs, storage for used aprons, emergency body shower and eye wash etc. have been provided.
- The Lab setup has necessary captive and raw power supply, space for sufficient fuel and water provisions and thus can be easily transported by road and deployed at the site of emergency as per the requirement. Air bellow suspension has been used to reduce the vibration during transport and air compressor for inflating tyres.
- Specifically, for Covid-19 testing, the lab has been provided with Real-Time PCR detection platform. Medical Professional can easily and safely handle and preserve samples from disease outbreaks or during surveillance. The interior view of the Mobile containment laboratory showing Class III biosafety cabinet, real time PCR, PCR work station, pass box, -20 degree Celsius freezer, refrigerator and incubator.
- Real time PCR provided for COVID-19 screening from clinical samples can test about 300 samples per day. The Lab has been Handed over to Viral Research and Diagnostic Laboratory (VRDL) of Mysore Medical College and Research Institute (the sole authorised COVID-19 testing facility in Mysore region) to enhance their testing capability.
19.3 CONTAINERIZED TEST MODULE

- A containerized test lab module is conceptualized for COVID-19 related testing mobile laboratory
- This can be utilized as testing lab and accommodating doctors/paramedics.
- One module can accommodate 06 persons at a time
- The module can be transported to remote locations
- Approximate Cost: Rs 20 lakh
- Production Capacity: 1st within first month and thereafter 25 per Month

![Containerized Test Module Image]

20 MULTI PATIENT VENTILATION (MPV) KIT

- Multi Patient Ventilator Kit has been developed which can convert single ventilator to be used for multiple patients at the time of emergency.
- The MPV kit trials have been carried out at Apollo hospital and ESIC hospital in Hyderabad, suggestions are being implemented.
- The MPV Kit can convert single ventilator for use by multiple patients at the time of emergency.
- It can regulate pressure for each patient. UV filters are integrated on each line to avoid contamination.
- This product will give a big boost on health care capacity against Covid-19.
21 MOBILE APP FOR QUARANTINE TRACKING

21.1 SAMPARC

- A Mobile based application called SAMPARC (Smart Automated Management of Patients and Risks for Covid-19) is developed for tracking of covid-19 suspects under isolation or quarantine.
- The App is installed on the smartphones of the patients, and a server-side application is used by the state authorities to track the patients.
- The App does not collect any private information of the patient except his/her location of quarantine and the current location of the patient.
- The application works effectively by enabled Geo-fencing and Artificial Intelligence based automated face recognition between picture of patient taken during registration and subsequent selfies taken by the patient.
- The location information is displayed on a map which can be color coded to depict hotspots and containment zones.
- From the perspective of the patients, honest usage of SAMPARC could give them an option of home isolation instead of isolation in a government facility. From the perspective of the state officials, SAMPARC is expected to drastically reduce the overhead of tracking every patient under home isolation.
- The authorities can keep a check on the violators which can be shown in different color on a map when the patients break the Geo-fence or their Selfie does not match or when patient’s smartphones stop sending periodic updates.
- Many state governments are exploring the utilization of the SAMPARC system. Assam has already started the installation and trials.
21.2 KAVASAM

- CVRDE, Chennai has developed a Mobile based application called Kavsam for COVID-19 Tracking and resource allocation.
- The application is built on four level hierarchy with Admin, Epicenter Head, Team Leader and Health Worker roles.
- The application is useful for planning, bi-directional approval and monitoring process of the quarantined and COVID-19 patients.
- The application is installed in the Android mobile of the quarantined person to be tracked.
- Geo-fencing of 100m is enabled in the application.
- The application has the provision to select 1.5km, 3km, 5km radius from Epicenter and select the streets and houses for survey within the radius automatically/manually.
- The application enabled efficient allocation of houses to field worker for data collection. It can be automatically or manually allocated based on number of houses in a street.
- The application enables data collection and entry by field worker at allocated streets which can be used for any resource allocation namely vaccination for COVID 19 at a later date.
- Geofencing of the quarantined person - Notification to Super admin, Epic Head and Team Leader/policemen if quarantine person moves away from home
- Highlighting of the houses in map with different colours to identify suspects easily.
- SMS notification at all stages to ensure authentication
- Map views and generation of various reports required at different levels
- Geocoding of streets is built as database for fine control on the planning of resources. Data is divided in zones and wards for planning
- Avadi corporation service is using the map with mapmyindia data
- The application can be used for multiple purposes after the pandemic. The other applications areas include revenue department and disaster recovery.

22 SURAKSHA KAWACH – CUSTOM DESIGNED IOT DEVICE

- DRDO developed an IoT based solution for Corona patient tracking & surveillance to fight Corona situation.
- It is an ankle/arm band based custom IoT solution.
- The product ‘Suraksha Kawach’ is realized to be a tamper proof solution for tracking of COVID-19 patients.
- It is a GSM and GPS enabled rugged system for real time tracking.
• It is an integrated solution with software for central monitoring and management.

• It is enabled with Geo-fencing, tamper detection, battery status monitoring, mechanism for alerts to urban local bodies / police and distributed alert mechanism.

• The device can also be integrated with Arogya Setu or any other mobile app through server feeds or by introducing a Bluetooth low energy chip in the current design.

• The unit has battery capacity to withstand quarantine period of 21 days or more, so the device need not be removed for charging. This ensures that the person under quarantine need not remove the device for charging during the monitoring.

• The configuration or design modifications can allow it to be re-utilized for other tracking purposes after the end of Corona Pandemic.

• Prototype is developed and demonstrated

• Production can be scaled to 10000 per day capacity

• Cost of device: Rs 5000/- (For bulk production the cost may come down)
23 PREDICTION OF COVID-19 PATH

- METRICS (Mathematical Estimation for Tracking Infections of COVID-19 Spread in India) is developed for generating a daily estimation report based on data available. The model predicts on the basis of current data which signifies the lockdown situation.
- The prediction being done is for short term based on current reproduction number.
- Prediction for long term is being done by curve fitting method integrated with multiple factors like social distancing, reproduction rate and other parameters. Multiple parameters are varied to predict various scenarios post lockdown.

- A tool based on AI algorithms for trend reversal prediction and estimation of new COVID cases per day is developed called ‘Agradoot’. The model is being tuned based on daily developments in the Indian environment.

24 VIDEO CONFERENCING SOLUTIONS

In situations where interaction via video conferencing (VC) is necessary, there is a growing tendency to use non-private, insecure and easily mis-configured platforms compromising security and privacy. Due to lockdown, an urgent need was felt for trusted infrastructure to facilitate interaction from home and office. It was required that the DRDO community do not use non-private and untrusted server facilities for VC (such as Zoom/Skype etc). In such platforms
presence of unauthorized user cannot be ruled out and server infrastructure is vulnerable to eavesdropping.

In order to provide a robust, secure and easy to use application for video conferencing solution on internet, DRDO has developed two Video Conferencing solutions on internet.

24.1 NARAD

- Narad is a easy to use platform which can support up to 150 participants in the meeting.
- It is a highly secure application having two layer authentication.
- Participant can join the conference by clicking the unique link (unique link for each meeting instance) along with the access code generated by the meeting initiator.
- The backend is powered by Docker container, thus allowing access only to few applications. This prevents the attacker from uploading the malicious content.
- HTML5 is used here with CSRF protection preventing the attacker to execute or pass any malicious content/payload/html tags. Browser based and Cookie based attacks are also disabled.
- SSL protection is used to prevent man-in-the-middle attack
- It is being used by limited users from government officials
24.2 SAMMUKH - DRDO VIDEO CONFERENCING SOLUTION ON INTERNET

- This VC facility is provided for DRDO community to meet the requirement of uninterrupted working. This VC facility has been setup in DRDO premises and is named as SAMMUKH.
- A typical usage scenario diagram of SAMMUKH is shown in the Figure 1. The Sammukh VC server is placed at DRDO HQ running on Ubuntu (ver 18.04) server and hosted on secured domain name as https://vc1.drdo.in. The server is physically protected.

![Figure 1: SAMMUKH VC usage scenario](image)

- It is Based on WebRTC video-conference, and it uses modern XMPP communication server for high performance audio-video conferencing. Reverse Proxy Nginx is configured for Authentication and Videobridge i.e. an SFU server manages all conference media streams.
- The VC Traffic is under control and do not go outside DRDO. Three-tier independent Access control / authentication have been provided i.e. Website Access, VC Room Creation and Room Entry Password. A firewall is implemented to protect the system from cyber-attacks. Other security and encryption features have also been used to make it safe.
- The gives HD quality video, lossless audio, supports more than 100 participants, provides private meeting rooms, screen share option and chat box for the participants. The controls (Mike, Speaker, Video) have been provided in user friendly manner.
- Security assessment of Sammukh has been done by SAG, DRDO with complete Source Code Analysis and independent VA/ PT has been carried out by Advisor Cyber.
- Detailed SOP has been issued by DRDO. DRDO officials and MOD Departments/ Units may obtain User login/access credentials for SAMMUKH VC facility as per their requirement.

25 ROBOTS FOR MEDICAL USE

25.1 SEWA - DRDO ROBOT FOR KEEPING HOSPITAL STAFF SAFE

- A team of scientists at CAIR, DRDO has quickly customized one of its robotic solutions to come up with a cost effective robot within a week. The robot is named as Sewak.
- Sewak can be a safe alternative for the hospital staff like medical professionals and health workers taking care of the COVID-19 patients in the quarantine centers and hospitals.
- Sewak can be teleoperated by the hospital staff from a remote location to navigate the robot in the quarantine zone and distribute food, water, medicine etc. to the affected persons.
• Operational distance is about 30-50m (can be extended). The robot gets power from maintenance free rechargeable batteries and can work continuously for 5 hours on full charge. It has a capacity of 30 Kgs.
• Video camera fitted in the front helps navigating to the patient’s bed.
• Audio facility provided in the robot facilitates two-way communication between the patient and the hospital staff. This will help the hospital staff communicate with the patient to understand his/her health condition and the recovery he/she is making, explain the dosage of the medicines and comfort the patient.
• All this is possible while the hospital staff is positioned in a safe zone while the robot moves inside the quarantined zone. This eliminates the risks of exposure of the infection to the frontline workers while taking care of the needs of the patients.
• Video conferencing ability between patient and healthcare professionals is being built to provide video link between patients and hospital staff.

![Image](image_url)

25.2 MEDIDOOT – MEDICAL TROLLEY

• Medidoot medical trolley is designed to supply critical items – Food, Cloth & Medicine to the patients infected with contagions like the present COVID-19 in the Isolated wards, thereby reducing the exposure of doctors and other health staff to the infected area/patients.
• Design of MEDIDOOT medical trolley was jointly carried out by ASL, DRDO and M/s JanYu Technologies, a startup at IIT-B, Mumbai. The design review was done and after the improvements given by the ASL design review, first prototype was developed and tested for hospital use.
• Trolley is remotely operated by a trained person to carry medical supplies (Medicines, food & clothes) to the designated patient in a remote location.
• Trolley has closed enclosures to prevent cross contamination of the supplies and should be able to open only by the operator remotely.
• There is a provision of two-way audio visual interaction between the patients and the medical team through the screen and microphone either on WiFi or standalone cellular network.
• Trolley has the capability to sense obstacles and stop automatically in order to take care of operational errors.
• Trolley is provided with an alarm to alert the patients when the trolley reaches the destination.
• Short circuit protection mechanism is in-built for patient safety.
• Pilot light is provided to alert the people that the device is in operation.
• A battery charge level indicator is provided in the interface console.
• The trolley can be easily sanitized (Dry/Wet) post operation without removal of any of the components.
• Hot swapping of the battery is possible for continuous operation of the trolley.

26 ATULYA – MICROWAVE STERILIZATION FOR DISINFECTION OF CORONA VIRUS

• After analyzing the morphology of Corona Virus it is found that it gets disintegrated above 56°C.
• Experiments were performed using a magnetron based microwave generator with following parameters: Output power = 780 watts at 2.45 GHz and the volume of the cavity is 26 litres. This leads to power density inside the chamber of 0.03 watt/cc.
• Microwave heating is volumetric, wherein heat is generated because of friction of polar molecules. Unlike conventional surface heating, microwave heating is inside out. This results in uniform and rapid heating ensuring cent percent efficacy.
• In 20 seconds with approximately 780 watt output power, the temperature of 30 cc protein (30.9 gram with density of 1.03 gm/cc) rises to 95°C.
• NMR analysis of the proteins before and after microwave treatment shows that the protein gets disintegrated after the protein is subjected to the above specified microwave energy.
• Based on these experiments a high power microwave sterilizer is designed around a commercially available 700W Magnetron.
• The system consists of Microwave Sub-system with an aperture matched radiator and circuitry for power supplies, control/interlock circuits and forced air cooling mechanism.
• The radiation in the back direction is less than -20 dB/cm² and hence safe for operator.
• Approximate weight of the system - 3Kgs
• Approximate cost – Rs 4000/- per unit
27 MULTIPURPOSE DOOR OPENER TOOL

- In day to day life, the usage of objects such as door handles, cupboard handles, key pads of lifts, ATM kiosk key pads, computer keyboards can become means of spread of the COVID-19 virus. It is very difficult to ensure continuous sanitization of these common objects.
- A multipurpose door opener tool is designed using 3D printing process and thermoplastic material. It is ergonomically designed, compact and very handy tool to provide a touch free operation of most of the commonly used objects such as door handles.
- This tool is made up of two parts, a hook and a cover. The hook is designed considering the common sizes of door handles. The hook is also provided with a tip to operate the key pads at ATMs, Lifts and Keyboards. The cover is designed to accommodate thin layer of felt or tissue to sanitize the tool when closed. Hence, it will be safe to handle the tool for frequent use.
- M/s. Sanjay Technoplast Pvt. Ltd, Pune is the identified industry partner and knowhow for production in large numbers have been provided.

28 DRONE BASED SURVEILLANCE SYSTEM

- An unmanned aerial vehicle (DRONE) is configured for surveillance of COVID-19 hotspots and containment zones to ensure strict compliance of lockdown guidelines in densely populated areas, where streets are too narrow for motorised patrolling and police personnel are susceptible to infection in case of manual patrolling. The system has been developed in collaboration with an industrial partner from Greater Noida.
- The size of drone is 2.5 ft x 2.5 ft and weight is less than 3kg. It can be remotely operated through a hand-held tablet. It can fly up to 60m
altitude and has a range of 3km with the capability of way point navigation. It is equipped with a public announcement system and an onboard video camera for recording and broadcasting real time video feed to the control room. The controlling software of the drone has built-in artificial intelligence tools for decision-making. The UAV automatically returns to its home location in case of any communication failure.

• The system has been demonstrated to the Chandigarh Police in the containment zone of Bapu Dham Colony, which has become a major hotspot of COVID-19 positive cases in Chandigarh.

• The system can act as a force multiplier for our law enforcement agencies, who have been a frontline warrior in this battle against the global pandemic.

29 ULTRA SWACHH – DISINFECTION OF PPE’S AND OTHER MATERIALS

• A Disinfection Unit named Ultra Swachh is developed to disinfect a wide range of materials, including PPEs, electronics items, fabrics etc.

• The system uses an advanced oxidative process comprising of multiple barrier disruption approach using Ozonated Space Technology for disinfection. The system is double layered with specialized Ozone sealant technology assuring trapping of ozone for the necessary disinfection cycle. It also has catalytic converter to ensure environment friendly exhaust i.e. only oxygen and water.
• The system is in compliance with International Standards of Industrial, Occupational, Personal and Environmental Safety.

• The Ultra Swachh comes in two variants namely Ozonated Space and Trinetra Technology. Trinetra technology is the combination of Ozonated space and Radical Dispenser. Treatment is optimized with automation for quick disinfection cycle.

• The system operates on 15 Amp, 220 V, 50 Hz power supply. The system has been provided with various safety features such as emergency shutdown, door interlocks, dual door, delay cycle, and leak monitors etc. to ensure safe operations for longer duration. Dimensions of the Industrial Cabinet are 7’ X 4’ X 3.25’ to disinfect large quantity at a time.

• Cabinets of different sizes will be available for the industry.

• It has been developed with industry partner M/s Gel Craft Healthcare Private Ltd, Ghaziabad.

### 30 AI-BASED CONTACTLESS ATTENDANCE SYSTEM

• Covid-19 pandemic has presently made it unsafe to use contact based biometric verification. An AI based Attendance Application (AINA) is developed, which allows non-contact based personnel verification using facial features of the person

• Existing CCTV cameras can be utilized for capturing facial images

• Facial features of several thousands of employees can be stored in the computer since for each employee the facial features are encoded in a small (less than 25 KB) file

• The system is scalable since the time for identification and verification for each person remains constant even as the number of registered personnel increase

• It is secure because
  
  o It works as a standalone system and does not require internet
  o Since only the facial features are saved in encoded form, the actual face images need not be saved, thereby ensuring privacy and security.
  o Server for storing facial feature database is placed within organisation premises.
• AINA can be deployed with minimal upgradation to the legacy attendance infrastructure with RFID (Radio Frequency Identification) readers
• AINA has a light-weight installation process. AINA can be installed on a normal desktop computer with a GPU based display adapter
• AINA comes with a very intuitive and user-friendly GUI

31 INDUSTRY

A number of products and technologies for various domains of COVID-19 combat are designed and developed by DRDO in a very short span of time. These are outcome of expertise in various technologies, innovative ideas quickly converted to products and spin-offs of existing technologies. The technologies have been developed and transferred to various industries which have been enabled to ramp up the production as per requirement. Many industries which develop components and sub-components for these primary industries have also been enabled. About 200 industries have been activated to produce the required equipment and products for combating COVID-19 epidemic.

32 WAY FORWARD

DRDO scientists are continuously innovating and developing various other products in respective laboratories. There is continuous infusion of ideas and prototyping for solving various issues of healthcare professionals, governance, disinfection etc. More products are expected to be introduced in the coming days after testing and approvals. DRDO will support industry to produce the products in bulk to meet the current demand.
# List of DRDO Developed Products and Industry Contacts for their Supply

**03/06/2020**

<table>
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<tr>
<th>Sr. No.</th>
<th>Product</th>
<th>Laboratory</th>
<th>Industry</th>
<th>Detailed Address</th>
<th>Industry Contact Person</th>
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<tbody>
<tr>
<td>1</td>
<td>Automated Luggage Disinfector Using UV-Bath</td>
<td>NPOL, Kochi</td>
<td>M/s Apollo Microsystems Ltd</td>
<td>Plot No. 128, Road No. 12, IDA Mallapur, Hyderabad - 500076</td>
<td>Mr Adepalli Krishna Sai Kumar 12, IDA Mallapur Hyderabad - 500076</td>
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<td>2</td>
<td>Automatic Mist Based Sanitizer Dispensing Unit</td>
<td>CFEES, Delhi</td>
<td>M/s Riot Labz Pvt Ltd</td>
<td>D-57, Sector 6, Noida - 201301</td>
<td>Shri Shishir Gupta 9810972971 9899603619 <a href="mailto:Shishir@oakter.com">Shishir@oakter.com</a></td>
</tr>
<tr>
<td>3</td>
<td>Automatic Mist Based Sanitizer Dispensing Unit</td>
<td>TBRL Chandigarh</td>
<td>M/s North Star Safety Systems Pvt. Ltd.</td>
<td>SCO-311, Level-1, Sector 40 D, Chandigarh - 160036</td>
<td>Mr Arpan Aggarwal 9814931961 9814012704</td>
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<tr>
<td>4</td>
<td>Body Temperature Probe (Contact Type) - Industrial/ Domestic Type</td>
<td>NPOL, Kochi</td>
<td>M/s Keltron Controls, Aroor</td>
<td>A unit of KSEDC Ltd Aroor, Alappuzha Kerala - 688534</td>
<td>Mr Abdul Haseeb VP 9895885323 <a href="mailto:haseeb@keltron.org">haseeb@keltron.org</a> <a href="mailto:kelka@keltron.org">kelka@keltron.org</a></td>
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<td>5</td>
<td>Defence Research UV Sanitiser - DRUVS (UVC Sanitizer Cabinet)</td>
<td>RCI, Hyderabad</td>
<td>M/s Vijay Machine Tools, Telangana</td>
<td>D No 5-9-287/51 Plot No 51 Rajeev Gandhi Nagar Prashanti Nagar Industrial Area, Bala Nagar Hyderabad - 500037</td>
<td>Shri P Jyothi Baba 8008434343 <a href="mailto:vmt@rediffmail.com">vmt@rediffmail.com</a> <a href="mailto:vmt_12345@yahoo.co.in">vmt_12345@yahoo.co.in</a></td>
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<td>6</td>
<td>Full Face Shield - Visor Based</td>
<td>RCI, Hyderabad</td>
<td>M/s Sigma Microsystems Pvt Ltd</td>
<td>24/A, Hardware Park Near Airport, Srisailam Highway Hyderabad - 501510 Telangana</td>
<td>Shri C Damodar Reddy 9440803700 cdr@sigmamicro systems.com sigma@sigmamicro systems.com</td>
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<td>7</td>
<td>Econo-Walk-in Swab collection Kiosk(WISK)/High End WISK</td>
<td>NPOL, Kochi</td>
<td>M/s AJ Designs &amp; Constructions, Kochi</td>
<td>1st Floor, Kolaveli Shopping Complex Kakkanad Kochi - 682030</td>
<td>Mr Jolly KX 99955522618/9072869169 <a href="mailto:kanath.constructions@gmail.com">kanath.constructions@gmail.com</a></td>
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<tr>
<td>8</td>
<td>Enclosure For Intubation Procedure/Aerosol Containment Box</td>
<td>RCI, Hyderabad</td>
<td>M/s ArrowEngineering Industries Pvt Ltd</td>
<td>5-5-35/287/1A, plot No 64 Saibab Nagar Colony, Kukatpally Hyderabad - 500072</td>
<td>040-23070167/168 9246549570 9959650733</td>
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<td>Enclosure For Intubation Procedure/Aerosol Containment Box</td>
<td>TBRL, Chandigarh</td>
<td>M/s Urgent Engineering Works</td>
<td>Plot No 502, Industrial Area, Ph 2 Chandigarh, Punjab</td>
<td>Mr Gurnaib Singh 8847504046</td>
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<td>Enclosure For Intubation Procedure/Aerosol Containment Box</td>
<td>TBRL, Chandigarh</td>
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<td>D-103, Phase VII, Mohali, Punjab</td>
<td>Mr Sukhwinder Singh 9915553754</td>
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<td>Full Face Shield - Visor Based</td>
<td>RCI, Hyderabad</td>
<td>M/s iMake, Hyderabad</td>
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<td>Sudhir K 9849313146</td>
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<td>Full Face Shield - Visor Based</td>
<td>TBRL, Chandigarh</td>
<td>M/s Modern Manufacturers</td>
<td>Plot No 478, Sector 82, Mohali, Punjab</td>
<td>Dr Charanjit Singh 9988467178</td>
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<td>TBRL, Chandigarh</td>
<td>M/s Kirat Mechanical Engineering</td>
<td>Plot No 139, Industrial Area, Ram Darbar Phase-II</td>
<td>Mr Tejinder Singh 9814244856</td>
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<td>14</td>
<td>Full Face Shield - Visor Based</td>
<td>PO-I, DRDO HQrs</td>
<td>M/s Wipro 3D Business Unit of Wipro Enterprises Pvt Ltd</td>
<td>9 B-10A, Phase-1, Peenya Industrial Area, Bangalore-560058</td>
<td>Mr Ajay Parikh, CEO Wipro 3D 8861138219 <a href="mailto:ajay.parikh@wipro.com">ajay.parikh@wipro.com</a></td>
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<td>M/s Global Health Care</td>
<td>Global Health Care 409, Second Floor Munirka, New Delhi-110067</td>
<td>Sanjay Pathak 9810310798 <a href="mailto:sanjaypathaks@gmail.com">sanjaypathaks@gmail.com</a></td>
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<td>16</td>
<td>Herbal Disinfecting Wipes &amp; Towels</td>
<td>DIPAS, Delhi</td>
<td>M/s. Aimil Pharmaceuticals</td>
<td>2994/4, Street No. 17, Ranjeet Nagar, New Delhi - 110008</td>
<td>Dr. Anil Kumar Sharma Contact No. 9810515282 <a href="mailto:corporate@aimilpharmaceuticals.com">corporate@aimilpharmaceuticals.com</a></td>
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<td>M/s. Sarvotham Care (P) Ltd.</td>
<td>1-20-248, Umajay Complex, 1st Floor, Rasoolpura, Secunderabad - 500003</td>
<td>Mr. Sajan Kiran Contact No. 9816178373 <a href="mailto:sarvothamoff@sarvothamcare.com">sarvothamoff@sarvothamcare.com</a></td>
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<td>M/s Ambrosia Foods</td>
<td>317, Patpadiyanj Delhi -110092</td>
<td>Abhishek Jain 9811826118 011-65027424, 011-22143147 <a href="mailto:abhishek.ambrosia@gmail.com">abhishek.ambrosia@gmail.com</a></td>
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<td>M/s. Dalmia Bharat Sugar and Industries Ltd.</td>
<td>Vill. Jawaharpur, Distt. Sitapur, UP</td>
<td>Mr Navin Gupta Contact No. 9818517070</td>
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<td>Pune</td>
<td>Dr. Ajay Shankar Contact No. 9373324431 9860736073 <a href="mailto:rasgreensweet@gmail.com">rasgreensweet@gmail.com</a></td>
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<td>A-2/48, GD Steel Compound, Ghaziabad</td>
<td>Sh. Ajay Gupta 8800993936 <a href="mailto:gelcrafthealthcare@gmail.com">gelcrafthealthcare@gmail.com</a></td>
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<td>Herbo Shwas</td>
<td>DIPAS, Delhi</td>
<td>M/s Stella Enterprises</td>
<td>Old Khandsa Road Sector 37, HSIIDC, Gurugram, HR</td>
<td>Ms Geetika Batra Mob: 9717157108 0124-5046868 Fax: 01245046899 <a href="mailto:vp@stellaindustries.com">vp@stellaindustries.com</a></td>
</tr>
<tr>
<td>25</td>
<td>Hypochlorous Acid Liquid for Personnel Sanitization Equipment</td>
<td>INMAS, Delhi</td>
<td>M/s Megnit Enterprises</td>
<td>RZ-A1/7 Dwarkapuri, Vijay Enclave, Dadri, Palam Road New Delhi - 110045</td>
<td>Mr Mangat Sharma 9540389077</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Product</td>
<td>Laboratory</td>
<td>Industry</td>
<td>Detailed Address</td>
<td>Industry Contact Person</td>
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<td>26</td>
<td>IR-Based Body Temperature Probe (Non-contact type) Industrial/Domestic version</td>
<td>NPOL, Kochi</td>
<td>M/s Keltron Controls, Aroor</td>
<td>A unit of KSEDC Ltd Aroor, Alappuzha Kerala - 688534</td>
<td>Mr Abdul Haseeb VP 9895885323 <a href="mailto:haseeb@keltron.org">haseeb@keltron.org</a> <a href="mailto:kelkca@keltron.org">kelkca@keltron.org</a></td>
</tr>
<tr>
<td>27</td>
<td>Isolation Shelter</td>
<td>R&amp;DE (E), Pune</td>
<td>M/s Raksha Polycloats Pvt. Ltd</td>
<td>S-17, T Block MIDC Bhosari, Pune - 411026</td>
<td>Mr. Abhijit Sarkar 9823024322</td>
</tr>
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<td>28</td>
<td>Isolation Shelter</td>
<td>R&amp;DE (E), Pune</td>
<td>M/s Accurate Savan Defence Pvt. Ltd</td>
<td>S No 78/1, Dangat Industrial Estate, Shivane, Pune - 411023</td>
<td>Mr. Sunil Shivapurkar 7796688201</td>
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<tr>
<td>29</td>
<td>Isolation Shelter - Negative Pressure</td>
<td>DEBEL, Banglore</td>
<td>M/s Sure Safety (India) Pvt Limited</td>
<td>Plot-42, A/B, Yogi Nagar Township Besides Zenith Tin, NH48, Channi Vadodra Gujrat-391740</td>
<td>0265-2760150</td>
</tr>
<tr>
<td>30</td>
<td>Kiosk for COVID-19 Sample Collection (COVSACK)</td>
<td>DRDL, Hyderabad</td>
<td>M/s Vega Aviation Products Pvt Ltd</td>
<td>543, Vithaldev Lane, Shahapur, Belgaum - 590 003, Karnataka</td>
<td>Mr Suhas P Chandak, Director, 9845272888, <a href="mailto:suhas@vegaauto.com">suhas@vegaauto.com</a></td>
</tr>
<tr>
<td>31</td>
<td>Masks - Advanced (N99 Equivalent)</td>
<td>DRDE, Gwalior</td>
<td>M/s INTEC Safety, Kolkata</td>
<td>INTEC Safety, Madhurima House, 83 &amp; 84, Chanditala Main Road, Kolkata - 700053</td>
<td>033-24032001</td>
</tr>
<tr>
<td>32</td>
<td>Masks - Advanced (N99 Equivalent)</td>
<td>DRDE, Gwalior</td>
<td>M/s Nikhtish Engineering Pvt Ltd</td>
<td>S No 91/3, Plot 14-A, Shriyash Bunglow Shikshanagar, Lane 09, Paud Road Vanaz, Pune - 411038 Maharashtra</td>
<td>Mr Nikhil Topkar 9922992100</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Product</td>
<td>Laboratory</td>
<td>Industry</td>
<td>Detailed Address</td>
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<td>33</td>
<td>Masks - Advanced (N99 Equivalent)</td>
<td>DRDE, Gwalior</td>
<td>M/s Venus Industries, Mumbai</td>
<td>Venus Safety &amp; Health Pvt, Plot No. L-75/76, MIDC-Taloja, Tindre Village, Dist Raigad, MH - 410208</td>
<td>022-27410018/19/20 <a href="mailto:info@venussohs.com">info@venussohs.com</a></td>
</tr>
<tr>
<td>34</td>
<td>Medical Oxygen Plant</td>
<td>DEBEL, Banglore</td>
<td>M/s Trident Pneumatics Pvt Ltd</td>
<td>5/232, KNG Pudur road Somayapalayam PO Coimbtore - 641108</td>
<td>Shri A Suresh 9994978925 0422-2400492 <a href="mailto:a_suresh@tridentpneumatics.com">a_suresh@tridentpneumatics.com</a></td>
</tr>
<tr>
<td>35</td>
<td>Mobile Area Sanitization System</td>
<td>DJ, Jodhpur</td>
<td>M/s Preteck Engineers</td>
<td>11/931, Chpasni Housining Board, Jodhpur, Rajasthan - 342008</td>
<td>9414128534 <a href="mailto:preteck@rediffmail.com">preteck@rediffmail.com</a></td>
</tr>
<tr>
<td>36</td>
<td>Mobile Virology Research and Diagnostics Laboratory (MVRDL)</td>
<td>RCI, Hyderabad</td>
<td>M/s iClean</td>
<td>Integrated Clean Room Technologies Pvt Ltd 201 Sri Vensai Towers, Varuna Block, Kompally, Hyderabad - 500 014. Telangana</td>
<td>Shri TV Prasad 9959938884 <a href="mailto:tv.prasad@icleantech.com">tv.prasad@icleantech.com</a></td>
</tr>
<tr>
<td>37</td>
<td>Multi-purpose Access tool</td>
<td>DRDL, Hyderabad</td>
<td>M/s Sanjay Technoplast Pvt Ltd</td>
<td>F16 &amp; F17, MIDC Ranjangaon, Pune - 412220</td>
<td>Mr Sunil M Pathak <a href="mailto:sunil.pathak@sanjaygroup.in">sunil.pathak@sanjaygroup.in</a> 9158898070</td>
</tr>
<tr>
<td>38</td>
<td>Notesclean</td>
<td>RCI, Hyderabad</td>
<td>M/s Vijay Machine Tools, Telangana</td>
<td>D No 5-9-287/51 Plot No 51 Rajeev Gandhi Nagar Prashanti Nagar Industrial Area, Bala Nagar Hyderabad - 500037</td>
<td>Shri P Jyothish Baba 8008434343 <a href="mailto:vmt@rediffmail.com">vmt@rediffmail.com</a> <a href="mailto:vmt_12345@yahoo.co.in">vmt_12345@yahoo.co.in</a></td>
</tr>
<tr>
<td>39</td>
<td>Paper Disinfector</td>
<td>NPOL, Kochi</td>
<td>M/s Keltron Controls, Aroor</td>
<td>A unit of KSEDC Ltd Aroor, Alappuzha Kerala - 688534</td>
<td>Mr Abdul Haseeb VP 9895885323 <a href="mailto:haseeb@keltron.org">haseeb@keltron.org</a> <a href="mailto:kelkca@keltron.org">kelkca@keltron.org</a></td>
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<td>40</td>
<td>Pen Sanitizer</td>
<td>INMAS, Delhi</td>
<td>M/s Progenbiolab Technologies</td>
<td>Adarsh Nagar New Delhi - 110033</td>
<td>Mr Ritesh Viswakarma 95582933615</td>
</tr>
<tr>
<td>41</td>
<td>Personnel Sanitization Disinfectant Life Enhancer</td>
<td>HEMRL, Pune</td>
<td>M/s Speciality Products Research Group, Pune</td>
<td>1st Floor, Plot No 29/3, F-II Block, MIDC, Pimpri, Pune - 411018</td>
<td>Mr Shivraj N Ghatge 9823036877 Mr Ranveer Ghatge 8983650507</td>
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<td>42</td>
<td>Personnel Sanitization Disinfectant Life Enhancer</td>
<td>HEMRL, Pune</td>
<td>M/s Coherent Pharmaceuticals LLP, Pune</td>
<td>1st Floor, Narendra Industries, Opp. Praj Matrix, Lavasa Road, Urawade, Tal - Mulshi, Dist - Pune 412 115</td>
<td>Mrs Prajakta Naik 9075089892 <a href="mailto:coherentpharma@gmail.com">coherentpharma@gmail.com</a></td>
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<td>43</td>
<td>Personnel Sanitization Enclosure</td>
<td>VRDE, Ahmednagar</td>
<td>M/s DH Ltd, Ghaziabad</td>
<td>Om nagar Mohan Nagar, Mohan Nagar, Rajendra Nagar, Ghaziabad, Uttar Pradesh 201007</td>
<td>Mr Pradeep Dass +91 9810187498</td>
</tr>
<tr>
<td>44</td>
<td>Personnel Sanitization Equipment</td>
<td>CFEES, Delhi</td>
<td>M/s Scientific Components Pvt Ltd, Delhi</td>
<td>B-663, Ill Floor, MIG DDA Flats, East of Loni Road, Delhi - 110093</td>
<td>Tariq Khan <a href="mailto:sales@scientificcomponents.com">sales@scientificcomponents.com</a> 011-22813632 9810314779 9811367597</td>
</tr>
<tr>
<td>45</td>
<td>Personnel Sanitization Equipment (Fog based)</td>
<td>HEMRL, Pune(PerSan)</td>
<td>M/s Jayashree Electron Pvt. Ltd.</td>
<td>EL 34, ‘J’ Block, MIDC, Bhosari, Pune-411026</td>
<td>Mr Dhananjay Dabke (Director) 9975575111 Mr Santosh Dhage (Manager Marketing) 9975575114 d <a href="mailto:dabke@jayashree.co.in">dabke@jayashree.co.in</a> <a href="mailto:sales@jayashree.co.in">sales@jayashree.co.in</a></td>
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<td>46</td>
<td>Personnel Sanitization Equipment</td>
<td>INMAS, Delhi</td>
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<td></td>
<td>(Also Named as Disinfection Tunnel)</td>
<td>M/s Hero Motorcorps Ltd</td>
<td>Khasra, No-67, Kila No-8/1, Musti Opp Royal Public School Wazirpur, Gurugram Haryana - 122505</td>
<td>Mr Harjeet Singh 9810005910 9818772245</td>
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<tr>
<td>47</td>
<td>Pneumatic Sealant Applicator Assembly</td>
<td>DRDL, Hyderabad</td>
<td>M/s.Venkateshwar Aerospace Private Ltd</td>
<td>Pahadi Shareef Hyderabad – 501218</td>
<td>Mr CSN Reddy 9849012228</td>
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<td>48</td>
<td>Pneumatic Sealant Applicator Assembly</td>
<td>DRDL, Hyderabad</td>
<td>M/s.CNC India Tools &amp; Services (P) Ltd</td>
<td># A320, 7th Main Road, 2nd Stage, Peenya Industrial Area Phase IV, Peenya, Bengaluru, Karnataka - 560058</td>
<td>Mr Venkatesh Reddy 9845079769</td>
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<td>49</td>
<td>Pocket Sanitizer</td>
<td>INMAS, Delhi</td>
<td>M/s Progenbiolab Technologies</td>
<td>Adarsh Nagar New Delhi - 110033</td>
<td>Mr Ritesh Viswakarma 95582933615</td>
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<td>50</td>
<td>Portable Backpack Area Sanitization Equipment</td>
<td>CFEES, Delhi</td>
<td>M/s ASKA Equipment Delhi</td>
<td>R-482, Shankar Rd, Block R, New Rajendra Nagar, Part 1, Delhi 110060</td>
<td>Kamlesh Dhuria 011-49458800 011-49458820</td>
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<td>51</td>
<td>Portable Backpack Area Sanitization Equipment</td>
<td>CFEES, Delhi</td>
<td>M/s CEASE Fire Equipment Delhi</td>
<td>Plot no 2&amp;3 kh.No.17/19 near MCD school matiala extn. Uttam Nagar - 110059</td>
<td>Raj Anand 8130521310 Madhu Menon 9999075115 Manoj Kumar Singh 8448395301</td>
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<td>52</td>
<td>PPE Seam Sealant</td>
<td>NMRL, Ambernath</td>
<td>M/s VCM, Mumbai</td>
<td>VCM Polyurethanes P Ltd W134/135 MIDC Ph II Dombivali(E) Dist Thane Pin 421204</td>
<td>K B Chhabria 9322407160</td>
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<td>53</td>
<td>PPE Seam Sealant</td>
<td>NMRL, Ambernath</td>
<td>M/s Setco Chemicals Pvt Ltd, Mumbai</td>
<td>S.No 72. Plot No 64 to73 Dewan and Shah Indl Estate Waliv Fhata Vasai East Thane Dist Waliv Phata 201408</td>
<td>Yogesh Solanki 9820218266</td>
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<td>54</td>
<td>PPE Type A</td>
<td>INMAS, Delhi/ADRDE Agra/DRDE Gwalior</td>
<td>M/s Gokuldas Exports, Bangalore</td>
<td>#16/2, Residency Rd, Shanthala Nagar, Ashok Nagar, Bengaluru, Karnataka 560025</td>
<td>080-41272200/46191500 infogokaldasexports.com</td>
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<td>55</td>
<td>PPE Type A</td>
<td>INMAS, Delhi/ADRDE Agra/DRDE Gwalior</td>
<td>M/s Kusumgar Corporates Private Ltd</td>
<td>101, Manjushree, V.M. Road, J.V.P.D., Vile Parle (West), Mumbai – 400 056, Maharashtra, India.</td>
<td>Phone: + 91 ( 22 ) 611 25139 Phone: + 91 ( 22 ) 611 25100 Fax: + 91 ( 22 ) 261 15651 <a href="mailto:info@kusumgar.com">info@kusumgar.com</a></td>
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<tr>
<td>56</td>
<td>PPE Type A</td>
<td>INMAS, Delhi/ADRDE Agra</td>
<td>M/s Radnik Exports Ltd</td>
<td>D-175, Sector-63, Noida, U.P. 201307</td>
<td>Gaurav Nagpal 9818071102</td>
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<td>57</td>
<td>PPE Type A</td>
<td>INMAS, Delhi/ADRDE Agra</td>
<td>Ms/ Icon Designs</td>
<td>184/167, Wajidpur, Jajmau, Kanpur - 208010 INDIA.</td>
<td>Samarjit 9839012910</td>
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<td>58</td>
<td>PPE Type A</td>
<td>INMAS, Delhi/ADRDE Agra</td>
<td>M/s Qualiance international pvt.ltd</td>
<td>D. No: 5/491-R, Lakshmi Nagar, Vengamedu, Angeripalayam Road, Chettipalayam Village, Tirupur 641603, Tamil Nadu, INDIA.</td>
<td>Telephone: +91 421 2485001 Fax: +91 421 2475002</td>
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<td>Sr. No.</td>
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<td>59</td>
<td>PPE Type A</td>
<td>INMAS, Delhi/ADRDE Agra</td>
<td>M/s Aruna Clothing Company</td>
<td>No 53/1b&amp;56/1d Multi Nagar Main Road Multi Nagar Industrial Area Gerugambakkam Chennai - 600122.</td>
<td>Mr. B. Karunakaran +91 9840664833 - <a href="mailto:karunakaran@aruna.in">karunakaran@aruna.in</a></td>
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<tr>
<td>60</td>
<td>PPE Type B</td>
<td>DRDE, Gwalior</td>
<td>M/s Pioneer Hygiene Products</td>
<td>268-270, GIDC Pandesara, Surat-394221, Gujrat</td>
<td>Ashish Vaidya 9925031972</td>
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<tr>
<td>Sr. No.</td>
<td>Product</td>
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<td>Industry</td>
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<td>65</td>
<td>Sanitization Shoe Mat</td>
<td>DIPAS, Delhi</td>
<td>M/s Macro Scientific Works Pvt Ltd</td>
<td>B-35/3, GT Karnal Toad Industrial Area Delhi -110033</td>
<td>Rajiv Manchanda Director 9810110476 011-48494849</td>
</tr>
<tr>
<td>66</td>
<td>Sanitization Shoe Mat</td>
<td>INMAS, Delhi</td>
<td>M/s Satya Traders</td>
<td>P-29, Shivaji Road, Aadarsh Nagar New Delhi - 110033</td>
<td>Mr Ashok Mahajan 9990605604</td>
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<tr>
<td>67</td>
<td>Sanitizer</td>
<td>DJ, Jodhpur</td>
<td>M/s Preteck Engineers</td>
<td>11/931, Chopsani Housing Board, Jodhpur, Rajasthan - 342008</td>
<td>9414128534 <a href="mailto:preteck@rediffmail.com">preteck@rediffmail.com</a></td>
</tr>
<tr>
<td>68</td>
<td>Sanitizer</td>
<td>DJ, Jodhpur</td>
<td>M/s Tomar Scientific Corporation</td>
<td>Bhati Bhawan, Opp Police Line, Ratanada Road, Jodhpur, Rajasthan - 342011</td>
<td>9828587890</td>
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<tr>
<td>69</td>
<td>Sanitizer (IPA sanitizer based on WHO guidelines)</td>
<td>RCI, Hyderabad</td>
<td>M/s Sri Polymers</td>
<td>Plot No 6, Road No 15-D, Industrial Park, Nacharam, Hyderabad, Telanagana - 500076</td>
<td>Srinivas 9848017408</td>
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<tr>
<td>70</td>
<td>Sanitizer (IPA sanitizer based on WHO guidelines)</td>
<td>RCI, Hyderabad</td>
<td>M/s Photon Lifesciences LLP</td>
<td>Plot No 15, Sri Mahalakshmi Cooperative Society, Tirumalgherry, Secundrabad, Telangana - 500015</td>
<td>Kiran Kumar Rampally 8106977446</td>
</tr>
<tr>
<td>71</td>
<td>Sanitizer</td>
<td>DRDE, Gwalior</td>
<td>M/s Gwalior Alco Brew Pvt Ltd, Gwalior</td>
<td>Village Jitawali Rairu farm, Kuleth Road, AB Rd, Gwalior, Madhya Pradesh</td>
<td>0751-2568308 <a href="mailto:cc@gapl.co.in">cc@gapl.co.in</a></td>
</tr>
<tr>
<td>72</td>
<td>Sanitizer</td>
<td>DRDE, Gwalior</td>
<td>M/s Shreenath Ji Chemicals, Bhopal</td>
<td>Plot No-97, Sector-A, Industrial Area, Mandideep, Raipur, Madhya Pradesh 462046</td>
<td>7480401531 <a href="mailto:info@shrinathjichemicals.in">info@shrinathjichemicals.in</a></td>
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<tr>
<td>Sr. No.</td>
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<td>73</td>
<td>Sanitizer</td>
<td>TBRL, Chandigarh</td>
<td>M/s Alliance Formulations</td>
<td>Plot No 30B, 31-32, EPIP, Phase-I, Jharmiri, Baddi, Dist Solan, Himachal Pradesh -173205</td>
<td>Mr Rajesh 9417206800</td>
</tr>
<tr>
<td>74</td>
<td>Sanitizing Car Mat</td>
<td>DIPAS, Delhi</td>
<td>M/s Macro Scientific Works Pvt Ltd</td>
<td>B-35/3, GT Karnal Toad Industrial Area Delhi -110033</td>
<td>Rajiv Manchanda Director 9810110476 011-48494849</td>
</tr>
<tr>
<td>75</td>
<td>Sanitizing Car Mat</td>
<td>INMAS, Delhi</td>
<td>M/s Satya Traders</td>
<td>P-29, Shivaji Road, Aadarsh Nagar New Delhi - 110033</td>
<td>Mr Ashok Mahajan 9990605604</td>
</tr>
<tr>
<td>76</td>
<td>Sewak - Robot for Medical Use</td>
<td>CAIR, Bengaluru</td>
<td>M/s Apollo Microsystems Ltd Hyderabad</td>
<td>Plot No 128, Road No 12, IDA Mallapur Hyderabad - 500076 Telanagana</td>
<td>Addepalli Krishna Kumar Sai 9246247993</td>
</tr>
<tr>
<td>77</td>
<td>Sewak - Robot for Medical Use</td>
<td>CAIR, Bengaluru</td>
<td>M/s MTAB Engineers Pvt Ltd</td>
<td>G26A SIDCO Industrial Estate Kaakalur Tiruvallur, Tamilnadu - 602003</td>
<td><a href="mailto:sales@mtabindia.com">sales@mtabindia.com</a> 9444395852</td>
</tr>
<tr>
<td>78</td>
<td>Sewak - Robot for Medical Use</td>
<td>CAIR, Bengaluru</td>
<td>M/s Comint Systems and Solutions Pvt Ltd</td>
<td>Eden Amsri Square, Office no. 307 &amp; 308, 3rd Floor, St. John's Road, Secunderabad - 500 026, Telangana, India</td>
<td>L. Rambabu, Managing Director Tel: +91-40-2780 2235 Fax: +91-40-2780 2234 Mob: +91-98499 50840 Email: <a href="mailto:comint@comintindia.com">comint@comintindia.com</a></td>
</tr>
<tr>
<td>79</td>
<td>Sewak - Robot for Medical Use</td>
<td>CAIR, Bengaluru</td>
<td>M/s Larsen &amp; Toubro Limited</td>
<td>L&amp;T Defence, Swami Vivekananda Road, Rajana Colony, C V Raman Nagar, Bengaluru - 560 093, Karnataka</td>
<td>Email: <a href="mailto:defblrmkt@larsentoubro.com">defblrmkt@larsentoubro.com</a></td>
</tr>
<tr>
<td>80</td>
<td>Single Outlet Automatic Resuscitator</td>
<td>DEBEL, Bangalore</td>
<td>M/s ITI Limited</td>
<td>Doorvani nagar Bengaluru</td>
<td>TS Sudhaka, AGM 080-28503671 9901068688</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Product</td>
<td>Laboratory</td>
<td>Industry</td>
<td>Detailed Address</td>
<td>Industry Contact Person</td>
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<td>81</td>
<td>Trolley Mounted Large Area Sanitization Equipment</td>
<td>CFEES, Delhi</td>
<td>M/s ASKA Equipments, Delhi</td>
<td>R-482, Shankar Rd, Block R ,New Rajendra Nagar, Part 1, Delhi 110060</td>
<td>Kamlesh Dhuria 011-49458800 011-49458820</td>
</tr>
<tr>
<td>82</td>
<td>Trolley Mounted Large Area Sanitization Equipment</td>
<td>CFEES, Delhi</td>
<td>M/s CEASE Fire Equipment Delhi</td>
<td>Plot no 2&amp;3 kh.No.17/19 near MCD school matiala extn. Uttam Nagar - 110059</td>
<td>Raj Anand 8130521310 Madhu Menon 9999075115 Manoj Kumar Singh 8448395301</td>
</tr>
<tr>
<td>83</td>
<td>Ultra Swacch - PPE Disinfection unit</td>
<td>INMAS, Delhi</td>
<td>M/s Gel Craft Healthcare Pvt Ltd</td>
<td>A2/48, GD Steel Compound Site-4, Industrial Area, Sahibabad, Ghaziabad, UP-201010</td>
<td>Mr Ajay Gupta Mo. 9810717192</td>
</tr>
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<td>84</td>
<td>UV Blaster - UV Based Area Sanitization</td>
<td>LASTEC, Dehi</td>
<td>M/s New Age Instruments &amp; Materials</td>
<td>12-15, 2nd Floor Apna Enclave, Shopping Complex Railway Road Gurugram</td>
<td>Tapan Sharda Sameer Sharda 0124-4086513/14/16 7011801108</td>
</tr>
<tr>
<td>85</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Ananth Technologies Ltd</td>
<td>Plot No 39, Ananth Info Park HiTech City, Phase - II Madhapur Hyderabad - 500081</td>
<td>Mr Y Chaterji <a href="mailto:ychaterji@ananthtech.com">ychaterji@ananthtech.com</a> 9000661730</td>
</tr>
<tr>
<td>86</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Fusiontek Pvt Ltd</td>
<td>Dwarka, New Delhi</td>
<td>Ram Upadhyaya 9892025783</td>
</tr>
<tr>
<td>87</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Indicent Medical Devices</td>
<td>3E/15 Jhandewalan Extn New Delhi - 110035</td>
<td>Dr Bobin Saluja <a href="mailto:drbobin@gmail.com">drbobin@gmail.com</a> 9810294477 011-41543747</td>
</tr>
<tr>
<td>88</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s E Connect Systems</td>
<td>K-197, MIDC Industrial Area Waluj, Aurangabad, Maharashtra</td>
<td>Mrs Prajaka Kulkarni 9657716142</td>
</tr>
<tr>
<td>89</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Harida Enterprises Pvt Ltd</td>
<td>Chennai</td>
<td>Mr R Subramanian 9940020316 info@haridraenterprises.</td>
</tr>
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<td>Industry</td>
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<td>90</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Maxwell Medical Engineering</td>
<td>Manjusar, Lambdpura Road Savli, Vadodara</td>
<td>Mr Vittahal Tripathi 9838915701</td>
</tr>
<tr>
<td>91</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Matrix Integrated Products Pvt Ltd</td>
<td>D2, Gali No 105, Sagar Complex Nashik Highway, Ovali, Bhiwandi Mumbai - 421302</td>
<td>Mr Tejas 7045947045</td>
</tr>
<tr>
<td>92</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Synopsis India</td>
<td>B-501, Waterridge, Undri Pune</td>
<td>Mr Tarun Chawla 9975899106</td>
</tr>
<tr>
<td>93</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Pyrotech Electronics Pvt Ltd</td>
<td>F16A, Road No 3 MIA Madri, Udaipur Rajasthan</td>
<td>Ruchir Bapna 08209192488</td>
</tr>
<tr>
<td>94</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Theta Controls</td>
<td>1, Electronic Estate Satara Road Pune 411009</td>
<td>Raja Mahubhani 09923107771 <a href="mailto:raja@thetacontrols.com">raja@thetacontrols.com</a></td>
</tr>
<tr>
<td>95</td>
<td>UV Sanitization Box</td>
<td>INMAS, Delhi</td>
<td>M/s Lab India Instruments Pvt Ltd</td>
<td>202, Nand Chambers, LBS Marg Thane (Near Vandan Cinema) Mumbai Maharashtra - 400602</td>
<td>Mr Lalit Bambahani 022-25986000 9867571114</td>
</tr>
<tr>
<td>96</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Macro Scientific Works Pvt Ltd</td>
<td>B-35/3, GT Karnal Toad Industrial Area Delhi -110033</td>
<td>Rajiv Manchanda Director 9810110476 011-48494849</td>
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<tr>
<td>97</td>
<td>UV Sanitization Box</td>
<td>DIPAS, Delhi</td>
<td>M/s Unitech Technocrates</td>
<td>Village Meerpur Gurudwara, Post Office Trilokpur Tehsil Nahan, District Sirmour Himachal Pradesh</td>
<td>Ashutosh Garg 9355575276 8198982206</td>
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<tr>
<td>98</td>
<td>UV Sanitization Box - Vertical (For Masks)</td>
<td>INMAS, Delhi</td>
<td>M/s Precious Life Care</td>
<td>21/31, West Patel Nagar Delhi</td>
<td>Mr Mohit Agarwal 9826951655 991170071</td>
</tr>
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<td>99</td>
<td>UV Sanitization Handheld Device</td>
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<td>Ram Upadhyaya 9892025783</td>
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<td>102</td>
<td>UV Sanitization Handheld Device</td>
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<td>K-197, MIDC Industrial Area Waluj, Aurangabad, Maharashtra</td>
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<td>Chennai</td>
<td>Mr R Subramanian 99400020316 <a href="mailto:info@haridraenterprises.com">info@haridraenterprises.com</a></td>
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<td>Mr Tejas 7045947045</td>
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</tr>
<tr>
<td>110</td>
<td>Vehicle Sanitization System (Fog Based)</td>
<td>HEMRL, Pune</td>
<td>M/s Jayashree Electron Pvt. Ltd.</td>
<td>EL 34, ‘J’ Block, MIDC, Bhosari, Pune-411026</td>
<td>Mr Dhananjay Dabke (Director) 9975575111 Mr Santosh Dhage (Manager Marketing) 9975575114 <a href="mailto:d.dabke@jayashree.co.in">d.dabke@jayashree.co.in</a> <a href="mailto:sales@jayashree.co.in">sales@jayashree.co.in</a></td>
</tr>
</tbody>
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