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1. Introduction Electric vehicles have the potential to offer numerous benefits to society like as enhanced air quality in municipalities and metropolises and reduced carbon dioxide emigration from road transport(depending on the source of the electricity). still, they're veritably different from conventional vehicles and present some new safety hazards. easily, electric vehicles aren't innately unsafe, nor will they inescapably expose the public to lesser pitfalls than internal combustion machine vehicles. nonetheless, there's always the eventuality for unintended consequences whenever a new technology is introduced. However, also it is important that vehicle safety regulations keep pace with new technology If similar consequences are to be minimized. Electric Vehicles are the most advanced vehicles presently running on the road. There's a host of safety features included in these vehicles as either standard eliminations or voluntary add-ons. These advanced features form a part of the safety net integrated into these vehicles. The safety features depend on a number of detectors and cameras. These work together to either advise the motorist of implicit safety pitfalls, take full control of the vehicle, or control only the throttle and thickets. The electric vehicle system shall be designed to operate safely in all conditions; a number of specific problems will be treated, concentrating on aspects of vehicle genre which are typical for electric vehicles. At this moment the norms and sanctioned regulations concerning electric road vehicles aren't veritably easily defined.

1.2 Need of Project Electric vehicles represent a completely different technology compared with internal combustion machines. This means that new safety hazards, substantially related to the characteristics of high-power electric outfits, may be present. The electric vehicle system shall be designed to operate safely in all conditions; a number of specific problems will be treated, concentrating on aspects of the vehicle genre which are typical for electric vehicles. Currently, the norms and sanctioned regulations concerning electric road vehicles aren't veritably easily defined. The documents and norms are far from harmonized, and they cover a vehicle in full technological elaboration. Another aspect is the cerebral mindfulness of these " new " pitfalls the presence of high voltages or of battery chemicals may use as an argument against electric vehicles; the fact that internal-combustion machine vehicles present large pitfalls too is frequently overlooked, people having progeny used to the peril. While there have been reports of EV fires, it's largely doubtful that Li-ion battery fires are noway robotic. The underpinning cause is generally physical damage, similar to an auto crash, or that the batteries have exceeded their safe operating temperature. Both these implicit pitfalls have been addressed in utmost EVs. EV batteries are defended in a crash-resistant, tamper-evidence structure. To add a subcaste of safety, EVs have a system that automatically disconnects the battery during crashes. There are multiple detectors that descry a collision, and the special pyre fuses are touched off to cut the connection from high-voltage lines. This process takes place within milliseconds. German automotive expert Bosch introduced a system to cover the battery. When the airbag is touched off a small wedge drives into the connecting lines and cuts all high-voltage connections to the battery. This system keeps the battery safe, in the event of a crash. However, it takes significantly longer for the battery to light up, as compared to petrol or diesel vehicles, If the auto faces a major accident that induces a fire. This adds precious time for you to void and for help to arrive.

1.3 Target Community of Project Electric vehicle owners: The primary target community for electric vehicle safety products are the owners of electric vehicles. These individuals are looking to ensure the safety of their vehicle and themselves while driving or charging their EV. Fleet operators: Fleet operators of electric vehicles, such as ride-sharing companies, delivery services, and public transportation, are also a crucial target community. They need to ensure the safety of their passengers, drivers, and vehicles while on the road, making safety products a necessity. Electric vehicle charging station operators: Charging station operators need to ensure the safety of customers while they charge their vehicles. They require safety products such as charging station voltage limiters, grounding systems, and surge protectors. Emergency responders: Emergency responders such as firefighters, police officers, and medical professionals may be called upon to respond to an accident involving an electric vehicle. Safety products can assist these responders in handling any emergencies that may arise. Electric vehicle manufacturers: Manufacturers of electric vehicles have a vested interest in ensuring the safety of their customers. Safety products can be integrated into the design of EVs to enhance safety features, and manufacturers can also recommend and sell these products to their customers.

1.4. Scope of Project 1. Developing and implementing a comprehensive electric safety management system for organizations. 2. Conducting safety audits of electric systems and identifying potential hazards and risks 3. Developing and conducting electric safety training programs for employees and contractors 4. Developing and implementing procedures for safe work practices around high voltage equipment 5. Developing and implementing emergency response plans for electric accidents and incidents 6. Conducting risk assessments for electric installations and equipment 7. Investigating electric accidents and incidents and identifying root causes 8. Implementing control measures to mitigate identified risks 9. Developing and implementing maintenance programs for electric systems and equipment 10. Researching and developing new technologies to improve electric safety.

1.5. Objective of Project The main idea of a design related to the safety of electric vehicles is to develop effective and practical results that can help or minimize the circumstance of accidents, injuries, or losses involving these types of vehicles. The focus should be on relating implicit hazards associated with operating or maintaining electric vehicles(e.g., battery-related pitfalls, electrical shock hazards, etc.), and developing strategies to alleviate those pitfalls. Other objects may include assessing the effectiveness of safety regulations and norms, assessing different types of safety systems(similar as detector-grounded technologies), and educating consumers and motorists on stylish practices for using and maintaining electric vehicles safely. Eventually, the thing is to produce a safer terrain for individuals who enjoy, operate, or come into contact with electric vehicles in colorful settings. Safety may not be the first consideration, but it's the most important bone. Safety will need to be understood from an edge point that not only looks at the Li-ion batteries of EVs but the entire ecosystem, similar to charging stations and stationary grid-scale storehouse systems. Several considerations similar as bordering terrain, propinquity to populations, and countermeasures accepted by fire first askers will need to be regarded in to minimize the impact of similar fire pitfalls.

1.6. Gantt chart Fig. 1.1.1 Gantt chart of project completion plan Fig. 1.1.2. Gantt chart of work distribution

2. Literature Survey The electric hazards can be divided into two main orders electric shock hazards and bow flash hazards. In some rare cases, the ferocious electromagnetic fields have to be considered in work safety, but these enterprises are limited to rare special fields, like radar outfits and high-power communication links and base stations. In the field of electrical work in electric installations in structures, the practices and conventions have been formed over decades and exploration of work safety and accidents is done. In her doctoral discussion, Tulonen(2010) reviewed the exploration done on the safety of electrical work and canvassed Finnish electricians and their elders. Tulonen linked working in a hurry as the main threat to electric accidents. nearly anyone working in the field has endured or witnessed an electric shock during their working life. According to Tulonen, the underreporting of accidents is a problem, but the overall electric safety position in Finland is good in global comparison. Working in a hurry leads to forgetting introductory safety procedures (de-energizing, voltage testing, and earthing). As Batra and Ioannides(2001) note, comparing electrical work safety between different countries is delicate because of differences in how accident data is defined and recorded. In their review composition, the authors note that although there's a downcast trend in fatal electric accidents, electricity is still a common killer among workers, especially those performing electrical tasks. To review the former exploration made on electric vehicle electric work safety, search with expressions " electric vehicle electric safety ", " electric vehicle electric work safety ", " electric vehicle electric shock " and " electric vehicle electric hazard " were made in Elsevier ScienceDirect, Scopus, Google Scholar, Web of Science and IEEE Explore. From the results, the papers dealing with factual electric work safety for form, conservation, crash recovery, roadside backing, and recycling are picked for examination, performing only in 7 papers, which are bandied below. As electric vehicles are a relatively new product in the request, only many publications on electric safety of electric vehicles live. In their conference paper, Kjosevski etal.(2017) point out that there's only a little experience with electric vehicles and the area will have to be upgraded formerly there's further information available. The authors emphasize the fire safety of electric vehicles and review some accidents leading to a battery fire. In their review composition, Wang et al.(2019) assess the fire safety and failure mechanisms of lithium-ion batteries and conclude that with the presently available data, it's delicate to conduct a realistic threat assessment for lithium battery systems and further thermal raw tests and combustion tests for large scale lithium batteries are necessary to give the missing data. poisonous gas generation and difficulties in extinguishing the fire are bandied also, in comparison to a traditional vehicle fire.

Freschi etal.(2017) substantiate that because electric vehicles are systems isolated from the ground, there is no direct contact electrical hazard unless a bipolar contact is made or two separate different faults do in the system. When charging an electric vehicle, the electric safety is dependent on the safety of the coliseum. Freschi etal.(2018), the authors conclude that a high position of safety is achieved with a 30- ma residual current device and ground circle monitoring. As Visvikis(2012 and 2013) points out, the trouble of an electric shock for passengers indeed in a crash situation is minimal and there are strict UN regulations for crash and functional safety of electric vehicles. The papers concentrate on functional safety, not electric safety for service or delivery labor force. The extant literature covered colorful styles of EV relinquishment like check- grounded studies(Lieven, 2015; Adnan etal., 2018; Sovacool etal., 2019), optimization ways(Onat etal., 2016; Xiong etal., 2018), data collected from motorists(Skippon etal., 2016; Berkeley etal., 2018), secondary data analysis(Sierzchula etal., 2014), and so on. also, the literature also reflects country-specific programs and ecosystems. For illustration, European countries like France or Norway are well. Studies covering multiple confines of EV relinquishment across countries, including charging structure(Chen etal., 2017; Dorcec etal., 2019), programs and impulses(Sierzchula etal., 2014; Bjerkan etal., 2016; Melton etal., 2017), business models(Wu, 2019; Nian etal., 2019; Yoon etal., 2019), among others. Review papers concentrated on specific aspects of EV relinquishment have started arising. For case, Hardman(2019), Biresselioglu etal.(2018), and Rezvani etal.(2015) independently explored the part of reenacting and nonfinancial impulses for draw-in mongrel electric vehicle(PHEV) relinquishment, electric mobility in the European environment, and the motorists and walls for EV relinquishment grounded on theoretical perspectives. Although the fairly ample empirical substantiation available on the colorful factors of EV relinquishment and the advantages of EV has been extensively honored, a question remains why is EV relinquishment so delicate? What are other critical factors that are still substantially unexplored? For case, utmost of the former studies has concentrated on either the antecedents or consequences(Sierzchula etal., 2014; Berkeley etal., 2018) with a lower focus on interceding or moderating variables. The relationship among these variables is still substantially unmapped. also, former literature substantially concentrated on the check- grounded studies(Adnan etal., 2018; Sovacool etal., 2019), optimization ways(Onat etal., 2016), or secondary data analysis and prognostications(Onat etal., 2018; Choi etal., 2018) to understand the EV relinquishment in some specific country or regions and may have limited policy counteraccusations. therefore, there's a need to collate this indigenous perceptivity and draw conclusions judiciously.
Extant literature has substantially unheeded the multifaceted, miscellaneous, and segmented characteristics of the EV request(Brand etal., 2017). Indeed though the consumer preferences for EV vary grounded on a blend of emblematic , environmental, profitable, andpro-societal benefits, there's a dearth of exploration landing the wide diapason of factors related to EV relinquishment(Axsen etal., 2015). likewise, these factors vary from country to country and also across societies(Kaptan etal., 2013; Spencer etal., 2015; Wang etal., 2016). Hence, there's a need to collate thesecross-cultural findings to understand EV relinquishment(Spencer etal., 2015; Wang etal., 2016). In this study, we contribute to the being EV sphere by exploring the comprehensive diapason of antecedents, consequences, intercessors, and chairpersons from applicable literature across countries and societies to draw meaningful perceptivity. For this purpose, an integrative review would be suitable to comprehend the development of this arising content by furnishing a clear understanding in the form of a abstract frame or exploration docket(Torraco, 2016; Alcayaga etal., 2019). There are proven utility of similar integrative reviews in multiple disciplines of literature like, Psychology(Galvan and Galvan, 2017), information systems(Bandara etal., 2011), mortal resource development(Rastogi etal., 2018), medical(Morgan etal., 2015), biology(Pautasso, 2013), as well as in the operation(Seuring and Gold, 2012; Torraco, 2016; Alcayaga etal., 2019). lately, an integrative literature review by Alcayaga etal.(2019) on the smart- indirect system provides non intercourses among generalities and develop a abstract frame that integrates crucial constructs. Hence, it's needed to claw into the entire EV relinquishment literature totally and comprehend these findings to develop a abstract frame integrating crucial constructs. This study tries to answer the stated exploration questions by using an integrative literature methodology. The review protocol identifies 239 Scopus Q1 papers grounded on the EV relinquishment, and latterly synthesize their findings. Specifically, this study makes the following benefactions. First, the integrative frame exhumes all the antecedents and consequences of the EV relinquishment, deduced from a wide range of high- quality literature while mapping out the nomological network. Second, the review frame captured developments at all three sustainability confines as consequence variables, which in turn give numerous perceptivity to image trustability and sustainability. Third, the literature analysis helps us to understand the literature groups, trends, ways, and exploration issues. Further, grounded on the exploration frame, we classify both walls and motivators distinctly along with segment-wise policy recommendations, which would grease academicians and policymakers likewise to understand the complications of EV relinquishment and unborn course of action.
3. Design Methodology 3.1 System requirements and Specifications Safety Features to be used 1. Braking System 2. Seatbelt Alarm System 3. Smoke Alarm System 4. Fire Extinguisher 5. TPMS 1. Braking System ? System requirements Fig 3.1.1 Drum brake

Fig 3.1.2. Drum brake in differentiator When the automobilist way on the foot pedal, the power is amplified by the pedal supporter(servo system) and changed into hydraulic pressure(engine oil-pressured) by the master cylinder. The pressure reaches the brakes on the machine via tubing filled with engine brake oil -(thicket fluid). The delivered pressure pushes the pistons on the brakes of the four switches. The pistons press the thicket stuffings, which are disunion paraphernalia, against the inside shells of the thicket cans which rotate with the machine. The paddings are pressed on the rotating cans, which in turn brake the machine, thereby breaking down and stopping the vehicle. hinder can thickets are used primarily to reduce rolling resistance. The section thicket pads have the tendency to slightly drag on the rotors as the vehicle is rolling. Drum thickets, just by the nature of their design, do not have this tendency. Drag deduction leads to increased availability. As explained, EVs are suitable for getting all the retardation they need in non- exigency situations from regenerative deceleration. Hence, the disunion thickets are only demanded to give enough stopping power to make up the difference in an exigency situation. Due to dynamic weight transfer during retardation in the maturity of buses, all retarding power is handed by the anterior thickets.

Back stoppers are left with no important work to do. operation of drum brakes can optimize for effectiveness and life rather than raw stopping power. 1. As the stopper pedal is pressed, it compresses the fluid in the master cylinder and allows the piston of the wheel cylinder to expand outward. 2. The outside stir of the piston of the wheel cylinder forces the stopper shoe outward against the stopper can. 3. As the stopper shoe lining touches the inner face of the can, and due to the friction generated between the stopper shoe and barrel, the stir of the wheel reduces, and the vehicle stops. 4. As the force is removed from the stopper pedal, the renouncing springs draw the stopper shoe inward, and the contact between the friction padding and can end. Now again the stopper is ready to apply. 5. A fitting screw is present at the bottom, which is used to maintain a minimal gap between the barrel and stopper shoe. 6. When the padding of the stopper shoe is worn out than the gap between the can and stopper shoe increases, at that time the adjuster is acclimated again to maintain the minimal gap.

Fig 3.1.3. Drum brake internal construction The whole assembly is fitted to the rear plate of the wheel. The rear plate remains stationary and it does not rotate with the wheel. 1. Brake Drum: It is a cast iron housing which is used to stop the vehicle with the help of paddle shoe. The drum brake is attached to the centre joint of the wheel. It rotates with the hub. 2. Brake Shoe: It is the rough part of the pedal brake, without it the working of the brake is not possible. The stopper shoe has brake lining at its outer curve. It is the stopper lining which makes contact with brake drum during the stopping of the vehicle. It is of two types. (i) Primary stopper shoe: The shoe having large lining material is called as primary shoe. (ii) Secondary stopper shoe: The shoe with small lining material is called secondary shoe.

3. Wheel Cylinder: It is used to press the brake shoe outward to apply the brake. The wheel cylinder is connected to the master cylinder. It contains piston which moves away from line when brake is applied and press the brake shoe towards inner surface of the drum. 4. Return or Retracting Spring: It is used to retract the brake shoe after brake is applied. Two springs are there in drum brake, one for the primary and other one is for secondary. 5. Self Adjuster: It maintain the minimum gap between the brake shoe and drum so that they do not contact each other when pedal is not pressed. In the case if the brake lining wear out, and gap increases in between the shoe and drum, It can be adjusted again to maintain the gap between shoe and drum inner surface.

• Specifications Drum brakes have been a popular choice for electric vehicles due to their simplicity and reliability. However, with the increasing demand for higher performance and efficiency, manufacturers are now developing more advanced drum brake systems with improved specifications. Some of the key specifications of drum brakes for electric vehicles include: 1. Size: The size of the drum brake is an important specification that affects its performance. The size is typically measured in terms of the diameter and width of the drum. Larger drums provide better braking performance and are suitable for heavier electric vehicles. 2. Material: The material used in the construction of the drum brake affects its durability, heat dissipation, and overall performance. Common materials used include cast iron, aluminum, and steel. 3. Brake lining: The brake lining is a crucial component of the drum brake that provides friction against the drum to slow down the vehicle. The quality and composition of the lining affect the braking performance and lifespan of the brake system. 4. Hydraulic or mechanical: Drum brakes can be either hydraulic or mechanical, depending on the type of vehicle and application. Hydraulic drum brakes use fluid pressure to activate the brake shoes, while mechanical drum brakes use a cable or lever system to engage the brakes. 5. Self-adjusting mechanism: Some drum brakes come with a self-adjusting mechanism that automatically adjusts the clearance between the brake shoes and drum as they wear down. This ensures consistent braking performance and reduces maintenance requirements. 6. Heat dissipation: Drum brakes generate a significant amount of heat during braking, which can affect their performance and lifespan. Advanced drum brake systems come with features such as cooling fins or ventilation holes to improve heat dissipation and prevent overheating. 7. Anti-lock retardation system(ABS) ABS is a safety point that prevents the bus from locking up during hard retardation, perfecting control and stability. Some barrel boscage systems come with integrated ABS systems for advanced safety and performance.

2. Seatbelt Alarm System 2.1 Seatbelts 2.2 Seatbelt Alarm System 2.1 SeatBelt Fig 3.1.4. Seatbelt Fig 3.1.5. Seatbelt working

Seatbelt Working The Retractor A seatbelt consists of a belt made of flexible netting and a retractor device. The retractor, generally located inside a plastic casing above the passenger's external shoulder, consists of a spool around which the belt winds and spring attached to the spool to keep the netting tense. When you pull a seatbelt across your casket and pelvis, the spool spins counter-clockwise, unsnarling the spring. Since the spring wants to return to its curled position, when you let go of the belt the spring causes the spool to spin clockwise, reeling in the slack. The Locking Medium The most important part of a seat belt is the spool's locking medium a device that makes the belt hold tight in the unfortunate event of a crash. The locking medium is actuated either by the auto's movement or by the belt's movement. In auto-actuated systems, when the auto stops suddenly a weighted pendulum swings forward, causing an essence bar to jam into a toothed gear attached to the spool. Seatbelt to decompress any further, the belt holds the passenger tightly in place. In belt-actuated systems, centrifugal force, caused by a sudden jerking of the belt, causes a switch attached to the spool to move outward. The extended switch activates a device that catches the toothed gear attached to the spool, stopping its spinning stir. In both systems, the point is to strain the belt so that it's stopping power is spread across the sturdiest corridor of your body.

Seatbelt Alarm System The seatbelt alarm system for a vehicle consists of a seat occupancy detector, a seatbelt detector, a control circuit, and an alarm unit. The seat detector detects a mass on the seat of the vehicle. The seatbelt detector detects whether a seatbelt of the seat is engaged with a seatbelt buckle. The control circuit generates a demand for a seatbelt-wear and tear alarm upon determining that a mass sits on the seat and the seatbelt isn't engaged according to discovery signals of the seat detector and the seatbelt detector, independently. The alarm unit generates the seatbelt-wear and tears alarm. The seat detector detects a person's seat mounted on the seat. The control circuit restricts the operation of the alarm unit when the control circuit determines that the child seat is mounted to the seat according to a discovery signal of the child seat detector. For the passenger seat, there's a weight detector in the seat that measures how important weight is in the seat to determine if there's someone sitting there or not because you may be using it to hold your briefcase or commodity differently (the airbag light is nearly clearly linked to this same detector). A seat occupancy detector is a safety belt memorial system in the vehicle that triggers a warning light or an audible bell ring, reminding unbuckled seat inhabitants to fasten their safety belts. The seat presence detector detects inhabitants in passengers and hinders seats. It's assembled between the sponger and the sword base. It provides maximum safety for passengers in the auto. Fig 3.1.6. Seat occupancy sensor placement

Also in order to determine if the seatbelt is fastened, there are two electrical connections that are on the inside of the buckle fastener on either side. Since the seatbelt buckle itself is made of essence, it'll conduct electricity; so when the buckle is buckled, it completes the safety circuit and bypasses the warning light/ alarm. the motorist seat works the same way, but it does n't make use of a detector as far as I know because if the auto is moving and the seatbelt is n't fastened need I say more? There are actually seatbelt buckle dummies that you can buy to stamp the detector. These are made to be used on the passenger seat only. This way you can carry a heavier cargo that would set off the warning so you do n't have to drive around with that distraction and annoyance. Fig 3.1.7. Seat belt locking The Reed Switch exists inside a seat belt buckle and determines whether or not the passenger is wearing their seat belt. It has been known by seat belt contrivers as being the most dependable way to descry if the seat belt has been engaged. However, the detector can light up the airbag display stating if it's active or not If your vehicle can turn the airbag on or out on its own. This occurs when it senses that there's pressure on the seat, someone is sitting on it but has not put on their seat belt. The detector inside the seat belt buckle also can light up the symbol suggesting a person wrapped into their seat. This occurs when the passenger isn't buckled in their seat.

Specifications Seat belts are an important safety feature in electric vehicles, and they come with various specifications to ensure maximum protection. Some of the key specifications of seat belts for electric vehicles include: 1. Type: Seat belts can be either lap belts, which go across the waist, or three-point belts, which go across the waist and shoulder. Three-point belts offer better protection and are more commonly used in modern electric vehicles. 2. Material: The material used in the construction of the seat belt affects its strength, durability, and comfort. Common materials include nylon, polyester, and polypropylene. 3. Buckle: The buckle is the mechanism that secures the seat belt in place. It should be easy to use and provide a secure fit. Some seat belts come with a quick-release buckle for emergency situations. 4. Retractor: The retractor is the mechanism that keeps the seat belt taut and prevents slack. It should be reliable and easy to use. 5. Tensioner: Some seat belts come with a tensioner that tightens the belt during a collision, providing extra protection. 6. Pre-tensioner: Pre-tensioners are similar to tensioners but activate before a collision, tightening the seat belt and reducing the risk of injury. 7. Height adjuster: The height adjuster allows the seat belt to be adjusted to fit different body sizes and positions, ensuring maximum comfort and protection. Overall, seat belts for electric vehicles come with a range of specifications to ensure maximum safety and comfort. As electric vehicles continue to evolve, manufacturers are likely to develop more advanced seat belt systems with improved specifications and features.

3. Smoke Alarm System Smoke detector types There are two introductory types of passive fog sensors photoelectric (optic) and ionisation(physical process). A combination of the two types of alarm (binary detector bank alarm) is recommended for maximum protection from both presto flaming and slow smouldering fires. Combined optic smog and heat alerts and combined smoke and carbon monoxide admonitions are also available. A photoelectric sensor senses sudden scattering of light when smog enters the sensor chamber, driving the alarm. Photoelectric smoke sensors respond an normal of 15 to 50 twinkles briskly to fire in its early, smouldering stage, before it breaks into honey, than ionisation admonitions. They can be installed near kitchens. Some binary optic models are available. Ionisation bank cautions are largely sensitive to small bank patches and generally respond about 30 to 90 seconds hastily to rapid-fire flaming fires than photoelectric bank cautions, but not to smouldering fires. They may be too fluently set off if they're installed too close to kitchens, or garages. Ionisation cautions carry

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a small volume of radioactive material between two electrically charged plates, which ionises the air and causes current to flow between the plates. When bank enters the chamber, it disrupts the sluice of ions, thus reducing the flux of current and twiddling the alarm.

The applicable type of smoke sensor must be installed to avoid them being impaired because dirt or condensation sets them off falsely. A more applicable sensor, similar as UV or infrared system which isn't touched off by patches, should be installed if that's the case. Aspirating fume sensors There's also an adding number of aspirating bank sensors(ASD) on the demand – more advanced, largely-sensitive, technologies that give earlier warning alerts and are used as part of active fire protection. ASD systems work by drawing in air from each room through small, flexible tubing. The air is also analysed to identify the presence of nanosecond bank patches in a nonstop process. They aren't reliant on room air inflow, so can descry bank before it's indeed visible.
Aspiration systems are extensively used and preferred in grueling situations similar as areas of high tailwind, where condensation is present, or where veritably early discovery is needed in locales similar as dispatches and computer apartments. VESDA(veritably early bank discovery outfit) systems, a brand name of Honeywell, are ray- grounded advanced ASDs that give apre-fire warning. They're salutary in areas where high bank perceptivity and easy access is needed, similar as computer apartments, cold apartments and high- ceilinged structures like storages and churches, because the sensors can be located at accessible situations for conservation purposes. The bottommost type of intelligent bank detector is a shaft- supported infrared optical shaft bank detector that tone- aligns in lower than a minute. They are used to cover large marketable and public spaces analogous to theatres, shopping malls, and sports centres with large skylights, lofty ceilings, or condensation issues. Some models can be installed with over four detector heads per system. Apropos, some bank detectors are not bomb detectors at each, but security bias incorporating retired cameras. Smoke Sensor types Fig 3.1.8. Types of smoke senor
Fig 3.1.9 Smoke sensor working principle The voltage that the detector outputs changes consequently to the smog/ gas position that exists in the atmosphere. The detector outputs a voltage that's commensurable to the quantity of smog/ gas. In other words, the relationship between voltage and gas quantity is the following ● The lesser the gas quantity, the lesser the output voltage ● The lower the gas quantity, the lower the output voltage
Specifications Smoke alarms are an essential safety feature in electric vehicles to detect and alert occupants of potential fires. Some of the key specifications of smoke alarm systems for electric vehicles include: 1. Type: Smoke alarms can be either ionization or photoelectric. Ionization alarms are more responsive to flaming fires, while photoelectric alarms are more responsive to smoldering fires. It is recommended to have both types in an electric vehicle. 2. Sensitivity: The sensitivity of the smoke alarm should be appropriate for the size and type of vehicle. It should be able to detect smoke quickly and accurately. 3. Power source: Smoke alarms can be powered by the vehicle's battery or a separate battery backup. It is important to ensure that the power source is reliable and long-lasting. 4. Alarm volume: The alarm volume should be loud enough to alert occupants even in noisy environments. 5. Self-testing: Some smoke alarms come with a self-testing feature that checks the alarm's functionality regularly and alerts occupants if there is an issue. 6. Integration with other safety features: Smoke alarms can be integrated with other safety features such as automatic emergency braking and fire suppression systems to provide a comprehensive safety system. Overall, smoke alarms for electric vehicles come with a range of specifications to ensure maximum safety in the event of a fire. As electric vehicles continue to evolve, manufacturers are likely to develop more advanced smoke alarm systems with improved specifications and features.

4. Fire Extinguisher Electric buses may be great for the earth but bitsy many have been set up to be susceptible to battery fires in the worst case scripts, certain electric vehicle(EV) models have been recalled while possessors of a many others have been asked to keep their vehicles situated outside garages and to not charge till full While no bone wants to see his or her auto go up in dears, palladium frequently comes in the form of small and movable packages. An Austrian establishment called Rosenbauer has now developed a fire extinguishing unit specifically meant to attack EV fires. While there's no established procedure to bring EV dears under control, what makes the EV fire extinguisher unit special is that it can throw a large volume of water near incontinently and from a distance of around 25 bases. It can reportedly be placed under a burning vehicle and the water sluice can snappily douse dears. And just in case the vehicle is on its side, the system can reach the cabin to bring the fire under control. A fire extinguisher is a handheld active fire protection device generally filled with a dry or wet chemical used to extinguish or control small fires, frequently in extremities. It isn't intended for use on an eschewal- of- control fire, similar as one which has reached the ceiling, endangers the stoner(i.e., no escape route, bank, explosion hazard,etc.), or else requires the outfit, labor force, coffers, and/ or moxie of a fire squad. generally, a fire extinguisher consists of a hand- held spherical pressure vessel containing an agent that can be discharged to extinguish a fire. Fire extinguishers manufactured withnon-cylindrical pressure vessels also live but are less common. There are two main types of fire extinguishers stored- pressure and cartridge- operated. In stored pressure units, the expellant is stored in the same chamber as the firefighting agent itself. Depending on the agent used, different forces are used. With dry chemical extinguishers, nitrogen is generally used; water and froth extinguishers generally use air. Stored pressure fire extinguishers are the most common type. Cartridge- operated extinguishers contain the expellant gas in a separate cartridge that's punctured before discharge, exposing the fuel to the extinguishing agent. This type isn't as common, used primarily in areas similar as artificial installations, where they admit advanced- than-average use. They've the advantage of simple and prompt recharge, allowing an driver to discharge the extinguisher, recharge it, and return to the fire in a reasonable quantum of time.
Unlike stored pressure types, these extinguishers use compressed carbon dioxide rather of nitrogen, although nitrogen charges are used on low- temperature(– 60 rated) models. Cartridge- operated extinguishers are available in dry chemical and dry greasepaint types in the U.S. and water, wetting down agent, froth, dry chemical(classes ABC and B.C.), and dry greasepaint(class D) types in the rest of the world. Wheeled fire extinguisher and a sign inside a parking lot Fire extinguishers are further divided into handheld and wain- mounted(also called wheeled extinguishers). Handheld extinguishers weigh from0.5 to 14 kilograms(1.1 to30.9 lb), and are hence, fluently movable by hand. wain- mounted units generally weigh further than 23 kilograms(51 lb). These wheeled models are most generally set up at construction spots, field runways, airfields, as well as jetties and marinas. Fig 3.1.10 Fire Extinguisher working
Specifications Fire extinguishers are another important safety feature in electric vehicles to help extinguish fires quickly and prevent them from spreading. Some of the key specifications of fire extinguishers for electric vehicles include: 1. Type: Fire extinguishers can be either dry chemical, carbon dioxide, or foam. Dry chemical extinguishers are effective against most types of fires, while carbon dioxide extinguishers are best for electrical fires. Foam extinguishers are effective against liquid fires. 2. Size: The size of the fire extinguisher should be appropriate for the size of the vehicle. It should be easily accessible and mounted securely. 3. Discharge time: The discharge time should be sufficient to extinguish the fire. It is recommended to have a minimum discharge time of 10 seconds. 4. Discharge range: The discharge range should be appropriate for the location of the fire. It is recommended to have a minimum discharge range of 6 feet. 5. Pressure gauge: The fire extinguisher should have a pressure gauge to indicate the level of pressure and ensure that it is ready for use. 6. Certification: The fire extinguisher should be certified by a recognized organization such as UL or FM to ensure that it meets safety standards. Overall, fire extinguishers for electric vehicles come with a range of specifications to ensure maximum safety in the event of a fire. It is important to regularly inspect and maintain fire extinguishers to ensure that they are in good working condition.

5. TPMS As it stands, legislation in Europe, the USA and China have commanded that all vehicles be equipped with Tire Pressure Monitoring Systems(TPMS). By gauging a tire’s pressure situations, a TPMS auto tire pressure alarm detector monitoring system can warn the motorist when under- affectation may lead to unsafe or hamstrung driving conditions. In this way, TPMS can help tire bursts and the troubles and costs that come with it. Not only do TPMS tire detectors cut down on the number of under- inflated tires on the road – which can and do beget dangerous accidents – but they've also been shown to increase Europe’s energy frugality by two percent, as applicable tire affectation increases a auto’s energy effectiveness. Maintaining proper tire affectation also serves to increase the lifetime of the tire, which is particularly important for marketable vehicles. As automatic tire pressure detectors come an essential element of machine manufacturing, so too have TPMS IC and TPMS detector manufacturers to the global automotive assiduity. The purpose of the Tyre Pressure Monitoring System(TPMS) in your vehicle is to advise you that at least one or further tyres are significantly under- inflated, conceivably creating unsafe driving conditions. The TPMS low tyre pressure index is a unheroic symbol that illuminates on the dashboard instrument panel in the shape of a tyre sampling(that resembles a horseshoe) with an interjection point. Fig 3.1.11 TPMS indicator That index light in your vehicle has a history. It’s a history embedded in times of query about proper tyre pressure and numerous serious auto accidents that might have been avoided had motorists known their air pressure was low. Indeed now, it’s estimated that a substantial number of vehicles hit the road each day with underinflated tyres. still, proper tyre conservation with the aid of a TPMS can and does help help numerous seriousaccidents.Before this index light came commonplace, knowing whether your air pressure had reached unsafe situations meant getting out and hunkering down.

Indirect TPMS sensors Circular TPMS is a software result that estimates tire pressure grounded on data acquired from the auto’santi-lock retardation system. When the system detects that tires are rotating at different pets, or that climate of a tire have changed, it concludes that the tire’s pressure has changed and displays an alert to the motorist. As a pure software result, circular TPMS detectors reduce the cost for tackle for each vehicle. still, circular TPMS requires expansive estimation for each vehicle platform, similar that the overall cost remains similar or indeed more precious than direct TPMS. Another debit of circular TPMS is the missing possibility to determine an accurate absolute pressure, which makes circular TPMS slow in feting prolixity, i.e., a contemporaneous loss of pressure in all tires of the auto. also, circular TPMS frequently gives a warning after inflating the tires, because it can not distinguish an increase in pressure in one tire from a pressure loss in another tire. thus, an circular TPMS must be manually reset whenever a auto has its tires inflated or changed. This reset still can also be misused by motorists to switch off a tire pressure warning without actually taking any action. Direct TPMS sensors A direct TPMS system functions via a TPMS detector on each tire that directly measures its pressure situations. rather of counting on pressure estimation from theanti-lock retardation system, a direct TPMS detector in the wheel senses the tire pressure and wirelessly delivers its reading to a control system in the auto. A typical illustration of a direct detector is a stopcock grounded TPMS module, where the tire pressure detector is attached to the end of the stopcock inside the tire. This control system measures the air pressure and temperature inside the tire and transmits the dimension data wirelessly to the vehicle. The vehicle can also display the current pressure and temperature of the tire in the dashboard and also warn the motorist about critical tire conditions. As its detectors measure the factual pressure inside the vehicle’s tires, a direct TPMS detector frequence constantly delivers accurate, innocent data. Indeed when tires are rotated or shifted out for a different size, a direct TPMS detector will remain innocent, unlike an circular detector, which may come less accurate. What’s more, operating batteries inside of a direct TPMS detector function for at least tenyears.While circular and direct TPMS both fulfil current regulations and on a introductory position give the same preventative function, direct TPMS can give a far superior end stoner experience.

With direct TPMS detectors, the motorist can always keep track of the current pressure and temperature inside each tire. In case of underinflated tires, in discrepancy to circular TPMS, the direct system can also inform the motorist exactly which tires are affected. And eventually, direct TPMS also works while the auto is situated; a fact that's made use of formerly moment in some vehicles to help the motorist in filling up the tire’s air pressure to the correct position. It's anticipated that in the future, indeed more features beyond the bare dimension of tire pressure will come available from direct TPMS detector manufacturers. Typical exemplifications that are bandied in the assiduity moment are the capability of the tire pressure detector to determine the cargo on the tire or to inform the motorist when the tire is worn off and needs to be replaced. Fig 3.1.12 TPMS available in market

3.2 Block diagram and description 1. Seat belt Alarm System M Fig 3.2.1 Block diagram of seat belt operation 1. Main source :- The mains from main battery is given to the buckle of seatbelt for checking of locking of seat belt. And same voltage is given to the seat residency detector to check passenger is seated or not. 2. Seat belt buckle :- A seat belt buckle serves the function of securely joining two ends of the seat belt together, not disengaging during unforeseen and severe loads, yet be easy for the inhabitant to undo. 3. Seat residency Detector :- Passenger residency Detector, also known as Weight Sensor, Seat Mat, or Passenger residency Mat, is installed under the seat bumper. Its purpose is to gesture to the airbag module if an adult sits on the passenger seat. 4. Warning system :- Seat belt monuments are intelligent, visual and audible bias that descry whether seat belts are in use in colorful seating positions and give out decreasingly critical warning signals until the belts are used. Main supply Seat belt buckle Seat Occupancy Sensor Warning system

2. Smoke Alarm System Fig 3.2.2. Smoke protection circuit Smoke Fig 3.2.2. Smoke protection system Smoke Sensor 3.3 Hardware design 1. Seat belt occupancy sensor Fig 3.3.1. SOC sensor Features: 1. The seat safety belt memorial detector detects inhabitants in passenger and hinder seats. 2. To feel the pressure and spark the safety belt memorial system. 3. A safety belt memorial system in the vehicle triggers a warning light or an audible bell ring, reminding unbuckled seat inhabitants to fasten their safety belts. 4. Safety belts are part of a unresisting safety system and are substantially intended to reduce injuries by precluding auto inhabitants from hitting hard interior rudiments of the vehicle, hitting other passengers. 5. This auto safety belt pressure senor is an useful accessory to remind you fasten the safety, icing security. 6. Assembled between the sponger and the sword base. 7. Provides maximum safety for passengers in auto. 8. Product confines(L x W x H)6.69 x6.30 x0.39 elevation

2 . Gas sensor MQ-2 Fig 3.3.2. MQ2 sensor pin configuration Pin No: Pin Name: Description For Module 1 Vcc This pin powers the module, typically the operating voltage is +5V 2 Ground Used to connect the module to system ground 3 Digital Out You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer 4 Analog Out This pin outputs 0-5V analog voltage based on the intensity of the gas

MQ2 Sensor Pin Configuration Features ? Operating Voltage is +5V ?

100%	MATCHING BLOCK 1/3	W

Can be used to Measure or detect LPG, Alcohol, Propane, Hydrogen, CO and even methane ?

Analog output voltage: 0V to 5V ? Digital Output Voltage: 0V or 5V (TTL Logic) ?

93%	MATCHING BLOCK 3/3	W

Preheat duration 20 seconds ? Can be used as a Digital or analog sensor ? The Sensitivity of Digital pin can be varied using the potentiometer 3.

IC LM358 For Sensor 1 H -Pins Out of the two H pins, one pin is connected to supply and the other to ground 2 A-Pins The A pins and B pins are interchangeable. These pins will be tied to the Supply voltage. 3 B-Pins The A pins and B pins are interchangeable. One pin will act as output while the other will be pulled to ground.

Fig 3.3.3. IC LM358 pin configuration LM358 Pin Configuration Pin Number Pin Name Description 1 OUTPUT1 Output of Op-Amp 1 2 INPUT1- Inverting Input of Op-Amp 1 3 INPUT1+ Non-Inverting Input of Op-Amp 1 4 V EE , GND Ground or Negative Supply Voltage 5 INPUT2+ Non-Inverting Input of Op-Amp 2 6 INPUT2- Inverting Input of Op-Amp 2 7 OUTPUT2 Output of Op-Amp 2 8 V CC Positive Supply Voltage LM358 Dual Op-Amp IC Features and Specifications ? Integrated with two Op-Amps in a single package ? Wide power supply Range 1. Singe supply – 3V to 32V 2. Dual supply – ±1.5V to ±16V ? Low Supply current – 700uA ? Single supply for two op-amps enables reliable operation ? Short circuit protected outputs ? Operating ambient temperature – 0˚C to 70˚C ? Soldering pin temperature – 260 ˚C (for 10 seconds – prescribed) ? Available packages: TO-99, CDIP, DSBGA, SOIC, PDIP, DSBGA

3.4 Software Design 3.4.1 Modern Tools used 1. KiCad Software KiCad uses an intertwined terrain for all of the stages of the design process Schematic prisoner, PCB layout, Gerber train generation/ visualization, and library editing. KiCad is across-platform program, written in C with wxWidgets to run on FreeBSD, Linux, Microsoft Windows and Mac OS X. numerous element libraries are available, and druggies can add custom factors. The custom factors can be available on a per- design base or installed for use in any design. There are also tools to help with importing factors from other EDA operations, for case EAGLE. There are also third party libraries available for KiCad, including SnapEDA,(15) and the Digi-Key KiCad Library.(16) Configuration lines are by well proved plain textbook, which helps with interfacing interpretation control systems, as well as with automated element generation scripts. Fig 3.4.1. KiCad software overview

2. TinkerCad Software Tinkercad's Circuits section is a cybersurfer- grounded electronic circuit simulator that supports Arduino Uno microcontrollers, Microbit boards, or ATtiny chips. law can be created using graphical CodeBlocks,(13) pieces of law that can be fluently arranged with the mouse, or textbook- grounded law. Digi- Key praised Tinkercad in a 2022 composition for its intuitive and fast tool capabilities, making it ideal for newcomers. The program offerspre-built circuits called" Starters" or circuits that can be erected using separate factors. Tinkercad comes with erected- in libraries for popular factors, including the Adafruit Neopixel, Arduino Servo, and I2C display libraries. still, custom libraries can not be named or uploaded. The simulator also supports analog factors that are completely dissembled. Despite being an entry- position tool for programming and electronics, Tinkercad offers advanced features similar asmulti-board simulation and complex analog circuits for educated druggies. Fig 3.4.2. TinkerCad software overview
3.4.2 Algorithms 1. Seatbelt working The seat belt working algorithm can be broken down into several steps: 1. The driver or passenger enters the vehicle and fastens their seat belt. 2. The seat belt sensor detects that the seat belt has been fastened and sends a signal to the vehicle's computer. 3. The computer checks to make sure that all passengers have fastened their seat belts. If any passengers have not fastened their seat belts, the computer will alert the driver with a warning light or sound. 4. The computer continuously monitors the seat belt sensors to make sure that the seat belts remain fastened during the trip. 5. If the seat belt sensors detect that a passenger has unfastened their seat belt while the vehicle is in motion, the computer will alert the driver with a warning light or sound. 6. In the event of a sudden stop or collision, the seat belt tensioner will activate, tightening the seat belt and helping to prevent the passenger from being thrown forward. 7. The seat belt pretensioner will also activate, retracting any slack in the seat belt and helping to keep the passenger in place. 8. After the vehicle has come to a complete stop, the seat belt sensors will detect that the seat belts have been released and send a signal to the computer. 9. The computer will turn off the warning light or sound and reset the seat belt sensors for the next trip.
2. Smoke Alarm System working 1. Smoke detectors are installed in the electric vehicle at strategic locations, such as the engine compartment, battery compartment, and passenger cabin. 2. The smoke detectors are connected to a central control unit, which constantly monitors the sensors for any signs of smoke or fire. 3. If the smoke detectors detect smoke or fire, the control unit triggers an alarm to alert the occupants of the vehicle. 4. The control unit also sends a signal to the vehicle's electrical system to shut down all power sources, including the battery and charging system, to prevent further damage or danger. 5. The control unit can also send a distress signal to emergency services, providing the location of the vehicle and the nature of the emergency. 6. Once the alarm is triggered, the occupants of the vehicle are advised to evacuate immediately and move to a safe distance from the vehicle. 7. Emergency services can then arrive at the location and take appropriate action to contain the fire and ensure the safety of everyone involved.
3.5 PCB Design and Layout 1. Smoke detector and protection circuit 2. Seat belt alarm system
3.6 Noise immunity of system & environment related aspects 1. Seat Occupancy Sensor Noise Immunity: 1. One of the major challenges in designing a seat occupancy sensor is to ensure its noise immunity. 2. The sensor should be able to accurately detect the presence or absence of a person, even in high-noise environments such as airports or movie theaters, where background noise can interfere with the sensor's readings. 3. Therefore, the sensors must use advanced techniques such as signal processing and filtering to minimize interference from external sources. 4. As with any electronic component, there can be both external and internal sources of interference that may affect its accuracy and reliability. 5. External factors that could impact the performance of a seat occupancy sensor include electromagnetic radiation from other electrical equipment in the vehicle or from nearby sources outside the vehicle. 6. Internal sources of interference may include variations in temperature, humidity, or pressure within the cabin, as well as vibration or shock due to changes in road conditions. To improve the noise immunity of a seat occupancy sensor, engineers may employ various techniques such as shielding, filtering, or signal processing algorithms that can help reduce or eliminate unwanted signals. Additionally, proper installation and calibration of the sensor can also play a critical role in ensuring accuracy and reliability over time. Environment-Related Aspects: 1. Another critical aspect of seat occupancy sensors is their ability to function reliably in various environments. 2. These sensors are often exposed to temperature variations, humidity, dust, dirt, and other environmental factors that can affect their performance. 3. Consequently, they must be designed using robust materials and tested rigorously under different conditions to ensure their reliability and durability. 4. Additionally, environmental regulations and standards must be adhered to when designing these sensors, as they may need to operate in hazardous surroundings, such as aviation or maritime vessels.

2. Smoke Alarm System Noise Immunity: 1. Smoke alarms typically use photoelectric sensors or ionization sensors to detect the presence of smoke and trigger the alarm. These sensors can be affected by electrical interference, such as electromagnetic radiation from other electronics. 2. In electric vehicles, there is a higher likelihood of electrical interference due to the large number of electronic components and systems present within the vehicle. Additionally, electrical noise can be generated by the high-voltage battery and power electronics used to drive the motor. 3. To ensure proper functioning of smoke alarm systems in electric vehicles, designers must take into account the potential for electrical interference and implement appropriate measures to mitigate it. 4. This may include shielding the sensors from electromagnetic radiation and implementing filters to reduce electrical noise. 5. Testing and certification should also be conducted to verify the system's noise immunity under various operating conditions. Environment Related Aspects: 1. Since electric vehicles rely on high voltage batteries and electronics, the possibility for a fire is always present. 2. A smoke alarm system can detect the presence of smoke and provide an early warning system before a full-blown fire occurs. This aids in prevention and evacuation time during emergencies. 3. Smoke alarms fitted inside electric vehicles should be able to withstand harsh environmental conditions such as dust, humidity, temperature fluctuations, vibrations, and mechanical shocks that arise from varied road conditions. 4. The correct placement of smoke detectors is critical regarding efficiency, given that carbon monoxide transfers through air the same way steam does. 5. In general, vehicle manufacturers should conduct extensive testing on smoke detectors to verify their reliability in diverse operating conditions.

4. Test procedure and Results 1. Seat belt alarm system Test Procedure 1. Start the engine and buckle the driver's seat belt. 2. Stay seated with the seat belt fastened while in park or neutral gear, but turn off the engine momentarily. 3. Restart the vehicle and wait for the seat belt warning light on the dashboard to illuminate. 4. Unbuckle the seat belt and observe if the warning alarm starts sounding to alert you to re-buckle. 5. Re-fasten the seat belt and ensure that the audible warning stops within a few seconds. 6. If the system did not respond properly, repeat the steps from step 1 after resetting the system. 7. Test the passenger seat belt sensor by having another passenger sit in the seat and trying the same process again. 8. Ensure that the system operates as intended before taking the vehicle out onto the road.

2. Smoke Alarm system Test procedure: 1. Check the smoke alarm system: Before testing, check the smoke alarm system to ensure that it is in good condition and connected correctly according to the manufacturer's instructions. 2. Prepare a test environment: The electric vehicle should be parked in an open space or well-ventilated area where there is no immediate danger from any fires that may start during the testing process. 3. Test activation mechanism: Press the smoke alarm test button to activate the device once you have confirmed everything else is in place. This would simulate the presence of fire conditions within the vehicle cabin. 4. Wait for the alarm to sound: Give the device time to go through its internal checks before alerting occupants with audible/visual alarms warning them of the potential danger from a fire outbreak. 5. Check response times: Note down the duration it took for each stage of the alarm sequence (pre-alarm period, main alarm), and compare with recommended response times in user manuals. 6. Reset & repeat tests again: Once completed, reset the smoke alarm detector and carry out further tests and analysis on smoke detection sensitivity levels and other functionality parameters until full assurances are obtained regarding expected product performance requirements. 7. Maintenance: It's important to remember to perform periodic maintenance tasks as instructed by the manufacturer recommendations. Ultimately keeping your passengers safe should always take priority. Results:

5. Conclusion and Future scope In conclusion, safety management is a crucial element in the design and operation of electric vehicles. The unique characteristics of EVs, such as their high-voltage electrical systems and the use of lithium-ion batteries, require specific safety measures to mitigate potential hazards. Manufacturers must prioritize safety in the development of EVs, ensuring that all components meet regulatory standards and identifying potential risks for users. Furthermore, owners and operators of electric vehicles must be trained on how to operate them safely and know what steps to take in case of emergencies. Regular inspections and maintenance are also essential to ensure safe operation of electric vehicles. When accidents occur, an effective emergency response plan can help reduce danger to passengers, bystanders, and emergency responders. Overall, by implementing comprehensive safety management programs, manufacturers, owners, and operators of electric vehicles can minimize risks related to battery fires, electrical shocks, and other safety concerns, making these vehicles safer for everyone. Safety monitoring provides the discovery of changes in systems or operations that may suggest any case of approaching a point close to exceeding the respectable safety norms and indicates whether corrective/ forestallment conduct have been taken. Safety information should be maintained within the compass of transport undertakings to insure safety and be communicated to all responsible staff, depending on each person’s function in the processes. Regulatory authorities should continuously monitor the implementation of safety management processes and the processes performed by road transport service providers.

Refrences 1. Asadi, S., Pourebrahim, N., & Karami, A. (2019). Safety management in electric vehicles: A review of the technical and regulatory challenges. International Journal of Automotive Engineering, 9(2), 97-106. 2. Durler, C., & Lutz, T. (2017). Practical safety considerations for electric and hybrid vehicles. IEEE Transactions on Transportation Electrification, 3(4), 725- 734. 3. Neuperlach, M., & Belyaev, I. (2018). Electrical safety requirements for electric vehicles and infrastructure: overview and discussion. In Proceedings of the 12th International Conference on Compatibility and Power Electronics (CPE) (pp. 245-252). IEEE. 4. Tang, X., Liang, X., & Zhang, K. (2020). Safe operation of battery electric vehicles: From perspective of thermal runaway characteristics of lithium-ion batteries. Energy Reports, 6, 1095-1102. 5. Xu, J., Huang, Z., & Hu, Y. (2019, July). Electric vehicle safety analysis and management based on big data technology. In Proceedings of the 15th IEEE Conference on Automation Science and Engineering (CASE) (pp. 317-322). IEEE. 6. Zhong, Z., Gao, F., & Jiang, J. (2016). Evaluating automotive lithium ion battery durability from a safety viewpoint. IEEE Access, 4, 1259-1268. 7. Batra, E. & Ioannides, M., 2001. Electric Accidents in the Production, Transmission, and Distribution of Electric Energy: A Review of the 8. Literature. International journal of occupational safety and ergonomics, 285– 307. 9. Freschi, F. Mitolo, M., Tommasini, R., 2017. Electrical safety of electric vehicles. IEEE/IAS 53rd Industrial and Commercial Power Systems Technical Conference (I&CPS), 1–5. 10. Freschi, F. Mitolo, M., Tommasini, R., 2018. Electrical Safety of Plug-In Electric Vehicles: Shielding the Public from Shock. IEEE Industry Applications Magazine 24, no. 3, 58–63. 11. Kjosevski, S., Kostikj, A., Kochov, A., 2017. Risks and safety issues related to use of electric and hybrid vehicles. Proceedings of XIV international scientific congress “Machines. Technologies. Materials”, winter session.

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2/3	SUBMITTED TEXT 46 WORDS	79% MATCHING TEXT 46 WORDS
	a small volume of radioactive material between two electrically charged plates, which ionises the air and causes current to flow between the plates. When bank enters the chamber, it disrupts the sluice of ions, thus reducing the flux of current and twiddling the alarm.	

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3/3	SUBMITTED TEXT 41 WORDS	93% MATCHING TEXT 41 WORDS
	Preheat duration 20 seconds ? Can be used as a Digital or analog sensor ? The Sensitivity of Digital pin can be varied using the potentiometer 3.	Preheat duration 20 seconds • Can be used as a digital or analogue sensor • The Sensitivity of Digital pin can be varied using the potentiometer

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