# INTRODUCTION

Most victims of fire succumb to the smokeand toxic gases and not to burns. Fire produces poisonous gases that can spread rapidly and far fromthe fire itself to claim victims who are asleep and not even aware of the fire. Even if residents awaken, the effects of exposure to these gases can cloud their thinking and slow their reactions so that they cannot make their escape.This is why it is so crucial for you and your family to have sufficient warning so thatyou can all escape before your ability to think and move is impaire**d.**

# PROJECT OVERVIEW

In order to undertake the process of designing a fire system for a building it is necessary to have a sound understanding of the relevant design standards, the legal framework surrounding building safety legislation and a sound working knowledge of product application theory. The following system design process is intended to give a reasonable overview of all the areas of knowledge required for the successful design of a fire alarm system. Due to the complex nature of legislation and design standards relating to fire alarm system design, this course is not intended to be a comprehensive to all aspects of fire alarm design but rather a very useful source of background information to which further application specific detailed information can be added from other sources as required.

# PURPOSE

- **Detect Fire**

Your fire alarm system is designed to detect fire in two main ways: smoke and heat. It should also have the capability of manual pull, in case a fire is observed before smoke or heat reaches the sensors of the system. Other systems are activated when movement in the sprinkler system is detected, indicating that the sprinklers are responding to a fire.

- **Alert Occupants**

When the fire alarm system detects smoke, heat, or water movement, it alerts occupants of the building using both audible and visible alarms. These alarms will be bright, loud, obnoxious, and impossible to ignore, which help mobilize individuals to follow your evacuation plan. Using both types of alarms ensure that every person in the building is alerted.

1. **Manage Risks**

Your building's fire alarm system works in a third way to protect you: by reacting to potential risks using control measures. When the alarm is activated, some systems perform a set of tasks that help prevent fire and smoke from spreading as well as protect occupants, such as: automatically shutting doors in different zones, powering off ventilation and air conditioning, or redirecting elevators to bring cars to a designated level

2. **Notify Authorities**

The fourth purpose of your fire alarm system is to notify authorities. This ensures the fire department is en route as quickly as possible, so they can respond and extinguish the fire before it becomes an even bigger threat

## LITERATURE SURVEY

Title: Urban Fire Risk Evaluation Based on 2-tuple AHP—Taking the 8th Division with Shihezi City for Example

### Description:

The evaluation of urban fire risk was an important gist of scientific and effective urban firefighting management, planned and constructed. This study, took the 8th division with Shihezi city (Shi-City) as an example, an evaluation index system of urban fire risk was first built through analyzing the influential factors of fire risk in urban areas, which contained four first-class indexes and twenty-two second-class indexes. Then, to overcome the weaknesses of the analytic hierarchy process (AHP), 2-tuple fuzzy linguistic representation model was incorporated into AHP to calculate the weights of indexes. After that, an urban fire risk evaluation model was proposed. Finally, the developed model was applied into the fire risk evaluation of Shi-City and the fire risk rating of Shi-City was derived as slightly higher than medium, which offered significant guidance for fire control and safety management.

## EXISTING PROBLEM

When fire alarm panels are in trouble condition, it can be difficult to find the root cause of the problem. Trouble signals occur due to ground faults, circuit problems, battery faults, or other failures within the system

## REFERENCES

1. Ananthram Swami, Qing Zhao, and Yao-Win Hong, “Wireless Sensor Networks, Signal Processing and Communications Perspectives,” Copyright© 2007 John Wiley & Sons Ltd, the Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.

2. Elias Kyriakides, Jonathan W. Stahlhut, and Gerald T. Heydt, “A Next Generation Alarm Processing Algorithm Incorporating Recommendations and Decisions on Wide Area Control,” Power Engineering Society General Meeting 2007, IEEE, June 2007, Tampa, FL, USA.

3. John Ypsilantis, “The Trial of a Self-Learning Alarm Processor and Generator,” Heuristics Australia Pty Ltd, Copyright© 2001 J., Sydney, Australia http://www.heuristics.com.au.

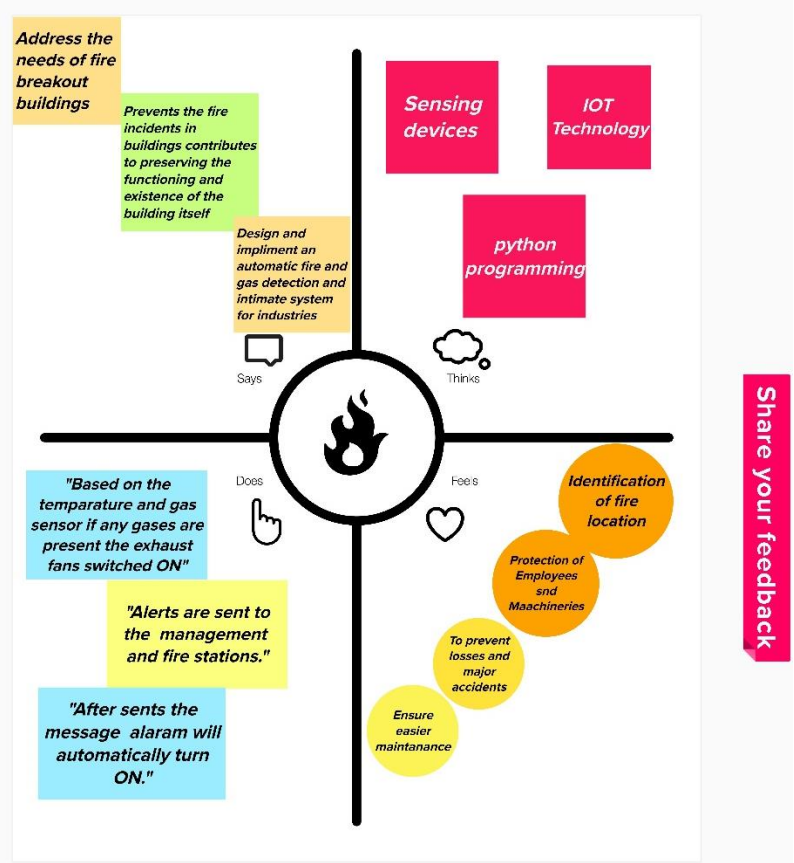
## PROBLEM STATEMENT DEFINITION

The smart fire management system includes a Gas sensor, Flame sensor and temperature sensors to detect any changes in the environment.
Based on the temperature readings and if any Gases are present the exhaust fans are powered ON.
If any flame is detected the sprinklers will be switched on automatically.
Emergency alerts are notified to the authorities and Fire station.

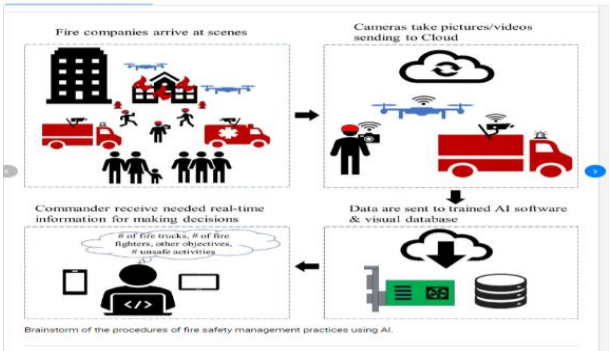
## IDEATION & PROPOSED SOLUTION

- Based on the temperature readings and if any Gases are present the exhaust fans are powered ON.
- If any flame is detected the sprinklers will be switched on automatically.
- Emergency alerts are notified to the authorities and Fire station.

## EMPATHY MAP CANVAS




## IDEATION AND BRAINSTORMING



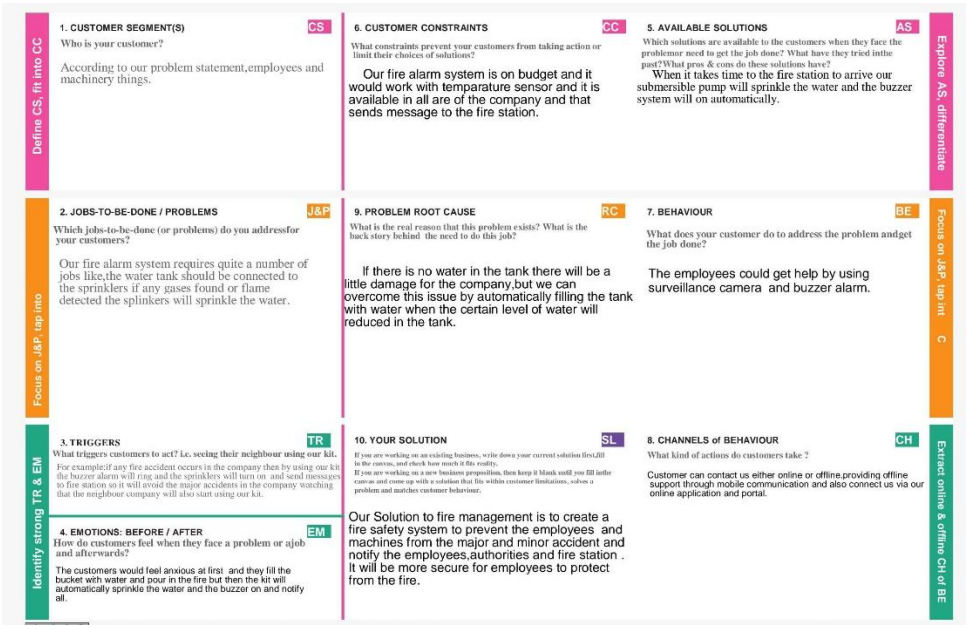
# PROPOSED SOLUTION

Based on the temperature readings and if any Gases are present the exhaust fans are powered ON.

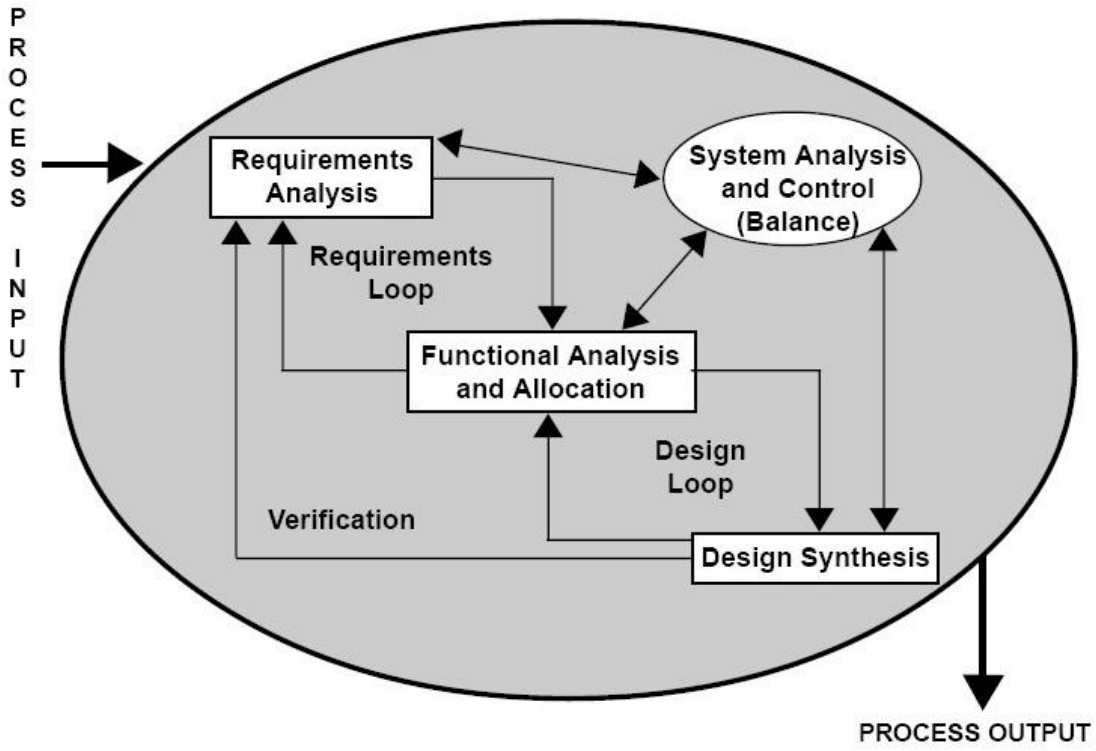
If any flame is detected the sprinklers will be switched on automatically.

Emergency alerts are notified to the authorities and Fire station.

# PROBLEM SOLUTION FIT




# REQUIREMENT ANALYSIS




# Functional requirement

Following are the functional requirements of the proposed solution.

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|---|---|---|
| FR-1 | User Requirements | Monitor the gas, temperature, and flame.<br>In the event of a gas leak, turn on the exhaust fans.<br>In the event of a fire, activate the sprinklers and<br>Notify the fire station and authorities. |
| FR-2 | User Registration | Manual registration<br>Registration through the webpage<br>Registration through the form<br>Registration through Gmail |
| FR-3 | User Confirmation | Confirmation via Phone<br>Confirmation via Email<br>Confirmation via OTP |
| FR-4 | Payment Options | Cash on Delivery<br>Net Banking/UPI<br>Credit/Debit/ATM Card |
| FR-5 | Product Delivery and Installation | Door Step delivery<br>Free Installation and 5 year Warranty |
| FR-6 | Product Feedback | Through Webpage<br>Through Phone calls and G-mails<br>Through Google forms |

# Non Functional requirement

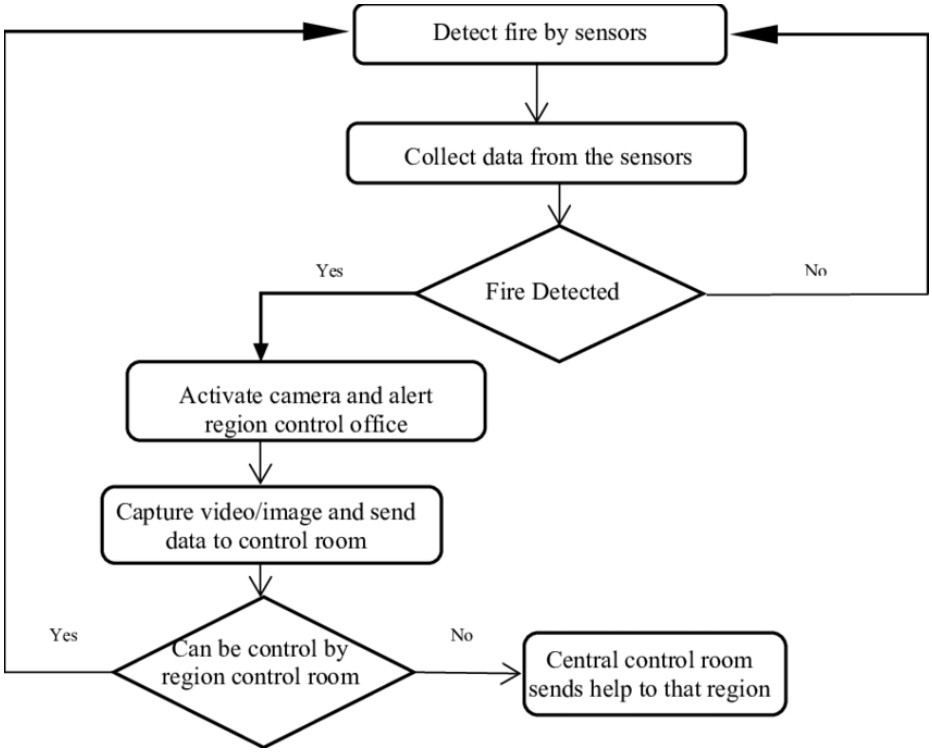
Following are the non-functional requirements of the proposed solution.

| NFR No. | Non-Functional Requirement | Description |
|---|---|---|
| NFR-1 | Usability | It's mostly automatic<br>So, it can manage the fire itself.<br>This automated feature makes usability easier |
| NFR-2 | Security | The system itself is used to manage fires and secure people<br>It did not cause any accidents<br>It's just working on the methods of sensing and detecting, so it doesn't affect the user's devices and data. |
| NFR-3 | Reliability | Regular maintenance of hardware like sensors, exhaust fans, and sprinklers and periodic service of the system is mandatory.<br>If these are done perfectly, then the system is more reliable. |
| NFR-4 | Performance | It's a smart fire management system which, detect the changes in the environment.<br>If gases or flames are detected, the exhaust fans will be powered on and the sprinklers will be switched on automatically, respectively. And, alerts the authorities and the fire station.<br>However, all of this requires a specification system within RAM-Minimum of 4GB and a processor-Min. configuration OS-Windows/Linux/MAC.<br>So, the performance is more efficient. |
| NFR-5 | Availability | Due to its automation, detection, and management features, this system will be available everywhere with high demand.<br>It replaces three different systems. |
| NFR-6 | Scalability | The system has to sense the given space and sprinkle precisely in the place of fire.<br>In the case of communication, irrespective of the distance or signal, it must inform the fire station. |

## PROJECT DESIGN

The primary purpose of fire alarm system is to provide an early warning of fire so that people can be evacuated & immediate action can be taken to stop or eliminate of the fire effect as soon as possible. Alarm can be triggered by using detectors or by manual call point (Remotely). To alert/evacuate the occupants siren are used. With the Intelligent Building of the rapid development of technology applications, commercial fire alarm market demand growth, the key is to use the bus system intelligent distributed computer system fire alarm system, although installation in the system much easier than in the past , but still cannot meet the modern needs, the installation costs of equipment costs about 33% ~ 70. The suggested technique in Fire alarm system used the addressable detectors units besides using the wireless connection between the detector in zones as a slave units and the main control unit as the master unit. The system shall include a control panel, alarm initiating devices, notification appliances, and the accessory equipment necessary for a complete functioning fire alarm system. In the wireless fire alarm, individual units are powered by primary & secondary batteries for the communication.

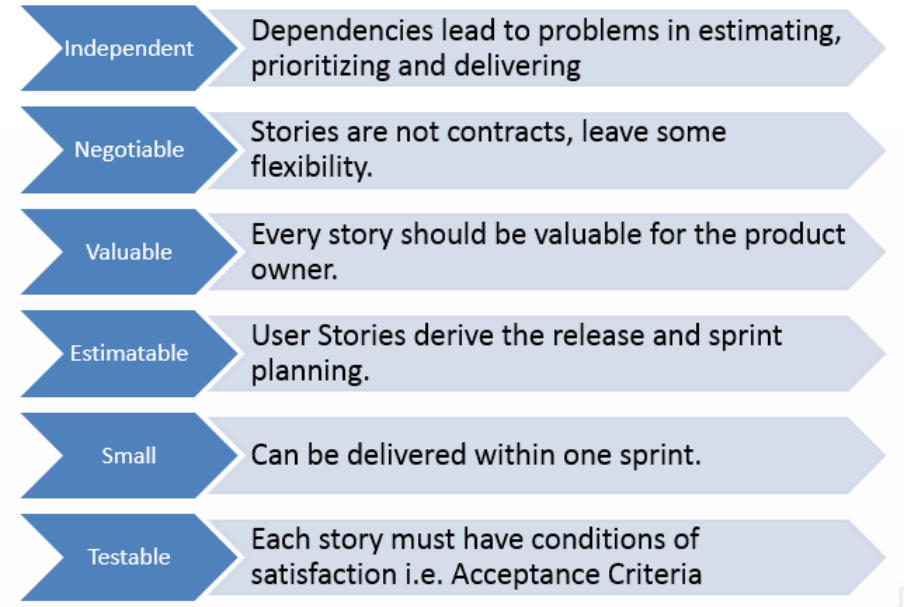
## Data Flow Diagrams




# Solution & Technical Architecture

| S.No. | Parameter | Description |
|---|---|---|
| 1. | Problem Statement (Problem to be solved) | The primary purpose of fire alarm system is to provide an early warning of fire so that people can be evacuated & immediate action can be taken to stop or eliminate of the fire effect as soon as possible. |
| 2. | Idea / Solution description | Based on the temperature readings and if any Gases are present the exhaust fans are powered ON.<br><br>If any flame is detected the sprinklers will be switched on automatically.<br><br>Emergency alerts are notified to the authorities and Fire station. |
| 3. | Novelty / Uniqueness | When the fire start spreading then the temperature rises and if any gases are present the exhaust fans are powered on.<br><br>Then if any flame detected the sprinklers will be switched on automatically and send message to higher authorities and fire station. |
| 4. | Social Impact / Customer Satisfaction | Customer experience can be recognized through client feedback through the customer those who utilize our kit and send their feedback. |
| 5. | Business Model (Revenue Model) | The financial benefit by using this model we achieve the short span of time |
| 6. | Scalability of the Solution | The solution is scalable and it will be provided<br>By using python program, sprinkler, Buzzer, and temperature sensor. |

# User Stories



| | | |
|---|---|---|
| Ideation-Brainstorming | Brainstorming is a group problem-solving method that helped us to gather and organize various ideas and thoughts from teammembers. | 17 September 2022 |
| Define Problem statement | The Customer Problem Statement helps us to focus on what matters to create experiences peoplewill love.<br><br>A well-articulated customer problem statement allowed us to find the ideal solution for the challenges customersface. | 19 September 2022 |

| TITLE | DESCRIPTION | DATE |
|---|---|---|
| Literature Survey& Information Gathering | A literature review is a comprehensive summary of previous researches on the topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area of research. | 3 September 2022 |
| Prepare Empathy Map | An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. It helps us to understand the customer's pain, gain and difficulties from their point of view | 10 September 2022 |

Use the below template to create product backlog and sprint schedule

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|---|---|---|---|---|---|---|
| Sprint-1 | Login | USN-1 | As a customer , I might ensure login credential through gmail ease manner for the purpose of sending alert message to the owner. | 2 | High | Dhanusha S L<br>Biruntha M<br>Devasavitha M<br>Fathima Riznlya S |
| Sprint-1 | Registration | USN-2 | As a user , I have to registered my details and tools details in a simple and easy manner in case of fire incident. this registered system sends notification to the industrialist. | 2 | High | Dhanusha S L<br>Biruntha M<br>Devasavitha M<br>Fathima Riznlya S |
| Sprint-2 | Dashboard | USN-3 | As a user, In case of Fire in the industry I need the sprinkler to spray water on the existing fire automatically. | 2 | Low | Dhanusha S L<br>Biruntha M<br>Devasavitha M<br>Fathima Riznlya S |

Our fire sprinkler project managers have extensive training in effective communication, giving them the ability to structure their questions to find the best solutions for the client and their facilities. Providing guidance throughout each step of the project, they make certain that each component of the project is correctly directed and that each team member is working in tandem to have everything completed as quickly and efficiently as possible.

## SCHEDULING

After the completion of any ITM, it is vital that managers review all testing documentation completed by staff or a contractor. Oftentimes, workers leave boxes unchecked, miss systems or components during the inspection, miscount devices, forget to include pages, or document deficiencies without noting corrections. These oversights could be simple to correct, or they could be substantial enough to require shutdown of an entire building system or fire watch

Although these tasks can be time-consuming, they are as essential to ensure that fire protection and life safety systems will perform properly in the event of a fire. It is often helpful to engage another person within the department or a trusted partner to assist with document review.

Another common issue when it comes to ITM — especially in 24/7 facilities, facilities with high levels of security, or even standard commercial buildings — is scheduling the work. Fire alarm testing at 7 a.m. or 5 p.m. can disrupt building occupants. Flowing water from standpipes or a fire pump might temporarily close stairwells or rooms, or it could destroy landscaping. Activating smoke control systems can make doors difficult to operate, cause issues with furniture or artwork within an atrium, or bring in large quantities of cold air during winter.

Because of these potential problems, coordinating testing not only with facility staff but other ancillary staff and building occupants in affected areas can be critical to successful ITM. That said, proper care and coordination in advance can assist in successful testing.

| | | |
|---|---|---|
| Problem Solution Fit | It helped us understand and analyze all the thoughts of our customer, their choice of options, problems, root cause, behavior and emotions. | 26 September 2022 |
| Proposed solution | It helped us analyze and examine our solution more in the grounds of uniqueness, social impact, business model, scalability etc. | 28 September 2022 |
| Solution Architecture | Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. It helped us understand the features | 1 October 2022 |

## CODING & SOLUTIONING

```
    margin-top: 10px;
    opacity: 0.8;
   }
  </style>
  <!-- Css ending here. -->

  <!-- Complete javascript for login. -->
  <!-- Add url of javascript -->

  <!-- Java Script -->
  <script>
  border: 1px solid red;
  padding: 16px;
  font-weight: bold;
  background-color: rgb(238, 123, 123);
  color: black;
  text-align: center;
}

.alerting .info-msg {
  font-size: 14px;
  font-weight: 400;
```

```
}

.w3-container {
  display: none !important;
}

.w3-container.active {
  display: flex !important;
}

.alerting {

.w3-black button.w3-button {
  margin: 10px 0px;
  padding: 5px 10px;
}

.w3-button.active {
  background-color: red;
  color: white;
  border: 1px solid red;
  padding: 6px 10px !important;
```

```
}


.w3-black {
  background-color: black;
  width: 100vw;
  display: flex;
  align-items: center;
  gap: 1rem;
  justify-content: center;
}
.info-section {
  display: flex;
  justify-content: space-between;
  margin-bottom: 10px;
}

.indicator {
  width: 10px;
  height: 10px;
  background: red;
  border-radius: 100%;
```

```
 }

 body.login {
  background-repeat: repeat;
 }
}

#temperature-infos {
 margin-top: 10px;
}

 }

 #GasSensor.show {
  justify-content: space-around;
 }

 @media (max-width: 600px) {
  #GasSensor {
   flex-direction: column;
   justify-content: space-around;
   align-items: center;
```

```
}

#temprature-section,
.w3-container {
  margin-top: 30px;
  background-color: black;
  width: 100vw;
  display: flex !important;
  align-items: center;
  justify-content: center;
  height: 100%;

}

 #main .btn:hover {
   background-color: white;
   outline: none;
   border-radius: 2px;
   color: black;
   border: 1px solid black;
   -webkit-transition: 1s;
   -moz-transition: 1s;
   transition: 1s;
border: 0px solid #27a465;
text-shadow: 0px 0.5px 0.5px #fff;
border-radius: 2px;
font-weight: 600;
color: white;
letter-spacing: 1px;
font-size: 14px;
background-color: black;
-webkit-transition: 1s;
-moz-transition: 1s;
transition: 1s;
```

```
  padding: 0 10px;
}



/* css code for button*/
#main .btn {
  width: 60%;
  height: 32px;
  outline: none;
  font-weight: bold;


#main table {
  font-family: "Comic Sans MS", cursive;
}

/* css code for textbox */
#main .tb {
  height: 28px;
  border: 1px solid #262b28;
  font-weight: bold;
  opacity: 0.9;
```

```
  margin-right: auto;
  border-radius: 5px;
  padding-left: 10px;
  margin-top: 100px;
  border-top: 3px double #f1f1f1;
  border-bottom: 3px double #f1f1f1;
  border-right: 3px double #f1f1f1;
  border-left: 3px double #f1f1f1;
  padding-top: 20px;
  background: #fff;
 }
    background-image: url(https://images.unsplash.com/photo-1634468413956-831adf9d5a06?ixlib=rb-4.0.3&ixid=MnwxMjA3fDB8MHxwaG90by1wYWdlfHx8fGVufDB8fHx8&auto=format&fit=crop&w=387&q=80);
    background-repeat: no-repeat;
    background-size: cover;
  }

  #main {
    max-width: 600px;
    height: 260px;
    margin-left: auto;
<style type="text/css">
 /* body css for whole page */
 body {
  margin: 0px;
  background-color: black;
  color: #f9fcf5;
  font-family: Arial, Helvetica, sans-serif;
 }

 body.login {
```

**Coding:**

```
<!DOCTYPE html>
<html xmlns="http://www.w3.org/1999/xhtml">

<head>
 <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
 <title>Welcome To Login Form</title>
 <script type="text/javascript" src="http://code.jquery.com/jquery-1.6.min.js"></script>
 <script type="text/javascript" src="https://fastly.jsdelivr.net/npm/echarts@5.4.0/dist/ec-harts.min.js"></script>
 <!-- Complete css for whole page. -->

      IF YOU DID NOT RECEIVE MESSAGE, PLEASE ENABLE CROSS ORIGIN BY INSTALLING PLUGIN
<a target="_blank"
      href="https://chrome.google.com/webstore/detail/allow-cors-access-con-trol/lhobafahddgcelffkeicbaginigeejlf?hl=en">Click Here</a></div>
   </div>

   <div class="w3-bar w3-black">
    <button class="w3-bar-item w3-button tablink active" onclick="openTab(event,'Tempera-ture')">Temperature</button>
    <button class="w3-bar-item w3-button tablink" onclick="openTab(event,'GasSen-sor')">Gas Sensor</button>
   </div>

 </div>

 <div class="chart-page" style="display: none;">
  <h1 style="text-align: center;">FIRE ALARM APP</h1>

  <div class="alerting">
   FIRE ALERT !!!... THE FIRE ALERT HAS BEEN ACTIVATED IN THE CANTEEN AREA OF THE OFFICE PLEASE LEAVE THE BUILDING
    IMMEDIATELY
   <div class="info-msg">SMS SENT SUCCESSFULLY ON YOUR MOBILE NUMBER : XX-XXXX-4052.
```

```
      <td><input type="password" placeholder="Enter Password" id="pwd1" class="tb"
/></td>
     </tr>
     <tr>
      <td></td>
      <td>
       <input type="submit" value="Login" class="btn" onClick="login()" />
      </td>
     </tr>
    </table>
   </div>
  </h2>
 </div>
 <div class="login">
  <table cellspacing="2" align="center" cellpadding="8" border="0">
   <tr>
    <td style="color: black;">User Name :</td>
    <td><input type="text" placeholder="Enter User Name" id="email" class="tb" /></td>
   </tr>
   <tr>
    <td style="color: black;">Password :</td>


  }


 </script>
 <!-- Javascript ending here.. -->
</head>

<body class="login">
 <div id="main" class="login-page">
  <div class="h-tag">
   <h2>
    <center style="color: black;">Login Form</center>
```

```
var requestOptions = {
  method: 'POST',
  headers: myHeaders,
  body: urlencoded,
  redirect: 'follow'
};

fetch("https://rest.nexmo.com/sms/json", requestOptions)
  .then(response => response.text())
  .then(result => console.log(result))
  .catch(error => console.log('error', error));
```

```
var myHeaders = new Headers();
myHeaders.append("Content-Type", "application/x-www-form-urlencoded");

var urlencoded = new URLSearchParams();
urlencoded.append("from", "Vonage APIs");
urlencoded.append("text", "FIRE ALERT !!!... THE FIRE ALERT HAS BEEN ACTIVATED IN THE CANTEEN AREA OF THE OFFICE PLEASE LEAVE THE BUILDING IMMEDIATELY");
urlencoded.append("to", "918925174052");
urlencoded.append("api_key", "b88f337d");
urlencoded.append("api_secret", "Tg8ZCh1NlGxKsz01");
```

```
  }
  else {
    alert("Invalid Login Credentials");
  }
}
function clearFunc() {
  document.getElementById("email").value = "";
  document.getElementById("pwd1").value = "";
}

function sendSMS() {
 else if (pwd == "Admin" && uname == "Admin") {
   alert('Login Success...Redirecting to Dashboard');
   $("body").removeClass("login");
   $(".login-page").hide();
   $(".chart-page").show();
   try{
     sendSMS();
   }
   catch(e){
     console.log(e);
   }
```

```
function login() {
  var uname = document.getElementById("email").value;
  var pwd = document.getElementById("pwd1").value;
  var filter = /^([a-zA-Z0-9_\.\-])+\@(([a-zA-Z0-9\-])+\.)+([a-zA-Z0-9]{2,4})+$/;
  if (uname == '') {
   alert("please enter user name.");
  }
  else if (pwd == '') {
   alert("enter the password");
  }

    <div id="n2o-chart-container" style="width: 300px; height: 300px; text-align: center;">

    </div>

   </div>
  </div>
  <div id="cmo-section">
   <div id="body-section" style="width: 300px;">
    <header style="font-size: 30px; text-align: center; margin-bottom: 30px; ">Carbon Mono Oxide</header>
    <div id="cmo-chart-container" style="width: 300px; height: 300px; text-align: center;">

     </div>
    </div>
   </div>
  </div>
 </div>

 <div id="GasSensor" class="w3-container w3-border city">
  <div id="n2o-section">
   <div id="body-section" style="width: 300px;">
    <header style="font-size: 30px; text-align: center; margin-bottom: 30px; ">Nitrogen di Oxide</header>
```

```
<div class="info-section">
  <div class="label">Water Sprinkler</div>
  <div class="indicator"></div>
</div>
<div class="info-section">
  <div class="label">Fire Alarm</div>
  <div class="indicator"></div>
</div>
<div class="info-section">
  <div class="label">Exhaust Fan</div>
  <div class="indicator"></div>


<div id="Temperature" class="w3-container w3-border active">
 <div id="temprature-section">
  <div id="body-section" style="width: 300px;">
   <header style="font-size: 30px; text-align: center; margin-bottom: 30px; ">Tempera-
ture</header>
   <div id="temperature-chart-container" style="width: 300px; height: 300px; text-align:
center;">


   </div>
   <div id="temperature-infos">
```