**Asset Management Flow –**

|  |
| --- |
| ✅ With this design you’ll have:   * **Scalability:** Any new industry, category, or type can be added without redesigning the DB. * **Multi-tenancy:** Assets belong to organizations/buildings but share a common reference taxonomy. * **IoT readiness:** You can link asset instances to IoT devices (meters, sensors) for live monitoring. |

# **Industry-wise Asset Classification**

|  |  |  |
| --- | --- | --- |
| **Industry** | **Asset Categories** | **Example Assets** |
| **Facilities & Real Estate** | HVAC, Electrical, Fire Safety, Security, Plumbing, IT, Civil | Chillers, AHUs, FCUs, Transformers, UPS, Generators, Fire sprinklers, CCTV, Access control, Elevators, Escalators, Building structure |
| **Manufacturing & Industrial** | Production Machinery, Utilities, Safety Systems, Material Handling | CNC machines, Robotics, Compressors, Boilers, Motors, Gearboxes, Cranes, Forklifts, Tooling & dies, Pipelines |
| **Construction & Infrastructure** | Heavy Equipment, Transport, Temporary Systems, Tools, Structures | Excavators, Cranes, Dumpers, Concrete mixers, DG sets, Scaffolding, Survey instruments, Road pavers, Bridges, Tunnels |
| **Energy & Utilities** | Generation, Transmission, Distribution, Pipelines, Renewable, District Cooling/Heating | Turbines, Boilers, Generators, Transformers, Switchgear, Transmission lines, Pipelines, Solar panels, Wind turbines, Smart meters, Chillers, Pumps |
| **Transportation & Logistics** | Air, Sea, Rail, Road, Ports, Warehouses | Aircraft engines, Avionics, Ships, Locomotives, Tracks, Trucks, Buses, Gantry cranes, Cold storage, Charging stations |
| **Healthcare** | Medical Devices, Lab Equipment, ICU, Hospital Infra, Cold Chain | MRI, CT, X-ray, Dialysis machines, Ventilators, Monitors, HVAC, Power backup, Pharmacy refrigerators, Sterilizers, Ambulances |
| **Mining & Natural Resources** | Exploration, Heavy Vehicles, Processing, Ventilation, Safety | Drilling rigs, Dumpers, Loaders, Crushers, Mills, Conveyors, Gas detectors, Ore treatment plants, Storage tanks |
| **Agriculture & Food Supply** | Farm Equipment, Irrigation, Greenhouse, Drones, Food Processing, Storage | Tractors, Harvesters, Pumps, Sprinklers, Sensors, Drones, Mixers, Packaging lines, Cold rooms, Silos |
| **Defense & Aerospace** | Air, Naval, Ground, Space, Communication, Weapons, Facilities | Fighter jets, Drones, Submarines, Tanks, Missile launchers, Satellites, Radars, Military base infrastructure |

### ****Tables & Key Fields****

#### **Industry Table**

* IndustryID (PK)
* IndustryName (Facilities, Manufacturing, Energy, Healthcare, etc.)
* Description

#### **AssetCategory Table**

* CategoryID (PK)
* IndustryID (FK → Industry.IndustryID)
* CategoryName (HVAC, Electrical, Heavy Equipment, Medical Devices, etc.)
* Description

#### **AssetType Table**

* TypeID (PK)
* CategoryID (FK → AssetCategory.CategoryID)
* TypeName (Chiller, Transformer, Excavator, MRI Machine, etc.)
* Prefix (max 5 latters string)
* Description
* StandardMaintenanceGuidelines (optional – for preventive/predictive rules)

#### **AssetInstance (Asset Register)**

* AssetID (PK)
* TypeID (FK → AssetType.TypeID)
* OrganizationID (FK → Organization table, multi-tenant)
* BuildingID (FK → Building table, if Facilities industry)
* LocationID ( )
* AssetTag/Barcode/RFID
* SerialNumber
* Manufacturer
* Model
* PurchaseDate
* WarrantyExpiryDate
* Location cordinate (GPS coords)
* Condition (Good, Fair, Critical, etc.)
* Status (Active, Under Maintenance, Retired)

### ****Support Tables for Maintenance & Monitoring****

* **MaintenanceSchedule** (PPM plans linked to AssetID)
* **WorkOrders** (Reactive & Planned maintenance tasks)
* **SensorData / IoT Data** (if integrated with live meters/sensors)
* **AssetCosts** (Capex, Opex, spare parts, material use)
* **Depreciation/Finance** (optional if lifecycle costing is needed)

# **PPM Schedule Form (Frontend Design)**

### 🔹 Key Fields

1. **General Information**
   * Schedule ID (auto-generated)
   * Asset (dropdown → from Asset Register)
   * Asset Category (auto-filled)
   * Location (auto-filled from Asset register)
2. **Maintenance Plan**
   * Task/Activity- select checklist
   * Description (what to do in this task)
   * Discipline (Mechanical, Electrical, Civil, etc.)
   * Priority (Low, Medium, High, Critical)
   * Estimated Duration (hours)
   * Required Manpower (technician count)
   * Team
3. **Frequency**
   * Schedule Type: **Time-based** or **Meter-based**
   * Time-based: Weekly, Monthly, Quarterly, Semi-Annual, Annual, Custom interval (e.g., every 45 days)
   * Meter-based: Run-hours, Energy consumption, Water usage, etc. (requires IoT integration)
4. **Schedule Dates**
   * Start Date
   * Next Due Date (auto-calculated based on frequency)
   * End Date (optional if recurring forever)
5. **Resources & Costs**
   * Spare Parts/Materials required (dropdown with qty from Inventory)
   * Estimated Cost
6. **Workflow**
   * Assigned To (Technician/Team)
   * Approval Required (Yes/No)
   * Status (Planned, Approved, In Progress, Completed)

# **PPM Schedule Table (Backend DB Design)**

### ****PPMSchedule****

* PPMScheduleID (PK)
* AssetID (FK → AssetInstance.AssetID)
* TaskName
* Description
* DisciplineID (FK → Discipline table: Mechanical, Electrical, etc.)
* PriorityID (FK → Priority table)
* EstimatedDurationHours
* RequiredManpower
* ScheduleType (Time-based / Meter-based)
* Frequency (Daily, Weekly, Monthly, Quarterly, Annual, Custom)
* CustomIntervalDays (nullable – if custom chosen)
* StartDate
* NextDueDate
* EndDate (nullable)
* MaterialList (JSON or relation to PPM\_Materials table)
* EstimatedCost
* AssignedToUserID (FK → Users)
* ApprovalRequired (Boolean)
* Status (Planned, Approved, In Progress, Completed, Cancelled)
* CreatedBy / CreatedDate
* UpdatedBy / UpdatedDate

### ****PPM\_Materials (Support Table)****

* PPMMaterialID (PK)
* PPMScheduleID (FK → PPMSchedule.PPMScheduleID)
* MaterialID (FK → Inventory.ItemID)
* Quantity

### ****PPM Execution (when performed)****

We also need a **PPM\_Log / WorkOrder link** to track history.

**PPM\_Log Table**

* PPMLogID (PK)
* PPMScheduleID (FK)
* WorkOrderID (FK → WorkOrders table)
* PerformedDate
* PerformedByUserID
* Status (Completed, Skipped, Delayed)
* Remarks

# **PPM Workflow (Step by Step)**

1. **Define Schedule**
   * Admin/Facility Manager creates a **PPM Schedule** for an asset.
   * Includes frequency (time-based or meter-based), tasks, required materials, assigned team, etc.
2. **Trigger (Scheduler or IoT)**
   * System checks **Next Due Date** or **Meter threshold**.
   * If condition met → **Auto-generate Work Order**.
3. **Work Order Creation**
   * Work Order is linked to Asset + PPM Schedule.
   * Includes tasks, spare parts, manpower, etc.
   * Status: **Open** → Assigned to technician/team.
4. **Execution**
   * Technician accepts → Attends → Performs maintenance.
   * Logs start, pause, resume, complete times.
   * Uses materials from Inventory.
5. **Completion & Logging**
   * Technician submits completion report.
   * Supervisor reviews & approves (if required).
   * Work Order closed.
   * Entry logged into **PPM\_Log (History)**.
6. **Next Due Date Update**
   * System calculates next due date (based on frequency).
   * Updates PPM Schedule.

# **Database Flow**

* **PPMSchedule** → (Scheduler/IOT Trigger) → **WorkOrder**
* **WorkOrder Execution** → **PPM\_Log** (History)
* **Inventory Transactions** (materials used) → linked to WorkOrder

# **Comprehensive 52-Week PPM Calendar**

### ****Core Features****

1. **Calendar View (52 Weeks)**
   * Yearly grid (Week 1 → Week 52)
   * Each block shows PPM tasks scheduled for that week
   * Color-coded by **status** (Planned, Approved, In Progress, Completed, Overdue)
2. **Filters & Search**
   * **Industry / Site / Building / Floor / Location**
   * **Asset Category** (HVAC, Electrical, Fire Safety, etc.)
   * **Asset Type** (Chiller, Transformer, Pump, etc.)
   * **Specific Asset** (from Asset Register)
   * **Technician / Team** (assigned workforce)
   * **Priority** (Critical, High, Medium, Low)
   * **Discipline** (Mechanical, Electrical, Civil, etc.)
   * **Status** (Planned, Overdue, Completed, Cancelled)
3. **Drill-Down**
   * Click on a week → see list of all tasks due in that week
   * Click on a task → open Work Order details
4. **KPIs & Indicators**
   * Task counts (per week, per filter)
   * SLA/Compliance % (Completed on time vs Overdue)
   * Manhours required vs available
   * Material requirement forecast (from inventory link)
5. **Export Options**
   * Export calendar to PDF, Excel, or Share with Team
   * Auto-email weekly PPM tasks to technicians