

# MES Production Confirmation - POC Specification

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Version: 1.0 Date: 2026-01-30 Scope: Proof of Concept

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## 1. POC Objective

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Build a standalone Production Confirmation UI that demonstrates:

- Capturing production confirmation at operation level
- Material consumption and production tracking
- Batch traceability
- Status management

### Reference Documents:

- MES – Consolidated.docx (Requirements & Data Model)
  - Satyendra MOM.pdf (Meeting Discussion)
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## 2. POC Scope

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### In Scope

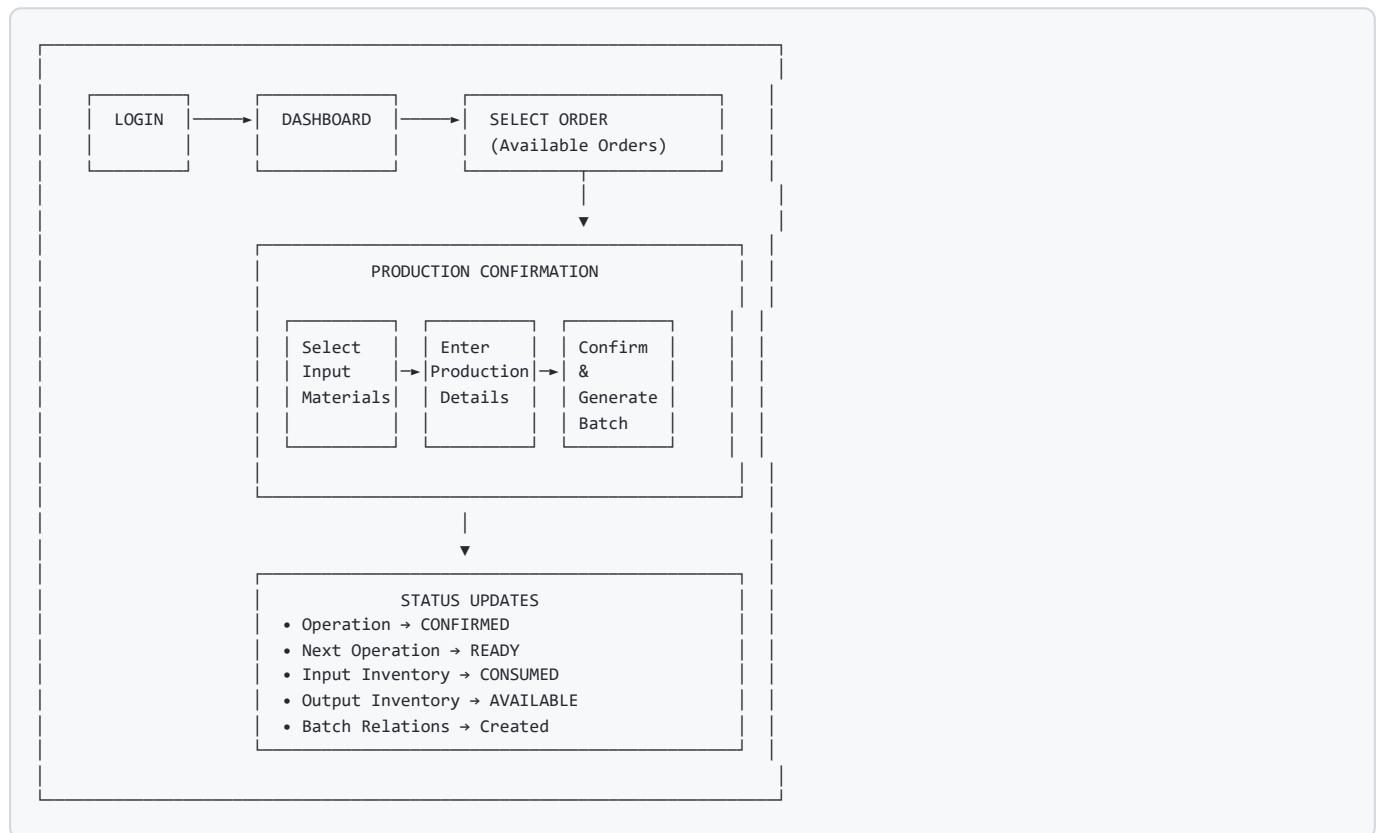
| Feature                 | Description                                     |
|-------------------------|-------------------------------------------------|
| Login                   | Single pre-seeded admin user                    |
| Order Selection         | View and select available orders for production |
| Production Confirmation | Capture production data at operation level      |
| Material Selection      | Select RM/IM batches for consumption            |
| Batch Generation        | Generate output batch on confirmation           |
| Status Updates          | Update operation, process, order line status    |
| Basic Traceability      | View batch parent-child relationships           |

## Out of Scope (Future)

- User management & roles
- Quality control module
- Reporting & analytics
- Notifications
- External integrations

## 3. Core Workflow

### 3.1 Main Application Flow

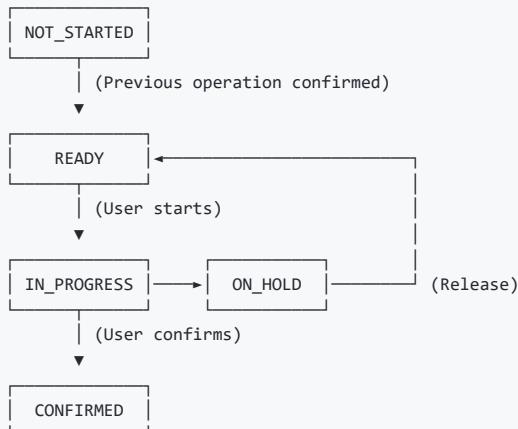


## 3.2 Production Confirmation Flow (Detailed)

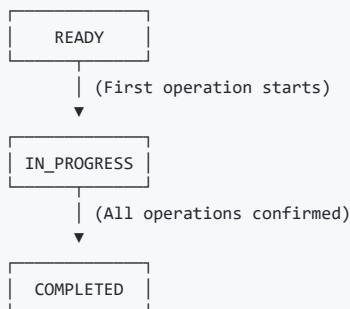


## 4. Status State Flows

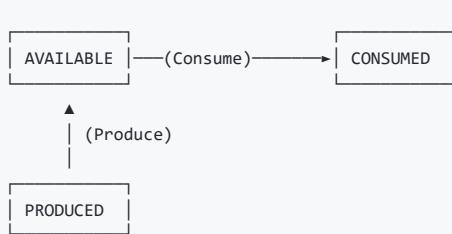
### 4.1 Operation Status



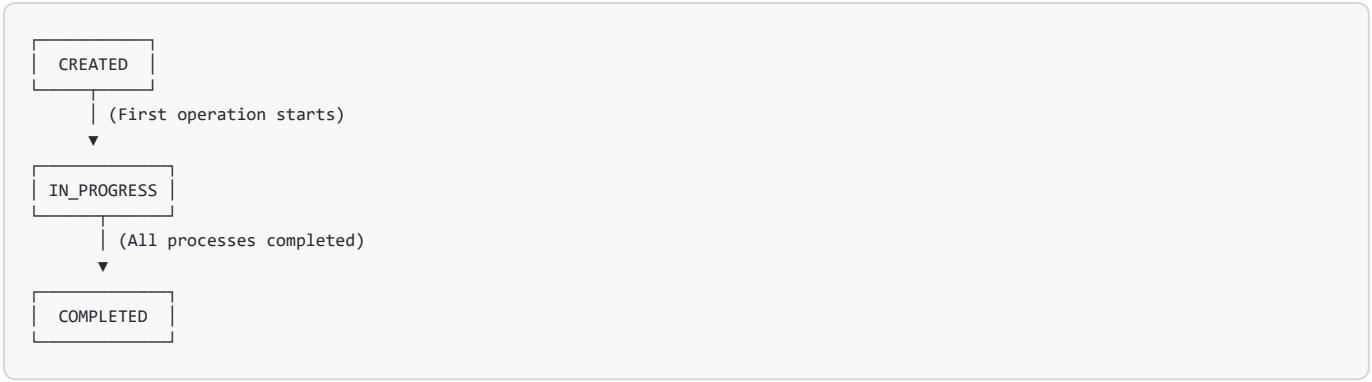
### 4.2 Process Status



### 4.3 Inventory State



## 4.4 Order Line Status



## 5. POC Wireframes

### 5.1 Login Screen

The wireframe shows a login form titled 'MES Production Confirmation'. It contains fields for 'Email' (with a placeholder box) and 'Password' (with a placeholder box). Below these is a 'LOGIN' button. At the bottom left of the form area, there is a note: 'POC: admin@mes.com / admin123'.

#### Behavior:

- Single pre-seeded user in database
- On success → Dashboard
- On failure → Show error message

## 5.2 Dashboard / Order Selection Screen

MES Production Confirmation [Admin] [Logout]

Available Orders for Production

Orders shown: Operation Status = READY

| Order ID | Product     | Qty   | Process   | Operation       |
|----------|-------------|-------|-----------|-----------------|
| ORD-001  | Steel Coil  | 100 T | Rolling   | Hot Rolling     |
| ORD-002  | Steel Sheet | 50 T  | Tempering | Heat Treatment  |
| ORD-003  | Steel Bar   | 200 T | Casting   | Continuous Cast |
| ORD-005  | Steel Plate | 120 T | Melting   | Furnace Load    |

Selected Order Details

Order: ORD-001  
Product: Steel Coil (SKU-SC-001)  
Order Qty: 100 T  
Delivery Date: 2026-02-15

Current Process: Rolling (Process 3 of 5)  
Current Operation: Hot Rolling (Op-10)  
Operation Status: READY

Process Flow:

```
graph LR; Melting[Melting] --> Casting[Casting]; Casting --> Rolling[Rolling]; Rolling --> Tempering[Tempering]; Tempering --> Cutting[Cutting];
```

BOM Input Required: Steel Slab (Cast) - 105 T  
Expected Output: Steel Coil (Rolled) - 100 T

[Start Production Confirmation]

Legend: ✓ Completed • Current ○ Pending

### Data Source:

- Orders joined with OrderLineItems, Processes, Operations
- Filter: Operations.Status = 'READY'

### 5.3 Production Confirmation Screen

MES Production Confirmation [Admin] [Logout]

[← Back] Production Confirmation  
Order: ORD-001 | Process: Rolling | Operation: Hot Rolling (Op-10)

STEP 1: Input Materials —

Required: Steel Slab (Cast) - 105 T (from BOM)

Available Batches:

| <input type="checkbox"/>            | Batch ID     | Material   | Available | Consume |
|-------------------------------------|--------------|------------|-----------|---------|
| <input checked="" type="checkbox"/> | BATCH-CS-001 | Steel Slab | 60 T      | [55 ]   |
| <input checked="" type="checkbox"/> | BATCH-CS-002 | Steel Slab | 70 T      | [50 ]   |
| <input type="checkbox"/>            | BATCH-CS-003 | Steel Slab | 45 T      | [ ]     |

Total Selected: 105 T    Required: 105 T    ✓ Requirement Met

STEP 2: Production Details —

Start Time [2026-01-30] [09:00]    End Time [2026-01-30] [11:30]

Produced Quantity [100 ] T    Scrap Quantity [5 ] T    Yield 95.2%

Equipment                          Operator  
[] Rolling Mill #1    [] John Smith (OP001)  
[] Rolling Mill #2    [] Mike Wilson (OP002)  
[] Rolling Mill #3    [] Sarah Brown (OP003)

Delay (if any)  
Duration: [30 ] mins    Reason: [Equipment Issue ▼]

STEP 3: Process Parameters —

|                               |                        |                   |                     |
|-------------------------------|------------------------|-------------------|---------------------|
| Temperature [850 ] °C         | Pressure [120 ] bar    | Speed [25 ] m/min | Thickness [2.5 ] mm |
| Energy Consumption [450 ] kWh | Coolant Usage [150 ] L |                   |                     |

(Parameters are dynamic based on Operation + Product)

STEP 4: Output Batch —

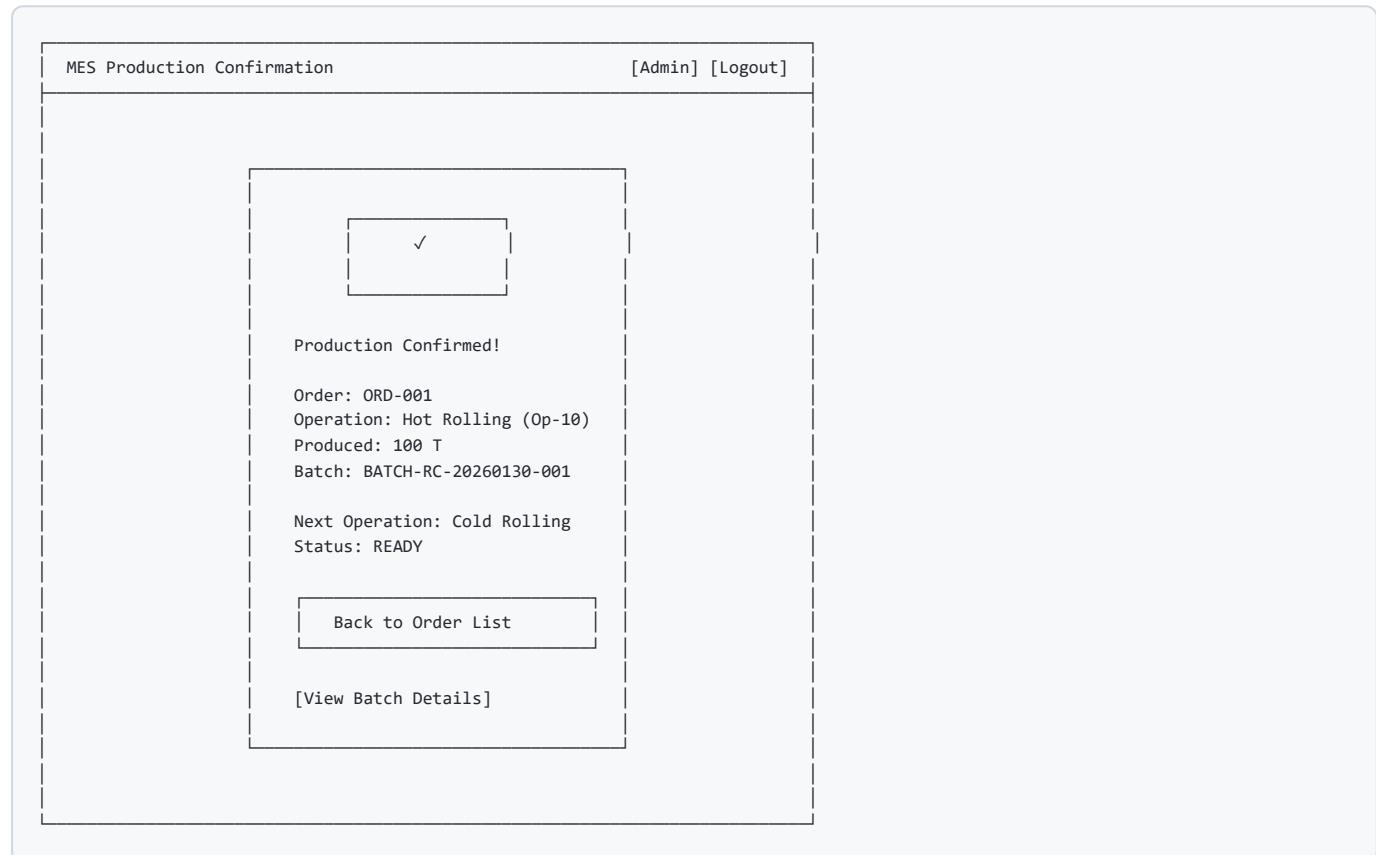
New Batch Number: BATCH-RC-20260130-001 (Auto-generated)  
Output Material: Steel Coil (Rolled)  
Output Quantity: 100 T

[Confirm Production]

On Confirm:

1. Create ProductionConfirmation record
  2. Update consumed batches: Inventory.State → CONSUMED
  3. Create new Inventory record: State = AVAILABLE
  4. Create new Batch record
  5. Create BatchRelations (parent batches → child batch)
  6. Update Operation.Status → CONFIRMED
  7. Set next Operation.Status → READY
  8. If last operation, update Process.Status → COMPLETED
  9. Create AuditTrail entries
- 

## 5.4 Confirmation Success Screen



## 5.5 Batch Traceability Screen

MES Production Confirmation [Admin] [Logout]

[← Back] Batch Traceability

Batch Information

Batch Number: BATCH-RC-20260130-001  
Material: Steel Coil (Rolled)  
Quantity: 100 T  
Status: AVAILABLE  
Created At: Hot Rolling (Op-10) | Rolling Process  
Created On: 2026-01-30 11:30

Genealogy (Input → Output)

INPUT BATCHES (Parents) OUTPUT BATCH (Child)

```
graph LR; A["BATCH-CS-001  
Steel Slab  
Consumed: 55 T  
Operation: Casting"] --> C["BATCH-RC-20260130-001  
Steel Coil (Rolled)  
Produced: 100 T  
Operation: Rolling"]; B["BATCH-CS-002  
Steel Slab  
Consumed: 50 T  
Operation: Casting"] --> C
```

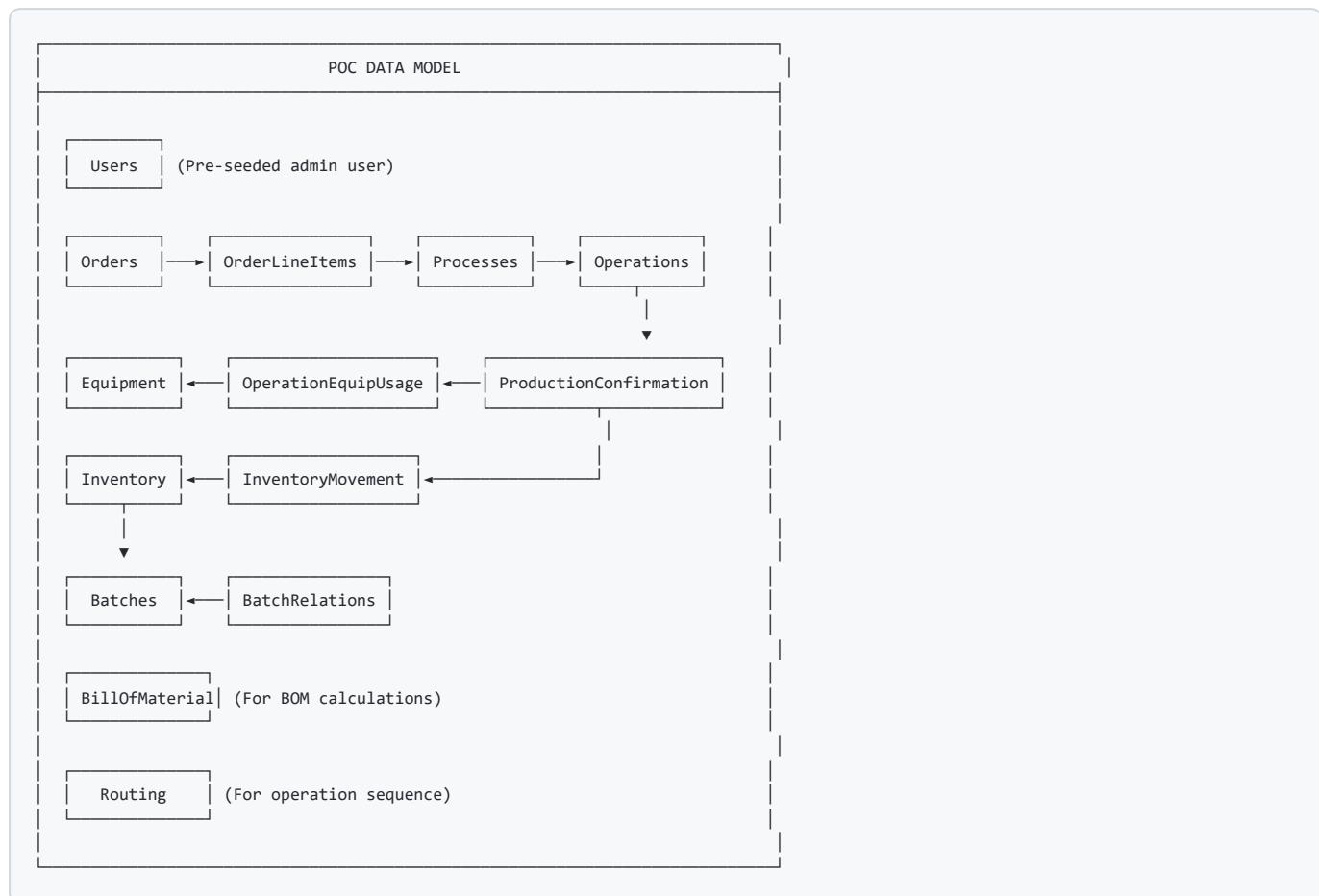
Total Input: 105 T Total Output: 100 T Yield: 95.2%

Production Details

Order: ORD-001  
Process: Rolling  
Operation: Hot Rolling (Op-10)  
Start: 2026-01-30 09:00 End: 2026-01-30 11:30  
Equipment: Rolling Mill #1, Rolling Mill #2  
Operator: John Smith, Mike Wilson

## 6. Data Model (From Consolidated Document)

### 6.1 Core Tables for POC



### 6.2 Table Definitions (Key Fields)

#### Users

UserID (PK)  
Email  
PasswordHash  
Name  
Status (ACTIVE)

#### Orders

OrderID (PK)  
CustomerID  
OrderDate  
Status (CREATED / IN\_PROGRESS / COMPLETED)

## OrderLineItems

```
OrderLineID (PK)
OrderID (FK)
ProductSKU
Quantity
DeliveryDate
Status (CREATED / IN_PROGRESS / COMPLETED)
```

## Processes

```
ProcessID (PK)
OrderLineID (FK)
BOMID (FK)
StageName
Status (READY / IN_PROGRESS / COMPLETED)
```

## Operations

```
OperationID (PK)
ProcessID (FK)
OperationName
OperationType
Status (NOT_STARTED / READY / IN_PROGRESS / CONFIRMED)
```

## ProductionConfirmation

```
ConfirmationID (PK)
OperationID (FK)
ProducedQty
ScrapQty
StartTime
EndTime
DelayMinutes
DelayReason
ProcessParameters (JSON)
CreatedBy
CreatedOn
```

## Inventory

```
InventoryID (PK)
MaterialID
InventoryType (RM / IM / FG)
State (AVAILABLE / CONSUMED / PRODUCED)
Quantity
BatchID (FK)
```

## Batches

```
BatchID (PK)
MaterialID
BatchNumber
Quantity
GeneratedAtOperationID (FK)
Status (AVAILABLE / CONSUMED)
CreatedOn
```

## BatchRelations

```
RelationID (PK)
ParentBatchID (FK)
ChildBatchID (FK)
OperationID (FK)
QuantityConsumed
RelationType (MERGE)
```

## Equipment

```
EquipmentID (PK)
Name
EquipmentType (Batch / Continuous)
Status (AVAILABLE / IN_USE)
```

## BillOfMaterial

```
BOMID (PK)
ProductSKU
MaterialID
QuantityRequired
YieldLossRatio
SequenceLevel
```

## 7. API Endpoints (POC)

**Authentication:**

```
POST  /api/auth/login      - Login
POST  /api/auth/logout     - Logout
GET   /api/auth/me         - Current user
```

**Orders:**

```
GET   /api/orders/available - Orders with READY operations
GET   /api/orders/:id       - Order details with processes
```

**Operations:**

```
GET   /api/operations/:id  - Operation details
GET   /api/operations/:id/bom - BOM requirements for operation
```

**Inventory:**

```
GET   /api/inventory/available - Available batches for consumption
GET   /api/inventory/available?materialId=X - Filter by material
```

**Production:**

```
POST  /api/production/confirm - Submit production confirmation
```

**Batches:**

```
GET   /api/batches/:id      - Batch details
GET   /api/batches/:id/genealogy - Batch traceability
```

**Master Data:**

```
GET   /api/equipment        - List equipment
GET   /api/operators         - List operators
GET   /api/delay-reasons    - List delay reasons
```

## 8. Pre-seeded Master Data (POC)

### 8.1 Sample Data Requirements

| Entity            | Sample Records               |
|-------------------|------------------------------|
| Users             | 1 admin user                 |
| Orders            | 3-5 orders                   |
| Products/SKUs     | 5-6 products                 |
| Processes         | 4-5 processes per product    |
| Operations        | 2-3 operations per process   |
| Equipment         | 5-6 machines                 |
| Operators         | 3-4 operators                |
| Raw Materials     | 5-6 materials                |
| Inventory/Batches | 10-15 batches                |
| BOM               | Multi-level BOM for products |
| Routing           | Operation sequences          |

### 8.2 Sample Process Flow (Steel Coil)

```
Product: Steel Coil

Process 1: Melting
  └─ Op-10: Furnace Loading
  └─ Op-20: Melting

Process 2: Casting
  └─ Op-10: Continuous Casting

Process 3: Rolling
  └─ Op-10: Hot Rolling
  └─ Op-20: Cold Rolling

Process 4: Tempering
  └─ Op-10: Heat Treatment

Process 5: Cutting
  └─ Op-10: Slitting
```

## 9. Validation Rules (POC)

| Field           | Rule                   |
|-----------------|------------------------|
| Email           | Required, valid format |
| Password        | Required               |
| Consumption Qty | > 0, <= Available      |
| Produced Qty    | > 0                    |
| Scrap Qty       | >= 0                   |
| Start Time      | Required, <= Now       |
| End Time        | Required, > Start Time |
| Equipment       | At least 1 selected    |
| Operator        | At least 1 selected    |
| Delay Reason    | Required if Delay > 0  |

## 10. Technology Stack

| Layer         | Technology                                |
|---------------|-------------------------------------------|
| Frontend      | Angular 17 (Module-based, not standalone) |
| UI Components | Angular Material / Bootstrap              |
| Backend       | Spring Boot 3.2 (Java 17)                 |
| Database      | PostgreSQL                                |
| Auth          | JWT tokens (Spring Security)              |
| ORM           | Spring Data JPA / Hibernate               |
| Build         | Maven (Backend), Angular CLI (Frontend)   |
| DB Patches    | Custom SQL patch mechanism                |

### Database Patching Mechanism

- SQL files in `resources/patches/` folder
- Naming convention: `001_description.sql`, `002_description.sql`
- Applied automatically on application startup
- Tracked in `database_patches` table
- Sequential execution by patch number

## 11. POC Deliverables

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1. **Login Screen** - Authentication with single user
  2. **Dashboard/Order List** - View available orders
  3. **Production Confirmation** - Full workflow
  4. **Batch Traceability** - View parent-child relations
  5. **Database** - Seeded with sample data
  6. **API** - Endpoints for all operations
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