# MES Production Confirmation - POC Specification

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

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## 1. POC Objective

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

### 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

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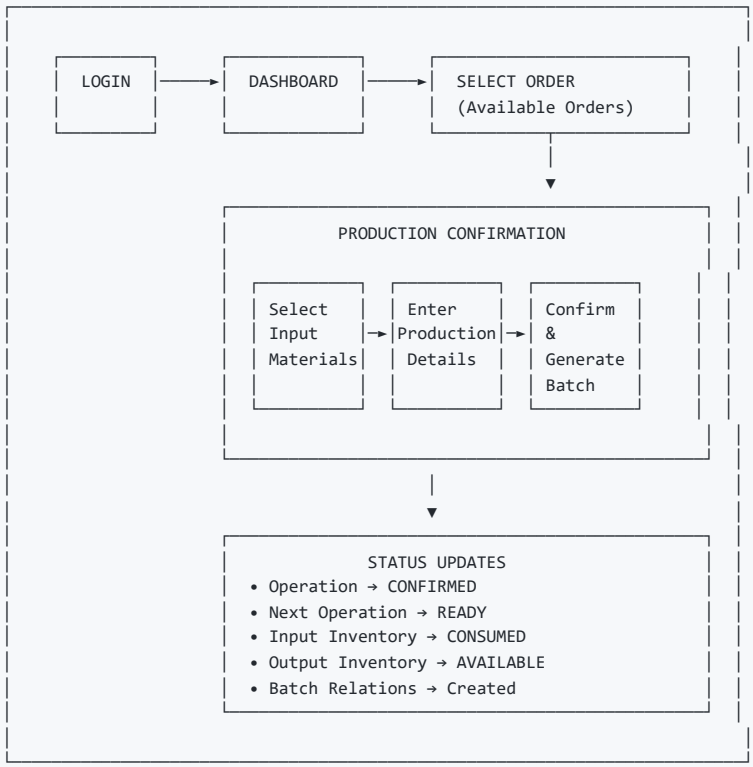
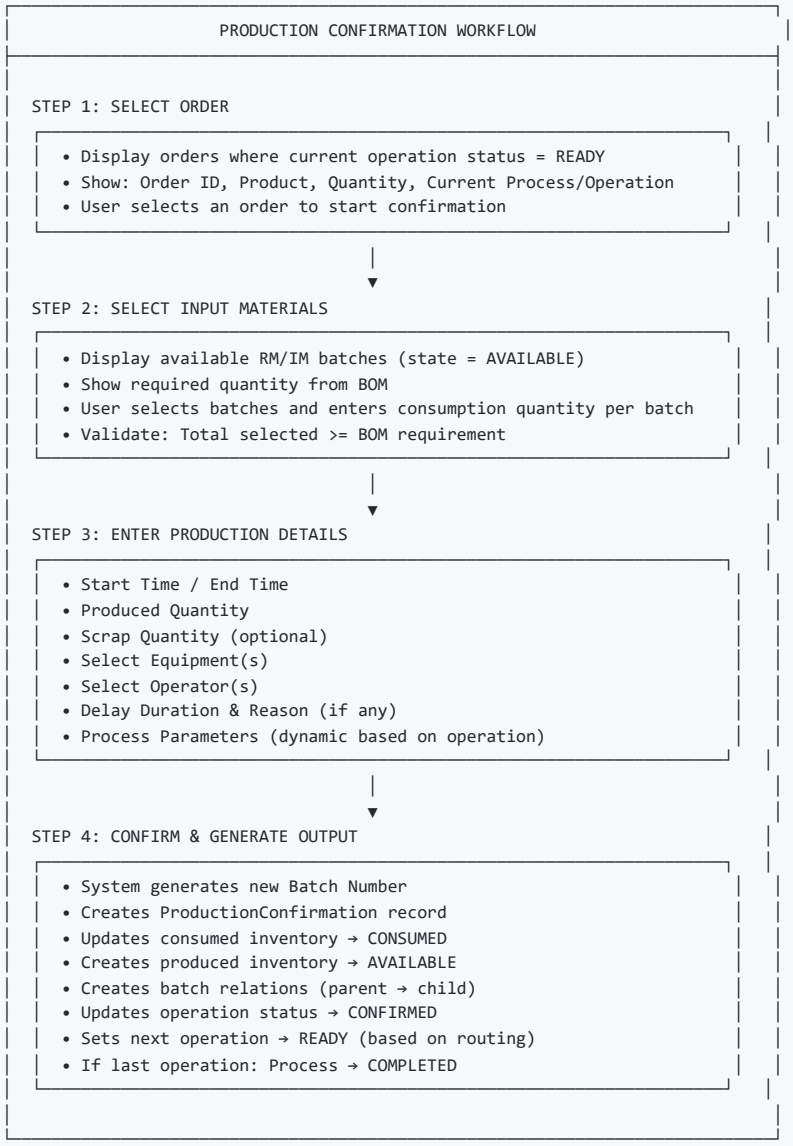
## 3. Core Workflow

### 3.1 Main Application Flow

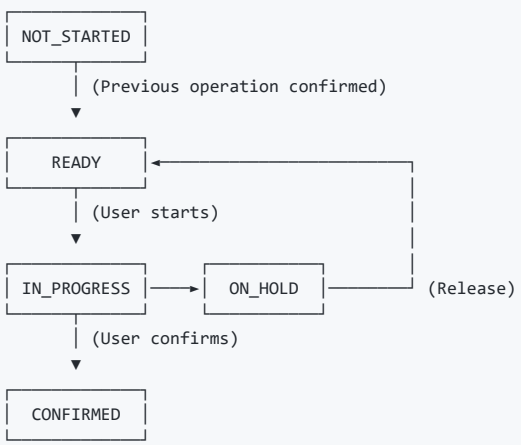


## 3.2 Production Confirmation Flow (Detailed)

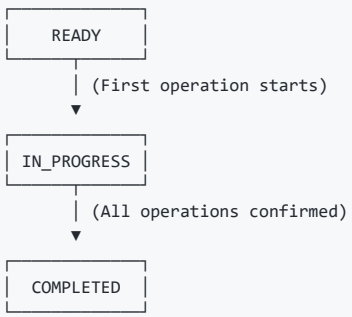


# 4. Status State Flows

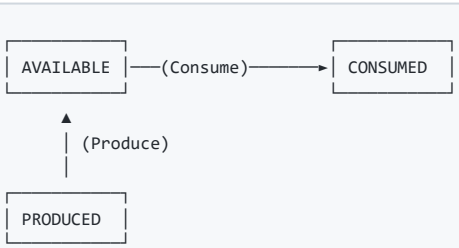
## 4.1 Operation Status



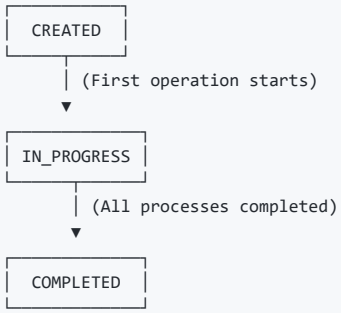

## 4.2 Process Status




## 4.3 Inventory State



### 4.4 Order Line Status

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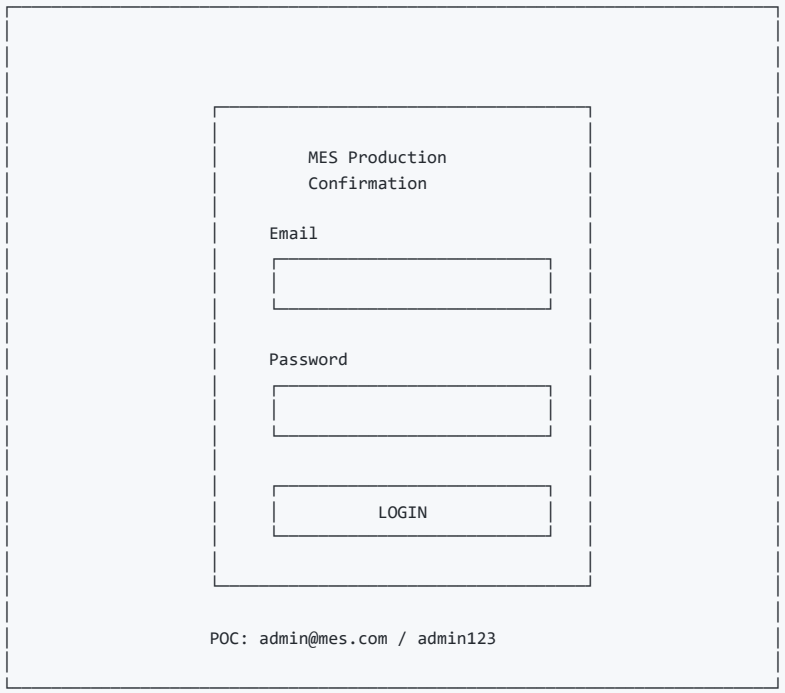
## 5. POC Wireframes

### 5.1 Login Screen




**Behavior:**

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

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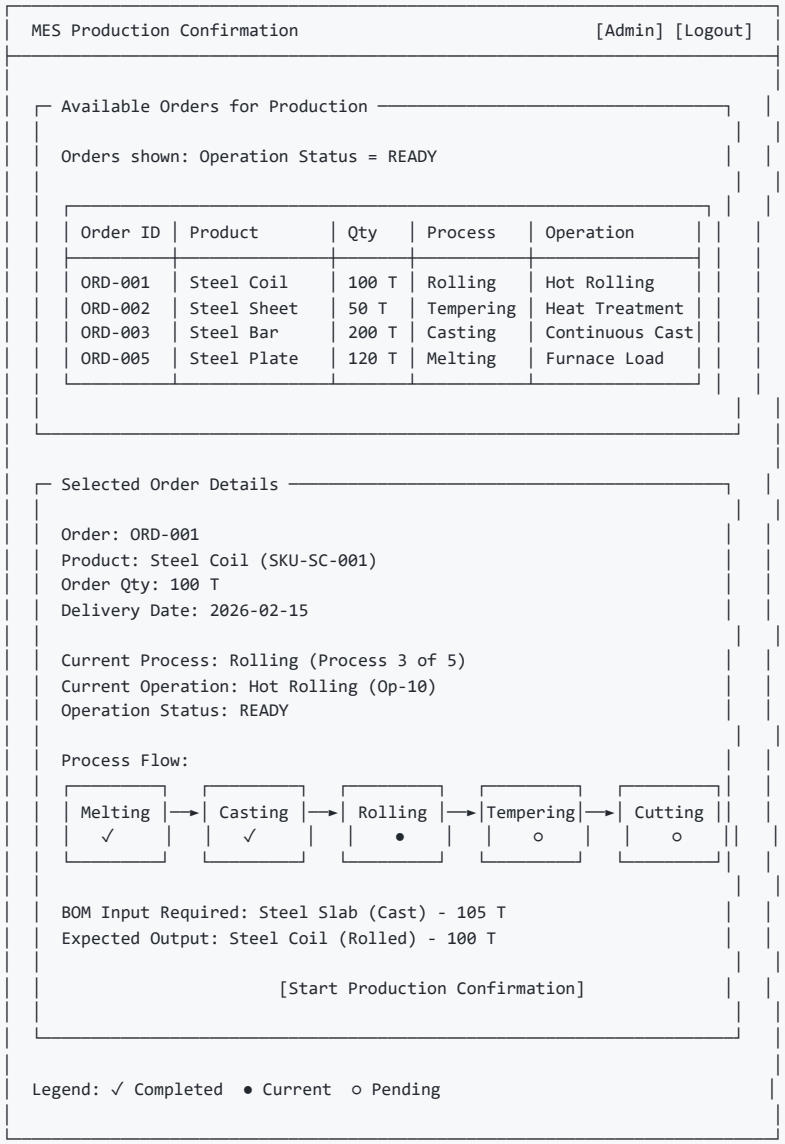
## 5.2 Dashboard / Order Selection Screen




**Data Source:**

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

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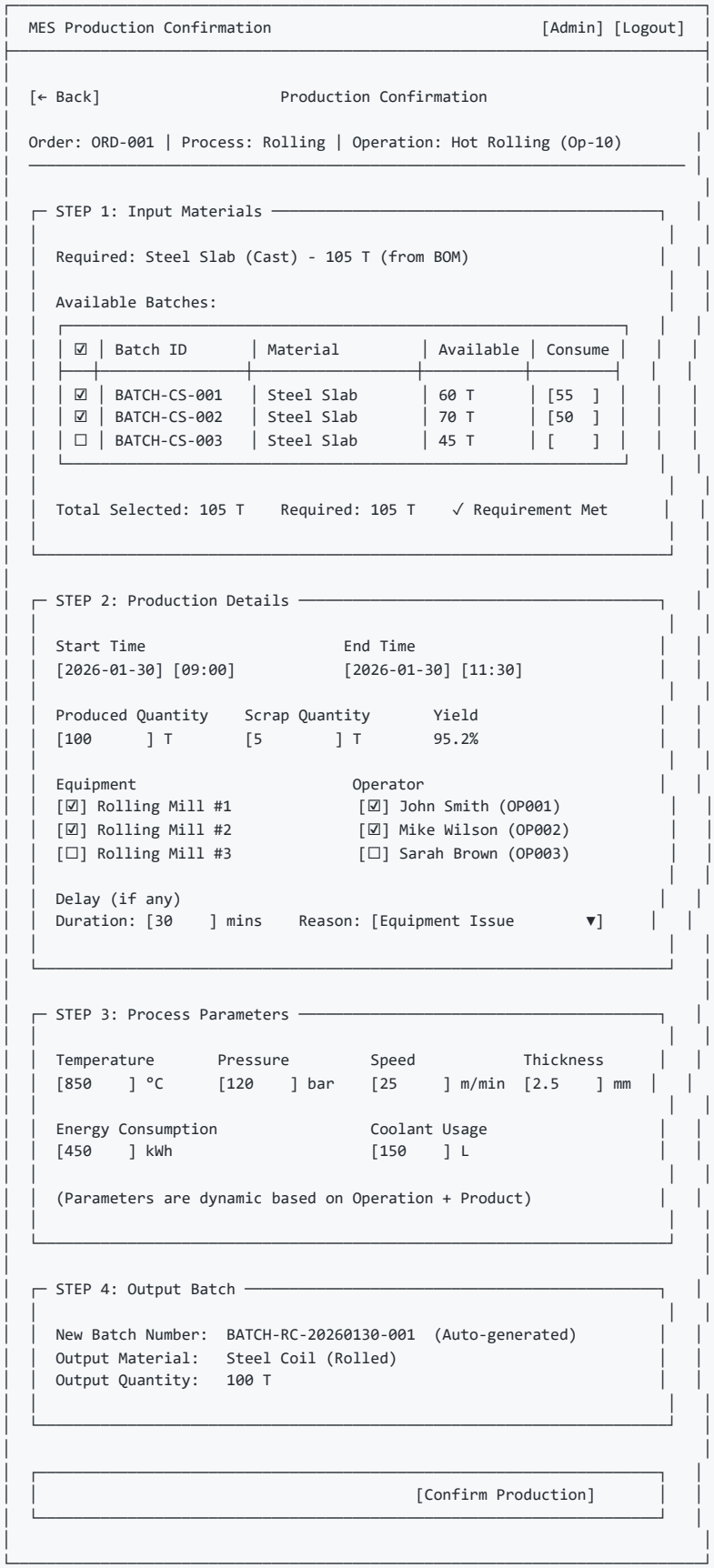
## 5.3 Production Confirmation Screen




### 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

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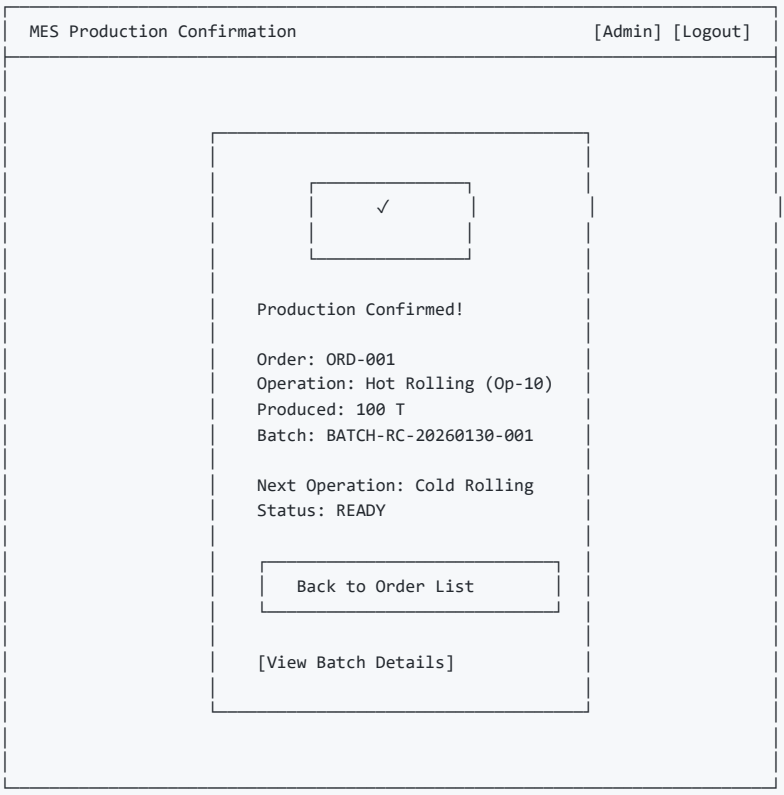
## 5.4 Confirmation Success Screen

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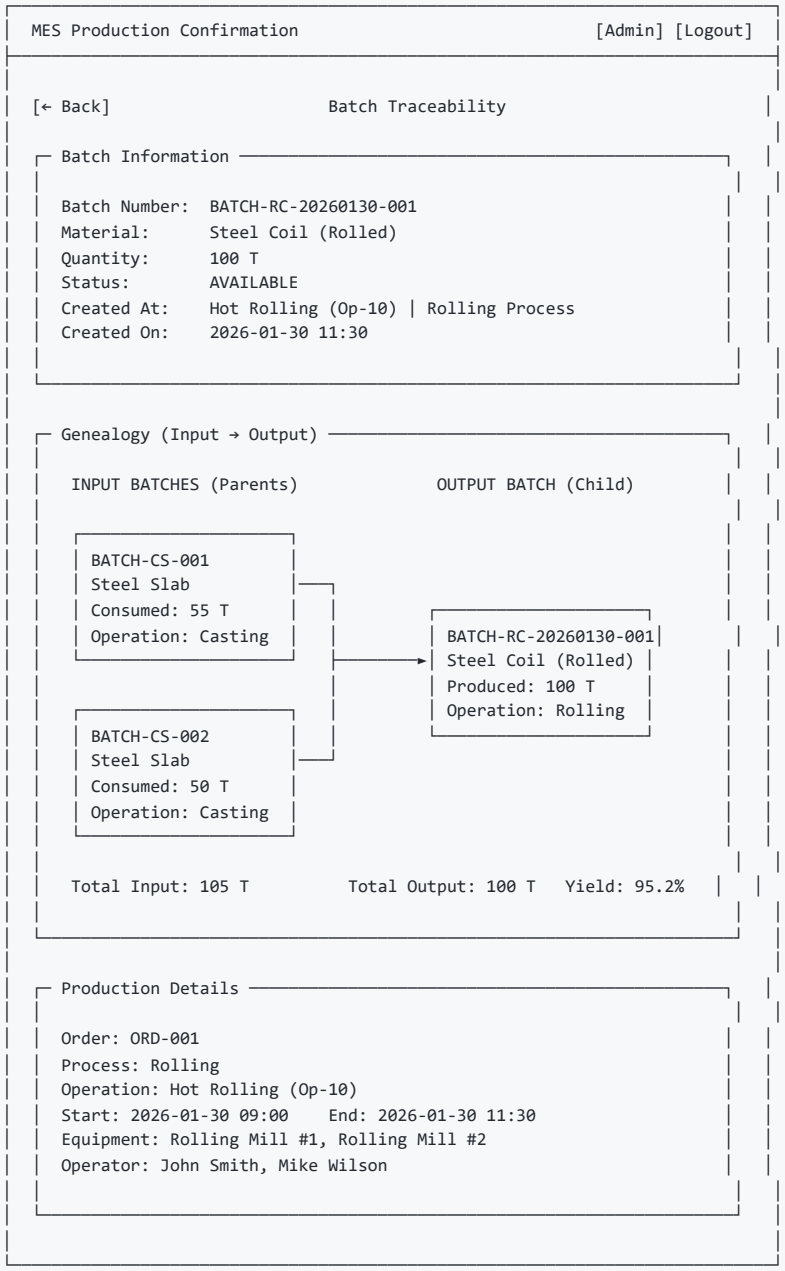
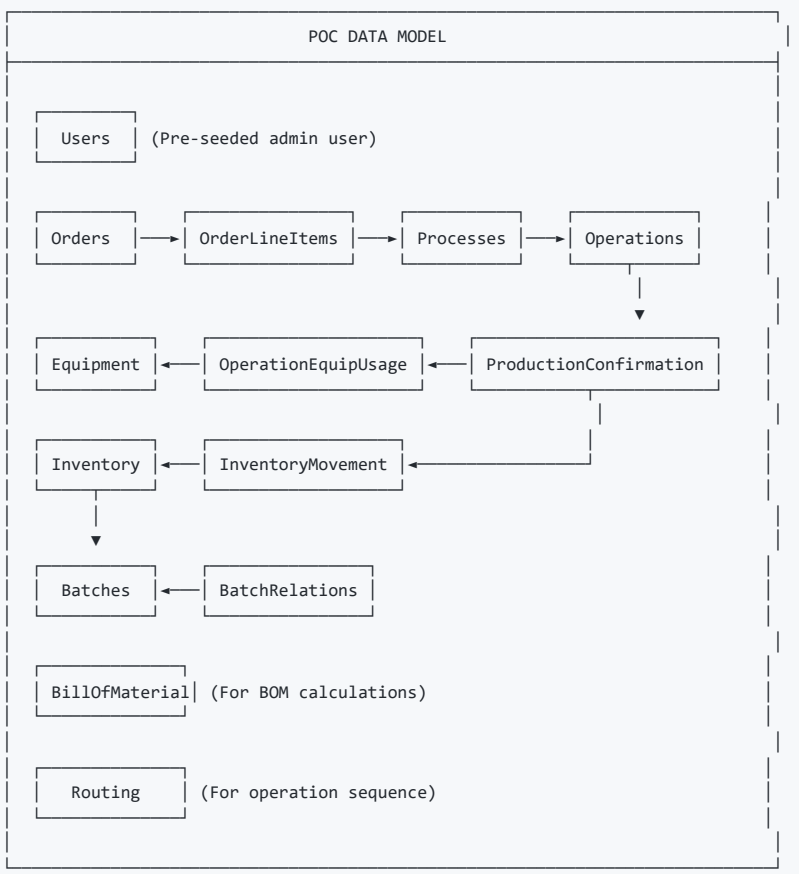
## 5.5 Batch Traceability Screen



# 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
```

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## 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
```

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# 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 |

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## 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

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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