This is the framework of the problem.

Production

- Production process is by product per batch with setup between products
  - Example:
    Product sequence is Product A – C – B – D
    Batch 1 – Customer 1, Customer 2, Customer 5, Customer 7

  So the production process will start with all demand units of product A for customers 1,2,5,7 followed by a setup process, then all demand units of product C for customers 1,2,5,7 followed by another setup for product B, and so on. After completion of Batch 1, production for Batch 2 will begin.

Distribution

- Delivery is done by heterogeneous vehicles (varying capacity) and allows multiple trips for each vehicle.
- Each production batch is assigned a delivery vehicle. (The delivery vehicle is unique in a sense that they can be assigned the same vehicle but is distinguishable in terms of the tour number of that vehicle)
  - Example:
    Batch 1 – Vehicle (v) 1, Tour (h) 1
    Batch 2 – Vehicle (v) 3, Tour (h) 1
    Batch 3 – Vehicle (v) 1, Tour (h) 2

  The vehicle can have another production batch (tour) assigned if it is available: Either, (1) the vehicle is at the plant (has already delivered a tour and is just at the plant) and its start time is the production completion time of the batch $(c_f^p \leq s_{v,h+1}^d)$ OR (2) if the vehicle is delivering a current tour but can make it on time at the plant just as the production of the assigned batch is completed $(\alpha_{n+1,v,h} \leq s_{v,h+1}^d)$.

- Routing
  - Example:
    Batch 1 – Customer 1, Customer 2, Customer 5, Customer 7

  Routing: Plant (Location 0) – Customer 2 – Customer 7 – Customer 1 – Customer 5 – Plant (Location n+1)

Remarks:

Data in excel makes use of placeholders 0 and n+1 for the manufacturing plant. For instance, if there are 25 customers, 0 represents the plant as the starting location and 26 represents the plant as the final location.

I am not sure if manually typing the possible combinations for data is necessary when it comes to heuristics since from what I know, it can be possible to just input the data requirements:

For data generations, should always be Random. (Uniform Distribution)

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Number of customers: 100

Plant – Starting (0) and Final Location (n+1)

Number of products: Generated

Setup and Process Time: Generated. Setup U(1,10). Process U(1,5)

Demand: Generated U(10,50)

Travel Time: From the given data set

Time Window [LB,UB]: Adapted original data for Lower bound. Upper bound = generated. Group customers into 4 groups. UB = original UB + group number x 0.5 x Total Unloading Time

Loading and Unloading time: Given Data. Unloading (0.2*Demand size for customer i)

Vehicle Info (Number of vehicles, Capacity, Cost): From given data set

Cost (cost/time): Generated