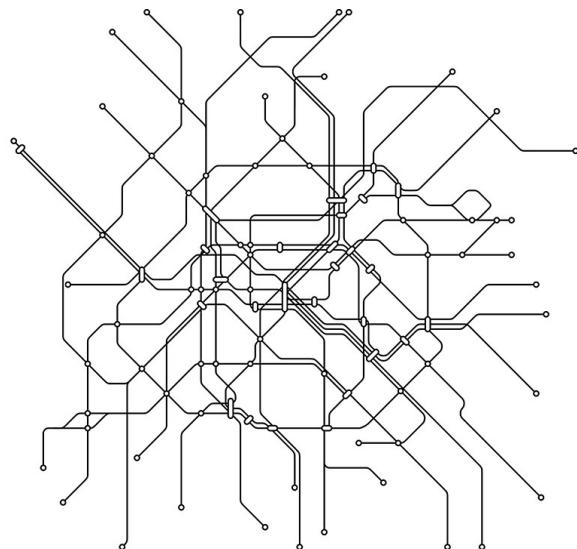


Figure 1: Initial Brainstorm of patterns



PARIS

Begin with complex image of Paris Metro map.

Design subway route with simpler paths taking into account .125" marble constraint. Began idea of engraved landmarks, deserted in next design because of size constraints .

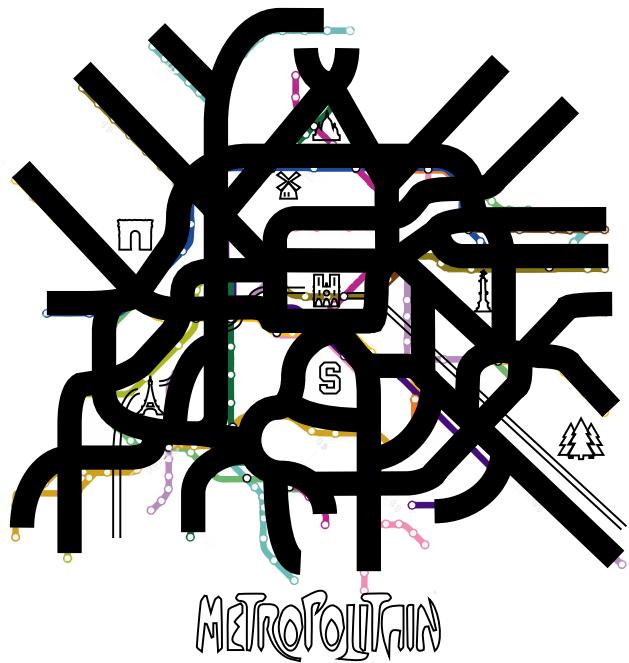


Figure 2: Pattern development

Checklist Items:

- wall thicknesses and acute angles
- required tooling for geometry
- dimensions of threaded holes

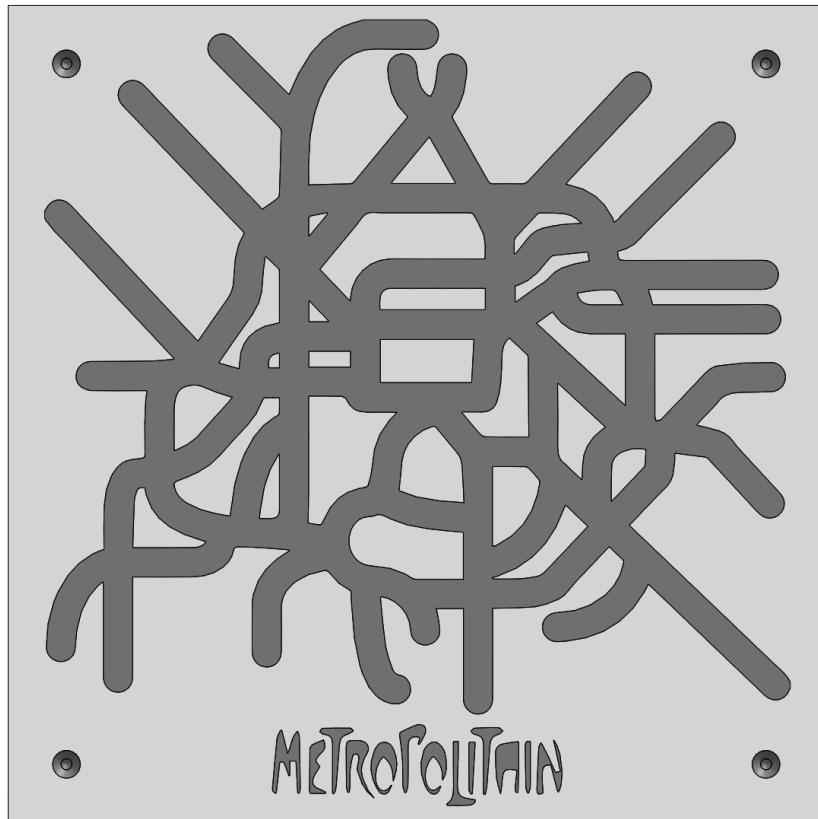
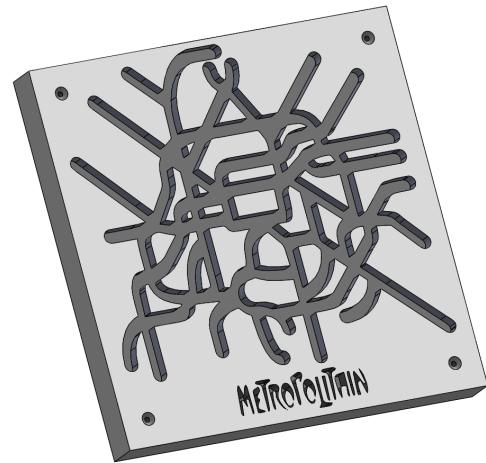
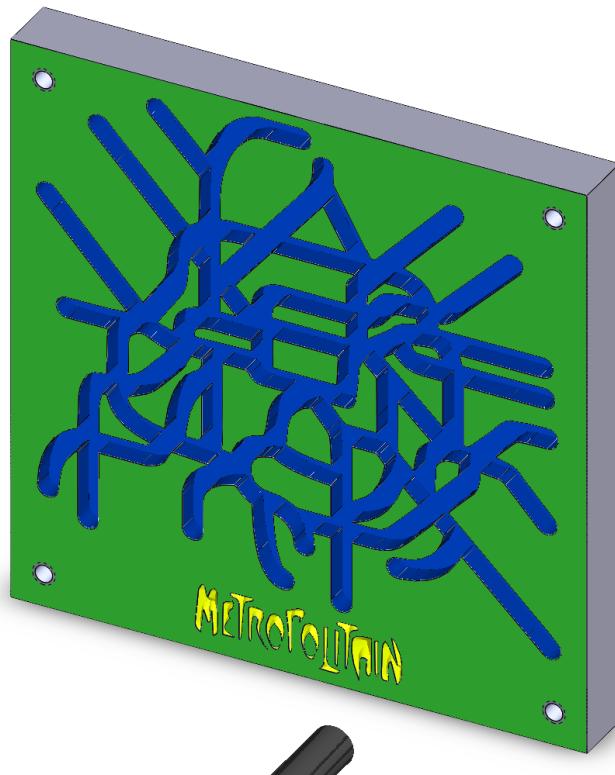


Figure 3: Initial Solidworks Models

Prototype: Laser graved into 1/4" acrylic



Revised geometry and HSM generated tool path:



Machining Protocol

Make sure to have CNC Protocol on hand

1. Start up
 - A. Check coolant, oil, air pressure
 - B. Power up/Restart
 - C. Warm up spindle if necessary
 - D. Load file (LIST PROG -> CANCEL -> USB -> WRITE/ENTER)
 - E. Load stock in vice with parallels
2. Tools
 - F. MDI/DNC -> OFFSETS -> TOOL OFFSETS -> ORIGIN
 - clear tool offsets (keep probe/check if there)
 - G. Load Tools (type tool # -> ATC FWD with doors closed) -> Measure approximate length
 - T1 3" 6 flute shell mill Z_{approx} = _____
 - T2 1/8" carbide 2 flute flat end mill Z_{approx} = _____
 - T3 No. 1/8 pilot drill Z_{approx} = _____
 - T4 6-32 UNC Thread Former (WIDIA) Z_{approx} = _____
 - T5 1/4" Chamfer End Mill Z_{approx} = _____
 - H. Measure Tools: OFFSET -> TOOL OFFSETS -> TOOL INFO
 - FLUTES: 6, 2, 1, 1, 1
 - TOOL TYPE (check says spindle next to tool #): Endmill, Endmill, Drill, Thread form, Chamfer end mill
 - Endmill and Shell mills: Select **Rotating length and diameter probing**
 - Drills and taps: Select Rotating length probing
 - Probe (if cleared): Non-rotating length probing
 - PROBING: hand jog to bottom left corner
 - Work Offset G54 -> 9 -> WRITE ENTER -> OUTER CORNER (bottom left) ->
 - Incremental Z = - _____ (negative careful)
 - Incremental X,Y = .5 -> CYCLE START
3. Graphics and Air Pass
 - A. LIST PROG -> SELECT PROG (loaded)
 - B. Graphics Pass: MEM -> SETNG/GRAFH (x2) -> CYCLE START
 - C. Air Pass: Add offset to G54 Z (+2") -> CYCLE START, observe:
 - Cut depth, Cut location, Speeds/feeds, Coolant
 - Subtract offset to G54 Z (-2")
4. Run: MEM -> check comfortable rapid -> CYCLE START
5. Clean up

Process Photos:

