4.510 Digital Design Fabrication
Fall 2008

Recitation #1

AutoCAD and CNC Basics

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Important Notes

1 – Make sure to sign up for a 2 hour slot (Thursday – Sunday)

2 – EZ CAM only accepts AutoCAD 2004 and lower

3 – You should consider staining or painting your board before cutting

4 – Measure the thickness of the material with a caliper

5 – You will need a tape measure

Process

```
  ( [1]  )  →  ( [2]    )  →  ( [3]    )  →  [ [4]        ]
  ( CAD  )     ( EZ CAM )     ( Techno )     [ Assembly   ]
                              ( CNC    )     [ Finishing  ]
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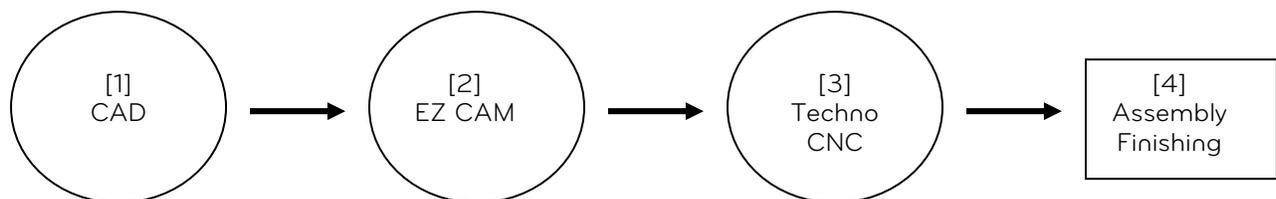
1.0 AUTOCAD

1.1 Creating a Drawing

- o Units >> units – set to architectural
- o End snaps >> F3 (snaps on) F8 (ortho – makes straight lines)
- o Start drawing at 0,0

- o Working with layers
  - Never use layer 0
  - Label layers in four character sets for example (PLAN-DOOR-EXTE)

- o Lines (Plines)
  - Only work with polylines >> pl
  - Every line command has a subset of commands.

- o Popular Commands
  - Scale: "sc"
  - Poly Line: "pl"
  - Erase   "e"
  - Mirror   "mi"
  - Stretch   "s >> c (for area)"
  - Rotate   "ro"
  - Trim   "tr"
  - Offset   "o"
  - Model Space   "ms"
  - Paper Space   "ps"
  - Boundary   "bo"

1.2 Formatting a Page

- o Paper Space
  - Title Block
  - Printing
- o Model Space - Drawing

1.3   Printing with Varying Line Weights

- o   Working with Line Weights

    - ▪   Best to use three or four line weights

- o   Line weights in the printer dialogue box only

    - ▪   Select a printer

    - ▪   Select acad.ctb

    - ▪   Edit line weights based on color

1.4   Zoom Scale Commands

1" = ¼" 1/48xp

1" = 1/8"   1/96xp1)

1" = 1/16"   1/192xp

1.5   Printing

You should draw a few shapes, change the line weights and print, this assures that the objects will print correctly before creating the entire document.

If you are printing on a laser printer, make sure all the lines are colored in white. Other colors will print in shades of gray and will be hard to see.

Refer to Francis Ching & Architecture Graphic Standards if you have questions about which lineweight to use. Both books can be found in the Rotch library.

1.6   Coloring a Drawing in Photoshop

Drawings can be colored in autocad using hatching tools, however it a bit difficult to teach in a week. Photoshop is better for adding color to a drawing, by printing a file as a pdf drawing. Open the pdf in autocad (set the dpi to 300), after open flatten the drawing

1.7   Submitting a File to Stellar

Creating a PDF from the Word Document

Go to – Assignments page - Submitting a File (Upload to Stellar)

2.0   EZCAM

2.1   Signup Sheet

The only copy of EZ CAM is on the machine with the router, you will need ½ hour min. setup and 1 hour to cut - 2 Hour signup

2.2   Material

You should use "1" 24" x 24" ½ board.

2.3   File Format

EZ CAM will only take AutoCAD 2004 Drawings (No 2008),

2.4   AutoCAD

Prepare three separate Files

1. Drill (separate file)

Drilling removes tight corners for mating pieces. The drill bit works on a series of rotations, therefore treat angular corners as a radius, therefore leaves unnecessary geometry in tight corners.

2. Pocket (separate file)

Intersection "sockets" within the primary geometry that need to be removed before the entire piece is milled out of the stock. Since pockets are customarily smaller than the entire piece, the stock may shift is this step is left for last.

3. Mill (separate file)

The final step which removes the main component from the stock. This step ends the cutting of the piece and will be ready to be removed from the stock.

2.5   EzCAM

Create a folder with under your name. Prepare all three files

Open EZCAM
        Tool Info
                Curve >> New
                        Click on point

                Machining >> Workstep Data
                        New Step
                                Rename Step – Drill
                        Path ID >> Curves >> Onestep per curve

                        Tool Info >> Tool ID >> Flat tools .. 1/8" drill #1
                        Zdata >> Rapid @ .5 (height above material)
                                Clear @ .5
                                Depth @ .5
                                Step @ 0,25

                Spindle Speed >> 100,0000 / 20k wood, (See: Feed and Speed Chart)ce Data)

        Cycle Data
                Offset Direction –   For drill no direction
                                            For pocket – Counter clockwise on left
                                            For mill – Counter clockwise on right

        Post file – 1 Verify All – Show steps & Check for Error

        Machinig >> Stock and Optimization –   Set x – Long Direction
                                               Set y – Short Direction
                                               Set size
        Simulate 3D

        Post Proess (Button)
                Change – G-Code File – Location
        End – Close EZCAM

2.6   Techno CNC

Turn on Router – See setup (TA)

Screw stock to table – Inch boarder

Open Techno CNC Software

Load nc file in the program

Set tool to 0,0

PreProcess file

Start

- Make sure the spindle is turning

- Keep your hand on the stop butting

- Measure the first cut with a tape measure