ChristmasExpo

Do It Yourself (DIY) "Everything Wireframe"

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Who am I

- Mark Zembruski – "Zman" on all Christmas Forums
  - My one claim to fame in our community that most do not know:
    - I originated the tag line. "I have the C.L.A.P., do you?"
      - **C**hristmas **L**ight **A**ddition **P**roblem
  - One of the central organizers of **C.L.A.P**. in the PacNW, regional decorating gathering
    - **C**hristmas **L**ight **A**ddition **P**rogram, for those with **C.L.A**P.!

  - Yeah OK so what…..

  - Decorating since I was 20
  - Self admitted gadget geek, weekend warrior, learner of all trades, mastering NONE of them……….
  - Decided to start growing in 2003
  - Approx **125,000** Lights (98% LED)
  - Approx **530+** channels of AC Light Animation
  - **9600** Channels of **RGB** Pixel Animation - 47 E1.31 Universes
  - One traditional DMX Universe
  - Generally I do nothing "original" in my display, I enhance what I steal, er, borrow……………….

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Wireframes - Overview

- The *most* versatile display feature IMHO (for what it's worth)
  - Small
  - Flat
  - Stand alone
  - Grounded
  - Static
  - Signs
  - Enhanced with Garland
  - Virtually Anything Christmas
  - Virtually Any Season or Holiday
  - Virtually Anything Period…………
  - Big
  - 3 Dimensional
  - Vignettes
  - Suspended
  - Animated
  - Characters
  - Leverage any light style

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Wireframes – Four Options

1. ## Buy frames with lights
   - Great selection from vendors
   - Immediately usable in your Display
   - Depending on size there are shipping considerations

2. ## Buy bare frames
   - Customize color(s) and look

3. ## Work with Vendor for Custom Frames
   - Personalized frame to your specifications
   - Use options from above
   - Saves time or if you don't have access to welder

4. ## Spark your own DIY Custom Frames
   - Full & unlimited creativity

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Wireframes - Vendors

Planet Christmas Links (19 current vendors!)

- Vendors I have used - recommend:
  - Lori's Lighted D'lights
  - Christmas Done Bright
  - 3G Lighting Creations

Vendor Custom Frames

- Vendors will work to create your frame to your specs
- Ensure you fully understand the process, provide explicit details, photos, sketches etc…
- Ensure you **APPROVE** concept with vendor before work begins
- Approve completed frame before it ships

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Wireframes – DIY Custom

This section assumes building with *steel*.

However, aluminum is a great alternative material for custom building wireframes and is something that should be considered. Be aware, there is additional consideration when deciding to build custom aluminum frames as it pertains to the welding process. This is considered a somewhat "Advanced" method as different tools, methods etc… need to be used to accomplish these types of frames.
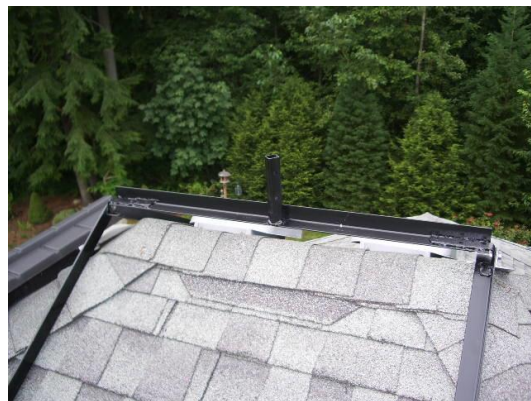
If you have questions feel free to contact the instructor.

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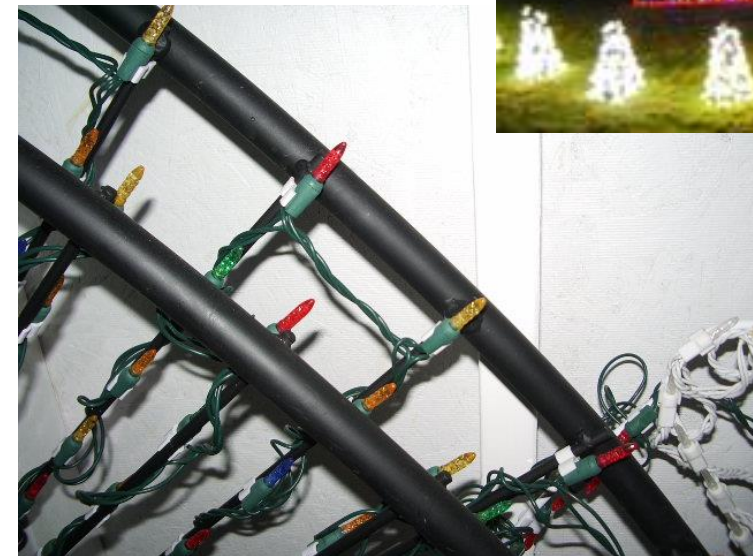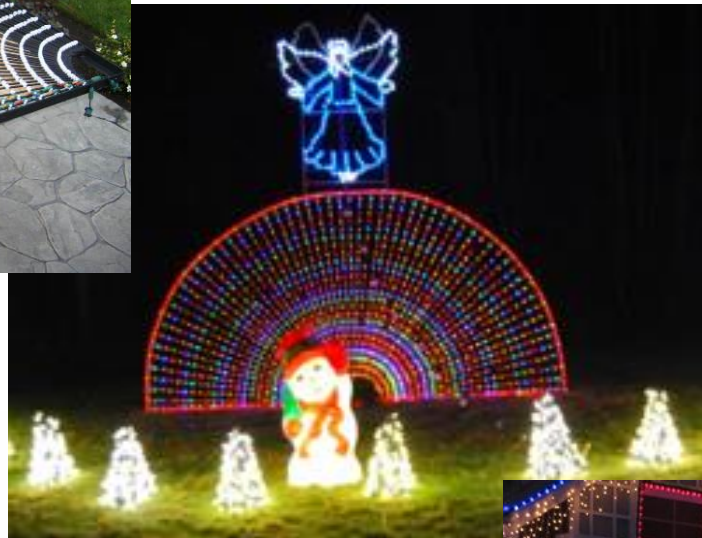# Wireframes – DIY Custom
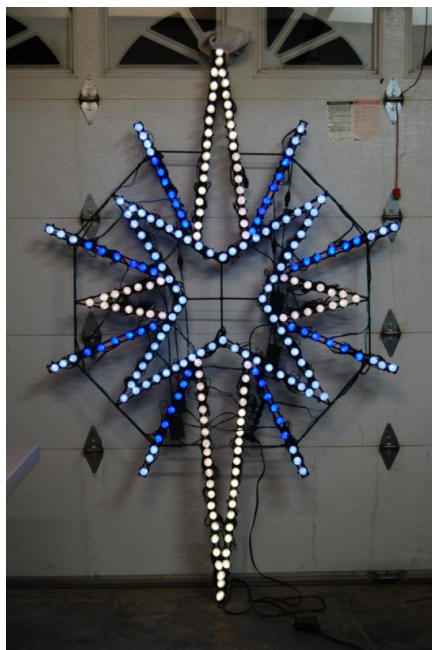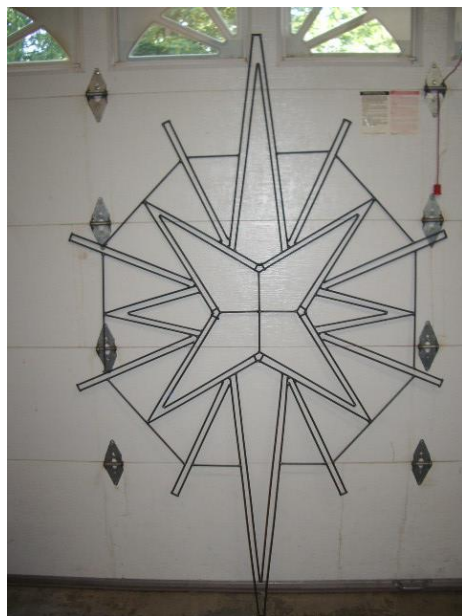
- Zmans Holdman Star
  - 5 channels
  - 7' tall
  - 250 C9 LEDs
  - Custom Cradle

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Wireframes – DIY Custom

- Zmans Marty Fan
  - 2 - 90 degree halves
    - "L" – EMT - Rod
  - 1500 M6 Multi LEDs
  - 16 AC Channels
  - Red LED Rope Outline
  - 2017 Upgraded
    - 1500 RGB Pixels
    - 15 E131 Universes

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Wireframe – DIY Welding Agenda

- Equipment
- Welding Basics
- Designs
- Pattern Transfer
- Types of Metal
- Planning / Cutting / Manipulating
- Welding
- Cleaning / Finishing
- Clip – Zip – Rip
- Light and Stringing Options
- Animating
- Advanced Wireframe Design Considerations
- Supplemental Information
- Reference Information

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Wireframe – Welding Equipment
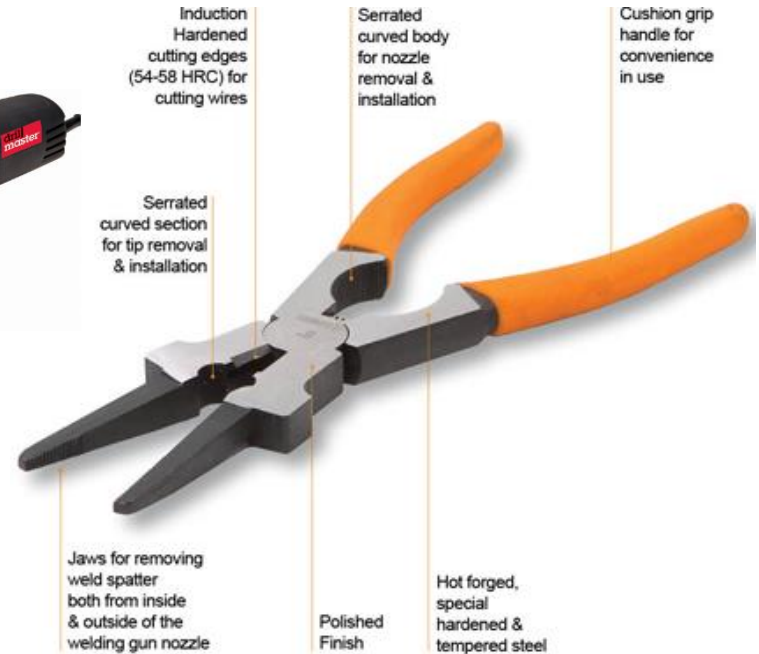
Welding Equipment (Not all Req'd)

- Computer (optional)
- Projector – VGA or Overhead
- Welder
  - Small 120V – MIG – Wirefeed – Shield Gas
  - Cart (optional but convenient)
- Bolt cutters
- Hack Saw
- Planetary Roller (optional)
- Metal Chop Saw (optional)
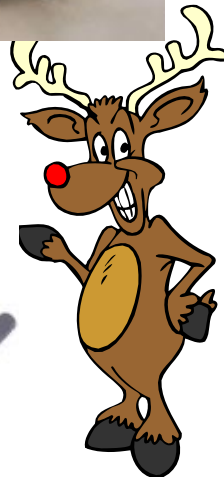
Wireframe – Welding Equipment

Welding Equipment (Not all Req'd)

- Bench Vise
- Anvil & Hammer
- Bar & Rod Bender (optional)
- Grinder / Metal Files
- Welding Pliers – Vise Grips
- Flexible Measuring Tape – String or Twine
- Work area
  - Welding Table, Workbench, Plywood/Saw Horses

Induction Hardened cutting edges (54-58 HRC) for cutting wires

Serrated curved body for nozzle removal & installation

Cushion grip handle for convenience in use

Serrated curved section for tip removal & installation

Jaws for removing weld spatter both from inside & outside of the welding gun nozzle

Polished Finish

Hot forged, special hardened & tempered steel

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Wireframe – Welding Equipment

Safety Equipment (all req'd)

- Adequate clothing
- Metal Handling Gloves
- Safety Googles
- Welding Gloves
- Welding Helmet
- Fire extinguisher
- Bucket of water/towel, spray bottle w/water
- Ear muffs (optional)

Welding Gloves

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Wireframe – Welding Basics

Basics

- A Welder can be one of the most useful tools you ever own. It goes **WAY** beyond wireframes that is mentioned in this material.

Wireframe – Welding Basics

Basics
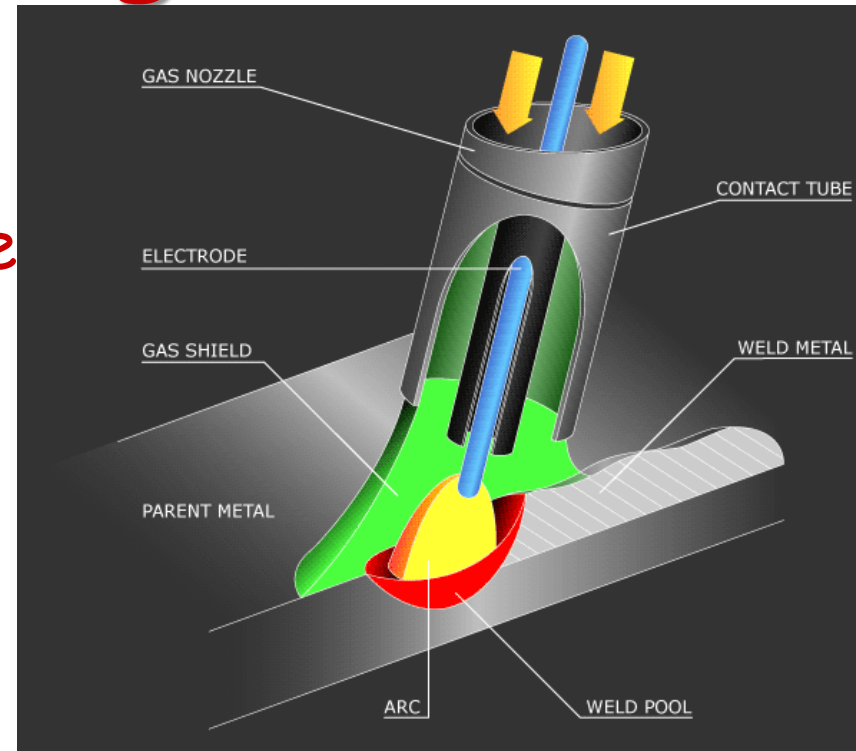
- You can get good functionality for not a lot of money.
- Learning is easy, videos, find a local mentor, Decorating Group, Trade Tech schools etc…
- Galvanized materials (iron coated with Zinc) can be welded, ***however***, **CAUTION** should be used as the process creates hazardous fumes and airborne particulates
  - Please review this information

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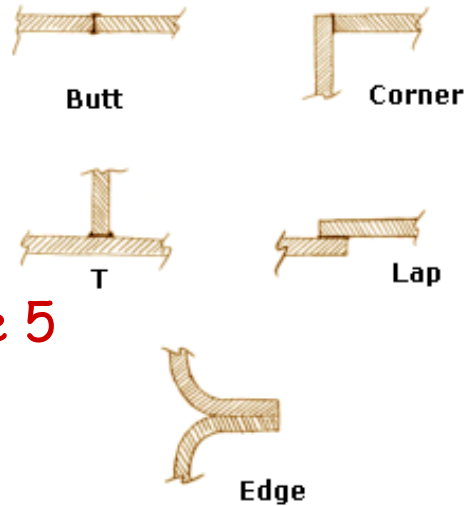
Wireframe – Welding Basics

Basics

- Welding is the joining of metal by causing coalescence (to join into a single mass) using heat to melt the work pieces and adding a filler, upon cooling forms a strong joint.

- Many forms of welding – Metal Inert Gas (MIG) is easiest to learn.
  - A.K.A. – Gas Metal Arc Welding (GMAW)
  - Uses inert gas, *typically* Argon/Carbon Dioxide
    - Protects the weld area from oxygen, and water vapor
  - Wire feed of a consumable electrode

GAS NOZZLE
CONTACT TUBE
ELECTRODE
GAS SHIELD
WELD METAL
PARENT METAL
ARC
WELD POOL

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Wireframe – Welding Basics

Basics

- **Typical weld joints**
  - Some variation of these 5

- **Good Weld**

- **Joint issues/examples**

Butt

Corner

T

Lap

Edge

TYPES OF WELD JOINTS

Good Weld	Travel Too Fast	Travel Too Slow	Voltage Too Low	Voltage Too High	Amperage Too Low	Amperage Too High	Less Stickout No gas
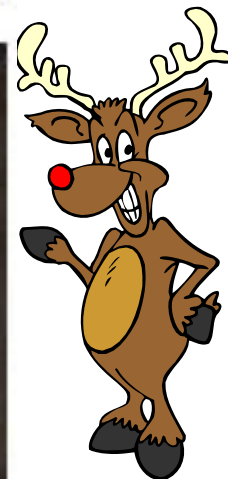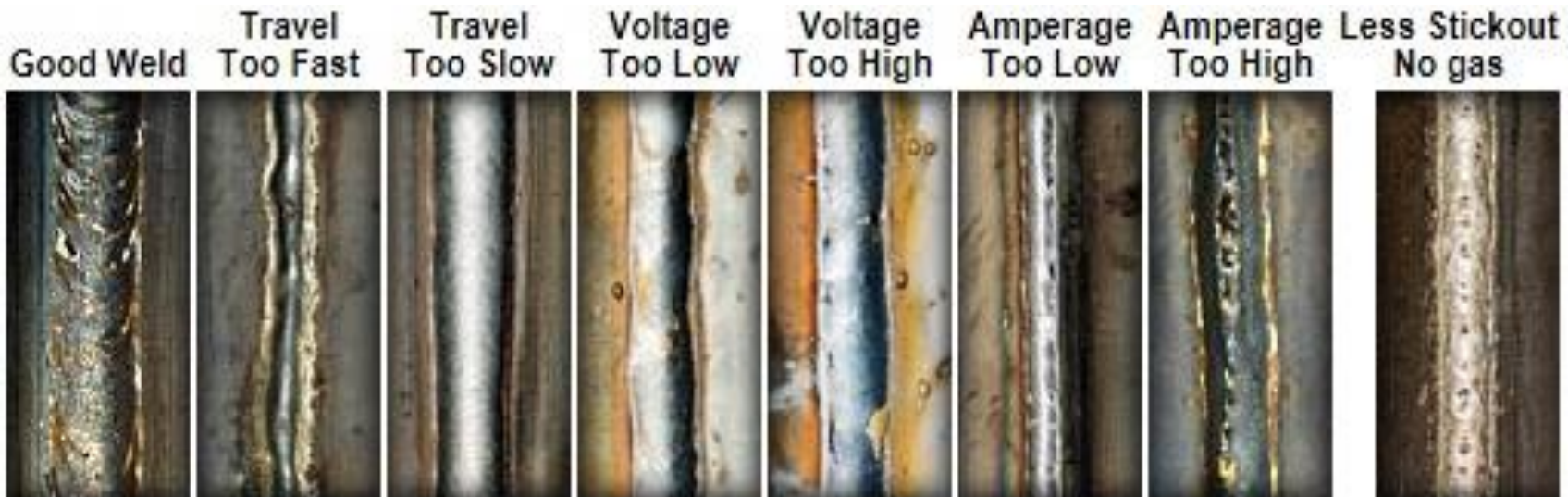
Wireframe - Metal
Types of Metal

- **Steel Rod (Hot & Cold Rolled)**
  - ¼" Primary Size for Wireframe Designs
  - Hot rolled easier to work with than cold rolled both have pros/cons
  - Available in many sizes for other uses
  - 20' pieces. Buy whole and cut to transport if needed
  - Main Frame, Connector & Support Pieces
  - Note: Smaller diameter 3/16" rod is acceptable for wire frames. Consider frame size for flexibility and stability

- **Tube & Solid Stock (Square & Round)**
  - ¾" - 1", etc....
    - Frames, Stands, Supports

- **Angle Stock (I-U-L-T)**
  - ¾" - 1" – 1 ½"
    - Frames, Stands

- **Bar Stock**
  - Standard Sizes
    - Connector Pieces, Supports

- **Flat Stock**
  - Custom & Standard sizes
    - Used with other pieces to make Stands, Supports etc

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Wireframe - Welding

Designs

Identify Project

- Obtain image(s)
  - Snag Pictures off internet websites
  - Catalogs / Magazines – Scan into image for computer projection
  - Coloring books
  - Hand drawings

Pattern Transfer

- Using Computer w/ VGA projector or overhead projector
  - Project onto surface covered with roll paper
    - Draw pattern onto butcher paper
      - Alternate to paper, is Plastic Table Cloth by the roll
      - Alternate – Recreate image using graph paper pattern
  - Consideration at this point - Scalability of Design
    - Depending on light types, consider segment length and scale design accordingly. Start planning early for lights.

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Wireframe - Welding
Planning – Cutting – Manipulating

Planning
- Review pattern
- Measure Segments
- Use flexible tape measure to approx. length of metal segments
  - String or twine is another alternative
- Cut all "straight" pieces that match your segments
  - With segment measurement add some additional length to each piece
- Mark up pattern as needed for reference
  - Write dimensions & notes right onto paper pattern

Cutting
- Chop Saw
  - Work space consideration – SPARKS!
  - Let the saw do the work, don't force it
  - Make sure you wear goggles!
- Grinder
- Bolt Cutters
- Hack Saw

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Wireframe - Welding
Planning – Cutting – Manipulating

Manipulating

- Lay up metal on pattern
- Plan your pieces
  - Weld Acute Angles where possible
    - 2 pieces to make angle (Star)
  - Bend Obtuse Angles
- Mark feature start and end with Metal Pencil or Chalk
  - Manipulate, compare, manipulate, etc,….
- Wedge into vise, use muscle leverage
- Pound on anvil with hammer
- Use Planetary Roller or Bender
- Screws in plywood to create jigs & set ups
- Steel has a slight "memory" to it
  - This will require some exaggerated manipulation
  - There is plenty of "fudge factor" to correct overages
  - Once finished with sizing, check it and correct for flatness

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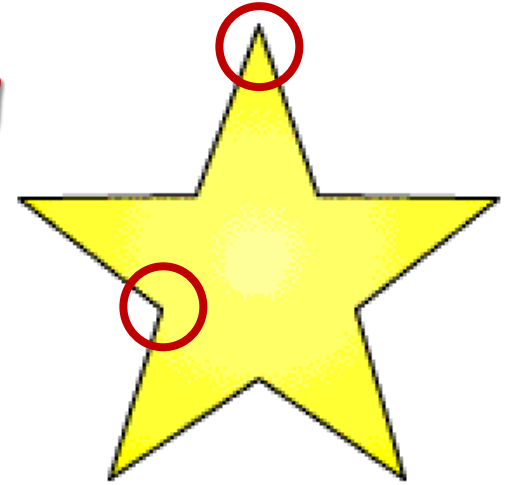
Wireframe - Welding
Welding (Preparation) – SAFETY FIRST!

Prepare Area

- If welding on plywood, keep bucket with water and towel handy, or spray bottle with water.
- Use pattern underneath if needed
- Weld in an open area, be careful what's around
- Keep fire extinguisher handy – **WELD BEADS WILL ROLL!**

Prepare Yourself

- Welding Helmet
- Welding Gloves
- Old clothes, long sleeves, pants, shoes, base ball hat under helmet.. (You will get sparks flying)

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Wireframe - Welding
Welding (Preparation) – SAFETY FIRST!

Prepare Welder

- Proper wire, voltage, speed/feed, tips
- Shielding Gas? Open regulator
  - Be sure you turn off your gas when not actively welding it will seep out at a very slow rate when not used
- Set proper speed and voltage for material
- Ensure you have proper ground connection to piece

Prepare Pieces

- Clean metal oil / oxidation before welding (Creates better welds, less spatter)
  - Acetone (Allow to dissipate)   - Wire Brush
  - Sand Paper   - Metal File
  - Angle Grinder   - Shop Towels
- Lay over top of patter, or place in jig for alignment

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Wireframe - Welding
Welding (Execution) Practice – Practice!

- Secure pieces with magnets, or clamps
- Use vice grips, welding magnets, jigs, screws to hold pieces in place
- Rest mallet/hammer, weight, angle iron on top of pieces to keep flat
- Wire extended from tip, approx. 1/4"–3/8" (Stickout)
- Tack to hold pieces in place
- Use Tip Dip to help with spatter
- Work on seam or spot – **DO NOT BE IN A HURRY**
  - Flip if necessary
- Longer seams when welding, will sound like eggs frying in a pan if set up and technique is correct

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Wireframe - Welding
Welding (Execution) Practice – Practice!

- Once weld is complete - **USE CAUTION!**
  - Welding occurs at several thousand degrees
  - Metal is very **HOT** and will remain so for a while
  - Even short durations generate tremendous heat
  - Do **NOT** grab with bare hands!
- Clean Spatter with brush if needed
- Grind / file welds if necessary
- Complete Welding and Assembly
  - Evaluate if you need to weld, bracing, stabilizing, spacing pieces
  - Perform a Drop Test
    - Hold 3-4' off ground and drop it!
      - Reveals weak joints that otherwise look good

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Wireframe - Welding

Cleaning / Finishing

- Final Clean with Wire Brush or Sand Paper/ Acetone
- Allow to dissipate – Dry
1. Paint
    - Prime with Rustoleum
    - Depending on Item:
        - Paint white or black (Rustoleum)
            - White will accentuate lights and frame
            - Black makes frame invisible
        - Paint frame sections to match light colors (option)
            - Help with frame definition during daytime
            - Use cut drinking straws to cover lights

No matter how well you prep and paint, rust will eventually show through, don't get discouraged

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Wireframe - Welding

Cleaning / Finishing

2. Powder Coating
   - Electro-static spray deposition, oven cured
     - Expensive – Usually seen on purchased frames
     - Requires finding vendor
     - Not Optimal for one frame at a time

   - Will last longer than paint, but will eventually succumb to the elements

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Wireframe – Light Attachment
Clip – Zip – Strip

- Light Clips are arguably the best method for Mini's
  - Fastest and allows for easy adjustments
  - Make sure you get the right size, 1/8" - 1/4" - 3/16"
  - Perpendicular Clips can be found
- Zip Ties
  - Time consuming but sturdy
  - For Rope Light, this is the preferred method
    - Suggestion - get a Zip Tie Gun
  - Even if you use Clips, in areas you may need to use ties
- Strapping Tape
  - Probably the least desirable method
    - Frays and crumbles over time

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Wireframe – Lighting

Light and Stringing Options

- Lights – Incandescent – LEDs
  - Minis (M5/6's) & Rope (Ford's or Chevy's – personal taste)
  - C6, C7 & C9's can be used as well
  - Mixture of lights leveraging coroplast (Hybrids)
    - Minis, C7's and rope all on same frame be creative
  - RGB (Dumb/Intelligent) – Nodes – Strip – Pixels

- Stringing Minis
  - Pick start point, move optimally for string length
    - Leverage bulb counts 25/35 – 50 – 100
      - Especially required for LED usage (intermixable, replaceable)
    - Cut and extend light strings if needed
    - Swap out bulbs to account for different colors
      - Or use clear mini/M5's with Color Caps
    - Make sure you manage and secure extra wire between sockets
      - Wrap / twist wire on frame, or use zip ties

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Wireframe – Lighting

Light and Stringing Options

- Stringing Rope
  - 3/8" – 1/2" / 2 wire, 3 wire, 5 wire (chasing)
  - Start with predominant color
  - Start near ground (plug)
  - Know minimum rope length for type being used
    - Split/Splice and extend rope if needed
      - Assumes you know how to cut and wire rope light
      - Search Forum - Google
  - Cut lengths are different for LED (3') vs Incandescent (18")
  - Avoid or carefully bend tight angles with rope
    - Do this in warm environment

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Wireframe - Animating

- ## Static Channel Controllers
  - Vendors Sell As-is with 2 or more channels controller

- ## Computer Animation
  - Using Hardware AC/DC/DMX/E1.31 controllers
    - (LOR, Renard, Falcon, etc.....)
  - Assign channels in sequence
    - Customize movement to match song / vignette

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Wireframe - Advanced

Advanced Wireframe Design Considerations

- Consider how acute angle features will impact stringing lights
- Carefully plan movement if you are designing an animated/multichannel wireframe
  - Be sure you consider how the 2 channels will have to inter-relate and co-exist on the same frame.
- Alternate Methods
  - Combine Coro/Acrylic and Wireframe (Hybrid)
    - Zmans Rudy (Nose/Eyes)
    - Bill Foley / Carrie Sansing - Father Christmas

Used with permission from Carrie Sansing

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Wireframe - Supplement

Supplemental Information

- Equipment / Supplies
  - Check Harbor Freight for great deals
    - Welder, Planetary Roller, Bender, Anvil etc…
  - Roll Paper – Sam's Club – Butcher Paper
    - Alternative is Plastic Table Cloth by the roll
      - Allows you to keep your template permanently
  - Michaels or Ebay for VGA or Overhead Projector
- Metal
  - Check the web or phone book for local suppliers
  - Big Box stores, Hardware stores
    - Shop, shop, shop for pricing
- Calculations
  - Circle Circumference
    - Pi (3.14 x Diameter)
      - www.mathgoodies.com/calculators/circumference-calculator
    - Polygon Calculator
      - www.cleavebooks.co.uk/scol/calpolyg.htm
- Metal Chalk/Pencils & Tip Dip
  - Home Depot – Lowes – Welding Supply (Central Welding)

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Wireframe - Supplement

Supplemental Information

- Clips (Google)
  - Christmas-LED
  - Lori's Lighted D'Lites
  - Christmas Light Emporium
- Perpendicular Clips
  - Kellog Plastics
- Pixel Clips
  - Rainy Oregon Christmas – Facebook Link
- Replaceable LED strings (Reliable, intermixable, replaceable)
  - Reinders
- Color / Black Out Caps
  - Christmas Light Emporium
  - Christmas – LEDs
- Static Controllers
  - Novelty Lights
  - All American Christmas

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Wireframe - Reference

Reference Information

- Welding (Google)
  - Videos - www.millerwelds.com/resources/video-library

- Precision EMT Bending
  - Woodinville Wonderland http://www.woodinvillewonderland.com/images/EMT_Bending_3.0.pdf

- Trumpet Soldier Wireframe - Project Video
  - Canigiani Christmas Light Show www.youtube.com/watch?v=pXIomyjLBUk

- There is a lot of free web based video's and how-to's if you do a internet search. Here is some great info:
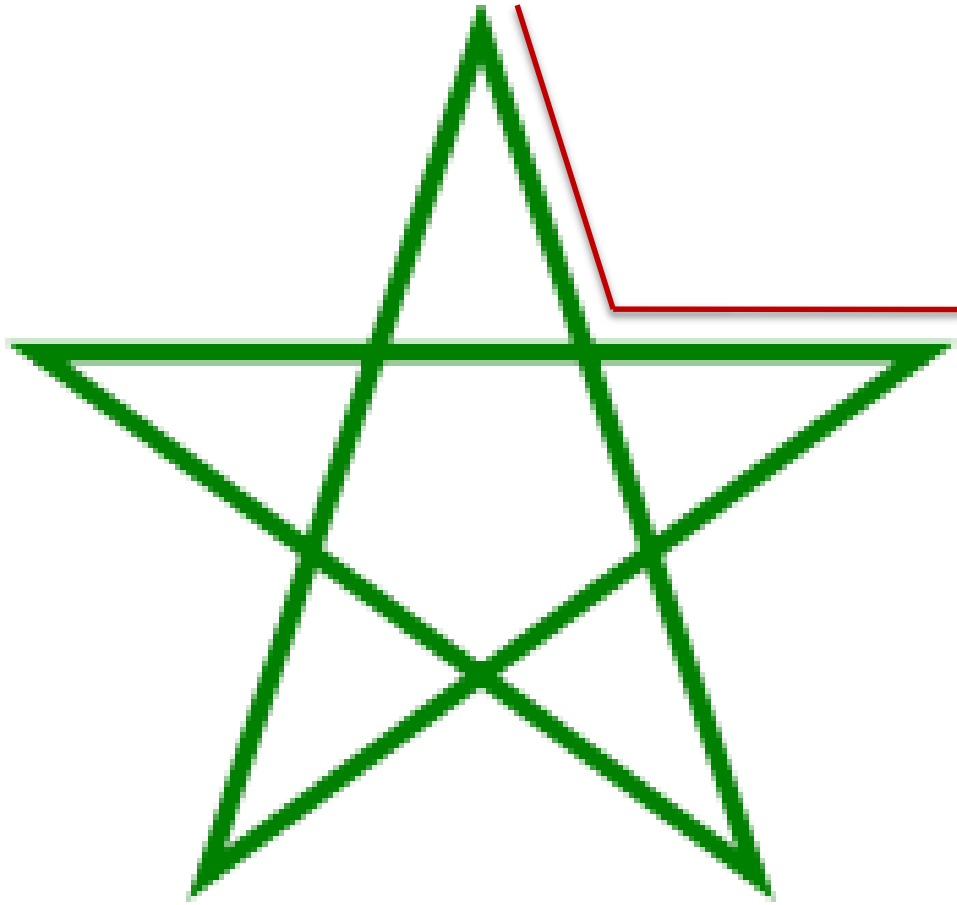 - https://www.millerwelds.com/resources

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Pacific Northwest CLAP/Holiday Swap Meet

Wireframe Hands on Lab

Lab Project :
Darryl Brown's Shooting Stars

Workshop Project :
Darryl Brown's Shooting Stars

Star template was created using this image file.

Note : the Segment Line in red. We will be making 5 segments in this manner

**Workshop Project :
Darryl Brown's Shooting Stars**

Wireframe Workshop - Lab

- Template premade
- Rod – ¼" pre-cut and cleaned
- Break project up into easy sections
  - 5 – 18" Obtuse angle sections
  - Bend angle in vise
    - Compare against template
  - Get 5 sections mocked up
    - Hold down with angle iron
  - Set up welder
  - Prepare area, self, project
  - Spark away
    - Drop test (after it cools)

Thank you for attending!

Think It
Weld It
Light It

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