

Your Soldering is Terrible (probably)

or

“How I learned to stop worrying and love flux”

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22 March 2016

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But first...

Some house keeping

Calendar at a glance

Week	Dates	Lecture	Reviews	Demos	Assessment submissions
1	2/3 – 6/3	Introduction			
2	7/3 – 11/3	Principles of Mechatronic Systems design			Problem analysis
3	14/3 – 18/3	Professional Engineering Topics			
4	22/3 – 25/3	Your soldering is (probably) terrible	Progress review 1		
Break	28/3 – 1/4				
5	4/4 – 8/4				
6	11/4 – 15/4				
7	18/4 – 22/4		Progress seminar	25% demo	
8	25/4 – 29/4	Switch to Q and A sessions			
9	2/5 – 6/5			50% demo	
10	9/5 – 13/5		Progress review		
11	16/5 – 20/5			75% demo	Preliminary report
12	23/5 – 27/5				
13	30/5 – 3/6	Closing lecture		Final testing	Final report and reflection

You are here →

Ongoing

Lecture nominations

- Now is the time to nominate lecture topics
 - Send to me via e-mail before Wednesday
 - If I get more than one nomination, there will be a Doodle poll that will close Friday.
- The first bespoke lecture will be 4th April
 - If there are no nominations, it will be Q&A

Gentle reminder

- Please don't take LEGO figures from c404
- Everyone needs to be able to use them
 - They'll get lost if you take them out
- Also, they're actually my own stuff and I promised them to my nieces...
 - Don't make me a bad uncle. ☹

FAQ Roundup

- **Decided on borehole diameter yet?**
 - Yup – it'll be 86 mm ID.
- **What about two boreholes?**
 - Nope. Just the one.

Back to business...

Soldering ahoy!

Notes on safety

- Soldering is generally a low-risk activity, with the following exceptions:
 - Minor to moderate to severe burns
 - Cuts, punctures and lacerations
 - Electrocution
 - Lead poisoning, other chemical poisoning
 - Partial loss of eyesight, total loss of eyesight

... so nothing to worry about, right?

Helpful safety tips

Zeroth rule of soldering:

- Mind where you stick the hot pointy end
 - Take note of people around you when working
 - Return the iron to its cradle when not soldering
 - If you drop it, don't try to catch it!

Helpful safety tips

First rule of soldering:

- Always assume a soldering iron is hot!
 - NEVER pick it up by the wrong end
 - Remains hot for a while, even when unplugged
 - Things heated by a soldering iron are also hot

Helpful safety tips

- Treat a hot-air gun or hot-air reflow soldering station like a tiny lightsabre
 - Invisible beam of destruction 30 cm from tip
 - Nozzles also get extremely hot! ($>500^{\circ}\text{C}$)
- Fumes are less good for you than they smell
 - They cannot get you high (I can confirm this)
 - Work in a well-ventilated area
 - Use the extractor if you have it

Helpful safety tips

- Wash hands before eating
 - ... no matter how good the lead tastes
 - Lead is toxic: acceptable exposure level is small
 - Use ROHS solder and materials where possible
- Use and dispose of chemicals responsibly
 - Don't flush PCB washing chemicals
 - Be *extremely* careful of etching chemicals
 - Do not eat the flux (tastes terrible)

Helpful safety tips

- Don't solder on flammable surfaces (duh)
 - Ceramic tiles make excellent surfaces!
 - \$5 worth of Not-Burning-Your-House-Down
- Keep flammable liquids and heat separated
 - Methylated spirits, kerosene, turpentine etc.
- Turn off circuit power before working on it
 - Pay particular attention to Lipo cells
 - Solder one lead at a time (insulate the other)

Helpful safety tips

Wear eye protection. *Always.*

It might only matter once in your career,
but you'll be grateful you did

Warning

“Do not attempt to solder
with remaining eye.”

Always wear eye protection

Principles of soldering

- Soldering is the process of joining two metal surfaces with a fusible metal

Heat both surfaces simultaneously and
then introduce solder to the joint

Don't apply solder to iron first and *then* to joint

- Clean surfaces, enough heat, enough flux
 - Quick zap and out

Helpful soldering tips

- Solder flux is the universe's gift to you

It is highly likely that—

- You need to use less solder
- You need to use less heat
- You need to use more flux

~THE SOLDER MUST *FLOW*~

How to identify a good joint

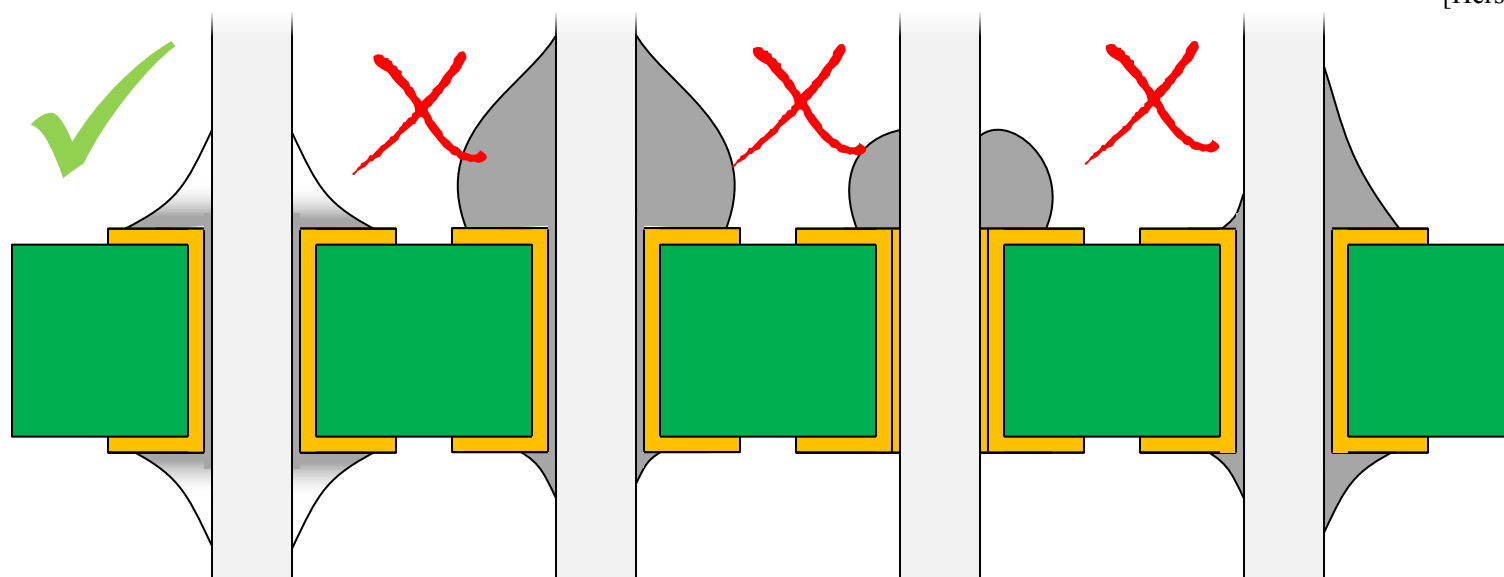


Helpful soldering tips

- How to identify a good joint
 - Even, shiny symmetric meniscus
 - No Hershey's Kisses, no blobs



Hershey's Kiss
[Hershey's]



Good joint!

Hershey's Kisses

Dry joint

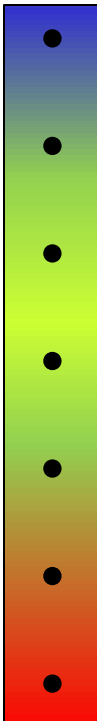
Asymmetric joint

How to fix a joint

- General method:
 1. Add a little flux
 2. Apply heat to the joint and hold
 3. Wait until the solder wicks into the joint
 4. Remove heat and let cool
 5. If more solder is needed, add more

Helpful soldering tips

On temperature:

- 
- 250°C is probably too cold – bump it up!
 - 275°C can be ok for fragile parts
 - 300°C is pretty comfortable
 - 325°C is Just Right
 - 350°C is more than enough
 - 375°C – what are you *doing*?
 - >400°C What the I don't even??

Different solders like different temperatures – know your solder!

Practical demonstration

- Working with wire
 - Stripping, tinning, joining to PCB
 - Joining and splicing
 - Heat shrink and insulation
 - Thick, multi-core wires
- Through-hole parts
 - Journey to the Lost World

Topics to cover today

- SMD passives
 - Point to point, Pre-tin, Reflow
- SMD ICs: SOT-23/SOIC/TSSOP
 - Point to point, Tack and Drag, Pre-tin, Reflow
- Leadless SMD: LGA/QFN/BGA
 - Descent into the winding madness from which there is no escape, only the gnawing twisting spiralling frenzied desolation that chews upon the Ur-soul in the grip of endless torment

Questions

?



‘Hotflash’ aka “Princess Solderflux” [Firepixie]

Tune-in next time for...

Nothing!

or

“Coffee makes the world go round.”

Fun fact: Biocompatible solder is 98% gold.
It is frighteningly expensive.