Buildings and services

Water torture ...

Drip, drip, drip. Faulty water overflow systems can be really annoying and costly, as well as a waste of fresh water. 30 % of drinking water is wasted through leaking pipes and overflowing water cisterns in one water company area.

What you have to do

A young entrepreneur wants to market a new device for the layperson. She thinks we have to rely on plumbers too often for simple problems, like a sticking valve in a water cistern. She believes the system should be made much more user-friendly - so if there's a fault, it's easy to take apart, fix and re-assemble. She also believes a warning should be given as soon as the system starts to fail, so the home owner can arrange for repairs before too much water is wasted.

This device should solve two problems; an early warning device for the overflow and an easily repaired valve.

Mary Drip,
Young Enterprises,
Clapham
London

Dear Sir/Madam,

Re: Design Brief

The device must fit to existing water cisterns, and piping. Pipe dimension - 15 mm external diameter.

Standard fittings must be used to make it easy to replace one if it fails.

The device must be safe.

The device must be finished to extend its life in damp conditions.

The device must have an audible or visible alarm, which is activated when the water level approaches the overflow point, thereby giving the homeowner an opportunity to carry out repairs before the water is wasted.

Clear instructions on fitting should be supplied with the device.

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How to set about it ...

What exactly do they want?

1. Draw a table like the one below (you may need more rows). Use the first column to list the **key design features** from the **design brief**. In the second column, "Initial thoughts", make a few notes about what you'll have to bear in mind as you begin to come up with possible solutions.

Key design feature	Initial thoughts

2. You can now write your **design specification**. This should explain exactly what's required, and the implications of each design feature.

Generating ideas and shortlisting

3. Using the internet, library and/or resource centre, carry out some research into plumbing fittings. Here are a few places you might like to try:

   http://www.plumbworld.co.uk an online supplier of plumbing goods

   http://www.plumbingsupply.com (a massive online catalogue of plumbing components and tools)

   http://www.plumbers.org.uk (The Institute of Plumbers web site)

   http://www.learnplumbing.co.uk (online training materials relating to plumbing

   http://1valves.com Component sales online)

4. Produce a number of **design ideas** using simple freehand sketches to try to visualise them.
5. Shortlist three of your ideas, explaining the decisions behind your choices. Even at this stage you should be pretty sure your design ideas will work; scientific principles will help. For example, you should make sure the materials you intend to use will survive in damp conditions.

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And then there was one ...

6. You must now work out the pros and cons of your three design ideas. There are a number of ways to help you work these out. A few of them are:
    - You could carry out simple tests on scale models of particular components. For example, you should test the fittings to make sure that they all work together and do not create leaks - the very thing you are trying to avoid. In some cases you may want to test a scale model of the whole structure.
    - Think about costs. Which of your devices would be most expensive to manufacture?
    - What's the rough life expectancy of your different designs? Is one much more hard-wearing than another?
    - Do any of your designs have more than one use? Could your device be fitted to toilet cisterns? (with a simple modification and a change of marketing you might be able to sell your designs to a wider client base).
7. Having weighed up the pros and cons, you've probably got a decent idea which design you think is the best. But the client is the paymaster. So, to help choose a final **design solution,** you should get feedback (comments and suggestions) from an expert who understands your client's needs.
    - Make 2-D and 3-D drawings and/or scale models of your three design ideas. These should be of good enough quality to allow you (and anybody else for that matter) to visualise exactly what your device will look like.
    - Show your sketches and/or models to your client, and listen to what they have to say (but if you're adamant one design is better than another, make sure you can explain this to the client - you have to give them what they want, but YOU are the designer!).
8. Choose your final design solution and summarise the reasons behind the choice, including how your **design solution** fulfils the **key design features** in your **design specification.**

Presenting your solution

9. Decide on a suitable engineering drawing technique to present your final solution. Make 2-D and 3-D engineering design drawings, or use computer aided design (CAD) to produce them. Make sure you stick to engineering standards and conventions.

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You've done the design job ...

10. You've successfully produced a **design solution** from a **design brief**. But what now? You've done the job of the designer, so you need to put your engineer's hat on. The design solution has to be turned into a **product specification** - giving the manufacturer the information needed to actually make the product.

    A product specification details all the materials needed to make a product; it includes its dimensions, tolerances and details of how the different components will be joined together.

    You need to decide which materials will be best to make your device. To decide which materials are best you should look back at the design brief and your initial research. You should also use databases and other resources to find out properties of materials.

    You might also want to try tests for materials, joints and finishes to show how these can vary and influence your choice for the product specification.

    COMPARATIVE TESTS