



# DESIGN AUTOMATION FOR STRUCTURAL ENGINEERS

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## **About this guide**

An informative guide to transforming your company to more efficient and competitive workflow via programming, APIs and design automation.

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# THE COMPETITIVE LANDSCAPE



Structural engineering companies are evolving and changing the way they design. Particularly in the case of smaller, repetitive designs where the parameters are somewhat controlled and limited, automating the process is relatively straight-forward. This shifts the business model of some of these firms towards faster, more automated designs at a fixed-rate cost structure.

On top of this, there are a number of tech disruptors - startups working towards changing the way we construct and design buildings, homes, and components. Many are putting the work and freedom into the hands of the clients; enabling them to model, modify and iterate themselves to design what they need and want.

# BUILD AN ASSET, NOT A PROCEDURE

The beauty of code is that you build it once, and it will serve you for many years at no cost. If you want to be efficient, it is better to build technology to solve a problem, rather than adding more personnel resources. You're building an asset to serve you for many years.

It's no secret that many companies are looking to offshore engineering teams to reduce cost. Managing more people, in a foreign location on a different timezone is not a simple solution. Why not build smart tech to automate workflows for your current engineering team?

The initial cost is nothing in comparison to the inefficiencies, complexity and training required to maintain an offshore engineering team.

The process will be much faster. A smart algorithm can perform the work in fractions of a second with a simple click of a run button. This is much faster than a week turnaround from your engineering team.

Code also runs the exact same way every single time; so there is no room for human error. Designs will be more accurate and less open to human error.

## Benefits of Code

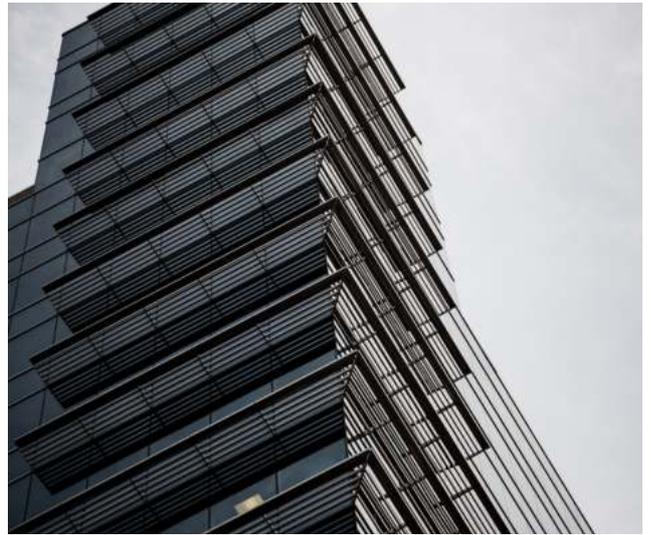
- ✓ Faster - instant results
- ✓ More reliable - lower risk of human error
- ✓ Cheaper - code costs nothing to run



# DESIGN AUTOMATION

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We have seen a number of manufacturers and engineering firms introduce automation to an otherwise manual process. The need to turn designs around faster is at the forefront of this change.



Engineering firms like this are offering their clients a better experience through the use of technology and automation. For example, through automation, the client can design what they want using a modelling tool with live pricing. They build what they want, with an accurate understanding of cost, then send the model directly to the manufacturer and engineer. This is condensing the two week preliminary design into minutes, where the client has full control over what they want.

# TYPES OF DESIGN AUTOMATION

## 1. Preliminary Design and Tendering

With the right technology, project managers can build a structural model themselves and handover an analytical model to the structural engineer of what they want. From there the structural engineer can focus on fine-tuning the model and improving the design to reduce costs for the client. Any changes that come through, will be automatic and allow the engineer to always have the latest model.

## 2. Repetitive Designs

Consider another of our Structural Engineering API clients; a prominent design consultant in Sydney, Australia. They were contracted to design 100+ overhead cable structures. Instead of having an engineer manually do these, they wrote a script to loop through and model, save and analyse all of these structures with the click of a button. The models were built and stored in the SkyCiv file manager, so the engineer could open the file at any time to review the model and results in SkyCiv Structural 3D.

## 3. Design Optimization

Structural engineers are usually time-poor. With clients wanting packages released earlier and earlier, there isn't much time for engineers to experiment and try different designs. With the right technology, engineers would be able to automatically test hundreds or even thousands of alternative designs to find the best fit. This is an area of design automation that is probably a few years away. This will hopefully result in more efficient, sustainable and cost-effective designs.

# API TECHNOLOGY

API's are pretty simple in practice. A simple example would be: if you want a site's wind speed as per ASCE 7-16. You could simply send the following information to the SkyCiv API to receive the wind speed and site elevations of a specific location:

```
{
  "site_data": {
    "country": "United Kingdom",
    "lat": 51.501364,
    "lng": -0.14189,
    "elevation": 6.36,
    "formatted_address": "Westminster, London SW1A 1AA, UK"
  },
  "wind_data": {
    "uk_ireland_contour": 21.621648873984707,
    "distance_from_shore": {
      "0": {
        "distance": 233.92573712464545,
        "lat": 53.60510578995467,
        "lng": -0.1418899999999966
      }
    },
    "wind_speed": 21.8
  }
}
```

So instead of looking up the design table, or opening up a spreadsheet to get this information manually, the API does the work for you. Your productivity has skyrocketed.

Now imagine that connectivity could extend out to the modeling process, design decisions, and beyond.

Cloud APIs allow you to access this functionality from anywhere. They sit on the cloud (online) so you don't need to have the software or the plugin downloaded or installed. You can process data in and data out from any location. Your entire team can also use the system you create without individually downloading or installing the packages and plugins.

# BENEFITS OF USING AN API

- 01 Automation**

Automate repetitive or mundane tasks. That task becomes automated, handled instantly by a computer.
- 02 Integrations**

Integrate with your current systems and applications to create a seamless workflow.
- 03 Adaptability**

API solutions can easily be modified to change with needs and new technology
- 04 Personalization**

Build your own solutions that are specific to your company and needs - not relying on general use software.
- 05 Reliability**

Using a commercial product which has internal QA and testing processes
- 06 Future Proof**

as more functionality and design code updates are added to the API, they become automatically available to the end user

## All this, from a bit of code

The SkyCiv structural analysis and design API functions are easily implemented. Simply translate your data into the S3D model data (a simple JSON object) and unlock the possibilities for automated modelling, rendering, analysis and design functionality.

```
1 {  
2   'function': "S3D.member_design.check",  
3   'arguments': {  
4     'design_code': "AISC_360-16_LRFD",  
5     's3d_model': model_data,  
6   }  
7 }
```

# THE FUTURE ROLE OF ENGINEERS

It's not a bleak future for structural engineers. On the contrary, it is a bright one. Engineers have such powerful and creative minds, capable of solving many of the world's problems. Unfortunately, much of their time is being consumed by mundane and repetitive tasks.

Imagine a world where engineers had more time to apply their skills to more creative and efficient solutions. Where engineers could spend more of their time innovating. Where we could spend less time on mundane repetitive tasks, and more time engineering. Scientists are dreamers, but engineers are creators.

As computers and technology develop, so too will our designs. As we've already seen, structures are becoming more complex. For this reason, structural engineers are becoming more a critical piece in the design process - helping architects find that perfect balance of form and function.

With a new age coming, it's time to adapt and employ technology to handle



# About SkyCiv

SkyCiv is focused on building powerful, accurate and easy-to-use Structural analysis and design software, completely on the cloud. As a constantly evolving tech company, SkyCiv is committed to innovating and challenging existing workflows to save structural engineers time in their designs.

Since inception in 2015, SkyCiv has developed all of its software in house, by qualified structural and mechanical engineers with programming skills, to ensure the highest quality and accuracy of our software.

With users from 170 countries worldwide, SkyCiv is building structural engineering software for the future.



Like what we're talking about? Get in touch and start the conversation on how you can design more efficiently today...

