**Workflow**

The Net Zero Heroes is a collaborative, innovative, and geographically diverse team from six of the seven offices of BSA LifeStructures. The team consists of architects, designers, and engineers from various roles within the firm and has a total of 51 years of experience. When we decided to pursue the ASHRAE LowDown Showdown competition, we wanted to create an exceptional interdisciplinary design process, so a special effort was made to include representatives from as many offices, disciplines, and levels of experience as possible.

Our particular challenge was our entire team could never be all in the same place at the same time, so we needed a robust backbone of collaboration tools to create a cohesive whole. Throughout the design process we held weekly “face-to-face” coordination meetings using WebEx, an online collaborative video conferencing platform, which we used to keep ourselves on track and check in on the status of everyone’s work. In-between these meetings, we used Trello to make requests, track tasks, and share information. In our first meeting, we compiled all our Strengths Finder results to help us understand how to best communicate and tackle our tasks.

We set our initial schedule by working backward from the deadline and breaking the project into three phases: three weeks of research, 10 weeks of design/modeling, and four weeks of presentation preparation. During the research phase, we derived a list of topics from the competition requirements we would like to explore and potentially use in our design. Next, we participated in a two-part charrette during which we shared our research and generated ideas for the design. One especially useful tool for this process was Bluebeam Studio, which we used to create a collaborative “sketchbook” for the team to add ideas and images to during the charrette. Another important output from the charrette was our target EUI, or our “energy budget”, found by determining how much energy we could generate with our allotted 10,000 sf of PV panels. In the last part of the charrette the team created a pull plan to help set expectations and determine realistic milestones.

The beginning of the design phase consisted of site selection and exploration of architectural form using FormIt and SketchUp. All team members were encouraged to generate architectural layouts, which were imported into Revit and analyzed using Insight 360. The resulting high-level energy modeling results allowed us to compare all the models according to EUI, and after a team vote the leading model was chosen for further development. Similarly, we compared five potential sites around Denver that could realistically host a new museum (no greenfields!) and chose one by a team vote.

As we proceeded into design, we used various software to test and develop specific aspects, including Autodesk CFD, AGI32, and OpenStudio. A parallel cost estimation spreadsheet was also developed, which included historical construction cost information and input from a contractor. This information was updated throughout the design process. Dialogue flowed between the energy modelers, daylighting designer, cost estimator, and architects throughout. We were able to quickly make modifications to our design and evaluate their impacts while keeping in mind the goal of net zero energy.