Copper:
Designing, Building, Learning

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A recent investigation using copper as a building material was completed as a workshop at the ACSA West Central Conference, at Drury University, Springfield, Missouri, October 20-21, 2000. The title of the workshop was, 'Copper: In(s)cite and Insight.' The workshop's name the follows these homonyms:

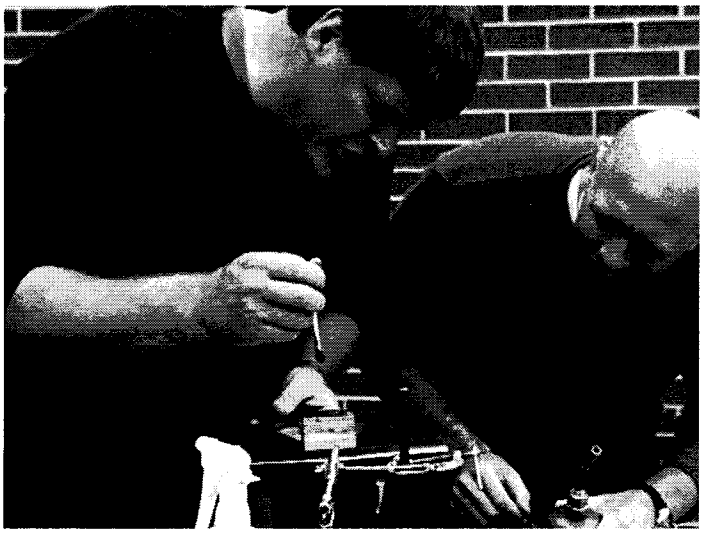
INSIGHT:

1. Power or faculty of immediate and acute perception or understanding; intellectual discernment, intuition whether that power is regarded as a general inner faculty, a special capacity for a particular field of view or the gift of mystical vision . The perception of the inner nature of a thing; also the act of such inward apprehension 3. Mental engrossment in regard to something. 4. An inspection; a scrutiny.

incite: to arouse to a particular action; move to act by inducement or persuasion; urge onward; stir Up, instigate; stimulate.

in site: the location or placement into position of a design; the ability to explore using the phenomenology of a place.

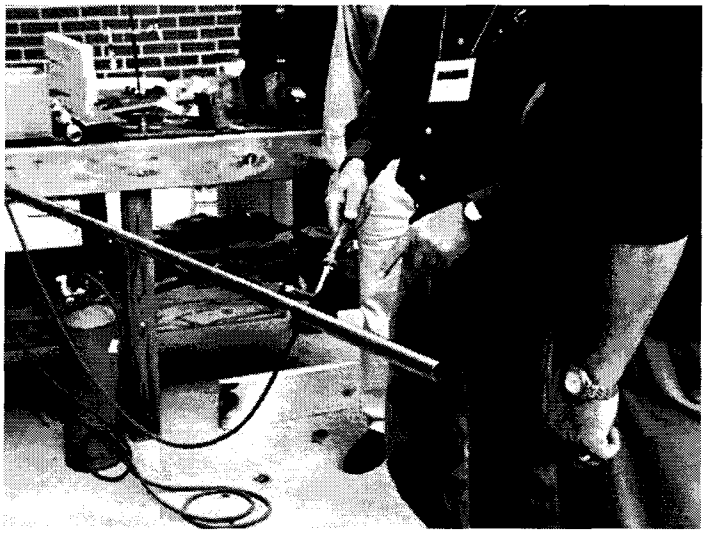
in sight: remaining in view; to keep as a goal.

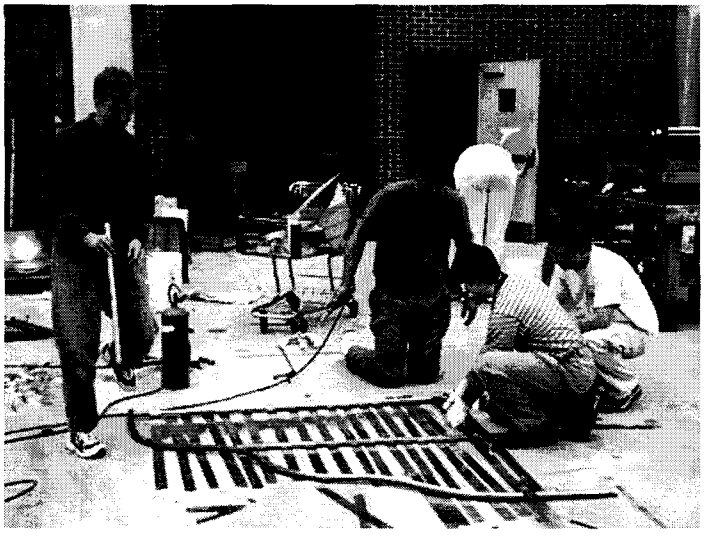


The beauty of copper, the ease with which it is worked, and the opportunity to build in place, on site was certainly all of the above homonyms. The proposal explored the interactive quality of material and designer, the act of making, the collaborative design process, and the phenomenon of place. The exploration using copper and related building systems with a group of students and attendees, involved making a partition that was designed at the end of the first day of the conference. This process was important. The students quickly assimilated new knowledge of a material, its inherent properties, and rudimentary skills in copper construction.

The project was supported in part by material donation from member companies of the Copper Development Association (CDA) that was left over from a previous studio. The CDA also supplied copper tubing to support the workshop. A small hand brake/roller/shear - 3-in-1 machine, soldering equipment and metal working tools were transported to the workshop to assist the investigation. A brief demonstration on the use of all the available tools was made at the beginning of the workshop; followed by material experimentation. The piece was designed in a brief charette after a CDA workshop, lecture and some experimentation time. The design of the object was refined in site, at a local supply company based upon available materials. Different assemblies from these materials created moving arms for the partition. In this local hardware store, the students tested different assemblies of copper tubing. Tee, and sleeve sections were tested for their abilities to allow the partition arms to rotate.

It was determined that copper should be the only material involved in construction of this object. We wanted to examine the role of copper as structure, and investigate its potentials as infill material. The partition had three arms attached to a central spine, using copper tubing as the structure. Each rotating arm allowed the students to examine the standard tectonic forms of copper assembly, simultaneously adding their discovered methods in unconventional fastening. On one arm, the students examined folding and weaving to create a copper skin intended to display the effects of light on the material. On another arm, the roller on the copper break created rigid double helixes of lead coated and standard copper strips, further exploring the sensitivity of the material to light. The final arm used copper tubing as a wind chime, or as a musical instrument, adding a kinetic aspect to the piece. The tubing was cut to specific lengths to get precise notes, and were hung from lead coated plates with heavy soldering wire.





The frame afforded many potential opportunities for learning, as students learned how to cut the material at different angles and join them. An innovative use of plumbing sections in, and on the center posts created panels that could be folded for storage or display. One intriguing part of the workshop involved learning how to bend copper tubing accurately. The tube sections were heated to the point of malleability, and then filled with sand. The sand filling afforded clean bends without crimping. We were able to create the curves that we had initially designed, by drawing them in chalk upon the concrete driveway upon which we worked. The tube sections were bent to match. After emptying the sand, the tube was ready for assembly. The final object displays most tectonic processes involving copper construction. Students became familiar with the methods of soldering, brazing, and sheet detailing.

These projects are an important means of adding a vital building material into students' architectural vocabulary. Copper has great longevity in architectural applications especially cladding for roofs and facades. It is infinitely recyclable and is an ecologically sustainable material. It may be melted down after deconstruction and reformed with little or no waste. It is fire resistant, low maintenance and relatively light in weight compared to materials used in similar applications. Its aesthetic possibilities are many, from the varieties of colors, to the dialogue it has with responding to light and environmental reactions over time. By introducing this method of master of craft – master of form, the students become more comfortable with the material, and are more likely to embrace it in future projects academically and professionally. The discoveries germane to these explorations create an excitement to explore in other design investigations. Students may test other materials in the manner that they have experimented with copper, attempting innovation in tectonic form.