Exploring Critical Making: A Design Tectonics Primer for a Mechanical Shade Tree

PATRICK PETERS and GEORGE SACARIS
University of Houston

Fig. 1. Fabricating steel frame in school shop

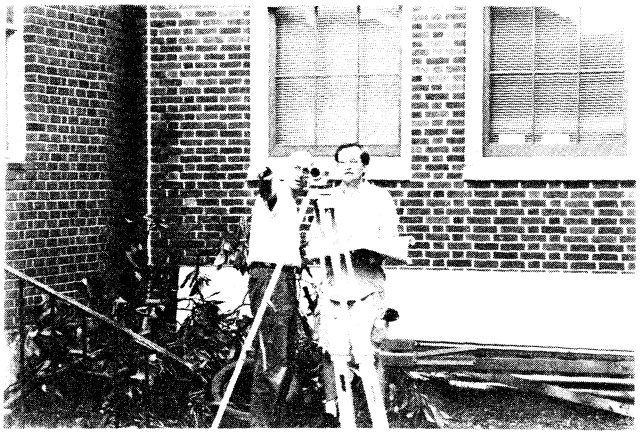

Fig. 2. Positioning footings on site

The mechanical shade tree was a cooperative project of a local elementary school and a class of Level I graduate architecture students. As the subject of their annual summer design/build studio, the students were asked to develop an existing disused courtyard in a 1928 brick elementary school to allow for better use as a recreational area. Their response to the harsh Houston climate was a free standing steel structure with retractable roof panels closed to the summer heat but open to the winter sun.

From the outset, the schemes generated reflected the students' concerns for enhanced natural breezes and protection from the sun and the rain. Throughout the design, development, and construction documents phases

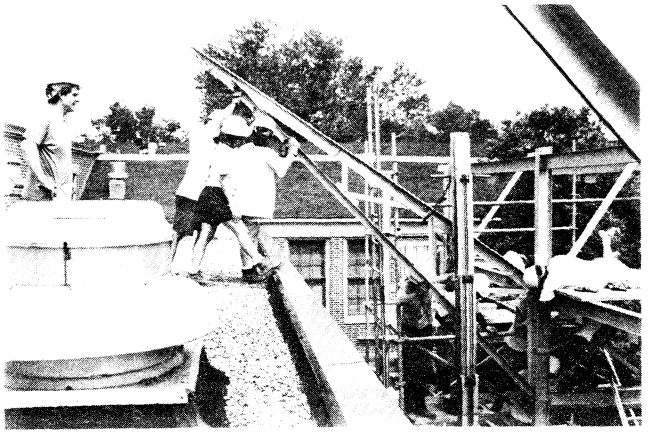

Fig. 3. Raising truss B3

informed by consultation with not only the elementary school faculty and administration, but also a structural engineer, laboratory tests studying the precise solar shading and air flow patterns resulted in various refinements yielding the final angles and heights of the structure's geometry. Fig. 4.

Subsequently, while securing a building permit, the students fabricated the steel frame in the architecture school shop by cutting, welding, grinding, and drilling the raw steel angle, plate and wide flange sections. Fig. 1. The steel was galvanized and then erected by the class on pier foundations at the site.

Over the course of the summer project, the students acquired skills in AutoCAD, construction documents, project budgeting and management, steel fabrication and erection, surveying and concrete placement. Fig. 2. More importantly, they were challenged to bring to bear on their design judgments the working knowledge gained in other coursework, particularly that regarding architectural systems, environmental factors, and structural theory. This interconnection with the design process proved to be potent inspiration for a self-critical act of making. Fig. 3.

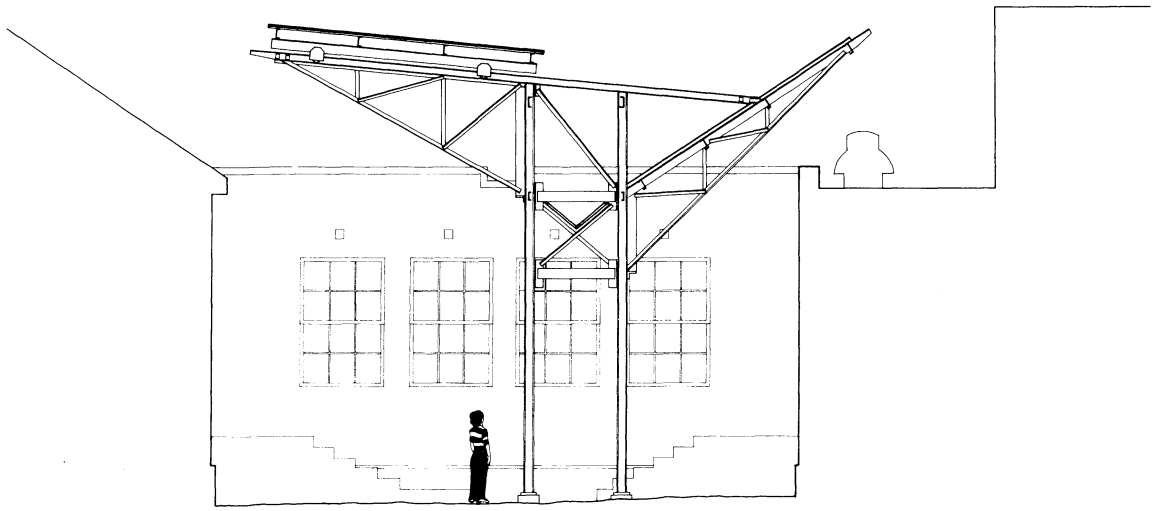

Fig. 4. Transverse section