

BUILDING TOLERANCE a design + building studio



MILU, site specific installation at 11th International Venice Biennale of Architecture - The Nordic Pavilion, 2009.
rintala eggertsson architects

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“A common definition of ‘tolerance’ is that it refers to a permissible limit (or limits) of variation in a physical dimension, or a measured value or physical property of a material, manufactured object or system. Dimensions or properties can vary within certain limits without affecting significantly the functioning of a product (or a process). Tolerances are specified to allow for imperfections and inherent variability without compromising performance. The building industry knows how to deal with imperfections (such as the slight sag in the poured concrete slab) and inherent variability (such as different thermal behaviour) without compromising performance.”

- Branko Kolarevic, “Why We Need Architecture Of Tolerance” 2014.

1 Branko Kolarevic, “Why We Need Architecture Of Tolerance” in *High Definition : Zero Tolerance in Design and Production AD*, ed. Bob. Sheil. (John Wiley & Sons, Incorporated, 2014)

Much of the finishes and details in a building are there for the purpose of hiding the gaps that exist at the intersections of materials and building elements (floors/walls/ceilings/roofs). Contemporary construction techniques often depend upon the layering of materials to accommodate material diversity. This allows for a layering of tolerances and precision as well. The first layer (a frame) is rough, the second layer (sheathing) is more precise, and the third layer (finish) is highly exact. In this studio we will examine this condition of tolerance and precision. We will ask, how does the architect control tolerance? How can the architect design tolerance? These questions will inform strategies for material, construction, program, form and space.

THE ROLE OF TOLERANCE IN ARCHITECTURE

Definition 1: an allowable amount of variation of a specified quantity, especially in the dimensions of a machine or part.

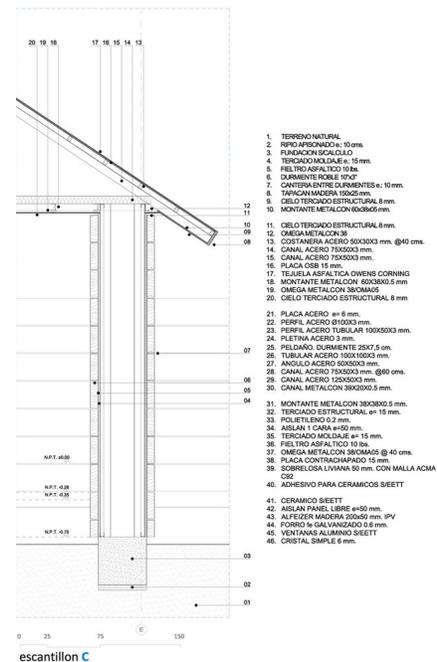
In the translation from drawing to built work, a design must accommodate reality: the imprecision of equipment, humans, materials, and site. The literal gaps given over to “reality” are what we understand as tolerances.

Tolerance is the deviation we allow for human (and machine) error in installation and in the creation of the parts that create a building. As with statistics, tolerance is an allowable deviation from the precision of a drawing that will allow a building to “fit” together. While tolerances have improved with the industrialization and manufacture of materials, humans are still involved in the installation of components on site. The assembly of these components is fundamentally contingent on the various workers installing each piece of the building in the right location, the location being where it is intended to be on site, and each piece must be manufactured or cut to the dimensions in a drawing either off or on site. This is essentially impossible to control to perfection – in the field of mathematics, there are theorems that demonstrate that we will only ever be able to get infinitely close to zero. Despite our innovations with robotics and BIM technologies, we will only be able to reduce tolerances, not eliminate them.²

Space is a fundamental tool for tolerating discrepancies and differences in architecture. Extra space allows for breathing room between two elements. Overlapping space enables coverage between varied elements. Could it be possible to learn deeper lessons on tolerance from architecture?



emA Arquitectos; Casa Cuidador “Hijuela El Durazno” - photo of constructed cladding.



escantillon C
emA Arquitectos; Casa Cuidador “Hijuela El Durazno” - wall section detail.

2 This paragraph is a summary from Genevieve Baudoin’s “A Matter Of Tolerance.” *The Plan Journal: Tectonics*: 33-46, 2016

THE ROLE OF TOLERANCE IN SOCIETY

Definition 2: a fair, objective, and permissive attitude toward opinions, beliefs, and practices that differ from one's own.

“No one is born hating another person because of the color of his skin or his background or his religion...” “People must learn to hate, and if they can learn to hate, they can be taught to love... For love comes more naturally to the human heart than its opposite.”
-Nelson Mandela as Tweeted by President Barack Obama

On Saturday August 12th, 2017 Former President Barack Obama tweeted this quote from late South African President Nelson Mandela in response to the deadly white nationalist rally in Charlottesville. By Tuesday August 15th, the first tweet from Obama had nearly 2.5 million likes and about 1 million retweets. According to Twitter-tracking site Favstar, the former president's tweet was the second-most-liked tweet of all time. The quote signaled hope in the shadow of this tragic weekend. It highlighted that the answer to hate and bigotry is not more hate and violence but rather education that leads towards tolerance. This idea is echoed in Helen Keller's famous quote: “The highest result of education is tolerance.”

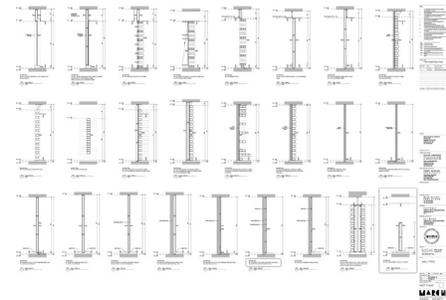
Tolerance is challenging in multicultural societies. On Saturday, August 12th, Charlottesville found itself in the center of this struggle. Hate and intolerance invaded the public spaces, exposing alarming tensions surrounding issues of race, nationality, religion, sexual orientation and political preference. In addition to examining the role of tolerance in the construction of architecture, the studio will examine spatial and programmatic strategies that embody and promote directions towards social and political tolerance. We will design and build a space for transformative social learning. This will be a space for new ways of thinking, pluralism, diversity, deep consensus, but for also respectful disagreement.

RESEARCH OBJECTIVES:

- To build a small, mobile pavilion for the A-School that promotes and enables diversity and tolerance in celebration of the Bicentennial events.
- To study design and space as a response to material and construction methods.
- To define design parameters for material and program tolerances.
- To discover poetic uses for common building materials
- To test levels of tolerance and precision between physical and virtual acts of construction with Building Information Modeling (BIM).
- To measure space and matter with the human body.
- To create an exquisite corpse construction resulting from the collection of 12 unique student/designer identities and 3 unique instructor/designer identities.



Construction dependant upon variety and difference. Hotel Hotel Lobby and Nishi Grand Stair Interior / March Studio



Details illustrating levels of tolerance in the installation of Hotel Hotel Lobby and Nishi Grand Stair Interior / March Studio



Image from President Obama's Tweet following White Nationalists' rally in Charlottesville

STUDIO OVERVIEW

This research studio will study the ubiquitous building material of wood through the execution of a small design/build structure on the A-School grounds. The 1:1 design and building phase of the studio will occur during a month-long workshop led by Robertson Professors Dagur Eggertson and Sami Rintala. During this workshop students will work in small teams to design and construct a series of mobile, lightweight elements primarily made of wood, using basic hand tools. These built elements should be able to stand alone and come together to form a larger collective structure. The project will serve as an A-School artifact in the Fall Bicentennial celebrations, but should also have a spatial and programmatic narrative surrounding tolerance and diversity. The pavilion will be a library of identity, diversity, and tolerance.

Following the construction exercise, we will closely examine, measure and document how levels of tolerance impact the performance of the structures. In a reversal of typical architectural procedures, we will generate precise, coordinated, measured drawings post-construction. For a month following the build, studio participants will document their physical constructions through virtual models using BIM and through video or sound recordings. This work should do more than document facts. It should seek to reveal a story about the architecture and suggest future iterations that go beyond the as-built conditions. Autodesk Revit will be the primary modeling software for the studio, but no prior experience is needed.

PROJECT: IDENTITY LIBRARY

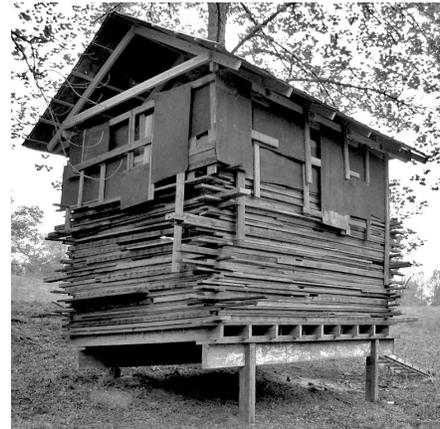
If a solution for promoting tolerance in our community is education and exposure, one strategy is to build a space for sharing cultural identity. We shall call this an Identity Library. It will be a space for “transformative social learning.” It will be a space for finding commonalities while also celebrating differences.

“Education for sustainability above all means the creation of space for transformative social learning. Such space includes: space for alternative paths of development, space for new ways of thinking, valuing and doing, space for participation minimally distorted by power relations, space for pluralism, diversity and minority perspectives, space for deep consensus, but also for respectful disagreement (Lijmbach et al., 2002) and differences (Olson and Eoyang, 2001), space for counter-hegemonic thinking, space for self-determination, and, finally, space for contextual differences.”³

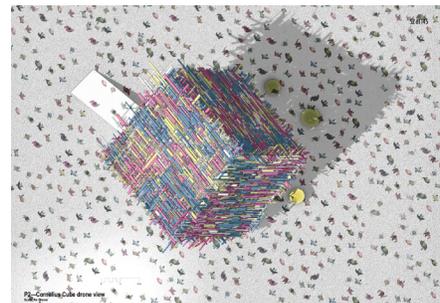
3 from ‘Mirroring, Gestaltswitching and transformative social learning’
- Stepping stones for developing sustainability competence
Arjen E.J. Wals Wageningen University, Wageningen, The Netherlands



Hut to Hut, Design + Build Workshop, 2013.
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Ad Hock Shack 1, Design + Build project, 2003.
S. McDowell.



Cornelius Cube, Revit Modeling for Sziget
Festival Pavilion, 2017. S. McDowell.

STUDIO TOOLS - SOFTWARE

- **Autodesk Revit (Student Download Available)**
- **VRay for Revit (Student Download Available)**

STUDIO TOOLS - HARDWARE

- **Toolbelt with pockets and hammer loop.**
- **Tape measure (25')**
- **Carpenter pencils**
- **Work gloves (tight fitted for handling wood)**
- **Hammer (can use shop's but probably useful to purchase your own)**
- **Drill bits (useful to have your own bits)**

STUDIO TOOLS - SHARED HARDWARE FROM SHOP

- **Woodshop power tools (All students should have taken shop training by August 28/29th)**
- **Hand saws**
- **Chisels**
- **Levels**
- **Chalklines**
- **Drills**
- **Hammers / Crowbars / Cat's Claws**
- **Pliers**

JAQUELIN T. ROBERTSON VISITING PROFESSOR IN ARCHITECTURE: RINTALA EGGERTSSON ARCHITECTS

The studio will be joined and lead by Robertson Professors Sami Rintala and Dagur Eggertsson during the month of October. Visit <http://www.ri-eg.com> to learn more about their work.

Rintala Eggertsson Architects is a Norway based studio established in 2007 by the Finnish architect Sami Rintala and the Icelandic architect Dagur Eggertsson and in 2008 joined by the Norwegian architect Vibeke Jensen. They are currently working on projects in Norway, Finland, Iceland, Sweden, Canada, Chile and China. Their work has been awarded by Global Award for Sustainable Architecture, Architizer A+ Awards, International Architecture Award, Travel+Leisure Award, 2x Mies van der Rohe awards nominee, Bauhaus awards nominee and a European 7 runner up.

The office bases it's activities on teaching, furniture design, public art projects, architecture and planning. Important feature in Rintala Eggertsson's practice are their 1:1 buliding workshops with students and clients.



MM1 - Design + Build Workshop, 2013. rintala eggertsson architects



Tintra Footbridge, 2015. rintala eggertsson architects



Seljord Lookout Points, 2011. rintala eggertsson architects