Revealing the Process: A Bakery for Kenmore Square

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figure 1  
photo montage view into oven
ABSTRACT

This thesis seeks to explore the connection between humans and the machines they created. Machines in our daily lives have been miniaturized; one can no longer understand how they function, causing distress and anger. Exposure to a highly mechanized yet simple and understandable process will ease the stress caused by machines. The development of a large scale bakery is the mechanism through which to reconnect visitors with the technology they no longer understand.

Thesis Advisor: Andrew Scott
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figure 2
photo montage placing bakery in Kenmore Square
Most of all, thanks to my family: a true source of inspiration and courage in my life.

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for computer troubleshooting tips always accompanied by smiles.
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aerial view of Kenmore Square
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figure 4
collars: image of repetition

figure 5
cars: image of repetition
"It is contemporary man's peculiar tendency to place economic and technological considerations ahead of more fundamental human values. As a result, technology itself has become alienated from us, and the world defined by technological evaluations has acted to alienate us from our fellow man. Our human relationships have progressively degenerated to the mere exchange of information, and our objects are increasingly determined only by their usefulness."

Robert McCarter, from "Escape from the Revolving Door: Architecture and the Machine"
This thesis began by looking at how we interact with technology on a daily basis. We take machines in our lives for granted, rarely stopping to think about the technology needed to make the machines we use. A simple example is the typewriter. Early typewriters were comprehensible; one could see the fan of metal bars beneath the cover, striking the ribbon as each key was hit. Today we sit in front of computers, essentially typewriters in a fancy box. The process by which keystrokes are delivered to the CPU and then to the monitor occurs at a frighteningly quick rate, but do we understand how that happens? Shouldn’t we? The miniaturization of technology, in the form of the computer, has increasingly placed a “skin” over “the machine”, preventing one from understanding how things work, or even how they are assembled.

As technology proliferates into our lives, there will be a desire to see and learn about how items are manufactured. Already we are seeing more being revealed. The example of a car wash has been around for many years, but this trend has been adopted by many in the food industry. Krispy Kreme, a southern U.S.-based donut chain, has a large neon sign telling customers when the donuts are “HOT”. Bertuccis’ restaurant chain opens the kitchen to the diners. Sushi chefs prepare food on one side of a bar, patrons sit on the other. Microbreweries and accompanying tours are growing in popularity as well. These types of establishments begin to reveal their craft, but it is possible to take the process a few steps further.

The idea of a bakery is designed to tap into this thirst for knowledge. It is meant as a destination for school children. The bakery is a place to stop before and after a Red Sox game. It is a place to meet your friends before heading off to see the rest of Landsdowne Street. It is a place to learn, to be entertained.
Sewage Pumping Station
Bjorn Hallsson
These two pages contain precedent studies which served to illustrate several points inherent in the thesis. The first example, the Financial Times building by Nicholas Grimshaw and Partners, is a typical example of a newspaper printing facility. It opens its workings to visitors by means of a large glass facade. Traditionally newspaper presses were found within urban centers where it would be easy for someone to see the inner workings of the presses. For various reasons the presses were moved away from the urban cores and placed along the urban edges. One sense of manufacturing had been removed from people's lives. To see a working press today, it is necessary to make a special trip to visit them.

Financial Times Building

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figure 9
Financial Times Building
Nicholas Grimshaw and Partners

figure 10
Financial Times Building
Nicholas Grimshaw and Partners
The next example is a sewage pumping station by Bjorn Hallsson. Located in Reykjavik, Iceland, it is "reminiscent of an ancient settlement watched over by the benign eye of the cubic belvedere that marks the centre of the composition" (Phillips 1993). Thousands of tons of trash are generated every day in this country; perhaps if the recycling stations were a little more prominent in the public eye, we would be more aware of recycling, reducing and reusing. This project begins to take on this theme, but its remote location prevents it from accomplishing that possible goal.

Bakery visits also played a large role in the precedent studies for this thesis. Those will be discussed in Chapter 5: Baking.
figures 13 - 15
Fenway Park, with Kenmore Square and the famous Citgo sign beyond
“It is a New England landmark, no less so than the Bunker Hill Monument, the Old Man of the Mountain, or Walden Pond. And when Major League Baseball is no longer played in Fenway Park, there is a good chance that the left-field wall will be preserved, either as part of the next park or as a monument to the first century of American League baseball in Boston.”

Dan Shaughnessy, Boston Globe Columnist
Kenmore Square is located within the city of Boston, just next to the border of Brookline, Massachusetts. The square marks the convergence of Commonwealth Avenue, Beacon Street, Brookline Avenue and Deerfield Street. The site is perhaps best known for two of its landmarks, the neon Citgo sign and Fenway Park, home to the Boston Red Sox.

Kenmore Square presents an unique situation within the city of Boston. It is one of the few neighborhoods which sustains activity close to twenty-four hours a day. Boston University, with its staff, faculty and students, draws a large number of people into the area. There is a major T stop to mark the convergence of three of the MBTA Green line branches. Keeping activities running into the night, Landsdowne Street bars and nightclubs offer entertainment to adult visitors. Fenway Park and the Boston Red Sox have been another crowd attraction for the past 88 years. The Park draws crowds both during the days and nights, weekdays and weekends.
There are few spots within an urban setting in which one can place a large scale industrial building. The scale of Kenmore Square allows for more non-traditional building types than most neighborhoods of Boston. Already inherent in the neighborhood is the sense of a nightlife and entertainment, two ideas important within the bakery.

The site provides several important design determinants for the project. The relatively narrow depth of the site has an impact on the potential arrangement of the machinery and therefore the visitor circulation. The proximity of Fenway Park is another advantage to the site. As a corner parcel, this site serves as a marker for the area. Elevating the viewer to a height above the park affords another learning experience within the bakery.

This page shows some images of Kenmore Square. Images of the site and surrounding streets are found on the next two pages.
Consideration of noise and pollution from the highway will also shape some design decisions. Revealing the process within this project goes beyond showing how the machines function. It involves exposing the mechanics of the building to the patrons to demonstrate how it functions to allow for light and ventilation. Although the machines are highly automated, several employees on the production floor will be necessary; adequate natural lighting without glare is essential to the production line.

figure 22
image of Fenway vendor

figure 23
view of highway and rail tracks directly behind the site
Kenmore Square affords the opportunity to move an industrial process back into the urban fabric. It is a chance to take the industries located along the urban edges and move them back to a place where they will experience a rediscovery by its visitors. The relocated industries themselves will experience a rebirth of sorts as they move more prominently into the public eye.
Fenway Park, although a favorite ballpark to many, is sadly growing old and is becoming rapidly outdated. Local community efforts and the Red Sox organization have both proposed development schemes for the new park. Local efforts, as seen on this page, favor a renovation plan for the existing facilities. The Red Sox organization prefers buying surrounding parcels of land and building an entirely new facility, as shown on the opposite page. For the purposes of this thesis, it was assumed that a new park would be built, but the Green Monster and portions of the seating would remain as a tourist attraction. The design of the bakery takes advantage of the current and proposed situation at Fenway Park.

**figure 28 (right)**
proposed renovation plan for Fenway Park
Charles Hangenah

**figure 29**
score keeper’s space inside the Green Monster

- Yawkey Way pedestrian only during games
- 17,700 new seats in an upper tier cantilevered over the grandstand
- 10,550 upper grandstand seats
- 73 extra luxury suites & 1450 premium club seats
- Van Ness Street may possibly be pedestrian only
- New pedestrian walkway to Kenmore Square
- New Red Sox corporate offices with an underground connector to Park
Figures 30 - 31
Illustrations for new Fenway Park Red Sox organization

Fenway Park proposals

Old Fenway
Parts of field will be open as public park

Old “Green Monster”

New “Green Monster”
Manual scoreboard to be preserved

Main entrance

Bleachers

Luxury boxes

View from street
Pedestrians on Brookline Avenue and Boylston Street will be able to view parts of the field through gates.

Field will be 20 feet below street level

Third deck grandstand

Proposed ballpark

Existing Fenway Park

Pesky pole preserved

Figure 32
Plan for new Fenway Park
Red Sox organization
figure 33
large oven
"The ability of the human operator to handle fragile products at very high production rates is unmatched by most machines. The fact is that high-volume repetitive packaging tasks are tiring for operators and can cause serious repetitive motion problems."

-Richard B. Tallian and Michael A. Weinstein, "Flexible Automation Solutions for Today's Bakeries"
When looked at from a broad perspective, baking is not an inherently difficult task. Mix up some dough, let it rise, bake it, eat it. But when one looks beneath the surface, there are numerous issues which one must consider. The decisions to use machines is not a decision to be made lightly. Those in the business of artisan breads believe that the only way to craft high quality bread is to produce it entirely by hand. While this may be true to some extent, there are certain types of bread and rolls which need to be produced through automation because the costs of human labor would be too great. This project uses machines which produce 400 rolls per minute. This is considered to be a low-end output. McDonald's bakeries, an example of a high-end output, would use a 1,200 rolls per minute machine (Domenicucci 1999).

figures 35 - 37
different types of production
Four different automated bakeries and two hand-crafted bakeries were visited over the course of the semester. The first bakery, Quinzani's in Boston, Massachusetts, produces breads and rolls but no pastries. They operate 6 days a week, 24 hours a day. The down-time on Sunday is to allow for repairs. The bakery has several lines, each added as the bakery expanded. The newest one is outfitted with Winkler machines and will be discussed later. The high speed roll line is located on a second floor. There is no retail business associated with Quinzani; only wholesalers, distributors and restaurants may purchase goods.
The second bakery, Signature Breads in Medford, Massachusetts, is a par-bake facility. This means the bread is baked slightly more than half-way. The product is then frozen in a spiral freezer and sent to supermarkets or restaurants like Legal Seafoods. There the kitchens complete the baking process enabling these businesses to deliver fresh bread to their customers. This process enables restaurants and supermarkets to provide fresh bread without having to outfit their facilities to accommodate the entire baking process. Of all the bakeries visited, this one was the most recently built. As such, it had the most linear process. They employ a large amount of employees because their customers prefer a more "handmade" look to the product.

Signature Breads

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![Baguettes rising: figure 39](image)

![Rolls in the proofer: figure 40](image)

![Diagram of production arrangement: figure 41](image)

Signature Breads, Medford, MA
linear arrangement of production
The third bakery, Harrison Bakery in New Jersey, is a classic example of how a bakery continues to function even though many pieces had been added over the past 100 years. This bakery was the least automated of all four visited. This bakery produces rye, sourdough, challah, white bread, pullman loaves, and submarine rolls to name a few types. The numerous types of bread and rolls require more silos for different types of flour. When the baking process is discussed later in this chapter, the approximate weights of ingredients and baking times are based upon the information obtained from Tony Campos, Plant Manager, during the visit and interview.

Harrison Baking Company

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panned loaves ready for the oven: figure 43

figure 42

Harrison Baking Company, New Jersey
non-linear arrangement of production

dough divider: figure 44
The Rockland Bakery was the last bakery visited. This bakery is unique among the four; it is the only bakery to have retail sales on the premises and allows the customers to walk near the machines as they select their bread and rolls from the carts and racks. Retail sales account for about 15-20% of the total revenue. They produce 15 types of rolls and 10 types of breads on a weekly basis in addition to a full line of pastries on the premises. They ship to New York City, New Jersey, and as far away as Philadelphia. The bakery operates 24 hours a day, seven days a week, and has retail hours every day. They hire about 150 employees to run the bakery alone. Additional help is needed in the pastry preparation, retail areas and in administration.

Most of the cooling conveyors are overhead, allowing customers to walk around in a limited area where the ovens are operating. Mr. Battaglia, one of the owners, mentioned that the equipment is chosen as

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**Rockland Bakery**

**28**

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**figure 45**
Rockland Bakery, New York
non-linear production

**figure 46**
Rockland Bakery, New York
cooling carousel
much for its baking capacities as its ability to be used as an obstacle to keep customers out of other areas of the bakery. The bakery has undergone extensive renovations in the past few years. The first phase is complete and a second one is in the planning stages. The retail and pastry preparation spaces will be expanded; customers will no longer be able to walk near the machines once the work is completed.

This bakery served as the model for the thesis bakery with one fundamental difference. The Rockland Bakery allows customers into the bakery primarily because the retail space was once too small to hold both products and customers causing unavoidable overflow into the bakery. The tradition has continued despite modernization of the facilities. The thesis project seeks to incorporate the visitors' experience from the beginning, to think about how the machines and people interact together.
Typically, a factory of this size would require at least four truck loads per week of flour. The flour is stored in several 120,000 lb capacity silos. Roughly 200 lbs. of flour are needed to make each batch of dough. Water, salt, yeast and a baking agent are added to the mix as well. This yields a dough which weighs about 1,000 lbs. If it is a sponge dough it will need to rise for 3-4 hours, but straight dough (used for rolls) can be used immediately.

The dough is divided into portions using a scaler. It rises again in an intermediate proofer for about 2 minutes. This allows the dough to be worked into a shape. If it wasn't subjected to this intermediate step, the dough would spring back into the original ball shape. From the intermediate proofer, the dough moves into the stringline, where the rollers stretch the dough into its final shape through a variety of small steps. At this point, the dough may or may not be placed into pans, depending upon the type of product being made. Most of the bakeries used pans in this step. The dough is in a constant state of flux; it is important to keep the dough

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</tr>
<tr>
<td>0.500 kg Mixed wheat bread, baked without a pan</td>
<td>240–200 ºC</td>
</tr>
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<td>1.500 kg Mixed rye bread, baked in a pan</td>
<td>270–220 ºC</td>
</tr>
<tr>
<td>1.500 kg Mixed rye bread, baked in a pan</td>
<td>260–220 ºC</td>
</tr>
<tr>
<td>1,000 kg Rye bread, baked without a pan</td>
<td>270–220 ºC</td>
</tr>
<tr>
<td>1,000 kg Coarse rye bread, baked in closed boxes</td>
<td>220–160 ºC</td>
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Facing page:

Figure 53 mixer
Figure 54 shaper
Figure 55 product moving from proof to oven
Figure 56 finished product on cooling conveyor
moving. This part of the process takes about 12 minutes to complete. The machines used in this portion of the design project were sized according to product literature from Winkler, Inc. This can be seen in greater detail in the next chapter.

The pans are conveyed into a proof box, or steam box, where the dough rises for about 50-60 minutes depending upon current temperatures and humidity within the bakery. If the line is completely automated, the pans are moved through the proofer on a series of conveyor belts. If the bakery uses racks, then the pans are manually placed on large carts, called racks, and those are pushed into the proofer. Each new batch comes in on new carts which are pushed into the steam box, moving the older carts forward. The risen dough is retrieved from the other side of the proofer when it is ready.

From here, the dough moves to the oven, where it bakes for eight to nine minutes (breads require more time). The product comes out of the oven and is cooled for roughly 25 minutes, then packaged and shipped.
figure 57
traditional bakery plan

figure 58
revised bakery plan

1. mixers
2. stringline
3. proofer
4. tunnel oven
5. cooling conveyor
"The transit of a nail through a plank, the compression of a column of steel, the tense stretch of aluminum skin, the modulation of a breeze, the framing of a view, the pleurization of a place form the metrics of the built machine. This poetics is not applied but indigenous, not borrowed but discovered, not timeless but temporal, not arbitrary but directed. Architecture's return to the machine - in the full dedication and richness of its possibilities - holds the hope for architecture's future as both servitor and art."

Michael Sorkin, Pamphlet Architecture
This project was developed through a series of diagrams and small study models. After several studies, it was determined that the best arrangement was to place the bakery's functions along the highway and to place the more public functions along Landsdowne Street, as shown in the program diagram.

Circulation is treated as the piece which holds the two parts together. From the walkways, one can see both the cafe / restaurant spaces and the bakery floor.

Ground Plan

1. outdoor space
2. flour storage silos
3. mixers
4. scaling area
5. ingredient storage
6. proofer
7. bulk packager
8. retail space
Upon entering the building, one finds that the lobby of the building and the bakery are one and the same. One is immediately immersed in the baking environment.

What arises from these diagrams is the concept of nesting spaces in one another.

Machines were aligned in a linear fashion to maximize production and to accommodate visitors.

A structural diagram emerged as part of a later study of the project.

6. proofer  11. stringline
9. entrance  12. tunnel oven
10. viewing area  13. cooling conveyor
12. tunnel oven
14. viewing platform
15. cafe
16. restaurant / cafe kitchen
North Elevation
figure 68

Restaurant Plan
figure 69

17. viewing platform
18. restaurant
19. outdoor terrace
The idea of nesting is carried into the section as well, where one large membrane encloses smaller, discrete spaces. The nesting concept can be seen in the adjacent diagram. The layering of spaces, one after the other, provides an opportunity for the visitor to unfold them as they progress through the learning stages associated with the bakery.
Lighting and ventilation became important design considerations. Prevention of glare while allowing light to filter onto the production floor provided a challenge. These two systems began to work together in the eventual design solution.

Physical Models
40

figure 74  figure 75
north elevation  north facade detail
The folding plates of the roof provide structural stability while devising a method to allow constant north light to filter into the spaces. The north light permeates the space through the folding planes of the facade as well. These planes are punctuated by ventilation louvers.
figure 78  figure 79
aerial view  south elevation, exposing structure
The mechanical louvers may be opened at different times of the year to facilitate natural ventilation. The louvers are fully automated and act in response to the climatic changes within the building. The visitors then realize and see the building react to the processes housed within. The overhead louvers are concentrated near the heat producing region of the building, the 100 foot long tunnel oven.
figure 82
detail of mixers below

figure 83
sectional view
Shown below are detail images of the interior of the model. It proved to be difficult both to physically model and photograph the interior spaces. A series of computer generated illustrations found on the following pages attempt to convey the feeling of the interior to the viewers.
Computer Renderings

aerial view from north west
figure 87
aerial view from south east
figure 88 (left)
view along Brookline Avenue

figure 89 (below)
view of south facade
figure 90 (right)
view from Kenmore Square along Brookline Avenue

figure 91 (below)
exploded axonometric perspective
figure 92 (left)
view down entire bakery space

figure 93 (below)
view from entrance
figure 94 (right)
view along north facade

figure 95 (below)
view from cafe viewing platform
figure 96
the crowd stares in wonder
In conclusion, it is possible to bring industry back into the urban centers. In today's world one is no longer completely sure how things function. There is an increased awareness and desire to learn more about our surroundings and our possessions. The bakery in Kenmore Square reveals a process to its visitors and reveals something about ourselves in the process.

We are by nature inquisitive; hiding industries inside faceless boxes on the perimeter of our cities may no longer be the answer to today's challenges. The bakery gives us a chance to learn about a process in a passive way. Our culture is wrapped up in passive entertainment to a certain degree. It seems that as more people tune into the Internet, they turn themselves over to the possibility of passive entertainment. This is an opportunity to learn, to socialize, to enjoy what the bakery has to offer.

The bakery reveals itself through a series of layers, similar to the complexity of our society today. The bakery is therefore interpreted on many different levels. On one level, it is a place for learning. School children may visit the bakery to learn in the same way they will visit a museum or an aquarium.

On another level, the cafe is a place to meet people for a cup of coffee and a roll. A chance to talk, to catch up with one another, to see how your friend is coping with daily stresses.

Yet on a deeper level, the bakery is saying something about our society today. There is an endless need for more information and for that knowledge to be presented in an overly simplified manner. The bakery presents its inner workings as that clarified knowledge, as a way of communicating what it does and how simple the process really is. It in fact reveals the process.
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<tr>
<td>Autodesk Mechanical Desktop 3</td>
<td>A web site was produced in conjunction with the thesis project. It was used to show progress in the design process and to demonstrate spatial ideas through the use of several animations. The information on the CD ROM is best viewed on a PC using Netscape or Internet Explorer.</td>
</tr>
<tr>
<td>Adobe Photoshop 5.0</td>
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<tr>
<td>Adobe PageMaker 6.5</td>
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<tr>
<td>Microsoft Word 2000</td>
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<tr>
<td>Kinetix 3D Studio Max 3.0</td>
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<tr>
<td>Adaptec Easy CD Creator</td>
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