Bringing the Farm to the Table: Reinventing the Slaughterhouse for Seattle

Rebecca Ann Becker

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Brian McLaren

Brad Khouri

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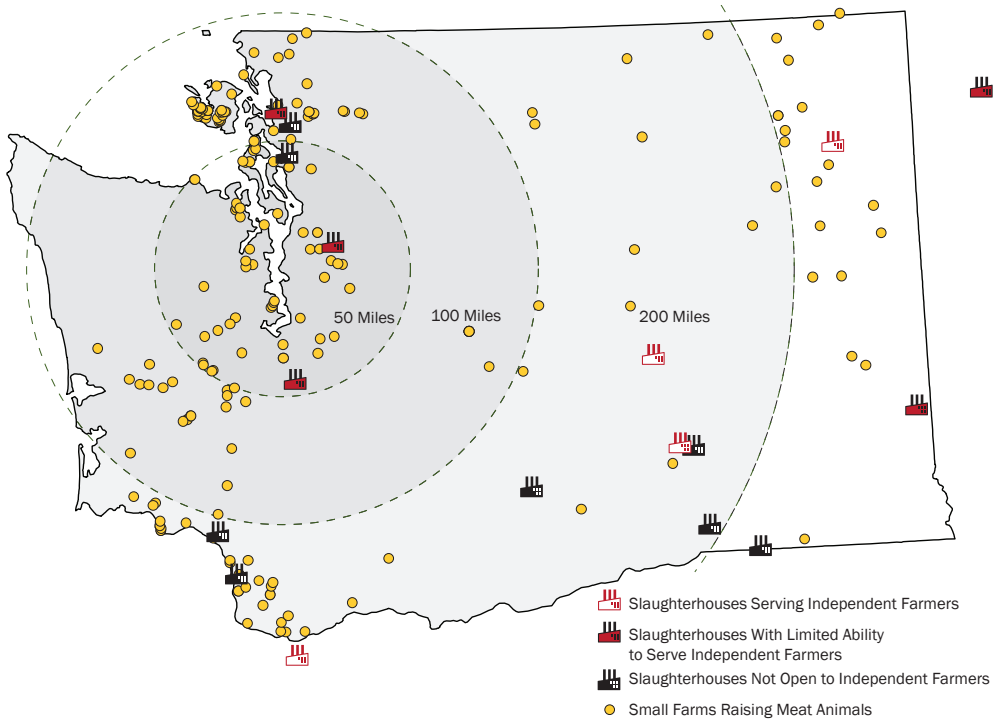
Chapter 1: The Slaughterhouse Dilemma

> "Meat is everywhere, but animals and butchering are nowhere to be found."
>
> Dorothee Brantz, *Slaughter in the City*[1]

"Eat local" has become the new mantra of the sustainable food movement. But what does "eat local" mean when it comes to meat? Local farms raise the meat that is available at local farmer's markets and stores, but often that meat has traveled hundreds of miles. Unlike produce, meat cannot travel straight from the farm to the table, but must first be processed at a slaughterhouse in order to be sold to consumers. In order to sell cuts of meat directly to consumers or to restaurants, farmers must have their animals processed at a United States Department of Agriculture (USDA) inspected facility.[2] In the 2009 Future of Farming Report, the Washington State Department of Agriculture (WSDA) lists only four facilities in the state of Washington that provide USDA-inspected slaughter to independent producers without limitations, and an additional five that have significant limitations in their abilities to serve independent farmers.[3] The closest facility readily accessible to independent farmers is approximately 150 miles from Seattle (Figure 1.1), a 300 mile trip for local meat potentially raised only a few miles outside the city.



1.1 Small Farms and USDA Slaughterhouses in Washington State
Data from USDA Food Safety and Inspection Service

Interest in local and urban agriculture is strong in the Seattle community, with many local organizations dedicated to helping connect local consumers with local producers.[4] Some consumers have decided to become producers as well and are raising meat in their own backyards. Seattle's 2010 Urban Agriculture Bill allows residents to raise eight chickens and three small mammals such as rabbits and goats.[5] Chickens lay eggs for one to four years, but can live for as many as twelve years. Cities with urban agriculture laws similar to those in Seattle have passed bans on slaughter within city limits.[6] While Seattle has not banned backyard slaughter, many urban farmers lack the knowledge to slaughter their own animals humanely. With no access to slaughterhouses and no training in slaughter, even those who wish to raise their own meat in the city may not be able to do so.

Slaughter has become invisible in everyday urban life. Slaughter facilities are now consolidated in rural areas, where they are out of sight and out of mind. While a USDA inspector provides oversight, the public is excluded by both policy and geography, and the accountability of the slaughterhouse is only to the government. With the speed and capacity of the industrial slaughterhouse, even the USDA can only provide minimal oversight. Consumers have no access to these facilities, and little opportunity to gain an understanding of where their food comes from. With operations focused on speed and uniformity, there is no room for small farmers with special needs. The current model is fundamentally incompatible with small farmers who want to produce local meat and concerned consumers who want to consume it.

In order to create a local meat supply, educate local meat producers, and inform local consumers, this thesis argues that the slaughterhouse must be moved back to the city. In order for the slaughterhouse to operate at an urban scale, the scale of the slaughterhouse must be reduced. This will allow it to integrate with the urban environment and ensure that the scale of the facility is appropriate to serve small farms and individuals in the Seattle region.

Many people have advocated for greater transparency in the food system, which requires observation that is only possible if more people are present. Additionally, by bringing the slaughterhouse to consumers, food miles are not increased by the trip to the slaughterhouse. The intent is to design a teaching facility where urban farmers can learn how to process their own animals and consumers who wish to understand where their meat comes from can gain first-hand experience. Combining the basic program of the slaughterhouse with opportunities for

observation and education will transform the slaughterhouse from a utilitarian building into a community asset.

Transparency to the public, particularly within the slaughterhouse itself, will help to inform the public and maintain accountability of the facility to consumers. Retail space will enable farmers to sell directly to consumers, and provide a public face to the facility that will help it to integrate into the community. Instead of acting as a remote meat producing machine, the slaughterhouse can become an integral community asset and a crucial node for local meat production and consumption.

Endnotes

1 Dorothee Brantz, "Slaughter in the City : the Establishment of Public Abattoirs in Paris and Berlin, 1780-1914", 2004, 3.

2 "Summary of Meat Processing Issues in Washington State" (Washington State Department of Agriculture, n.d.), http://agr.wa.gov/FoF/docs/MeatProcessing.pdf.

3 Ibid.

4 For a representative sample of these organizations, see listings on the Seattle Tilth and Urban Farm Hub websites, respectively: http://seattletilth.org/our-community/urbanagfoodgroups , http://www.urbanfarmhub.org/organizations/

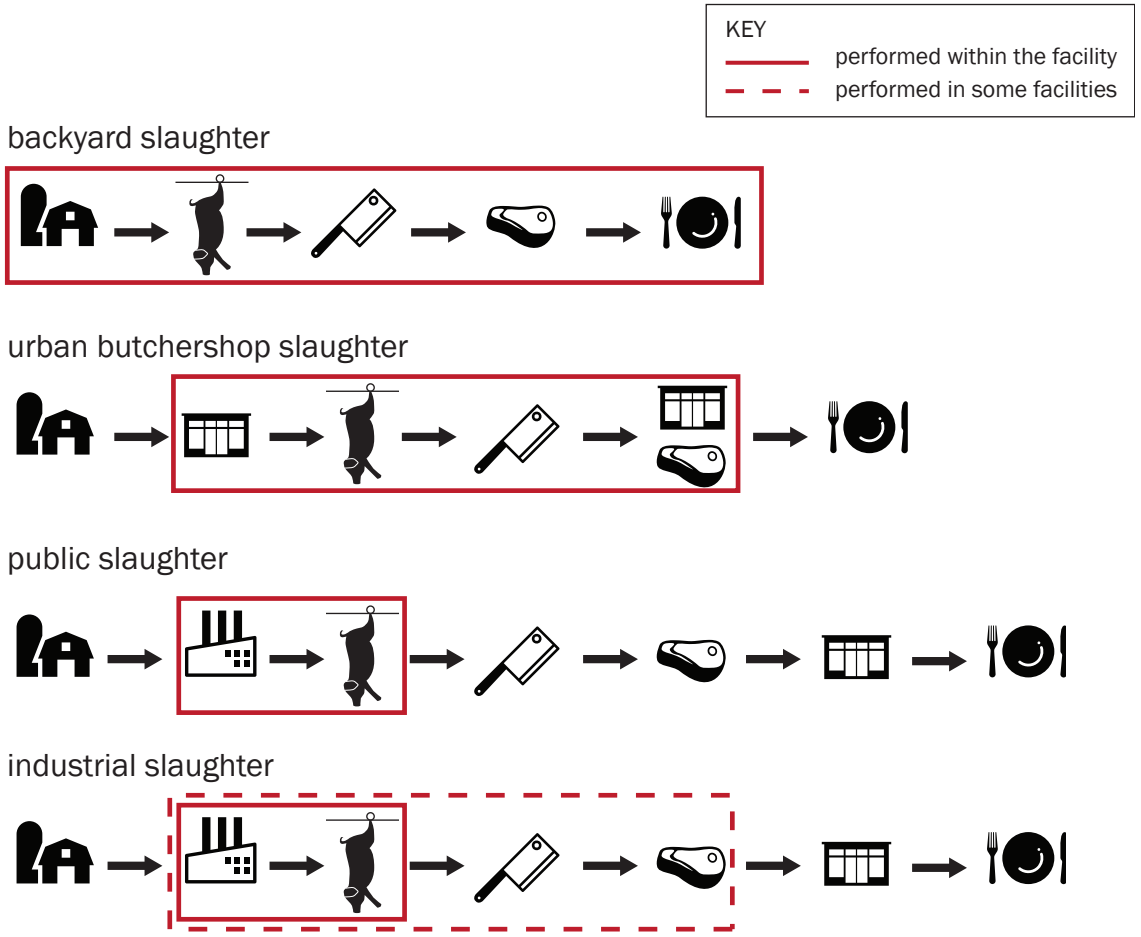
5 "DPD Client Assistance Memo #244 Urban Agriculture" (City of Seattle Department of Planning and Development, November 17, 2010), http://www.seattle.gov/DPD/Publications/CAM/cam244.pdf.

6 City of Denver, "Food Producing Animals (FPAs) Ordinance (CB11-0151)", June 24, 2011, 1, http://www.denvergov.org/Portals/682/documents/The%20Food%20Producing%20Animals%20(FPAs)%20Ordinance%20(CB11-0151)%20.pdf.

Chapter 2: The Architecture of Slaughter

Framing the Slaughterhouse: From Backyard to Factory

Historically, the most common space for slaughter was the home. People raised animals for their own consumption and slaughtered the animals themselves. While slaughter might occur in a designated area, there was no formal, built space specifically for that task. Waste was not a major issue, as the amounts generated by one animal could be used to fertilize the land. The total distance from farm to table could be measured in feet rather than miles, and processing was customized to individual tastes. The evolution of slaughter from an ordinary household task to a massive industrial process (Figure 2.1) had dramatic implications at all levels of the meat supply, from hygiene, to humane practices, to the most basic awareness of where meat comes from.



2.1 Evolution of Slaughterhouse Typologies

"Knife" symbol by Samuel Eidam, from thenounproject.com collection.
"Steak" symbol from thenounproject.com collection.
"Place Setting" symbol by Scott Lewis, from thenounproject.com collection.

Moving from the Backyard to the City

The history of the modern slaughterhouse begins with the history of the city. With urbanization came an increased and more concentrated demand for meat, with slaughterers and butchers providing the link between the rural areas where livestock were raised and the city where it was consumed. Initially, space for slaughter existed "as something excavated rather than built,"[1] informal spaces often integrated into the residential environment.[2] A slaughterhouse was any building in which animals were killed. There were at least 600 such buildings in Paris in the 1780s[3] and as many as 1,429 in London in 1874.[4] The butcher would purchase live animals at a livestock market and herd the animals to his shop, where they would be slaughtered in the backyard and then sold in the front.[5] Without refrigeration, meat would only last twelve hours after slaughter, which required the shop to be located near consumers so the meat was as fresh as possible.

These private and unsupervised businesses resulted in an urban environment filled with live animals being herded to slaughter, a constant stench in the air, and blood running through the streets.[6] Since neither the producer nor the consumer was able to observe the slaughter of the animals, consumers relied on municipal authorities and their own savvy to assure the quality of their meat. However, the dispersal of and numbers of slaughterhouses throughout the city meant that authorities could not effectively police the quality of meat sold to consumers. The lack of an effective oversight mechanism, the necessity of regularly moving animals through the streets, and the diffusion of butcher shops throughout the city resulted in a slaughterhouse typology that was eventually incompatible with changing social and hygiene standards for the urban environment.[7]

Regulation and Consolidation

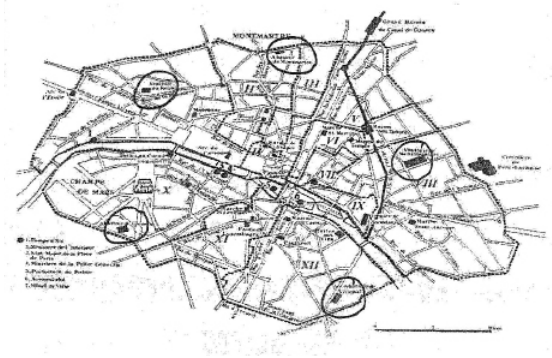
A growing public hygiene movement reacted to the omnipresence of slaughter in the streets with calls to reform the relationship of the slaughterhouse to the city.[8] Calls for slaughter reform grew from a series of concerns, including meat safety, pollution, and the danger that seeing slaughter posed to the public's morals.[9] These changes occurred in parallel with the development of other forms of urban infrastructure such as sewer systems and water supplies.[10] The key concern was to remove slaughter from the street and centralize it in a place that could both be observed and controlled by public authorities, thereby ensuring a safe and hygienic meat supply for the city.

New York City was one of the first cities to enact laws to ensure a cleaner urban environment. This included the establishment

of the first centralized slaughterhouse in the United States in 1676, almost 150 years prior to the establishment of a similar facility in Europe.[11] Live animals were herded from stockyards to municipal facilities to be killed, and then carcasses were transported to butcher shops for final preparation. At the same time, slaughtering, with its associations with blood and death, became separate from butchering, which, freed from those associations, became about clean, wholesome meat.[12] Although slaughter was concentrated, animals and carcasses were still constantly moving through the streets. As the city grew, additional facilities were opened under city license and supervised by municipal authorities.[13]

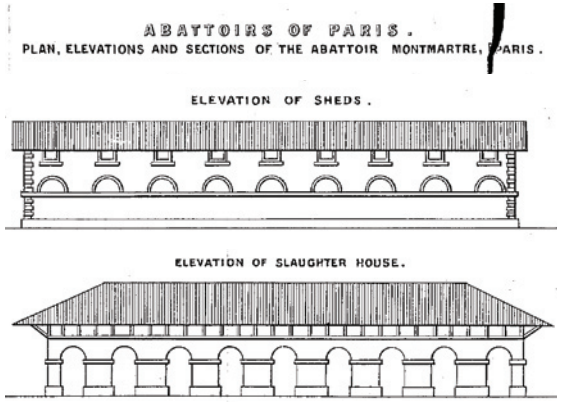
This system was relatively effective until the mid-1700s, when the city's demand for meat exceeded the capacity of the licensed slaughterhouses, and butchers began to slaughter animals on their own premises.[14] Without sewer systems or refrigeration, this trend created exactly the same problems that the centralized slaughterhouse had been built to solve. Although private slaughter was banned in 1749, butchers resisted the ban and continued to kill animals on their own premises.[15] By the late 1700s, New York City streets were as full of livestock, and meat as any other city in the world. Not until the 1860s, well after the development of public slaughterhouses in France, was slaughter once again under control of the city.

Paris experienced the same problems with slaughter as New York. In addition, the political power of the city's Butcher's Guild made it difficult for the government to create and enforce regulations that would limit the impact of slaughterhouses on the urban environment. However, in the early 1800s, Napoleon undertook a vast array of public works to develop the urban infrastructure of



2.2 Locations of Napoleonic Abattoirs
Dorothee Brantz, "Slaughter in the City : the Establishment of Public Abattoirs in Paris and Berlin, 1780-1914", 2004, 102.

Paris, including sewers, roads, water supplies and slaughterhouses. Napoleon's political authority, combined with a burgeoning public health movement, made it possible for civic authorities to begin to regulate slaughterhouses in the city. Laws that banned worker's associations in 1791 eliminated the political might of the Butcher's Guild,[16] which in 1802 allowed the government to limit the number of slaughterhouses permitted in the city.[17] Finally, in 1818, Paris opened five public



2.3 Elevation of Typical 1811 Slaughterhouse Design

Dorothee Brantz, "Slaughter in the City : the Establishment of Public Abattoirs in Paris and Berlin, 1780-1914", 2004, 102.

2.4 Slaughterhouse at Veljuif, one of the five 1818 slaughterhouses in Paris

"Les anciens abattoirs de Vaugirard," Le Pieton de Paris, September 25, 2010, http://pietondeparis.canalblog.com/archives/2010/09/25/19158666.html.

2.5 Paris Public Slaughterhouses, 1834

W.B. Clarke, "Eastern Division of Paris : Containing the Quartiers" (London: Baldwin & Cradock, 1834), Library of Congress Geography and Map Division, http://hdl.loc.gov/loc.gmd/g5834p.ct002443, with overlay by author.

slaughterhouses, banning all private slaughter within the city.[18]

Located outside of built-up areas, but still within the city walls for tax purposes,[19] (Figure 2.2) the slaughterhouse withdrew from the city center. The design of these complexes with high, blank walls (Figure 2.3), ensured that they were kept separate from the city. Although the buildings were civic in scale (Figure 2.4), the plainness and opaque nature of their design made them essentially invisible within the city, more like factories rather than civic buildings. Slaughter was hidden from the city, even as the urban fabric grew up around the slaughterhouse (Figure 2.5). The closing of the original five slaughterhouses within the city walls and the opening of La Villette at the outskirts of the city in 1867 (Figure 2.6) consolidated the city's slaughtering into one facility that also included the livestock market,[20] removing not only slaughtering but also livestock from city streets. Eventually, even La Villette was closed and all slaughtering moved to the countryside.

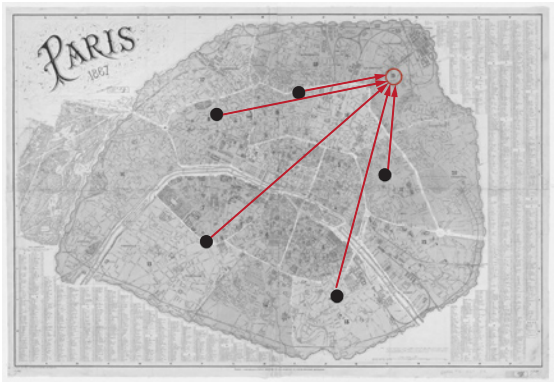
In the mid-1800s, the United States also saw the development of publicly owned slaughterhouses. However, without the power of the authoritarian government of France, the implementation of the public slaughterhouse was a hotly contested political issue whose

success varied from state to state. Numerous court cases attest to the political debates over the merits of free commerce versus the need for regulations for public health. As states imposed public health regulations, local butchers, who were often organized into strong political blocs, challenged those regulations in the courts.

In New York, the 1867 law banning the driving and slaughter of cattle below 40th street was upheld on the principle that no one was deprived of "property or liberty" by the regulation.[21] In Chicago, on the other hand, the establishment of a central slaughterhouse was struck down by the state Supreme Court.[22] A law passed in New Orleans to establish a municipally licensed, privately owned slaughterhouse was repealed by the Supreme Court on the grounds that it prevented citizens (i.e., butchers) from pursuing a legal business.[23] However, the court did uphold the right of municipalities to regulate the industry in the name of public health.[24] This created a legal environment that, in conjunction with a consolidating livestock industry, set the stage for large scale, private operations pushed outside of the city by health regulations.

Industrializing Slaughter

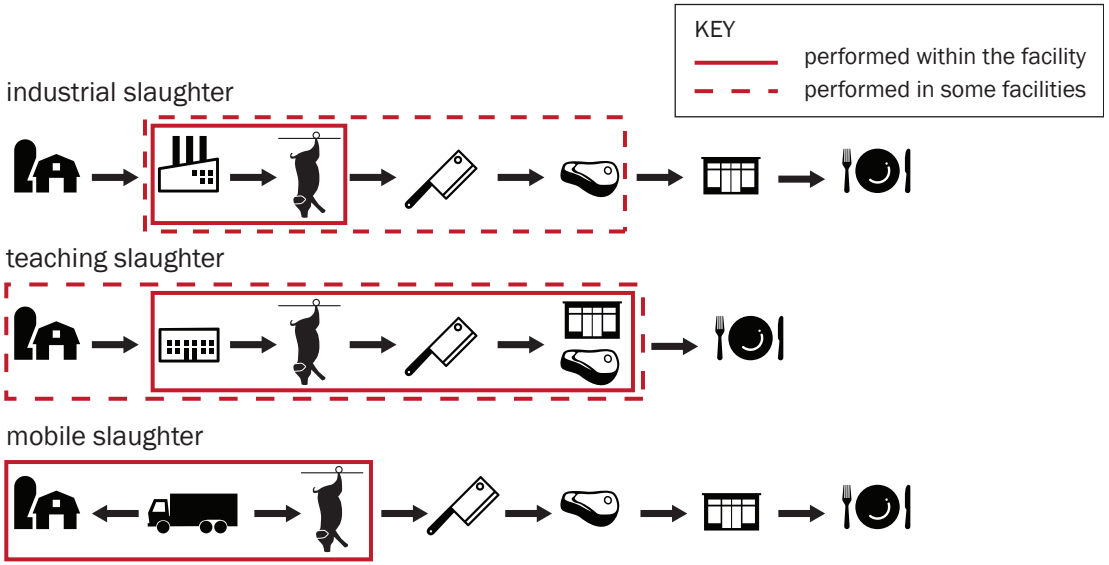
Ironically, many of the problems that made the slaughterhouse intolerable in the city were resolved at the same time that it was removed from the city. Mechanical refrigeration and modern sewage systems effectively eliminated rotting meat and blood as urban nuisances. With these technological improvements, the sights, scents and sounds of slaughter disappeared, rendering the slaughterhouse effectively invisible.[25] In the United States, the increasing scale of livestock operations, combined with advances in refrigeration and distribution, made it cheaper to move the slaughterhouses to the animals than to ship



2.6 Relocation of Slaughtering to La Villette
Eduard Dumas-Vorzet, "Paris 1867" (Paris: Librairie du Petit Journal, 1867), 010890135, Harvard Map Collection, http://nrs.harvard.edu.offcampus.lib.washington.edu/urn-3:FHCL:1201615?buttons=y, with overlay by author.

animals to population centers.[26] Butchers received carcasses rather than live animals, removing their personal association with slaughter and thus also the association of slaughter with the purchase of meat. Slaughter became an invisible site of death that no one wished to invite back to the city.

Even when sanitation would have allowed the slaughterhouse back into the city, the scale of the slaughterhouse was no longer



2.7 Modern Slaughterhouse Typologies

"Knife" symbol by Samuel Eidam, from thenounproject.com collection.
"Steak" symbol from thenounproject.com collection.
"Place Setting" symbol by Scott Lewis, from thenounproject.com collection.

compatible with the urban fabric of the city. In the United States, small facilities were the norm until the expansion west, combined with improved shipping, led to mass slaughter operations in cities like Cincinnati and Chicago.[27] The extension of the rail networks from livestock supplies in the West to the Midwest processing cities, coupled with the invention of refrigerated rail, created a large scale supply and distribution network in which spoilage (and thus distance) was no longer a concern.[28] Chicago was particularly notable for the development of large-scale slaughterhouses just south of the city, some up to seven stories tall, where animals were slaughtered in an assembly line at an increasingly rapid pace.[29]

While health regulations and technologies have changed some slaughtering practices, the industrial slaughterhouse model established in mid-nineteenth century Chicago remains the predominant model even today.

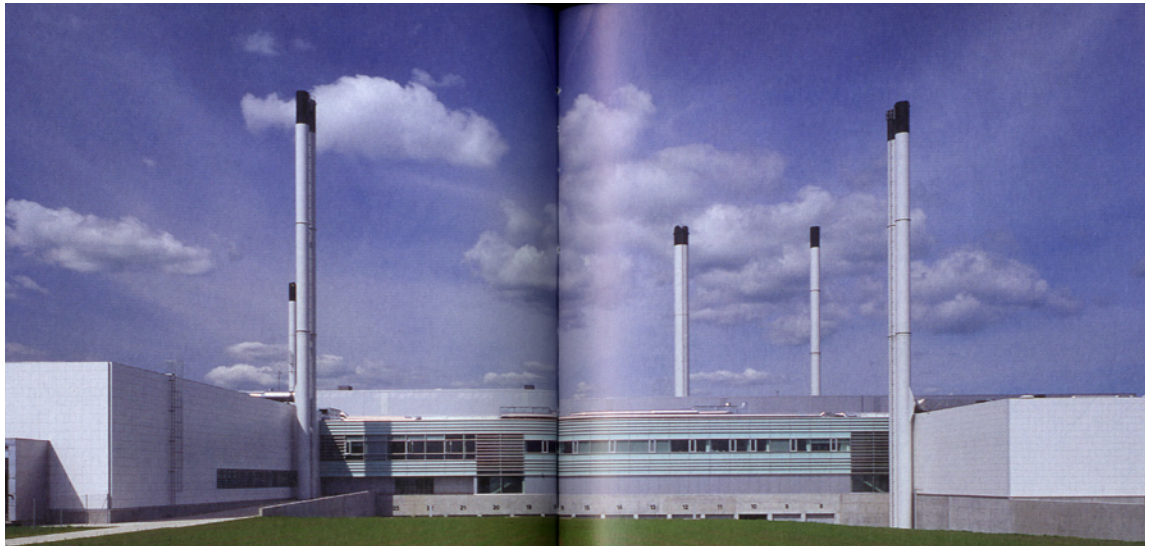
The Modern Slaughterhouse

The consolidation of the slaughtering industry has continued into the present day. Just four companies control more than 60% of the poultry and pork markets.[30] However, while large industrial slaughterhouses dominate the industry and the public's attention, other models and scales of slaughter still exist (Figure 2.7), and can help to suggest an alternative to the consolidated industrial model.

Large Industrial Plants

Today's prototypical slaughterhouse is the large scale, centralized industrial facility. From the first public abattoirs in Paris to the

2.8 Danish Crown Slaughterhouse, Site
"Danish Crown, Horsens," Google Earth, June 1 2011, accessed December 6, 2012.

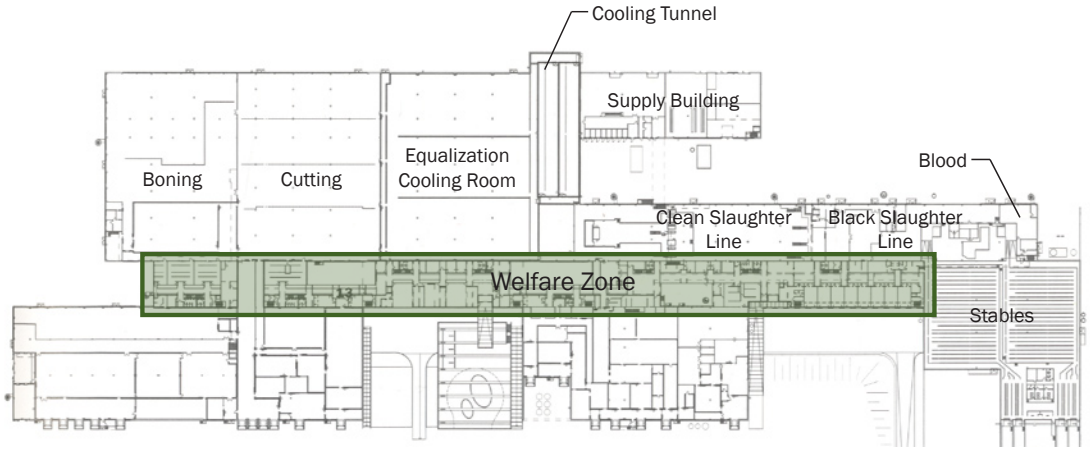


2.9 Danish Crown Slaughterhouse, Exterior
"Danish Crown, Horsens = Danish Crown, Horsens [Denmark]: arkitekt/architect, Arkitema.," Arkitektur DK 50, no. 3 (2006): 176–177.

stockyards of Chicago to the new Danish Crown facility in Horsens, Denmark, slaughter at a massive scale provides the majority of our meat yet remains invisible day to day. The Danish Crown slaughterhouse is the largest slaughterhouse in Europe and also one of the most technologically advanced. Nearly one-third the size of the nearest town (Figure 2.8), its massive scale makes it fundamentally incompatible with the urban fabric and requires that it be located outside of the city. Visually, its exterior provides few clues as to its interior function (Figure 2.9), while its interior presents a landscape of mass mechanization (Figures 2.10, 2.11). The central "welfare zone" is the one area that acknowledges that humans as well as machines inhabit the space (Figures 2.12, 2.13).[31] Regular tours of the facility accommodate about 150 visitors per day, but the mass scale of the slaughtering the facility performs, slaughtering 60,000 pigs per day,[32] seems to make it impossible to understand that individual animals are being killed. While Vialles describes slaughter on a mass scale as "harrowing, and...therefore kept out of sight,"[33] the scale of slaughter at Horsens seems to move beyond distressing to incomprehensible.

2.10 Danish Crown Slaughterhouse, Conveyor Belts

"Danish Crown, Horsens = Danish Crown, Horsens [Denmark]: arkitekt/architect, Arkitema.," Arkitektur DK 50, no. 3 (2006): 178.



2.12 Danish Crown Slaughterhouse, Plan

"Danish Crown, Horsens = Danish Crown, Horsens [Denmark]: arkitekt/architect, Arkitema.," Arkitektur DK 50, no. 3 (2006): 177.

2.11 Danish Crown Slaughterhouse, Packing Room

"Danish Crown, Horsens = Danish Crown, Horsens [Denmark]: arkitekt/architect, Arkitema.," Arkitektur DK 50, no. 3 (2006): 176–177.

2.13 Danish Crown Slaughterhouse, Welfare Zone

"Danish Crown, Horsens = Danish Crown, Horsens [Denmark]: arkitekt/architect, Arkitema.," Arkitektur DK 50, no. 3 (2006): 179.

Mobile Slaughterhouse

The mobile slaughterhouse is nearly the opposite of the industrial slaughterhouse, small and widely dispersed. This model brings slaughter to the animals, eliminating the mileage between the slaughterhouse and the farm. One of these facilities slaughters tens of animals a day rather than thousands. At the same time, they retain the same utilitarian, mechanical appearance as the industrial plants. From the exterior, the need for mobility trumps the internal functions, so the facility appears to be nothing more than a standard semi-trailer, windowless and completely opaque as to the functions inside (Figure 2.14). The interior is strictly functional, providing only the equipment and storage necessary for USDA certified slaughter (Figure 2.14). Given their small scale, slaughter is the only service these facilities can provide, so all additional processing and packaging necessary to prepare meat to sell to a consumer happens elsewhere. Depending on the location of the processing plant, this can add more mileage to the trip from farm to table than the the mobility of the slaughterhouse saves. The mobility of this typology also leads to its invisibility. It is not permanent, so it is not objectionable. While the farmer regains a connection with the slaughter of their animals, the consumer remains at the periphery.

Meat Laboratory

The meat laboratory constitutes another slaughterhouse typology that is found at many agricultural colleges. This facility resembles a small industrial slaughterhouse technologically and spatially, while also taking on the processing and retailing traditionally performed by a butcher shop. Unlike many small slaughterhouses, which often specialize in one type of animal, "meat labs," or teaching slaughterhouses, typically slaughter a wide

2.14 Mobile Slaughterhouse, Puget Sound Meat Producers Cooperative, Exterior

"Puget Sound Meat Producers Cooperative," Puget Sound Meat Producers Cooperative, 2009, http://www.pugetsoundmeat.com/default.html.

2.15 The J and G Lau Meat Processing Center, Cal Poly, Exterior

Tayler Duprel, "Meat and Greet: Processing Plant Opens for Viewing," Mustang Daily, October 18, 2011, sec. News, http://mustangdaily.net/cal-poly-meat-processing-center-opens-for-viewing/.

2.16 The J and G Lau Meat Processing Center, Cal Poly, Aerial View

Google, "J and G Lau Family Meat Processing Center, California Polytechnic State University, Cal Poly , San Luis Obispo, California.," Google Maps, July 27, 2012, https://maps.google.com/.

variety of animals. These facilities take on a more public role in their communities, providing space for local farmers to interact with researchers, classrooms and teaching abattoirs for educating students, and retail spaces for the public to purchase student processed products.

One of the newest teaching slaughterhouses is the facility at Cal Poly in San Luis Obispo that opened in 2011 (Figure 2.15).[34] Although the facility is located in a rural setting removed from the campus (Figure 2.16), the exterior is still highly opaque, with exterior windows only in the conference room and offices (Figure 2.17). The interior offers a greater degree of transparency, with windows from the hallway into all of the main working areas, but the continuous and narrow space does not encourage pausing (Figure 2.17). While the working areas accommodate teaching classes within the spaces (Figure

2.18), there is little room or opportunity for outside observers. Even the sales office lacks a window to the exterior, discouraging the public from interacting even in the space they are meant to occupy (Figure 2.17).

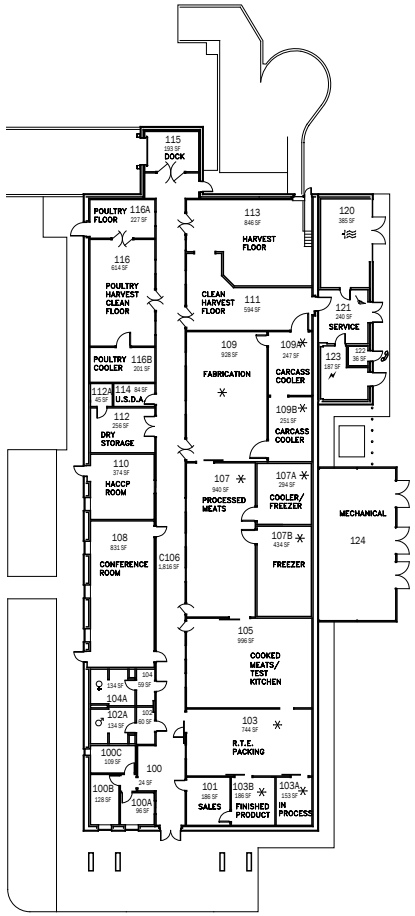
Although this building is primarily a teaching facility, the focus seems to be on creating an industrial space rather than a teaching environment. These teaching facilities are designed to teach students skills necessary for employment in the real world. The facility at Cal Poly seems to demonstrate that the world students are being prepared for is one where slaughter is hidden from public eye on the exterior and filled with industrial lighting on the interior.

While the architecture does not necessarily support public interaction, the program helps to tie the facility to the community. Both the retail space and the classrooms act as links between the community

2.18 The J and G Lau Meat Processing Center, Cal Poly, Interior

Christian Millan, "Photography and Cal Poly Meats," Newspaper, Mustang Daily, November 9, 2011, http://mustangdaily.net/cal-poly-meats/.

and the slaughterhouse. The primary purpose of these teaching slaughterhouses is to educate students rather than to provide a link between farmers and consumers. However, it makes a compelling model by demonstrating that one facility can house not only slaughter, but butchering, sales, and teaching in a way that provides it with a strong link to the community.



2.17 The J and G Lau Meat Processing Center, Cal Poly, Plan

Cal Poly Facility Services, "J & G Lau Family Meat Processing Facility Floor Plan", April 10, 2012, http://www.afd.calpoly.edu/facilities/unsecured/planroom/database/building/Floor_Plans/Building155-0_Floor1.dwg.

2.19 Victor Churchhill Butchery, Storefront
Paul Gosney, Victor Churchhill Butchery, Digital Photo, 2011, http://www.dreamtimeaustraliadesign.com/#/78.

Learning from Typologies

The purpose of the slaughterhouse is to provide a space in which to transform a live animal into clean, edible meat. However, the full transformation from animal to meat is a process that also requires a link from producer to consumer. At the scale of backyard slaughter, the producer is also the consumer, while in an industrial slaughterhouse the farmer might be separated from the consumer by several steps, including a slaughterer, butcher and sales person (Figure 2.7). The more steps there are between the producer and consumer, the more it is possible for slaughter to become something "unseen," denying the consumer knowledge about what they are consuming and lessening their power to change how it is produced. While some consumers are content to leave slaughter as an invisible process, others are becoming interested in how meat gets from farm to table.

Rethinking the Slaughterhouse

Whatever the size, when seen from the exterior most slaughterhouses seem to strive for invisibility. Noelle Vialles describes the slaughterhouse as "a place that is no-place,"[35] a quality she attributes to the psychological disjunction required between meat and death in order to accept slaughter on a large scale. As Paula Young Lee notes, by the mid-nineteenth century, "all the qualities that made a slaughterhouse 'modern' involved physical isolation," including relocation away from the city, elevation, opaque walls, and a screen of trees.[36] This new invisibility is partially attributed by Lindgren Johnson to the desire for sanitation, which had the effect of removing any evidence of slaughter apart from the end product of edible meat.[37] While the impetus to remove the less sanitary aspects of slaughter from the environment is clear, the desire to hide the very existence of slaughter from sight seems to also play a significant role in the architecture of the slaughterhouse today.

While the slaughterhouse is hidden, meat is not only displayed, but fetishized. The Victor Churchill Butchery by Dreamtime Australia represents one of the more extreme examples of this trend (Figure 2.19). From sausage-shaped door handles (Figure 2.20) to the display of the butchers themselves (Figure 2.22) the design of this store revels in the display of meat and butchery. However,

2.20 Victor Churchhill Butchery, Details
Simon Leong, "Simon Food Favourites: Victor Churchill: Gourmet Butchery, Woollahra (12 Sept 2009)", September 26, 2009, http://simon-foodfavourites.blogspot.com/2009/09/victor-churchill-gourmet-butchery.html.

2.21 Victor Churchhill Butchery, Detail
Paul Gosney, Victor Churchhill Butchery, Digital Photo, 2011, http://www.dreamtimeaustraliade-sign.com/#/78.

2.22 Victor Churchhill Butchery, Butchering
Simon Leong, "Simon Food Favourites: Victor Churchill: Gourmet Butchery, Woollahra (12 Sept 2009)", September 26, 2009, http://simon-foodfavourites.blogspot.com/2009/09/victor-churchill-gourmet-butchery.html.

this display is completely divorced from the animals the meat comes from. Cuts of meat are displayed individually like museum pieces (Figure 2.21), transformed into abstract objects with no indication of their origin.

At the same time, there is a growing interest in knowing where food comes from, that includes meat and thus by necessity slaughter. In Portland, the Portland Meat Collective offers classes in slaughter and butchery that provide hands-on experience of these hidden processes.[38] The BBC has filmed four seasons of a show called "Kill It, Cook It, Eat It," that, among other things, shows the slaughter and processing of an animal each episode.[39] Both of these examples provide the opportunity to observe the slaughter of a single or a limited number of animals, which becomes slaughter-as-ritual rather than slaughter on a dis-assembly line. Reducing the scale of slaughter allows the bridging of the disjunction between animal and meat, allowing people to become, as Vialles says "eater(s) of animals" rather than "eater(s) of substance."[40]

Observation of slaughter can do more than demonstrate the link between animal and meat. It can also help to ensure that that transition is made hygienically and humanely. Today, the role of observer falls primarily to USDA inspectors, who are responsible for ensuring that slaughter is performed according to regulation. However, consumers can also play an important role in observing slaughter. Exposing the process of slaughter to the public eye has been proposed as a solution to inhumane and unhygienic practices in the industry as early as the beginning of the nineteenth century, with the birth of the movement for the humane treatment of animals in England. In a report given to the Society of the Arts in 1895, H.F. Lester writes,

> "The public eye, however, is a great safeguard against all manner of evils, and an abattoir, therefore, besides being the property of the public, ought to be capable of having surprise visits paid to it by members of the public, as amateur inspectors of nuisances."[41]

More than 100 years later, Michael Pollan writes,

> "The industrialization–and dehumanization–of American animal farming is a relatively new, evitable and local phenomenon: no other country raises and slaughters its food animals quite as intensively or as brutally as we do. Were the walls of our meat industry to become transparent, literally or even figuratively, we would not long continue to do it this way...For who could stand the sight? "[42]

The idea that inhumane acts can be prevented merely by official observation would seem to be contradicted by the abuses reported at USDA inspected slaughterhouses, which are already under observation.[43] But the emphasis on the "public eye" is key- it is the public that consumes the meat, that causes the animal to be slaughtered, that ultimately bears the responsibility for the animal to be slaughtered humanely.

The role of the slaughterhouse is to produce meat for consumption. However, how this basic necessary function is fulfilled is significant both socially and spatially. When performed at a large scale, far from the source of the meat or the ultimate place of consumption, the slaughterhouse acts as a place of disjunction, separating farms from consumers and animals from meat. At a small scale, performed publically, near consumers, the slaughterhouse can actually bridge this disjunction, reconnecting people with the source of their food and ensuring that slaughter is performed safely and with respect for the animals being prepared for consumption.

Endnotes

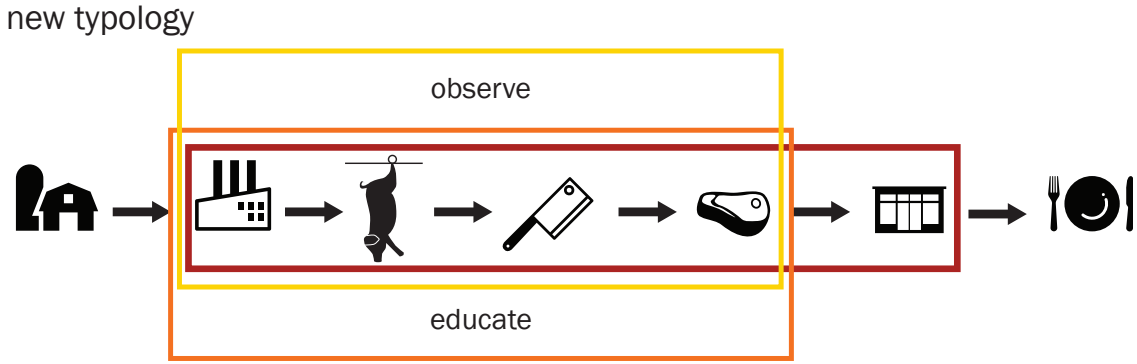
1 Paula Young Lee, "Hide, Seek, Slaughter, Meat: The Slaughterhouse as Site," ed. Paula Young Lee, *Food and History* 3, no. 2 (2008): 244.
2 Chris Otter, "Civilizing Slaughter: The Development of the British Public Abattoir, 1850-1910," ed. Paula Young Lee, *Food and History* 3, no. 2 (2008): 31.
3 Brantz, "Slaughter in the City : the Establishment of Public Abattoirs in Paris and Berlin, 1780-1914," 55.
4 Otter, "Civilising Slaughter: The Development of the British Public Abattoir, 1850-1910," 31.
5 See Brantz, "Slaughter in the City," 55 for a description of this process in Paris.
6 Brantz, "Slaughter in the City : the Establishment of Public Abattoirs in Paris and Berlin, 1780-1914," 57.
7 For a discussion of changing attitudes towards the urban environment as they related specifically to slaughter, see Brantz, "Slaughter in the City,".
8 Brantz, "Slaughter in the City : the Establishment of Public Abattoirs in Paris and Berlin, 1780-1914," 10–13.
9 Ibid., 10–12.
10 Maurice Guerrini, *Napoleon and Paris; thirty years of history.* (New York: Walker, 1971), 62.
11 Ronald M Labbé and Jonathan Lurie, *The slaughterhouse cases : regulation, Reconstruction, and the Fourteenth Amendment* (Lawrence, Kan.: University Press of Kansas, 2003), 45.
12 For more about the significance of this separation, see Noélie Vialles, *Animal to edible* (Cambridge [England]; New York, NY; Paris: Cambridge University Press ; Editions de La Maison des Sciences de l'homme, 1994).
13 Jared N. Day, "Butchers, tanners, and tallow chandlers: the geography of slaughtering in early-nineteenth-century New York City," in *Meat, modernity, and the rise of the slaughterhouse*, ed. Paula Young Lee (Durham, N.H.; University of New Hampshire Press; Hanover: published by University Press of New England, 2008), 178–197.
14 Ibid.
15 Ibid.
16 Brantz, "Slaughter in the City : the Establishment of Public Abattoirs in Paris and Berlin, 1780-1914," 75.
17 Ibid., 86.
18 Ibid., n.p.
19 Ibid., 86.
20 Ibid.
21 Labbé and Lurie, *The slaughterhouse cases*, 48.
22 Ibid., 44.
23 Ibid., 146.
24 Ibid., n.p.

25 Vialles, *Animal to edible*, 20.
26 Roger Horowitz, *Putting meat on the American table : taste, technology, transformation* (Baltimore: Johns Hopkins University Press, 2006), 46–7.
27 Ibid., n.p.
28 Labbé and Lurie, *The slaughterhouse cases*, 75.
29 Dominic A. Pacyga, "Chicago: slaughterhouse to the world," in *Meat, modernity, and the rise of the slaughterhouse*, ed. Paula Young Lee (Durham, N.H.; University of New Hampshire Press; Hanover: published by University Press of New England, 2008), 156–7.
30 Mary Hendrickson and William Heffernan, "Concentration of Agricultural Markets" (Department of Rural Sociology, University of Missouri, April 2007), 2–3, http://www.foodcircles.missouri.edu/07contable.pdf.
31 "Danish Crown, Horsens = Danish Crown, Horsens [Denmark]: arkitekt/architect, Arkitema.," *Arkitektur DK* 50, no. 3 (2006): 178.
32 "Visit Danish Crown Horsens," *Danish Crown*, n.d., http://www.danishcrown.com/Danish-Crown/FAQ/Visit-Danish-Crown-Horsens.aspx.
33 Vialles, *Animal to edible*, 31.
34 Tayler Duprel, "Meat and Greet: Processing Plant Opens for Viewing," *Mustang Daily*, October 18, 2011, sec. News, http://mustangdaily.net/cal-poly-meat-processing-center-opens-for-viewing/.
35 Vialles, *Animal to edible*, 15.
36 Lee, "Hide, Seek, Slaughter, Meat: The Slaughterhouse as Site," 247–8.
37 Lindgren Johnson, "'Slaughtering' Equality? Rendering the Animal and E-racing the Human in the Slaughterhouse Cases," ed. Paula Young Lee, *Food and History* 3, no. 2 (2008): 219–237.
38 "Portland Meat Collective", n.d., http://www.pdxmeat.com/.
39 "BBC Three - Kill It, Cook It, Eat It," *BBC*, n.d., http://www.bbc.co.uk/programmes/b006ywpr.
40 Vialles, *Animal to edible*, 30.
41 H.F. Lester, "The Progress of the Abattoir System in England," *Journal of the Society of Arts* 43 (1895): 432.
42 Michael Pollan, "An Animal's Place," *The New York Times*, November 10, 2002, sec. Magazine, http://michaelpollan.com/articles-archive/an-animals-place/.
43 United States Food Safety and Inspection Service, "Slaughter Inspection 101," *Food Safety and Inspection Service Fact Sheets*, April 6, 2010, http://www.fsis.usda.gov/Fact_Sheets/Slaughter_Inspection_101/index.asp.

Chapter 3: Meat in the City: Inspect, Inform, Consume

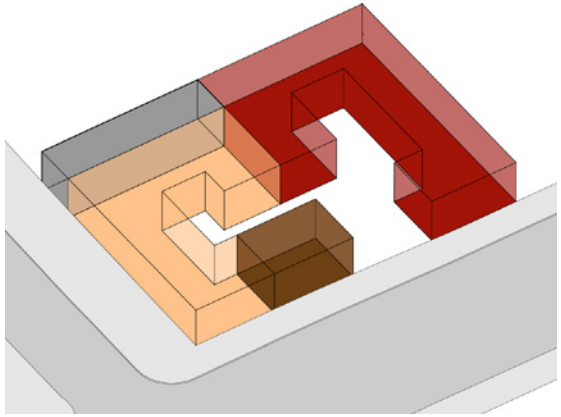
This thesis proposes a new typology for the slaughterhouse (Figure 3.1). While slaughtering forms the backbone of the program, observation, education and retail programs provide surveillance for its activities and markets for its products. Transparency will help to create accountability and attract consumers. Teaching people where their meat comes from will help to connect consumers to producers and strengthen the local food network.

The central programmatic element of the facility is the slaughterhouse itself (Figure 3.2). The visibility of the process of slaughter is key. By providing transparency, not only does the consumer learn about the process, but they are able to see that the slaughter and processing is performed humanely and hygienically. Limiting the scale of the facility helps to make slaughter observable and

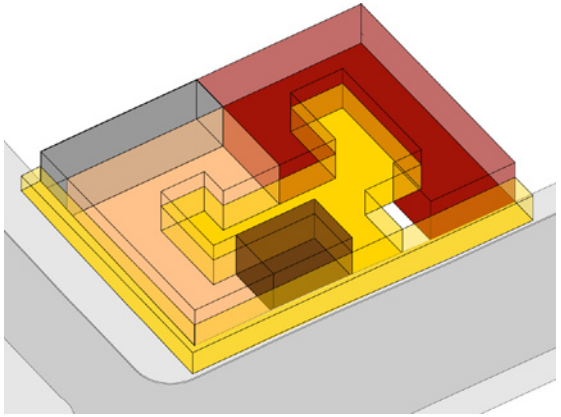


3.1 New Slaughterhouse Typology

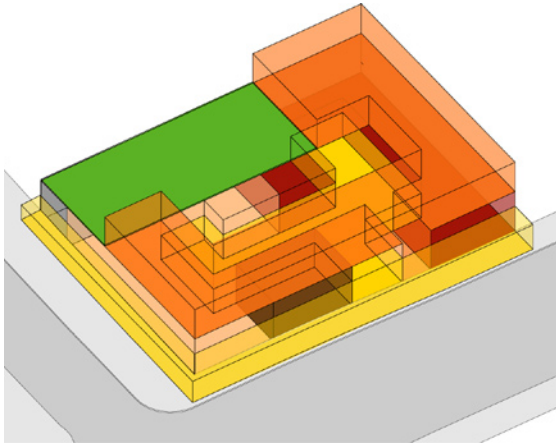
"Knife" symbol by Samuel Eidam, from thenounproject.com collection.
"Steak" symbol from thenounproject.com collection.
"Place Setting" symbol by Scott Lewis, from thenounproject.com collection.



3.2 Prototype Program- Base



3.3 Prototype Program- Observation



3.4 Prototype Program- Formal Education

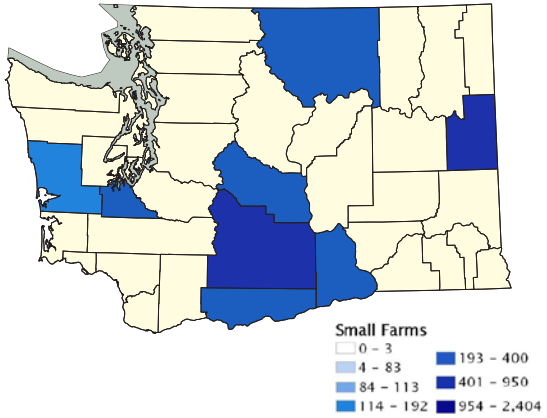
ensures that the building will fit within the urban fabric. A retail space provides direct access to the meats and products produced within the building, and will be the storefront and main public interface for the facility.

Informal spaces for observation (Figure 3.3) provide transparency to the slaughtering activities and opportunities for learning. Openness to the street gives some level of understanding, while an interior courtyard offers further opportunities for observation in a semi-public space.

Formal education facilities (Figure 3.4) provide an additional means to learn about the process of slaughtering and butchering. While not all people will wish to have hands-on knowledge, those raising their own meat and/ or wishing to have a full understanding of where meat comes from will have an opportunity to do so. A hands-on learning space, traditional classroom, and demonstration garden offer a variety of learning experiences.

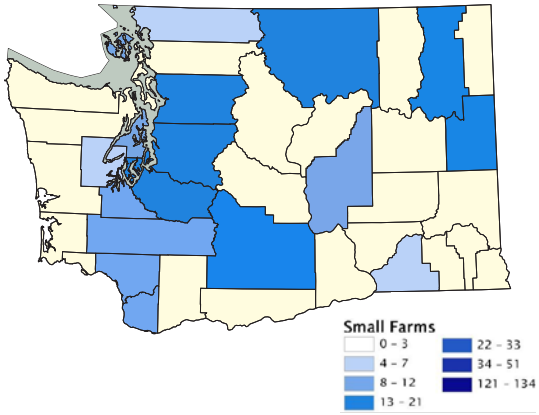
Slaughter & Processing

The spatial requirements of slaughtering and processing are directly related to the kinds of animals slaughtered. Urban farmers in Seattle



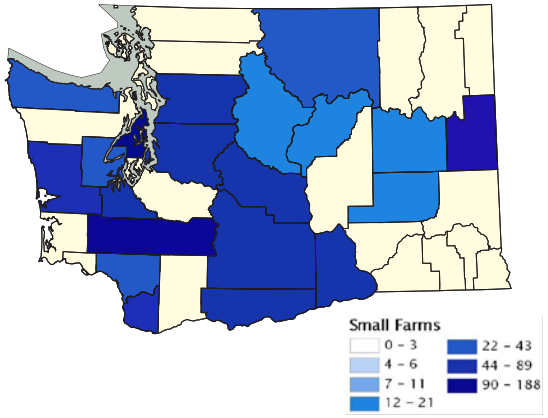
3.5 Counties with no Cattle Slaughter Facility and 150 or more Small Cattle Farms

United States Department of Agriculture Food Safety and Inspection Service, "Slaughter Availability to Small Livestock and Poultry Producers - Maps" (U.S. Dept of Agriculture, Food Safety and Inspection Service, May 4, 2010), http://www.fsis.usda.gov.



3.6 Counties with no Chicken Slaughter Facility and 7 or more Small Chicken Farms

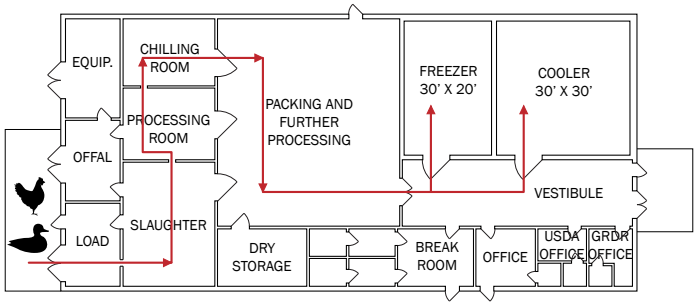
United States Department of Agriculture Food Safety and Inspection Service, "Slaughter Availability to Small Livestock and Poultry Producers - Maps" (U.S. Dept of Agriculture, Food Safety and Inspection Service, May 4, 2010), http://www.fsis.usda.gov.



3.7 Counties with no Hog Slaughter Facility and 15 or more Small Hog Farms

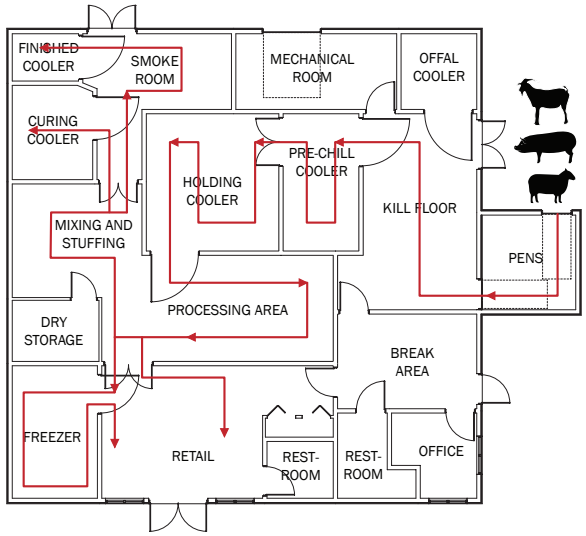
United States Department of Agriculture Food Safety and Inspection Service, "Slaughter Availability to Small Livestock and Poultry Producers - Maps" (U.S. Dept of Agriculture, Food Safety and Inspection Service, May 4, 2010), http://www.fsis.usda.gov.

are permitted to raise poultry, pygmy goats, and other small mammals such as rabbits,[1] with chickens making up the majority of the animals raised in the city. Additionally, there are many local farms near Seattle with a high demand for local slaughtering facilities. In 2010 the USDA released a series of maps that showed the relationship between small farmers and slaughterhouse locations (Figures 3.5-3.7). Counties in blue have a high concentration of small farmers that is greater than the national median for the given species and no slaughter facility in the county.[2] There are high concentrations of small chicken and hog farmers in western Washington who do not have easy access to a USDA or state certified slaughterhouse. These statistics suggest that a local slaughter facility that processe of hogs, goats, chickens and other small livestock would serve the needs of both rural farms near Seattle as well as urban farms within Seattle.



3.8 Model Poultry Processing Facility

Smithson Mills, Report on the Feasibility of a Small-scale Small-animal Slaughter Facility for Independent Meat Producers in North Carolina (North Carolina Department of Agriculture & Consumer Services, n.d.), 107, http://www.extension.org.



3.9 Model Red Meat Processing Facility

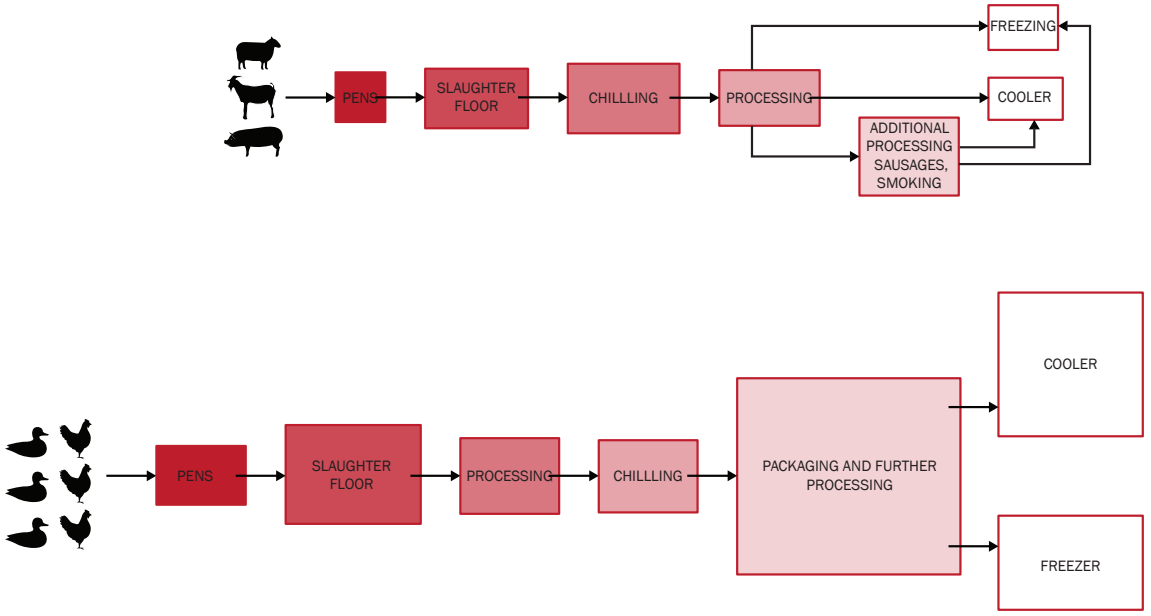
Arion Thiboumery, ed., "Guide to Designing a Small Red Meat Plant with Two Sizes of Model Designs" (Iowa State University University Extension, March 2009), 19, http://www.extension.iastate.edu.

The slaughter of poultry and the slaughter of small mammals have spatial and regulatory requirements that have some significant differences but also many similarities. Key differences affecting the architectural layout are the size of the animal processed, how the exterior skin of the animal is dealt with (skinning, scalding, plucking), the treatment of organs (disposal and/ or processing for consumption), and the need for cooling (Figures 3.8, 3.9). A two-line slaughter program would allow the slaughter of both poultry and red meat (Figure 3.10), which would help to meet the needs of urban and local farmers, as well as maximize the variety of products offered for sale to their retail customers. This part of the slaughter program should be as transparent as possible for those who choose to observe the process, while still preventing accidental or undesired viewings.

The size of the slaughterhouse is closely connected to its capacity for production. In the proposed model, the number of animals slaughtered must be related not only to how much meat can be sold, but also what the community can support in terms of animals transported to the facility and in the observation of the slaughter process itself. Vialles notes that there is something about observing slaughter on an industrial scale that is uniquely discomforting in comparison to the slaughter of a single animal.[3] While an individual's threshold for observation may vary, this thesis strives to find a middle ground between the pure economic efficiency of an industrial facility and the personal slaughter of a single animal.

In order to impact the status quo of slaughter, the facility must be economically viable, while at the same time restraining speeds and quantities to a level sustainable for the welfare of workers, animals, and observers. Taking into account the average American meat consumption[4] and the real need for additional slaughter facilities, the proposed detailed program (see Appendix A) accommodates approximately 30 hogs, goats, or sheep, and 500 chickens or other poultry per day, which would allow an individual facility to supply about 1% of Seattle's annual meat consumption.

The slaughterhouse is linked to the public through a street facing butcher shop. The butcher shop provides a means to make the program of the facility visible within a



3.10 Red Meat and Poultry Slaughter Comparison

"Goat" symbol by Joseph Gray, from thenounproject.com collection.
"Chicken" symbol by C. Vanderlee, from thenounproject.com collection.

familiar context, while supporting the smaller scale of the slaughterhouse. It also provides opportunities for social interactions between customers and staff. Although ready-to-eat products are sold, no space is provided for on-site consumption of food, so that the retail space is an interface with the public over the purchase of meat rather than meals.

Observation

The public observation of slaughter serves two purposes: to educate the public and to make the processor accountable to the public. However, in order to educate, the experience should be one that the observer will be able to process and learn from. Encountering slaughter as a surprise is more likely to induce shock than understanding. Therefore, the observation of slaughter should be a known choice on the part of the observer. At the same time, the observation space must be accessible to the public.

The street is most accessible to the public, but provides limited space for observer choice. The primary role of street-based observation, then, is to provide an indication of the activities inside without causing distress. Windows to the butcher shop and screened views of advanced processing activities make up the informal street observation.

Space for a more complete understanding of the slaughtering process is provided in the courtyard. Placing broader observation opportunities behind a threshold allows the public to choose what they wish to see. The courtyard, while more private than the street, is less private than a building interior and presents a relatively public space for informal observation.

Teaching

Formal education spaces provide an additional source of outreach for the facility as well as support for urban agriculture and local meat in the region. The hands-on classroom, traditional classroom, and demonstration garden all provide opportunities for learning about different aspects of urban and local meat.

The hands-on classroom provides butchering and slaughtering experiences in a sanitary environment. This model supports a class size of twelve people, with large work tables for each participant. The materials and design of the classroom are similar to the slaughter floor, with easily cleaned surfaces, ample light, and sufficient working space. Attached refrigeration, freezing and storage allows the space to operate independently of the commercial slaughterhouse.

The traditional classroom space provides opportunities for learning information rather than skills. Instruction about urban chicken keeping, purchasing meat from local farmers, or workshops for people looking to open their own processing facilities

could all be accommodated in this space.

Finally, the demonstration garden provides space for the public to learn how to raise chickens and other permitted animals in an urban environment. Growing fruits and vegetables as well as raising animals, demonstrates a full range of potential urban agriculture activities.

Endnotes

1 "DPD Client Assistance Memo #244 Urban Agriculture."
2 United States Department of Agriculture Food Safety and Inspection Service, "Slaughter Establishment Availability – Updated Maps" (U.S. Dept of Agriculture, Food Safety and Inspection Service, August 9, 2010), http://www.fsis.usda.gov/PDF/Slaughter_Estab_Maps_080910.pdf.
3 Vialles, *Animal to edible*, 31.
4 United States Department of Agriculture. USDA, "Profiling Food Consumption in America," in *Agriculture Fact Book : 2001-2002* (USDA, 2003), 14–21, http://www.usda.gov/factbook/chapter2.pdf.

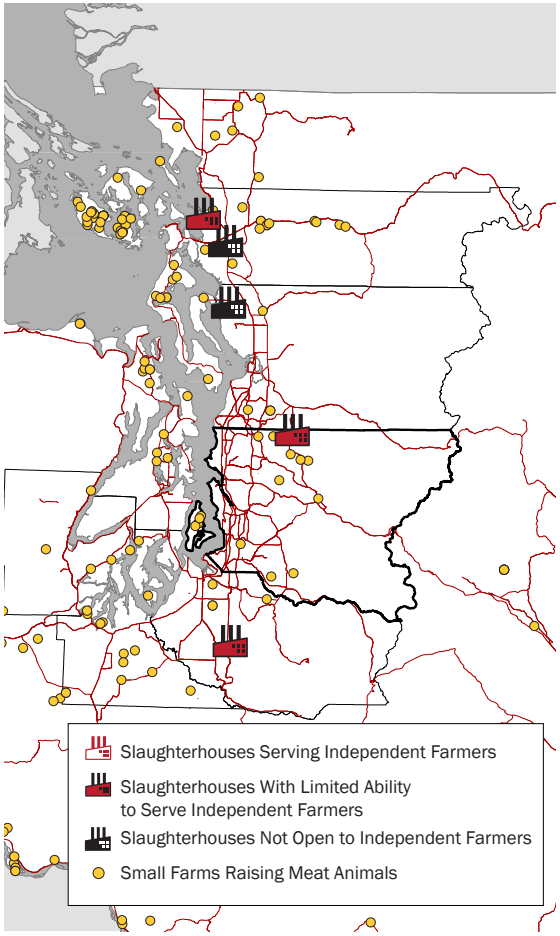
Chapter 4: Siting the Slaughterhouse

The Slaughter System in Washington State

Throughout the United States, the issue of slaughterhouse concentration has become increasingly pressing, especially for small farmers. The replacement of many small slaughterhouse facilities with a few, large-scale facilities has had several negative impacts on small farmers. Fewer slaughterhouses mean greater travel distances to slaughter and thus increased cost of production for the farmer. Longer travel times also increase the stress on the animals transported to slaughter, which results in a lower quality of meat. Additionally, these large slaughterhouses make money through speed and efficiency, which they achieve through standardization. A small farmer with a special breed of livestock or who has special processing requirements has no place in the current mass-production model of the large slaughterhouse.

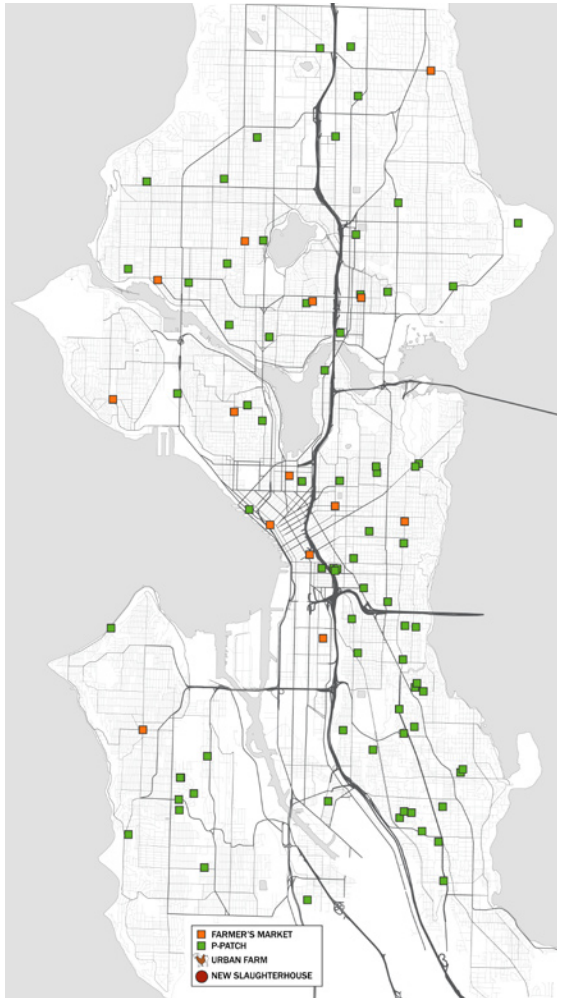
A key factor in slaughterhouse access for small farmers is not only the availability of a slaughterhouse, but also the willingness of the slaughterhouse to serve small farmers. Most large scale operations are not structured to process small quantities of animals. When the location of available slaughterhouses is correlated with the locations of small farms producing all kinds of meat (Figure 4.1), one can see that King County has a high number of small farms, but limited access to nearby slaughterhouse facilities. Indeed, the closest slaughterhouses that are actively accessible to small farmers are more than a 300 mile round trip from the areas near Seattle (Figure 1.1).

Since demand for local and sustainably produced food is highest in urban areas, the Seattle area is also a hub for consumers of local meat. While many



4.1 Small Farms and USDA Slaughterhouses in the Puget Sound Region

Data from USDA Food Safety and Inspection Service



4.2 Farmers Markets and P-Patches in Seattle

local meat producers already sell at local area farmer's markets, currently they must not only transport their meat to the farmers market, but also return unsold meat to their farms. A local slaughterhouse and retail facility would eliminate this need for multiple round trips, while providing constant access to local meat and an illustration of how local meat is produced.

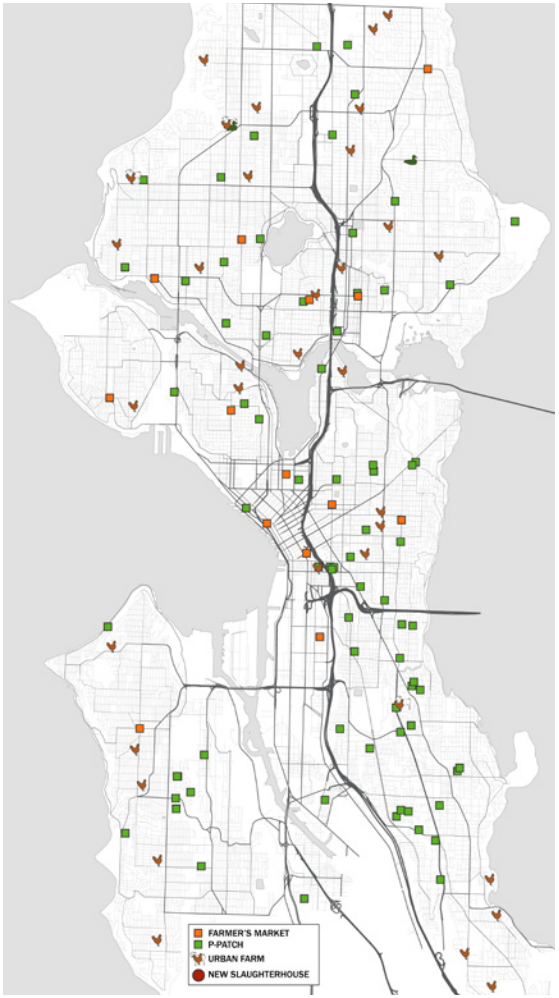
Slaughter in the City: Seattle

Seattle has a strong existing local food infrastructure (Figure 4.2). Farmers markets throughout the city provide access to local food from the region. P-Patches in local neighborhoods provide the opportunity for residents to grow their own food. The passage of the Local Food Action Initiative in 2008[1] solidified the city's commitment to its local food infrastructure, and led to a major expansion of the city's P-Patch infrastructure in 2010.[2] Through these efforts, Seattleites have ready access to local produce.

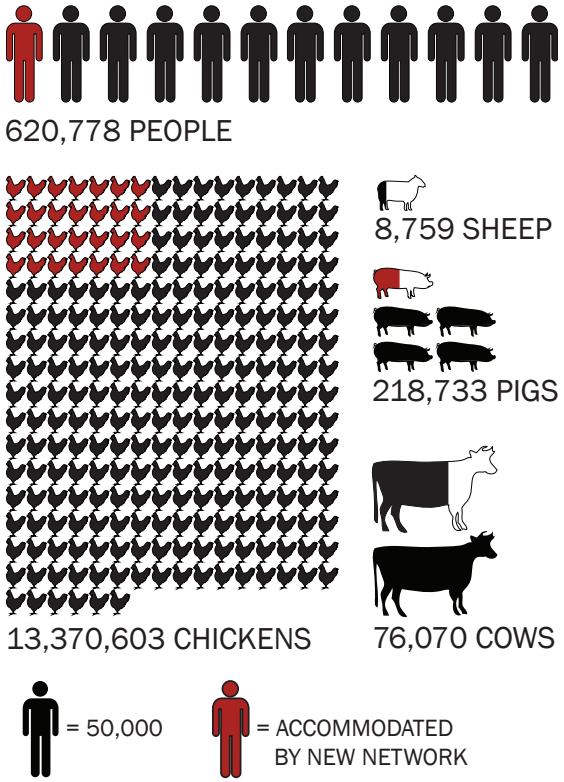
Similar access to local meat is still uncommon (Figure 4.3). In 2010 the City of Seattle passed an urban agriculture bill that permitted up to eight chickens and three small mammals such as pygmy goats or rabbits. However, the implications of this policy have not been fully realized. Neither chickens nor goats are productive for their entire lifespans. The owner of the animals can choose to continue to keep the animals as pets, but there are few options for those who wish to raise backyard animals as part of a sustainable food supply. Cities with urban agriculture laws similar to Seattle's have passed slaughter bans that prevent individuals from slaughtering their own animals.[3] Although Seattle does not forbid backyard slaughter a slaughtering ban could be implemented in the future. An urban slaughterhouse would provide a facility for urban farmers in the city to have their animals

slaughtered in a humane and sanitary manner.

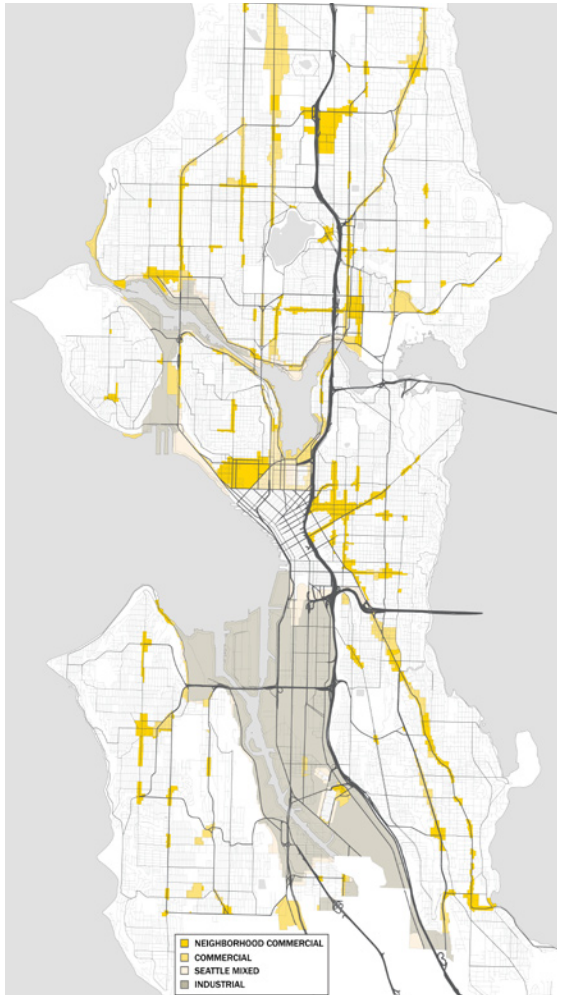
A single slaughterhouse, however, does not sufficiently address access to local meat in Seattle. Seattleites consume the equivalent of approximately thirteen million chickens and two hundred thousand pigs every year (Figure 4.4). The proposed program of a single facility would accommodate approximately one percent of that demand. This thesis proposes eleven potential sites that together would meet about ten percent of Seattle's meat consumption.



4.3 Emerging Urban Agriculture in Seattle



4.4 Seattle Meat Consumption



4.5 Lots Zoned for Small Scale Manufacturing in Seattle

Site Selection Criteria

Zoning

The Seattle Municipal Code considers slaughtering to be a manufacturing activity.[4] Manufacturing uses are permitted in Commercial 1 & 2, Neighborhood Commercial 2 & 3, the Seattle Mixed zone, and all Industrial zones. Of these zoning types, the Neighborhood Commercial typologies offer the greatest opportunities for the slaughterhouse to be a visible part of the community. However, depending on the urban fabric, the other zones also offer opportunities for visibility (Figure 4.5). By situating the slaughterhouse in an area with a high level of foot traffic, the potential for chance encounters with the public increases, helping the slaughterhouse to be a part of the urban fabric rather than hidden from sight.

Accessibility

The slaughterhouse is part of a meat production and distribution network. While the model proposed by this thesis combines several stages of this process into one building, it still requires links to both the farmers raising animals for meat and the consumers of the end products. To connect to local and urban farmers, the facilities must be readily accessible by motor vehicle, meaning they should be located on an arterial road. Ready access to highways, especially I-5 and I-90, improves the accessibility of the facility to local farmers. At the scale of the site, alley and/or side access is necessary to allow motor vehicles to use the facility without interfering with pedestrians.

Consumer use is primarily neighborhood based, ideally becoming a part of the day to day life of the community. To be linked to consumers, it should be walkable, located in a neighborhood with a relatively

high residential density that has an active pedestrian life.

Visibility

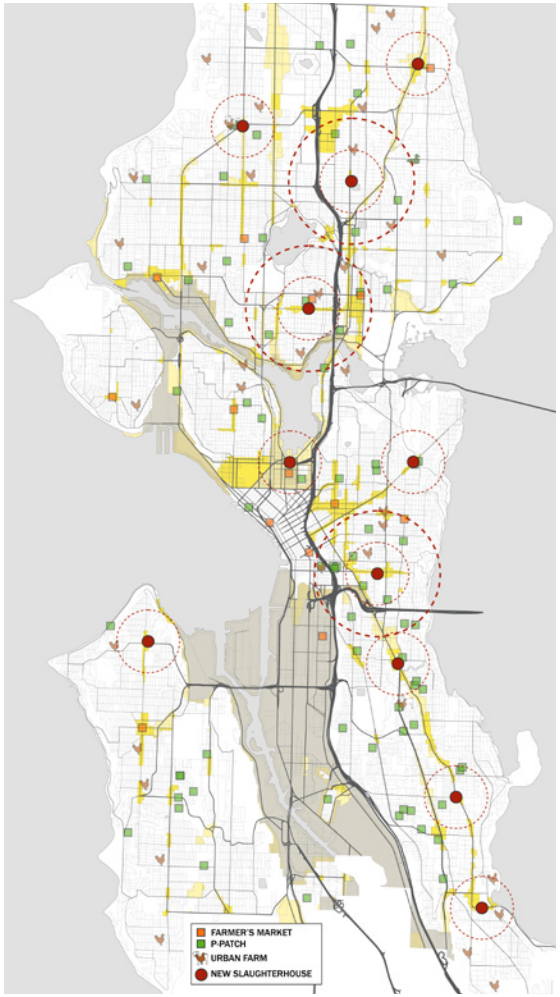
In order for the slaughterhouse to be visible within the community, there must be people there to see it. While choosing a site with good access will help that goal, the urban environment also plays an important role. First, the area must have a density of population that will support not only observation but also sales. Additionally, a pedestrian oriented environment will generate a significantly higher number of incidental observers than a car oriented one. These criteria favor more commercially oriented zones rather than traditional industrial areas.

Community

The success of the facilities will ultimately depend on the support of the local neighborhood. Communities with a strong interest in urban farming and local meat will be more likely to make use of the educational and processing facilities. As demonstrated by the meat lab typology, consumers can become advocates for the slaughterhouse. This facility would have the ability to provide meat products not otherwise readily available in Seattle such as whole animals, religious slaughter and fresh meat, as well as to provide slaughtering services to those raising chickens locally. When located in communities with demand for these products and services, the facility could gain not only customers but also advocates.

Seattle Local Meat Network

This thesis proposes eleven sites throughout Seattle (Figure 4.6). Each site meets the criteria for zoning, accessibility, visibility and community, and provides access to local meat to a unique neighborhood in Seattle. Of those eleven sites, three are proposed for



4.6 Proposed Local Meat Network

4.7 Maple Leaf Site Access

4.8 Maple Leaf Urban Fabric

the development of a prototypical urban slaughterhouse (Figure 4.6). The sites, in Maple Leaf, Wallingford, and Central Seattle, represent a range of neighborhood types and urban conditions that collectively provide the majority of conditions the new slaughterhouse typology would encounter in Seattle. Working across three sites, rather than one, helps to ensure that the prototype is appropriate across Seattle, ultimately workable at all eleven proposed sites rather than at only one.

Maple Leaf: NE 89th Street and Roosevelt Way NE

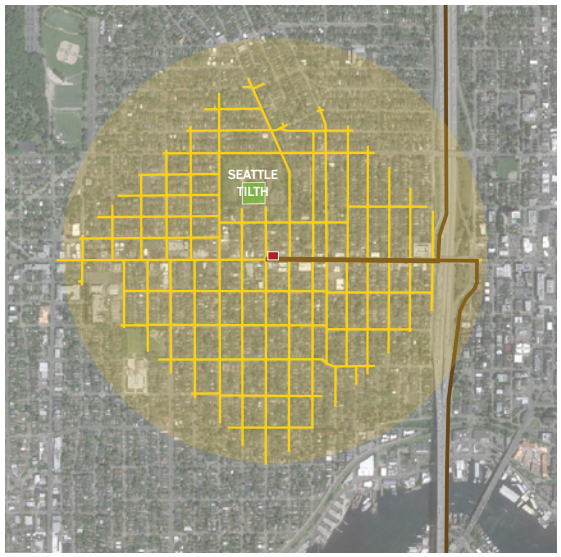
The Maple Leaf site has ready access to I-5 via Lake City Way and is located in the middle of a predominately single-family residential neighborhood with easy pedestrian access (Figure 4.7). The urban fabric is highly suburban and less dense than the other sites, with average building heights of one to two stories (Figure 4.8). While there are street-facing retail uses along Roosevelt Way, there is no continuous street wall and less pedestrian activity than other neighborhoods in Seattle. The construction of the new Maple Leaf Reservoir Park south of the site will help to draw people to the area and generate additional pedestrian traffic at the site.

Programmatically, the 15,000 square foot site can easily accommodate the basic prototypical program. The relative lack of P-Patches near the site suggests an opportunity to also develop a larger community garden that could be used not only for demonstration purposes but also for the public to grow vegetables and raise chickens. This would broaden the facility to a full urban agriculture center, supported by not only the community garden but also additional community spaces within the building.

Wallingford: N 45th Street and Corliss Ave

The Wallingford site has ready access to I-5 via 45th Street and is located in the middle of a residential neighborhood with ready pedestrian access (Figure 4.9). The urban fabric is denser than at the Maple Leaf site, although the average building heights are still fairly low (Figure 4.10). The urban street wall is mostly continuous, although the site presently creates a large gap in the street wall that would be filled by the new building proposed by this thesis. Seattle Tilth, a local food advocacy organization, is located two blocks to the north and would provide additional community support and learning opportunities for the facility.

The site, at 10,000 square feet, is smaller than the Maple Leaf site, but the adjacent building fabric supports a building of similar height to the Maple Leaf site. The spatial limitations, in addition to the adjacency of the Seattle Tilth headquarters and gardens, suggest that the basic prototypical program would fulfill the needs of the adjacent community.

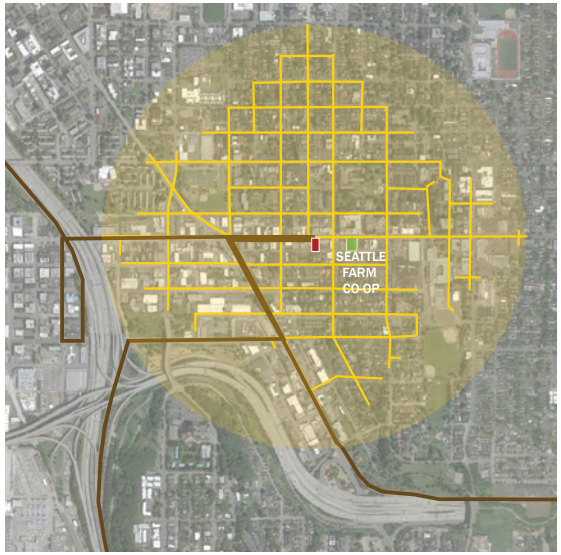


4.9 Wallingford Site Access

4.10 Wallingford Urban Fabric

Central: S Jackson Street and 17th Ave S

The Central area site is accessible via both I-5 and I-90, and is located in a neighborhood with a diverse and developing urban fabric (Figure 4.11). Much of the fabric along Jackson Street is made up of small-scale manufacturing and commercial buildings, including several food manufacturing companies. At the same time, there are several new multifamily developments at a substantially larger scale (Figure 4.12). The new prototype building has the opportunity to both expand the kinds of food being made in the area while at the same time bridging between the smaller scale existing fabric and



4.11 Central Site Access

4.12 Central Urban Fabric

the larger-scale emerging fabric.

The site is the same size as the Wallingford site, 10,000 square feet. However, the taller heights of the adjacent buildings support a larger scale facility than in Wallingford. Additionally, the site's location near both the major east-west and north-south interstates makes it ideal for regional outreach and advocacy. Adding additional offices and meeting spaces to the program would help expand the mission of the facility while also making the scale of the structure more suitable for the site.

Endnotes

1 City of Seattle, *Seattle City Council Resolution 31019*, 2008, http://clerk.seattle.gov/~scripts/nph-brs.exe?s1=&s2=&s3=31019&s4=&Sect4=AND&l=20&Sect2=THESON&Sect3=PLURON&Sect5=RESN1&Sect6=HITOFF&d=RES3&p=1&u=%2F~public%2Fresn1.htm&r=1&f=G.

2 Richard Conlin, "2010: Another Successful Year for Action on Local Food," Seattle City Councilmember Richard Colin, March 15, 2011, http://conlin.seattle.gov/2011/03/15/2010-another-successful-year-for-action-on-local-food/.

3 City of Denver, "Food Producing Animals (FPAs) Ordinance (CB11-0151)."

4 City of Seattle, "Seattle Municipal Code 5.30.035 Definitions G-M", n.d., http://clerk.seattle.gov/~scripts/nph-brs.exe?d=CODE&s1=5.30.035.snum.&Sect5=CODE1&Sect6=HITOFF&l=20&p=1&u=/~public/code1.htm&r=1&f=G.

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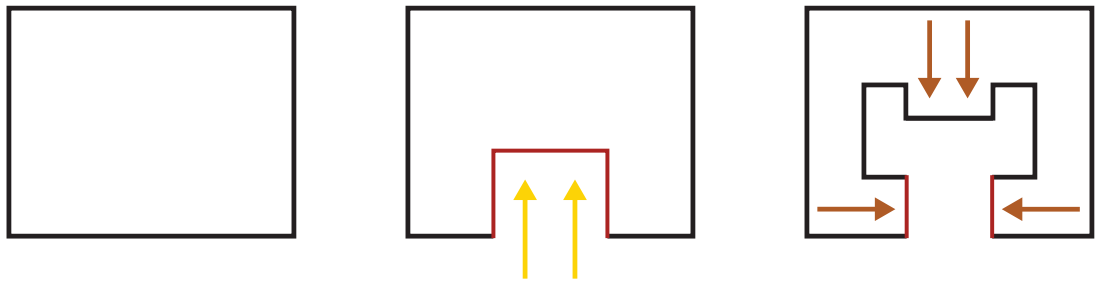
Chapter 5: An Urban Slaughterhouse Prototype for Seattle

This thesis proposes a new typology for the slaughterhouse, one that stands in direct opposition to the large scale, rural, industrial slaughterhouse that dominates the meat industry today. Historically, as social conditions and food production methods have changed, so has the slaughterhouse. As Seattle moves away from a centralized industrial model for meat production towards a smaller scale, dispersed system, a new kind of slaughterhouse infrastructure must emerge to support that system, one made of many small facilities located in the same areas that the animals are produced.

The need for many small facilities demands a broader response than a single building. By developing a prototypical design, the proposed solution can be used not only at one site but across the city.

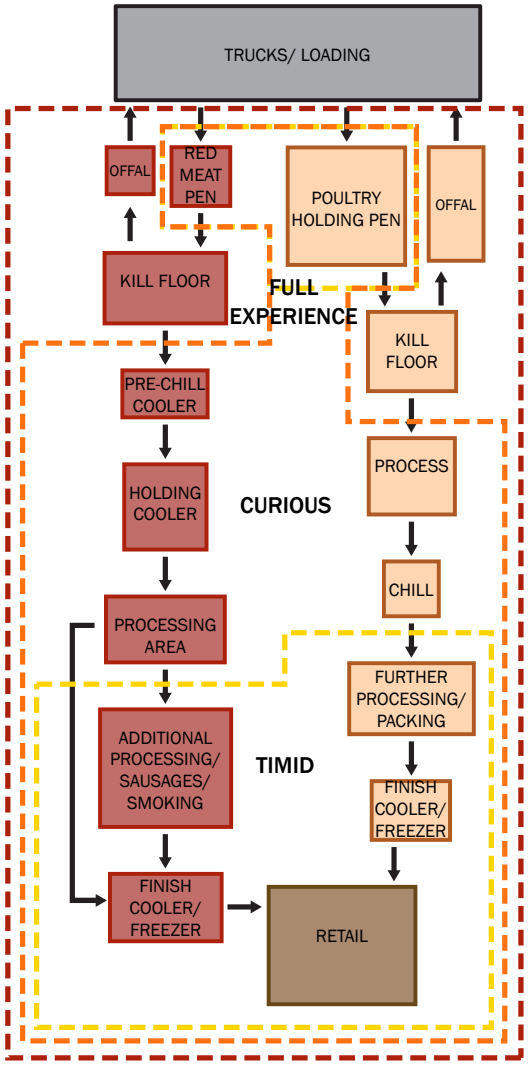


5.1 Reshaping the Slaughterhouse

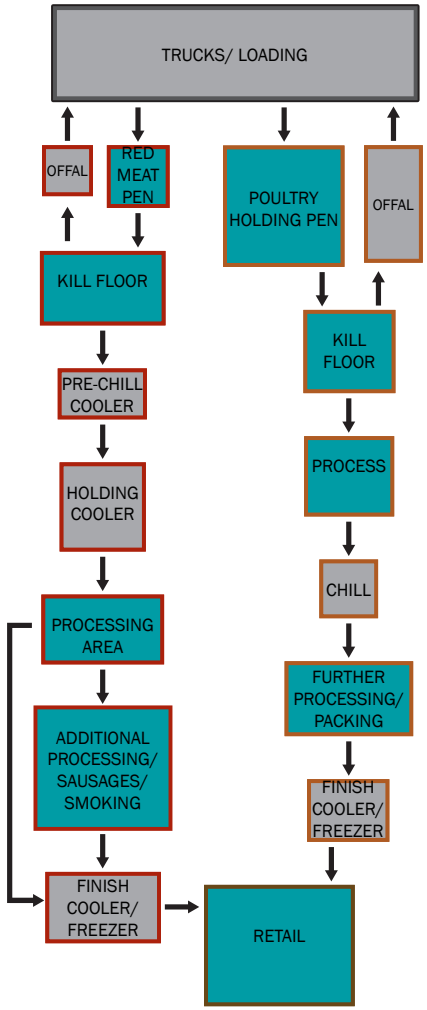
Shaping the Slaughterhouse for the City

Adapting the slaughterhouse for the city requires a fundamental change in approach. Instead of being strictly a space for production, the facility must engage the city by creating space for observation. Pushing into the black box of the typical slaughterhouse makes space for the public. Then, drawing the most interesting portions of the program toward the observer engages their observation and creates interaction between the facility, the observer, and the neighborhood (Figure 5.1).

Not all visitors will be comfortable seeing all the activities within the slaughterhouse (Figure 5.2). The most timid observers may barely be comfortable with the activities taking place within the butcher shop, which are similar to what could be observed in any grocery store. The most advanced processing activities like additional processing on the poultry line and mixing and stuffing



5.2 Observer Experience of the Slaughterhouse



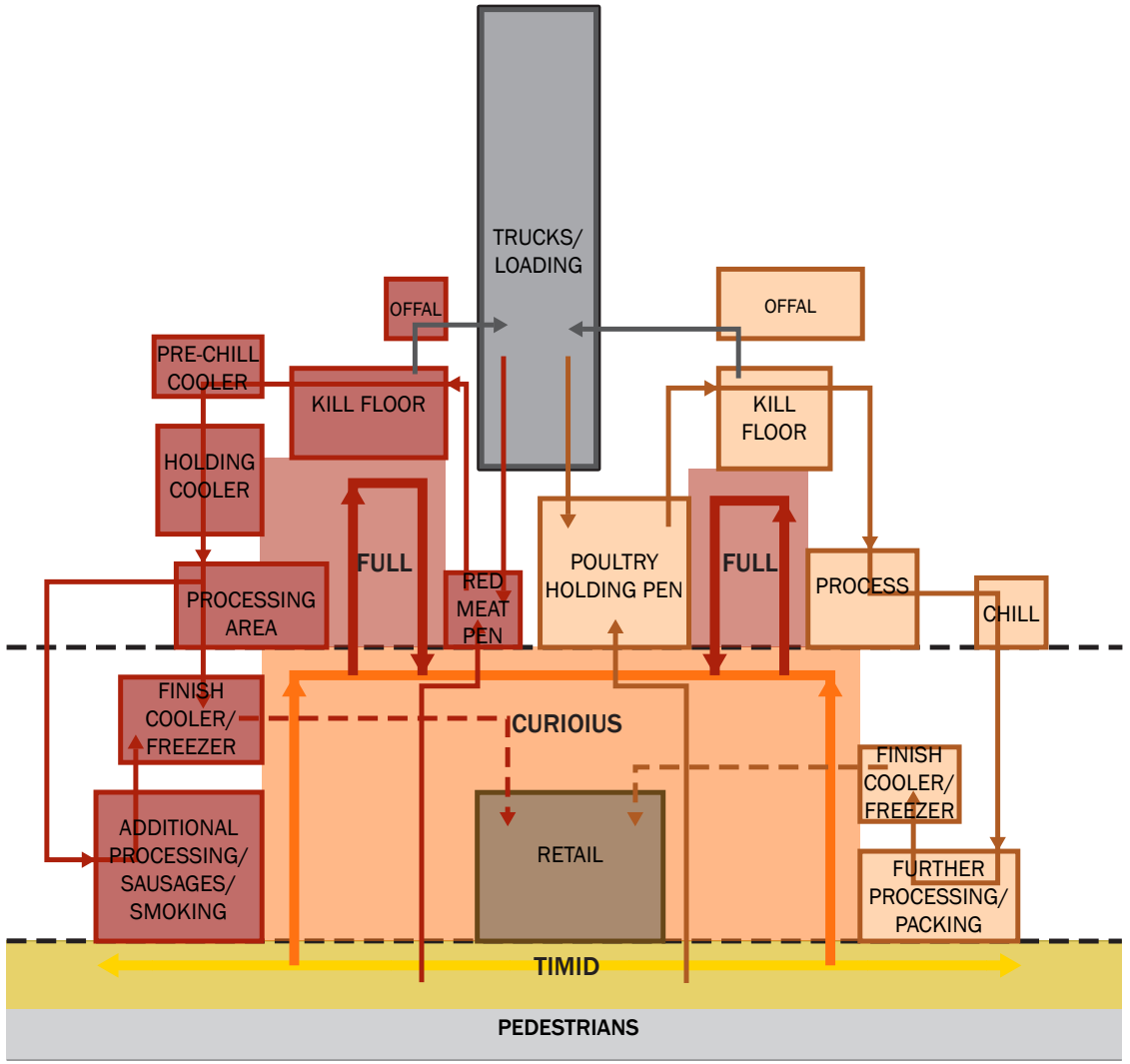
5.3 Active and Passive Slaughterhouse Program

on the red meat line, while perhaps slightly unfamiliar, are still activities that many people undertake in their own kitchens and should be comfortable for most. Similarly, the pens show live animals, the view of which would likely only be distressing in context. Basic processing, on the other hand, deals with larger carcasses that bear a greater resemblance to the animals of their origin and may make a more timid viewer uncomfortable. The kill floor is the space where at the most basic level, animals become meat, and as such has the greatest potential to cause emotional distress.

At the same time, separated from their emotional content, not all spaces within the slaughterhouse are equally interesting to observe. Many spaces are for storage or holding, where a pause occurs between one step of the process and the next (Figure 5.3). Bringing the active uses to the forefront will help to engage the observer and allow them to

understand the activities of the facility.

Linking this program to the city implies a relationship to the street. The facility can engage the public while still respecting the emotions of an observer, by pulling the most interesting and least controversial program to the front and pushing the potentially more distressing program to the rear (Figure x.x). The most timid observer can remain on the street, where they engage only that program similar to what they might see at the grocery store. A more curious user gets hints of the building's purpose at the street, and can choose to go inside to observe the processing and pens, without being forced to encounter the activities at the kill floor. Finally, visitors wishing to have a full understanding of the process can pass the threshold at the kill floor and see the entire process from beginning to end.



5.4 Site and Program Interaction

5.5 Maple Leaf Massing and Section

5.6 Wallingford Massing and Section

5.7 Central Massing and Section

Three Sites, One Prototype

While the observer experience shapes the basic layout of the slaughterhouse program, the urban context of each site and the program variance appropriate for each context determines how the prototypical arrangement is realized. Ultimately, each building is similar, but uniquely appropriate to its neighborhood.

Massing

Each site was chosen to have a commercial context as well as surrounding residential neighborhoods. As such, each building acts as a transition between a larger scale commercial fabric and a smaller scale residential context (Figures 5.5-5.7). In Maple Leaf, the building is kept low, and steps back to the north to allow sun to reach the community gardens.

In Wallingford, the building is similarly held below the forty foot height limit, and steps back at the north to transition from the larger retail context at 45th Street to the single family residential fabric north of the site. The Central site has the biggest variation in building fabric, with a 5 story multi-family development to the north and two story residential buildings at the south. The three story elevation at the street

5.8 Maple Leaf Site Perpective and Section

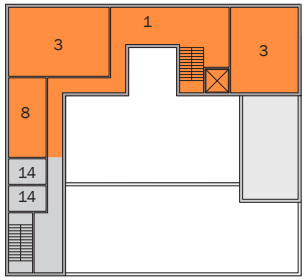
5.9 Wallingford Site Perpective and Section

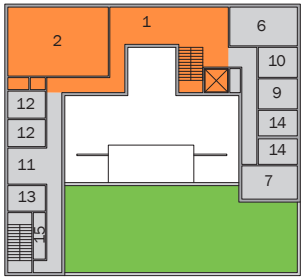
5.10 Central Site Perpective and Section

front steps back to the south, bridging the massing difference between the street and the residential neighborhood while also bringing light into the courtyard space.

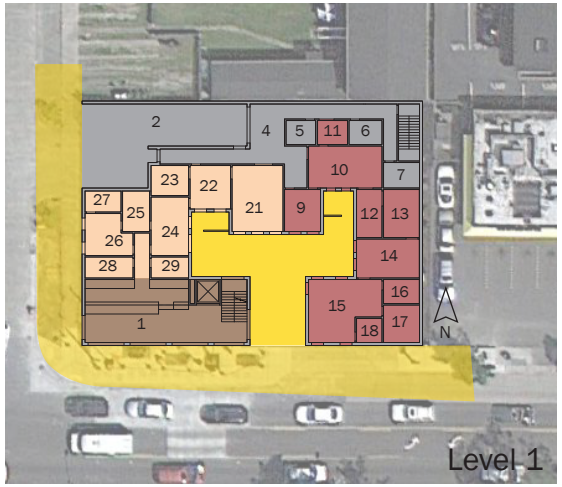
Urban Expression

While the design for each site uses the same materials, the urban expression of each building is designed to work with the site context (Figures 5.8-5.10). At Maple Leaf, the exterior is softened with a greater use of wood and smaller scale articulation of the storefront windows at the butcher shop. The awning is carried across the front of the community garden to create a boundary and tie the outdoor space to the building. At Wallingford, large storefront windows create a public presence at the corner for the butcher shop. The front stair is expressed on the elevation to invite the public up to the formal education spaces. The Central site navigates an eight foot grade change across the site by breaking the awning at the courtyard entrance and stepping the butcher shop windows. The elevation responds to the larger scale of the urban fabric through the use of more regular glazing and larger windows than the other two sites.

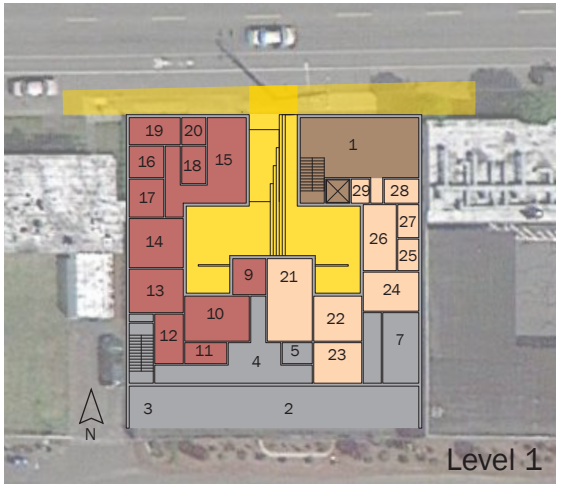




5.11 Maple Leaf Plans



5.12 Wallingford Plans



5.13 Central Plans

Plan Key

Level 1
1 Butchershop
2 Truck
3 Parking
4 Loading
5 Receiving
6 Storage
7 Mechanical
8 Demonstration Garden

Red Meat Line
9 Pens
10 Kill Floor
11 Offall
12 Pre-Chill
13 Holding Cooler
14 Processing
15 Mixing and Stuffing
16 Finish Cooler
17 Finish Freezer
18 Dry Storage
19 Smoke Room
20 Cure Cooler

Poultry Line
21 Pens
22 Kill Floor
23 Offal
24 Eviceration
25 Air Chill
26 Processing
27 Dry Storage
28 Finish Cooler
29 Finish Freezer

Level 2
1 Lobby
2 Hands-on Classroom
3 Traditional Classroom
4 Community Space
5 Demonstration Garden
6 Administration
7 Conference Room
8 Outreach Offices
9 USDA Office
10 Grader Office
11 Break Room
12 Locker Room
13 Kill Floor Locker Room
14 Restroom
15 Storage

Plan

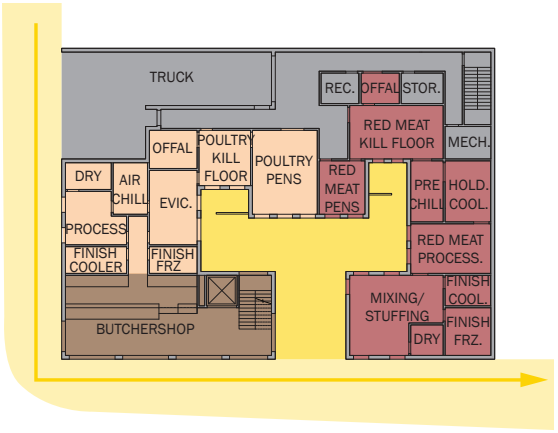
Although the space used for building is approximately 10,000 square feet at each site, the site dimensions, as well as the proposed programs, change the details of the plan organization at each site (Figures 5.11-5.13). All three sites follow the basic program layout, organizing two slaughter lines around a central courtyard, placing the butcher shop at the street, and pulling the pens into the courtyard to create a separate courtyard space to observe the kill floor. While the Maple Leaf and Central sites present the program in a mostly linear manner, the shallowness of the Wallingford site means that not all elements of the program are directly observable from the courtyard. However, its location on a corner site means that all elements of the program can still be observed.

At the upper floors, plan organization is strongly influenced by program. In all cases, the public-facing education programs are located closest to the elevator and forward stairs, while the service spaces for the slaughtering program are located towards the rear. Hallways are located adjacent to the courtyard to provide opportunities to view the first floor activities from above, integrating the informal observation activities of the spaces below with the more formal education spaces.

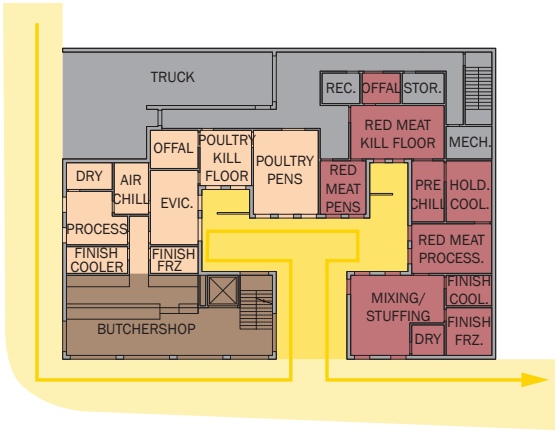
5.14 Wallingford Detailed Site Plan

Detailed Design: Wallingford

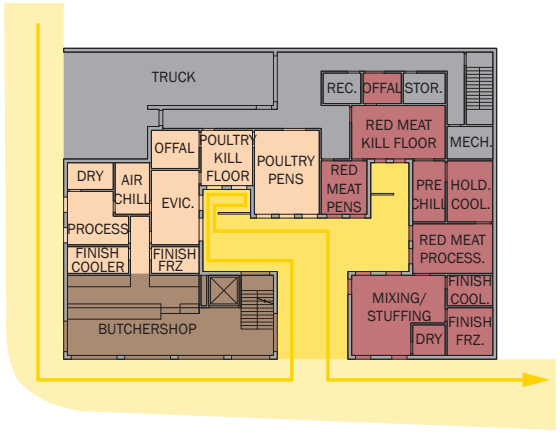
All three sites were developed at a schematic level to ensure that the basic design concepts would be applicable throughout Seattle. The site at Wallingford (Figure 5.14) was chosen for more detailed development because the program for the site was most similar to the prototypical program, and the site presented the strongest opportunities in terms of location, visibility and community.



5.15 Timid Observer Path



5.16 Curious Observer Path



5.17 Full Understanding Observer Path

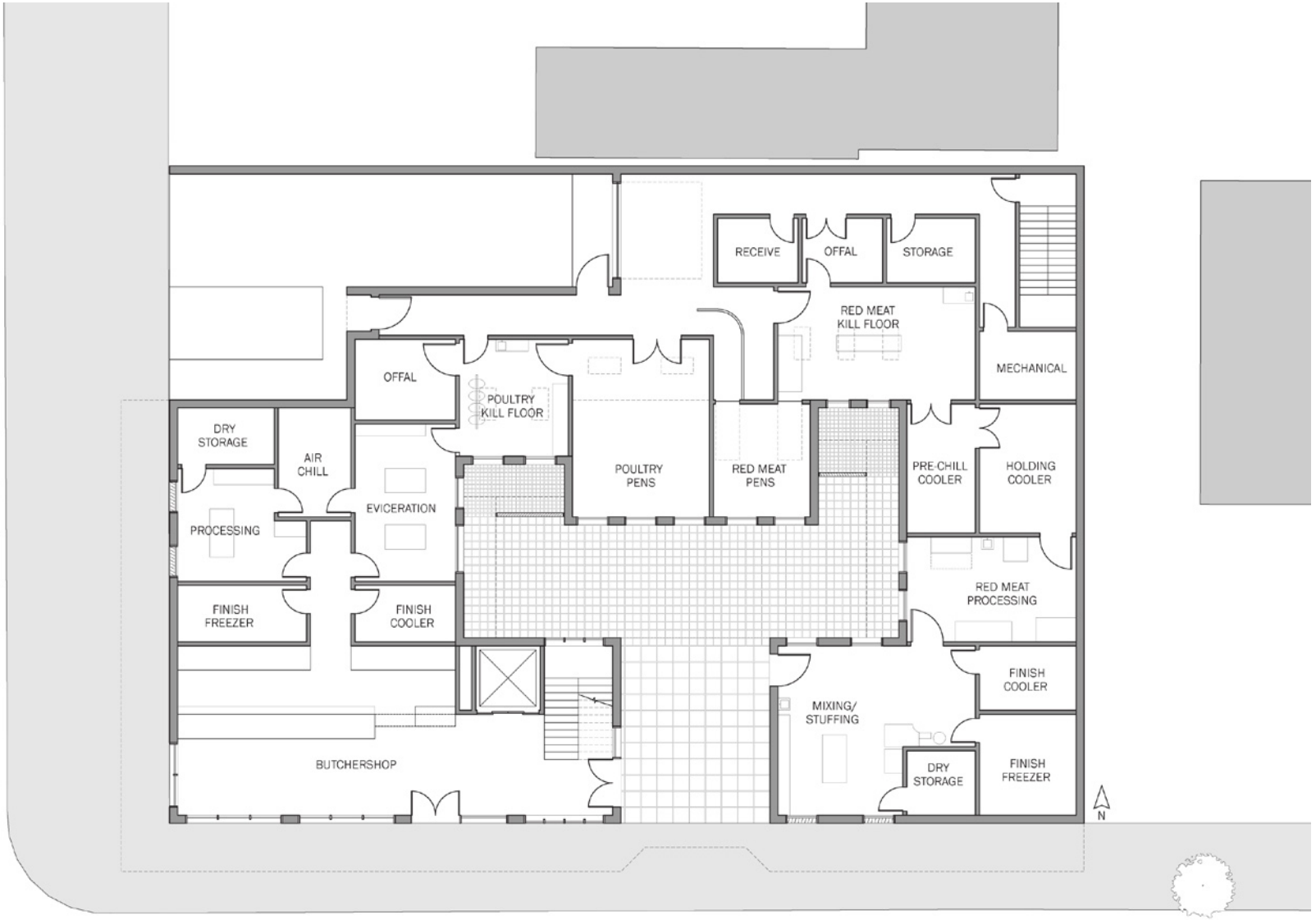
Threshold

When realized in the building design, the thresholds proposed in the initial diagram (Figure 5.4) take on a series of different forms. For the most timid observer (Figure 5.15), the envelope of the building itself provides a threshold between the program and the observer. For the more curious observer (Figure 5.16), the entrance to the courtyard provides a public threshold that creates a clear choice without providing a barrier to entry. For the observer that wants a full understanding (Figure 5.17), the screens at the kill floors provide a lighter threshold that provides a hint to the activities behind as the observer approaches (Figure 5.28).

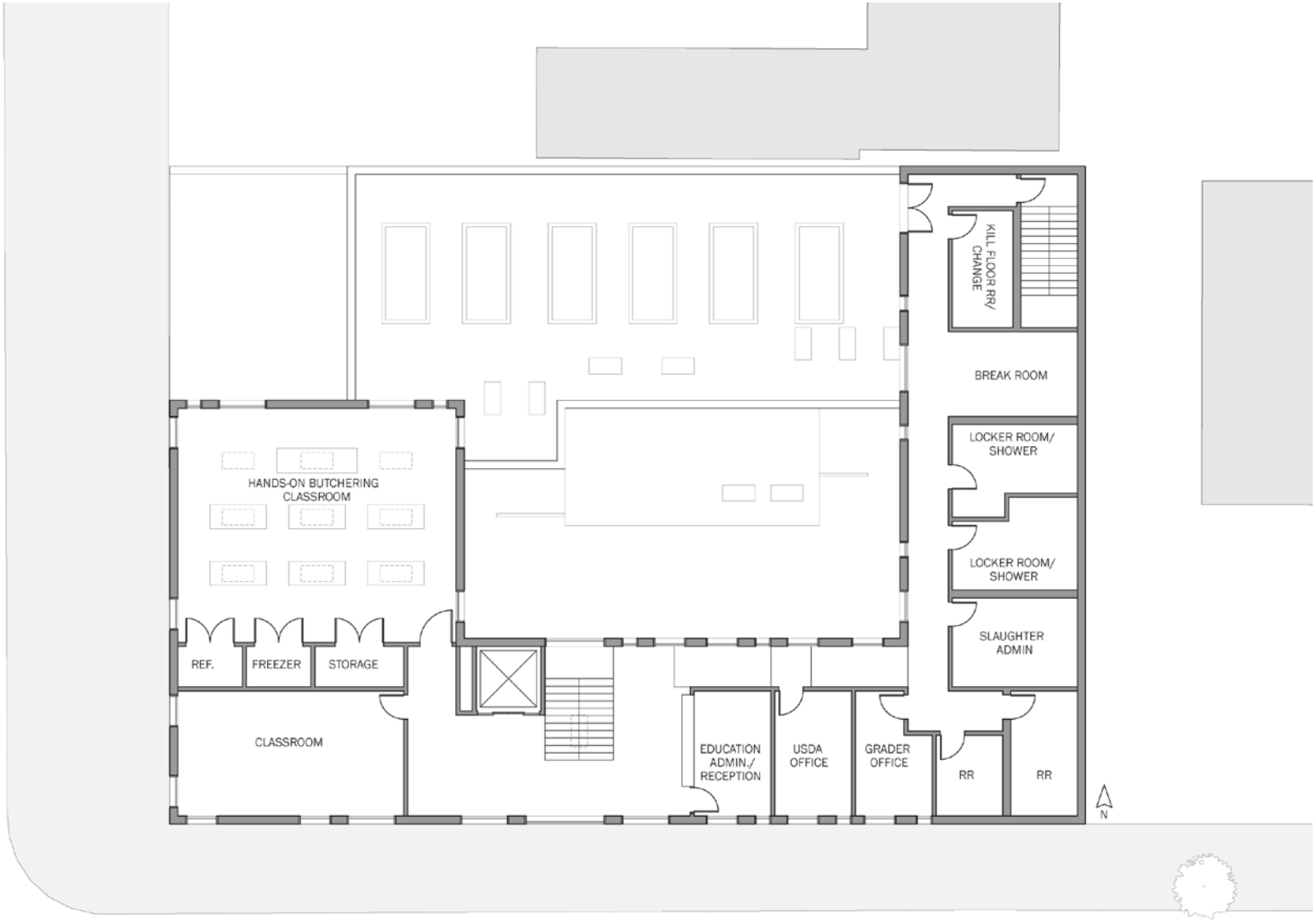
Material

These thresholds are supported and emphasized by the materials of the building. At the ground plane (Figure 5.18), the paving softens as the observer approaches the more emotionally distressing parts of the program. The sidewalk is solid at the street. At the courtyard threshold, this ground turns into a two foot square paver, which is reduced in scale to a one foot square paver as the observer enters the courtyard. At the kill floor, a six inch square paver creates an even softer ground plane, cushioning the experience of the observer.

The exterior expression of the building (Figure 5.20) strives to strike a balance between solidity and approachability. The primary cladding material is a six inch by four foot terracotta panel that provides a sense of



5.18 Wallingford Detailed Plan- First Floor



5.19 Wallingford Detailed Plan- Second Floor

5.20 Wallingford Exterior

stability and solidity, while providing a more gentle and approachable texture than a CMU block or a brick. Wood is used as a secondary cladding material at the visual and physical thresholds, both providing a visual indication that there is something to see as well as softening the material experience at potentially distressing moments.

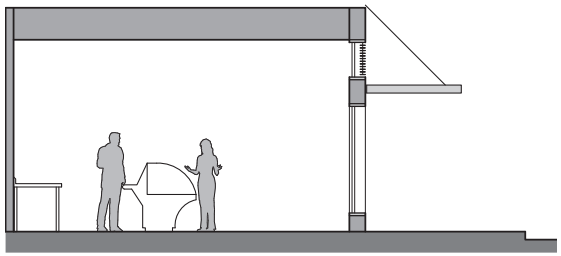
Wood is also used overhead to draw an observer around the building and into the courtyard. At the exterior face, the underside of the awning is clad in wood. At the interior of the courtyard, the shading structure is more textured and draws the observer along the wall to the kill floor (Figure 5.27).

The interior uses the conventional smooth white walls and concrete floor of the traditional slaughterhouse to contrast with the texture of the exterior materials and to frame the activity within. These materials also carry a connotation of hygiene and cleanliness which is appropriate for the facility.

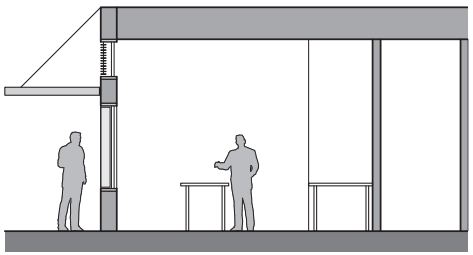
Transparency

The transparency of the interior to the exterior is crucial in allowing the activities of the building to be understood by an observer. At the same time, the level of transparency must be controlled to accommodate the comfort levels of the observer.

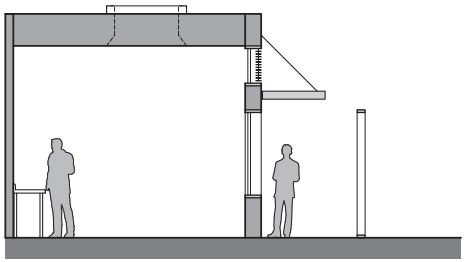
Lighting plays an important role in allowing an observer to see into the building. If exterior light levels are substantially higher than interior levels, the glazing will act as a



5.21 Shading and Daylight at Butchershop



5.22 Shading and Daylight at Poultry Processing



5.23 Shading and Daylight at Poultry Kill Floor

mirror rather than a window and the observer will be unable to see inside. Clerestories at all spaces meant to be observed by the public daylight those spaces and help interior light levels to reflect exterior levels. Awnings at the exterior face of the building, as well as shading from the building itself at the courtyard, lower exterior light levels at the windows, increasing transparency (Figures 5.21-5.23).

Although daylight at the interior helps to create transparency, too much light can create glare that would prevent the facility from operating efficiently. Traditional glare control methods, like blinds, are not only unsanitary in a meat processing space, but also would hinder the ability of the public to see inside. Instead, glare control is handled at the scale of the building, through permanent awnings on the exterior, temporary shading in the courtyard, and vertical fins at the windows of the street facing processing spaces (Figure 5.22).

These vertical fins not only provide solar shading, but also control the level of transparency of the program to the street. The fins allow an observer who pauses to have a nearly unobstructed view inside, while those who do not wish to pause and observe see only the material of the screen itself. This is further developed at the screen in front of the kill floor (Figure 5.23), where the angle of the screen is aligned to reveal the activities behind only after a viewer has fully approached the processing space windows (Figure 5.28). By providing levels of transparency that change with the movement of the visitor, the use of screening helps the observer to choose how much he or she wishes to see.

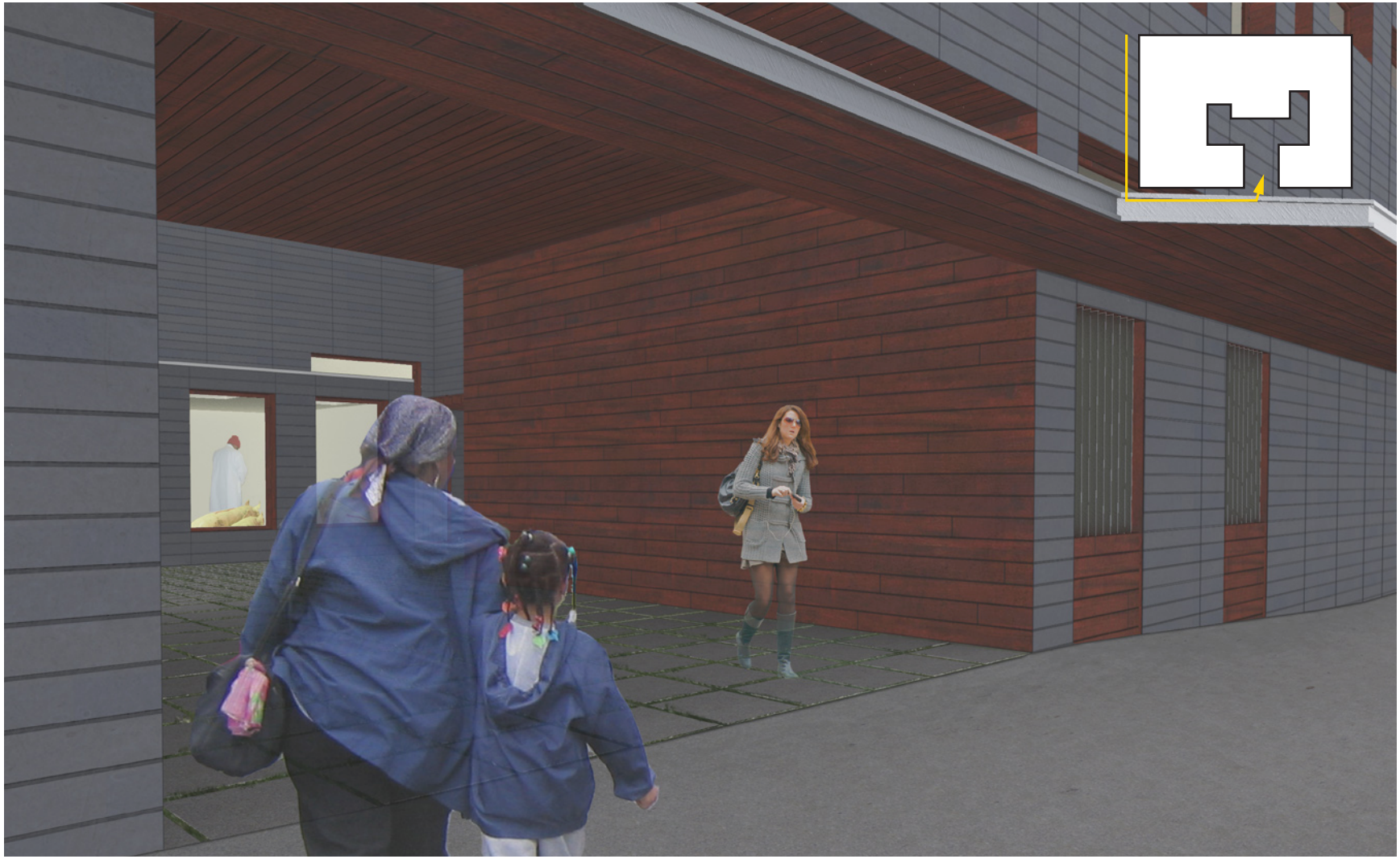
Narrative

The building is first encountered from the street. Screens break the view of the processing floor, requiring a passerby choose to turn and pause to obtain a full view (Figure 5.24). At 45th Street, the butcher shop creates a transparent public face for the building, providing space to engage the community in a familiar context (Figure 5.25). The threshold to the courtyard provides a clear view to the animal pens, drawing people in (Figure 5.26). As an observer moves deeper into the site, he or she gains a full view of the pens and the processing floors (Figure 5.27). Approaching the processing floor also begins to reveal the kill floor, which is fully revealed when the visitor stands directly in front of the processing windows (Figure 5.28). The viewer can then choose to move beyond the screen to fain a floor to ceiling view of the kill floor, or choose to turn around and head into the building (Figure 5.29). Entering the butcher shop, the observer encounters a bright, open space, with pendant lights placed to light the faces of the workers and encourage conversation (Figure 5.30). Heading up the stairs for a class, the visitor gains a full overview of the courtyard from the stair's half-landing (Figure 5.31). The kill floor is still screened, but the rest of the facility's activities are exposed. At the top of the stairs, views to the courtyard as well as glimpses to the demonstration garden give a broader sense of the building (Figure 5.32). In the classroom, large tables provide ample workspace for students, and skylights provide plenty of daylight for students to learn visually demanding skills like butchering (Figure 5.33). Views to the demonstration garden as well as the city provide a sense of the building's broader context. The demonstration garden provides space to demonstrate and experiment with methods of urban chicken raising and other urban agriculture activities (Figure 5.34). Finally, back in the courtyard (Figure 5.35), formal and informal education come together to engage the pragmatic meat processing program, moving beyond the utilitarian black box of the industrial slaughterhouse to a prototype that engages the community and provides a full understanding of where meat comes from and how it is produced.

5.24 View to Processing From Street

5.25 View to Butchershop

Woman in tights texting under an umbrella by gareth 1953, old couple holding hands by JMazzolaa, woman with groceries by zoetnet, all from immediateentourage.com



5.26 View to Courtyard

Woman with dark tights and MP3's by Ed Yourdon, from immediateentourage.com

5.27 View to Pens and Processing Floor

5.28 Threshold at Slaughter Floor

5.29 View to Stairs, Butchershop

Standing girl in jeans by gareth1953, from immediateentourage.com

5.30 Butchershop Interior

Man smiling and standing by gareth1953, from immediateentourage.com

5.31 View from Stair Landing to Courtyard

5.32 View from Second Floor

Standing girl in jeans by gareth1953, man scratching belly by Immediate Entourage, both from immediateentourage.com

5.33 Hands-On Classroom

5.34 View from Demonstration Garden

5.35 View at Courtyard

Guy with backpack walking away by FaceMePLS, from immediateentourage.com

Chapter 6: Evaluating the Prototype

Although this thesis took on a utilitarian building type, the fundamental underlying question of the thesis was not one of utility, but rather of emotion. How can architecture be used to mediate human experience? The loaded nature of the program generated a strong response to the design that made it possible to readily evaluate the effectiveness of design decisions. Ultimately, by allowing incremental encounters with the building's program, the design helped people to learn about the program without generating shock that might hinder that learning. While the exact methods of screening and presenting view could be further refined, the overall strategy provides a promising way to present an emotionally loaded program.

At a broader scale, this thesis also explored how to develop a prototype, which like the grocery store or the coffee shop might be encountered throughout the city. Developing the project at three sites helped to support this idea, by demonstrating that the concept could work at different places throughout the city. The use of three sites also improved the prototype by subjecting it to a wider variety of conditions than it would have experienced at one site. At the same time, the success of the prototype as building required choosing, at some level, a prototypical site. An inviting and interesting pedestrian environment, reasonable levels of access, and favorable zoning are all required for the prototype to function successfully. The prototype is never separate from its context.

That context includes not only the three sites with developed designs or the eleven proposed sites, but the entire city of Seattle. The city has made a substantial commitment to developing local food systems. This thesis accepts that commitment and explores a potential facet of the existing urban agriculture laws as well as the city's future interest in developing the infrastructure for local food. If the goal of urban food production is a more sustainable and resilient food supply for the city, more than P-Patches and backyard chickens will be needed to get food to the tables of Seattle.

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Appendix A: Detailed Program

	Poultry (5000/ day)	Red Meat (40-65/ day)
Slaughter		
Loading Dock	650 sf	shared
Pens	350 sf	150 sf
Slaughter	200 sf	300 sf
Offal	150 sf	100 sf
Chilling	100 sf post-processing	150 sf pre-processing
		250 sf holding
Processing	250 sf	300 sf
Packing and Further Processing	250 sf	350 sf
Dry Storage	100 sf	100 sf
Finish Product Freezer	100 sf	150 sf
Finish Product Cooler	100 sf	100 sf
Smoke Room (if provided)		150 sf
Cure Cooler (if provided)		100 sf
Education		
Observation courtyard	1,700 sf	
Outdoor demonstration garden	2,050 sf	
Hands-on classroom	1,000 sf	

Storage	100 sf
Refrigeration & freezers	100 sf
Traditional classroom (ea)	500 sf
Community room (if provided)	400 sf
Outreach office (if provided)	300 sf
Retail	
Butcher shop	750 sf
Support Space	
Equipment	250 sf
Break room	350 sf
Locker rooms	450 sf
Restroom	280 sf
Offices	
Slaughter admin office	150 sf
USDA Office	150 sf
Grader Office	150 sf
Education admin office	200 sf
Net Square Footage (avg.)	**15,000 sf**
Net to Gross Multiplier (10%)	1,500 sf
Total Gross Square Footage	**16,500 sf**

Appendix B: Lighting Design Criteria

This thesis proposes a counterpoint to the current industrialized nature of slaughtering in the United States. Slaughterhouses, like other utilitarian or manufacturing facilities, have typically been neglected by the field of lighting design. Quantitative standards are typically applied uniformly without consideration for the experience of workers or animals. The high, uniform lighting levels of industrial lighting is immediately identifiable to lay observers and can create a strong impression of industrial activity even if the activities taking place under that lighting are not of an industrial scale. The focus in retail lighting is also predominately quantitative, focusing on color rendering index (CRI) and the quantity of UV light generated by a fixture, which accelerates meat discoloration.[1]

While quantitative guidelines can help to ensure a minimum level of lighting performance, humans and animals experience light qualitatively, not quantitatively. Using qualitative as well as quantitative criteria can help to create a lighting environment that not only meets minimum requirements but actually enhances the experience of animals, workers and observers. As such, this appendix sets forth a series of lighting criteria based on the primary user groups of the facility: slaughterhouse and processing workers, slaughter animals, observers of the slaughter process, students participating in hands-on classes, and retail shoppers.

Slaughterhouse Workers

The slaughtering and processing of meat is a highly demanding visual task. Maximizing visual acuity and minimizing visual fatigue are the chief goals of lighting for slaughterhouse workers.

Visual acuity is dependent not only on the amount of light provided, but also the color temperature of light and the ability of light to render colors. The Food Safety and Inspection Service (FSIS) suggests a minimum of 50 footcandles.[2] Inspection areas have higher lighting requirements, with minimum illuminance values as high as 200 footcandles.[3] Light with a higher color temperature can also increase visual acuity independently of light quantity[4]. Since meat can take a bluish appearance at very high color temperatures,[5] a color temperature of 4000-5000K is recommended for slaughterhouses.[6] Although CRI does not always correlate to good color rendering in the red spectrum,[7] a high CRI can also improve visual acuity, and lamps with a minimum CRI of 80 are recommended.[8]

Even when the correct amounts and qualities of light are provided, the distribution

of that light can lead to visual fatigue. One of the chief contributors to visual fatigue in a slaughterhouse is glare. In a slaughterhouse environment, where many surfaces are specular, controlling glare is challenging, but necessary to reduce visual fatigue. Another important factor in lighting distribution is the orientation of the visual task. Some slaughtering activities, especially those performed on large carcasses, are in a vertical plane. For these tasks, the recommended quantities of light should be provided vertically.

Lighting impacts mental and physical fatigue as well as general well-being. Higher light levels can reduce the rate at which workers tire.[9] Change in lighting over time, similar to that experienced in daylit spaces, can also increase stimulation and decrease fatigue,[10] as well as improve workers' moods.[11] Ultimately, worker safety and happiness is strongly affected by a quality lighting environment. While quantitative criteria provide minimum standards for safety and effectiveness, qualitative criteria can help ensure that the lighting is also used effectively for worker well-being.

Qualitative Criteria for Workers

No glare in task visual field

Variation in luminance

Spaces are perceived as well-lit and colorful

Quantitative Criteria for Workers

30 fc minimum general lighting

50 (red meat) to 100 (poultry) footcandles minimum available task lighting in the appropriate vertical or horizontal work plane (dimmable by user)

200 fc minimum specific inspection tasks

CRI 80 minimum, 85 preferred

Color temperature ≈ 4100 Kelvin

Slaughter Animals

Lighting plays an important role in the amount of stress an animal experiences during the slaughter process. While mammals and poultry experience and respond to lighting in different ways, appropriate lighting design can significantly reduce the amount of stress for both kinds of animals.

Pigs, goats, sheep, and poultry are all prey animals, highly attuned to threats with a wide field of vision. [12] Anything within that visual field than can be perceived as a threat contributes to the animal's stress level and impact the animals' willingness to move from one area to another. While poultry can be easily moved from one area to another, larger mammals are more difficult and even dangerous to move. Careful use of lighting can encourage an animal to move from one area to another with a minimum of stress and effort.

All prey animals, including pigs, goats, and sheep, feel safest in dim light, and thus are the least stressed in low lighting

levels.[13] Light of 0.5 footcandles, work well for animals but are too low for workers. Illuminance levels between 2-4 footcandles provide a calm lighting experience but also enable workers to perform basic tasks. A transition from a bright outdoor space to a dark interior space, however, can effectively blind the animals and cause them to balk.[14] By using diffuse, bright lighting at the end of a ramp, the animals' natural tendency to move from dimmer to lighter spaces helps to move them to the desired location with minimal stress.[15] Minimizing contrast and glare reduces potential distractions and helps move the animals to the desired location.[16]

Poultry also exhibit calmer behavior under lower light levels.[17] One study showed that under light levels lower than 5 footcandles struggling was significantly reduced.[18] Since poultry are usually moved by workers, this light level should be maintained from the holding to shackling areas until the birds are stunned.

Qualitative Criterial for Red Meat Animals

Minimum contrast between exterior and interior spaces

Diffuse and brighter light at the end of ramps

Quantitative Criteria for Red Meat Animals

0.5-120 fc ramp lighting, 10 fc preferred

2-4 fc holding pen lighting

Quantitative Criteria for Poultry

5 fc max holding pen

5 fc max/ opaque hoods pre-stunning

Observation

Lighting for both slaughterhouse workers and animals has mainly pragmatic considerations. However, when considering lighting from the point of view of an observer, the key role of lighting is to influence the perception of the slaughterhouse and to convey the mission of the facility. Light can be used to convey openness and cleanliness and create a sense of trust in the facility. At the same time, focusing light on areas of interest and importance can clarify the slaughter process and help the facility achieve its educational mission.

Dim lighting can give an impression of secrecy and uncleanliness. At the same time, bright, uniform lighting can convey the sense of an industrial process even when the scale is not industrial. Thus, the slaughtering and processing areas should appear to be well lit, but with variation. Bluer light can also make spaces appear cleaner, while de-emphasizing the appearance of blood.[19]

Focusing light on specific tasks will help emphasize the teaching mission of the facility. Lighting the faces of workers as well as their tasks can emphasize a human element and make the workers seem more relatable.[20]

Qualitative Criteria for Observation

Slaughter area appears well-lit and clean.

Workers faces are well lit

Light places emphasis on specific tasks

Quantitative Criteria for Observation

Observation area illuminance < Slaughter/ Processing illuminance

General color temperature > 4000 K

Retail

Perception is everything in retail lighting. Lighting that draws attention to products and makes them better looking is more appealing to customers and improves sales. Meat that looks red and fresh is more appealing to consumers. Unlike other retail products, however, light also affects the decomposition of meat. Thus, lighting design for retail meat sales must take into account not only product appearance, but also the effect of the lighting on the product's degradation.

In this design, the butcher shop is also a key interface with the public. Lighting the faces of the workers in this area can help by making their faces easier to see and thus more accessible for interaction.

Qualitative Criteria for Retail

Slaughter area appears sanitary.

Workers faces are well lit

Light places emphasis on specific tasks

Quantitative Criteria for Retail

Product contrast ratio 10:1

Color temperature 2800-3500 K

Maximum product light intensity 150-200 K[21]

CRI 80 min, 90 ideal[22]

Additional Considerations

Fluorescents perform poorly in cold environments (citation needed). Consider metal halide or LED lamping for chillers, freezers, and all cold-temperature working environments.

Endnotes

1 M.C. Hunt et al., "Meat Lighting Facts" (Pennsylvania State University, 2009), http://www.das.psu.edu/research-extension/meat/pdf/LightGuideSept09.pdf.
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6 Food Science Australia, "Lighting in meat processing areas," *Meat technology update* 3, no. 97 (November 2006): 3, www.redmeatinnovation.com.au/.../meat-technology-update-97-3.pdf.
7 Don Kropf, "Meat Display Lighting" (Washington State University Extension, April 22, 2010), 3, http://www.extension.org/pages/27341/meat-display-lighting.
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9 Henri Juslén and Ariadne Tenner, "Mechanisms Involved in Enhancing Human Performance by Changing the Lighting in the Industrial Workplace," International Journal of Industrial Ergonomics 35, no. 9 (September 2005): 849.
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11 Juslén and Tenner, "Mechanisms Involved in Enhancing Human Performance by Changing the Lighting in the Industrial Workplace," 847.
12 Temple Grandin, "Behavioral principles of livestock handling", 1999, 2002 1989, http://lamar.colostate.edu/~grandin/references/new.corral.html.
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14 Ibid.
15 Grandin, "Behavioral principles of livestock handling."
16 Grandin and Johnson, Animals in translation, 39.
17 R.Bryan Jones, Daniel G Satterlee, and Gary G Cadd, "Struggling Responses of Broiler Chickens Shackled in Groups on a Moving Line: Effects of Light Intensity, Hoods, and `curtains'," Applied Animal Behaviour Science 58, no. 3–4 (July 1998): 345.
18 Ibid., 346.
19 Hunt et al., "Meat Lighting Facts."
20 Juslén and Tenner, "Mechanisms Involved in Enhancing Human Performance by Changing the Lighting in the Industrial Workplace," 848.
21 Hunt et al., "Meat Lighting Facts."
22 Ibid.

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Appendix C: Detailed Lighting Design

The lighting design plays a crucial role in the function of this building. From the observer's view, lighting creates transparency and highlights the most important activities within. For the worker, lighting creates a safe and interesting work environment. For the animals, lighting creates a calm environment with minimal stress.

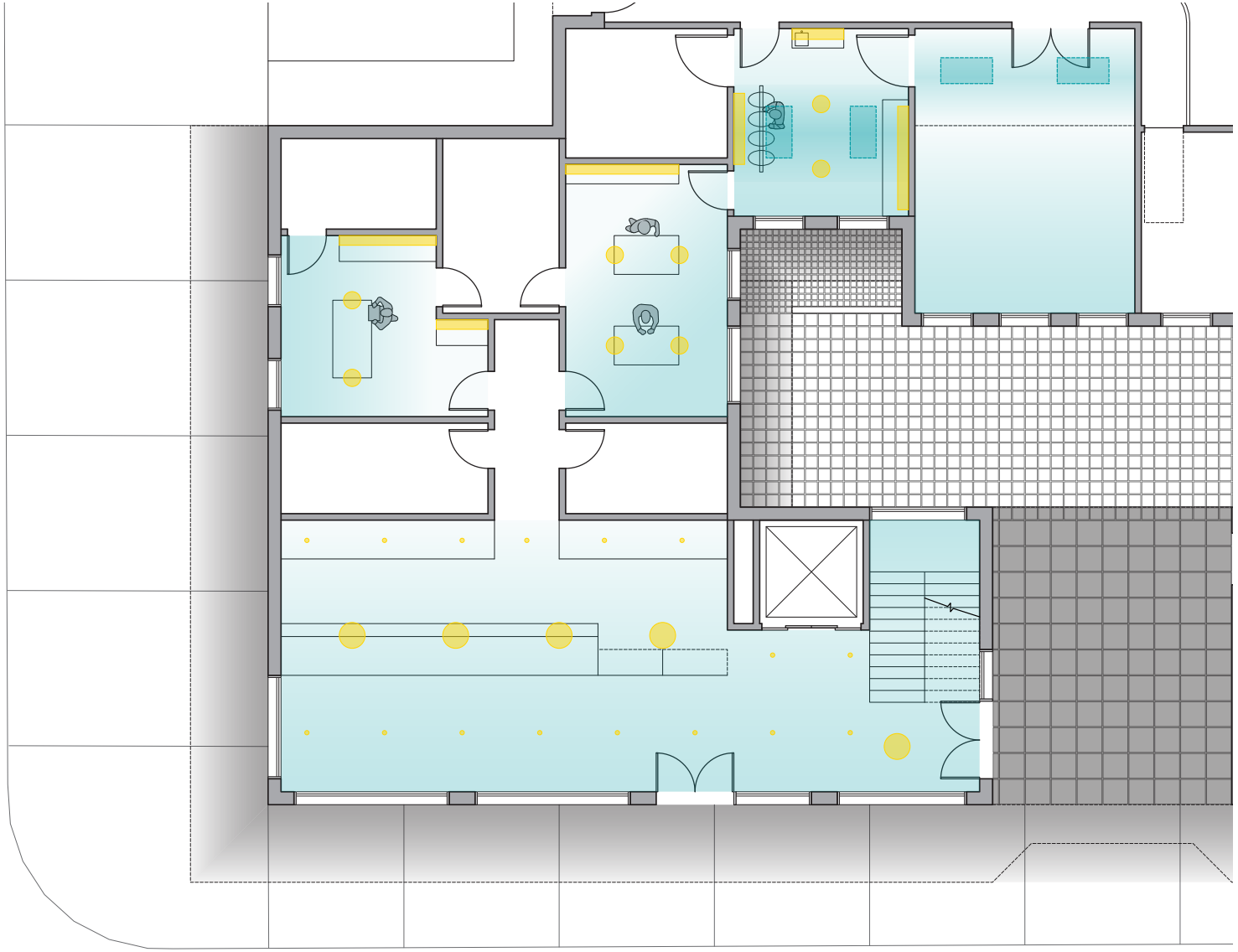
Since the technical requirements for poultry and meat processing are similar,[1] the design focuses primarily on the poultry line, which has the broader range of lighting conditions. The butcher shop and the hand-on classroom are also explored as key spaces facing the public.

Overview: Day

During the day, maintaining the transparency of the interior to the exterior is crucial in order for the public to be able to observe the activities inside (Figure C.1). The main source of transparency in the building is glazing, which requires light levels to be relatively equal between interior and exterior to maintain visibility. The use of daylighting helps to keep indoor and outdoor light levels at similar levels to preserve this transparency. The courtyard proposed in the prototype maintains this access to daylight in a variety of urban sites. Shading at key spaces both improves transparency and minimizes glare for those working inside. Electric task lighting is provided for visually demanding tasks where daylighting from the side is not sufficient. Daylighting helps to keep indoor & outdoor lighting in sync with one another- ensures transparency

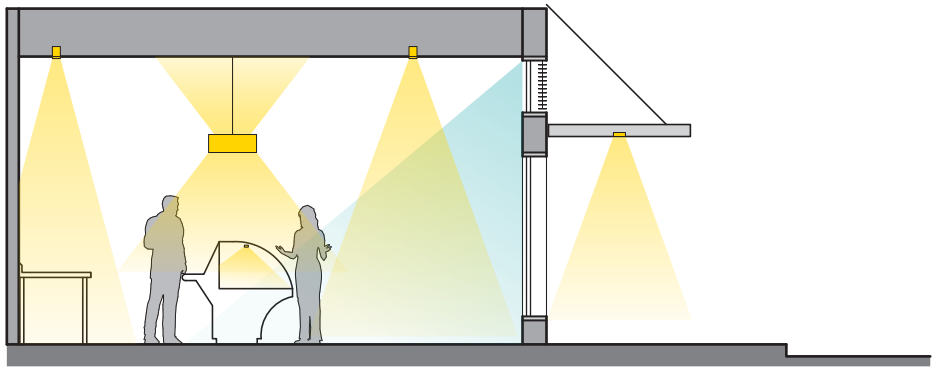
Overview: Night

Although the project would be open to the public only during business hours, in the winter in Seattle some of those hours would take place in partial or complete darkness, which requires that the lighting design for the public should accommodate dark conditions (Figure C.2). At night, the spaces of shade created by the awning become spaces of light. Exterior light is held to a minimum, focusing only on lighting the path of the public. The interior lighting is allowed to be substantially brighter than the exterior in order to preserve the required functional light levels. Although the lighting is task focused, it is also designed to light the faces of the workers inside, helping the public to make a connection with those who work at the facility.

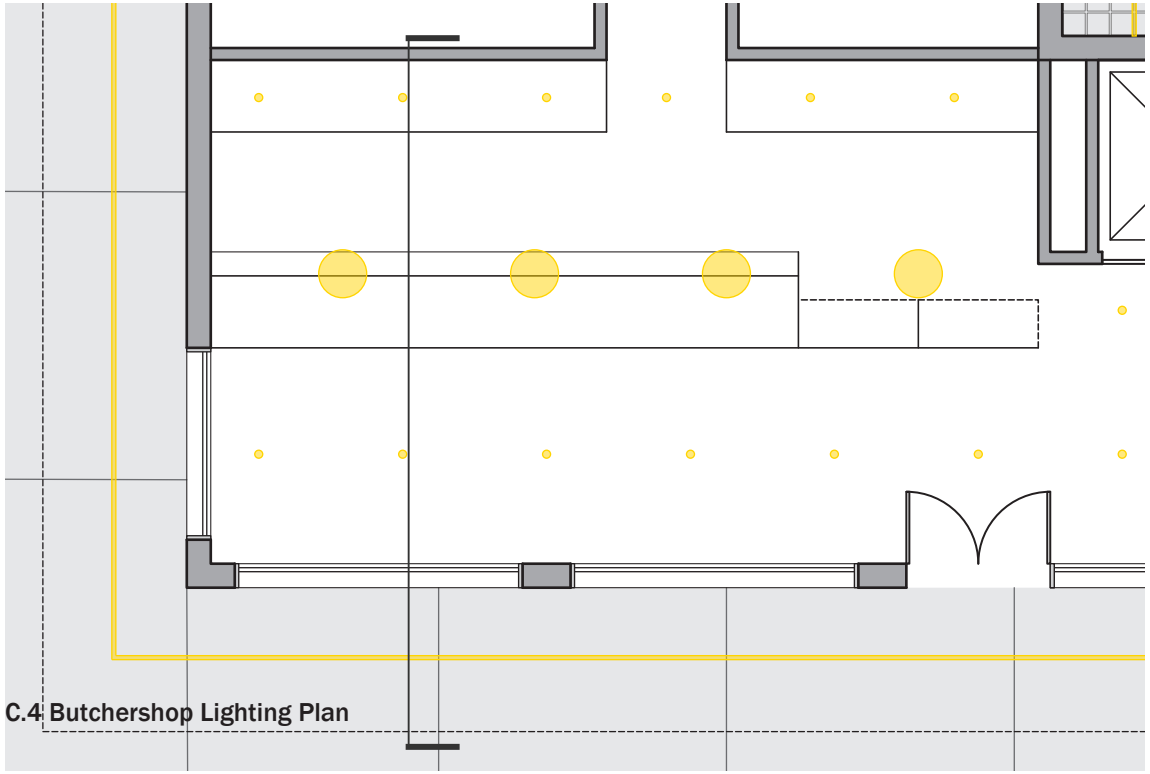


C.1 Lighting Plan- Day

C.2 Lighting Plan- Night



C.3 Butchershop Lighting Section



C.4 Butchershop Lighting Plan

Detail: Butcher Shop

The butcher shop is the main public face of the building. It is the most open and transparent to the street, while having fewer functional requirements than some of the other spaces of the building. The south-west orientation of the glazing provides some glare control challenges. The retail program of the space means that lighting for sales is an additional consideration.

Daylighting

The main daylighting strategy is side lighting through the use of clerestory windows. The relative shallowness of the space means that even at the rear of the shop the levels of light are sufficient for general lighting, although supplemental electric task lighting is necessary for work at the rear counter.

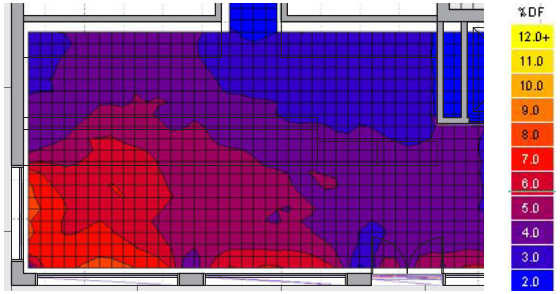
Glare Control

During most of the day, the awning provides shade from the south sun at the view windows.

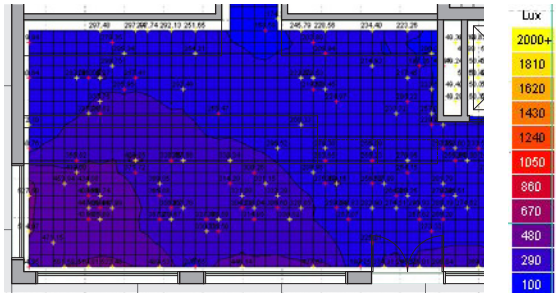
Automated blinds at the clerestory windows help to maintain daylighting while preventing glare. The south west orientation of the view windows creates a glare problem for some portion of most afternoons, particularly since the position of the building at an intersection means that adjacent buildings don't provide additional shade. Interior shades can be used to control glare at these times.

Electric Lighting

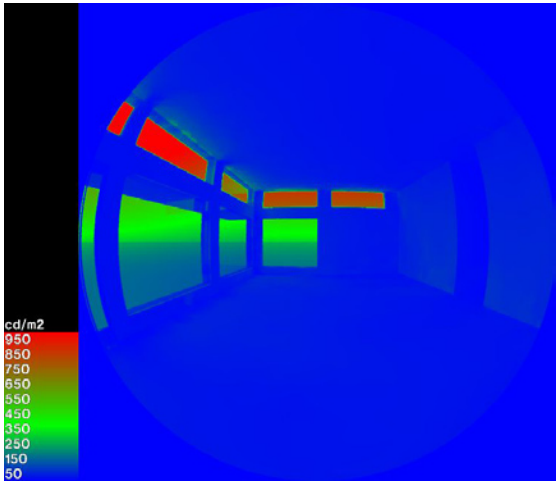
While daylighting provides most of the general light, electric lighting helps to draw attention to workers and products and provides supplemental light for visually intensive tasks. Hanging pendants above the meat case provide visual focus, lift the space by brightening the ceiling, and help to create a connection to the public by lighting the faces of workers and customers. Integrated lighting in the meat case helps to highlight the products for sale. Recessed cans provide task lighting at the work counter, and cans in front of the meat case provide supplemental lighting at night. At night, linear fixtures in the awning provide just enough light for walking and soften the transition between the interior and exterior.



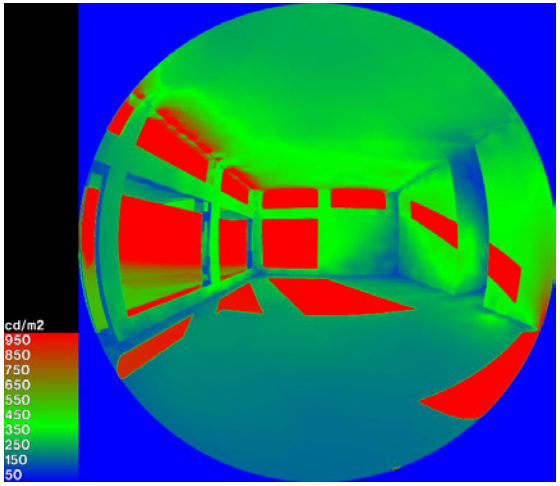
C.5 Butchershop Daylight Factor



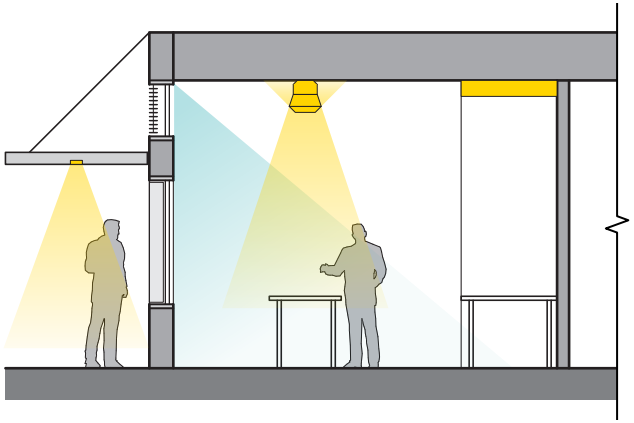
C.6 Butchershop Illumination- December 31



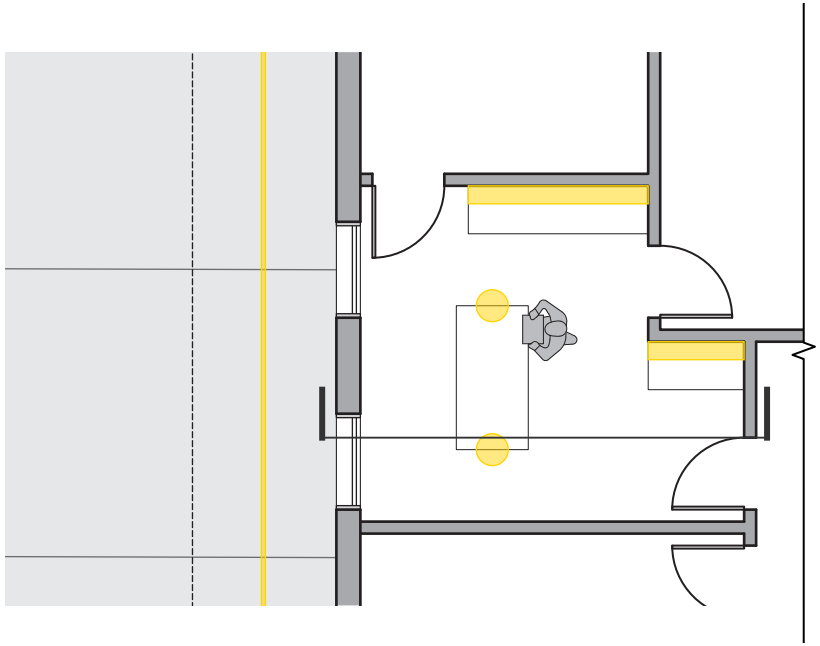
C.7 Butchershop Luminance- Winter, Noon



C.8 Butchershop Luminance- Spring Afternoon



C.9 Poultry Processing Lighting Section



C.10 Poultry Processing Lighting Plan

Detail: Processing

The poultry processing space is open to the street, with west facing glazing that provides views as well as daylight to the space.

Daylighting

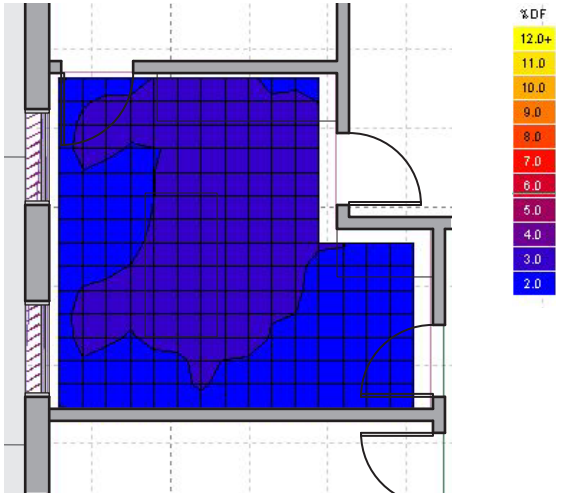
A large clerestory window provides general lighting. The high lighting requirements of the visual tasks require additional task lighting for much of the year.

Glare Control

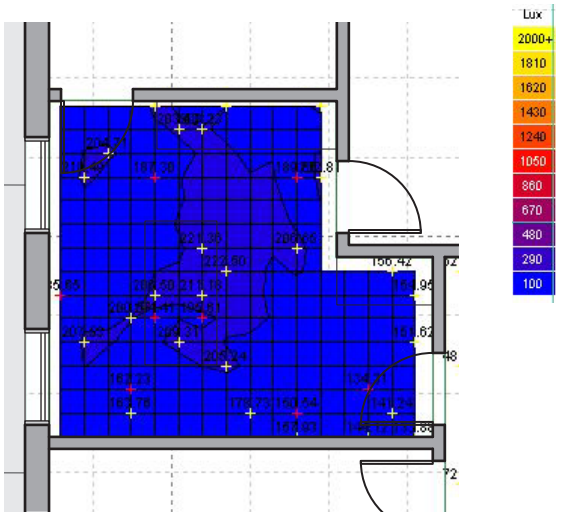
While the awning provides some shade and visibility to the interior, the western orientation requires additional shading. Automated exterior shades at the clerestory window allow daylighting to the interior while maintaining sanitary interior conditions. The vertical fins at the window are oriented not only to screen views for observers, but also to shade the west sun, although glare in late summer afternoons may still be an issue.

Electric Lighting

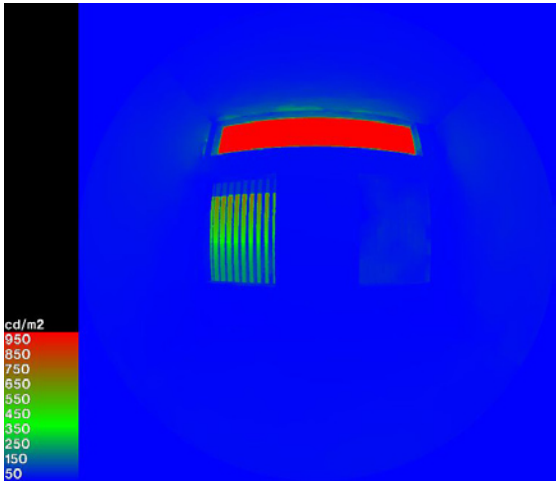
Fixtures for food processing spaces have specific technical requirements which limit fixture choices. Lighting at the tables is provided through a semi-direct ceiling fixture. This helps to brighten the ceiling, reducing any sense of dinginess, while directing most light at the task. A corner mounted fluorescent provides task lighting at wall work spaces.



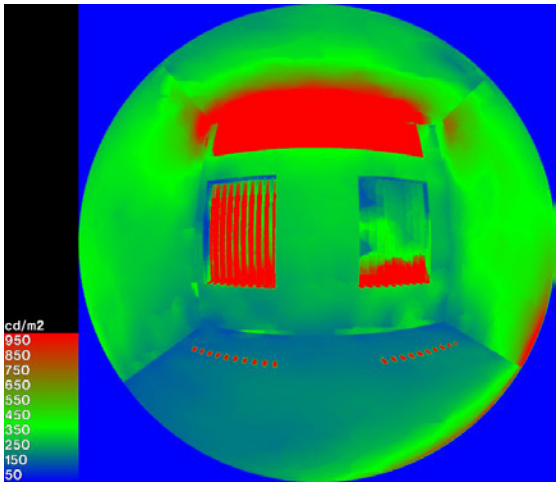
C.11 Processing Daylight Factor



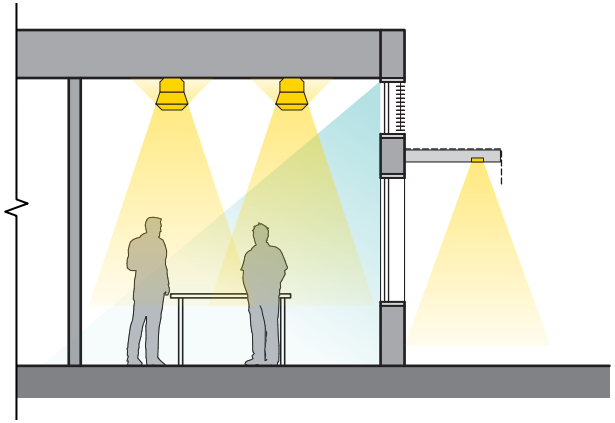
C.12 Processing Illumination- December 31



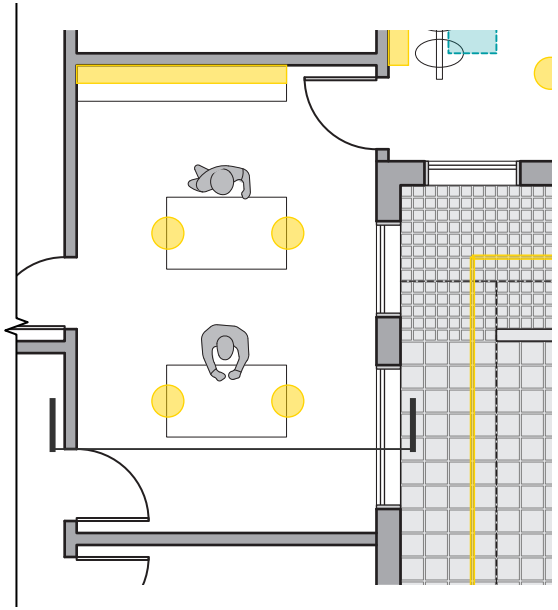
C.13 Processing Luminance- Winter, Noon



C.14 Processing Luminance- Summer Afternoon



C.15 Eviceration Lighting Section



C.16 Eviceration Lighting Plan

Detail: Evisceration

The evisceration space is open to the courtyard, with east facing glazing providing views into the space as well as daylight.

Daylighting

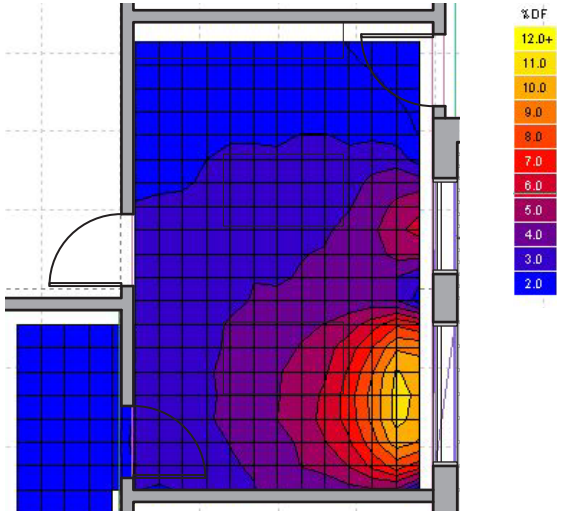
A large clerestory window provides general lighting for most of the space. The high lighting requirements of the visual tasks require additional electric task lighting for much of the year.

Glare Control

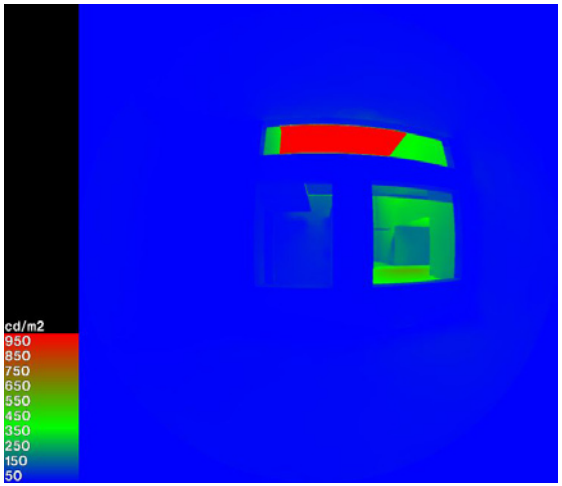
The courtyard facing glazing is shaded for the majority of the year by the building itself. In summer months, when sun angles are too steep to be shaded by the building, an awning structure provides seasonal shading. Removing the shade when it is not required improves light levels the rest of the year. The clerestories above the awning structure are shaded with automated exterior shades.

Electric Lighting

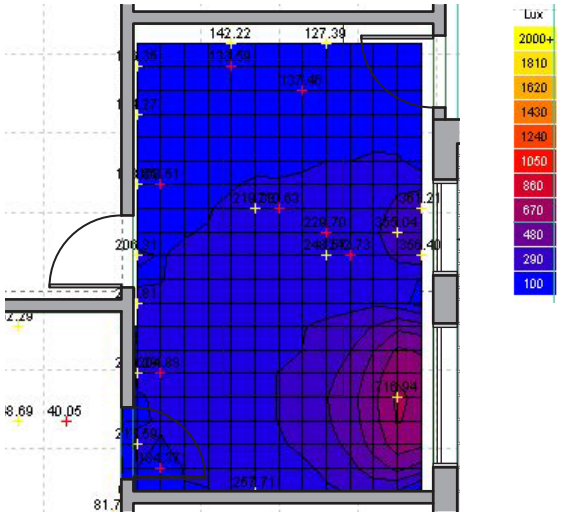
The electric lighting for this space is similar to the processing space, with semi-direct ceiling fixtures at the tables, and corner-mounted fluorescent fixtures at wall work spaces. This provides sufficient task lighting while also brightening the ceiling and reinforcing the appearance of a clean and hygienic space.



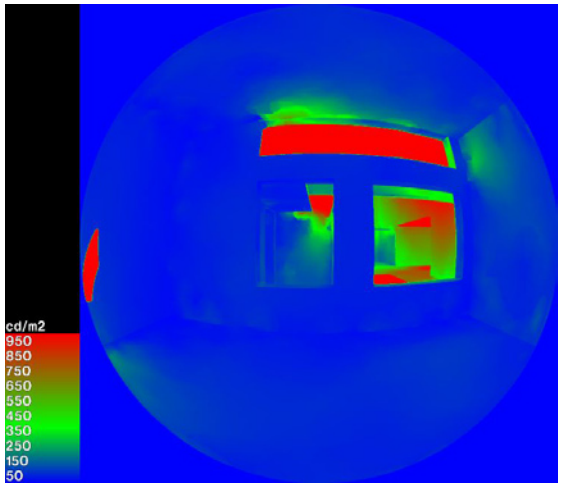
C.17 Eviceration Daylight Factor



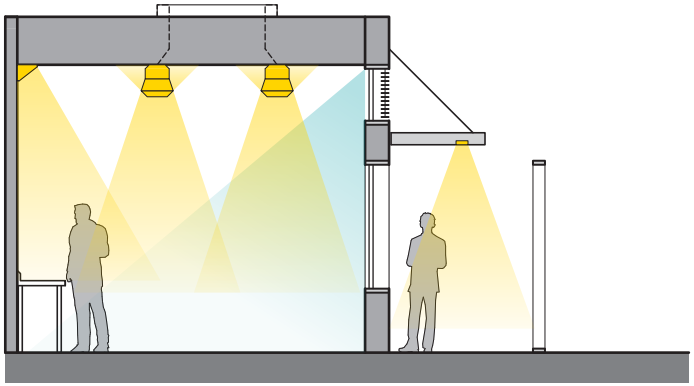
C.19 Eviceration Luminance- Winter, Noon



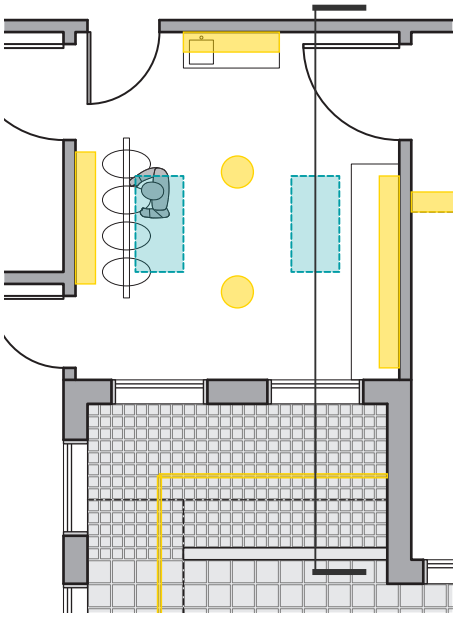
C.18 Eviceration Illumination- December 31



C.20 Eviceration Luminance- Spring Morning



C.21 Kill Floor Lighting Section



C.22 Kill Floor Lighting Plan

Detail: Kill Floor

The kill floor is open to the courtyard, with south facing glazing. An overhead awning as well as a free-standing vertical screen provides shading as well as screening of potential views.

Daylighting

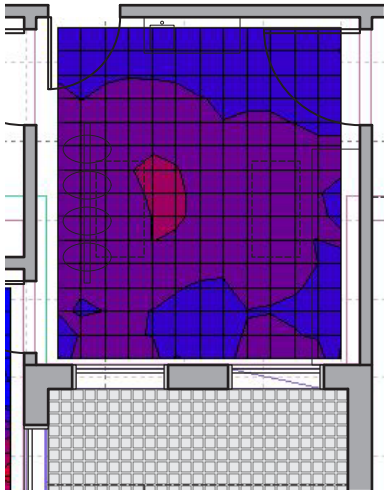
The kill floor is daylight at the front of the space with side lighting through a large clerestory window and at the rear by two translucent skylights. This provides sufficient general and task lighting for most months of the year.

Glare Control

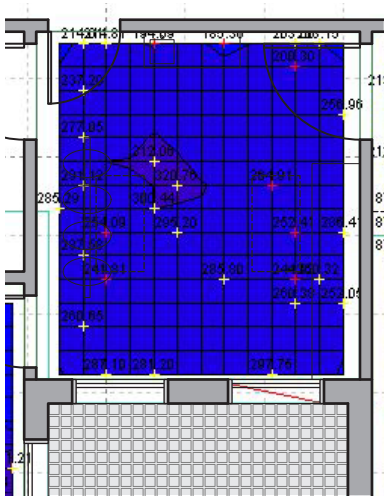
The awning at the view window shades the noon sun for the majority of the year. The free-standing screen in front of the window shades the lower sun angles that are not shaded by the building itself. Shading at the clerestories is achieved through automated exterior blinds.

Electric Lighting

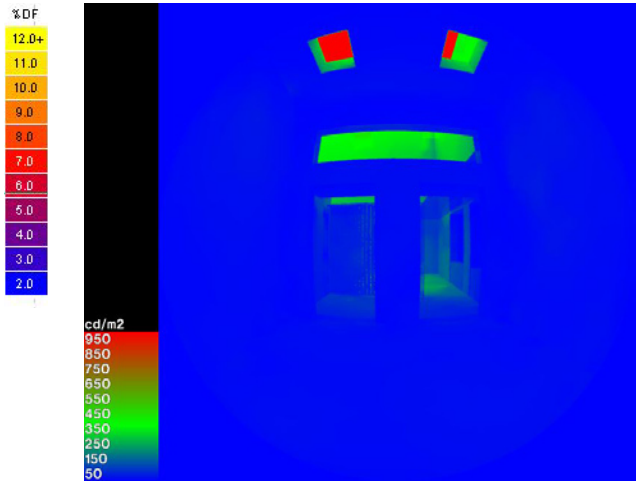
The electric lighting for this space, is similar to the processing space, although less task lighting is needed in daylight hours. Semi-direct ceiling fixtures provide mainly general lighting, while corner mounted fixtures at the walls provide most of the task lighting for the space.



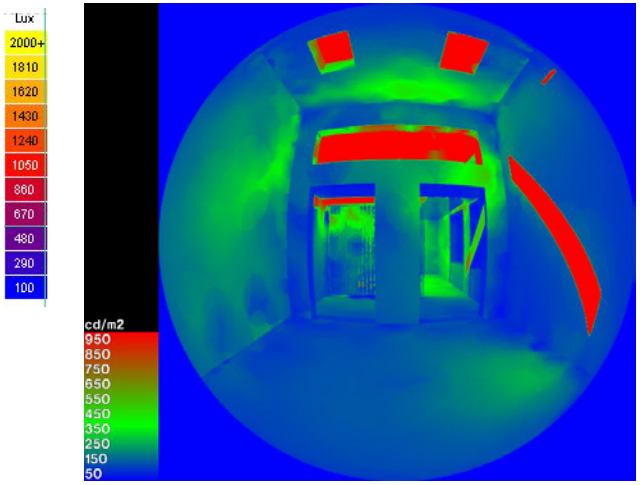
C.23 Kill Floor Daylight Factor



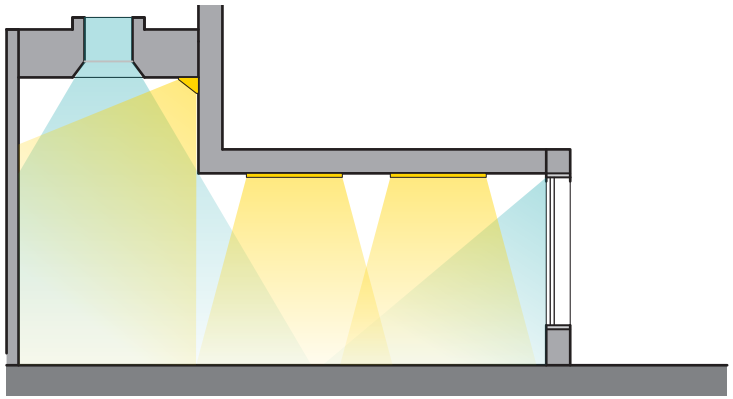
C.24 Kill Floor Illumination- December 31



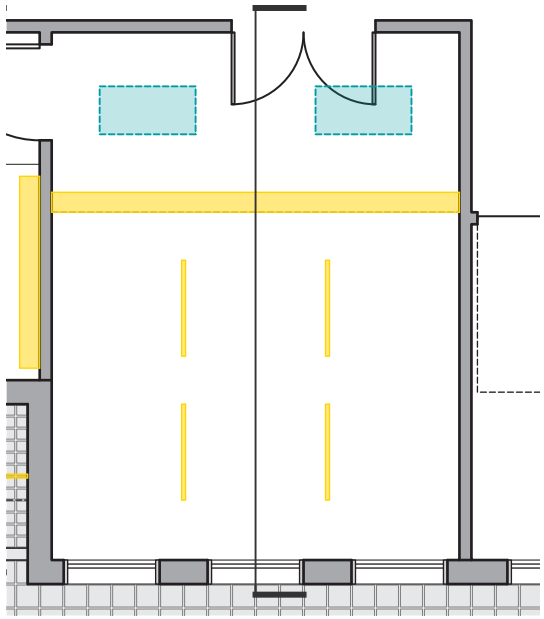
C.25 Kill FLoor Luminance- Winter, Noon



C.26 Kill Floor Luminance- Spring Morning



C.27 Holding Pens Lighting Section



C.28 Holding Pens Lighting Plan

Detail: Pens

The pens have some of the most challenging design constraints, with the need to balance the preference of the animals for darkness with the need for transparency to the public eye. The pens have lower ceilings than the work spaces, with south facing glazing open to the public through the courtyard.

Daylighting

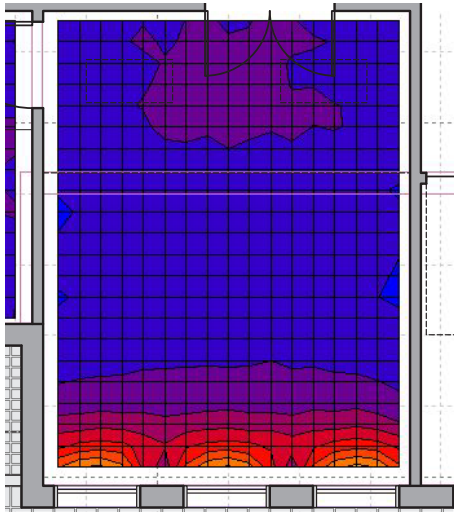
The south-facing windows at the front of the space allow daylight and views to penetrate. A skylight at the rear of the space provides lighting for worker circulation and draws the eye through the space, making it possible to understand the entire space so that it feels like nothing is hidden. The middle of the space is allowed to remain relatively dark for the comfort of the animals.

Glare Control

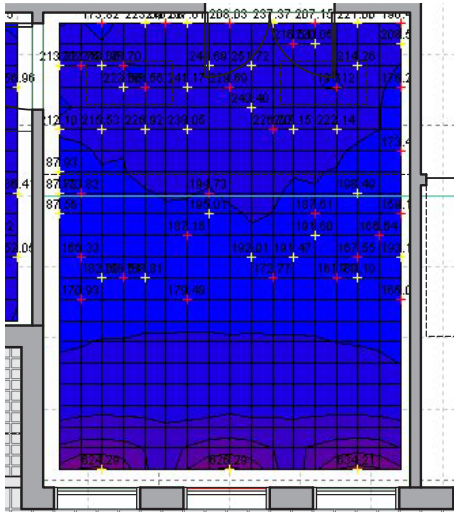
The majority of the glare control is provided by the shading of the building. In the summer, additional shading may be required to limit sun penetration. An alternative option is to locate the animals to the middle and rear of the space in summer, or to shade the pens at the interior, to limit their exposure to bright light

Electric Lighting

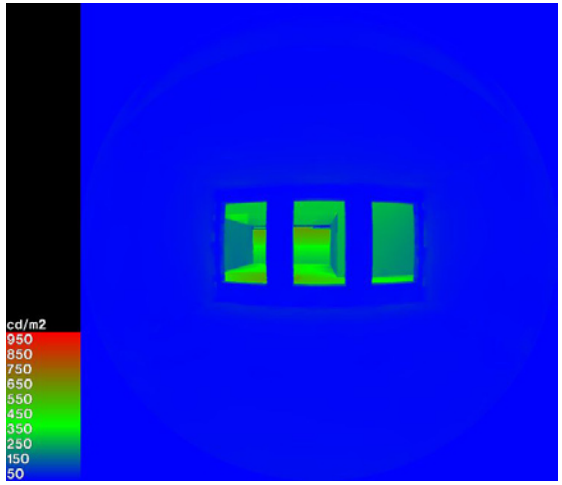
The lighting requirements for tasks in this space are relatively low. Linear ceiling mounted fluorescents light the space between pens as needed. A corner linear fluorescent is located at the high portion of the space and has integrated daylight controls associated with the skylight to light the work and circulation space.



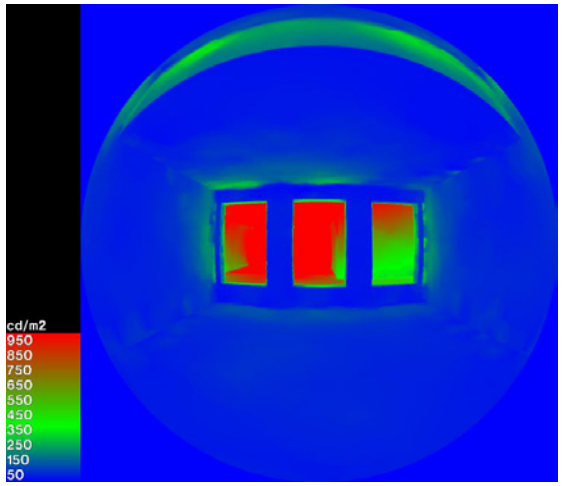
C.29 Holding Pens Daylight Factor



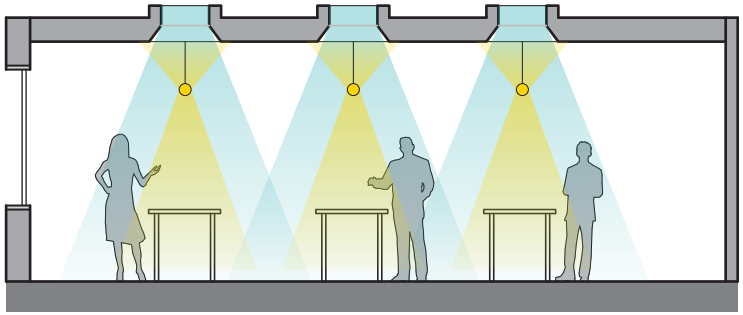
C.30 Holding Pens Illumination- Dec. 31



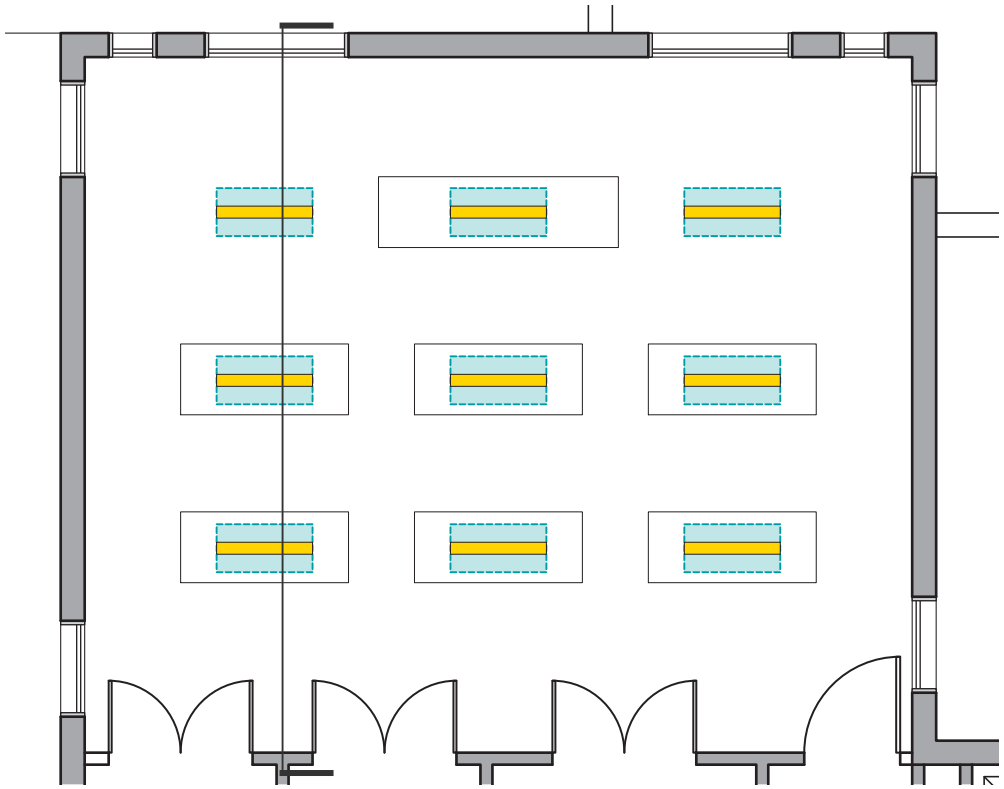
C.31 Holding Pens Luminance- Winter, Noon



C.32 Holding Pens Luminance- Spring, Noon



C.33 Classroom Lighting Section



C.34 Classroom Lighting Plan

Detail: Classroom

The classroom is located on the second floor of the building, with windows to the north, west and east. While the visual tasks are similar to those that take place in the production spaces, the program requires a more personal and connected feel to the space. Extra view windows and hanging fixtures make the space feel more approachable and intimate than the functional spaces at the first floor.

Daylighting

Translucent skylights are used for both general and task lighting for most of the year. Side windows are provided primarily for view purposes.

Glare Control

Window integrated blinds allow full glare control at the view windows, while the interior remains easy to clean. Unlike the spaces at the first floor, there is no need to maintain

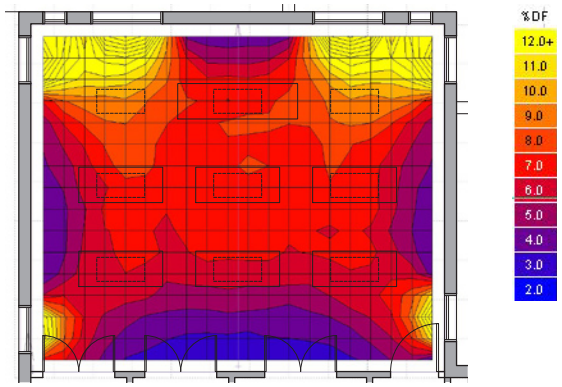
transparency to an exterior public, which allows the blinds to be user controlled rather than automated.

Electric Lighting

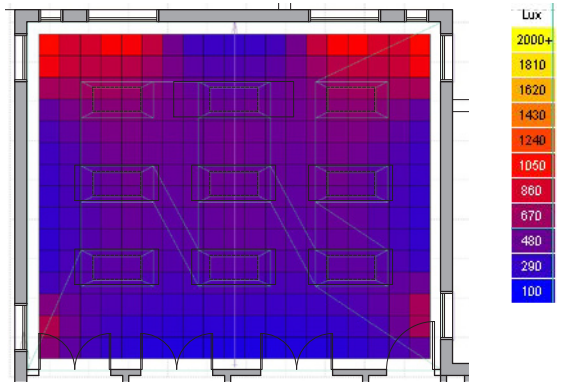
Electric lighting is provided through hanging direct-indirect linear fixtures. These brighten the ceiling, helping to open the space, while providing task lighting at the work tables. During the day, controls for these fixtures can be integrated with the sky lighting to provide only direct lighting during the day as needed for visual tasks.

Endnotes

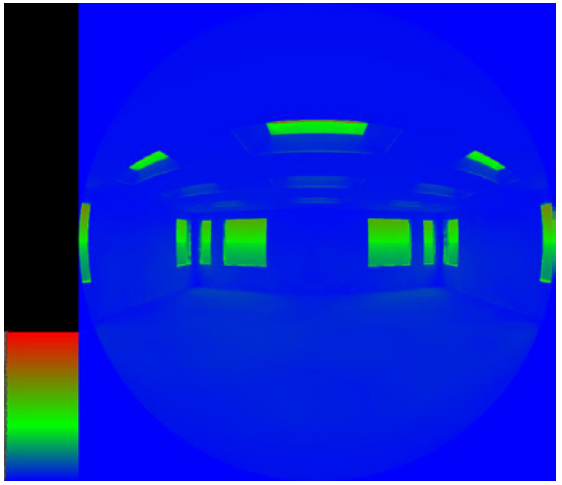
1 United States Food Safety and Inspection Service, "Sanitation Performance Standards Compliance Guide."



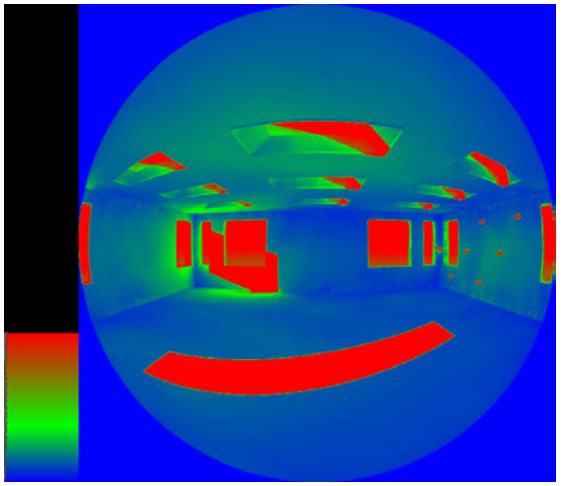
C.35 Classroom Daylight Factor



C.36 Classroom Illumination- December 31



C.37 Classroom Luminance- Winter, Noon



C.38 Classroom Luminance- Spring Afternoon

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