

## Telemedicine Prototype Facility Planning & Design Project for Arizona Rural Tribes

June 2013



## 1.1 | Acknowledgements

# Telemedicine Prototype Facility Planning & Design Project for Arizona Rural Tribes

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*Drachman Institute is the research-based outreach arm of the College of Architecture, Planning, and Landscape Architecture (CAPLA) at the University of Arizona. The Institute is dedicated to environmentally-sensitive and resource-conscious planning and design with a focus on under-served and vulnerable communities. As an interdisciplinary collaborative, we engage students, staff, faculty, and citizens to work towards making our communities healthier, safer, more equitable, and more beautiful places to live. We embrace a service-learning model of education serving the needs of communities while providing an outreach experience for students. This model is a fundamental educational goal consistent with the mission of CAPLA and The University of Arizona.*

*All photos, renderings, drawings, charts, GIS layers, or other content were generated by Drachman Institute staff unless otherwise noted.*

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## Telemedicine

This section introduces the topic of telemedicine and its benefits, services provided, and different applications for small communities.

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## 1.1 | About Telemedicine and Telehealth

### ACCESS TO HEALTH CARE

Access to quality health care is an important achievement in establishing health equity for Americans. Improving health care access is shown to have a positive impact on people's lives by:

- Improving the overall physical, social, and health status
- Preventing diseases and disabilities
- Improving the detection and treatment of health conditions
- Improving quality of life
- Decreasing the number of preventable deaths
- Increasing life expectancy<sup>1</sup>

One of the ways that access to health care can be expanded to areas with limited or no access to medical care is through the provision of telehealth and telemedicine services.

<sup>1</sup> List Source: HealthyPeople.gov. "Access to Health Services."

### TELEHEALTH VERSUS TELEMEDICINE

The Health Resources and Services Administration defines telehealth as the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration. Technologies include video conferencing, the internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications.<sup>2</sup>

Telemedicine is similar to telehealth, although the latter refers to a broader scope of health care services. Telemedicine most specifically refers to remote clinical services, but can also be used in reference to remote non-clinical services such as provider training, administrative meetings, and continuing medical education.<sup>3</sup>

<sup>2</sup> U.S. Department of Health and Human Services. "Telehealth."

<sup>3</sup> HealthIT.gov. "What is telehealth? How is telehealth different from telemedicine?"



University of Arizona's Arizona Telemedicine Program

Image Source: <http://opa.ahsc.arizona.edu/newsroom/news/2009/uas-arizona-telemedicine-program-receives-113m-grant-start-regional-center>



## 1.2 | Benefits of Telemedicine

### OVERVIEW

The idea of using televisions to improve health care has been around since the late 1950's. However, it isn't until more recently when advances in technology, price reductions in equipment costs, and improved data transmissions have allowed telecommunications technologies to become a much more feasible option.<sup>4</sup> As a result, telemedicine and telehealth have been able to spread rapidly as a health care solution.

The biggest benefit of telehealth is that it provides access to health services for areas that have traditionally had limited or no access due to lack of availability and/or other barriers such as travel distance. The benefits of telemedicine can be explored through three different perspectives: economic development and quality of life, patients, and providers.<sup>5</sup> A brief summary of the benefits of telemedicine are outlined below.

### **Economic Development and Quality of Life**

From an economic perspective, telemedicine offers cost savings for both providers and patients, while simultaneously bolstering the local economy. It also has the ability to improve quality of life because of increased access to health care services. The list below briefly outlines the economic and quality of life benefits of telemedicine. For more information, please refer to the resources in the appendix.

Telemedicine:

- Helps hospitals to save on costs by outsourcing specialty physician services<sup>6,7</sup>
- Enhances health services such as home health care<sup>8</sup>
- Allows more dollars to be captured in the local economy from the increased use of local health services<sup>8,9</sup>

4 Norris, Thomas E., MD, et al. "Low-Bandwidth, Low-Cost Telemedicine Consultations in Rural Family Practice."

5 Britain, Catherine, John Irwin and Erwin Parker. "Benefits of Telemedicine."

6 Specialists usually command large salaries that a rural hospital struggles to pay. By outsourcing these types of services via telemedicine, smaller hospitals and rural areas can still offer these services as a pay-per-use model rather than having the burden of the salaries for specialists.

7 Whiteacre, Brian, et al. "Evaluating the Economic Impact of Telemedicine in a Rural Community."

8 Britain, Catherine, John Irwin and Erwin Parker. "Benefits of Telemedicine."

9 Studies have shown that laboratory or pharmacy work is performed in the area where the patient's initial screening was performed. Because the initial exam is done locally, the resulting follow-up work is also done locally. This translates



A community health care center in Virginia with telehealth capabilities.

Image Source: <http://ehealthvirginia.org>

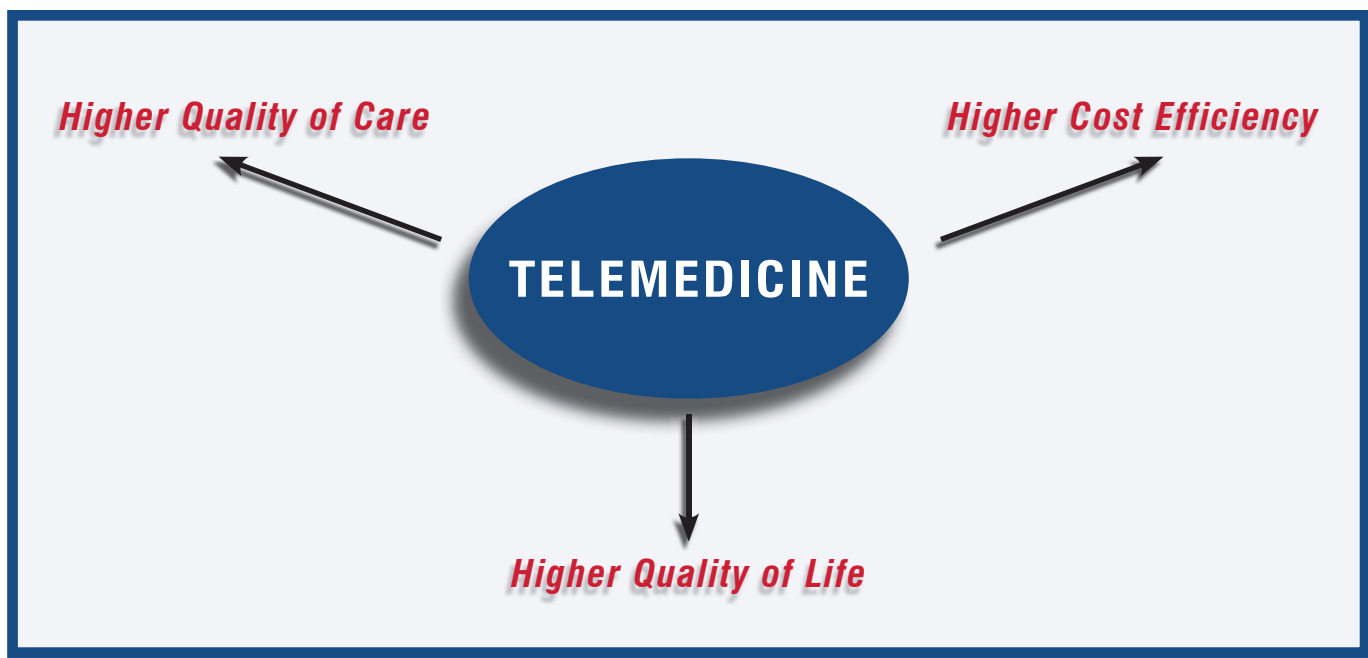
- Aids in the recruitment and retention of businesses locally<sup>8,10</sup>
- Aids in workforce development and jobs if teleconferencing abilities are shared with educational institutions to help train people for locally available jobs in health care<sup>8</sup>
- Improves people's individual health which impacts the economy through improvements in life expectancy and social productivity<sup>8</sup>
- Allows rural, remote and underserved areas to become part of clinical trials, which is a multi-billion dollar business<sup>8</sup>

into money captured locally that would have normally been captured elsewhere.

10 Locally available quality healthcare and schools are the two key factors when it comes to the attracting new businesses, especially in a rural community.







#### *Benefits of Telemedicine*

##### **Patient Perspective**

From a patient perspective, telemedicine offers cost savings by significantly decreasing transportation costs while increasing access to health care services. The list below briefly outlines the benefits of telemedicine from a patient's perspective. For more information, please refer to the resources in the appendix.

Telemedicine:

- Improves access to quality medical care and treatment by specialists<sup>11</sup>
- Saves patients on travel time and expenses<sup>12,13</sup>
- Saves patients money by reducing the number of hours that they would miss from work<sup>12,14</sup>
- Improves collaboration by care providers which increases patients' confidence that they are getting the best treatment available<sup>11</sup>
- Is becoming more accepted and patients are becoming more comfortable with the use and application of this technology<sup>11</sup>

<sup>11</sup> Britain, Catherine, John Irwin and Erwin Parker. "Benefits of Telemedicine."

<sup>12</sup> Whiteacre, Brian, et al. "Evaluating the Economic Impact of Telemedicine in a Rural Community."

<sup>13</sup> When considering a community as a whole, a telemedicine facility has the potential to have a substantial impact in transportation savings.

<sup>14</sup> When patients have to travel for medical services, they are missing time at work. By reducing the amount of travel time, a telemedicine facility can save patients from missing a substantial number of hours at work which translates into increased income.

##### **Provider Perspective**

From a provider perspective, telemedicine improves the quality of health care through increases in system efficiency, reductions in medical errors, and improved educational opportunities. The list below briefly outlines the benefits of telemedicine from a health care provider's perspective. For more information, please refer to the resources in the appendix.

Telemedicine:

- Provides life-saving support in emergency situations, especially when the nearest emergency room/trauma center is too far away<sup>15</sup>
- Helps to reduce medical errors by making it easier for doctors to get a second opinion on their diagnosis<sup>15</sup>
- Increases efficiency in the health care system by reducing traveling times and "paper-based" data transfer<sup>15</sup>
- Enhances educational opportunities for "health care providers, patients, and families which improves clinical outcomes and reduces hospitalizations"<sup>15</sup>

<sup>15</sup> Britain, Catherine, John Irwin and Erwin Parker. "Benefits of Telemedicine."



## 1.3 | Types of Telemedicine & Services

### **TYPES OF TELEMEDICINE**

A telemedicine facility can take on various forms, but the primary goal is to improve communication between the patient and local health care provider in one location and a physician or specialist in another location. There are three broad forms of telemedicine: store-and-forward, remote patient monitoring, and interactive health care services.<sup>16</sup> Each of the different types of telemedicine offers a range of benefits to patients and doctors. A brief explanation of each is provided below:

#### **Store-and-Forward**

Store-and-forward consists of capturing and storing a patient's medical data, such as diagnostic images, and then securely storing and transmitting the image to another location where a physician or specialists makes an assessment.<sup>17</sup> The advantage to this type of telemedicine is that it is not required for both parties to be present at the same time.<sup>18</sup> Store-and-forward telecommunication is most commonly used in disciplines where direct contact with the patient is not required.

Store-and-forward is most commonly used for:

- Radiology
- Pathology
- Dermatology
- Ophthalmology<sup>19</sup>

<sup>16</sup> Downey, Roger. "Types of Telemedicine."

<sup>17</sup> "What is Telehealth?" <<http://cchpca.org/what-is-telehealth>>.

<sup>18</sup> Downey, Roger. "Types of Telemedicine."

<sup>19</sup> List Source: "What is Telehealth?" <<http://cchpca.org/what-is-telehealth>>.



*Teleradiology is a common use for store-and-forward telemedicine*  
Image Source: <http://pivotalteleradiology.co.in/>



*A patient's health can be monitored remotely, from the comfort of their home*

Image Source: <http://mobihealthnews.com/5577/intel-health-guide-lands-varied-customer-base/>

#### **Remote Patient Monitoring**

Remote patient monitoring uses devices to remotely collect, store, and transmit a patient's health information to health care providers.<sup>20</sup> The data is monitored and evaluated, and if necessary, an intervention takes place to small health concerns before they turn into larger health problems.

Remote patient monitoring is most beneficial for monitoring chronic conditions, such as:

- Diabetes
- Heart disease
- Asthma
- Sleep apnea
- And others<sup>21</sup>

Studies have shown that remote patient monitoring provides patients with chronic diseases improved levels of care and "could reduce health care costs in the U.S. by almost \$200 billion over the next 25 years."<sup>22</sup>

<sup>20</sup> Ward, Jesse. "Telemedicine: Remote Patient Monitoring."

<sup>21</sup> List Source: Digitome. "Remote Patient Monitoring."

<sup>22</sup> Downey, Roger. "Types of Telemedicine."



## **Interactive**

Interactive health care services allow for the physician to interact with the patient in real time through telemedicine and other technology.<sup>23</sup> Technology can include phone calls, online communications, medical quality video equipment, and standard video conferencing equipment.

Interactive telemedicine can be used to perform services such as:

- Medical history reviews<sup>23</sup>
- Physical examinations<sup>23</sup>
- Psychiatric evaluations<sup>23</sup>
- Consultation Services
  - Primary care providers can consult with medical specialists not available locally<sup>24</sup>
  - Patient examinations can be conducted with medical specialists when distance is a barrier<sup>24</sup>
  - Care can be coordinated with patients who may be reluctant to keep appointments in person<sup>24</sup>
  - Access to care can be better provided for patients with limited mobility<sup>24</sup>
- Educational Services
  - Special medical education seminars for patients and their families<sup>24</sup>
  - Training seminars for remote facility operators

<sup>23</sup> Downey, Roger. "Types of Telemedicine."

<sup>24</sup> Whiteacre, Brian, et al. "Evaluating the Economic Impact of Telemedicine in a Rural Community."



*Interactive telemedicine can be achieved using both complex equipment (neurosurgery application shown above) or simpler video conferencing equipment (general practitioner application shown below).*

*Image Sources: Above: <http://neurosurgerycns.wordpress.com/tag/telemedicine>  
Below: <http://clinicianstelmed.com/telemedicine/>*

## **Specialties Offered Via Telemedicine**

Allergy/Immunology	Family/General Practice	Orthopedics
Anesthesia	Gastroenterology	Pathology
Cardiology	Infectious Diseases	Pediatrics
Critical Care	Internal Medicine	Psychiatry
Dentistry	Maternal/Fetal Medicine	Pulmonology
Dermatology	Mental/Behavioral Health	Radiology
Otolaryngology (ENT)	Neurology	Rehabilitative Medicine
Emergency Medicine	Oncology/Hematology	Rheumatology
Endocrinology	Ophthalmology/Optometry	Urology

*Specialties that are often offered via telemedicine*

*List Source: Telehealth Resource Centers. "Types of Telemedicine Specialty Consultation Services."*





## 1.4 | Communities that Benefit Most

### OVERVIEW

One of the greatest benefits of telemedicine is that it provides the ability to offer quality health care services economically. As a result, communities that have limited economic opportunities *and* limited or no access to medical services can have better access without an extremely large investment.

While there are several types of communities that may have limited or no access to medical services, a majority of people live within three specific communities. These communities are identified and discussed below:

- Rural Communities
- Remote or Isolated Communities/Areas
- Medically Underserved Areas or Populations

### Rural Communities

Rural Communities are loosely defined as geographic areas located outside of cities and towns. More specifically, these communities are typically associated with characteristics that include:

- Small size
- Sparse settlement
- Limited shopping and service opportunities
- Distant from concentrations of population
- An economic reliance on agricultural industries, sometimes in tandem with tourism<sup>25</sup>

<sup>25</sup> List Source: Monk, David H. "Recruiting and Retaining High-Quality Teachers in Rural Areas."

### Five Categories of Health Care Barriers

Transportation difficulties  
Limited health care supply  
Lack of quality health care  
Social isolation  
Financial constraints

#### *Barriers to health care in rural areas*

*Stanford School of Medicine. "Healthcare Disparities & Barriers to Healthcare."*

A rural community with characteristics similar to those listed above would value a telemedicine/telehealth facility that:

- Is easily accessible for residents
- Is inexpensive to build and operate
- Provides a wide range of services
- Provides education opportunities via telecommunication technologies

Rural communities that are small and sparsely settled do not have the population count or density to offer a large range of traditional medical services. There may or may not be a general practitioner located in close proximity to the community, and any specialty care is typically referred to the closest city, which may be an hour or more away. As a result, a telemedicine facility that provides access to specialist care would be beneficial to a rural community.



*Rural communities typically have limited access to health care due to lack of availability and/or distance barriers*

Image Source: <http://www.albafarmers.org/farms.html>



### **Remote or Isolated Communities/Areas**

Remote or Isolated Communities are areas that are considerably far from other populations and have limited access to and from the area. More specifically, these types of areas are associated with characteristics that include:

- Limited transportation example: road, rail, air
- Limited access to a commercial or service hub
- Limited infrastructure example: water, off-grid, health care, schools, internet
- A single, primary employer<sup>26</sup>

Types of remote communities may include:

- Communities built around a single employer or industry such as a mining town
- Some Native American Tribes
- Research outposts

A remote or isolated community with characteristics similar to those listed would value a telemedicine/telehealth facility that:

- Is easily accessible to the community
- Is easily constructed with local materials
- Is as off-grid as possible
- Provides a wide range of services, which may also include some emergency services
- Provides education opportunities via telecommunication technologies

Because remote or isolated communities have limited transportation, access to infrastructure, and availability of medically trained people to staff the facility, the facility would have to be self-sustaining and easy to use. The facility would need to be able to be operated and services rendered by someone with minimal training. As a result, it is crucial for the telecommunications technologies to be able to capture high quality images for diagnosis.

<sup>26</sup> List Source: National. "Towards a Remote Communities Investment Strategy for Canada: Shaping Economic Growth in Canada's Remote Communities."

### **Medically Underserved Areas or Populations**

A medically underserved area or population is, by definition, a geographic location (urban or rural) or population that has insufficient health resources (manpower and/or facilities) to meet the medical needs of the resident population.<sup>27</sup> Insufficient access can be due to location, economic, cultural, and/or linguistic barriers.<sup>28</sup> These designations are applied based on the demographic characteristics of the area/population. Characteristics include one or more of the following:

- Too few primary care providers
- High infant mortality rate
- High percentage of the population living below the federal poverty level
- High elderly population<sup>29</sup>

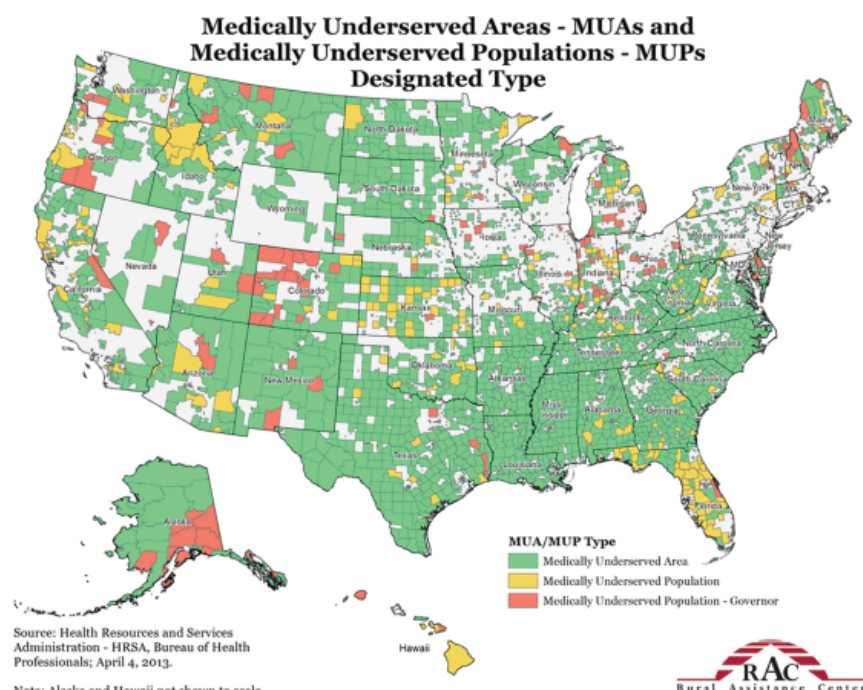
An underserved area and/or population would value a telemedicine/telehealth facility that provides:

- Primary care services
- Access to specialists
- Education opportunities via telecommunication technologies

<sup>27</sup> Montana Primary Care Association, Inc. "MPCA."

<sup>28</sup> List Source: Montana Primary Care Association, Inc. "MPCA."

<sup>29</sup> Arizona Department of Health Services. "Shortage Designation Program: Federal Medically Underserved Areas/Populations (MUA/P)."



*Medically Underserved Areas and Populations in the U.S., 2013*  
Image Source: <http://www.raconline.org/racmaps/>



## **10 Benefits of Telemedicine**

1. Enables more informed decision making and enhanced quality of care
2. Saves lives through remote consultations, whether urgent or diagnostic
3. Creates more efficient, convenient and potentially more cost effective delivery of care
4. Facilitates earlier – and more accurate – diagnoses
5. Provides greater, and faster, access to a patient's medical history, reducing the risk of negative drug interactions or poor response to a course of treatment
6. Improves administrative efficiency and coordination
7. Allows rural residents to receive expert diagnosis and treatment from distant medical centers
8. Increases timeliness of treatment and decreases transfer rates while reducing medical costs through video technology
9. Supports real-time treatment by first responders through the use of wireless devices
10. Enhances senior wellness and preventative care through telemedicine and remote in-home monitoring

*Ten Benefits of Telemedicine*

*List Source: Business Wire. "10 Benefits of Telemedicine, eHealth and Health IT."*





## Case Studies

This section presents different case studies of telemedicine facilities and other facilities that are similar in size and program.

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## 2.1 | Case Study 1: Native American Health Care Center

### Oneida Community Health Center, Wisconsin

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View from the exterior

Image Source: <http://www.oneidanation.org/healthcenter/page.aspx?id=4766>

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### **OVERVIEW**

The Oneida Community Health Center in Wisconsin provides comprehensive outpatient and inpatient medical services to Indian people living on or near the Oneida Reservation. Care is provided by a staff of full-time physicians, nurse practitioners, physician assistants, registered nurses and ancillary health care providers.<sup>1</sup>

<sup>1</sup> Sovereign Oneida Nation of Wisconsin. "Oneida Community Health Center."



## **Facility History<sup>2</sup>**

Provision of health services began in a small suite of rooms with only eight employees: a director, a secretary, four community health representatives, a RN, and a LPN. They offered very limited services.

As the need for health services grew, they were able to move to a new location and add a small laboratory. The medical staff consisted of: volunteer doctors, nursing staff, alcohol and drug abuse counselors, and social workers. Dental services were provided by volunteer dentists from a neighboring city on weekend. Many of the specialist services were contracted out.

Due to increased growth, the Oneida Nation was able to build a Community Health Center in 1978. This facility served as the hub for health care services for the next 25 years until the facility was outgrown. They were then able to open the current ambulatory health clinic in 2002.

## **Location**

- Oneida, Wisconsin

## **Facility Size**

- Approx. 55,000 sf (Opened 2002)

## **Governing Entities<sup>3</sup>**

- Oneida Comprehensive Health Division
  - Combines four health programs within the Oneida Nation
- Indian Health Services & Indian Health Service Commission Corps
  - Provides for limited holistic health services

## **Services Offered<sup>3</sup>**

- Diagnosis
- Treatment
- Well child care
- Immunizations
- Family planning
- Minor surgical procedures
- Preventive care

## **Specialist Services<sup>3,\*</sup>**

- Internal Medicine
- Pediatrics
- Podiatry
- Obstetrics
- Gynecology
- ENT
- Urology
- Endocrinology
- Asthma and Immunology

<sup>2</sup> Oneida Comprehensive Health Division Patient Handbook

<sup>3</sup> Sovereign Oneida Nation of Wisconsin. "Oneida Community Health Center."

\* Note: Physicians are contracted to provide specialized services



Radiology Department

Image Source: <http://www.oneidanation.org/HealthCenter/page.aspx?id=4442>



Exam Room

Image Source: <http://www.uticaod.com/culture/x1531247482/Oneida-Nation-clinic-combines-modern-health-care-culture>



Dental Clinic

Image Source: <http://www.oneidanation.org/healthcenter/dental.aspx>



## 2.2 | Case Study 2: Large Clinic with Telemedicine

### La Clinica de la Raza, California

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La Clinica Monument (Concord, CA): View from the exterior - front entry way

Image Source: <http://www.roebbelen.com/la-clinica/>

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### OVERVIEW

La Clinica de La Raza (La Clinica) is a community based clinic and provides primary care and other specialist services to low income and medically underserved populations across the East Bay of Northern California. La Clinica has grown from a single storefront clinic in 1971 to one of the largest community-based clinic agencies, encompassing 26 service delivery sites in Alameda, Contra Costa, and Solano counties.<sup>4</sup>

<sup>4</sup> Duclos, Christine Ph.D, et al. "Telehealth in Community Clinics: Three Case Studies in Implementation."





### **Location**

- La Clinica de la Raza operates across the East Bay in Northern California
- Pictured facility is in Concord, California

### **Services Provided<sup>5</sup>**

- |                                  |                     |
|----------------------------------|---------------------|
| • Medical                        | • Adolescent Care   |
| • Dental                         | • Mental Health     |
| • Optical                        | • Behavioral Health |
| • Women's Health                 | • Case Management   |
| • Prenatal and Postnatal         | • Referral          |
| • Preventive Medicine            | • Pharmacy          |
| • Health and Nutrition Education | • Radiology         |
|                                  | • Laboratory        |

### **Telemedicine Program: Teledermatology<sup>5</sup>**

La Clinica addressed the implementation of a telemedicine program in 2007 to improve operational efficiency and access to health care.

The top three telehealth programs identified were:

- Health education
- Dental services
- Dermatology

Although health education and dental services were eliminated on the basis of low clinical importance (education) and complexity of implementation (dental), they were able to implement a telemedicine program for dermatology.

### **Funding<sup>5</sup>**

Funding to implement the pilot telehealth program was provided by a grant from:

- Californial HealthCare Foundation (CHCF)

La Clinica developed a budgeting model based on payer reimbursement for regular follow-up with primary care providers to keep the program sustainable after the end of CHCF funding terms.

### **Dermatology Service Contract<sup>5</sup>**

La Clinica was able to form a relationship with the University of California, San Francisco to provide teledermatology consultations. Method used:

- Store and Forward model
- In person follow up visits if required

<sup>5</sup> Duclos, Christine Ph.D., et al. "Telehealth in Community Clinics: Three Case Studies in Implementation."



La Clinica Monument (Concord, CA): View from the exterior  
Image Source: <http://www.roebbelen.com/la-clinica/>



La Clinica Monument (Concord, CA): Lobby/waiting room  
Image Source: <http://www.roebbelen.com/la-clinica/>



La Clinica Monument (Concord, CA): Dental examination room  
Image Source: <http://www.roebbelen.com/la-clinica/>



## 2.3 | Case Study 3: Small Rural Health Care Center

### Rural Health Care Center, India

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Exterior View

Image Source: <http://www.detail-online.com/daily/rural-health-care-centre-bangalore-india-by-flying-elephant-studio-6179/>

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### **OVERVIEW**

This health care center, designed by Flying Elephant Studios, addresses the multitude health care problems that exist in India with a level of architectural sophistication that can be studied and implemented in other countries.<sup>6</sup>

<sup>6</sup> Detail Daily. Rural Health Care Centre, Bangalore, India by Flying Elephant Studio.



## **Architect**

- Flying Elephant Studios

## **Location**

- Bangalore, India

## **Design Objectives**

The design of this building was conceived based on three primary objectives:

- Low Budget
- Economy of Operation
- Sustainability<sup>7</sup>

## **Impact of Budget<sup>8</sup>**

A compact footprint was required for this program because of the relatively low budget for the size and scale of the building.

The compact linear footprint proved to be beneficial in terms of allowing better daylighting into the building and cross ventilation.

## **Economy of Operation**

The clinic consists of two exam/hospital bed areas that can support four beds, a physicians office, a business office, and other supporting functions. The core clinic program spaces are located within the interior building with circulation and waiting area located around the building core in outdoor spaces.

## **Sustainability**

Sustainability was one of the primary objectives of this design. As a result, the building relies on passive systems to regulate the internal environment and incorporates several sustainable strategies:

- Double skin system to shade the building core
- Natural cross ventilation
- Water catchment system
- Uses locally available materials<sup>7</sup>

## **Cultural Sensitivity**

The building uses local, vernacular materials in order to give it a sense of identity within the community.<sup>9</sup>

<sup>7</sup> List Source: Detail Daily. Rural Health Care Centre, Bangalore, India by Flying Elephant Studio.

<sup>8</sup> Flying Elephant Studio. Projects: Healthcare Centre.

<sup>9</sup> Detail Daily. Rural Health Care Centre, Bangalore, India by Flying Elephant Studio.



Front entry way

Image Source: <http://www.detail-online.com/daily/rural-health-care-centre-bangalore-india-by-flying-elephant-studio-6179/>



Architectural details

Image Source: <http://www.detail-online.com/daily/rural-health-care-centre-bangalore-india-by-flying-elephant-studio-6179/>



View of the outdoor walkway between building and outer skin

Image Source: <http://www.detail-online.com/daily/rural-health-care-centre-bangalore-india-by-flying-elephant-studio-6179/>







## Prototypes

Basic Design Prototypes for  
Telemedicine and Telehealth Facilities

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## 3.1 | Section Overview

### **POSSIBILITIES**

The nature of the Telehealth design model allows for a vast variety of layouts, from a minimal stand-alone telemedicine clinic that can be inserted almost anywhere in a community to a telemedicine facility with standard medical examination capacities and Telehealth/TeleEducation components for community education and advancing community health programs.

This section shows the potential of this design model by highlighting a few prototypes of minimum requirements that are possible across this range.

### **METHODOLOGY**

Each prototype is described with the following information:

- Its potential application in the community
- Minimum spaces/rooms required are described and annotated as needed
- Minimum equipment for each space/room listed and referenced to Prototype plan
- Basic design issues and impact on site and community
- Prototype plans
- Prototype area analysis

Plans are design to convey the following:

- Basic minimum prototype layout
- General space/room relationships
- Minimum equipment required per space/room annotated and referenced to the list in description
- Dimensions in feet indicate each space/room's minimum practical dimensions
- Space/Room relationships, equipment, area and facility design will change after completion of Design Program and initiation of the Design Phase

Area Analysis includes the following:

- Net area (interior area) of all space/rooms
- Total facility net area (square feet)
- Grossing factor range (percentage used to determine approximate gross area)
- Gross area range for the Prototype incorporating minimum required space/rooms and equipment.



## 3.2 | Prototype 1: Basic

### **LAYOUT**

Prototype 1 is a minimal Telemedicine Clinic designed to fit within a small budget and to work in collaboration with either an existing medical clinic or to work as an advanced option for remote communities or under-served communities. Showcasing only the most needed elements, it serves to show how easy and possible it would be to add a Telemedicine clinic to any community.

### **Spaces/Rooms**

- Telemedicine Clinic with integral Medical Professional Station
- Main Entry and Waiting Room
- Toilet and Lavatory with Janitorial Supply Closet (Alternate: if retrofitting existing facility, the existing Toilets and Lavatory would be utilized as long as code requirements are met)

### **Space/Room Equipment**

#### *Examination Room*

- A. Gurney/Examination Table
- B. Mobile Telemedicine Unit
- C. Patient Interview Table and Chair
- D. Medical Professional Workstation and Storage
- E. Medical Storage/Cart
- F. Auxiliary Seating

#### *Restroom/Storage*

- G. Accessible toilet with grab bars
- H. Accessible lavatory, mirror, and soap dispenser
- I. Locking janitorial storage cabinet
- J. Water heater

#### *Waiting Room*

- K. Seating for two occupants
- L. Table

### **DESIGN**

Prototype 1 has the potential to either be a stand-alone clinic, a clinic retrofitted to any existing building or complementary to an existing Medical Facility.

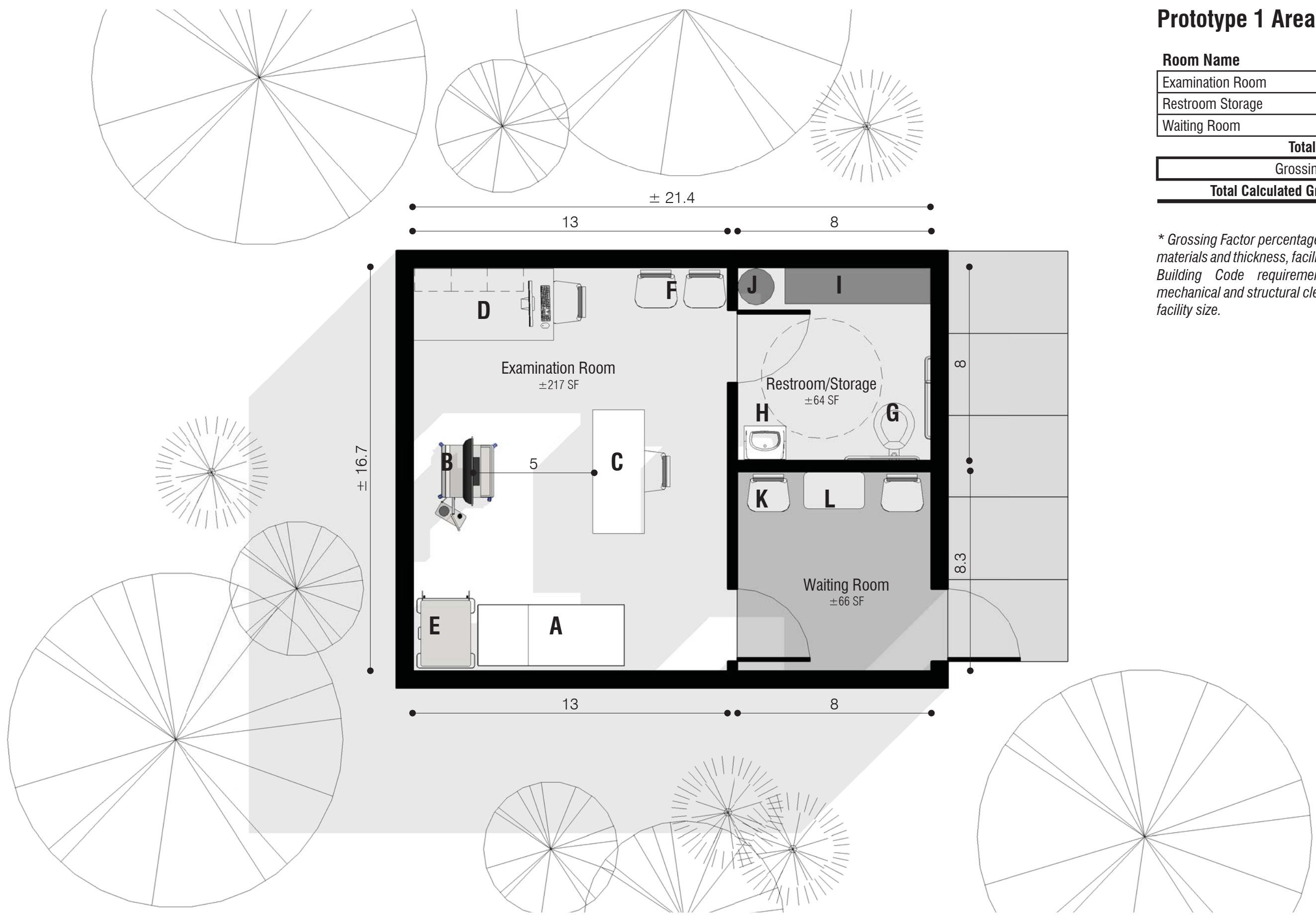
As a stand-alone facility, the footprint is extremely small allowing it to share space with an existing building on its site as a satellite or to be accommodated on any small undeveloped site within the community. As it is intended to be a Telemedicine only facility, parking requirements would be minimal, requiring parking for the current patient, a waiting patient, and the medical professional(s). Site sanitation needs and noise impact would be extremely small.

Retrofitting this prototype into an existing building would require that the appropriate space relationships are maintained, that the Examination Room maintains auditory privacy, and the Clinic itself is physically securable within the parent facility.

For addition to an existing Medical Facility, verification would be required to ensure that the parent facility can accommodate the extra burden on its electrical, mechanical and structural capabilities and that any extra load on its physical capabilities, including toilet capacity and parking, are acceptable and within the limits established by local Building Codes.

As long as the prior parameters are met, the Waiting Room and the Restroom can be eliminated for Prototype 1.





# Prototype 1 Area Analysis

Room Name	Net Area
Examination Room	220SF
Restroom Storage	64SF
Waiting Room	66SF
<b>Total Net Area</b>	<b>350SF</b>
Grossing Factor*	1.3-1.5
<b>Total Calculated Gross Area</b>	<b>455-675SF</b>

\* Grossing Factor percentage range accounts for wall materials and thickness, facility climatic requirements, Building Code requirements, circulation areas, mechanical and structural clearances and spaces and facility size.



### 3.3 | Prototype 2: Multiuse

#### LAYOUT

Prototype 2 is a stand-alone Telemedicine Clinic designed to fit within any community and to be used for both Telemedicine needs and standard medical uses. Multiple uses allow the facility to be more economically practical for a community and to be more functional than with just one use.

#### Spaces/Rooms

- Examination Room with Telemedicine capabilities and direct access to Restroom
- Reception Room with file storage
- Main Waiting Room with access to Restroom
- Accessible Restroom
- Maintenance Closet/Linen Storage
- Medical Professional Office with direct access to Examination Room and integrated separate Pharmaceutical Dispensary Room

#### Space/Room Equipment

##### *Examination room*

- A. Gurney/Examination table
- B. Mobile Telemedicine Unit
- C. Patient interview table and chair
- D. Storage cabinets and counter top
- E. Auxiliary seating

##### *Medical Professional Office*

- F. Workstation
- G. Secured medical storage

##### *Secured Pharmaceutical Dispensary Room*

- H. Automated Pharmaceutical Dispensary or Secured Pharmaceutical Dispensary Cabinet
- I. File Cabinet and/or computer terminal if needed

##### *Storage Room*

- J. Soiled/clean linen storage
- K. Janitorial cleaning supplies storage
- L. Water heater

##### *Restroom*

- M. Accessible toilet with grab bars
- N. Accessible lavatory, mirror, and soap dispenser

##### *Waiting Room*

- O. Seating for two+ occupants
- P. Table

##### *Reception*

- Q. Desk/Work station
- R. Computer terminal
- S. File cabinets
- T. Secured storage

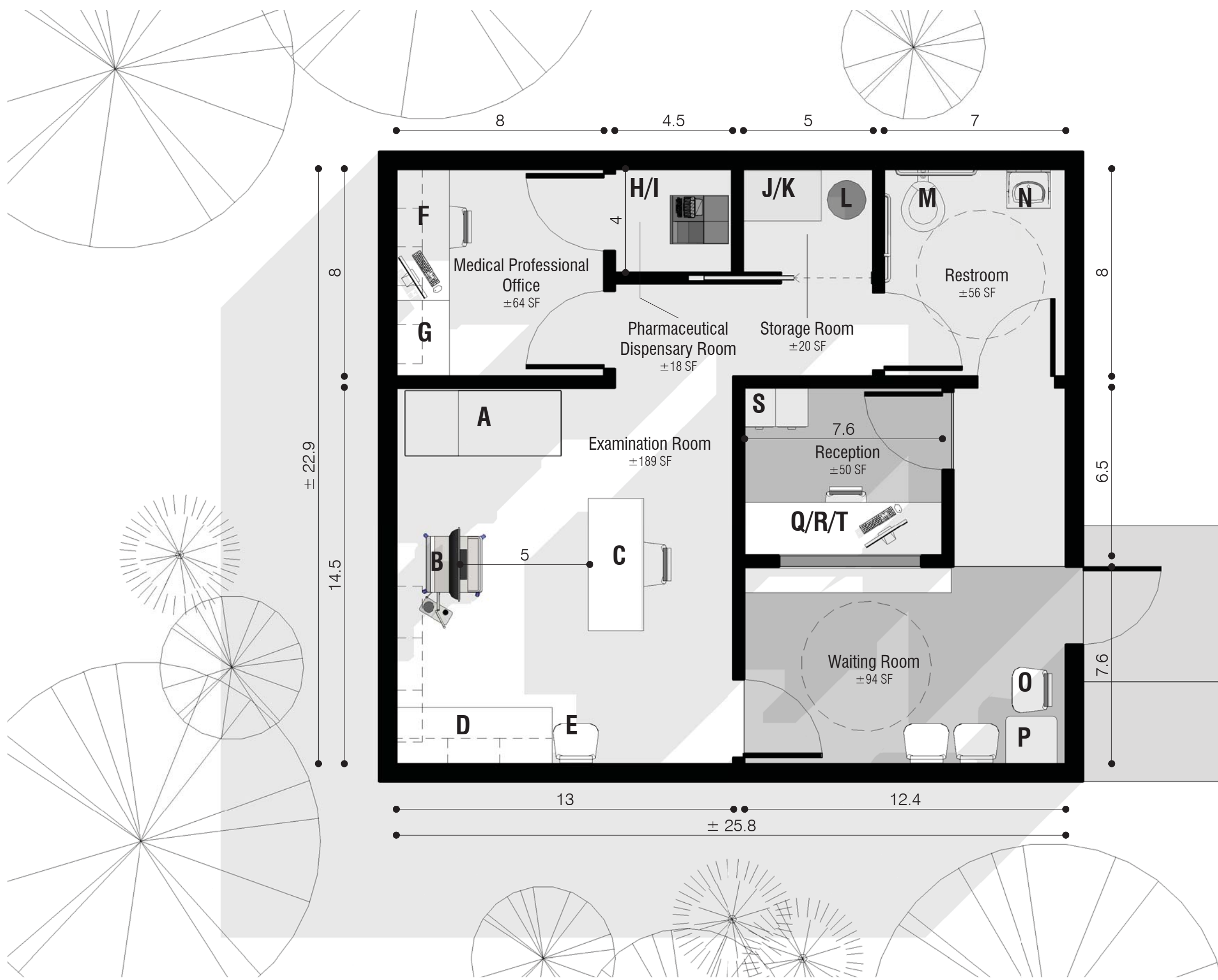
#### DESIGN

Prototype 2 has the potential to either be a stand-alone clinic or to be retrofitted to an existing building.

As a stand-alone, the footprint is small which would lead to a low site impact. Minimal parking, site sanitation needs, and noise impact would make it feasible in a variety of locations within a community.

Retrofitting this prototype into an existing building would require that the appropriate relationships are maintained, as well as ensuring that the main Examination Room has aural privacy, and the Medical Professional Office and the Pharmaceutical Dispensary Room are physically secure.





## Prototype 2 Area Analysis

Room Name	Net Area
Examination Room	190SF
Medical Professional Office	64SF
Pharmaceutical Dispensary Room	18SF
Storage Room	20SF
Restroom	56SF
Reception	50SF
Waiting Room	94SF
<b>Total Net Area</b>	<b>492SF</b>
Grossing Factor*	1.5-1.75
<b>Total Calculated Gross Area</b>	<b>740-860SF</b>

\* Grossing Factor percentage range accounts for wall materials and thickness, facility climatic requirements, Building Code requirements, circulation areas, mechanical and structural clearances and spaces and facility size.



3.4 | Prototype 3: Telemedicine + Telehealth

LAYOUT

Prototype 3 is similar to the multiuse Prototype 2 but with the addition of a Telehealth/TeleEducation Room. This combination of a Telemedicine Facility with Telehealth/TeleEducation capacity can help a community organize beneficial health programs without leaving their community as well as creating an adaptable informal gathering place for other community uses.

Spaces/Rooms

- Examination Room with Telemedicine capabilities, medical workstation and direct access to Restroom
- Reception Room with file storage
- Main Waiting area with access to restroom
- Multiple Accessible Restrooms
- Multiple storage areas for medical, janitorial and other supplies
- Medical Professional Office with an integrated secure Pharmaceutical Dispensary Room and direct access to Examination Room
- Telehealth Room with extra chair/table storage

Space/Room Equipment

Examination room

- A. Gurney/Examination table
- B. Mobile Telemedicine Unit
- C. Patient interview table and chair
- D. Medical workstation with computer
- E. Medical storage/cart
- F. Auxiliary seating

Medical Professional Office

- G. Workstation
- H. Secured medical storage

Secured Pharmaceutical Dispensary Room

- I. Automated Pharmaceutical Dispensary or Secured Pharmaceutical Dispensary Cabinet
- J. File cabinet and/or computer terminal if needed

Restroom(s)

- K. Accessible toilet with grab bars
- L. Accessible lavatory, mirror, and soap dispenser
- M. Soiled/Clean linen storage
- N. Water heater
- O. Janitorial cleaning supplies storage

Waiting Room

- P. Seating for 2+ occupants
- Q. Table

Reception

- R. Desk/Work station
- S. Computer terminal
- T. File cabinets
- U. Secured storage

Telehealth Room

- V. Seating for 16
- W. Monitor and sound system connected to Telemedicine/Telehealth Network

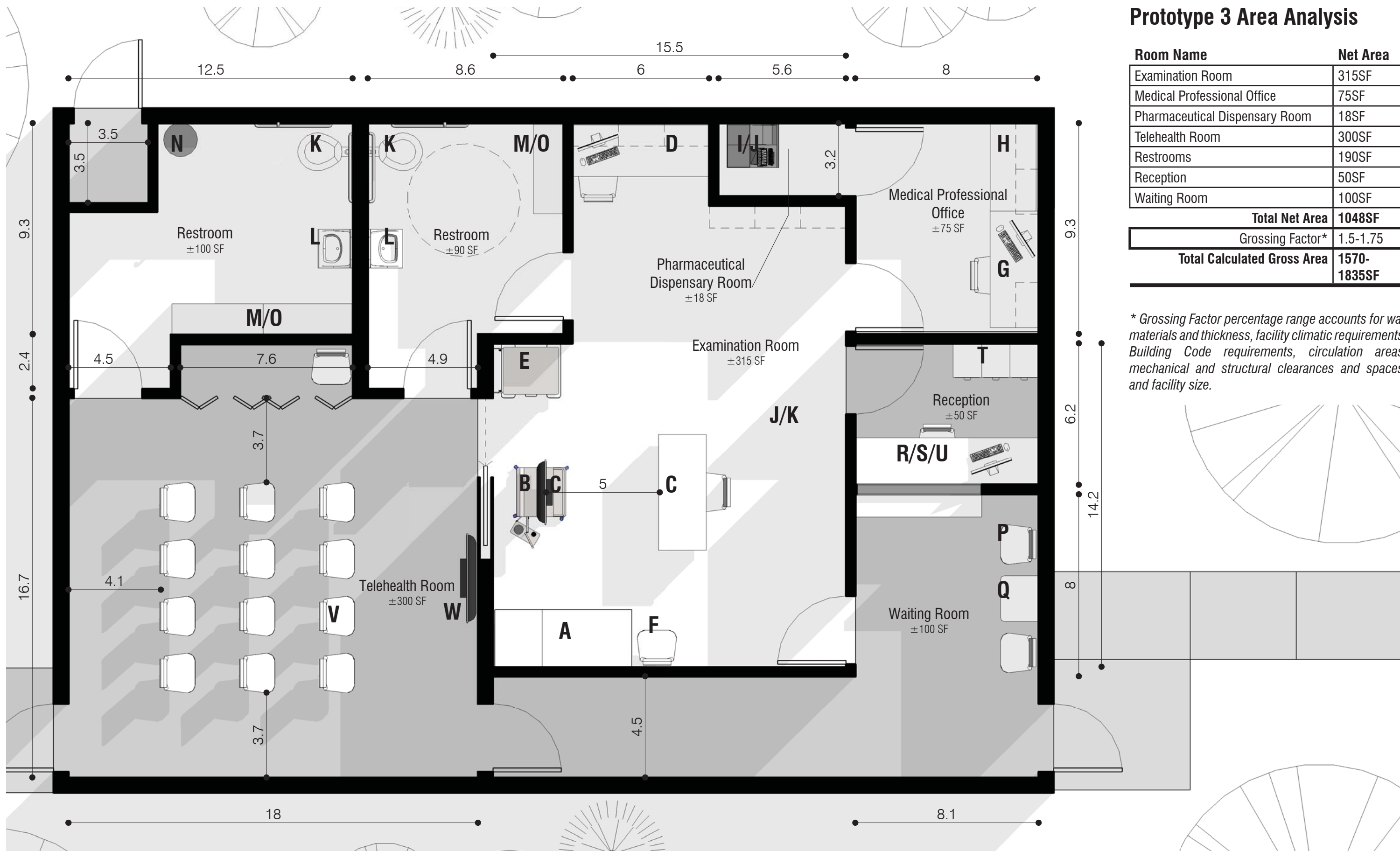
DESIGN

Prototype 3 has the potential to be a Telemedicine clinic and a standard medical clinic as well as a community education facility and a gathering place for community events. Separation between these two programmed uses allow either use to occur without interrupting the other.

Securable medical facilities allow the education areas to be used during off-hours, which could potentially increase sources of revenue through rental of those spaces to other users.

Due to its large capacity, there is the possibility that fire sprinklers would be needed to be Local Building Code compliant. Sanitation capacity and storage and adequate Local Building Code compliant parking would also be needed with this prototype.

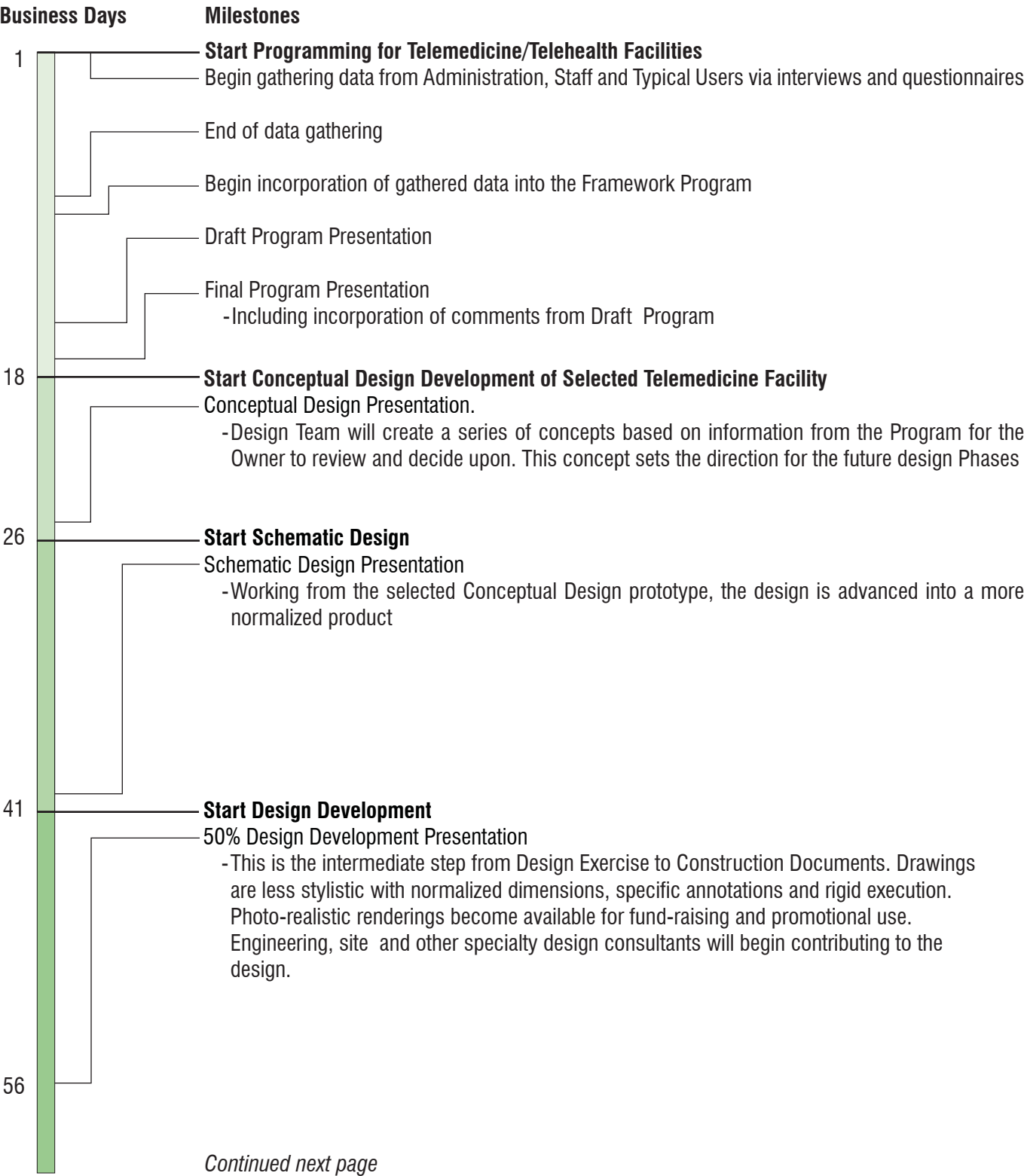


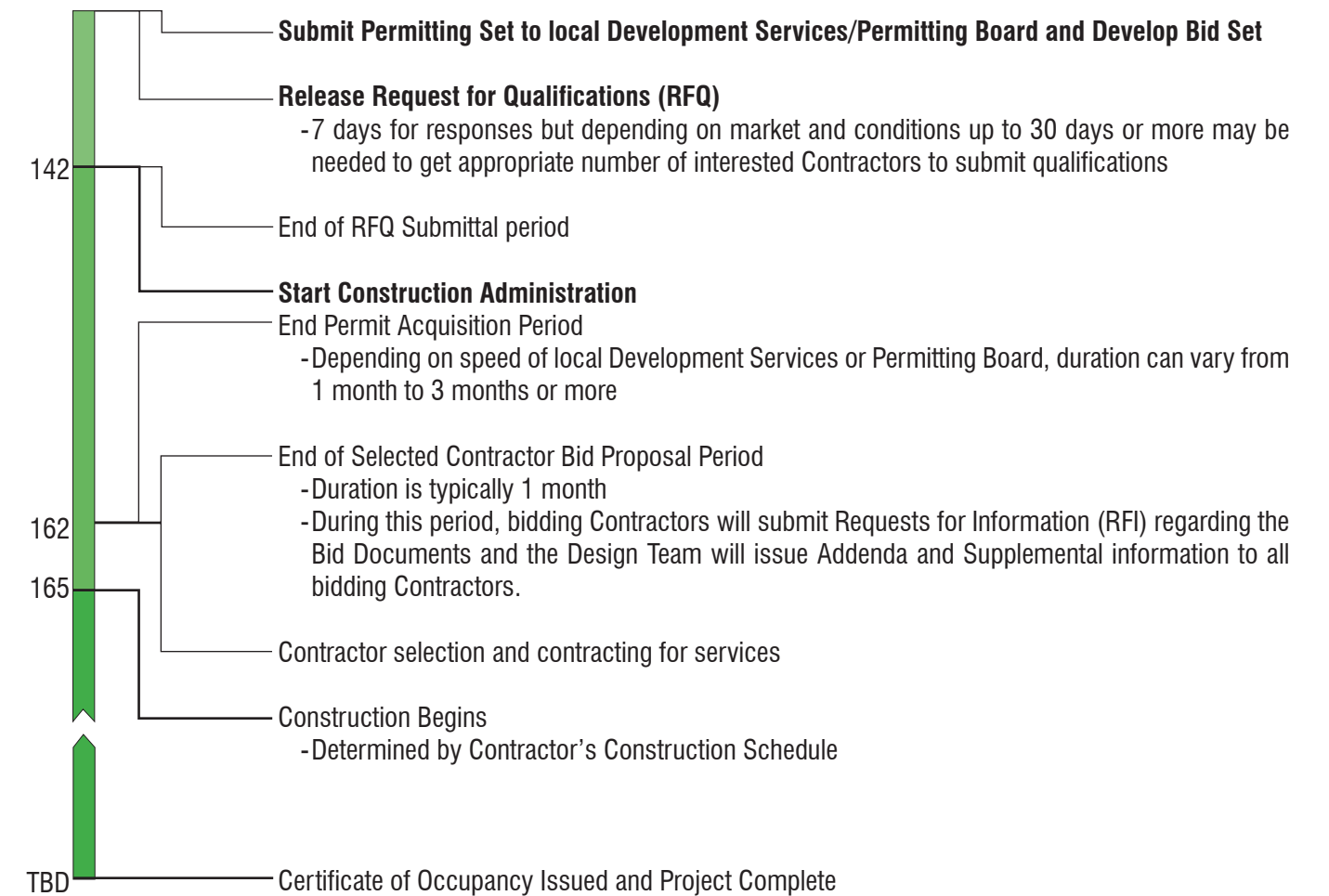
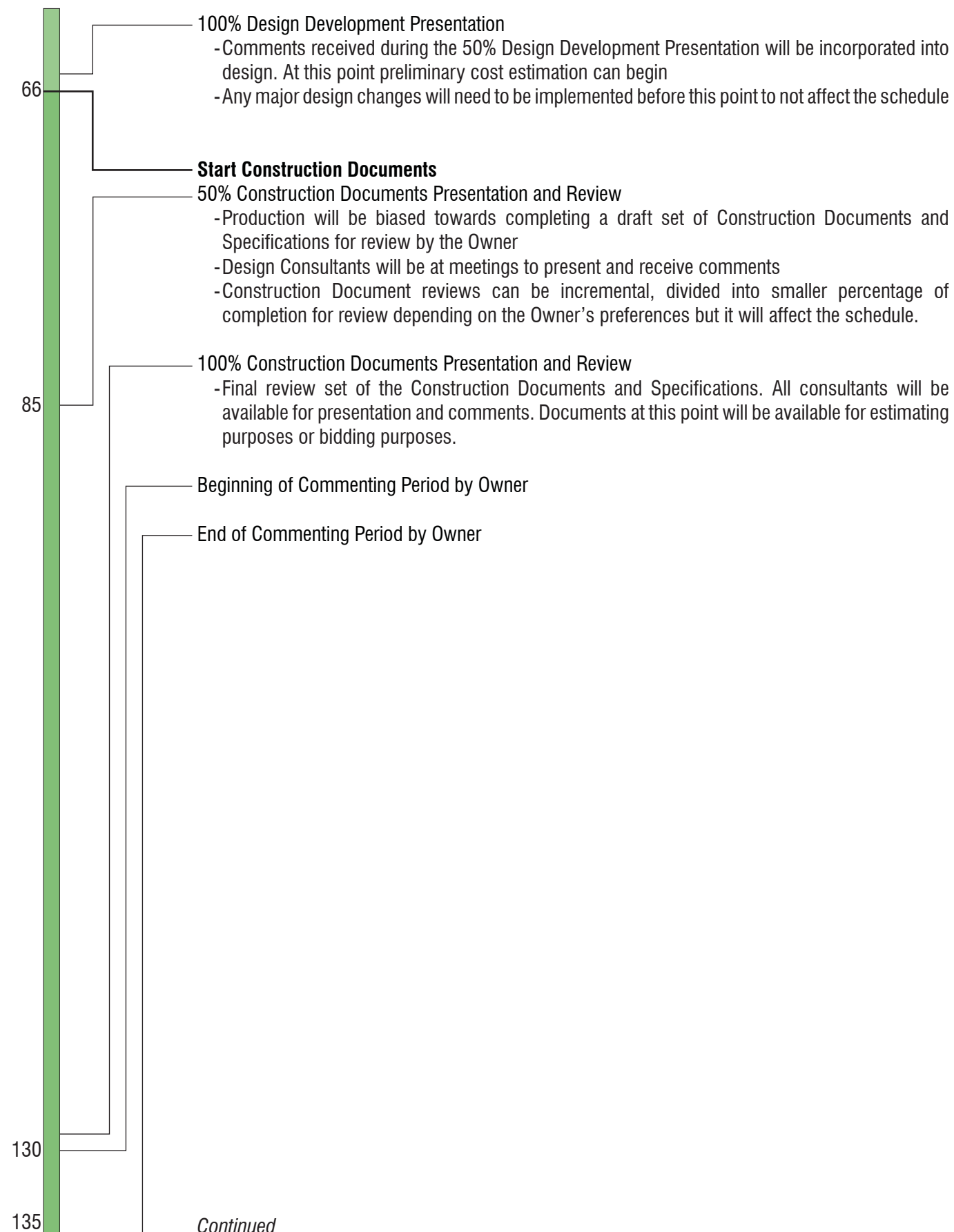




3.5 | Typical Design Timeline

This timeline represents the steps to move forward, beginning with gathering data to be inserted into the Framework Program to the start of Construction. It is represented graphically on the left with a bar indicating business days from start of project and on the right with text referring to Phases, major milestones, and important meetings and presentations.







# Appendix

## 4

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## Appendix

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## 4.1 | Resources

### 1 | TELEMEDICINE

#### 1.1 | **About Telemedicine and Telehealth**

HealthIT.gov. *What is telehealth? How is telehealth different from telemedicine?* n.d. June 2013. <<http://www.healthit.gov/providers-professionals/faqs/what-telehealth-how-telehealth-different-telemedicine>>.

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U.S. Department of Health and Human Services. *Telehealth*. n.d. June 2013. <<http://www.hrsa.gov/ruralhealth/about/telehealth/telehealth.html>>.

#### 1.2 | **Benefits of Telemedicine**

Britain, Catherine, John Irwin and Erwin Parker. *"Benefits of Telemedicine."* Telehealth Alliance of Oregon, 2007. May 2013. <<http://www.jirwinconsulting.com/Benefits%20of%20Telemedicine.pdf>>.

Norris, Thomas E., MD, et al. *"Low-Bandwidth, Low-Cost Telemedicine Consultations in Rural Family Practice."* Journal of the American Board of Family Practice 15.2 (2002): 123-127. June 2013. <<http://www.jabfm.com/content/15/2/123.full.pdf>>.

Whiteacre, Brian, et al. *"Evaluating the Economic Impact of Telemedicine in a Rural Community."* Oklahoma State University, n.d. May 2013. <<http://pods.dasnr.okstate.edu/docshare/dsweb/Get/Document-4993/AGEC-1007web.pdf>>.

#### 1.3 | **Types of Telemedicine and Services**

Digitome. *Remote Patient Monitoring*. 2011. June 2013. <<http://digito.me/remote-patient/monitoring-2/>>.

Downey, Roger. *Types of Telemedicine*. 28 July 2012. June 2013. <<http://healthworkscollective.com/rdowney14/41206/types-telemedicine>>.

Telehealth Resource Centers. *Types of Telemedicine Specialty Consultation Services*. n.d. June 2013. <<http://www.telehealthresourcecenter.org/toolbox-module/types-telemedicine-specialty-consultation-services>>.

Ward, Jesse. *Telemedicine: Remote Patient Monitoring*. 28 September 2011. June 2013. <<http://www.ntca.org/new-edge/epapers/telemedicine-remote-patient-monitoring>>.

*What is Telehealth?* n.d. May 2013. <<http://cchpca.org/what-is-telehealth>>.

Whiteacre, Brian, et al. *"Evaluating the Economic Impact of Telemedicine in a Rural Community."* Oklahoma State University, n.d. May 2013. <<http://pods.dasnr.okstate.edu/docshare/dsweb/Get/Document-4993/AGEC-1007web.pdf>>.



## 1.4 | Communities that Benefit Most

Arizona Department of Health Services. *Shortage Designation Program: Federal Medically Underserved Areas/Populations (MUA/P)*. n.d. May 2013. <<http://www.azdhs.gov/hsd/shortage/muap.htm>>.

Business Wire. *10 Benefits of Telemedicine, eHealth and Health IT*. July 2011. June 2013. <<http://www.businesswire.com/news/home/20110728006848/en/10-Benefits-Telemedicine-eHealth-Health>>.

Monk, David H. *Recruiting and Retaining High-Quality Teachers in Rural Areas*. 2007. 22 May 2013. <[http://futureofchildren.org/futureofchildren/publications/docs/17\\_01\\_08.pdf](http://futureofchildren.org/futureofchildren/publications/docs/17_01_08.pdf)>.

Montana Primary Care Association, Inc. *MPCA*. n.d. May 2013. <<http://www.mtpca.org/bphc-gl.htm>>

National. *"Towards a Remote Communities Investment Strategy for Canada: Shaping Economic Growth in Canada's Remote Communities."* n.d. Cleantech Community Gateway. May 2013. <[http://http://ctcg.org/wp-content/uploads/2013/03/ge\\_canada-full\\_report-remote\\_communities-en.pdf](http://http://ctcg.org/wp-content/uploads/2013/03/ge_canada-full_report-remote_communities-en.pdf)>.

Stanford School of Medicine. *Healthcare Disparities & Barriers to Healthcare*. n.d. June 2013. <<http://ruralhealth.stanford.edu/health-pros/factsheets/disparities-barriers.html>>.

## 2 | CASE STUDIES

### 2.1 | Case Study 1

Oneida Comprehensive Health Division. *"Oneida Comprehensive Health Division Patient Handbook."* August 2010. Sovereign Oneida Nation of Wisconsin. June 2013. <<http://www.oneidanation.org/uploadedFiles/OCHD%20patient%20handbook%20-%20FINAL%20-%20Printed%20August%202010.pdf>>.

Sovereign Oneida Nation of Wisconsin. *Oneida Community Health Center*. n.d. June 2013. <<http://www.oneidanation.org/healthcenter/page.aspx?id=4766>>.

### 2.2 | Case Study 2

Duclos, Christine Ph.D, M.P.H, Julie M., M.A., M.P.H. Hook and Michael P., M.A. Rodriguez. *"Telehealth in Community Clinics: Three Case Studies in Implementation."* 2010. June 2013. <<http://www.chcf.org/~media/MEDIA%20LIBRARY%20Files/PDF/T/PDF%20TelehealthClinicCaseStudies.pdf>>.

### 2.3 | Case Study 3

Detail Daily. *Rural Health Care Centre, Bangalore, India by Flying Elephant Studio*. 20 August 2012. June 2013. <<http://www.detail-online.com/daily/rural-health-care-centre-bangalore-india-by-flying-elephant-studio-6179/>>.

Flying Elephant Studio. *Projects: Healthcare Centre*. n.d. June 2013. <<http://www.flyingelephant.in/complete.php?pid=6>>.



