A HEALTH CITY IS A CITY WITH CUTTING-EDGE HEALTH SCIENCE DEVELOPMENT
QUALITY AFFORDABLE HEALTHY LIFESTYLE
A HEALTH CITY IS A CITY PROVIDING MEDICAL THERAPY
REHABILITATION

CHICAGO LAKE SIDE HEALTH CITY
CONFERENCE CENTRE
1. URBAN STRATEGY
   - south works site
   - industrial history
   - neighbourhood analysis
   - healthcare industry: background research
   - the concept of the health city
   - health science campus

2. THE SITE
   - site conditions
   - the ore walls: adaptive reuse
   - the typology of the green spaces
   - functional masterplan
   - conference centre - the functional link
   - chosen location for the building
   - transport accessibility

3. DESIGN CONCEPT
   - the city between the walls
   - spatial concept
   - routing concept
   - exploded view diagram
   - structural concept
   - climate concept
   - general view

4. FUNCTIONAL PROGRAMME
   - programme bar
   - space organisation
   - plans
   - general plan

5. MATERIALISATION
   - materials
   - references
   - facades / sections
   - details

6. CONCLUSION
   - graduation report
   - exterior view
   - interior views
South Chicago - a chevron-shaped community is one of Chicago's 16 lakefront neighborhoods near the southern rim of Lake Michigan 10 miles south of downtown. A working-class neighborhood, it is bordered by East 79th Street on the north, South Chicago Avenue (the Chicago Skyway) on the southwest, a small stretch of East 95th Street on the south.

Originally the site of U.S. Steel's South Works, was first opened in 1882 as the North Chicago Railway Mill Company. Since then the site went through several name changes before becoming the U.S. Steel South Works. The neighborhood around the factory, South Chicago, was filled with immigrants of all types who came to the area for the well-paying jobs at the mill. In the 1970s The South Works began a long period of downsizing, before its final closure on 1992. Since then the site has been inactive. Several proposals have been introduced, but the basic idea remains, a mixture of industrial, commercial and residential with new parkland along the lakefront. The most important attempt however, was made in 2010, designed by Skidmore Owings & Merrill LLP (SOM). The masterplan includes a mix of proposed uses, including over 15,000 residential units and more than 15 million sq. feet of retail, restaurants, commercial, institutional and research and development facilities. The site is near 2.8 sq. kilometers and is surrounded by 79th Street on the north and the Calumet River on the south. It extends to Burley Street and Green Bay Avenue on the west and Lake Michigan on the east. It is located 15 miles south of the Loop and 10 from west from the Midway International Airport.
South Chicago (Chicago, Illinois) neighborhood has faced a serious decline in the recent years. It is evident in the number of vacant properties. The analysis of the area indicated the increase of racial segregation and community area decline after the closing-down of the steel industry in 1992. The unemployment that followed resulted in decreasing population, vacant properties, poor quality of life, low incomes, bank foreclosures, increasing number of ethnic minorities and soon enough led to the growing crime rates and gang activity boom.

The Chicago Department of Public Health has created a new public health agenda with an ambitious sense of purpose for Chicago – an agenda that engages our city with bold action and goal-driven results.

The strategies within each property area call for action in one of three areas:

- Policies, including regulatory changes and law
- Programs and services
- Education and public awareness

Source: Healthy Chicago Annual Report Feb’14 2013

THE PLAN FOR ECONOMIC GROWTH AND JOBS, 2012

Support entrepreneurship and foster innovation in mature and emerging sectors. We should build on recent entrepreneurial momentum by expanding the networks that connect entrepreneurs with customers, venture capital, and mentorship opportunities. We should implement new, targeted initiatives focused on promising clusters. And we should facilitate stronger connections between academic research and private industry to promote higher rates of innovation in our firms and to increase industry-driven research, development and commercialization at universities.

The strategies within each property area call for action in one of three areas:

- Education and public awareness
- Programs and services
- Policies, including regulatory changes and law
1. URBAN STRATEGY

1. URBAN STRATEGY

HEALTH CITY DEVELOPMENT

HEALTH CITY

HEALTH CITY PRINCIPLES

DEFINITION OF A HEALTH CITY

HEALTH SCIENCE RELATED

HEALTHY LIFESTYLE RELATED

BOTH

WHAT'S A HEALTH CITY?

AMPLE HEALTH-RELATED SERVICE INDUSTRY

CUTTING EDGE MEDICAL TECHNOLOGY

ADVANCED PATIENT CARE SERVICES

HEALTHY FOOD

ENVIRONMENTAL QUALITY

ACTIVITY & SPORTS SPACE

PUBLIC TRANSPORT & ACTIVE TRANSPORTATION

QUALITY AFFORDABLE HOUSING

ECONOMIC OPPORTUNITY

HEALTHY LIFESTYLE

HEALTHY FOOD

WALKING & BIKING

PUBLIC TRANSPORT & ACTIVE TRANSPORTATION

QUALITY AFFORDABLE HOUSING

ECONOMIC OPPORTUNITY

HEALTHY FOOD

WALKING & BIKING

PUBLIC TRANSPORT & ACTIVE TRANSPORTATION

QUALITY AFFORDABLE HOUSING

ECONOMIC OPPORTUNITY

HEALTHY FOOD

WALKING & BIKING

PUBLIC TRANSPORT & ACTIVE TRANSPORTATION

QUALITY AFFORDABLE HOUSING

ECONOMIC OPPORTUNITY

HEALTHY FOOD

WALKING & BIKING

PUBLIC TRANSPORT & ACTIVE TRANSPORTATION

QUALITY AFFORDABLE HOUSING

ECONOMIC OPPORTUNITY

HEALTHY FOOD

WALKING & BIKING

PUBLIC TRANSPORT & ACTIVE TRANSPORTATION

QUALITY AFFORDABLE HOUSING

ECONOMIC OPPORTUNITY
1. URBAN STRATEGY

- GENERAL HOSPITAL
- CHILDREN'S HOSPITAL
- REHABILITATION CENTRE
- OUTPATIENT SERVICES

- PHARMACEUTICAL COMPANIES
- RESEARCH FOUNDATIONS
- STARTUP COMPANIES

- RETAIL
- FOOD SERVICES
- HOTELS
- CULTURAL FACILITIES
- CONFERENCE CENTRE

FUNCTIONAL MASTERPLAN: HEALTH SCIENCE CAMPUS

EXPANSION OF EDUCATION ZONE MIXED WITH HEALTH RELATED BUSINESS AND CONTINUE TO GROW INTO NEW COMMUNITIES ALONG THE N-S AXIS.

- MEDICAL UNIVERSITY
- LIBRARY & MEDIATHEQUE
- COMMUNITY LEARNING CENTRE

- MEDICAL SERVICES
- RESEARCH
- BUSINESS
- PUBLIC SERVICES
- MEDICAL SERVICES
- RESEARCH

HEALTH CITY STRUCTURE

- PATIENT CARE
- PUBLIC SPACE
- RESEARCH, MEDICAL SCHOOL
- RESEARCH & EDUCATION CLUSTER
- HEALTHY LIFESTYLE COMMUNITY
Residential Communities, Focused on Healthy Living

Healthy Living Environment

Functional Support

Green Spaces Availability

Efficient and Environmentally Friendly Public Transportation

Walkability

Recreation & Sports Spaces

Qualitative, Sustainable & Affordable Housing

Ideal Circle Definition

Radius: 400m - based on walkability and the ideal environment for one to spend an entire life

Circle area: 500,000m²

Density: 24,000 p/km²

Circle population: 12,000

Statistics per Circle

<table>
<thead>
<tr>
<th>Type</th>
<th>Provision (ha x people)</th>
<th>Number per circle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic</td>
<td>9000-12000</td>
<td>1</td>
</tr>
<tr>
<td>Doctor</td>
<td>2500-3000</td>
<td>5</td>
</tr>
<tr>
<td>Sports facility</td>
<td>4000-7000</td>
<td>2</td>
</tr>
<tr>
<td>Health food shop</td>
<td>2000-5000</td>
<td>3</td>
</tr>
<tr>
<td>Park</td>
<td>1-4ha per circle</td>
<td>1</td>
</tr>
</tbody>
</table>
"The best way to conserve a heritage building, structure or site is to use it ... Adaptation links the past to the present and projects into the future."

After the steel plant was shut down, all the traces of an industrial past were destroyed, except the 4 massive structures of the ore walls. Being out of use for more than 20 years, the walls became a part of the landscape – the distinctive feature of the site.

I believe that the ore walls could become the link between the past and the present, as well as the linking element of the campus. However they are valuable not as a monument, but as a significant part of the landscape. Constructed as essential functional elements in the process of transporting and sorting the iron ore, the walls were made to work. And the best way to conserve them will be to use them. I see the future of these elements of industrial history in the adaptive reuse. The new function will bring a great potential for creating a new space through the interpretation of industrial heritage.
2. THE SITE

CONFEREENCE CENTRE - THE FUNCTIONAL LINK

- MEDICAL SCHOOL
- HEALTH RELATED BUSINESS
- RESEARCH LABS
- COMMUNITY

CONFERENCE HALL
- LECTURE ROOMS
- MEETING ROOMS
- EXHIBITION HALL
- RECEPTION HALL

FUNCTIONAL MASTERPLAN

- RESTAURANT
- CAFES
- RETAIL
- PUBLIC AREAS
- EXHIBITION AREAS

LOCATION OF THE CONFERENCE CENTRE

CONFERENCE CENTRE - THE FUNCTIONAL LINK

TRANSPORT SCHEME
THE CITY BETWEEN THE WALLS

The initial idea was to design a space for collaboration and communication within the ore walls, that will link together different functions and people, serving as a public center of the campus.

Inspired by the concept of a street as an ideal public space, I tried to create a “conference city”, extended along the public route.

A street is a mirror of the city, projecting the main events, traditions and activities. Street is a connector between different functions and an important public space for socializing, entertainment, commerce and civic expression as well.
In order to separate the flows of people, the public route passing through the building is elevated above the ground level, while the conference facilities are connected by the network of passages on the ground floor.
3. DESIGN CONCEPT

Pitched silhouette of the roof structure, refers to the typologies of industrial buildings, connecting the building to the site (former steel plant) and the ore walls.

- Steel portal frames are positioned with a step of 2 meters
- Tension cables are bracing the frames into a single structural system
- Cable net facade structure: the glass is supported by the prestressed steel cables

THE ORE WALLS ARE INTEGRATED INTO THE BUILDING IN DIFFERENT WAYS:
- DIRECTING ELEMENT IN THE CAMPUS
- AN INTEGRAL PART OF THE INTERIOR
- A BASE OF THE STRUCTURAL SYSTEM OF THE ENVELOPE

Structural section fragment

Inventory of steel frame types

Monolith concrete setting plate, bracing the vertical elements on the ground level
The location and the orientation of the building establish the foundation of the climate scheme of the building, as well as the volumetric features.

- adjacent to the water - geothermal energy
- north-south orientation - solar energy on the south facade, shaded north facade
- large roof area - solar energy/heat recovery
- overheating - shading/cooling required
- large interior volume - heating/ventilation required

**MEASURES AND GOALS FOR ENERGY-EFFICIENT OPTIMISATION OF THE BUILDING ENVELOPE**

- Thermal insulation of the building components
- Passive use of solar radiation (thermal mass)
- Active solar thermal energy gains (solar collectors)
- Minimising ventilation heat losses (controlled system with heat recovery and internal heat exchanger)
- Waste heat recovery (expelled air, waste water)
- Ambient heat sources (soil, groundwater or surface)
- Seasonal heat storage
- Reducing the heat transfer (double glazing, cold bridges)
- Reducing the incoming solar radiation (sunshading, low-e glazing)
- Thermal mass and ventilation (stored thermal energy use, pre-cooled incoming air)
- Using the surface water for cooling (heat sink concept)
- Decentralised ventilation
- Separate ventilation zones (public space, meeting rooms, auditorium)
- Natural ventilation possibility (separate enclosed spaces)
- Mechanical ventilation units with a controlled supply/exact system
- Geometric optimisation (distribution of spaces according to daylight requirements)
- Daylighting systems (glass surfaces, shading)
- Photovoltaic panels integrated in the building envelope (roof panels, glass-integrated PV cells, solar louvres)
- Electricity from waste heat/solar energy
4. FUNCTIONAL PROGRAMME

Plan 2 floor
ORE WALLS TEXTURE

The ore walls have a unique original rough texture, that will be revealed through in the interior and exterior of the building. Acting on the contrast to the clean articulated surfaces of the inner volumes and sleek glass roof and facades, the texture of the walls will hold strong association with industrial heritage.

INTERIOR SURFACES

Contemporary technology provides a wide range of solutions for interior surfaces from the concrete. Moulding technics makes it possible to develop facade panels based on any patterns. Fibre reinforced concrete is ideal for elaborate perforated panels.

EXTERIOR ENVELOPE

The reflecting glass roof and facade surface will provide necessary daylight and create the feeling of bright and sunny interior street.
**7. CONCLUSION**

The site represents a very interesting location in terms of natural conditions and existing assets. The site occupies the lakefront location on the lake Michigan, between 83rd and 93rd streets. South Chicago - initially a working class neighbourhood, developed around the US Steel plant during the first half of the XX century.

The site has a long industrial history. Originally US Steel South Works opened in 1881 as the North Chicago Railway Mill Company. It then became a part of the US Steel - the world's largest business enterprise of the time. However due to the shifting market of steel that resulted in deindustrialization processes all over the United States, the US Steel had to shut the facility, leaving unemployed the whole neighbourhood that highly depended on the plant.

Deindustrialization and the closing of the steel mill caused unemployment that over the time led to low income, housing vacancies and race segregation of the neighbourhood. Unemployment, low quality of housing and lack of social services, race and class divides resulted in high vacancy rates, low education level and unattractive image of the community. In order to attract the investments and establishing new residents as well as for new arrivals. The research of the lifestyle related health conditions has become increasingly important today. Healthcare is one of the priority issues for the city government.

The initial phase of this work was dedicated to the research, concerning different scales (from Midwest to the South Chicago neighbourhood). The research included the field trip to Chicago that helped us identify the major assets of the site and general problems of the neighbourhood.

### 2 THE SITE

**SITE CONDITIONS**

- **Metra Station**: The most convenient connection to the downtown is the Metra Line. The 87th Street Station in located within 5 min walk from the centre of the site.
- **Lakeshore Drive**: Last autumn the extension of US41 Route, also known as The Lake Shore Drive, was opened to the public. It runs along the western border of site. It was constructed in the form of city boulevard, with numerous pedestrian crossings in order to slow traffic. It is also equipped with bike lanes and planned intersections (a base for our primary street grid).
- **Velodrome**: One of the existing assets is the Velodrome structure located on our site. At the moment it is a temporary construction, however the project for permanent building is ready.
- **Harbour**: The former vessel slip cuts deep into the site, creating a beautiful haven in the centre of the site- an ideal location for the yacht harbour.
- **Lakeshore Drive**: Last autumn the extension of US41 Route, also known as The Lake Shore Drive, was opened to the public. It runs along the western border of site. It was constructed in the form of city boulevard, with numerous pedestrian crossings in order to slow traffic. It is also equipped with bike lanes and planned intersections (a base for our primary street grid).
- **The Ore Walls**: After the South Works steel mill was shut down, all the traces of an industrial past were destroyed, except the 3 massive structures of the ore walls. The impressive and fascinating structures of the ore walls are the only remnants of the extensive industrial past of the site. Being out of use for more than 20 years, the walls became a part of the landscape – the distinctive feature of the site.

**THE ORE WALLS**

I believe that the ore walls could become the link between the past and the present, as well as the linking element of the campus. However they are valuable not as a monument, but as a significant part of the landscape. Constructed as essential functional elements in the process of transporting and sorting the iron ore, the walls were made to work. And the best way to conserve them will be to use them. I see the future of these elements of industrial history in the adaptive reuse. The new function will bring a great potential for creating a new space through the interpretation of industrial heritage.

**GRID DESIGN**

After the analysis of the site conditions and the existing masterplan proposal by SOM, we developed a new grid design for site.

- **Lakeshore Drive**: We base our grid design on the existing roads on the site.
- **Extending existing streets**: In order to retain the connection to the original Chicago grid we extend the existing east-west streets of the neighbourhood to the lake.
- **Diagonal avenue**: Diagonal avenue provides a direct view of the downtown.
7. CONCLUSION

GRADUATION REPORT

**Linear parks + Lakefront Park**: Intersecting the site, the linear parks provide green spaces and direct east-west and north-south pedestrian connections. The lakefront park continues the green belt of Chicago Public Lake Front.

- **Secondary roads grid**

**GREEN SPACES**
There are 3 types of green spaces in the masterplan:
- **Lakefront Park**: vast green space, open for sport activities and public events throughout the year
- **Linear Parks**: create a network of sport facilities and green zones connection different zones of the development
- **Courtyards**: semi-private green spaces within the residential areas – ideal space for communication, urban farming, community events

**TRANSPORT**
- **Existing situation**: At the moment the most convenient way to get to the South Works site by public transport is by Metra electric train, however the frequency is very low (once in 20 minutes). The bus lines extend neither to the site nor to the Lake Shore drive. The vehicular access is already good due to the Lake Shore drive, directly connecting the site to the downtown.
- **Proposed transport scheme**: The first step to provide convenient transportation system is to increase Metra trains frequency. The next step is to extend the existing bus routes to cover the new development on the site. In the long-term perspective it will be necessary to extend the CTA Red Line to South Chicago.
- **Bicycle lanes**: In accordance with the Health City principles, the transport strategy provides a network of bicycle lanes, incorporating the whole neighbourhood.

3 GENERAL SPATIAL STRATEGY

The ore walls and the harbour as well as the linear park, stretching from east to west emphasize the main public connection between the existing neighbourhood – and the site / lake Michigan. This area will be developed as the first phase of the masterplan – the Health Science campus. The later phases propose development of the “Healthy Lifestyle Communities” to the north and to the south of the central cluster.

- **HEALTH SCIENCE CAMPUS**
  The Health Science campus will become the platform for collaboration between medical schools, researchers and major health-related companies in Chicago. Moreover the Sciences Cluster will engage the existing residents and the new emerging community by providing a good base for healthcare education for both children and adults and becoming the public centre of the neighbourhood: vast green spaces and good walkability - diverse retail and public facilities. While lakefront, picturesque harbour and the proposed park and garden will act as magnets for the residents, the innovative research facilities and programmes will attract professionals from all over the US.
  The Cluster incorporates the Medical School, research institutions, Health-Related business platform and public infrastructure. The campus is stretches along the main east-west axis / linear park, reinforced by the ore walls, the harbour and the linear park, forming the public core. The eastern part of the campus is more student-orientated, while the west part, directly accessible from the Lakeshore Drive features Business / Research facilities. All the functional elements are interconnected with each other, creating an efficient system. Education provides specialists; Research provides technical support, internship & job opportunities, and knowledge base; Business provides medical equipment, business applications and promotion opportunities, internships & jobs; Patient care provides practical application opportunities as well as future employment and internships; while Public services act as a mediator, facilitating all other functions and the residents of the neighbourhood.

We studied several successful examples of Health Science campuses in Europe and United States.

Through the analysis of Karolinska Institutet Solna Campus, Karolinska Institutet Huddinge Campus, Novartis Basel Campus and Mayo Clinic Rochester Campus we studied the spatial structure, typical areas, statistics and the relation of spaces. Based on this research we developed a programme for Chicago Lakeside Health City Campus.

**PHASING**
According to our strategy the Health Science Campus should be developed in 4 steps:
- **1 Step**: The buildings within the ore walls, forming the heart of the campus and the medical school buildings are developed.
- **2 Step**: Research facilities and patient care facilities are added.
- **3 Step**: Offices and business related buildings are constructed next to the harbour
- **4 Step**: The multifunctional area to the north of the harbour is developed.

**CENTRAL LINEAR PARK ZONING**
The east-west linear park runs as the core axis of the central cluster. However it is divided into several parts by the ore walls and the buildings integrated with the walls. Therefore 3 green zones are created. Each zone was designed to provide different impression and encourage different activities:
- **Zone 1: Linear Park** is main public connection to the lakeside. Represents a public park with vast areas of grass and provides the feeling of space, with the lakefront visible in the end.
- **Zone 2: Gardens** is a mixed green zone, consisting of several thematic gardens, cultivating fruit trees, horticultural crops, medicinal herbs.
- **Zone 3: Courtyards** represent a set of green shady spaces between the buildings, connected by the public route, running through the buildings between the walls.

**HEALTHY LIFESTYLE COMMUNITIES**
The areas to the north and to the south of the central campus are developed as residential clusters. The design of the clusters is focused on the creation of healthy living environment, in terms of functional support, green spaces availability, efficient and environmentally friendly public transportation and walkability within the neighbourhood. The urban design should encourage healthy lifestyle and reduce the use of cars.

In order to convey these principles in the design, we studied several references of green neighborhoods and important data and statistics. The residential communities are subsequently divided into 4 circles, according to the normal walking distance and each circle is provided with a number of necessary facilities and services. Green area ratio per person is calculated for each circle.

All these factors combined with the central public core of the development could create an environment, encouraging healthy living.
7. CONCLUSION

While the roofs overbridge the walls, creating a cascade of ridges, their pitched silhouettes remind of the typologies of industrial buildings, connecting the building to the site (former steel plant) through the associations with its history.

• STRUCTURAL CONCEPT

There were several options of possible structural concept of the roof frames. I have studied several references. I was particularly inspired by the concept of slender beams positioned with a small interval from one another – found in the Louvre-Lens museum by SANAA. Similar concept could be found in the structure of Reggio Emilia station by Santiago Calatrava: slender frames, braced together by tension cables, covered by strips of glass – convey the feeling of weightlessness and make the structure light and transparent.

My structural concept consist of several elements:
− Steel frames
− Tension cable system
− Cable net façade

The painted steel frames, anchored in the ore walls, are positions with a step of 2 meters. Depending on the module of the roof, the steel frames have different configuration. The largest span is 38 meters.

Tension cables are bracing the frames into single structural system, allowing the structure to be very slim. Tension cables convert the upper part of the frame into the truss system that receives the bending forces.

The cable net façade system provides a very slim and highly transparent façade. The glass is supported by a net geometry of pre-tensioned steel cables. In order to keep the cables under constant tension, the ground connection features integrated steel springs.

• CLIMATE CONCEPT

Being fully aware of the flaws in energy performance of the glass envelope, I tried to exploit the form, location and the orientation of the building in order not only to ensure that the building is energy-neutral, but also to develop a concept of energy generation (both heat and electric energy).

I have studied numerous systems that exist today. Consequently I have chosen several technologies that could be integrated into one system and work together.

The building is north-south oriented. This means that the vast area of the roof is exposed to direct sunlight all year round, creating ideal conditions for the application of photovoltaic elements, integrated in the envelope. Thin film amorphous silicone PV modules could be applied without cell material directly to the glass surface.

Solar collectors could also be integrated into the building envelope. The elements absorb solar thermal energy that is further transported via heat pump and stored in the long-term heat storage under the ground.

The system will work well in combination with the waste-heat recovery system, based on the recuperation of thermal mass, accumulated in the volume of the building during the day. The reversible heat pump provides heating/ cooling in the building depending on the season, in combination with an integrated heat storage (boreholes or pipes, laid under the ground).

• ROOF CONCEPT

The external image of the building is created by the complex structures of the modular “roofs”, protecting the interior spaces. Each “module” of the roof differs due to its function, interior space and connections to the park and the harbour. The massive structures of the ore walls are integrated into the structural envelope, providing the necessary reinforcement for the roof frames.
7. CONCLUSION

Situated at the beginning of the long strip of the linear park, connecting the South Chicago neighbourhood & Lake Michigan, the conference centre plays an important role in the composition of the campus. Connecting the pedestrian routes, spanning from west to east and from north to south, the building becomes a linking element not only functionally, but also spatially.

The building is concealed behind the walls, with only the external envelope visible, reflecting the sky above.

The conference centre represents a multifunctional space- a centre of public activity both for the campus and the neighbourhood.