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ANDREA MARIA JANDRIČEK

THE LAND SURVEY AND
TRANSPORTATION PLANNING IMPACT
UPON MAKING OF AMERICAN CITIES

SUBJECT REVIEWS
UDC 711.4(73)"14/18"

UTJECAJ PREMJERA ZEMLJIŠTA
I PROMETNE INFRASTRUKTURE
NA PLANIRANJE AMERIČKIH GRADOVA

PREGLEDNI ZNANSTVENI ČLANAK
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FIG. 1 VIEW UPON ONE OF MANY US CITIES BUILT ACCORDING TO LAND ORDINANCE ACT OF 1785
SL. 1. POGLED NA JEDAN OD MNOGIH GRADOVA IZGRADENIH PREMA LAND ORDINANCE ACT IZ 1785.

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2.01.02 – URBANIZAM I PROSTORNO PLANIRANJE

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THE LAND SURVEY AND TRANSPORTATION PLANNING IMPACT UPON MAKING OF AMERICAN CITIES

UTJECAJ PREMJERA ZEMLJIŠTA I PROMETNE INFRASTRUKTURE NA PLANIRANJE AMERIČKIH GRADOVA

CITY PLANNING
HISTORIC AMERICAN CITY
LAND SURVEY
TRANSPORTATION PLANNING

PLANIRANJE GRADA
POVIJESNI AMERIČKI GRAD
PREMJER ZEMLJIŠTA
PLANIRANJE PROMETA

The first European settlements in the New World followed European planning rules (*The Laws of Indies*, 1573). However, the *Land Ordinance Act of 1785* introduced a land survey system which was largely influential in city planning. Advancements in transportation made during the Industrial Revolution helped in expanding West. The steam engine and steel manufacturing enabled a canal and railroad network, while new urban transportation allowed cities to expand their limits.

Prva europska naselja u Novom Svijetu građena su na principima europskog planiranja (*The Laws of Indies*) preradenim za novi prostor. Dokument kojim je postavljen kamen temeljac u planiranju američkih naselja je *Land Ordinance Act iz 1785* kojim su utvrđena pravila premjera zemljišta i novih naselja. Tehnološki napredak Industrijske revolucije omogućio je razvoj prometne mreže (vodnih kanala i željeznice) izvan i unutar gradova, a gradski promet uzrokuje naglo širenje gradova.

EUROPEAN ORIGINS FOR MAKING SETTLEMENTS

EUROPSKO PODRIJETLO NASTANKA NASELJA

To understand the planning ideas that streamed through the *colonist's* mind when erecting the first settlements on the shores of the New World, it is necessary to comprehend the city planning rules and cultural conditions developing in Europe prior to and during the great voyages of the mid 15th century. With the development of commerce and trade, the 13th century city form became larger and more sophisticated than before – a wall surrounded a rectangular area with streets on a grid and centrally positioned open space. These cities, *bastides*, primarily revealed a military and political character of the place in order to mark a region larger than previous feudal estates. They were built along the frontier lines in southwestern France and northern Spain.¹ Today, they are recognized as a transitional city form: between the castle and Renaissance or Baroque southern Europe city. One of the benefits that European city design and planning gained from these distant journeys was the introduction of gunpowder for military use which had enforced new ideas in planning the 14th century cities. The castle-cities (as military strongholds and fortresses) could no more resist the cannon balls fired the distance. In order to keep the city fortification effective, military engineers had to develop new fortified perimeter wall around the city. The need to secure cities resulted in a different city-layout design (circular perimeter which minimized the length of fortifications necessary in contrast to the multi-leg

star shape); but still, the most common street layout was rectangular (the Ancient Roman castrametation influence) or occasionally radial. The square was of a great importance, with cardinal streets emerging from the mid-points of the square perimeter (in contrast to *bastida* where streets ran along the square sides) and leading towards the city gates. Besides functional and defense issues, utopian and philosophical ideas regarding the Ideal City were great influences during that time. All this played an important role when it came to planning and establishing settlements in the New World.

Due to more intense travelling throughout the known World, travelers and traders spread and shared their knowledge of the newly found cities image with European public through sketches made on a site or after their return. Along with the advancements occurring in all areas, advances in printing technology enabled more efficient production of printed material (books, city plans and views) and the subsequent spread of ideas and knowledge. Among other prints, books on architectural and town planning issues became more prevalent, including "reprints" of older ones such as Vitruvius' opus, who became a very stimulating ancient theorist in architecture and city planning. Other contemporary theoreticians (like Leon Battista Alberti, Andrea Palladio, and military engineers) were of no lesser influence, and should not be neglected. The overall knowledge had been expanded, partially due to great journeys throughout entire Europe and to the Near and Far East.

DISCOVERING NEW WORLD

OTKRIĆE NOVOGA SVIJETA

After establishing the continental route towards the Far East in the mid 15th century, maritime countries, primarily Spain and Portugal, turned their efforts to finding a sea route to India and China as it could have been more secure than the continental one. After the Portuguese explorer Bartholomew Diaz rounded the African continent sailing around the Cape of Good Hope in 1486, Portugal stayed committed to the discovered route towards India and China. Meanwhile, the Spanish Crown focused upon discovering a west-

¹ REPS, 1965: 12. In order to drive the Moors from the Iberian peninsula, the Spanish ruler near Granada established a new siege town (Santa Fé) planned following *bastida* rules and pattern: regular street plan, central square with streets bordering two square sides, while the two streets join the plaza at the midpoint of the other two square sides (following the canons of Renaissance planning). This layout can be considered as a genesis of the *Laws of Indies*.

² The (East) *Indies* was the common name for India and China at that time. More than 7000 islands, reefs and cays



bound sea-route to India (East Indie)² which resulted in a fascinating trip of Christopher Columbus reaching land (the northern coast of today's island of Haiti) on October 12th in 1492, for which he thought to be Japan. He named the land Española (or Hispaniola) and built the first European fortress naming it *La Navidad* using timber from the wrecked ship. According to John Reps, this act may be considered the beginning of city planning in America.³

In November 1493, Columbus returned to the West Indies with seventeen ships and more than 1200 people on board, but found the fortress *La Navidad* destroyed and all the crew left there, killed. He built a new settlement, some thirty miles down to the east, naming it *Isabelle*, which lasted only for three years when it was replaced by another one named *Santo Domingo*, erected on the east bank of the Ozama River. Nothing is left of that settlement as it was destroyed in a hurricane some six years later. By the end of 1501, a new governor, Nicolás de Ovando, was sent to the new colonies (the island of Hispaniola) with a fleet of more than thirty ships and 2500 people on board who were ready to start a new life in the new Spanish colony. Arriving to Santo Domingo in 1502, Ovando decided to replace the existing settlement site for a new

one, this time on the west bank of the same river naming it again Santo Domingo and making it the oldest existing European settlement in North America. The town was soon pronounced the capital of the island of Hispaniola and had some characteristics of an urban place: gridiron street blocks and a main plaza with major civic buildings built along the plaza edges (Fig. 2). Some of the buildings shown on the maps from the 17th and 18th century still exist! The whole city was laid out with a ruler and a compass, with streets perfectly straight and more leveled and wider than the ones in Europe, but the blocks were irregular (Fig. 3).

The evening before he unfurled the sails westbound, Spanish king Ferdinand gave him instructions regarding the behavior that the crew and settlers should show towards the aborigines and the way of establishing settlements in newly discovered colonies. These instructions are considered to be the first "ordinances" for city making in the "New World". The most important one had in mind the future of city growth. More detailed instructions followed determining street layout and public spaces: A major plaza had to be the beginning and the nucleus of every new city. The streets had to be laid in an orthogonal grid, and every single house lot outlined using a cord and ruler (which means the beginning of a *Metes and Bounds* system of land survey). The other ordinances were dealing with the size and appearance of a city square, which had to be of a perpendicular shape, with the length at least one-and-a-half of the width.⁴ This proportion was considered to be the best for festivals and other celebrations with horses and cavalry. In addition to the proportion, the size had to suite the growing

FIG. 2 SANTO DOMINGO CITY LAYOUT AS IT MIGHT HAVE APPEARED IN 1671

SL. 2. LITOGRAFIJA SANTA DOMINGA IZ 1671.

FIG. 3 SANTO DOMINGO CITY-BLOCKS LAYOUT ALONG WITH MAJOR BUILDINGS AS SEEN ON THE MAP FROM 1755
SL. 3. SANTO DOMINGO NA PRIKAZU IZ 1755.

of the Caribbean Plate (delineation form landform which separates the Caribbean Sea from the Atlantic Ocean) were named *West Indies* after Christopher Columbus landed on one of the islands in his quest for the western route to India.

3 REPS, 1965: 26

4 The proportion 3:2 are very close to the architectural and planning proposals written by Vitruvius in his *Ten Books on Architecture*.

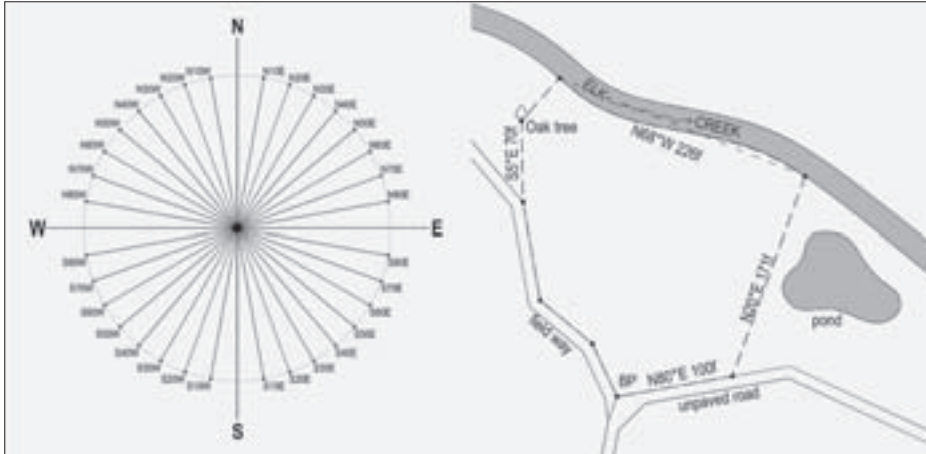


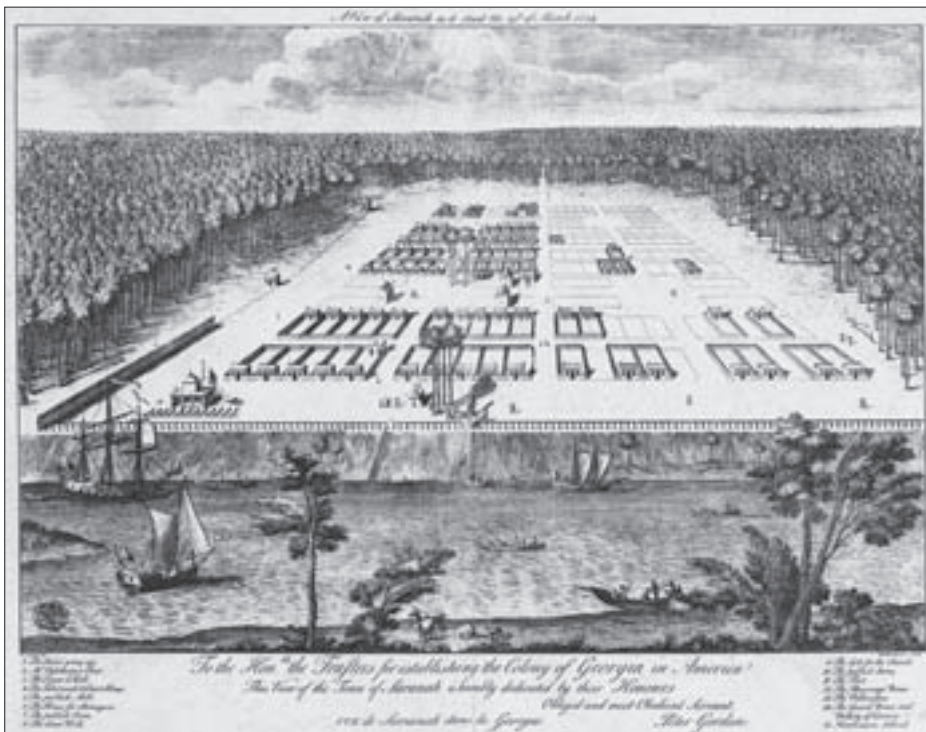
FIG. 4 AN EXAMPLE FOR METES AND BOUNDS LAND SURVEY SYSTEM

SL. 4. PRIMJER PREMJERA ZEMLJIŠTA PO PRINCIPU METES AND BOUNDS

city population comfortably for many years to come. So, an additional proposal was that the square width should be between 200-500 feet and length between 300-800 feet. As religion played an important role for all newcomers, the position of the church was very important – it had to be the most dominant building on the square, with a set-back from other buildings in order to create a feeling of its more imposing nature, and built on a platform above the ground, forcing the residents to climb several steps to reach the church entrance! As occasionally it might have served as an emergency fortification building for the residents, it had to be built out of stronger building material, like stone.

FIG. 5 SAVANNAH AS DEPICTED ON AN OLD LITHOGRAPH FROM 1734

SL. 5. NOVO PLANIRANO NASELJE SAVANNAH, NA LITOGRAFIJI IZ 1734.



FIRST REGULATION ACTS

PRVA URBANA PRAVILA

At the beginning of the 16th century, transatlantic voyages intensified and more people were arriving to live in the New World. With deeper penetration into the new territory and more discoveries, more land was conquered on behalf of the Spanish king. The first set of rules (mainly regulating the control between the Spaniards and the conquered indigenous people) is known as the *Laws of Burgos*, and were signed by Spanish King Ferdinand II on December 27, 1512. These Laws were revised twice by Spanish King Carlos I, in 1542 and 1552, but none of them gave any specific rules for establishing new settlements. To regulate the establishment of *presidios* (military towns), missions (centers for the spread of Christianity), and *pueblos* (civilian towns), King Phillip II signed the first version of the *Laws of the Indies* in 1573 with the rules for the colonists on how to *locate, build, and populate settlements*. These *Laws* were heavily influenced by Vitruvius' *Ten Books of Architecture*, and are considered to be the first set of ordinances for the design and development of new settlements. It consisted of 148 ordinances⁵, and was meant to regulate the political, social and economic life of new settlers, along with their relationship with the native people. They had been compiled several times, but the most important one is from 1680. As a result, many US cities (under Spanish control) have been established through these ordinances (Los Angeles, CA; Santa Fe, NM; Tucson, AZ; Laredo, TX; etc.). Interestingly, the ordinances of the *Laws of Indies* were, and still are, very influential in

⁵ Some of the ordinances (32-43) of the *Laws of Indies* posed the rules regarding *New Settlements*: Ordinance no. 37 regulated the decision making for the settlement site: "And they (settlements) should have good access and outlet by sea and by land, and also good roads and passage by water in order that they may be entered and departed easily with commerce, while bringing relief and establishing defences." Other important ordinances are the ones numbered by 110-137, and they defined the size of building lots, central plaza, Common ground (recreational areas), location of slaughter buildings, etc. [MUNDIGO, 1977: 249-259]

⁶ *Metes and bounds* is a LSS fully introduced and applied in the original Thirteen Colonies that later became the US. The term "metes" refers to a boundary defined by the distance between the breaking points, and its orientation or direction. The term "bounds" refers to the bearing from the true N-S line. It was used for creating a legal description of a land boundary in terms that could not be confused with any other property. A *starting point* (SPt) was defined followed by the description of direction and length of each border-line, finally ending at the SPt. After the description was defined and accepted, the breaking points were marked on the ground with permanent marks.

⁷ Peter Gordon, member of the group that sailed and reached the land of Georgia developed a plan (rectangular grid with "city blocks" containing ten house lots) for the settlement of Savannah, previously prepared by James Oglethorpe in 1733 in Great Britain. It was a lithograph print prepared and copied to be distributed to all immi-

creating regulations for designing communities in the US, as many of them had been incorporated into the very first US Act regarding land surveying and city planning – *Land Ordinance Act of 1785*.

An essential need for settling down was to be able to perform an undoubtedly defined land survey and determine land property. The land survey system that was used at that time was of British origin and today is known as *Metes and Bounds*⁶; the system measures and identifies land and its portions by identifying property boundaries using the physical features of the local topography, along with directions (determined by a compass-needle) and distances (measured in feet) of straight-line boundaries of the viewed portions of land (Fig. 4). The first New World settlements that were surveyed and established using *Metes and Bounds* system, following the rules and ideas for city making from Europe were Marlborough, VA 1691, Margravate, GA 1717, and Savannah⁷, GA 1733-4 (Fig. 5). The colonists that were already there and the new ones arriving to the New World experienced a problem in laying out Public Lands and its distribution to private owners. Therefore the land surveyors⁸ were of great importance. The existing land survey system (LSS) was not that accurate when implemented on vast discovered areas, consisting of thirteen colonies, which were struggling to declare independence from the British Crown.⁹ More than a year after the beginning of the 2nd Continental Congress, on July 4th, 1776 Congress adopted the Declaration of Independence (from the British Empire). The new country was born, along with all other legislative needs. One of them was to determine a uni-

grants as a model for the preferred look out of the settlements.

8 George Washington was one of the first Land Surveyors of a country soon to become the United States of America. To that list, names of Thomas Jefferson and Abraham Lincoln can be added, too.

9 The First Continental Congress took place in Philadelphia between September 5th and October 26th 1774. The main purpose was to express colonial grievances against the British Crown. The most important adopted act was the agreement for the creation of the Continental Association, which forbade the import of British goods and proposed the prohibition of colonial exports. The decisions were sent to Britain.

10 The fifth article of LOA described the mode of the LLS in the Western Territory: Along the N-S principle meridian, points (*standard corners*) are marked at 24-mile intervals beginning from the N-S *prime meridian* through which *standard parallels* (base lines) are set in E-W direction. From each *standard corner*, a line (*guide meridians*) runs true north. Because of the Earth's curvature, *guide meridians* do not intersect the *standard corners* along the above *standard parallel*, 24 miles to the north, but at *closing corners*. This created a 24-mile grid, containing *quadrangles* with 16 *Townships* sizing six by six miles, and further divided into 36 squares (*Sections*), mile by mile or 640 acres each and marked by the numbers: 1-36. [http://www./historicaltextarchive.com]

11 *Land Ordinance Act of 1785*, chapter 32.

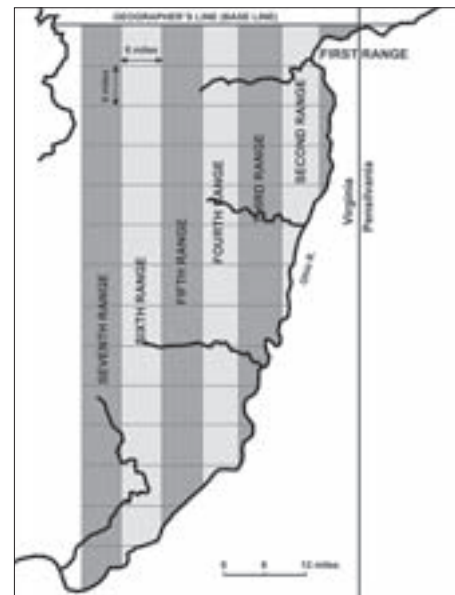
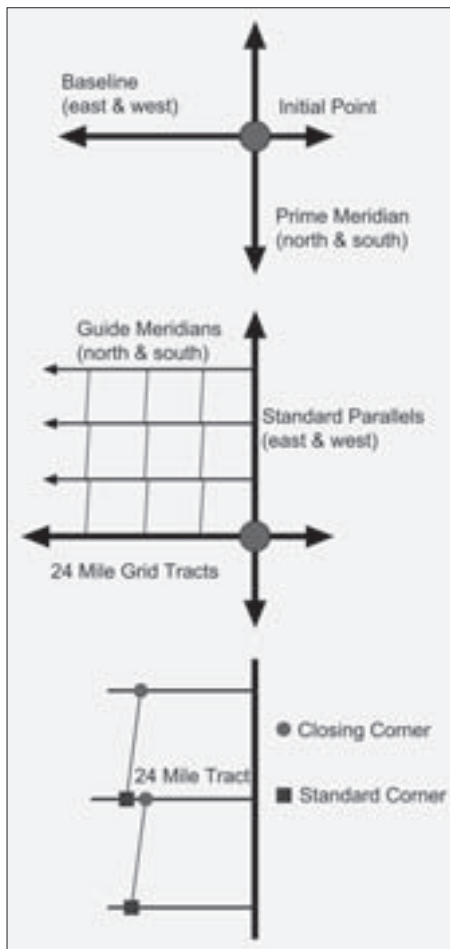


FIG. 6 PLAT OF SEVEN RANGES TOWNSHIP LAND SURVEY SYSTEM

SL. 6. CRTEŽ PRVE PODJELE DIJELA TERITORIJA DRŽAVE OHIO, POZNATE KAO SEVEN RANGES OF TOWNSHIPS

FIG. 7 GRAPHIC INTERPRETATION OF LAND SURVEY USING PRIME AND GUIDE MERIDIANS, BASELINE AND STANDARD PARALLELS, ALONG WITH CLOSING AND STANDARD CORNERS

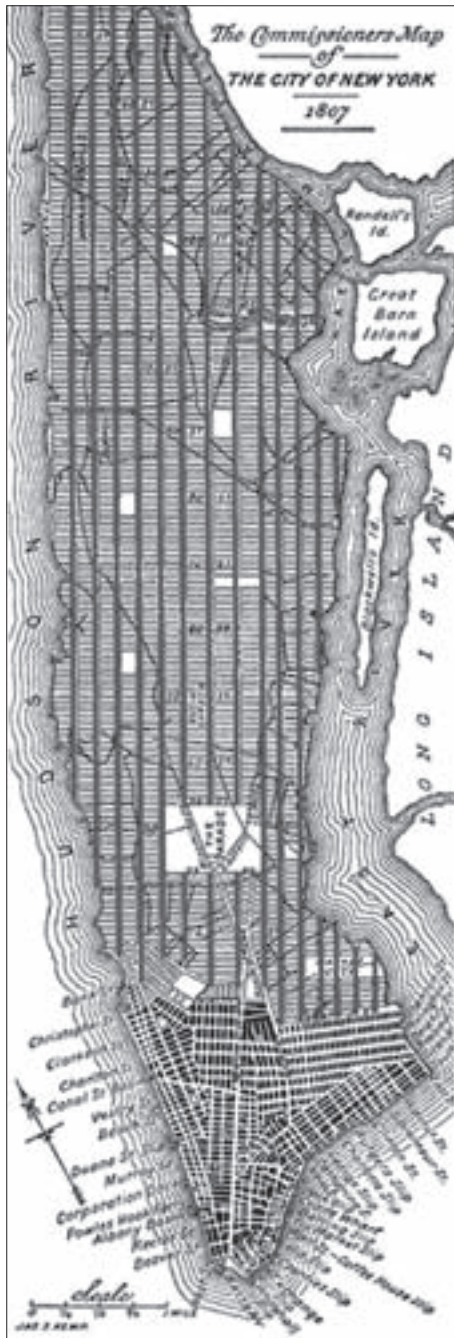
SL. 7. PRIKAZ PREMJERA ZEMLJISTA KORISTEĆI PRIME I GUIDE MERIDIJANE, TEMELJNE I STANDARDNE PARALELE TE CLOSING I STANDARD TOCKE

fied and omnipresent land surveying method which would help in creating new (public and private) properties and new towns. Following this need, the Continental Congress adopted on May 7, 1785 the *Land Ordinance Act* (LOA) providing a system for land survey which referenced land division according to two lines set in cardinal directions N-S (*Principal Meridians*) and E-W (*Base Lines*) with an *Initial Point* at their intersection, which has been in use ever since in most parts of the country. The *Initial Point* was set by astronomical observation and today there are 37 *Initial Points* or 37 *Principal Meridians* in the US. Following the LOA, the first application of this new land survey system (LSS) took place in eastern Ohio and is known as the *Seven Ranges* (Fig. 6) of the Northwest Territory or the *Northwest Ordinance*¹⁰ creating 77 (full or partial) quadrangles that were not exact squares (Fig 7). The term *Township* (Fig 8) did not only represent the land survey pattern, but the beginning of simple zoning as four sections of the Township (8, 11, 26 and 29) were reserved for the US to sell, while the section 16 was reserved for the *public schools*.¹¹ A term *Town-*

FIG. 8 DIVISION OF THE TOWNSHIP INTO 36 NUMERATED SECTIONS, ONE BY ONE MILE EACH

SL. 8. PODJELA PODRUČJA TOWNSHIP NA 36 DIJELOVA VELIČINE 1x1 MILJA, S OZNAKAMA POJEDINIHIH SEKCIJA

36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6
12	7	8	9	10	11	12	7
13	18	17	16	15	14	13	18
24	19	20	21	22	23	24	19
25	30	29	28	27	26	25	30
36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6



ship range represents a N-S set of townships, that were designated through notation of a horizontal number (E-W direction) of townships between the *Initial point* and the corner of the land property being described. A designation T₃NR₂W means: the third township unit north of the reference point and the second township unit west.

Following the rules of land surveying, the design of cities across the US became much more unified. As main streets have typically been laid out along section boundaries spaced one mile (1.6 km) apart, growing urban areas have adopted road grids with mile-long "blocks" as their primary street network. Such streets in urban areas are known as arterials or *section line roads*, and are designed primarily for automobile traffic. The basic idea for planning a "contemporary" city layout was achieved.

- **New York** – One of the best examples of a city on a grid is New York, which was ruled out by the *Commissioner's Plan*¹² of 1811 (Fig. 9). It was the original design plan for the streets of today's New York and Manhattan. However, Central Park was not part of that Plan as it was envisioned after 1853. The plan called for a regular grid of streets and property lines regardless of the island terrain topography. There were 16 numbered and lettered avenues running N-S direction roughly parallel to the shore of the Hudson River.¹³ In addition, 155 orthogonal streets were planned, all together forming 5-acre city blocks.¹⁴ As the city expanded (between 1821 and 1855, New York City nearly quadrupled in population), a need for the open space arose. In 1844 the first American landscape archi-

tect, Andrew Jackson Downing, began to publicize the city's need for a public park (like the ones in Paris or London). As a result, in 1853, New York City designated the area between the 59th and 106th Streets for the creation of a park. A contest for park design was held in 1857, in which Frederic Law Olmsted and Calvert Vaux won. The most influential innovations in the Central Park design were the "separate traffic circulation" systems for pedestrians, horseback riders and pleasure vehicles, while the cross traffic (emerging from neighboring streets on a grid) was concealed in sunken roadways! The idea of a city on a grid was preserved, and is still visible today (Fig. 10). In addition, the grid was very convenient for city public transportation: in 1871 New York introduced elevated railways and small steam locomotives in public transportation. The tracks were built three stories above city avenues and changed the city's look dramatically, enabling the residents to approach the train stops easily as they were only 10 to 15 minutes walk from their homes. However, there are many US cities that neglected the grid and followed its very own and unique city planning rules like: Boston, San Francisco, Washington DC.

- **Boston** – Boston was founded in 1630 by Puritans from England, who established a settlement on the Shawmut Peninsula connected to the mainland by a narrow strip of land and surrounded by the waters of Massachusetts Bay and Back Bay (Charles River). As the size of the peninsula was not sufficient for the newly expanding city, the first landfill on the shallow waters by the peninsula waterfront occurred between 1824 and 1826, during the seat of Mayor Josiah Quincy. The landfills became never-ending projects as the need for space was urgent – as a result many hills were lopped and deposited in the shallow water. In the 19th century, the landfill work tripled the city's area. The largest of landfill projects occurred between 1835 and 1882 when Back Bay was filled up. The landfill was intensified after 1857 when most of the dirt could have been transported by train and after the Great Boston Fire in 1872 when building rubble was used to fill the mud flats and marshes of Massachusetts Bay and Back Bay. The street network remained organic to this day, as well as some of the public parks,

FIG. 9 THE COMMISSIONERS' PLAN OF MANHATTAN, 1811
SL. 9. COMMISSIONER PLAN ZA MANHATTAN (NEW YORK)
IZ 1811.

FIG. 10 VIEW OF SOUTHERN MANHATTAN STREET LAYOUT
TODAY AS SEEN FROM THE EMPIRE STATE BUILDING, 2007
SL. 10. POGLED NA ULIČNU MREŽU JUŽNOG DIJELA
MANHATTANA S VRHA EMPIRE STATE BUILDINGA

¹² In 1807, the City Council appointed a three-member commission to design a street plan for Manhattan, setting up the goal: the streets should be laid to unite regularity and order. They presented their work in March 1811: the street network had 12 main N-S avenues and numerous cross streets, with Broadway running at an angle in order to enable air circulation through the city.

¹³ The streets of Manhattan were laid down according to the grid offset of 28.9 degrees from true E-W. As a result, the low sunset aligns with the streets twice a year: on



bordered by the major arterials of the city – *Boston Common Grounds* (Figs. 11, 12) located near the Financial District and Beacon Hill.

- **San Francisco** – The first Europeans that set their foot on the peninsula by the Bay were colonists from Spain; in 1776. They soon erected a fort and a mission named St. Francis of Assisi. In 1835, the first homestead was erected according to a sketch for a street layout made by William Richardson and Francisco de Haro. The settlement was named Yerba Buena, and renamed to San Francisco on January 30th, 1847, soon after Mexico ceded the territory to the US. The development of the port, on the coast of peninsula inside the Bay, and the opening of the Transcontinental Railway system in 1869 created opportunities for the city to become a trade center. City leaders started a campaign in 1870 towards establishing a public park, like the one in New York, covering the area west of San Francisco's city limits borders. But the major idea of the park was to attract more housing developments in this area and help in expanding the city westward. The great earthquake (April 18, 1906), along with the fire, burned the city nearly to the ground. Trying to catch up with time and make homes for the resi-

dents, calls for the redesign of the street layout were rejected. To gain more space for building, landfill projects were initiated (Embarcadero on the east waterfront and Marina and Hunters Point on the west waterfront). There are two major streets that have dominated the cityscape ever since: Market Street (Figs 13, 14), and Columbus Avenue. The first one was laid out by Jasper O'Farrell, a civil engineer, in the mid 19th century and today it connects the Ferry building clock tower (east) and the Twin Peaks saddle (west). The second one is Columbus Ave (ex. Montgomery Ave) which stretched directly from Black Point Ridge to the Montgomery Block (the first fireproof building in the city built by Henry W. Halleck in 1853.). Market Street is the boundary of two street grids: streets on its SE side are parallel or perpendicular to Market Street, while those on the NW are nine degrees off from the cardinal directions.

- **Washington DC** – On July 16, 1790, the US Congress passed the *Residence Act*, which approved the creation of a national capital to be located on the banks of Potomac River. The site was chosen and sized according to Article One, Section Eight of the US Constitution which permitted the establishment of a District not exceeding 10 miles square in size by cession of a particular state(s). On September 1791, the city was named after President Washington, while the District was named Columbia.

May 28th and July 12th, while on December 5th and January 8th the effect is reversed: the sunrise is framed by the skyscrapers of New York City.

14 The distance between avenues (100 feet wide) in the island center was planned at 922 feet (281 m), while those closer to the waterfront would be less. The cross E-W streets were planned at 60 feet (18 m) wide but 18 of them were planned at 100 feet width, with a distance of approximately 200 feet (61 m) between each other.

The major idea for the city layout design was the work of a French architect, engineer and city planner Pierre Charles L'Enfant, who arrived to the US as a military engineer during the American Revolutionary War. In 1791,

FIG. 11 MAP OF BOSTON WITH COMMON GROUNDS, 1826
SL. 11. PLAN GRADA BOSTONA IZ 1826. S PODJELOM
NA ČETVRTI I COMMON GROUNDS

FIG. 12 VIEW OF COMMON GROUNDS AS SEEN FROM ABOVE,
2008

SL. 12. POGLED IZ ZRAKA NA COMMON GROUNDS, 2008.



FIG. 13 PLAN OF SAN FRANCISCO AND EAST WATERFRONT (EMBARCADERO) LANDFILL, 1851

SL. 13. PLAN GRADA SAN FRANCISCA S PRIKAZOM NASIPAVANJA ISTOČNE OBALE (EMBARCADERO) IZ 1851.

FIG. 14 VIEW OF EMBARCADERO (LANDFILL) AS SEEN FROM ABOVE, 2007

SL. 14. POGLED IZ ZRAKA NA EMBARCADERO, 2007.



President Washington commissioned him to layout the design of the new capital, although Thomas Jefferson had more modest ideas regarding the city layout in a grid manner. To the contrary, L'Enfant's proposal was modeled in the Baroque style (Fig 15) incorporating wide avenues and open space for landscaping including a garden-lined grand avenue (one mile long and 400 feet wide) in the E-W direction today known as the National Mall. His Plan specified locations for the *Congress house* (the Capitol) on a hill, and the *President's house* (the White House). The diagonal avenues are intersected with the north-south and east-west streets at circular and rectangular plazas providing open space for numerous parks.

In March 1792, President Washington dismissed L'Enfant and passed over all the jurisdictions for completing the plans to Andrew Ellicott, who had worked with L'Enfant surveying the city. Although Ellicott made several revisions to the original plans, including changes to some street patterns, L'Enfant is still credited with the overall design of the city. In 1900, Congress formed a joint committee (with a senator James McMillan as Head) to work upon beautifying Washington's central space. The Plan, known as the McMillan Plan was presented in 1901 and revealed the only idea: re-landscaping the Capitol grounds and the Mall (Fig 16), and constructing new federal buildings along the Mall. The L'Enfant's city plan was preserved once more! Some ten years later, the *Heights of Building Act of 1910* amended the restrictions from the original *Act*:¹⁵ the height of any building was limited to the width of the adjacent street plus 20 feet (a building facing a 100-foot wide street could be 120 feet tall).

INDUSTRIAL REVOLUTION AND TRANSPORTATION

INDUSTRIJSKA REVOLUCIJA I PROMET

Beside the land survey rules, the transportation network played another important role in city layout and design. The Second Industrial Revolution following the Civil War (1865-1900) represents an unprecedented period of economic, technological and population growth that set the stage for the US entering the 20th century as a major world power. At the beginning of the 19th century, the country was economically shifting from an agricultural nation to an industrialized one. A rapidly changing regional and urban landscape required a fundamental transformation in almost every area from lawmaking and physical planning to infrastructure and transportation. The prosperity and growth of the 19th century would not have been possible had it not been for the technological advancements in transportation on an urban, regional and national scale. Not only did these advancements facilitate the physical movement of goods and people within cities but across and in between regions, as well. The most notable changes were influenced by the inven-

¹⁵ As a response to the construction of the 164-foot building of Cairo Hotel in 1894, D.C. Commissioners limited residential building height to 90 feet and 110 feet for business, or to the width of the street in front, whatever was smaller. The original *Height of Buildings Act*, was passed in Congress in 1899, but it only limited the building height according to the usage. There were some exceptions for the buildings along business streets 160 feet wide – the height could be up to 130 feet.

¹⁶ Steam powered engines began to replace water powered and horse powered ones, owing to James Watt and his steam engine patent from 1775. The creation of smaller



tion of the steam engine¹⁶ and the improvements in steel manufacturing. Next to these changes came the tremendous demographic change in the second half of the 19th century that served as a driving factor in shaping the industrial city. As industrial expansion created a need for more labor, it powerfully stimulated immigration from Europe and Asia, facilitated by huge improvements in safe transatlantic steamship voyages. Since most jobs created by the expanding industries were on the east coast, these urban centers absorbed most of the new immigrant population during the mid of 19th century. As the number of immigrants grew faster than the needed housing, a housing solution was offered through a competition for tenement housing by architect James E. Ware with his *dumbbell* floor plan¹⁷, which managed to crowd up to two dozen family units in a building on a plot sizing only 25 by 100 feet (Fig. 17)! The impact of substandard housing was twofold: first it prompted city officials to enforce humane housing laws while second, it forced a wave of immigrants to move out of the crowded Eastern cities to the expanding Mid-Western and Western territories. The American cities found themselves unprepared for the large population. As most of city streets were not

and more efficient steam engines allowed their usage in transportation like: trains and road vehicles. In addition, the advances in steel manufacturing created an astonishing new city skyline – the skyscrapers, which caused the city centers to be more compact, efficient and expand vertically.

¹⁷ The buildings provided a small shaft for air and light. Such substandard living spaces induced other problems such as disease, crime and juvenile delinquency.

¹⁸ However, horse drawn vehicles proved to be impractical as horses were slow and had trouble climbing steeper inclines.

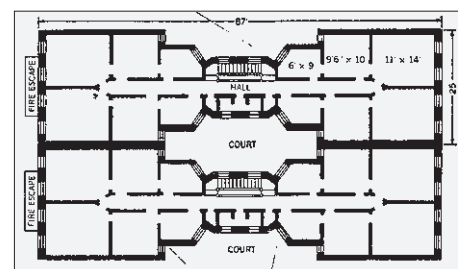
paved (dirt roads) and covered by an enormous amount of horse droppings, sanitation arose as one of the more acute problems. It wasn't until 1881 when a sanitation engineer, Colonel George E. Waring, Jr., pioneered the role of sanitation in big cities with organized removal of garbage.

- **Urban Mass Transit** – The population influx caused urban centers to naturally spread outward. Prior to the 1800s, cities may have been described as walkable, meaning not extending more than 2.5 miles from its center. However planning a major urban center to stay within the limits of a 2.5 mile radius was not realistic. Omnibuses and horsecars¹⁸ fundamentally changed the character of a city life and laid the foundation for more advanced systems of public transportation. By 1888, many major metropolitan cities, notably Boston and San Francisco experimented with cable cars operated by steam driven machinery in a powerhouse that was connected to wire cables through a slot beneath the street. This transportation option proved to be efficient especially on streets with steep inclines. The electrical power in the Industrial Revolution enabled the development of the electric trolley car in the 1880s which started a new era of public transportation. As the Second Industrial Revolution introduced a new level of urban mass transit, city planning began to take a new dimension: what was once only a radius of 2.5 miles from the city center now became a radius of 6 miles as the definition of a manageable, walkable city expanded. More efficient transportation meant that residential areas could spread over larger areas and depart from the idea of tenement housing. City zoning no longer had to follow the need of a pedestrian, but could

FIG. 15 COPY OF THE PLAN FOR WASHINGTON DC, DESIGNED BY PIERRE CHARLES L'ENFANT, 1771
 SL. 15. PLAN GRADA WASHINGTONA, DC PREMA IDEJI PIERRE CHARLES L'ENFANTA, 1771.

FIG. 16 NATIONAL MALL AND THE CAPITOL HILL WITH THE HOUSE OF CONGRESS BUILDING, 2011
 SL. 16. POGLED NA NATIONAL MALL I ZGRADU KONGRESA, 2011.

FIG. 17 THE DUMBELL FLOOR PLAN
 SL. 17. TLOŠIS KARAKTERISTIČNOG KATA STAMBENE ZGRADE S VEĆIM BROJEM MANJIH STANOVA



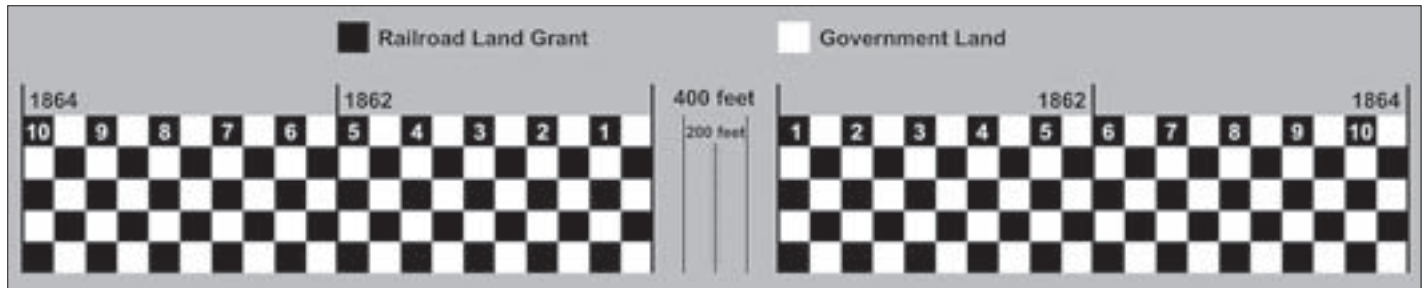


FIG. 18 GENERAL LAYOUT OF THE LAND-GRANT AGREEMENT BETWEEN RAILROAD COMPANIES AND US GOVERNMENT
 SL. 18. RASPORED VLASNIŠTVA ZEMLJISTA UZ ŽELJEZNIČKU PRUGU

take on more ambitious city-wide strategies. Trolley car companies that owned real estate or business developments outside the city created lines to areas, thus stimulating the growth. Peripheral towns that once maintained some sort of tranquility now were swallowed by a spreading metropolis – the city sprawl was born. The more extensive expansion of the suburb occurred along with the expansion of the automobile, making the suburbs places that were designed for automobile travel instead of public transportation. After the Treaty of Paris in 1782 (independence from Britain) was signed, the US began another process: the expansion westward, which brought to the enlarging of its territory several times. By 1912, the starting thirteen colonies grew to 48 states which today form the territory of the continental US, excluding Alaska and Hawaii. The First Industrial Revolution prepared the way for westward expansion with the growing canal and railroad network in the North while the Second Industrial Revolution completed the task of populating and urbanizing the areas of the Great Plains and West with the Transcontinental Railroad.

- **Canal System and Steamboats** – A brief period of economic instability in 1819 proved the need for more effective transportation system to move goods east to west faster. Horse drawn vehicles had a limited cargo volume and passenger capacity, while roads were very expensive to maintain. Therefore the transportation planning soon turned towards building a water transportation network. Advances in water transportation ac-

celerated with the first steamboat in 1807 designed by Robert Fulton and Robert Livingston. The introduction of steamboats and the expanding water canal network caused a population change in Midwest states. Before 1830, all of the major cities in the West were on main rivers. However, the canal system heightened the importance of lake cities such as Cleveland, Detroit and Chicago. Besides having a better canal network, the North had a more extensive railroad than any other part of the country. The South and newer states of the expanding nation still needed to be efficiently connected. The canal system was largely constructed by state governments, while the railroads were built by independent contractors. Moreover, the regions through which the railroads ran also had to be populated and so the government devised incentives for the development of new settlements. The *Homestead Act* of 1862 was an incentive program signed by President Abraham Lincoln to populate undeveloped federal land west of the Mississippi River and create sustainable regions. The law required participants who applied to be over the age of 21, to have never taken up arms against the US government, file an application, develop the land for 5 years and finally receive the deed of title.

- **Railroad Network** – The construction of the Transcontinental Railroad¹⁹ which would connect the East and West Coast was a decade's long movement characterized by political infighting (over the routes that would be defined) and tensions over how to cover the cost of such a huge project. The most impor-

¹⁹ The *Pacific Railroad Acts* of 1862 and 1864, signed by President Abraham Lincoln, supported the building of a Transcontinental Railroad with 30-year US government bonds and extensive land grants of government owned land.

tant issue was that it provided public lands to the railroad companies to build rail structures along with millions of acres of land to raise capital needed to build and maintain future railways. Within a 20 miles wide corridor (a 10 miles strip was established by the Act of 1862 and an additional 10 miles strip by the Act of 1864), ten square miles of land on each side of the proposed 400 feet wide rail track corridor was granted for every single mile of completed railway. The land was granted in alternating sections of one square mile. Each odd numbered section was assigned to the railroad company and each even numbered section kept by the government (Fig. 18). The railroad opened for traffic on May 10, 1869, with the driving of the "Last Spike" at Promontory Summit in Utah which established a mechanized transcontinental transportation network that revolutionized the population and economy of the American West. The railroad companies became a powerful corporate force and their long term strategic benefit in populating the West was accomplished in two phases: newcomers would first purchase their land at a profit and then secondly, the newcomers would create traffic that would sustain a growing railroad network. Soon every western railroad company set up a Land Department and Bureau of Immigration branch offices in eastern seaboard cities to greet the new immigrants and arrange their transportation to the west. The railroad companies glorified the railroad and presented the American West as the Promised Land to every European through their brochures and posters. It's no wonder why the American West swiftly shifted from a wild frontier to an urban society in a single generation which took the eastern States several generations to accomplish. The Transcontinental railroad²⁰ quickly proved its worth as in less than thirty years after the Civil War, the space gap was spanned by the railroad network and the inner land conquered and domesticated. The railroad provided a means of transportation for settlers to reach and populate remote areas from the overcrowded eastern seaboard cities.²¹

CONCLUSION

ZAKLJUČAK

The first set of rules that regulated the making of new settlements in the New World was *The Laws of Indies* of 1573. However, the major cornerstone for settling new cities was the *Land Ordinance Act of 1785*, which introduced a new system in land survey and city planning, so unique from anyone known in Europe at that time. The LOA ordinances created cities that became known around the world for their special layout – the GRID (Fig. 1). Along with the survey of newly discovered land, new ideas and advancements of the Second Industrial Revolution inventions were applied in transportation planning that became very influential in city making and city spread. A population boom was no longer an unruly problem, but could now be welcomed with full vigor. Opportunities were growing and if life in the Eastern cities or suburbs was not an option, then there was the Mid-West or the West with a railway system ready to transport eager newcomers there. The construction of the canal system in the northwest was followed by railroad network, which became the great conqueror of the West and contributed to the populating of areas that may have remained barren. Mechanized urban and transcontinental transport became the lifeblood for the American economy and way of life. Although the transportation technologies used during the Industrial Revolution are long gone, much of the transportation infrastructure is still intact and continues to serve today. At the turn of the 20th century, right before the introduction of the automobile, the United States was already well connected with a transportation network that enabled the swift movement of people and goods from region to region and within cities. The American city of 1900 was quickly rising and responding to the urban challenges using technology to the fullest to adapt to the changing modern lifestyle. Urban concepts such as zoning now had more meaning and could be used to create more strategic city plans.

²⁰ The railroad provided not only means of transportation for settlers to reach and populate remote areas of the Southwest and West, but a way to transport timber and building materials for their communities, too.

²¹ COOKE, 2002: 240

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- FIG. 1 Photo: author, 2008
- FIG. 2 MORRIS, 1994: 303
- FIG. 3 LC, Digital ID: g4954s ct000107
- FIG. 4 Sketch: author
- FIG. 5 LC, Digital ID: g3924s pm001305
- FIG. 6 Sketch: author according to image no. 4577028 [DRC]
- FIG. 7 Sketch: author
- FIG. 8 Sketch: author
- FIG. 9 <http://www.esperdy.net/?p=364>
- FIG. 10 Photo: author, 2007
- FIG. 11 KRIEGER, 1999: 193
- FIG. 12 Photo: author, 2008
- FIG. 13 LC, Digital ID: g4364s ct000187
- FIG. 14 Photo: author, 2009
- FIG. 15 LC, Digital ID: g3850 ct000514
- FIG. 16 Photo: author, 2011
- FIG. 17 <http://www.edteck.com/dbq/dbquest/quest11.htm>
- FIG. 18 Sketch: author

SUMMARY

SAŽETAK

UTJECAJ PREMJERA ZEMLJIŠTA I PROMETNE INFRASTRUKTURE
NA PLANIRANJE AMERIČKIH GRADOVA

Otkrice Novoga svijeta i njegovih prirodnih bogatstava krajem 15. stoljeca donijelo je naglo povećanje broja transatlantskih putovanja, kako vojnika tako i Europljana željnih brzog bogacenja. Većina njih bila je svjesna da je to u nacelu put bez povratka i da ce se u tom Novomu svijetu smjestiti i započeti novi život. Za sve njih bilo je potrebno izgraditi naselja i utvrditi pravila života, suživota i rada s narodima (kulturama) koja su bila toliko različita od Europljana (u načinu života, rada, životnim vrijednostima, religiji...). Većina vizija tih naselja bila je zasnovana na idejama korištenim u planiranju europskih gradova toga razdoblja. Ta su naselja trebala biti brzo izgrađena kako bi primila sve veći broj vojnika, njihovih obitelji te ostalih 'istraživača' i doseljenika. Španjolski guverner Nicolás de Ovando prvi je vojni osvajač koji dolazi s vrlo detaljnim kraljevskim uputama o načinu ponašanja i ophođenja brodovima pristiglih vojnika i ostalih 'civila' prema Indijancima. Na temelju tih uputa izgradio je prvo planirano europsko naselje – Santo Domingo na novootkrivenom otoku Hispaniola (područje današnje države Dominikanske Republike).

Osim pravila *Laws of Burgos* (1512.) i *New Laws of Burgos* (1542. i 1552.), posebno važno mjesto zauzimaju tzv. Zakoni Indije (*Laws of Indies*) iz 1573. koji se itekako oslanjaju na pravila planiranja i gradnje novih gradova zasnovanim na onima iz Vitruviusova djela *Deset knjiga o arhitekturi*. Mnogi američki gradovi (npr. Los Angeles, CA; Santa Fe, NM; Tucson, AZ; Laredo, TX) izgrađeni su na tim principima i zadržali su svoj tlorisni izgled sve do danas. Najpoznatije planirano naselje jest Savannah, GA, kojeg je plan izradio James Oglethorpe u Velikoj Britaniji 1733. godine. Kako su se novoootkrivena i osvojena područja iz dana u dan povećavala, bilo ih je potrebno što prije premjeriti i označiti u pravnim dokumentima kojima bi se potvrdilo njihovo vlasništvo. Pravi preokret u planiranju novih naselja donio je Zakon o premjeru zemljišta (*Land Ordinance Act – LOA*) iz 1785. godine, kojim su postavljene temeljni planiranja američkih naselja, a koji je proistekao iz novog načina premjera i označavanja zemljišta.

Umjesto dotadašnjega anglosaksonskog opisnog premjera (*Metes and Bounds*) prihvacen je čisto geometrijski način premjera i označavanja površina – na principu ortogonalne mreže. Tim zakonom utvrđena su pravila premjera, kako poznatog područja tako i onog koje ce tek biti otkriveno i zauzeto. Tako je na istočnom dijelu države Ohio (na istoimenoj rijeci), na granici prema državi Pennsylvaniji, utvrđena početna točka kroz koju je postavljen meridijan (*Prime Meridien*) i paralela (*Base Line*) te utvrđeno prvih sedam pojaseva uređenog zemljišta (*Town Ranges*). Počevši od te točke, počela je podjela teritorija SAD-a u kvadrate veličine 24×24 milje (*Quadrangles*), odnosno 6×6 milja (*Townships*), unutar kojih se dalje planirao razmještaj ulica i građevinskih cesta pojedinih naselja. Najpoznatiji primjer novoplaniranog širenja postojećeg naselja svakako je New Amsterdam (današnji New York i Manhattan), koji je tako utvrđenu mrežu ulica zadržao sve do danas. Ipak, nisu svi američki gradovi planirani isključivo na ortogonalnoj uličnoj mreži proizašoj iz LOA. Tako su Boston, San Francisco i Washington svoj razvoj i planiranje prepustili nekim drugim idejama (San Francisco – primjeni ortogonalne mreže preko brdovitog terena, ali u dva različita smjera; Boston – zadržava većinom organički raspored ulica s djelomičnom primjenom ortogonalne mreže, te Washington DC – preuzima ideje francuskog baroka zahvaljujući vojnom inženjeru podrijetlom iz Francuske – Pierreu Charlesu L'Enfantu), koje su zadržali do današnjeg dana.

Nekako istovremeno dolazi do velikih promjena u gospodarstvu (industrijska revolucija), koje posebno utječu na razvoj prometnih sredstava i prometnih pravaca, a time i na vecu pokretljivost ljudi. Zbog razvitka industrije i povećanog broja doseljenika mnoga urbana središta u SAD-u doživljavaju vrlo velik i nagao porast broja stanovništva. Većina njih iskazuje nespornost za prihvatanje tako velikog broja stanovnika – komunalna opremljenost gradova postaje jedan od najvećih problema toga doba, kao i odvijanje prometa unutar njih. Konjske zapre-

ge (koje su omogućavale prijevoz vrlo malog broja putnika i robe, a ujedno i onečišćavale postojeće ulice) zamijenjene su motoriziranim sredstvima prijevoza (omnibus, *cabecar*, auto). Pojam područja grada podobnog za život sada podrazumijeva povećanje polumjera od 2,5 milje na 6 milja. Nova prijevozna sredstva, izgradnja sustava kanala i otkriće parnog stroja omogućuju drukčiji pristup određivanju namjene površina unutar pojedinog naselja, budući da ljudi više ne moraju živjeti unutar pješacke udaljenosti od mjesta gdje rade. Tako nastaju gradska predgrađa koja se povezuju sa središtem grada i mjestima rada raznim novo-izumljenim prijevoznim sredstvima. Stvaranje novih naselja na zapadu kontinenta sigurno ne bi bilo moguće da se tehnološki napredak nije odrazio na uvođenje novih prometnih sredstava – željeznice, kao i donošenje odgovarajućih pravnih akata koji su poticali dolazak doseljenika na jugozapad i zapad te naseljavanje tih velikih prostranstava (*Homestead Act* iz 1862.). Budući da su gradovi na istočnoj obali bili prenaseljeni, mnogi stanovnici (zajedno sa sve većim brojem novih doseljenika iz Europe) krecu put zapada. Željezničke kompanije, zahvaljujući zakonu iz 1862. godine (*Pacific Railroad Act*), postaju snažne korporacije i zemljoposjednici koji doseljenicima iz Europe mogu prodavati zemlju u svojem vlasništvu po vrlo povoljnim kamatnim stopama. Povezivanjem istočne i zapadne obale, spajanjem istočnog i zapadnog kraka transkontinentalne pruge 10. svibnja 1869., željeznica je odigrala vrlo važnu ulogu, ne samo zbog dovođenja ljudi do udaljenih i nenaselejenih mjesta na zapadu, već i zbog toga što je omogućila održiv način života: proizvedenu robu na zapadu ili srednjem zapadu doseljenici su mogli slati i prodavati u gradovima na istočnoj obali, pa čak i u Europi. Sustav prijevoza tako postaje temeljem stvaranja moćnoga gospodarstva koje dopušta i omogućava slobodno fizičko kretanje ljudi i robe diljem zemlje, ali i unutar urbanih područja. „Američki način života“ nastavio je svoj razvoj i tako utro put prema suvremenom američkom gradu kakav danas poznajemo.

NENAD LIPOVAC
ANDREA MARIA JANDRIČEK

BIOGRAPHIES

BIOGRAFIJE

NENAD LIPOVAC, Ph.D. teaches several courses and studios at the DCRPLA, Faculty of Architecture in Zagreb. His doctoral (1996-2000) and postdoctoral (Fulbright) research was completed at the CED UC Berkeley (2003-2007) where he has lectured and conducted three regular academic courses. He has written 3 books, more than 15 scientific papers and has completed over a 100 professional projects.

ANDREA MARIA JANDRIČEK, graduated from the University of Columbia, New York in 1996 with a BA in architecture. After graduating, in 1997, she moved to Croatia where she is currently working towards Master's Degree in architecture and urban planning at the Faculty of Architecture, Zagreb University.

Dr.sc. **NENAD LIPOVAC**, dipl.ing.arh., izvanredni je profesor na Katedri za urbanizam Arhitektonskoga fakulteta u Zagrebu. Doktorsko (1996.-2000.) i postdoktorsko istraživanje provodi na CED UC Berkeley kao stipendist Fulbrightove fondacije, kojom je prilikom održao brojna redovita i pozvana predavanja. Autor je 3 knjige, više od 15 znanstvenih radova i 100 stručnih radova.

ANDREA MARIA JANDRIČEK diplomirala je arhitekturu na Sveučilištu Columbia 1996. Nakon što je diplomirala, radila je u poslovnom razvoju za nekoliko američkih i europskih tvrtki, a 1997. preselila se u Hrvatsku gdje trenutačno završava magisterij arhitekture i urbanizma na Arhitektonskom fakultetu u Zagrebu.

