EXTROVERTED GRAVITY

by

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Shane Michael Wallace

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ABSTRACT

Our society has fallen victim to social seclusion. With the advent of the automobile social energy has consistently drained from our urban cores, forming the sprawling and disarranged suburbs with which we are confronted today. In accordance with this physical isolation caused by personal necessity, there is the dilemma of digital media. Though such technology was developed to facilitate communication with others, our devices have inadvertently caused people to become cognitively irresponsive to their surroundings. Personal necessity has come to diminish social interaction.

By assessing the transition and communication between disparate groups of people, and developing a cohesive transportation system that plays off these assessments, people will be compelled to interact with one another while in transit. However, there still remains the issue of the personal device. By developing a scheme that actually responds to the current social media trend, people will be compelled to interact with their environment – and, in turn, with each other.

The idea is to deter people from wanting to travel in isolation, while concurrently drawing them together through the actual digital media applications that currently draw our attention so profoundly. The institution of an appropriate public transit system that is linked with social media networks will inherently provide the external stimulus necessary to get people to surrender their devices and interact with one another.

The conclusion is to strategically develop a multi-modal transportation hub that is centrally located in a specific urban context that will begin to provide an alternative method of travel other than the personal vehicle. Upon manipulating the existing transit network and developing a public transit center, the entire system is to be linked with digital media kiosks that will provide another means of connectivity between people.

extroverted [gravity] :

extroverted :	*a characteristic of being outwardly expressed; concerned primarily with the physical and social environment rather than the effects of one's self.*
gravity :	*a characteristic of being inwardly drawn; concerned primarily with the force of attraction exerted between proximal elements.*

introduction :

The enormity of the Earth has become insignificant in terms of transition and communication. With the surmounting human population and the increased necessity for global inter-dependency, people today are provided with the ability to interact with each other regardless of location. Extensive transportation infrastructure has been instituted to provide connectivity between disparate regions, while modern technological advancements have developed the means for digital communication – people are able to access information at the touch of a button (or screen) and converse with one another without even having to use the available transportation infrastructure to do so.

Accredited to globalization and this recent inclination toward self-sufficiency, though, there has been a transition from intimate civic integration toward expansive extraneous development. Rather than regularly encountering walkable and socially active streets, today we are predominantly confronted by a series of congested traffic networks and inhospitable highway systems that persist in their attempts to link the outlying, disarranged communities of suburbia with the city center. The city has been transformed into a setting of mechanical viability and subsequently has begun to structure itself in a way that disregards sociology and neglects the necessity for public interface.

Technology has physically manipulated the way in which society constructs its infrastructure and, in-so-doing, has actually altered the manner in which the human population interacts with its urban counterpart and with itself. People have the ability to expediently travel great distances to come into contact with one another, yet the transition between origin and destination is often spent in isolation. This is similar to how a person is able to have a conversation with someone else on the opposite side of the globe, but while-so-doing remains cognitively irresponsive to their actual surroundings. Urban cores are increasingly becoming nothing more than hosts to weekday commerce and economics – having a daily surge inward during the daytime and an inverse flow outward as the work shift ends. The urban fabric in its entirety has become disjunctive due to the affects of sprawl and single-function zoning and, attributed to this, social energy is persistently being siphoned from our downtowns and insufficiently dispersed along the periphery.

The urban experience is succumbing to diminution due to the fact that our senses have become submissive to the proliferation of our personal devices. Due to our mechanically-inflicted autonomy, a person often progresses through the day by remaining physically and more often than not emotionally isolated from those by which they are surrounded. The

common scenario seems to be a daily routine involving a vehicular commute where the carpool lane is off limits, the long monotonous walk from the parking lot to an office cubicle is only enthralling due to a cell-phone conversation or an i-Pod (or both with your i-Phone), and the work needing to be completed requires little more than redundancy.

Binately impacting the way in which we live and interact with each another, technology has been able to connect people while concurrently spreading them apart. Personal devices were developed to assure that people would be able to be in constant communication with one another, but in-so-doing have unintentionally made it acceptable to not need physical contact. The implications of such technological developments have, in turn, expanded the built environment to overwhelming proportions and have, as a result, displaced citizens from one another by way of physical and cognitive isolation. In turn, our mechanical devices have provided us with means for inter-societal connection; yet at the same time have pushed people toward independence from society altogether. It is because of urban disjunction and the associated dispersion of social energy that the city, though constantly in a dynamic state of communication and transition, has inadvertently become a place of seclusion.

> "It was the tentative and almost unconscious manner that the street in our landscape began a path that became increasingly congested and then culminated in a freeway. Imperceptibly and over many generations our vision of the city shifted from intimate clusters to the perspective of avenues and streets and uniform-size lots."[1]

As vehicular numbers continue to rise and highways are unable to provide capacity for such quantities, all aspects of the city will continue to expand from each other. The streets, the buildings and even the people will all continue to spread out. It is because of this that the interdependent nature of history's walkable communities has since been stretched and contorted to form the sprawling expanses of grey matter with which mankind is confronted today.[2]

Urban sprawl has pressed the boundaries of nearly every city on Earth, reducing infrastructural density and dispersing citizens among miles of extraneous development. The association between our downtowns and peripheral communities is gradually diminishing because city suburbs have come to present themselves as small towns in their own right. Attributed

[1] Jackson 66

[2] "The simple truth is that building more highways and widening existing roads, almost always motivated by concern over traffic, does nothing to reduce traffic. In the long run, it actually increases traffic. This revelation is so counter-intuitive that it bears repeating: adding lanes makes traffic worse." Duany 88

with the development of these sporadic community centers, social energy is being drained from civic cores by further displacing citizens towards the edges of a metropolitan complex. Accordingly, incoherent sprawl has facilitated the disjunction of urban components, and has consequently altered human sociology by unremittingly separating people from one another.[3]

The automobile, situated at the forefront of urban expansion, has demonstrated its proliferation through the impacts it has had upon the built environment. It has stripped us of our control of the urban environment by displacing us to the edges of hardscaped vehicular thoroughfares, allowing us to only engage for brief moments at the street corner as we wait for the traffic light to change.

"The public realm is the fabric that knits the city together and around which the city grows, yet it has become increasingly balkanized into single-function uses. Nothing is viewed in context beyond that one function, and secondary effects are rarely considered." [4] In the wake of vehicular propensity, the pedestrian realm is rapidly deteriorating as urban expansion continues to disregard human scale. Widening a road may increase traffic capacity but it is often overlooked that the act will then inherently eliminate sidewalk space. [5]

> "Today everyone who values cities is disturbed by automobiles. Traffic arteries, along with parking lots and gas stations, are powerful and insistent instruments of city destruction. To accommodate them, city streets are broken down into loose sprawls, incoherent and vacuous for anyone afoot."[6]

The streetscape has become, in a basic sense, a single function city zone that is specifically preordained to direct movement – it's sole purpose it to provide efficient means of transporting people and supplies from one point to the next. As a product, the urban condition is all-too-commonly exemplified by rigid sidewalks that are regimented by uniform building facades (which themselves are contingent upon the Euclidean geometry of the traffic network). Each component is coming to be developed in a presupposed manner and therefore the city itself is becoming nothing

[3] "In the years from 1950 to 1970, the motor vehicle population had grown four times faster than the human one. In subdivisions, being built at the rate of a million homes a year, human mobility was impaired. Everything was divided and zoned for exclusivity – house next to house, mall next to mall, and office park next to office park – auto-based land use shaped a life that could not function without 2,000 pounds of steel and wheels." Kay 265
[4] Peralta 75
[5] "Motorcars actually created the demand for more highways, which in turn increased the need for more vehicles, and so on ad infinitum." Jackson 270
[6] Jacobs 440

more than a series of thoroughfares of congested vehicular traffic and of blurred faces en route along a pre-determined trail of daily uniformity.[7]

In addition, is the predicament of the severance of socioeconomic links altogether. Though large traffic arteries have been constructed to provide interconnection, the further development of outlying, low-density communities incessantly detriments urban sociology. As each city is consumed by single-function use and the urban fabric becomes increasingly disjunctive, so too do the citizens become disassociated with one another. Cities are becoming more and more fractured by such zoning, developing issues that hinder both infrastructural densification and public interface while, in turn, perpetuating the inclination towards demographic segregation, economic gentrification and social isolation.[8]

Though the entire complex of artificial features that surrounds us has expanded so disproportionately, mankind persists in maintaining communication. Technological advancements have developed means to allow people to interact through digital media devices instead of having to actually come into physical contact. Due to the unrestricted potential of such devices, it is no longer necessary to have to interact with the people that surround us to procure the benefits of human sociology.

Transitioning through the urban context has become a withdrawn activity. Associated with society's self-dispersion and the unabridged ability to communicate by way of digital technology, people have become increasingly introverted. We have become so concerned with what is beyond our immediate context that we are often irresponsive to our physical environment and the people in it. It is not to say that we have become completely autonomous from our environment and each other, but it is evident that we prefer interacting with our personal devices over engaging with those nearby. Streetscape and civic space have come to form an out-of-focus backdrop for the application displayed on our media screens. Not only have we begun to physically isolate ourselves in response to mechanical viability, we now often cognitively remove ourselves from our surroundings. Modern society is self-inflicting isolation because the public realm has succumbed to private concern.

[7] "If we perceive the components of the city less in terms of their character than in terms of their location, it is because we usually experience it by moving through an elaborate system of arteries that has priority over the environment of buildings." Jackson 55
[8] Jacobs 212

intent [theoretic] :

It is time for gravity to kick in. To counteract the last sixty years of extraneous development, a scheme should be devised that begins to draw some of this dispersed social energy back to the city-center. Though elaborate highway systems have been developed to link outlying communities to downtown areas, traffic thoroughfares simply are not providing the means necessary for actual inter-societal connection. There needs to be a system that doesn't just provide physical connection between destinations, but rather invigorates public-interface by interrelating such a system with the local sociology.[9] Sociology, then, should be the architect who determines the manner in which such a system may be schematized and, inversely, that particular design scheme should have the ability to structure sociology.[10]

"The milieu in which men live and in which institutions develop must be based on the relationship between man and man."[11] Societal relations should be attained from the interactions between people; therefore dependency upon mechanical devices should not deteriorate the social composition of the physical assimilations of mankind. Urban design, then, should infer how social [re]integration may influence the development of the modern built environment. "It has to be seen as a part of the whole; no longer in regards to the differentiation between the layout of a city and the creation of the buildings in it, but rather in regards to the differentiation between conceiving the whole human habitat and then giving expression to the smallest reasonable units of it – people."[12]

> "When most people talk about urban design, they instinctively think about the public realm – the spaces between buildings. The primary focus today is to reorient urban spaces away from cars and toward people. There must be a return to self-sufficient, walkable communities designed to encourage social interaction." "[13]

Accordingly, a shift needs to occur in which the disarranged, incohesively-constructed metropolises of the modern mechanical world will no longer take precedent upon the drawing boards of urban planning. The

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[9] "A major change in the character of the artificial environment produces its effects upon the conditions of life for man. Thus, the expansion of the artificial component at the expense of the social portion ordinarily results in a decrease in human-interaction. The two must benefit from the developments of the other." (Rossi 234)
[10] "Cities are the product of the progression of human societies into a complex civilization and are shaped and molded by the values and aspirations of the societies in which they exist. Does this mean also that the design and the building of cities has an impact on society itself? Could it be that urban planning is an exercise not only in city building but also in social construction?" (Foran 141)
[11] Jacques Ellul (Jackson 58)
[12] Doxiadis 175
[13] Braungart 73

development of a system that correlates the movement of people with the interactions that occur between them must be pursued.[14] It is important, though, that such a system doesn't altogether disregard the technological advancements by which the modern world perseveres. Instead, the idea is to generate equilibrium between man and machine.

> "On one hand there are cities that are tightening up their downtown, reinforcing the role of the street, and in general reasserting the dominance of the center. But a growing number are going in the opposite direction. They are loosening up the structure; gearing it more to the car; taking the pedestrian off the street, and retailing too. They are doing almost everything, indeed, to eliminate the structured advantages of the center."[15]

Valuable urban land should not be overtaken by congestive highways and wide expanses of parking blacktop; it should be developed in a manner that promotes structural density and concordantly focuses attention on the pedestrian. Existing traffic networks should be reconfigured and appropriately linked with alternative methods of transport, and future infrastructural development needs to respect human scale. Densification must be pursued, drawing citizens back to the city-center.[16]

> "It is easily forgotten that a principle impetus behind city design is the need for socially oriented planning and the need for architects to concern themselves with the ordinary man's living standards. With the advent of the auto though, optimism for such design has lately turned to disillusion; disillusion with such a design itself and with the environment associated with it."[17]

The age of mechanical dependence is incontestably upon us, but its proliferation should be administered in a way that benefits the culture of man, rather than become a self-beneficiary. And, though human interaction may increasingly be a product of technological viability, such effects should in no way displace people from the modern cityscape by

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[14] "All of the many kinds of transport and transmission found in a complex society, and all the routes of circulation associated with them, should be located according to specific and necessary conditions. They should be affected by both the gross physical requirements and the general technical means, and also the most refined and specialized demands of the whole complex of artificial features. The networks of circulation are indispensable to the function of that complex, and are a faithful indicator of its character. (Wagner 134)

[15] Whyte 310

[16] "To right the transportation balance, cities and suburbs must be reconnected. They must be revamped with a viable infrastructure. The future of human mobility depends on reviving the built environment. To do so, [designers] must concentrate on land use and public transportation." (Borgmann 129)

[17] Richards 10

rendering them physically and cognitively isolated from the environment and its social functioning.[18]

> "Architecture is for humans. And human beings are not interchangeable. This requires that architects must be responsible to their psychological and cultural needs as well as their physical and physiological needs."[19]

Attributed to the fact that the city has been configured to accommodate our mechanical effects, the built environment has become increasingly regimented and standardized. Buildings should be architecturally befitting to their context instead of being constructed from a set a plans that could be interchanged from one construction site to the next.[20] A person should have the capability of understanding how a city is organized and be able to obtain an intuitive sense of its functioning simply from how they interact with the specific urban fabric and its components. Accordingly, there should be no reason to have to view a map or a diagram to make sense of direction; landmarks and specific infrastructural features should provide a means of orientation[21]

In relation to conceiving an environment comprised of engaging and aesthetically pleasing elements, it is important that there be additional stimuli to attract the attention of the public. Today our sidewalks and plazas are filled individuals talking on their phones, others listening to music, and yet others surfing the internet. Our public spaces have become submissive to private concern. To avoid social seclusion, public spaces should be stimulating enough to persuade people to temporarily surrender their personal devices and engage with their surroundings.

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[18]

[19] Richards 17

[20] "The architect has to understand the meaning of industrialization and standardization for sake of his own creation, and must be prepared to create an architecture which corresponds to the general trends of humanity. It is also the architect's responsibility to understand the necessity for socialization in the society of the present and to adjust his own architecture to serve the broader goals now set by humanity for greater numbers of people and for a better way of life." Doxiadis 68

[21] "We sense that our economic and social systems – even our notions of urban environmental systems – depend in a large measure upon the existence of streets and roads and highways as means of movement and communication and of orientation. The map, the diagram and the coordinates are what help us make sense of our cities today." Jackson 55

intent [thesis statement] :

By assessing connectivity between systems of transition and communication and utilizing these assessments to integrate such systems with the specificities of sociology, people will be encouraged to remain in constant communicative engagement. As a result, the physical seclusion attributed with urban sprawl and the cognitive isolation attributed with digital media with be superseded by societal inclination toward extroversion.

expansion : introversion :: contraction : extroversion

intent [strategic] :

With the increasing rate of consumption of our natural resources and the amplification of urban sprawl, a counteractive trend has begun to take place in metropolitan regions. Where suburban development once gained so much attention in terms of urban design, now stands the idea of Transit Oriented Development. This kind of development focuses on the enhancement of the pedestrian realm by integrating public transit with existing infrastructure.[22]

> "The effectiveness of Transit Oriented Development is highly influenced by the quality of the pedestrian environment. The internal and external system of walkways must be direct, well connected, safe and visually interesting. Streetscape, urban design, building orientation and public places all influence the decision to walk."[23]

The idea is to get people out of their cars and onto public transit, but the only feasibly way to accomplish this is to actually make people want to use alternative transportation systems. Americans spend over an hour and half commuting to and from work on public transportation systems each day, whereas the average time spent in our cars in about half that.[24] The intent is to significantly reduce these figures and then get people off the road by promote public transit as a more attractive method of travel over the automobile. Transit allocations then, for the sake of the passenger, should be strategically located throughout the entire metropolitan complex, and the services they supply should be expedient and convenient. Most importantly though, there need to be few limitations as to where and when a person can access any given mode of transport.

> "The most successful cities are those where transportation and sociability are in a certain balance with each other. The processes that generate the urban web involve nodes and connections, and a city of multiple-connectivity must have alternative connections to stay healthy."[25]

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[22] "At the convergence of trends, Transit Oriented Development has the potential to form a new approach to development that builds on synergy and results in places and regions that meet the demand for location-efficient mixed-use and supports regional economic growth strategies. It could be nothing less than the defining armature for a fundamental rethinking about how we build communities." (Dittmar 20)
[23] Dittmar 124
[24] note from author: according to the United Stated Department of Transportation it takes drivers an average of 24 minutes (one way) to get to work every day on our highways, but it takes an agonizing 46 minutes for those riding on our public transit systems.
[25] Abhijeet 118

A centrally located transit facility appropriately integrated into an existing urban complex could then be the feature that begins to draw some of this dispersed social energy back to the city center. Appropriation of transit lines that link the city center with the suburbs will inherently stimulate activity, so the further intent of the proposal would be to intensify this energy. Reiterating the necessity for establishing multiple access points, the primary facility must be developed in unison with an auxiliary arrangement of strategically-located, subsidiary stations.

By drawing together all necessary infrastructural components and densely configuring them with one another, the entire site periphery will need to be manipulated in order to account for increased activity. With such elevated influxes of people and traffic it would be expected to accommodate capacity by expanding the built environment, but newly instituted infrastructure will accommodate elevated capacities by being strategically linked. The infrastructural reconfiguration of the area will then assure efficient site access, and will do so in a manner that does not permit the artificial component to develop at the expense of the human component

For the most part, downtowns experience varying intensities of social activity as no particular core district ever remains consistently occupied. It is essential, that services such as retail and restaurants – places specifically intended for the public – be implemented in high proportions throughout all circulation corridors. All adjacencies should be consistently occupied by citizens and through-occupants alike so that interactions can occur between both passengers and those at leisure.[26] It is one thing to bring people to a place, but it quite another to get them to stay there.

The idea, though, is to not only instigate public interface through continuous occupancy, but to create social dynamics by strategizing the way in which people come into contact with one another.[27] Density and congestion of project components will develop structure and void as a product of the specificities of public interface and, in response to the capacity and frequency of such occurrences, the proposed transit facility will allocate space through a determination of public-versus-private use. Therefore, spatial components of the building will delineate subtle, yet distinct, boundaries between allocations for engagement [extroversion] and those for release [introversion].

[26] "A key to active street-life is creating a twenty-four-hour city, with areas so diverse in use that they are occupied around the clock. Eating, shopping, working, socializing – these activities are mutually reinforcing and flourish in the presence of the others." (Speck 81)

[27] "When people start to fill up a space, they do not distribute themselves evenly across it, and they do not head for the emptiest places. They go where other people are, or reasonably close." Bergel 167

In addition to strategizing a solution to physical seclusion, is the predicament of cognitive isolation via the personal device. Americans spend about eight hours each day interacting with digital media, and therefore one-third of the entire day is spent in cognitive isolation from our surroundings.[28] The predicament is that our devices draw our attention with such propensity, that our environment has fallen to neglect. Experiences are what draw people to places; and therefore all spaces should present multiple stimuli to capture the attention of the public.[29] If our surroundings were to actually draw our attention, we wouldn't be so compelled to turn to devices that direct us toward digital isolation.

A new hub, then, will need to be an amalgamation of public transit and technological viability that promotes urban densification and assesses the specificities of sociology. The intent is to instigate public interface by manipulating the built environment; yet the idea is to evaluate its users and compile information on them as they engage with each other and with the building itself.[30] The entire site is intended to be a digital repository where people are able to access applications and wirelessly communicate with others, yet it will also provide a setting for impromptu social engagement as people are able to access and then converse about information on facility use and interactions that have been made through the life of the project.[31]

Logistically speaking, the idea is to develop a transit facility design that is manipulated by the affects one method of transport may have upon another; but, since the focus of this thesis is on people, such a design should be attributed primarily to people. By instituting a mass intra-urban overhaul that links transportation infrastructure with sociability, the intention is to design a building that actually interacts with the people. In a basic sense, the idea of the project is to focus on the enhancement of street-life, while concordantly maintaining links with the rest of the world.

> "The restructuring of open space serves to reconfigure a wide variety of spaces: derelict spaces created by the extensive geometry of vehicular infrastructure, outdated spaces that need to be reprogrammed, and new spaces that serve as anchors for urban growth."[32]

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[28] note from author: fact according to the United States Census Bureau (2010 Census).
[29] "It has been said that people increase pace to escape sensory overload. But the commonplace explanation may be the right one: They walk fast because they're in a hurry. Sensory inclination is what draws people to objects and spaces." Bergel 66
[30] "Complexity in and of itself is responsible for the intricacies of integration. Things would not be related to one another if they were complex in themselves and not integrated into the system as a whole." Taylor 138
[31] "A sign of a great place is when some external stimulus provides a linkage between people and prompts strangers to talk to each other as if they knew each other." Whyte 154
[32] Busquets 109

site [peripheral] :

site specifics:

country		USA
state		Colorado
city		Denver
latitude		39° 45′ N
longitude		105° 00′ W
elevation (above sea level)	5280′	

geographic disposition/climate:

The land upon which the city of Denver is situated is geographically known as the South Platte River Valley. It is located in the High Plains region of Colorado, about twelve miles to the east of the Rocky Mountain Front Range. Attributed to this geographic disposition the region accumulates no more than sixteen inches of precipitation each year and is recognized as one of the sunniest areas in the nation. During the winter you can expect to encounter a good amount of snow, but since the area maintains a relatively moderate climate year round, the city streets are usually clear within a day or two.

summer temperature (high)		89°
summer temperature (average)		68°
year round temperature (average)	55°	
winter temperature (average)		42°
winter temperature (low)		16°
average wind speed		8.6 mph
primary wind direction		SSW to NNE
year round rainfall		16″
year round snow accumulation		62″
annual sunshine		300 days
summer solstice altitude		73.5°
vernal and autumnal equinoxes		50.0°
winter solstice altitude		26.5°
summer sunrise azimuth	59.21°	
summer sunset azimuth		300.79°
winter sunrise azimuth		120.79°
winter sunset azimuth		239.21°
summer solstice sunrise		05:32
summer solstice sunset		20:32
winter solstice sunrise		07:18
winter solstice sunset		16:39

summer daylight 14:59
winter daylight 09:21

In relation to urban America, Denver is nearly halfway between anywhere you will ever go. Because of this, the city is home to the tenth busiest airport in the world (accommodating 50,000,000 passengers each year), and is a pivotal transfer point along Amtrak's Zephyr Line between Chicago and San Francisco. Since the city is situated just over sixty miles from both Fort Collins and Colorado Springs (and only twenty-six miles from Boulder), Denver and its neighboring cities' have assimilated an increasingly interconnected megalopolis of socioeconomic development. With a population of 4,250,000 people, the Front Range Urban Corridor is the largest metropolitan area within a six-hundred mile radius.

establishment/history:

The region attracted attention in the late 1850s due to the discovery of gold near the confluence of Cherry Creek and the South Platte River. The potentially lucrative area attracted two separate mining camps, both of which chose to settle directly adjacent to this confluence. Separated by Cherry Creek, each camp was able to establish its own system of streets – one camp constructed a street grid that had a North-South orientation, whereas the other delineated a grid that was shifted 45-degrees off of this alignment. These abutting street grids set the framework for the oblique structures found along the edges of the central business district and the surrounding neighborhoods.

After only a decade the population of the two integrating settlements grew to over 100,000 people. However, by this time it was no secret that the gold deposits had nearly been depleted. Interest in developing mining camps further west began to drain Denver's economy and as citizenship declined there was fear that the city would become abandoned. To counteract the diminishing population, it was decided that the town would be utilized as a rail hub that would link the agricultural production in the Plains with the excavation of mineral deposits in the Rockies.

> "The presence of a railroad depot was the condition of survival for just about every town on this continent. The railroad not only brought commercial prosperity; it also sucked the life from the rural culture beyond its lines. In towns served by a railroad, the depot became a center of

curiosity and entertainment. It rivaled school, church and city center as a central point of public life."[33]

Since the advent of the automobile, though, Denver progressively fell victim to sprawling suburban development. This outward expansion began to drain interest from the historic downtown and as a consequence the city center fell into disarray and decay. In 1969, in an act to invigorate urban renewal, it was decided that thirty city blocks were to be demolished to make way for the modern era. Dozens of skyscrapers were constructed throughout the following decade, but the energy bust roused soon thereafter so a majority of the downtown was left as incomplete foundations and empty surface parking lots.

www.denvergov.org

demographics:

rank among US cities	26th largest
city population	600,158 people
city land area	154.9 sq mi
city population density	3,074.5 people/sq mi
metropolitan population	2,252,195 people
metropolitan land area	8,414.4 sq mi
metropolitan population density	303.3 people/sq mi
front range urban corridor population	4,328,406 people

Today, Denver stretches to cover 160 square miles of land and is home to over 600,000 people. Beyond the downtown street grid is an extensive highway system that persistently expands in attempt to connect the 8,400 square miles of disjunctive suburban development that is home to the other two million residents of metropolitan Denver. Despite such exurban development, though, the city center is revamping itself and has come to boast a bustling financial district that is surrounded by educational and cultural institutions, sports and recreational facilities, and an ever-increasing number of restaurants and retail spaces.

In respect to the city's inhabitants, the populace is demographically unique. After decades of decline, the population of Denver began on the rise again in the early 1990s. With this surge came a large

[33] Borgmann 41

Latin American influx and a noticeable increase in of a variety of other ethnicities. If you're looking for nightlife, Denver is known to have the most breweries and microbreweries per capita, as well as the highest number of single citizens of any US city. Yet due to elevated graduation rates, these relatively young citizens are recognized as having the highest educations in the nation.

www.census.gov

city planning/land-use:

Though Denver has an urban core that is comprised of a relatively dense conglomeration of buildings, relentless suburban sprawl and exurban development have persistently drawn people away from the city center. Attributed to such extraneous development and the stagnation of single-function zoning, the city center has become disjunctive. Each downtown district in one way or another has been afflicted by the attenuation of multi-use space and usually only experiences fluctuations in occupancy during specific hours of the day – during the work week the areas surrounding the high-rise structures of the central business district, the governmental buildings of the municipal district, and the educational institutions of the university district all swell with people; whereas areas such as LoDo (Lower Downtown) and the stadium district enliven primarily during the weekend and evening hours.

Fractured zoning and the expansive development of the region have incessantly displaced residential accommodations from the city center and, because of this, commuting has come to be the name of the game for the citizens of Denver. Each day there are a total of 280,000 people that commute to the central business district for work – 240,000 (86 %) of which travel by automobile. Due to the current inadequacy of public transit facilities and extensive urban sprawl only 26,000 (10 %) people get to work via light-rail or bus; and due to limited bicycle routes and pedestrian thoroughfares a dismal 12,000 (4 %) decide to ride their bike or walk. These numbers are likely attributed to the current inconveniency using alternative transportation methods.

Denver and its enclaves form the sixth-fastest growing metropolitan region in the United States in terms of population, and the area estimated to be home to nearly four-million people by 2025. The city is already renowned for its infrastructural sprawl, and with minimal facilities for public transit its citizens have become true dependents of the automobile. This vehicular dependency will only

proliferate as the population continues to grow and sprawl into suburbia, and future traffic congestion and insufficient parking will raise insurmountable problems.

site [immediate] :

site specifics:

location:	Union Station District
longitudinal site dimension (average)	1,200 ft
transverse site dimension	800 ft
total site area	**960,000 sq ft**
Denver Union Station footprint	60,000 sq ft
17th St easement	60,000 sq ft
Wewatta Avenue easement	80,000 sq ft
Chesnut Place easement	40,000 sq ft
site area for development	**720,000 sq ft**

contextual disposition:

The proposed site is located within the boundaries of downtown Denver, situated directly to the northwest adjacency of the historic Union Station building between 16th and 18th Streets, and oppositely traversed by Wewatta Street. The 22-acre area is abutted by the renowned higher-end restaurants and microbreweries of LoDo to the southeast, and is pivotally positioned between sports facilities, educational institutions and recreational attractions – Coors Field is two blocks away, while the Pepsi Center, the Auraria Campus and Elitch Gardens are all within a five-minute walk. Other than these nearby attractions, though, most of this downtown site and the land surrounding it remain vacant.

establishment/history:

The Union Station site had train passengers first arriving to the area in 1870, even though the building itself wasn't constructed until 1881. Only fifteen years after the building's completion , though, the central portion of the original structure (being made of wood) succumbed to the destruction of an electrical fire. Following the fire the site remained under-utilized, left in a state of vacancy and despair for nearly twenty years. In 1914 the Denver Union Terminal Railway Company finally decided to redevelop the site in an attempt to procure the socioeconomic benefits of railway transportation. At that time, the company collaborated with city officials and reconstructed the central portion of the Union Station

building (this time of stone); providing us the historic edifice with which modern day Denver is proud to behold.

During the 1920s and 30s the site was utilized to its maximum operational capacity, acting as a transfer point for 80 trains each day. The station continued to maintain peak operational levels until the early 1960s when the commercial airplane began to be a popular and more expedient means by which to travel long distances. Soon-thereafter there was a perpetual downturn in train service demand and the site slowly became abandoned. Other than operating services for few trains a day and being incorporated as a city bus stop, a majority of the site has since remained vacant of both infrastructure and people.

www.denverunionstation.org

city planning/land-use:

The Regional Transportation District's *FasTracks Program*, in an attempt to counteract these problems before they even arise, has taken initiative in developing a multi-modal public transit system that is capable of providing expedience and convenience during both regional and long distance travel. During its construction the expansion project is expected to develop 122 miles of new rail service and add 18 miles to the city's bus rapid-transit routes, supply 21,000 new parking spaces that will provide park-and-ride service to commuters, and create nearly 10,000 construction-related jobs.

The appropriation of the Union Station District of Denver as the proposed site is attributed to the city's plan to redevelop the area to accommodate a multi-modal transportation hub. The scheme depicts the reconfiguration and linking of existing transit routes with those still in planning, as well as the relocation of the city's primary bus facility from Market Street Station to the Union Station site. The intent is to develop a common transfer point for passengers traveling en route via one of six different methods of travel, as well as promote pedestrian and bicycle travel as a viable means of urban transport. The master plan, in its totality, calls for the facilitation of vehicular and bus traffic; the incorporation of both the 16th Street Mall shuttle and the proposed Downtown Circulator shuttle; further development of the area light-rail; and institution of commuter rail service while continuing passenger rail service.

According to the city's plan, the undeveloped land surrounding the site is to be developed to provide over two-million square feet of new office space and nearly two-thousand new homes. Playing off

the idea of transit oriented development, the implementation of alternative means of transport should support social connectivity and promote urban density by the manner in which infrastructure and public transit are developed in conjunction with one another. Once the FasTracks Program finishes out construction, passenger numbers are expected to be over three times the current value – the Union Station site alone is expected to experience ridership numbers of around 165,000 people each day.

www.rtd-fastracks.com

transit components:

Amtrak - California Zephyr Line (passenger rail)

Project completion	1949
Status	construction completed
Length	1,038 miles to Chicago 1,400 miles to San Francisco
Travel time (to downtown)	22 hours from Chicago 28 hours from San Francisco
Capacity	n/a
Frequency	2 per day

East Corridor - DIA connection (commuter rail)

Project completion	2014
Status	under construction
Length	23.6 miles
Parking	681 new spaces
Travel time (to downtown)	39 minutes
Capacity	8,680 people (3.1%)
Frequency	8 per hour

Gold Line Corridor (commuter rail)

Project completion	2015
Status	planning phase
Length	11.2 miles
Parking	2,000 new spaces
Travel time (to downtown)	31 minutes
Capacity	1,960 people (0.7%)
Frequency	4 per hour

North Metro Corridor (commuter rail)

Project completion	2015
Status	planning phase
Length	18 miles
Parking	3,767 new spaces
Travel time (to downtown)	41 minutes
Capacity	2,240 people (0.8%)
Frequency	2 per hour

Northwest Rail Corridor (commuter rail)

Project completion	2014
Status	final documentation
Length	38.1 miles
Parking	4,393 new spaces
Travel time (to downtown)	61 minutes
Capacity	9,240 people (3.3%)
Frequency	4 per hour

Central Corridor (light rail)

Project completion	1994
Status	construction completed
Length	5.3 miles
Parking	1,000 spaces
Travel time (to downtown)	n/a
Capacity	109,760 people (39.2%)
Frequency	8 per hour

extension

Project completion	2015
Status	planning phase
Length	0.8 miles
Parking	500 new spaces
Travel time (to downtown)	n/a

I-225 Corridor (light rail)

Project completion	2015
Status	final documentation
Length	10.5 miles
Parking	1,800 new spaces
Travel time (to downtown)	40 minutes
Capacity	280 people (0.1%)
Frequency	2 per hour

Southeast Corridor (light rail)

Project completion	2006
Status	construction completed
Length	19.1 miles
Parking	4,256
Travel time (to downtown)	38 minutes
Capacity	8,120 people (2.9%)
Frequency	4 per hour

extension

Project completion	2016
Status	planning phase
Length	2.3 miles
Parking	2,520 new spaces
Travel time (to downtown)	43 minutes

Southwest Corridor (light rail)

Project completion	2000
Status	construction completed
Length	6.7 miles
Parking	2,600 spaces
Travel time (to downtown)	26 minutes
Capacity	20,160 people (7.2%)
Frequency	4 per hour

extension

Project completion	2016
Status	planning phase
Length	2.5 miles
Parking	1,440 new spaces
Travel time (to downtown)	31 minutes

West Corridor (light rail)

Project completion	2012
Status	under construction
Length	12.1 miles
Parking	5,054 new spaces
Travel time (to downtown)	39 minutes
Capacity	4,760 people (1.7%)
Frequency	4 per hour

US 36 BRT Corridor (bus rapid transit)

Project completion	2016
Status	planning phase
Length	18 miles
Parking	4,393 new spaces
Travel time (to downtown)	36 minutes

program [qualitative program] :

> "To feel architectural space or architecture itself requires movement. The result would form a synthesis that compels man to walk through it, to feel and then become part of a piece of it, and not merely remain outside as an onlooker."[34]

Master plan strategy:

In accordance with organizing disparate transit lines into a cohesive design scheme, the entire site will present itself as something that is much more than simply a set of rail platforms by which people transport from one destination to the next – the station and its context are to become a destination in their own right. Union Station District will provide access to interlinking modes of transport; it will construct sufficient commercial and retail space – as to instigate urban densification and entice diverse crowds to occupy the area throughout all hours of the day; and it will develop street and park space that integrate with one another and enhance the pedestrian realm. In all, the area will present itself as a comprehensive urban master plan that appropriately allocates space for commercial, residential and service demands; creating a completely new socioeconomic center right in downtown Denver.

Transit configuration/traffic grid extension

optimal commute time		15 minutes	
average walking speed		2 mph	
optimal walking range		less than ½ mile	
average biking speed		8 mph	
optimal biking range		less than 2 miles	
average public transit speed		24 mph	
optimal public transit range		less than 6 miles	
average driving speed		37 mph	
optimal driving range		less than 10 miles	
total commute numbers		280,000 people	
within ½ mile of public transit		59 %	165,200 people
beyond ½ mile of public transit		41 %	114,800 people
existing commute numbers			
automobile travel	86 %	240,000 people	
public transit		10 %	26,000 people
walk/bike		4 %	12,000 people
proposed commute numbers			

[34] Doxiadis 137

automobile travel	41 %	114,800 people
public transit	37 %	103,600 people
walk/bike	22 %	61,600 people

commercial allocations:

Cities run on economics, therefore there must be the appropriation of a fare amount of businesses – this includes offices, retail space and restaurants. These businesses must vary enough and present themselves at a high enough proportion as to draw diverse crowds of people to them and instigate public interface throughout the entire day. Other than the 16th Street Mall and LoDo, a majority of downtown Denver becomes dormant after work hours because these areas have become susceptible to the single-function use of corporate America. Restaurants and retail – the services for the public – should occupy as much of the street level as possible for the sake of the pedestrian. The corporate giants will then be able to occupy subsequent levels.

residential allocations:

Along with the proficiency of suburban sprawl and the persistent diminution of multi-use districts, it has become increasingly difficult for citizens to find residency downtown. People need to have the ability to live where they work, and a lot of people work in downtown Denver. The simple truth, though, is that there just aren't enough housing units, and with such limited accommodations it has become nearly impossible for a middle-income family to afford such residency. As important as it is to assure that there are high densities of citizens living within proximity to each other, it is equally essential that residential accommodations support mixed-occupancy and income.

recreational allocations:

The idea it to encourage structural density, but every once in a while people need a release. Citizens shouldn't have to leave the city-center to find such a release. Trees, grass and other park elements should penetrate building facades and bring nature into our engineered enclosures, and public land cannot become occupied by private building infrastructure. Our rooftops, then, should be developed as green space as well, and provide us with social and sustainable benefits. The entire project itself will display an appropriate balance between the manmade realm and its natural counterpart.

It's time to take back the street. Street space has increasingly come to be recognized as service space, therefore this master-plan strategy will call for the tree-lined and pedestrian-filled

streetscape of the 16th Street Mall to be extended through all circulatory adjacencies of the proposal. The plan will restructure the peripheral traffic grid in order to control vehicular access to the site, and will present itself as more of a plaza than a vehicular thoroughfare – the sidewalk and the traffic lanes and green space should be integrated with one another.

transit facility implementation:

Public transit stations are intended to counteract the disjunctive developments of the past century by linking various components of transport into a single cohesive multi-modal facility and, in-so-doing, draw people from the disjunctive regions of metropolitan America back to the city-center. In turn, there exists the viability for people to maintain ties with their community and draw the attention of international enthusiasts - the new facility is meant to link downtown Denver with the extraneous developments of the outlying region; while concurrently providing the physical means to access the rest of the world.

With this assimilation of new transport infrastructure the expectation is to cut back on the hours the city citizens spend commuting to work. The institution of the central transit facility will prospectively provide a regular and convenient commute time of 20 minutes or less from any destination within metropolitan Denver. This will drastically reduce travel times to and from Boulder and Denver International Airport, as well as to and from Fort Collins and Colorado Springs. By making public transit within the area cost-efficient and convenient, people will be compelled to use it.

concourse:

Denver Union Station will be a transfer point for over 165,000 people traveling daily along the Regional Transportation District's transit routes. Therefore the concourse will need to be as accessible as possible, both in terms of its locale and actual human access. It may be expected that there would be confusion as to how people are able to make connections between varying methods of transport, but people will have the ability to understand where they need to go by being able to maintain sight-lines between each access point. The concourse is to be designed in response to the capacity and general requirements each method transit, and then assimilate into a cohesive edifice of transitional convenience and structural continuity. Such accessibility and continuity will allow easy navigation through the concourse and develop points of multiple connectivity that will ease the confusion of making transfers between differing transit components.

platforms:

Queuing areas for public-transit are often rendered as a concrete plinth upon which there are too few benches and the favorite musical genre of a transient is being improvised for the sake of making a few bucks. Boarding and disembarking from trains and busses should be something memorable. Platforms should be comfortable and secure areas for both passengers and those at leisure, and therefore they should be designed to provide both unobstructed paths of circulation and allocations for rest – there should be adequate space for those in express mode to move freely, but there should also be places to sit and lean for those awaiting transit or simply relaxing. In accordance with benches and moveable furniture, platforms are to be reminiscent of plaza space by incorporating trees and stonework and other similar components that make public places welcoming.

Suggested bus space	12 bays
Local	4 bays (12 per hour)
Regional	6 bays (18 per hour)
Long distance (commercial)	2 bays (6 per hour)
Downtown circulator shuttle	3 bays (18 per hour)
16th street mall shuttle	3 bays (18 per hour)
Proposed commuter traffic	6,250 people each hour
Passenger rail capacity	2 trains at a time
Passenger rail dispersion	2 tracks
Cargo rail capacity	2 trains at a time
Cargo rail dispersion	2 tracks
Commuter rail capacity	18 trains each hour
Commuter rail dispersion	6 tracks
Light rail capacity	22 trains each hour
Light rail dispersion	6 tracks
Bus capacity	36 buses each hour
Bus dispersion	12 bays
Shuttle capacity	36 shuttles each hour
Shuttle dispersion	6 bays

restaurants and retail spaces:

Denver has diverse demography, such spaces need to be implemented at a high proportion and be diversified enough to draw mixed-occupancy and use. LoDo is renowned for its high-end restaurants and microbreweries, so the transit center design will focus incorporation of retail stores and more affordable restaurant options. In accordance, as per structural and aesthetical continuity, allotments for these spaces will be regulated in terms of size and then be delineated in a way that emphasizes their significance to the overall site development.

Digital repository: [35]

Despite the introverted manner in which we often present ourselves around others, people are always interested in what others are doing. It is one thing, though, for people to be drawn to an area because of the ability to "people-watch" for a while, but it is quite another to draw people to an area because they are able to access information on others and even provide some of their own input if they would like. As people pass through the structure, their interactions with the building and with each other will be recorded and an ongoing assessment of facility functioning and use will be displayed. The transit station will actually double as a digital repository through which people can access information on the facility itself and on each other. People will be physically connected through transit routes, but by accordingly inter-linking these routes with the primary facility via digital kiosks, citizens of Denver will be able to enhance their local sociology by learning a thing or two about each other.

utility and service allocations:

Utilities and service spaces are often tucked away in some attempt to hide them from public view, yet these vital elements are what help us control our environment and should therefore be designed to

[35] note from author: as the entire structure is intended to be inter-connected through digital media, there will be no specific location at which people are able to access such media; therefore allocations for repository space will be incorporated with the figures for "waiting and queuing areas", rather than needing their own quantitative delineation.

incorporate with and become a part of the architecture. All infrastructure for such a design scheme should be developed in relation to one another for reasons of efficiency and aesthetic continuity. In accordance with exposing the structure of buildings, service systems should be proudly displayed in true character to give the occupants a sense of how our built environment actually functions.

parking structure:

Though the transit hub will be implemented for purposes of reducing vehicular traffic through the promotion of alternative transport, the proposal should accommodate space to temporarily store personal vehicles – the automobile is here to stay and accordingly parking must be provided for a project of this scale. Too often, though, allocations for public parking are inadequate in terms of location and capacity; surface lots are widespread, vacuous and barren; and parking structures are erratically and inconveniently located – a person's transition from vehicular transport to an available alternative should be one of comfort and convenience rather than inhospitability. The design will provide parking allotments for single-occupancy vehicles, as well as adequate storage for bicycles and other street-legal vehicles; yet it will do so in a manner that respects the presence of people.

program [quantitative program] : [36]

passenger train services and operations areas: 41800 sq ft

Passenger trains typically consist of 11 boxcars and 1 locomotive and are powered by an electric-diesel propulsion system. Trains will approach the station on 2 tracks that are elevated to approximately 48", allowing passengers to board and alight trains without steps.

Platforms must be a minimum of 16' wide and 600' long (24' wide and 800' long if a shared platform), and the minimum turning radius must be no less than 200' with standard heavy-gauge track spacing of 56 ½".

Following is assumed boxcar information: Width 126", Length 80', Height 156".

passenger train services:	1,400 sq ft	
train station offices		600
train crew facilities		400
ticketing and information	400	
waiting and queuing areas:		32000 sq ft
platform area (2 at 96,000 sq ft)		19200
waiting area beyond platform allotment		12800
baggage, mail, package:		8400 sq ft
general handling area		3600
supervising offices		2400
shipping and receiving		1200
baggage queuing		1200

commuter rail services and operations areas: 100200 sq ft

Commuter trains consist of 8 boxcars and are propelled by an Electric Multiple Unit (EMU) system. Trains will approach the station on 6 tracks that are elevated to approximately 18", allowing passengers to board and alight trains without steps.

Platforms must be a minimum of 16' wide and 600' long (24' wide and 800' long if a shared platform), and the minimum turning radius must be no less than 150' with standard heavy-gauge track spacing of 56 ½".

Following is assumed boxcar information: Width 118", Length 75', Height 144", with seating for 102 passengers per car and room for 32 standees.

commuter rail services:		4200 sq ft
commuter rail offices		1800
commuter rail crew facilities		1200
ticketing and information	1200	
waiting and queuing areas:		96000 sq ft
platform area (6 each at 9,600 sq ft)	57600	
waiting area beyond platform allotment		38400

[36] note from author: numbers for the quantitative program are in compliance to AIAS transportation guidelines and are altered accordingly for the specificities of this thesis.

light rail services and operations areas: **40200 sq ft**

Light rail trains consist of 4 boxcars and are propelled by a live overhead electric wire. Trains will approach the station on 6 tracks that are served curbside; therefore passengers must board and alight trains using steps (ADA highblocks will provide handicap accessibility).

Platforms must be a minimum of 12′ wide and 300′ long (16′ wide and 400′ long if a shared platform), and the minimum turning radius must be no less than 100′ with standard light-gauge track spacing of 56 ½″.

Following is assumed boxcar information: Width 102", Length 60′, Height 120″, with seating for 64 passengers per car and room for 32 standees.

Light rail services:	4200 sq ft	
light rail offices		1800
light rail crew facilities		1200
ticketing and information	1200	
waiting and queuing areas:		36000 sq ft
platform area [6 each at 3,600 sq ft]	21600	
waiting area beyond platform allotment		14400

bus services and operations areas: **16200 sq ft**

Buses will service the station a maximum of 12 at one time and are served curbside, therefore passengers must board and alight buses using steps (as per ADA requirements, an electric wheelchair lift has been installed in each bus).

Queuing areas must be a minimum of 12′ wide 50′ long

following is assumed bus information: width 102", length 46', height 126″, wheel base 23' 3", turning radius 44′, with seating for 48 passengers and room for 20 standees.

bus services:		4200 sq ft
bus station offices	1800	
bus crew facilities	1200	
ticketing and information	1200	
waiting and queuing areas:		12000 sq ft
queuing areas (12 each at 600 sq ft)	7200	
waiting area beyond queuing allotment		4800

shuttle services and operations areas: **7400 sq ft**

Shuttles will service the station a maximum of 6 at one time and are served curbside, therefore passengers must board and alight shuttles by using steps (as per ADA requirements, a maneuverable wheelchair ramp has been installed in each shuttle).

Queuing areas must be a minimum of 12′ wide and 50′ long

following is assumed shuttle information: width 96", length 42', height 120", wheel base 21' 5", turning radius 40', with seating for 20 passengers and room for 32 standees.

shuttle services:		1400 sq ft
shuttle station offices		600
shuttle crew facilities		400
information center		400
waiting and queuing areas:		6000 sq ft
queuing areas (6 each at 600 sq ft)	3600	
waiting area beyond queuing allotment		2400

TOTAL TRANSIT SPACE REQUIREMENT **205,800 SQ FT**

restaurant and retail allotment:			**260000 sq ft**
	restaurant space:	156000 sq ft	
		coffee shops	12000
		fast-food style restaurants	36000
		full-service restaurants / bars	108000
	retail space:		104000 sq ft
		news and snack stands	8000
		temporary retail set-up space	24000
		permanent retail stores	72000
digital repository space:			**60000 sq ft**
	digital repository space:		60000 sq ft
		digital media (equipment) space	6000
		hard-copy data access space	16000
		general interactive space	48000
general services and operations areas:			**85200 sq ft**
	station services:	11200 sq ft	
		general ticketing facilities:	1600
		general information center:	1600
		public restrooms:	4800
		public storage facilities:	3200
	operations areas:	74000 sq ft	
		general station offices:	2400
		employee facilities:	1600
		security department:	6000
		cleaning and waste facilities:	16000
		equipment and maintenance facilities (total):	48000
TOTAL CONCOURSE SPACE REQUIREMENT:			**405200 SQ FT**
Parking:			**363800 sq ft**
	Automobile parking:		320000 sq ft
		short-term parking (1200 each at 160 sq ft)	192000
		long-term parking (800 each at 160 sq ft)	128000
		handicap parking (32 each at 200 sq ft):	9600
	Alternative transport parking:		42000 sq ft
		bicycle parking (600 each at 10 sq ft)	6000
		other alternative parking (600 each at 60 sq ft)	36000
	general parking services and operations areas:		1800 sq ft
		parking ticketing and information	600
		parking security and enforcement	1200

TOTAL TRANSIT SPACE	205,800 sq ft
TOTAL CONCOURSE SPACE	405,200 sq ft
mechanical, structural and circulation allotment (30%)	183,300 sq ft
TOTAL PROJECT IMPACT AREA:	**794,300 SQ FT**

TOTAL PARKING SPACE	363,800 sq ft
mechanical, structural and circulation allotment (30%)	109,140 sq ft
TOTAL PROJECT IMPACT AREA INCLUDING PARKING:	**1,267,240 SQ FT**

program [code analysis] :[37]

> "It is virtually against the law in many parts of this country to build places that people love. Our historic cities are treasured for their walkable, intimate streets, their vibrant downtowns, and distinguished architecture. Today they would all flunk the parking, building setback and other requirements in many zoning laws."[38]

Use and Occupancy Classification:

Assembly Group A occupancy includes, among others, the use of a building or structure, or a portion thereof, for the gathering of persons for purposes such as civic, social or religious functions; recreation, food or drink consumption; or awaiting transportation.

Use Group: **assembly group A - 3** (section 303.1)
Occupancy: not to exceed 7 sq ft per person (table 1004.1.1)

Construction Allowances:

Type I and II construction are those types of construction in which the building elements listed in Table 601 are of not combustible materials, except as permitted in Section 603 and elsewhere in this code.

Construction Type: non-combustible, protected **Type II - A** (section 602.2)

The height and area for buildings of different construction types shall be governed by the intended use of the building and shall not exceed the limits in Table 503 except as modified hereafter. (section 503.1)

Height and Floor Area Allowances (table 503)

Maximum Allowable Height:	220′
Maximum Allowable Floor Area:	umlimited

Fire Resistance Requirements:

An automatic sprinkler system shall be provided for Group A - 3 occupancies where one of the following conditions exists (section 903.2.1.3):

The fire area exceeds 12,000 square feet
The fire area has an occupant load of 300 or more
The fire area is located on a floor other than the level of exit discharge

Fire-Resistance Rating Requirements (table 601)

Structural frame:	1 hour
Bearing walls (exterior):	1 hour
Bearing walls (Interior):	1 hour

[37] note from author: all code analysis information has been acquired from both the *2006 International Building Code (IBC)* and the 4th edition of *Architect's Studio Companion (ASC)* and is cited accordingly.
[38] Peralta 161

Non-bearing walls (exterior):	0 hours
Non-bearing walls (Interior):	0 hours
Floor construction:	1 hour
Roof construction:	1 hour

Standard dry standpipes are required in each stair-well. (page 206, ASC)

Accessibility Requirements:

Sites, buildings, structures, facilites, elements and spaces, temporary or permanent, shall be accessible to persons with physical disabilities. (section 1103.1)

Accessible routes within the site shall be provided from public transportation stops; accessible parking; accessible passenger loading zones; and public streets or sidewalks to the accessible building entrance served. (section 1104.1)

At least one accessible route shall connect each accessible level, including mezzanines in multi-level buildings and facilities. (section 1104.4)

Accessible routes shall coincide with or be located in the same area as a general circulation path. Where the circulation path is interior, the accessible route shall also be interior. (section 1104.5)

At least 60 percent of all public entrances shall be accessible. (section 1105.1)

For assembly group buildings, there must be at least one elevator per each 35,000 square feet of space, as well as one service elevator per each 265,000 square feet of space. (page 207, ASC)

Total building area		625,000 sq ft
Public use elevators		18
Service elevators	3	

The most appropriate elevator choice for commercial buildings of four or more stories is an electric traction elevator with compact hoisting machinery. (page 209, ASC)

Accessible Parking Spaces (table 1106.1)

The number of accessible spaces provided shall be 2 percent of the total parking allotment up to 1000 spaces, then an addition space for each 100 spaces beyond the initial 1000.

Total Parking allotment:	1,562 spaces
Accessible parking allotment:	26 spaces

Where passenger loading zones are provided, one passenger loading zone in every continuous 100 linear feet maximum of loading zone space shall be accessible. (section 1106.7.1)

Parking must be provided according to occupancy. Public transit facilities must provide .025 to .5 spaces per occupant. (page 316, ASC)

Minimum parking allotment:	1,562 spaces
Maximum parking allotment:	3,125 spaces

multi-bay circulation parking structure with two-way traffic and 90-degree stalls (page 328, ASC)

Must not exceed 1,200 ft pedestrian routes (comfort 350 -700)

Level of Service B: 62 stalls per bay
Length of bay 340' and width of 61.5

Must not exceed 8% slope (page 335, ASC)
Single lane 12 feet, double lane 22 feet
7 feet minimum (8'2" for accessibility)

Egress Requirements:[39]

Buildings or portions thereof shall be provided with a means of egress system that shall control the design. Construction and arrangement of means of egress components required to provide and approved means of egress form structures and portions thereof. (section 1001.1)

Minimum floor area allowances per occupant (table 1004.1.1)

Train terminal occupancy (hourly)	6,250 people
Concourse:	100 sq ft / person
Waiting areas:	15 sq ft / person
Required concourse floor area:	625,000 sq ft
Required space for waiting areas:	93,750 sq ft

Where access to three or more exits is required at least two exit doors shall be placed a distance apart equal to not less than 1/3 the diagonal distance of the area served. Additional exits shall be arranged a reasonable distance apart. (section 1004.2.1.1)

Where more than one exit or exit access doorway is required, the exit access shall be arranged such that there are no dead ends in corridors more than 20 feet in length. (section 1004.2.1.2)

The total width of means of egress shall not be less than the total occupant load served by the means of egress multiplied by the factors in Table 1005.1 and not less than specified elsewhere in this code. Multiple means of egress shall be sized such that the loss of any one means of egress shall not reduce the available capacity to less than 50 percent of the required capacity. (section 1005.1)

Accessible spaces shall be provided with not less than one accessible means of egress. Where more than one means of egress is required from any accessible space, each accessible portion of the space shall be served by not less than two accessible means of egress. (section 1007.1)

Egress width per occupant served (sprinkled) (table 1005.1)

Anticipated Occupant Load (per hour)	6,250 people
Stairways:	0.2"
Other egress components:	0.15"
Required stairway space:	104.2' / floor
Space for other egress components:	78.13' / floor

The minimum width of each door opening shall be sufficient for the occupant load thereof and shall provide a clear width of not less than 32 inches. The minimum height of each door opening then shall provide a vertical clearance of 7 feet 6 inches. (section 1008.1.1)

[39] note from author: occupancy will vary throughout the day, and due to this it is unknown how many people will be accessing the transit facility at one time. However, since the site is expected to be accessed by around 165,000 people each day - about 6,250 each hour - it will be assumed that the building occupancy load is 6,250 people.

Doors shall swing in the direction of egress travel where serving an occupant load of 50 or more persons. (section 1008.1.2)
All egress doorways must provide a minimum clearance of 32 inches (nominal 48") as per accessibility requirements. (page 261, ASC)

Egress stairways serving four stories or more are to be enclosed within 2-hour fire-resistance rated construction with a 1.5 hour self-closing door. (page 260, ASC)

All egress corridors and stairs must provide a minimum clearance of 44 inches if serving more than 49 occupants, but no less than36 inches in all occupancy cases. (section 1009.1)

Stairways shall have a minimum headroom clearance of 80 inches measured vertically from a line connecting the edge of the nosings. (section 1009.2)

Stair riser heights shall be 7 inches maximum and 4 inches minimum. Stair tread depths shall be 11 inches minimum. (section 1009.3)

Stair treads and risers shall be of uniform shape. The tolerance between the largest and smallest riser height or between the largest and smallest tread depth shall not exceed 0.375 inch in any flight of stairs. (section 1009.3.2)

There shall be a floor or landing at the top and bottom of each stairway. The width of landings shall not be less than the width of the stairways they serve. (section 1009.4)

Ramps used as part of a means of egress shall have a running slope not steeper than one unit vertical in 12 units horizontal (8-percent slope). The slope of other pedestrian ramps shall not be steeper than one unit vertical in eight units horizontal (12.5-percent slope). (section 1010.2)

The rise for any ramp run shall be 30 inches maximum. (section 1010.4)

The minimum width of a means of egress ramp shall not be less than that required for corridors. The clear width of a ramp and the clear width between handrails, if provided, shall be 36 inches minimum. (section 1010.5.1)

The minimum headroom in all parts of the means of egress ramp shall not be less than 80 inches. (section 1010.5.2)

The ramp landing length shall be 60 inches minimum. (section 1010.6.3)

Exit Access Travel Distance (table 1016.1)

Maximum distance: 250 feet

Minimum number of exits for occupant load (table 1019.1)

Minimum requirement: 4 exits / floor

Restroom Facility Requirements:

At least one of each type of fixture, element, control or dispenser in each accessible toilet room and bathing facility shall be accessible. (section 1109.1)

Minimum number of required plumbing fixtures (table 2902.1)

Passenger terminals and transportation facilities:

Male water closets: 1 per 500 (13)

Female water closets:	1 per 500 (13)
Lavatories:	1 per 750 (9)
Drinking fountains:	1 per 1000 (7)
Service sink:	1 in all (1)
Bathing facilities:	not required

Structural System:

floors post-tensioned site-cast concrete waffle slab, in combination with a concrete column vertical support system. (page 129, ASC)

skin hollow structural steel space-frame, in combination with a W14 cross-bracing system (or substitute an HSS component) for vertical and lateral support. (page 110, ASC)

For each foot in thickness of each structural floor plate, the maximum span between columns is increased by 30 feet. (page 129, ASC)

Restrictions due to shipping of members usually limit any pre-manufactured spans to 40 ft to 60 ft in length with a maximum depth of 24 ft or usually less depending upon site access. (page 131, ASC)

12,000 psi concrete will allow columns spacing to reduce to 60% of required columns. (page 132, ASC)

12-inch square concrete columns have a 3-hour fire resistance rating (page 132, ASC)

For precast columns the unbraced height is equivalent to that of the thickness in the sense that the thickness in inches is equal to the span in feet (i.e.: 12" column = 12' height). (page 133, ASC)

Tributary load for a 12" column cannot exceed 6,000 sq ft. (page 133, ASC)

Energy Codes:[40]

climate zone for Denver, Colorado zone 5

A zone 5 climate zone is characterized by average low temperatures of -10° (F) to -20° (F). Accordingly, the following energy code numbers are appropriate to this specific zone:

For each floor height, the building must allow a floor and a half spacing to neighboring structures. Therefore the ratio between height and distance is 1 : 1.5. (page 149, ASC)

Casting edge height (above grade): 78 feet

Required spacing to neighboring structures: 117 feet

building envelope (section 502)

fenestration (U-factor) 0.35

[40] note from author: information for applicable energy codes has been directly cited from the *American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) code 90.1* and are in compliance to *2009 International Energy Conservation Code (IECC)*.

glazing (U-factor)	0.35	
ceiling plenum (R-value)		38
above-grade wall mass (R-value)		17
floor plenum (R-value)		30
sub-grade wall mass (R-value)		13
maximum air leakage		33.5 psf

Fenestration must not occupy more than 50% of the total building surface, and glazing must not account for more than 75% of the total building surface.

mechanical systems (section 503)

Central All-air System - Single duct, constant air volume (page 176, ASC)

Floor-wide in-floor horizontal distribution, or floor-wide above-ceiling horizontal distribution. (page 212, ASC)

Every building must provide both a boiler room and a chilled water plant. These rooms are to have a height clearance between 12' and 16', and an area that is determinate upon building occupancy and square footage. (page 186, ASC)

Cooling capacity	3,000 tons	
Boiler room area	20,000 sq ft (total)	
Chilled water plant area		20,000 sq ft (total)
Cooling tower space		3,600 sq ft (total)
Cooling air volume		1,000,000 CFM

HVAC Requirements (page 219, ASC) per floor

Main supply and return duct area	600 sq ft	
Branch supply and return duct area	1200 sq ft	
Fan room area		10,000 sq ft
Fresh air louver area		1200 sq ft
Exhaust air louver area		1000 sq ft

The ventilation system may account for up to 100% outside airflow so long as it does not increase mechanical power load.

Minimum spacing between exhaust and supply air is 10 feet. (page 190, ASC)

Total shaft area is equal to between 2% and 4% of the area served on each floor (page 198, ASC)

Average floor area	125,000 sq ft
Minimum shaft area	2,500 sq ft
Maximum shaft area	5,000 sq ft

The minimum plenum height for high-rise mixed-use buildings is to be no less than 20 inches. (page 216, ASC)

minimum air temperature allowance	55° (F)
maximum air temperature allowance	85° (F)
minimum humidity	30%
maximum humidity	60%
equipment deadband	5° (F)

equipment efficiency	80%
minimum outside airflow	2,150 CFM

service water heating systems (section 504)

Every building must provide facilities for both domestic water pumps facility and fire pumps. (page 187, ASC)

domestic water pump room dimensions	8′ x 12′
fire pump room dimensions	8′ x 12′

Plumbing walls must have a minimum clearance of 12" for a single wall, and 16" for a double wall system. (page 201, ASC)

Combined service water heating and space heating devices are permissible as long as the heater input rating of the combined system is less than 150,000 btu / h.

minimum water temperature	90° (F)
maximum water temperature	110° (F)
minimum thermal efficiency	78%
maximum standy loss	30%+27/gal³
pipe insulation minimum at 100° (F)	0.26"
flow rate regulation	2.5 gal/min

electrical power and lighting systems (section 505)

Every building must provide an electrical service entrance, telecommunications closet, transformer vault, switchgear and emergency power supply rooms. (page 189, ASC)

transformer vault dimensions	20′ x 20′ x 11′H
switchgear room dimensions	30′ x 20′ x 11′H
telecommunications closet dimensions	10′ x 12′
emergency generator room dimensions	12′ x 22′

Both public transit facilities and libraries must provide an Uninterruptible Power Supply in order to maintain proper procedures during the event of a black out. (page 190, ASC)

minimum exterior power allowance	0.10 W/ft²
maximum exterior power allowance	10.0 W/ft²
minimum interior power allowance	0.02 W/ft² maximum
interior power allowance	2.80 W/ft²
minimum power factor for ballasts	90%
minimum accessible manual controls	1 per access

Lighting systems for each space must be calculated individually if more than 10% of the building is to be mixed-use.

When sufficient daylight is available the system must be capable of reducing the maximum power output by 50%.

Natural daylight efficacy is 90-150 lumens per watt, therefore the most proper lighting solutions would be utilization of metal Halide electric lighting due to its efficacy of 80 to 100 lumens per watt. (page 153, ASC)

program [zoning] :

Denver Union Station Planned Urban Development (DUS-PUD) [41]

T-MU-30 transit mixed-use district (division15)

The T-MU-30 district provides for urban development proximate to a mass transit railway system station to promote a mix, arrangement, and intensity of uses that support transit ridership and use of other transit modes, especially walking. Specific criteria to be met in the T-MU-30 district are approval of a general development plan and site improvements which reinforce both the relationship of structures to the transit station and the pedestrian connections and linkages throughout the transit oriented development (TOD). (section 59.301)

The district is intended for use at station areas with adequate land area to create a viable TOD and to transition to the surrounding community. Basic maximum gross floor area is equal to five (5) times the area of the zone lot, and the minimum required amount of open, unobstructed space is equal to ten (10) percent of total zone lot area. That point of a T-MU-30 district that is nearest to a mass transit railway system station shall be located no more than 1500 feet from the intersecting center lines of the tracks and adjacent passenger loading platforms. (section 59.306)

T-MU-30 district zoning restrictions (section 59.312)

maximum building area : zone lot area		5 :1
maximum building height	220 ft	
front setback		0 ft
side setbacks (with entrances)		5 ft
side setbacks (without entrances)	0 ft	
rear setback (with entrances)		5 ft
rear setback (without entrances)		0 ft
permissible stairway encroachment	5 ft	
permissible access ramp encroachment		ultd.
permissible structural encroachment		5 ft
permissible utility encroachment		3 ft

[41] note from author: information for the DUS-PUD has been directly cited from the *Denver Municipal Code*.

DUS-PUD design standards and criteria (section 59.313)

general criteria

Continue Denver's physical character, including mixed use development, access to parks and parkways, tree lined streets, detached sidewalks, interconnected street networks, and convenient access to parks, open space, and transit;

Provide an adaptable and interconnected transportation system that encourages multiple modes of transportation, disperses traffic, and provides streets that accommodate multiple transportation modes including motor vehicles, transit, bicycles and pedestrians;

Use man-made and natural features, such as open spaces, drainage corridors, parkways, streets and alleys, as development edges, transitions and interconnections;

Arrange residential, employment, retail, service, and open space uses to be convenient to and compatible with each other and with transit;

Create spatial definition of the streets with buildings and landscaping to promote pedestrian activity;

Design early phases of development so as to promote long-term quality and character;

Encourage housing in a range of densities, sizes, and types.

site design criteria

Locate, screen, and buffer service, storage, delivery and refuse areas to minimize the view from streets, adjacent zone lots, and open spaces;

Minimize the visual impacts of parking areas, parking structures, and residential garages on streets, open spaces, and adjoining development;

Improve the efficiency of parking areas by allowing multiple uses to share parking spaces, curb cuts, and circulation drives; and

Provide safe and attractive pedestrian and bicycle connections to building entries and public sidewalks within parking lots and transit facilities.

Site and design the use or utilize other technology to reduce potential adverse impacts between otherwise potentially incompatible uses.

Incorporate required water quality and storm water management features into the overall site design.

building design criteria

Create buildings that provide human scale and interest through use of varied forms, materials, details, and colors;

Provide architecturally finished and detailed elevations for all exposures of the building with the primary facade, typically the street-facing elevation, having appropriate architectural expression;

Provide a primary building entrance facing or clearly visible from the public sidewalk;

Use durable materials that complement Denver's tradition as a city of brick and masonry; and

Minimize the use of highly reflective glass, particularly at street level.

transit mixed-use design criteria

Site buildings are to emphasize or reinforce the relationship of the development to the transit facility.

Provide a primary building entrance facing or visible to the transit facility or the primary pedestrian connection to the transit facility.

Provide clear and adequate pedestrian connections and linkages between buildings and transit facilities, public rights of way and transit facilities, and between multiple modes of transit.

Configure the site so that a clear, safe, and attractive pedestrian system, with the transit facility as an easily identifiable component, is the primary public element to which buildings are oriented.

Maximize pedestrian amenities near transit facilities and along the primary pedestrian connections to transit facilities.

Arrange building uses, heights, and scaling devices to reinforce the station area core and to transition to adjoining areas.

Grand Central Terminal

Constructed on a site that occupies 48 acres in midtown Manhattan, Grand Central Terminal is the principal station for train travel within the New York City metropolitan area. Each day 67 tracks, dispersed among 44 platforms, deliver 125,000 commuters and 500,000 visitors to this centrally located Manhattan site. It doesn't just provide connections to public transit though, it a district hub for dining and retail. In accordance with supporting the facilitation of the largest train station in the world, the site is home to 103 businesses and has dedicated nearly half a football field of floor space for social events.

The construction of the terminal first required the demolition of the one previous. The design called for the engineering of a bi-level station below grade – the first utilization of underground platforms – so it was then considered most practical to perform an entire site renovation in conjunction with the erection of the new concourse. As a result of constructing terminal infrastructure underground, a large portion of the surface land became available – as the project intended on burying the tracks, developers were then able to purchase air-rights to the some of the most prime real-estate in the entire world.

The sole intention of the project was that the site be the terminus for multiple rail lines, but along with such a scheme calling for comprehensive area redevelopment comes the necessity to maximize capacity in terms of access and circulation. As the train station was being constructed below grade, a concept aroused that aimed to transform the bifurcated Park Avenue (which had previously bisected the site) into a stacked thoroughfare that would circumnavigate the site. The station, upon completion, was then able to accommodate multiple forms of transportation and allowed passengers to be picked up and dropped off at various locations and on multiple levels.

And yet another transformation is underway – expected to be completed in 2012, the East Side Access project plans to expand the physical capacity of Grand Central Terminal and provide new connections to local and exurban destinations. As the station currently has two levels of above-grade vehicular access and two levels of below-grade rail access, new construction will create two more levels of underground rail service – this means that passengers arriving to the lowest level of platforms will be 175 feet

below the streets of Manhattan and will have nearly a six-minute ascent to daylight.

Lessons learned:

site response: project development physically manipulated the regional street grid and, in-so-doing, enhanced peripheral traffic flow and permitted higher capacities of people to access and utilize the station at the same time. Then, by burying the existing rail lines, prime real-estate became available; invigorating redevelopment of the surrounding area and instigating urban density.

multiple connectivity: for the first time in history passengers could access modes of transport at different levels. The station is designed so that all rail lines initially go below grade and then are dispersed accordingly – mainline trains travel to the upper level, while suburban trains travel to the lower level. All vehicular traffic remains above grade and accesses the site via either level of the circumferential viaduct.

increased circulation: due to the stations depth both underground and above, the terminal was designed with ramps to improve passenger circulation. The design feature continues to impact museums and transportation hubs (especially airports) because ramps allow a higher capacity of people to move more freely and successively than stairs.

www.grandcentralterminal.com

precedent studies [current]:

Berlin Hauptbahnhof:

With the exception of the Second World War, the site of the Berlin Hauptbahnhof Station has been continuously utilized for passenger rail since 1871. The war conflicts instigated the construction of a physical boundary that divided the city, and in turn severed rail ties between the East and West – detrimental for a station that operates for trains that travel only in these directions. The site remained under utilized for over three decades as it lay in the shadow of the Berlin Wall, but following the barricade's demolition in 1989 the area has been renovated to become the largest rail-transfer station in all of Europe – reconnecting East and West.

The main concourse is an architecturally distinctive, 320-meter long megastructure that physically conforms to the bend of the adjacent Spree River. The architects had to devise an intricate glazing system that would allow construction of a glass terminal building that curves in all three dimensions. Due to the hyperbolic curvature of the building, the solution was a system of support cables that connect thousands of glass panes – none of which are in proportion to any other. This glass canopy allows natural illumination to all levels of the concourse, while boasting photovoltaic frits that provide two percent of the stations energy.

The design called for the project to elevate the East-West lines and have them mimic the old lines by bending with the curve in the river. These two elevated levels deal with commuter and local rail service. The North-South lines were then constructed to go 15 meters below grade and arrive at one of two underground levels. These subterranean levels accommodate long distance and regional rail service, as well as the infrastructure for a recessed traffic thoroughfare. Situated between these bi-levels of transit is a 45-meter high entrance concourse where ticketing and customer services are found – this level accommodates vehicular access.

Utilizing the site as more than a than a transit hub, the main concourse is traversed by two, 70-meter high towers that provide 55,000 square meters of commercial space. Rail service began to arrive to the new station in 2002, but because the towers were not due to completion until 2005 there aroused public safety concerns and required serious stipulations on construction techniques. The engineers developed a system that prefabricated entire half-sections of each tower and connected them by lowering them into place at a rate of 6 meters per hour. The apex of the construction

aroused as these sections came to rest in conjunction with one another 6 meters above the glass ceiling of the passenger terminal – the resulting gap was only 20 millimeters.

With passenger numbers that rival those of major airports, the Hauptbahnhof services nearly 350,000 passengers each day. With both local and long-distance service being provided, passengers will be riding on one of 1,800 trains that arrive daily to the station. Public transit was the primary component driving project development, yet due to its centrality the design required the institution of leasable real-estate. In accordance with setting the standard for rail capacity in Europe, this particular transportation hub has also been designed to accommodate 70,000 sq m of commercial space –15,000 sq m of which is dedicated to retail and public use.

Lessons learned:

site response: all routes of transport (including vehicular) have been pulled together and interwoven to facilitate easy transfer between one mode of transport to the next. Within 60 meters of vertical space, a central atrium accommodates five levels of transit and acts as a pivot between disparate regions of Europe.

sustainable consideration: through the manner in which many of the structural components were pre-fabricated, as well as the development of an innovative photovoltaic glazing system, the building envelope itself has the ability to replace energy depleted from the power-grid while being near-completely transparent – allowing natural daylight to illuminate all platform levels.

real-estate development: as a way to instigate mixed-occupancy and to enhance project funding, commercial and retail spaces have been allocated all-throughout the concourse and, as to maintain structural and aesthetic continuity, are regulated by specific proportions that allot 20 - 500 square meters of leasable floor space per business.

www.hbf-berlin.de

precedent studies [near-futuristic]:

San Francisco Transbay Terminal:

Originally designed as a multi-modal station that dispersed vehicular and rail traffic between San Francisco and Oakland, the terminal site succumbed to the proliferation of automobile travel and subsequently abandoned rail service. The site then became the city's primary bus station, and has remained a bus facility for six decades without undergoing any major renovations. Recent interest in reinstituting rail travel in the region, though, has aroused the commission of a *Grand Central Terminal of the West,* right in downtown San Francisco. As ground-breaking is already underway, rail service will continue with the completion of the first phase of the project in 2012.

In 2006 an international competition was held that called for reputable architects to submit a proposal for a multi-modal transportation hub that would redefine public transit on the West Coast. In conjunction with the development of a transit station, the architects had to design an iconic tower that demarcates the terminal and integrates with the San Francisco skyline. The focus of the proposal was primarily on the design of the transit center and the adjacent high-rise, but the project also had to exemplify functionality and feasibility within its context.

There's more to it than that though; each design submittal – though not specifically required by competition criteria – was encouraged to enliven the surrounding area with socioeconomic activity and provide affordable downtown living. In response to this, the winning proposal (Pelli and Associates) aims to redevelop the peripheral South of Market (SoMa) district – which presently exists as parking lots and city owned parcels that have remained undeveloped since the Loma Preita earthquake. Utilizing the construction of the transit center as a catalyst to initiate renovation of the surrounding area, over 40 acres of downtown real-estate is intended to be developed into 3,000,000 sq ft of office space and create 2,600 new homes.

The terminal will consist of four levels of transit. The rail lines will be rerouted from their current termini and recessed below the streets to access the station on one of two underground levels. The superstructure will be accessed by bus and single-occupancy vehicle via an elevated roadway. Along the street-level the terminal will boast an undulating glass façade that both controls pedestrian flow and allocates space for 100,000 square feet of retail. The

adjacent streets will be redeveloped as continuous sidewalks that seem more like plazas – the curb has been omitted and the distinction between that which is pedestrian and that which is vehicular is blurred. And, at its top – five stories above this redeveloped streetscape – the terminal roof has been designed to be a new 5.4-acre public park and nature preserve.

The Transbay Terminal project represents a multi-level, multi-modal transit hub that will support local bus and rail travel, as well as a proposed high-speed rail connection to Los Angeles (expected completion in 2018). Its elevated public park and redeveloped streetscape are expected to enhance social activity, yet are responsive to environmental concerns and specific site context. Designed in tandem with the terminal, the iconic superstructure will help with financing project costs and eventually be a place to live and work for thousands of citizens.

Lessons learned:

site response: not only is the project concerned with the development of a centrally located transit facility, it is meant to initiate urban renewal and aims to achieve structural densification by instigating peripheral development.

integrated infrastructure: by constructing the elements of the design in unison there is surely structural efficiency and aesthetic continuity, but most important will be the integration of activities between differing site components. Sight lines and circulation paths have all been assessed in order to assure that occupants are consistently able to associate with one another.

civic consideration: The project is meant to be utilitarian, but more importantly it is meant to be a destination for public interface. The concourse will represent itself as a retail and recreational center, and the redevelopment of the adjacent streets and the dedication of the elevated park will disguise the structure's function as a transit-facility.

www.transbaycenter.org

execution [methodology] :

> "The architect is responsible for an end-product that in itself is responsible for the way of life of people without the irresponsible trends which humanity as a whole imposes on him. It is the architect, then, who should study the situation developing around him, interpret it in terms of *ekistics*, present his conclusions in the form of buildings and explain the necessity for the new architectural creation."[42]

The sociology of Denver has been affected by physical disconnection because of the manner in which the city itself has been disjunctively designed and developed; and, in addition, it has been comparably affected by the digital isolation that is attributed with our reliance upon personal media devices. In order to develop a scheme that counteracts this societal affliction, the various linkages of the existing urban fabric – whether they are a product of physical connectivity or of digital – must be identified and then graphically composed as a means of formulating a set of diagrams. The idea is to figure out who is in communication with whom and then utilize these diagrammatic assessments as a means of developing new societal links that will enhance the local sociology.

By identifying and graphically documenting the locations of existing communicative and transitional networks of the region, and then densely configuring the resultant diagrams together by manipulating them within the boundaries of the site, the entire transit facility will present itself as a condensed representation of the whole urban complex. Accordingly, digital media spaces within the facility will be allocated in respect to the relative positioning of the individual nodes and connections along each specific transit route – each auxiliary station throughout the metropolitan area will be digitally linked with a specific adjacency within the concourse. In addition to this digital connectivity between different locales of the urban fabric, the system will form an artificial environment of technological communication and interaction that will prospectively dissuade people to use their personal devices.

The process will be that of architectural mapping; where the infrastructural and sociological configuration of the existing urban fabric itself will provide the methodology to generate an appropriate design solution. Each system of transportation and communication will be assessed individually and, as a result, each will be depicted as a distinct network diagram. Meshing of these disparate networks, then, will expose undefined societal connections and, in turn, inform the design of the most appropriate manner in which to compose programmatic elements. As a

[42] Doxiadis 67

result of developing these network diagrams and then layering them with one another, the process will create an all-encompassing abstract diagram that is an extraction of the existing sociology of Denver.

And, just as the graphic representations of individual systems are intended to be the basis upon which specific spaces are located, evaluation of personal space will be the catalyst from which to develop volumetric relations. Each space will be designated as *intimate, personal, social* or *public*,[43] and will be designed in relation to the specific proportioning of each of these spatial terms (relative to psychology). These spaces, though, will be integrated together in a manner that allows public space to account for intimate interactions, or that inversely allows intimate space to account for public interactions. The idea is to create extroversion within the urban core, therefore the line between public versus private should be subtle and a person's sense of personal space should be pushed to the limit or, in certain instances, disregarded altogether.

In response to initial conceptual mapping, there will be a final comprehensive site diagram that will translate into a spatial footprint for the facility. Therefore, the grade level of the site can then be realized as a two-dimensional plane that will be affected by the capacity (density) of each specific transit route – the higher the amount of people accessing a particular transportation system, the larger the volume of space needed to account for these numbers and the more drastically this mapping plane will be displaced from its original positioning. Similar to the principles of general relativity,[44] the manner in which the spaces will be volumetrically designed will be consistent with the manner in which gravity alters the fabric of space and time - emulating gravity's affects, the infrastructural reconfiguration of the region should warp the grid, so to speak, in relation to the increased structural and social density, and draw people back to the core.

systems diagrams: assess each mode of transportation and each network of communication, and then develop a series of diagrams that will graphically depict all the societal bonds that interconnect the disparate regions of the city.

architectural mapping: after completing all diagrammatic assessments, the intent is to layer the various network diagrams and identify the commonalities that will lead to the development of an abstract site drawing from which to begin organizing project program.

[43] note from author: these terms are in reference to the personal space diagram (refer to image).
[44] note from author: general relativity describes how all objects exert a force on all other objects, and may be a fundamental basis from which to mathematically schematize a design solution.

spatial development: resulting from the mapping exercise, the design will have a basic footprint from which to base the development of spatial adjacencies. However, the spaces will not be realized as simple extrusions of an orthographic plan; instead volumetric development will be the product of each specific programmatic constituent and, as each space will have varying intensities of social engagement, the abstract diagram will be warped accordingly.

REVISION:

Step 1: assess existing routes that traverse the site (type, infrastructure, capacity).

Step 2: assess proposed transit routes (RTD Fastracks) that will be integrated into the development of the site (type, infrastructure, capacity).

Step 3: assess the infrastructural geography and population density of the whole urban complex and begin to organize a strategy that plays off the density of the place from which a person is traveling (metropolitan America), with the density of the place to which they arrive (downtown Denver). Highways and automobile infrastructure require large quantities of space for a minimal number of people per vehicle, so automobile access should be the most restricted. Whereas rail lines transport the largest number of people per vehicle and the infrastructure requires minimal space, therefore site access allocations for rail transit will be more liberal.

Step 4: in plan, the idea it to manipulate barriers so that they no longer exist as barriers – all barriers along the edges of the site will be pulled inward toward the center, while all barriers that traverse the interior will be pulled outward. This will disperse the transit infrastructure evenly throughout the district and assimilate a network of intersecting routes from which to begin design. Then the challenge is to manipulate existing routes to coincide with the implementation of new ones as to begin to integrate infrastructure and develop multiple-connectivity. The initial step is to extend the peripheral street grid through the site as an armature from which to begin to structure the new district. However, rail lines are the most difficult to manipulate, so they too will influence the initial formulation of the infrastructural integration design. All other routes will then be manipulated to allow efficient site access, and dispersed in such a way as to assure that all thoroughfares are able to be accessed by one form of transit or other.

At this point the site will basically be a diagrammatic entanglement of transit routes – what is to be developed will be similar to the size of complexity of a traffic interchange. The idea, though, is to minimize infrastructural sprawl and vacant space, so the next step would be to systemize a way to tightly integrate the various routes as to not waste valuable land. An example to note would be the amount of urban land that the I-25 and Spree Avenue interchange occupies in comparison to the space occupied by that of the proposed site – both occupy nearly the same amount of urban land; yet due to the specific mode of transport and the permanency of its infrastructure, the land upon which this traffic interchange is constructed is bound to indefinitely maintain a population of 0.

Step 4: in section, transit access points must be located on multiple levels due to elevated through-traffic and the possibility of congestion between differing transit systems. The idea is to stratify these routes in such a way that the most public means of travel are situated along the periphery, while the most private means are situated near the center. This is to assure that those traveling by private means will be able to experience a very public transition between their auto and the city-center.

The project will then be uniformly layered as such from top to bottom: light rail, shuttle, automobile, bus, commuter rail. The initial stratification of routes maintains automobile access at grade level, however those traveling by private means should be forced to interact with the structure more so than just entering and exiting a vehicle. Therefore the project will be sunken into the ground so that those accessing the site via private means will be forced to interact with others traveling via more public means as they navigate between multiple transit levels.

The difference between levels will be based off of the height between the current grade level of the site and the existing entrance canopy to of the Union Station building; thus respecting the lines of the historic structure, as well as maintaining sight lines from Millennium Bridge and along the 17th Street corridor. Based off these 22-foot increments, each platform level will be provided with ample structural and mechanical space and permit site access of each mode of transit without causing delays and congestion.

Step 5: begin to develop spatial discoveries that will enhance multiple-connectivity between access points of differing modes of transit. The minimum spacing between routes will be based upon horizontal vehicle easement and to permit vertical circulation between platform levels; yet these spacing requirements only function as a means of creating physical connectivity between

transfer points. In an attempt to provide another level of connectivity, the design will locate access points in such a manner that there will always be a visual connection between each method of travel. This will provide an understanding of how to navigate through the facility, as well as enhance public links between passengers.

This restricted space will assure that automobile access points will maintain higher densities of people due to the subtraction of excess space and the increase in traffic density. On the other hand, those traveling by means of public transit are more densely configured with one another during transport, and therefore will be provided with excess space upon which to disperse their density upon alighting transit.

addendum [internet references] :

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