ARCADIS STATIONS
Creating viable and sustainable transport hubs
CAD drawing: Beijing
Changyang Metro Station
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CREATING VIABLE AND SUSTAINABLE TRANSPORT HUBS

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Transportation Stations
Arcadis is the leading global natural and built asset design and consultancy firm, covering the whole asset lifecycle. For over 125 years we have been working in partnership with clients around the world to deliver exceptional and sustainable outcomes.

Our reputation is built on a deep understanding of client needs, combined with our knowledge and experience worldwide. With 28,000 people and €3 billion in revenues, we’ve built a global network that enables us to serve our local clients on a global basis. The megatrends of the 21st century place increasing demands on clients worldwide. Rapidly increasing urbanization, shrinking budgets and environmental sensitivity require innovative approaches to deliver advanced infrastructure for the Megacentury. With our integrated approach we create stations that transform their local areas and connect communities around the world.

We look forward to working with you.
Dresden Hauptbahnhof, Dresden, Germany
ABOUT ARCADIS

Arcadis provides consultancy, design, engineering and management services in infrastructure, water, environment and buildings. Established in the Netherlands in 1888, Arcadis now operates with 28,000 staff in over 40 countries worldwide.

We provide services throughout the entire value chain – from strategic advice, planning, design and implementation, through to maintenance and total lifecycle operation. We offer our clients solutions that are robust in the long-term, viewed within the context of their business needs. Our experience shows that the challenges faced by our clients are rarely met through simply providing traditional professional services. It is our ability to understand the specific needs of clients, in their local context, and our innovative application of services that are new to the industry combined with traditional skills that delivers real results.

Arcadis has a substantial footprint worldwide. Our global network enables us to bring our knowledge and experience of projects worldwide and apply that expertise to specific local situations and needs.

Our mission is to improve the quality of life worldwide by creating assets of distinction and sustainable solutions that enhance the built environment. Sustainability is central to everything we do; in our work with clients, in the way our company is organized and in our approach to social responsibility. Arcadis supports UN-HABITAT with knowledge and expertise to improve the quality of life in rapidly growing cities around the world.

FACTS

Gross revenue by activity:

- Infrastructure: 24%
- Water: 15%
- Environment: 33%
- Buildings: 28%

Gross revenue: €3 billion.
The mega trends of the 21st century will bring rapidly increasing levels of urbanization as the global population is set to reach nearly 10 billion by 2050. This demands advanced infrastructure across; roads, railways, ports and waterways, airports, energy resources and communication networks. There is increasing urgency for sustainable solutions to resolve the issues of; climate change, fragile environments and the scarcity of natural resources.
INFRASTRUCTURE FOR THE MEGACENTURY

THE TOTAL MOBILITY CHALLENGES

In mature markets, limited government ability to commit to new infrastructure and challenged budgets mean that more innovative ways are needed to manage existing infrastructure assets through to refurbishment and optimization programs.

Emerging markets must also rise to the challenge by building new infrastructure in order to compete. Both require transformational thinking on; mobility, connectivity, safety, durability, aesthetics and sustainable solutions. This is infrastructure beyond the technical: this is Total Mobility.

FULFILLING THE POTENTIAL, MEETING THE DEMAND

Stations are increasingly important in the evolution of 21st century infrastructure, with many clients placing them at the center of their transportation and urban regeneration strategies. With our global presence, Arcadis has the expertise and experience to plan, design, build and manage even the most demanding of station projects. Taking into account integrated solutions with maximum stakeholder support. We have developed a deep understanding of regional, macro and micro-economic drivers that enables us to bring fresh perspectives, innovative thinking and solutions to complex problems. In doing so, we deliver Total Mobility to billions of people worldwide.

CONNECTING COMMUNITIES NOW AND INTO THE FUTURE

Arcadis responds to these challenges by working in partnership with the public and private sectors to deliver the intelligent transport systems that will connect communities now and into the Megacentury. All our activities embody the highest levels of safety, quality and effectiveness. Our designs are engineered to meet the world’s most rigorous safety standards; and when developing land we ensure there is balance with the natural habitat. Clients look to us to help transform their station environments and passenger experience safely and efficiently, with minimum disruption. And, most importantly, Arcadis is able to provide added value and additional capacity without the need for expensive build-outs.
Arcadis combines strategic advice with multi-disciplinary technical knowledge to create stations that are much more than transport hubs, transforming their local areas. We have been at the forefront of this expertise for over a century, ensuring safe and efficient connections worldwide.
NEXT GENERATION STATIONS

Stations have always been important components of rail infrastructure, but stations today are no longer just the place where a traveler arrives or departs. Retail and leisure facilities in and around a station increasingly make the area a destination in its own right. An attractive station can even enhance the prosperity of a city, district and region, creating economic growth and opportunities for major investment in urban development.

The Arcadis approach is to integrate early master-planning of the redevelopment of the station and its urban area, rather than leaving urban development to occur as a consequence of updating the station. It is our experience that well thought-through planning of the wider station area upfront creates high additional value and attracts inward investment.

Our track record of delivering sustainable station projects is exemplary. The operational life of a station is always expected to be at least 50 years, and sometimes the specification is for 100 years. So in designing stations we calculate how the needs of the station and its site will change over the long term. And we use sustainable materials so there is no need to redevelop or refurbish within a few years.

In the case of station re-development programs, which need to stay operational during the transformation. They continue to be crowded and shops stay open while trains run on time. The challenge is about expanding, upgrading and maintaining a station safely without disruption to daily operations or to the communities they serve. We have successfully applied lessons learnt over decades to client projects all over the world. Projection and analysis of passenger flows, for example, has become essential to assuring the smooth running of the station over time and the overall passenger experience. And our ability to manage a phased delivery is key to success in a complex environment, because a station project is always dynamic and subject to change.

Our attention to both the desired end results and the detail means that right from the start of the planning phase we identify, mitigate and even avoid issues that could affect the construction and safe operation of a station during its redevelopment. With forward thinking and excellence integrated into every phase of the project from planning to maintenance, clients trust our multi-disciplinary experts to deliver mobility, connectivity, safety, durability and sustainability across every station project.

LOCAL, GLOBAL AND INDEPENDENT

Our local presence helps us to maintain lasting relationships with our clients and to build in-depth understanding of local conditions. And our global network enables us to use our vast expertise to provide the best value added services and technologies to multinational, regional and local clients.

By combining global expertise with local presence, the projects we deliver incorporate the highest levels of strategic consulting with the full range of technical services and solutions for redeveloping stations.

As an independent company, Arcadis is best placed to advise clients such as government, suppliers or station owners objectively on the most appropriate solutions and suppliers.
Principe Pio Station,
Madrid, Spain
Clients need reliable planning, design and construction expertise that guarantees stations of lasting value to their communities: safe, sustainable and aesthetically pleasing – especially stations in special places, because they are important to the local area. With extensive experience in project management, design and construction, cost and commercial services of stations across Asia, Europe, the Middle East and the Americas, Arcadis has the proven ability to meet this need.
TRANSFORMING THE PASSENGER EXPERIENCE IN HISTORIC SETTINGS

Transforming the passenger experience in historic settings of many stations in city centers the historic and architectural value can be emphasized and at the same time today’s needs for connectivity, accessibility and comfort require substantial improvements. Arcadis delivers solutions for optimum passenger comfort, introducing natural light and space while conserving the fabric of heritage buildings, and improving the linkages between interchanges.

MERGING URBAN TRANSPORT STREAMS SAFELY

Stations in major metropolitan areas, cities and conurbations integrate tramways, subway lines, light rail or conventional railway lines, roads and bicycle/pedestrian routes. Arcadis advises on the merging of transport streams via high quality analysis and connections in and around some of the world’s busiest stations, helping clients to improve safety and efficiency.

MOBILITY ORIENTED DEVELOPMENT ENVIRONMENT

Mobility Oriented Development environment (MODe) is a performance-driven approach for creating mixed use and multi-modal urban environments, at and around transportation hubs – delivering the highest possible outcomes for the prosperity and health of people, predicting measurable social and economic benefits, and maximizing the return on investment in urban mobility.

ENABLING ECONOMIC GROWTH IN MIXED-USE AND COMMERCIAL DISTRICTS

Where a local area is experiencing rapid but uncoordinated economic growth, a station can become the urban hub that brings all the commercial and mixed-use businesses together. Employees who commute through the station will help to grow the local economy too. Arcadis advises on the master-planning and design of stations to bring separated parts of the city (or urban area) together to enhance local prosperity.

UNBLOCKING URBAN ROAD CONGESTION AND SUPPORTING ‘GREENER’ MODES OF TRAVEL

Municipalities around the world want to solve the problems of road traffic density and provide safer options for pedestrians and cyclists. As part of the drive for reducing pollution, they also want to encourage the use of light rail and bus services. Arcadis has extensive experience of integrating multimodal forms of travel seamlessly and efficiently to increase uptake of more sustainable transportation.
OUR CLIENT’S CHALLENGE
Metro de Santiago is the Chilean state-owned company that is developing 17 new stations on a new metro line (Line 3) as part of the Santiago’s subway network, adding over 22km of network to connect five new districts of the Metropolitan Region of Chile. The client’s particular challenges in developing the stations were to preserve the historic center of Santiago, minimize disruption to passengers during construction, improve safety and accessibility, and future-proof the design to allow further stations to be added later.

OUR APPROACH
The project is developed by the AWPA consortium formed in conjunction with WorleyParsons. Our role in this project was to:
- Develop the detailed engineering design for each of the 17 stations that make up Metro Line 3
- Finish the design of the detailed engineering connecting the stations, for all Metro Line 3’s tunnels and underground shafts.

In a second stage, the consortium will execute the Technical Supervision for the construction of the Metro stations.

The Metro project has incorporated important innovations, such as platform doors at all stations to increase safety, trains will be fully automated with the UTO system (Unattended Train Operation) and in order to eliminate third rail power supply, a catenary system was applied.

Particular attention was paid to phasing the construction work to enable continuous passenger flow, especially at the intersections with existing stations, and to protect the heritage buildings and green spaces (parks and squares) in Santiago city center.

THE OUTCOMES FOR THE CLIENT
- Teaming up with the Consortium meant that the client was supported throughout with project management and multidisciplinary expertise.
- Proposed optimizations to the designs of the stations will enable improved flow of mobility for future passengers.
- In addition to protect heritage sites and open spaces, the Consortium proposed significant improvements in the access areas of future stations to ensure they are consistent with their environment.

CASE STUDY
CONNECTING NEW URBAN REGIONS, PROTECTING HERITAGE SITE
Project: Detailed engineering design for Metro’s 17 Line 3 stations, Santiago, Chile
Date won/completed: November 2013 / July 2015
Client: Metro do Santiago
MAKING SURE THE TRAINS RUN ON TIME

One of the biggest challenges to station operators during refurbishment is ensuring that normal rail services can be achieved safely without disrupting the smooth progress of major construction works. This is especially demanding when the station serves high speed train routes. Arcadis has unrivaled expertise in managing the complexities of keeping all the station’s functions operational throughout a redevelopment project.

CATALYSTS FOR URBAN REGENERATION

Modernized stations can revitalize run-down urban areas and strengthen the sense of an attractive place, providing exciting retail and leisure opportunities for both passengers and investors. Arcadis has extensive experience of new ways of thinking about the convergence of urban transit and retail.

PUBLIC PRIVATE PARTNERSHIPS

Limited public funding means that public station owners and operators around the world are looking towards private sector funding to meet their investment goals. At the same time, investors are increasingly interested in assets that deliver a long-term guaranteed return. Arcadis can identify and scope the possibilities for Public Private Partnerships (PPP), assess the value of assets and structure the outsourcing of operations to private parties. We can also play a role in the formation of PPP and BOT (Build Operate Transfer) projects, bringing our engineering expertise into consortia.
OUR CLIENT’S CHALLENGE
Madrid’s historic Principe Pio station is located at the junction of regional train lines, two subway lines and one of the largest bus stations in the city. With more than 73 million commuters a year, this was an exceptionally attractive prospect for new commercial offerings. The client had accessed the most prestigious project in Madrid and was determined to realize the right value for money in creating a landmark retail center and civic space.

The challenges for the client were to achieve high returns on a very sensitive project with a Grade 1 listed building at its center, in a densely compact urban setting, without disrupting operational transportation services.

OUR APPROACH
CallisonRTKL (a Design Consultancy of Arcadis) restored and extended the station, maximizing the area’s value by combining its function as a transport hub with a newly created mixed used retail area offering; leisure, office facilities, cultural, shopping and service facilities.

• We integrated the new modern-style retail elements with the existing station, creating a central glass dome as an entranceway.
• We created a new full commercial basement spanning the main station and the new building, adding 28,000m² of commercial area as well as connecting the offices with the bus station and train/metro flow.
• All transit lines were maintained full operational capabilities while the development was in progress.

THE OUTCOMES FOR THE CLIENT
• High returns, a recession-proof mixed use project that was able to grow in demand even during the deepest recession in Spain.
• A retail destination that has attracted a number of UK retailers to Spain for the first time and has enjoyed 100 percent occupancy since its opening.
• Positioning the award-winning center as a new model for transit and a catalyst for urban regeneration.

CASE STUDY
INNOVATIVE APPROACH TO CONVERGENCE OF URBAN TRANSIT AND RETAIL
Project: Principe Pio Station, Madrid, Spain
Date won/completed: Completed – September 2005
Client: Grupo Riofisa

OUR CLIENT’S CHALLENGE
São Paulo, the capital of the Brazilian state São Paulo, is a densely populated urban area and is currently expanding its system of metro lines. Tiquatira Station will be a new intermodal transport hub in the eastern zone of Sao Paulo city, which will enable transfer to the metropolitan rail system and bus. The client wanted a solution that would provide a comfortable passenger experience, increase their mobility and offer connection to different transport modes in one place. The main challenge would be to keep the metropolitan rail connection fully operational while the station complex was being built.

OUR APPROACH
Arcadis was responsible for the basic design of architecture and civil work, including the following specialties:
• Geometry (track and roads)
• Drainage
• Foundation and concrete structures
• Geotechnical studies (shield solution)
• Architecture.

THE OUTCOME FOR THE CLIENT
Arcadis has developed an efficient solution that will allow the maintenance of existing railway line operation and reduce the impact for the metropolitan passengers.

CASE STUDY
BASIC DESIGN OF Tiquatira Station A Hub in East Zone of Sao Paulo City
Project: Line 2 – Green – Tiquatira Station
Date won/completed: 2012 / 2014
Client: Companhia do Metropolitano de São Paulo
OUR CLIENT’S CHALLENGE
Manchester Victoria Station is a major transport interchange in the city centre, with three interlinking elements: the Metrolink tram network, a railway station (including magnificent heritage architecture) and the Manchester Arena. It is overdue for redevelopment, recently voted the worst station in the UK. The client wants the station to become a memorable gateway to the city, to meet the growing passenger demand and to support economic growth in the region. The redevelopment forms a key part of a £1bn+ investment programme to increase rail capacity across the north of England.

OUR APPROACH
Arcadis had been involved in the project from GRIP Stage 3 through to completion of GRIP stage 4 designs. As part of the GRIP stage 5 Design and Build contract we designed:

• A new £16m roof to replace the enormous existing 1840s roof that will be demolished – a structure that will provide a bright and spacious station and will be a recognisable gateway to Manchester

• A new mezzanine link bridge linking the Manchester Arena (a 21,000 seat arena) to the lower level station concourse via a mezzanine staircase and retail units

• The complete remodelling of the Metrolink infrastructure at Manchester Victoria station, to increase tram capacity.

The detail design led by Arcadis required all parties to work in collaboration. Our solution was to use BIM (building information modelling), working with the entire supply chain and coordinating all the elements in a single model.

THE OUTCOMES FOR THE CLIENT

• The remodelled design transforms the station into a notable metropolitan gateway, while preserving Grade II listed building elements in this city centre site, and significantly improves capacity.

• Our pioneering use of BIM and collaborative approach with the supply chain has been critical to delivering greatest value, saving months on the construction program.
THE CLIENT’S CHALLENGE
Mockingbird Station is a mixed-use village named after and linked to an adjacent DART station via a pedestrian bridge. It is also the first mixed-use project in Texas specifically designed and built for a light-rail train station. The development responded to changing market demands of the time where the client was looking to create a development where people could live, work and play all in one place. The developer saw the light-rail station as a way to tap into the existing transit infrastructure and create a walkable, connected community.

OUR APPROACH
CallisonRTKL (a Design Consultancy of Arcadis), worked as the design architect on Mockingbird Station. Working alongside the developer, the city of Dallas and other stakeholders, the team was able to create a transformative project with this new urban village.

- Incorporating and extending existing warehouse and office buildings, the village is pedestrian-friendly and mixed-use.
- To take advantage of its location and to encourage further connections between people, CallisonRTKL designed 211 loft apartments; more than 90 shops and restaurants; offices and parking and an enclosed public plaza, all linked to the station. This was a pioneering project for Dallas, and set an important precedent for other transport-oriented developments (TODs) in the Dallas Metroplex.

OUTCOMES FOR THE CLIENT
- The client was happy with our ability to transform the area, repurposing existing buildings and connecting the transit systems already in place.
- The redevelopment of the Mockingbird Station has led to an increase in passengers (an estimated 185,000 per day in 2010) and a more walkable community.

CASE STUDY
URBAN VILLAGE DEVELOPMENT FOR A LIGHT-RAIL TRAIN STATION

Project: Mockingbird Station, Dallas, Texas, United States
Date won/completed: Completed – June 2002
Client: Dallas Area Rapid Transit (DART)
OUR CLIENT’S CHALLENGE
Amsterdam’s historic Centraal Station is located on an island in the River IJ. It is one of the largest railway hubs in the Netherlands, currently handling around a quarter of a million passengers daily. Links to other transit systems are being improved, including the new North-South Metro line and a new bus station. This busy railway station needed a large-scale upgrade.

The challenge for the client was to integrate ten major mega-projects on a complex island site while maintaining full operation of the railway station throughout.

OUR APPROACH
Arcadis was involved in all the large-scale projects as consultant, working alongside consultants Movares and as part of the VIA Consortium. The projects include:
• Constructing a new roof, tunnel and entrance hall on the River IJ-side (reclaiming 40 meters of land from the river), new bus station and canopy at ground level
• Constructing a tunnel beneath the IJ building for a new underground metro station
• Two new barrier-free passageways for cyclists and pedestrians, a slow traffic tunnel for cyclists and design of Europe’s biggest cycle racks
• Program P76+: this national program involves elevating the railway platforms to a height of 76cm
• Advising on the preservation of the historic station building – architect P. Cuypers
• Creating new retail space by widening the Oosttunnel to three times its present width.

THE OUTCOMES FOR THE CLIENT
Working collaboratively and combining our works with other ongoing works on site, we saved the client significant costs and ensured minimal disruption to passengers.

The project has transformed the facilities at Amsterdam’s main station, and created an efficient link between the existing national transport network and the local transit systems.
OUR CLIENT’S CHALLENGE
The client is responsible for developing Changyang metro station and the surrounding area, serving a residential area in Beijing’s Fangshan district. The project site area 2.5km², while the transport hub stays in a plot of about 10,000m², and has been approved by the regulatory authorities for transport use as a bus terminal connecting to the metro station.

The client wanted to retain the transport function of the site, while at the same time creating a mixed-use development that would bring in revenues to compensate for the investment in the metro station.

OUR APPROACH
CallisonRTKL (a Design Consultancy of Arcadis) was responsible for conceptual planning, urban design and architectural design.
• We created a master plan that centers around sustainable living as part of a transport oriented development.
• Our design for the transport hub provides a convenient access point that promotes smooth intermodal transportation by car, bicycle, bus and rail, connecting people living in the suburbs to employment opportunities in the city center.
• The architectural design is not just an elegant façade – it is intended to realize the potential for commercial success in attracting investors in retail, dining and office space.

OUTCOMES FOR THE CLIENT
• The land value is greatly increased by establishing a mixed-use site rather than just a bus and metro terminal.
• The project is expected to become a benchmark for similar development in the region. As the gateway to the new Changyang residential community, the station and surrounding area will attract visitors and local residents, helping to drive economic development throughout the region.
OUR CLIENT’S CHALLENGE
Rotterdam Centraal Station is one of four major rail stations in the Netherlands that are being upgraded to serve international high speed rail (HSL) traffic. This is the first HSL station stop for trains arriving in the Netherlands, so the station needed to be compatible with European stations in every way. Domestic passenger numbers have been growing rapidly too: currently 110,000 people use the station every day via HSL, train, metro, tram, bus, taxi and bicycle, a figure that is set to increase to 320,000 by 2030. There was a pressing need to increase capacity and improve facilities – while maintaining normal operational service.

OUR APPROACH
From the start of the project in 2004, Arcadis provided all the engineering and technical advice for ProRail, as well as project, construction and interface management, collaborating with other designing parties, such as TEAM CS, the contractors’ consortium BTrC and the engineering department of the city of Rotterdam (IGWR).

• Before the construction of the new station could start, a complete temporary station with replacement station hall was put in place and the old station buildings were demolished.
• The new station is much larger, with one integral glass roof covering the railway and platforms. On the city center side there is now a spacious station hall, with retail facilities underground and 4000m2 of new office space. There is also a station entrance on the Proveniers side, merging the public neighborhood area seamlessly with the station’s domain.

THE OUTCOMES FOR THE CLIENT
Since its opening by King Willem-Alexander on 13 March 2014, Rotterdam Central Station has gained numerous awards:
• In 2014: the Dutch National Steel Award, the International Brunel Award, the Dutch Timber Award and the Dutch Design Award
• In 2015: the Dutch BNA Award for Best Building of the Year.
Involving the complete phased demolition and reconstruction of the existing London Bridge Station to create a street-level concourse, and completely reconfiguring the track layout to increase through capacity while ensuring the station remains fully operational throughout.

**OUR APPROACH**

Arcadis and WSP signed a joint venture contract to deliver the detailed design and support for main contractor Costain to significantly increase passenger flow through central London as the last major part of Network Rail’s Thameslink Project.

- Arcadis/WSP’s design involved the transformation of access into and around the station to enhance passenger experience, including a new concourse at street level to accommodate retail and commercial units.
- The design also involved alteration of the platform configuration, from the current nine terminating platforms and six through platforms, to six terminating platforms and nine through platforms. When completed the concourse will be two-thirds larger than before.
- The team has reduced project risks, providing Network Rail with increased certainty that the project will be delivered safely, on time and to budget while meeting the aspirations of its major stakeholders and the travelling public. Arcadis has also ensured that the design stages incorporated the need for the station to remain fully operational and safe for passengers, station and contracting staff.

**THE OUTCOMES FOR THE CLIENT**

- Working collaboratively was critical to the success of this phase of the project and reflects the client’s vision for ‘one project team’. This was achieved by over 200 design staff working as one focused team, co-located on-site to ensure clear communication and to maximize everyone’s respective areas of expertise. The result has been increased efficiency, reduced duplication of effort and greater outputs, minimizing waste and unnecessary expense.
- By the end of the construction phase, there will be a significant improvement in train frequency, with trains to increase from 16 to 24 per hour, greatly improved facilities and providing space for 66% more passengers than the station handles today.
We have people and offices around the world. Our global network enables us to bring our knowledge and experience of projects worldwide and apply that expertise to specific local needs and situations. We are based in:

- Australia
- Bahrain
- Belgium
- Brazil
- Brunei
- Canada
- Chile
- China
- Czech Republic
- Dubai
- France
- Germany
- Hong Kong
- India
- Indonesia
- Italy
- Jordan
- Kazakhstan
- Korea
- Macau
- Malaysia
- Mexico
- Mozambique
- Netherlands
- Oman
- Peru
- Philippines
- Poland
- Qatar
- Romania
- Russia
- Saudi Arabia
- Serbia
- Singapore
- Slovakia
- Spain
- Switzerland
- Taiwan
- Thailand
- Turkey
- United Arab Emirates
- United Kingdom
- United States
- Vietnam
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