A black and white photograph of a large tunnel boring machine (TBM) cutterhead. The cutterhead is a massive, circular metal structure with numerous cutting tools arranged in a circular pattern. A worker wearing a hard hat and work clothes stands in the foreground, looking towards the cutterhead. The background shows the interior of a tunnel with a wire mesh lining.

DEEP CONNECTIONS

Presented by **Metro Art** in collaboration with artist **Ken Karagozian**



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Image Courtesy of
Richard F. Clarke

IN MY 30-PLUS YEARS OVERSEEING THE DELIVERY

of large transit infrastructure projects for various public agencies across the western United States, I have observed a heavy crossover between rail construction and the public art world. Both serve as key components of urban infrastructure and have the powerful objective of building civic identity.

Successful projects are all about collaboration. It's apparent that both the building trades involved in constructing transit corridors—and the artists working in the public realm—demonstrate a willingness to work together with Metro to dream

big and to build world-class transportation projects, which transforms the quality of life in our communities.

Metro is undertaking the largest transportation capital programs in the country and one of the greatest infrastructure projects of modern times. Wearing safety gear alongside Metro's construction crews, Ken has bravely and voluntarily captured the evolution of technologies that have enabled magnificent tunnel boring machines to operate at a dramatic scale and speed that once seemed impossible.

Please join me in celebrating these herculean feats of Metro's subway construction projects through the lens of Ken Karagozian.

RICHARD F. CLARKE

Chief Program Management Officer, Metro Program Management



At Hollywood/
Highland Station,
Red Line

WE ARE HONORED TO BRING TO THE SURFACE

DEEP CONNECTIONS, Ken Karagozian's decades-long body of work documenting the beautiful, messy and elaborate choreography happening beneath our feet.

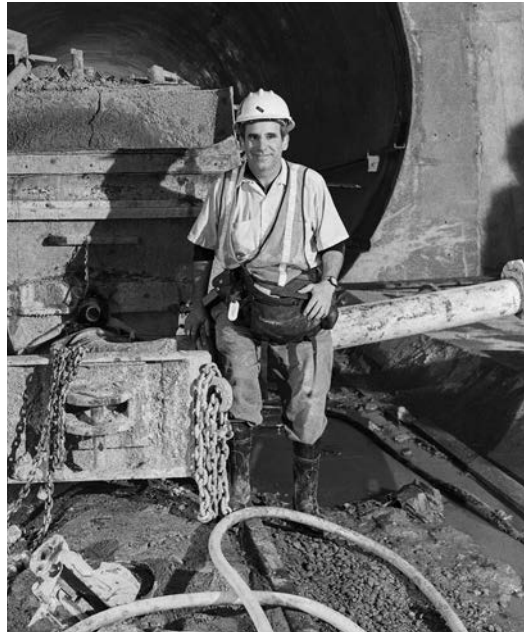
Ken's stunning photographs resonate on a visceral level. They are mysterious, industrial, busy and chaotic. They are also personal and sincere depictions of his subject. Below LA, there is an entire world few people have access to, yet Ken occupies this underground space with the dexterous ease of a seasoned professional.

Ken's heralded work on this project is a testament to his passion for the subject, as well as the many relationships he's built across LA. The images at times appear surreal with their immense sense of scale, the human form juxtaposed against gigantic machines most of us will never see. He captures aspects of the invisible underground construction world few know, and portraits of the hardworking people who are building our transit system. Ken's sensitivity towards the people he's photographed has earned him their trust and allowed him permission into construction sites otherwise unseen and undocumented.

We are deeply grateful to Ken for his remarkable talent and dedication in documenting this important urban infrastructure work, and proud to share it with transit riders and the general public. *DEEP CONNECTIONS* reveals yet again the incredible ways in which artists help tell stories and inspire conversations, as we work together to reimagine transportation in LA County.

MAYA EMSDEN

Deputy Executive Officer, Metro Arts & Design



Under the Hollywood Hills, Red Line

I NEVER IMAGINED THAT A SINGLE DAY DOCUMENTING a Metro construction site on Hollywood Boulevard would lead to nearly three decades of documenting the agency's expansion. Photographing underground opened up a whole new fascinating world; it is a landscape that is beautiful, dramatic and dynamic.

Using ambient light, I am drawn to rail lines that appear to go on for eternity, or magically disappear into an abyss. Similarly, I look for reflections, patterns and details to make aesthetically pleasing images that are relatable and timeless.

As rail tunneling and station construction progresses, the many steps required have improved and simplified with new technology and equipment. However, the need for human skill to manipulate steel and concrete remains consistent.

Over the years on Metro job sites, I have made many personal connections and have seen generations pass along the skill of the trades. I also have gained tremendous respect for the craftsmanship, hard work and dedication required.

Through this project, my hope is that viewers will share some of these same feelings, that they will be able to find a sense of wonder in the dirt, grime and sweat of constructing an underground rail system—a system that will continue to move and connect one community to another.

KEN KARAGOZIAN
Artist



As Karagozian recalls, "This is one of my first images of Red Line construction and one of my favorites. The graveyard crew had just finished their shift and were tired and ready for a shower."

RED LINE, 1994



Two miners inspect the breasting plates and teeth of the shield machine soon after it broke through to the station at 6th St and Vermont St. Two tunnels were bored underground from the construction site at Barnsdall on Hollywood Bl.

RED LINE, 1994



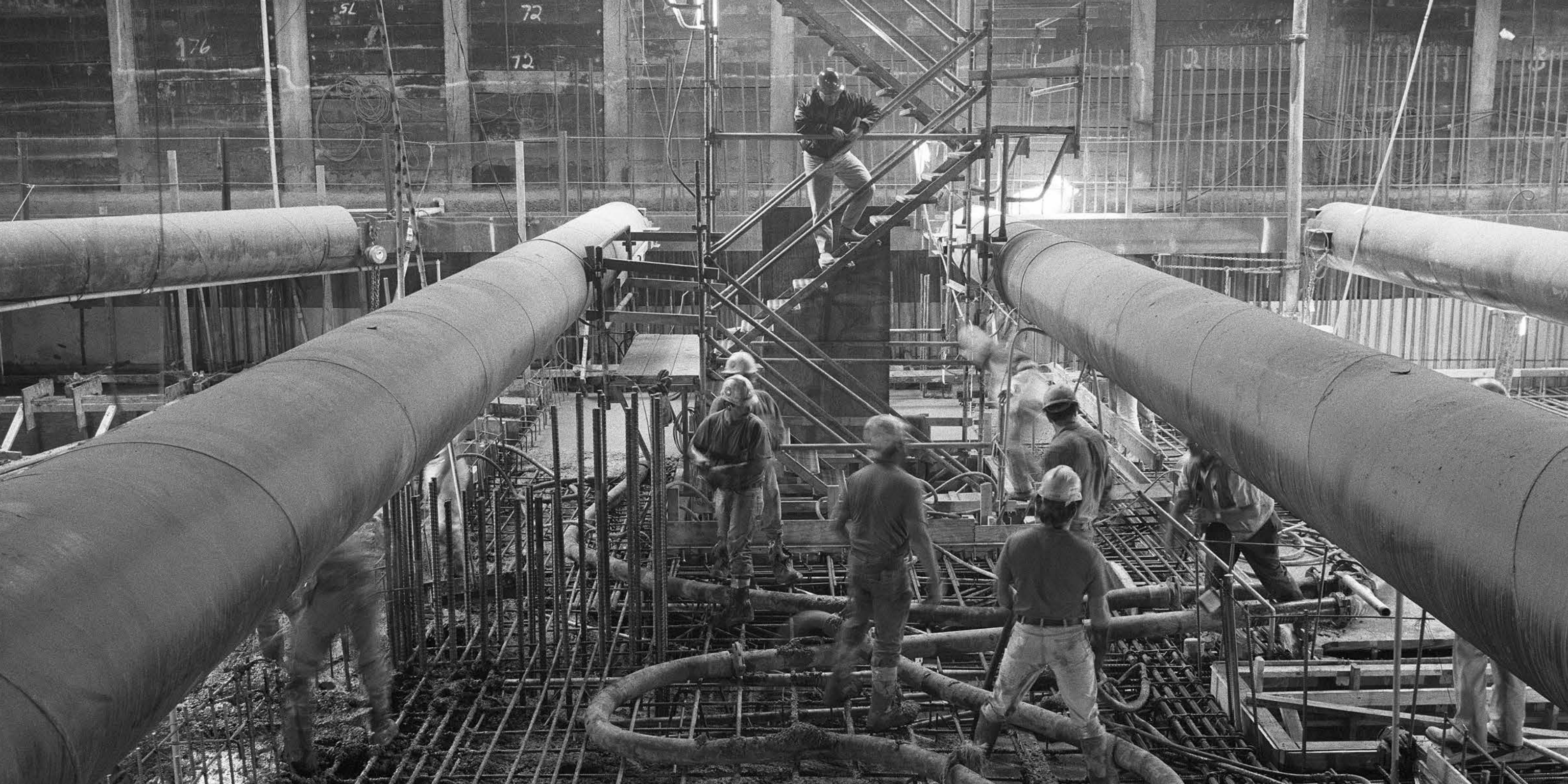
Tom Collins poses underground next to a Plymouth brand locomotive, also called a "loco."

RED LINE, 1994



Troy Monges, Miner, at the Barnsdall construction site. Per Karagozian, Monges explained his work: "I'm an underground excavation expert dealing with metamorphic and obsidian materials. What that boils down to in layman terms is that I'm an underground ditch digger."

RED LINE, 1996



Construction workers pour the concrete floor at Vermont/Santa Monica Station.

RED LINE, 1995



Tony Traylor, Miner, below the Santa Monica Mountains. In 2018, he retired after 43 years in Traylor Bros. Underground Division and he has worked on over 20 underground construction projects in his career, including Metro's Red and Gold Lines.

RED LINE, 1996



Tony Olea III is standing next to the concrete tunnel arch form for the Red Line. Per Karagozian, Olea III is currently Vice President of the Laborers Local 300 Union and his son is working on the Purple Line Extension.

RED LINE, 1996



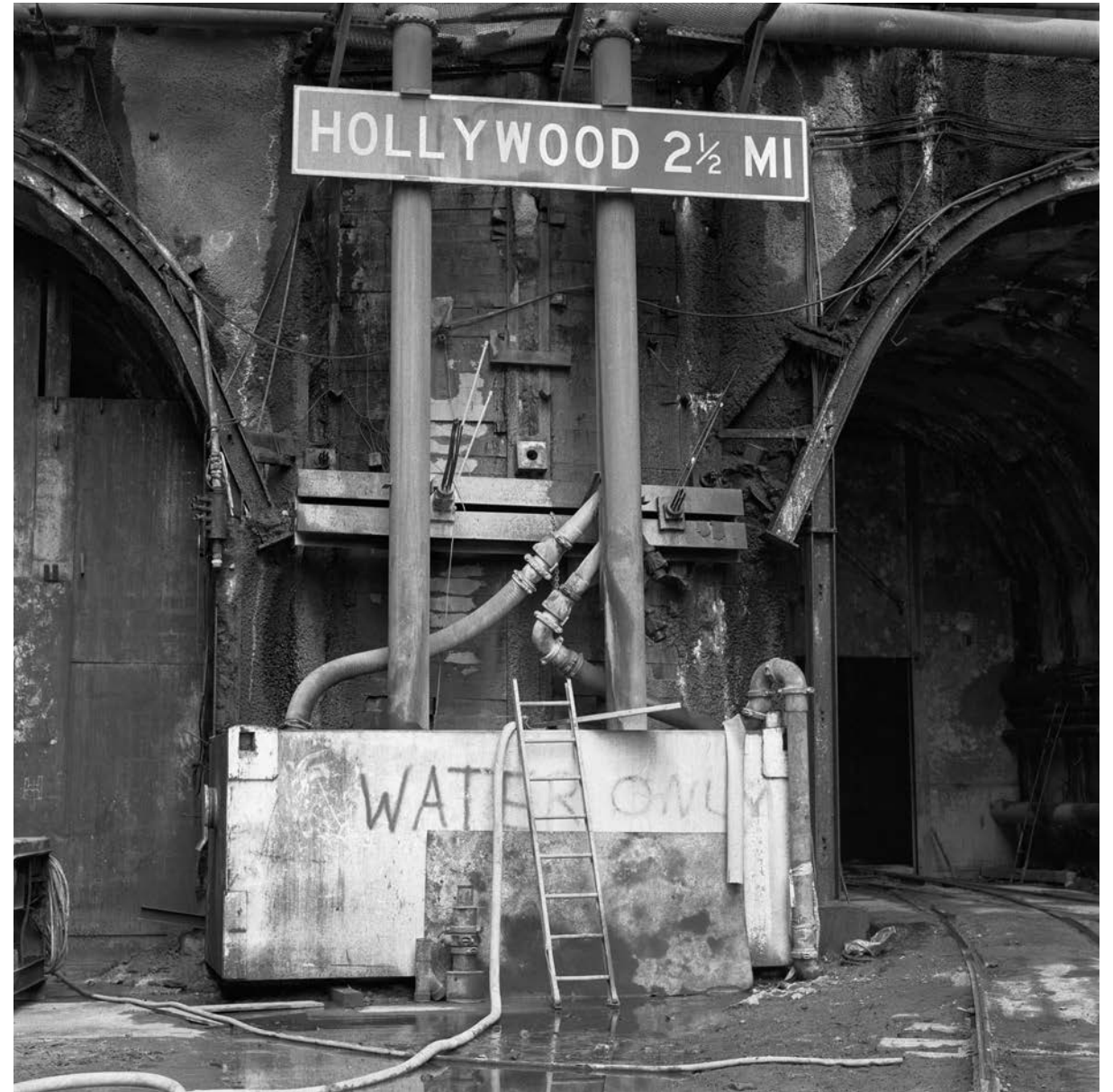
In the 1990s, tunneling technology was conducted in a “two-pass” lining system. The precast concrete segments are installed, then the HDPE membrane is glued in place (shown here), followed by the rebar and concrete arch form to complete the final cast-in-place concrete lining.

RED LINE, 1995



Thelma & Louise were the names given to the two mammoth TBMs that carved through 2.5 miles of rock beneath the Santa Monica Mountains to create the Red Line. Each machine was the length of a football field with a cutting diameter of 20.67 feet. The object in the foreground is one of the four outer sections of the cutterhead.

RED LINE, 1997



A favorite image of Ken Karagozian's, the "Hollywood 2 1/2 MI" sign was at the Universal City/Studio City Station construction site about 75' below ground.

RED LINE, 1997



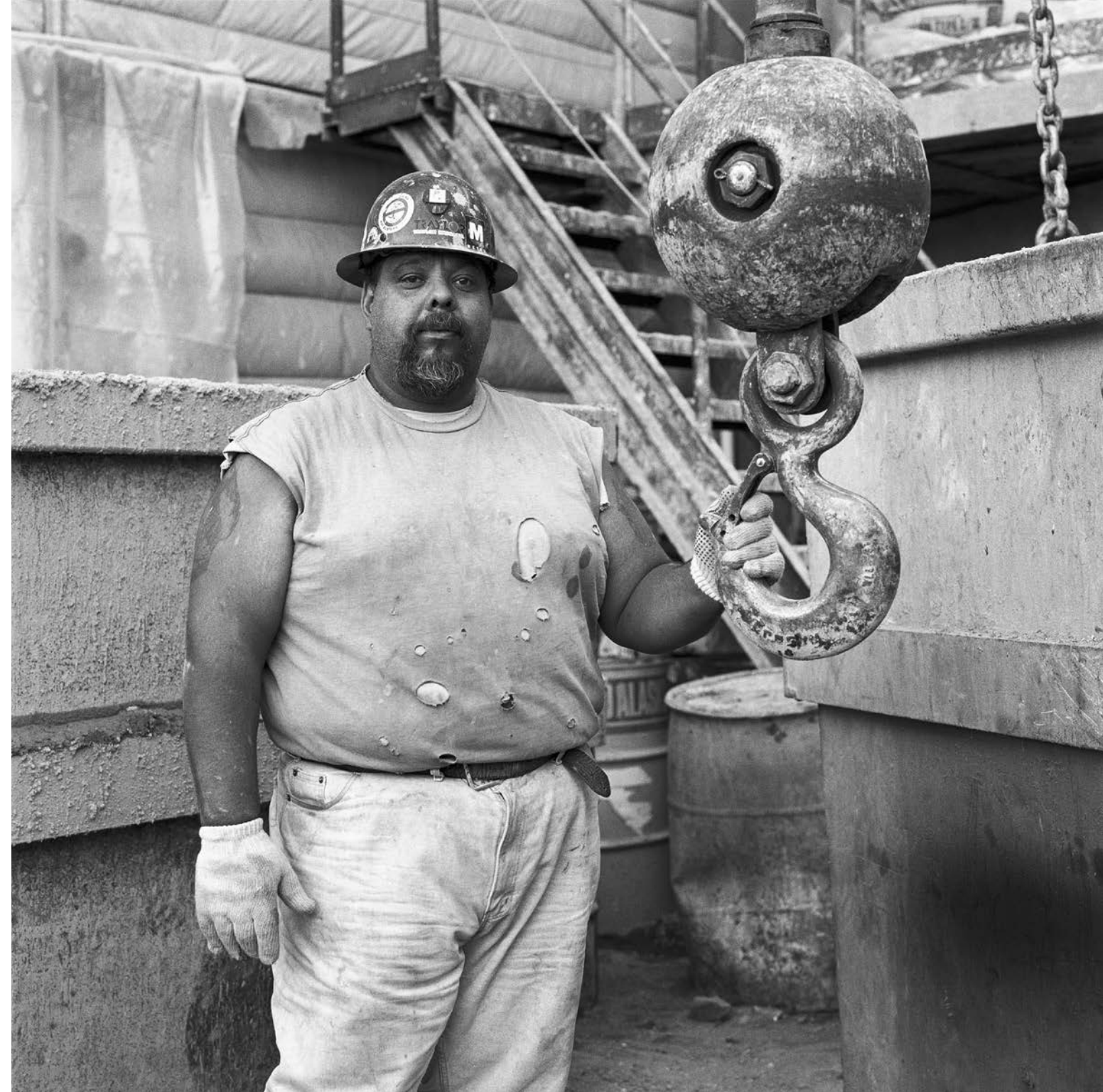
Pictured here at the Barnsdall topside construction site, Tony Anderson, a Tunnel Equipment Operator, worked many different tasks for the Red Line project from mining to welding, and as a mechanic.

RED LINE, 1995



Karagozian relays, "In 1999, at the Red Line Subway Grand Opening weekend my photographs were on display and I met Hector and Alex Barajas' parents and siblings. The brothers were so proud to share that they were part of the construction crew that helped build the Metro Red Line."

RED LINE, 1998



On La Brea Bl, north of Hollywood Bl, there was an access site for tunneling to continue from Hollywood to Universal City. This photograph of miner Dave Huerta was taken topside at La Brea Bl.

RED LINE, 1998



The concrete formwork assembly is shown within the Red Line Track Level Rooms excavated under the Santa Monica Mountains. These rooms house the gear controlling the crossover and the track and power equipment.

RED LINE, 1998



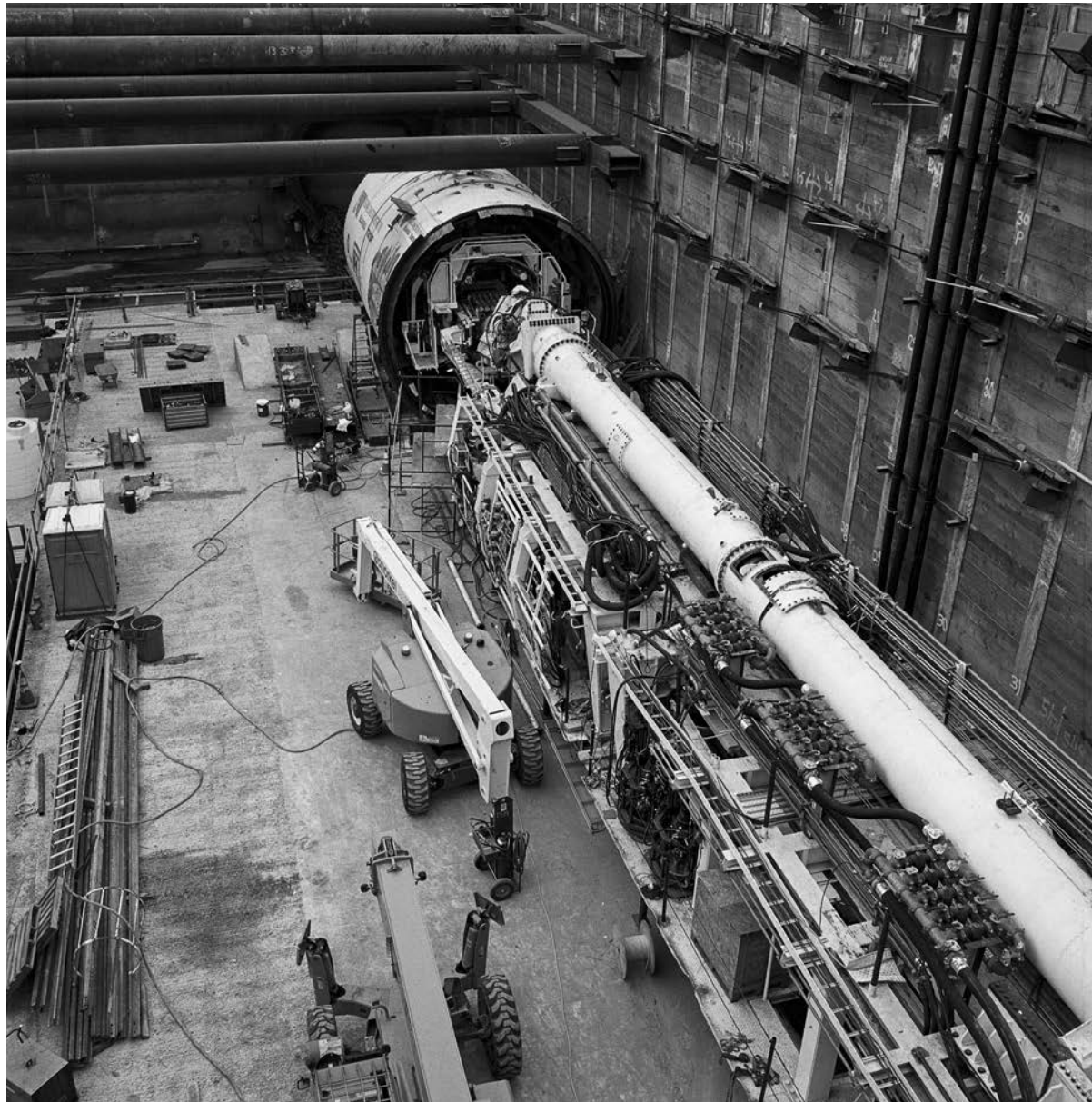
The TBM cutterhead is turning for a press event to showcase the 1.4-mile underground tunnel boring breakthrough in the Gold Line Soto Station. The construction worker is welding the steel cradle for the TBM to be moved onto.

EASTSIDE EXTENSION, 2006



This photograph is from the first Metro Gold Line Eastside Extension Project. The “loco,” a diesel powered locomotive rail car, is used to transport workers and equipment underground.

EASTSIDE EXTENSION, 2007



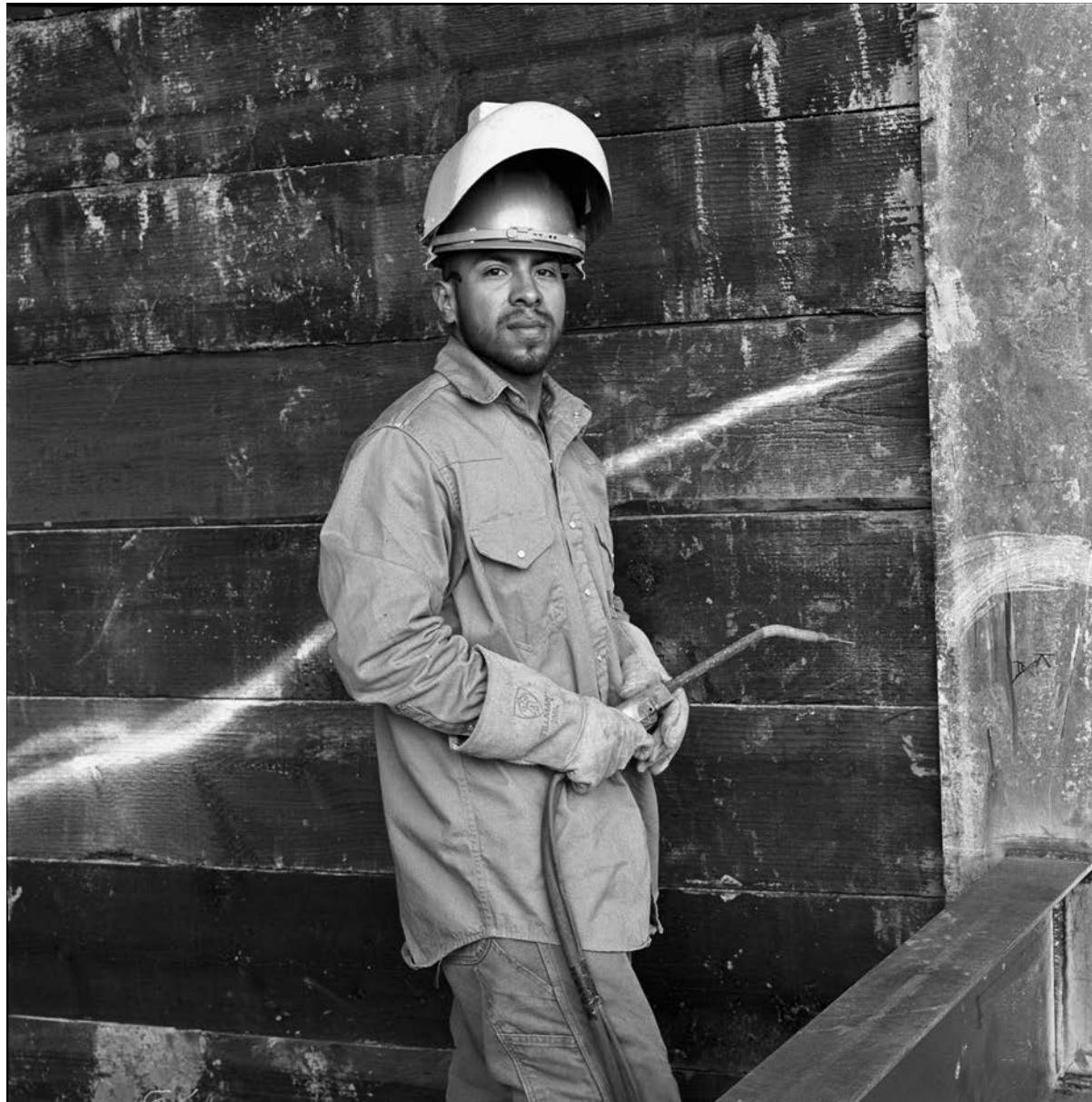
A view from street level at 1st and Central, looking down onto the TBM where it started its 1.1-mile drive. "A TBM is like a giant drill. The public voted to name the Regional Connector TBM 'Angeli.' Angeli traveled at an average rate of 50' per day. The miners set a one day record of mining 190' in one day in 2017."

REGIONAL CONNECTOR, 2016



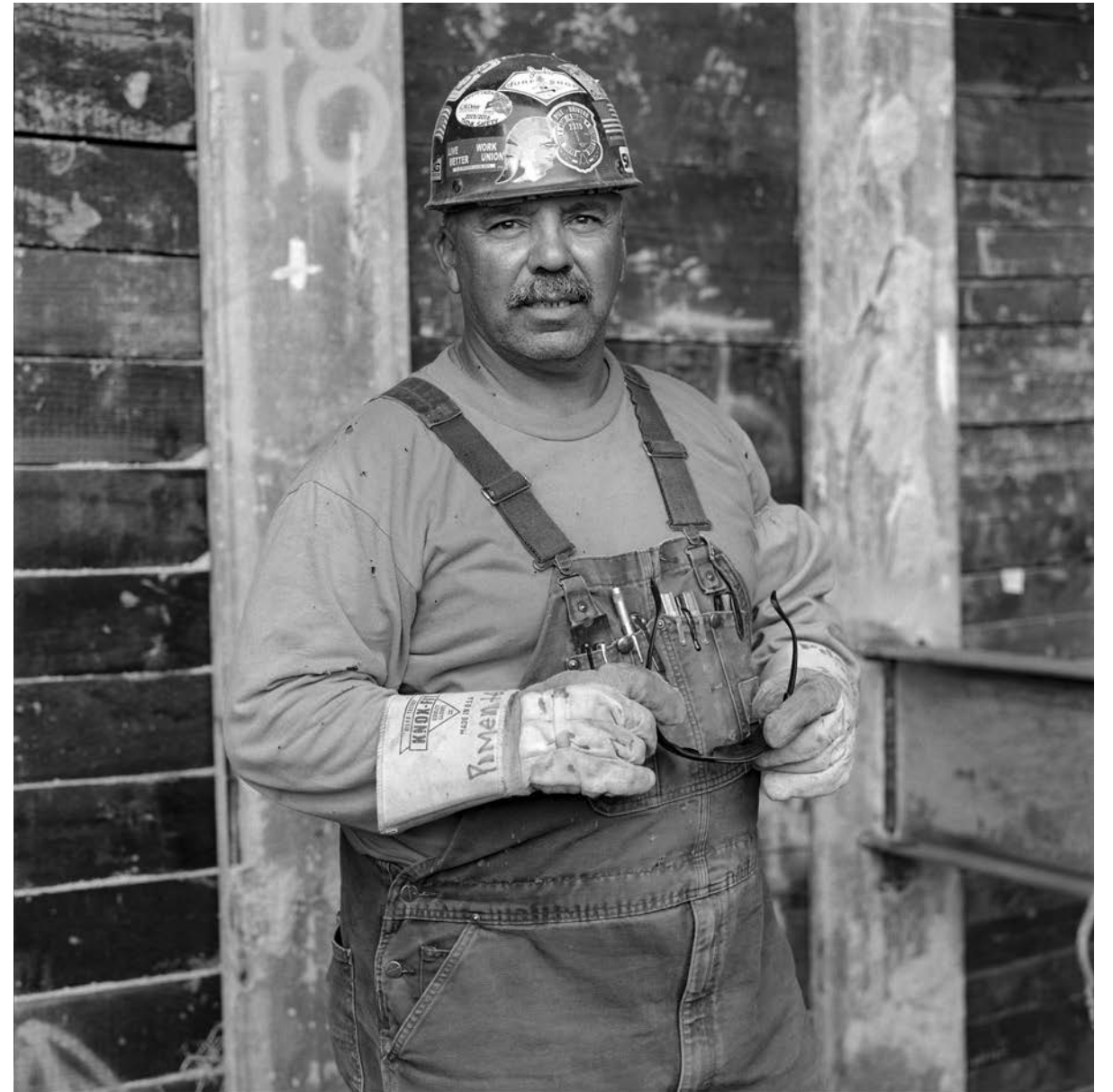
Bert Dore, pictured here in front of the TBM cutterhead in 2016, has been a miner since the 1970s and a Traylor Bros. Tunnel Superintendent for the Red Line, Gold Line Extension, Regional Connector and Purple Line Extension.

REGIONAL CONNECTOR, 2016



“In 2016, I started photographing the Regional Connector Transit Project and on my first day made a portrait of Luis Alcantara, Carpenter, who was welding the tieback braces that support the station wall.”

REGIONAL CONNECTOR, 2016



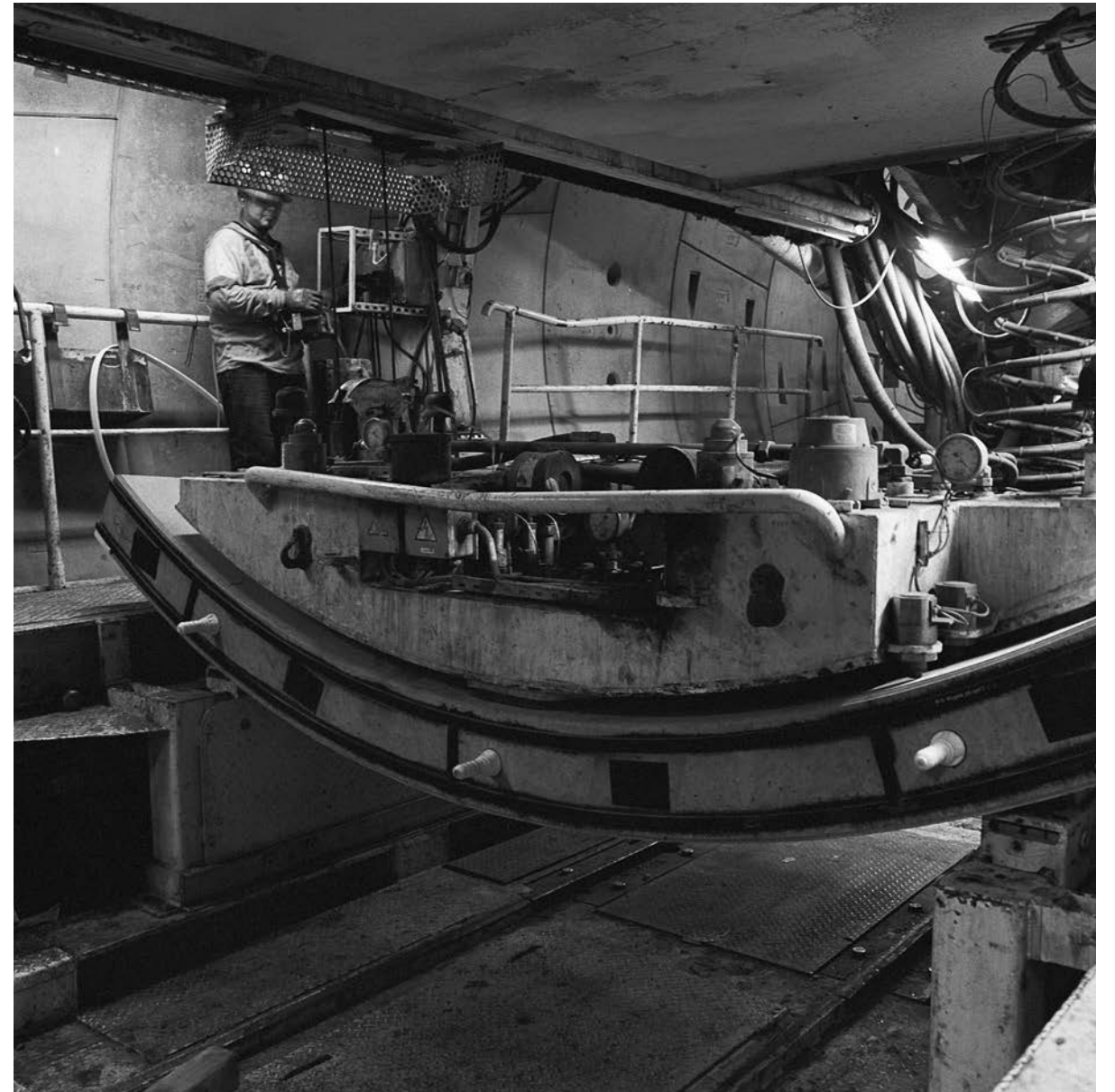
Ralph Pimentel, Carpenter, poses at the future station. Pimentel was welding the tieback anchors 110' below street level, making it the deepest point in the Metro system.

REGIONAL CONNECTOR, 2016



Karagozian relays, "A construction worker welding can make for a dramatic long exposure photograph. Here the worker is welding a tieback anchor collar to a soldier pile."

REGIONAL CONNECTOR, 2016



It takes six precast concrete tunnel lining segments to assemble a five-foot wide tunnel lining ring with a 18'-10" inside diameter. Inside the tail shield of the TBM, the operator works the remote control for the vacuum hoist cable crane that transfers the segments into place.

REGIONAL CONNECTOR, 2017



A view of the TBM tail with precast concrete tunnel lining segments that have double gasket joints to ensure a water and gas tight seal. The five-foot wide tunnel lining rings are assembled and placed as the TBM advances.

REGIONAL CONNECTOR, 2017



Karagozian shares, "A worker is weaving the rebar to reinforce the new concrete wall being built. Photographing ironworkers walking on the steel is like watching a trapeze artist at work."

REGIONAL CONNECTOR, 2017



Construction workers dismantle a concrete storm drain under 2nd Street at the future station.

REGIONAL CONNECTOR, 2017



This view below Flower Street looking northeast reveals a maze of underground utilities. The TBM was not used to tunnel in this area to avoid many abandoned tieback anchors, so a method called “cut-and-cover” was used to connect the TBM-constructed tunnel to the existing tail tracks of 7th Street/Metro Center Station.

REGIONAL CONNECTOR, 2019



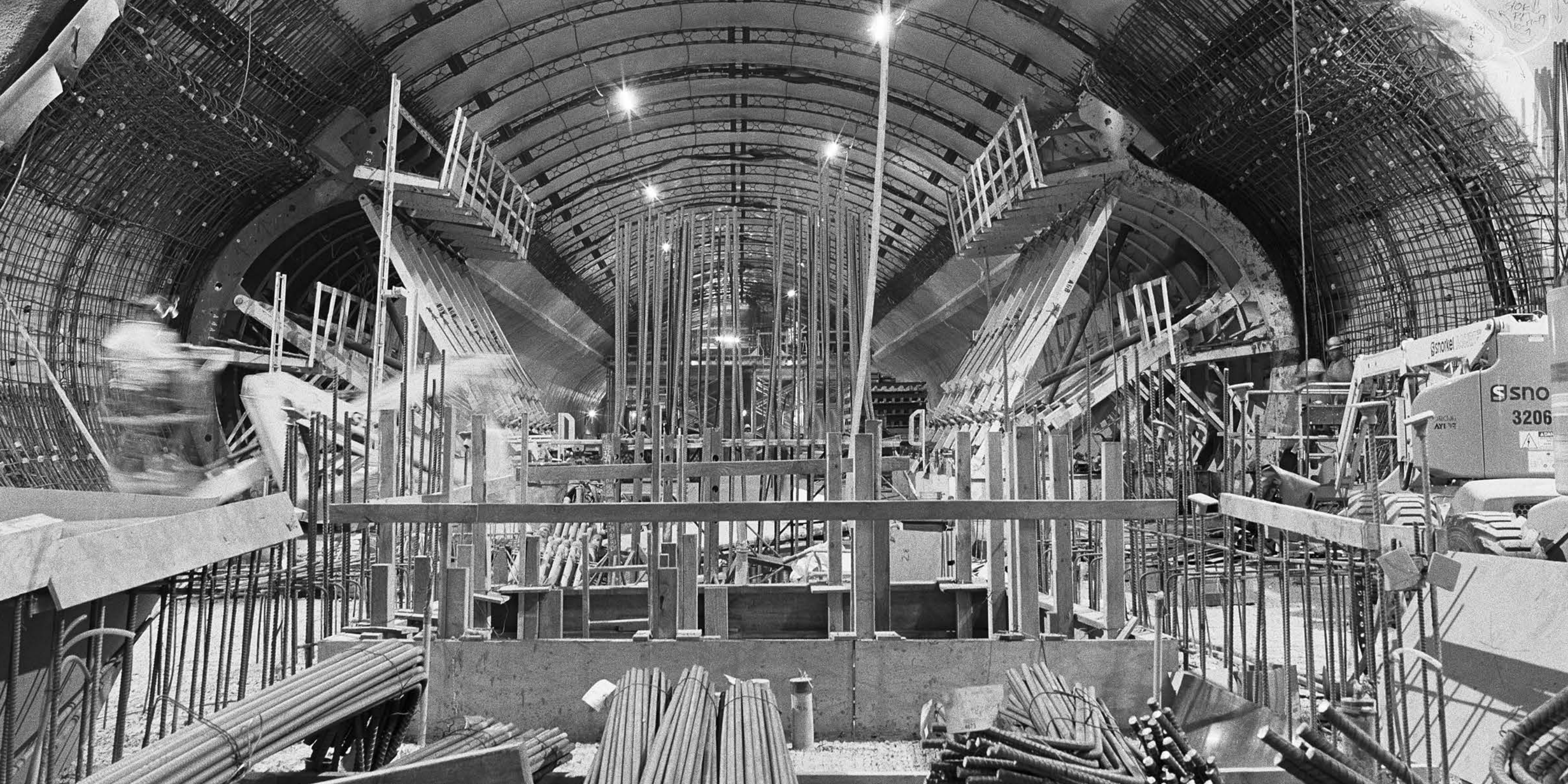
Lori Douglas, Heavy Equipment Operator, is removing the dirt for the “cut and cover” section of tunneling on the Regional Connector project.

REGIONAL CONNECTOR, 2018



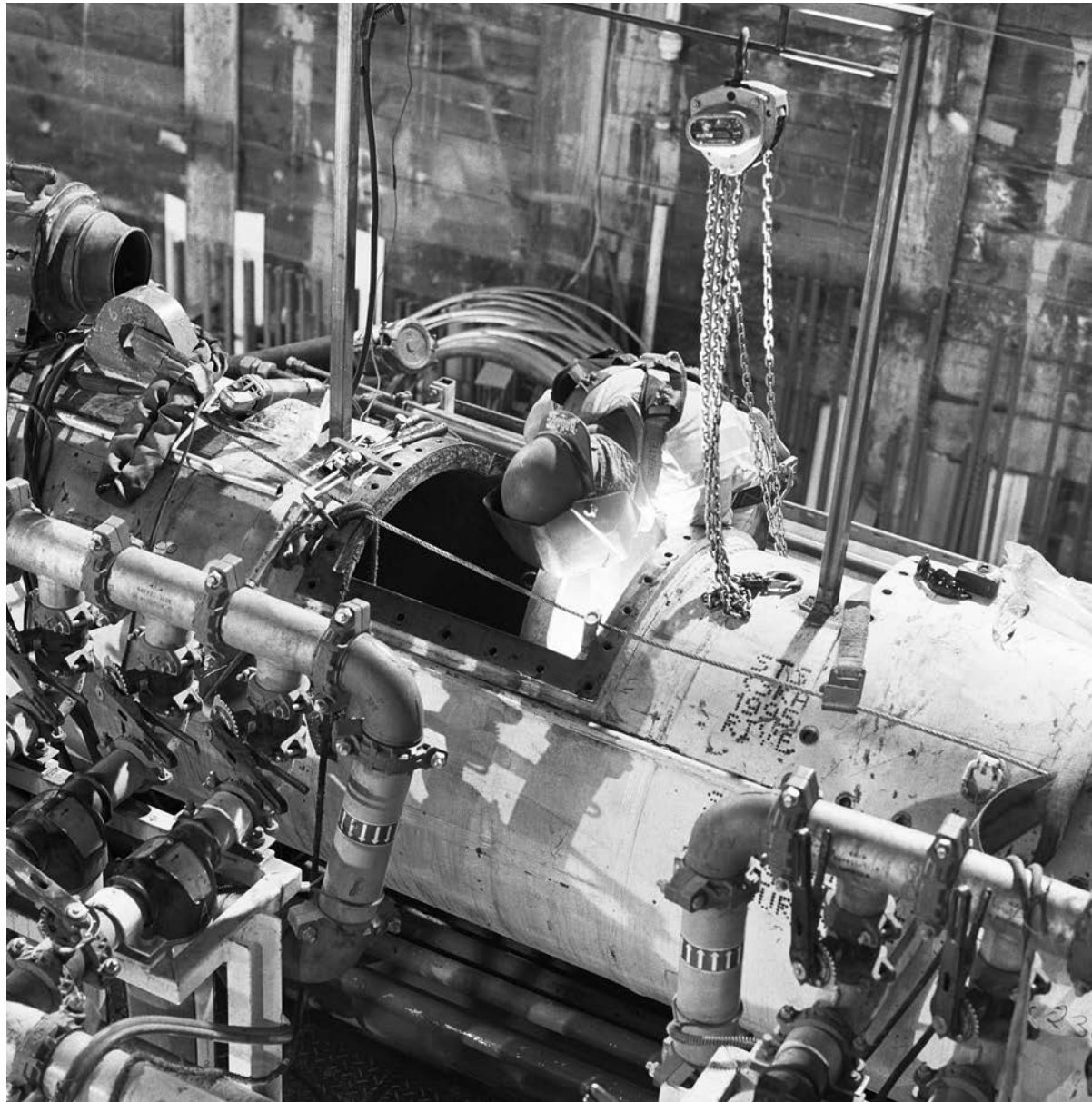
Workers install waterproof lining on the shotcrete lining surface of the Rail Crossover Cavern prior to the final lining installation.

REGIONAL CONNECTOR, 2019



First of its kind for LA Metro, the Rail Crossover Cavern measures 58' wide, 36' high and about 300' long, and is shown at the partial stage of installing the cast-in-place concrete tunnel lining. The crossover will allow trains traveling along the new rail line to switch tracks.

REGIONAL CONNECTOR, 2019



TBM crews reassembling the shaft of screw number 2. The screw is so long (55') that it needs to be cut in two pieces, due to the site constraints, and welded when transported to the next location. This screw is used for the dirt removal from the TBM cutterhead.

PURPLE LINE EXTENSION SECTION 1, 2019



Ilana Feingold, Electrician, is pictured here inside the TBM.

PURPLE LINE EXTENSION SECTION 1, 2019



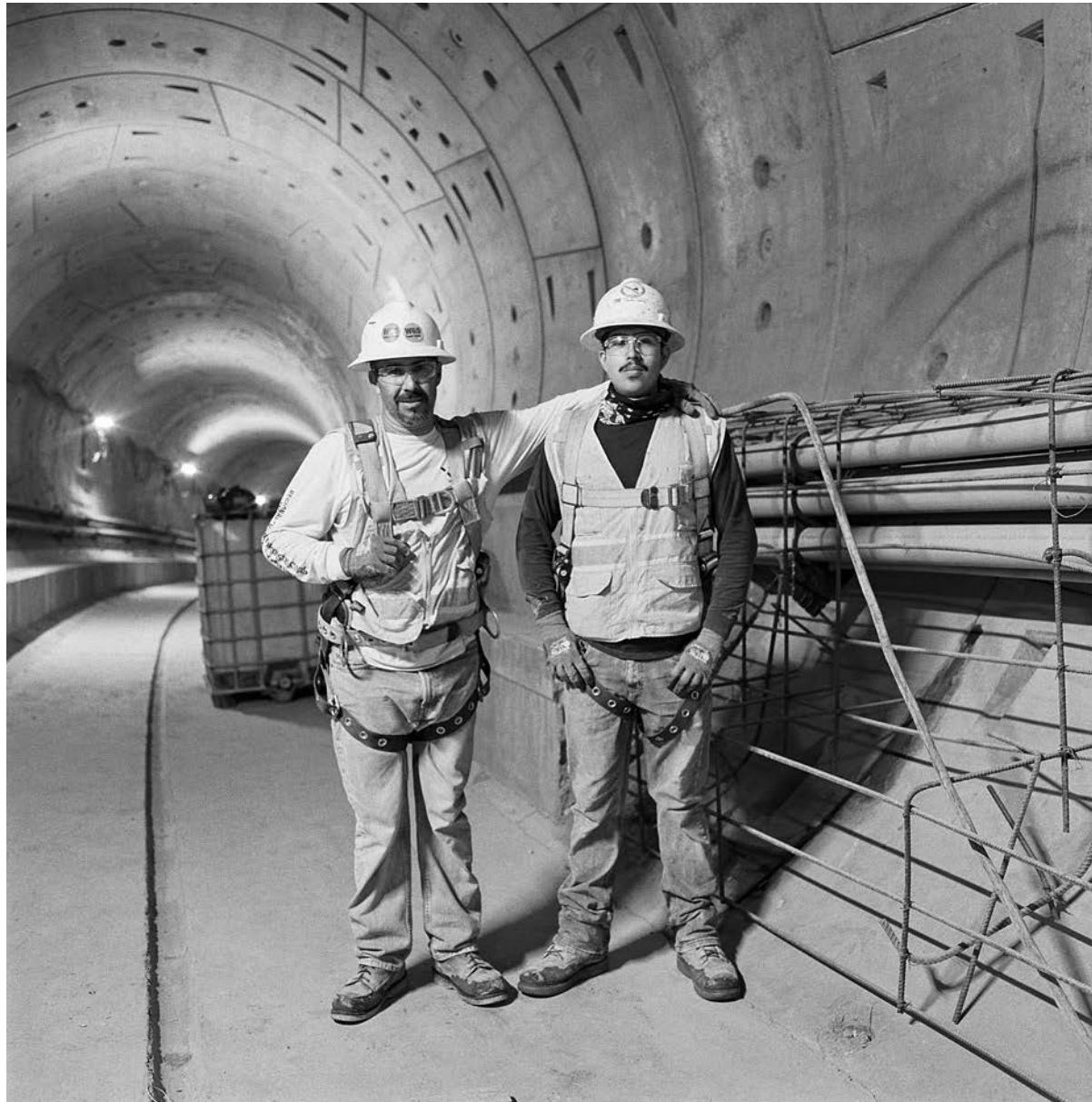
Hector Barajas and his son Hector Barajas Jr. pose after having moved the TBM cutterhead from underground to topside. Years before, Karagozian photographed Hector Sr. and his brother working on the Red Line.

REGIONAL CONNECTOR, 2018



Michelle Jones, Construction Safety Manager, and her son Jacob Jones, Journeyman Laborer, are both working at the future station.

REGIONAL CONNECTOR, 2020



Father and son, Alejandro Ramirez and Alejandro Ramirez Jr., pose in the tunnel entrance after working on concrete masonry for the future station.

REGIONAL CONNECTOR, 2019



Alicia Jimenez, Carpenter Apprentice, was encouraged by mentors to never give up on her goals.

REGIONAL CONNECTOR, 2019



Jorge A. Ocampo, Foreman, looks at the drawings for rebar placement at the future station.

REGIONAL CONNECTOR, 2019



Katherine "Kat" Norve poses above ground and, per Karagozian, is a Journeyman Laborer and board member for the organization 'Women in Non-Traditional Employment Roles.'

REGIONAL CONNECTOR, 2019



As Karagozian recalls, "I first met Jermaine Hampton, Miner, at the future Little Tokyo/Arts District Station. Here he is working topside (above ground) on the Purple Line Extension Section 1."

PURPLE LINE EXTENSION SECTION 1, 2020



A welder forms the base level of the tunnel box running beneath Flower Street. This new tunnel will connect the Regional Connector Transit Project to the existing rail network. The existing 7th Street/Metro Center Station is located directly behind the wall visible in the distant background.

REGIONAL CONNECTOR, 2020



Jenna Dorrrough, Carpenter, graduated from the “Women in Non-Traditional Employment Roles” program and was honored as the Female Craft Worker of the Year in 2018.

REGIONAL CONNECTOR, 2019



A group of ironworkers pose for a photo, after installing rebar on the crown of the cavern at the future station.

REGIONAL CONNECTOR, 2019



In this tunnel view, the conveyor belt that removes the dirt from the cutterhead is visible on the left, an important step as the TBM moves forward. The miners also add additional track, utility pipes and temporary electrical lines for the TBM as it advances.

PURPLE LINE EXTENSION SECTION 1, 2020



Pompeyo Hernandez, Miner, moves portable water pumps on the topside (above ground). Karagozian shares that Hernandez has worked on Metro's Regional Connector, Purple Line and Red Line.

PURPLE LINE EXTENSION SECTION 1, 2020



Farren Romero, Electrician, was reviewing drawings before installing conduit to be embedded in the future station.

REGIONAL CONNECTOR, 2020



Concrete segment tunnel liners are reflected in puddles of rain water at the bottom landing of the future station. The rail cars deliver these tunnel segments to the TBM.

PURPLE LINE EXTENSION SECTION 1, 2020



Sunlight filters into the bottom landing at the future station, where a section of air duct waits for transport into a tunnel. As the TBM advances, workers add air ducts, rail tracks and utilities, such as water and power.

PURPLE LINE EXTENSION SECTION 1, 2020

ABOUT THE ARTIST

KEN KARAGOZIAN has been documenting Los Angeles transit project construction since the 1990s. Documenting with medium format, black and white film, Karagozian excels in his portrayals of the constructed world. With subjects ranging from swap meet vendors to subway construction workers to leather-clad motorcyclists, Karagozian celebrates local subcultures through portraiture.

First discovering his love for black and white photography and the craft of developing a fine art print on a high school photography trip to the studio of Ansel Adams in Carmel, Karagozian continued photography workshops with Ansel's assistants and other fine art photographers.

Karagozian's photography has been widely exhibited locally and nationally, and has been featured in many publications, including *LIFE Magazine*, the *Los Angeles Times* and *Pasadena Magazine*, as well as on television. His award-winning work has been exhibited in galleries, at fairs and in the collections of the Huntington Library, the Metro and private collectors. A lifelong Angeleno, Karagozian lives and works in Agoura Hills, California.

ACKNOWLEDGEMENTS

DEEP CONNECTIONS is a photographic project of Metro Art featuring the artworks of Ken Karagozian. Metro wishes to thank the artist for contributing his vision and dedication to documenting the construction of LA County’s Metro rail network. We would also like to thank the thousands of workers who have built Metro’s immense and complex rail system over the past three decades. We quite literally would not have a subway in LA County without their essential labor.

We would also like to thank Metro Corporate Safety and the various project teams for their assistance in reviewing content for this publication. These images were taken prior to the COVID-19 pandemic and the institution of related safety precautions. Construction safety practices have evolved industrywide over 30 years to a higher standard. As we look back, the change is notable from when just hard hats were the basic requirement to the current mandatory higher level safety equipment that is tailored to the task and location, which in addition to hard hats includes high visibility vests, eye protection, hearing protection, hand protection and steel-toed boots.

Finally, gratitude goes to the board members, executives and staff who recognize and support this demanding work.

Phillip A. Washington
Metro Chief Executive Officer

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Metro Art, Metro’s public art program, offers innovative, award-winning visual and performing arts programming that encourages ridership and connects people, sites and neighborhoods throughout LA County.

This publication is designed and produced by Metro Communications. An online version is available at metro.net/art.

GLOSSARY

Concrete segmental lining—Pre-cast concrete segments that line and support the tunnel walls.

Crossover cavern—A large tunnel space that allows trains to switch rail lines.

Cut and cover tunnel—A method of tunnel construction, differing from underground boring, where an open trench is excavated, over which a roof structure is built and then covered.

Eastside Extension—The Metro Eastside Extension project added six miles of light rail and eight new stations that extended the Gold (L) Line from Union Station in downtown LA to Atlantic Station in East LA. Construction started 2004 and opening was November 2009. Metro currently has the second phase of the project under environmental review.

Light Rail—A low to medium capacity electrified rail system. It is distinguished by operation in routes that are generally exclusive, though not necessarily grade-separated, rights-of-way and typically powered by overhead wires.

Loc—Short for locomotive, is a rail car primarily used for moving equipment underground.

Heavy Rail—High capacity rail system with longer trains and heavy rolling stock. It is characterized by high-speed passenger rail cars on fully grade-separated rights-of-way that are electrically driven, typically with power drawn from an electrified third rail, and often run through tunnels.

Metro Line Letters—Metro is adding letters to the name and symbol of rail and busway lines. In the future, Metro will refer solely to the letter names. As of the time of publishing, the naming convention is:

A Line (Blue)	C Line (Green)	E Line (Expo)	J Line (Silver)
B Line (Red)	D Line (Purple)	G Line (Orange)	L Line (Gold)

SOURCES:

International Tunnelling and Underground Space Association “Main Glossary,” accessed November 13, 2020, <https://tunnel.ita-aites.org/en/component/seoglossary/1-mainglossary/>

Metro, “Glossary of Terms”, accessed November 13, 2020, <https://www.metro.net/projects/glossary-terms/>

PLE1—Section 1 of the Metro Purple Line Extension Transit Project is in construction to add three new stations along Wilshire Boulevard and approximately four miles to Metro rail’s Purple (D) Line.

Red Line—The Red (B) Line is Metro’s first heavy rail subway. The line runs between Union Station and North Hollywood and was completed in multiple segments. Initially, the first segment of what is now the Purple (D) Line was also a part of the Red (B) Line.

Regional Connector—The Metro Regional Connector Transit Project is a new approximately two-mile light rail service that will extend from the Metro Little Tokyo/Arts District Station to the 7th Street/Metro Center Station, with new stops added in Bunker Hill and Broadway. The alignment will allow passengers to transfer to Blue (A), Expo (E), Red (B) and Purple (D) Lines, bypassing Union Station.

TBM (Tunnel Boring Machine)—A machine used to cut or bore circular tunnels underground through soil or rock. It may also be referred to as a “mole.”

Tiebacks—A horizontal wire or rod used to reinforce retaining walls for stability.

Metro, “Line Letters Overview,” accessed November 13, 2020, <https://www.metro.net/projects/line-letters>

MTA “Glossary of Terms,” accessed November 13, 2020, http://web.mta.info/capital/sas_pdf/Glossary%20of%20Commonly%20Used%20Construction%20Terms%20%202022%2012.pdf

COVER: Thelma & Louise were the names given to the two mammoth TBMs that carved through 2.5 miles of rock beneath the Santa Monica Mountains to create the Red Line. Each machine was the length of a football field with a cutting diameter of 20.67 feet. The object in the foreground is one of the four outer sections of the cutterhead.

RED LINE, 1997

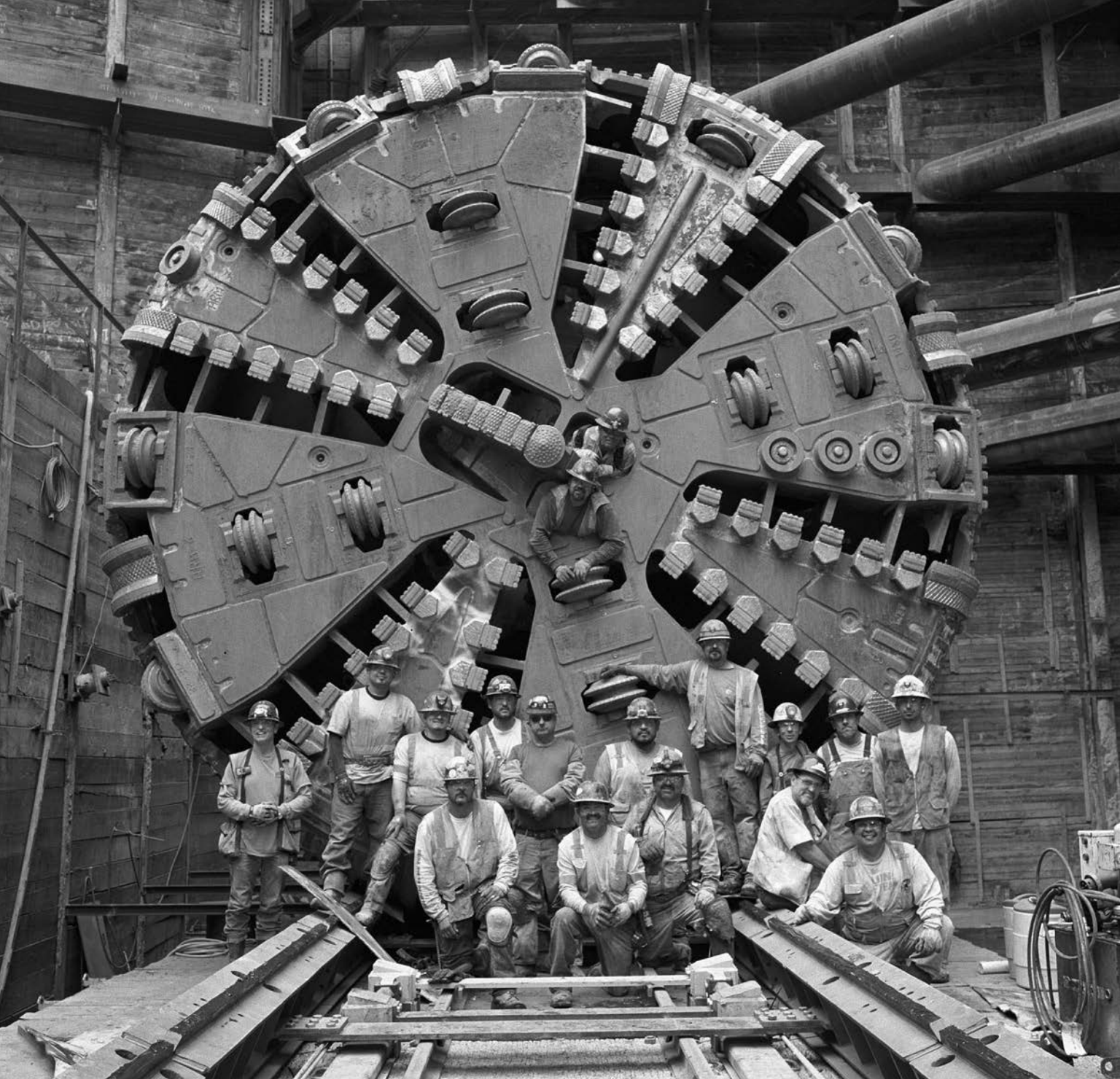
INSIDE COVER: Dramatic lighting in the tunnel with the hydrocarbon-resistant high-density polyethylene (HDPE) water/gas proofing membrane below Hollywood Bl.

RED LINE, 1995

BACK: “This was taken a few days after the TBM had broken through at the future station for the second tunnel drive. It is always a monumental achievement after a break through and I enjoy taking group photos of the workers involved with this milestone achievement, including two crawling out of the TBM cutterhead at the center of the photograph.”

RED LINE, 2017

Unless otherwise noted, images and text are provided by Ken Karagozian.



Metro

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