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MULTI-STORY FUTURE

WHAT WE KNOW
WHERE WE ARE GOING

› *Industrial*

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Includes:

- Distribution Centers
- Fulfillment Centers
- Last mile delivery
- Transload facilities
- Light Assembly
- Research & Development
- Cold Storage
- Tenant Improvements
- Corporate Headquarters


Ashley
HOMESTORE


BLACK CREEK GROUP


BRIDGE
DEVELOPMENT
PARTNERS, LLC


CBRE


CRITERION
CRITERION GROUP LLC


CROW HOLDINGS
INDUSTRIAL


DP
DERMODY
PROPERTIES


DukeREALTY


EXETER
PROPERTY GROUP


FIRST
INDUSTRIAL
REALTY·TRUST


HILLWOOD
A PEROT COMPANY


Hines


THE HOME DEPOT


INTERNATIONAL
AIRPORT CENTERS


IDS
REAL ESTATE GROUP


IRON MOUNTAIN
The Leader in Records & Information Management


Lift Partners


LOGISTICS
PROPERTY
CO


PANATTONI


PROLOGIS


RELATED


RYAN


SAMSUNG


The Davis Companies


TERRENO


Trammell Crow Company


TRIANGLE EQUITIES
DEVELOPER ▲ OWNER ▲ MANAGER


Westfield

CURRENT MULTI-STORY WORK

NELSON


Terminal
Logistics Center
TRIANGLE EQUITIES
DEVELOPER ▲ OWNER ▲ MANAGER


TRIANGLE EQUITIES
DEVELOPER ▲ OWNER ▲ MANAGER

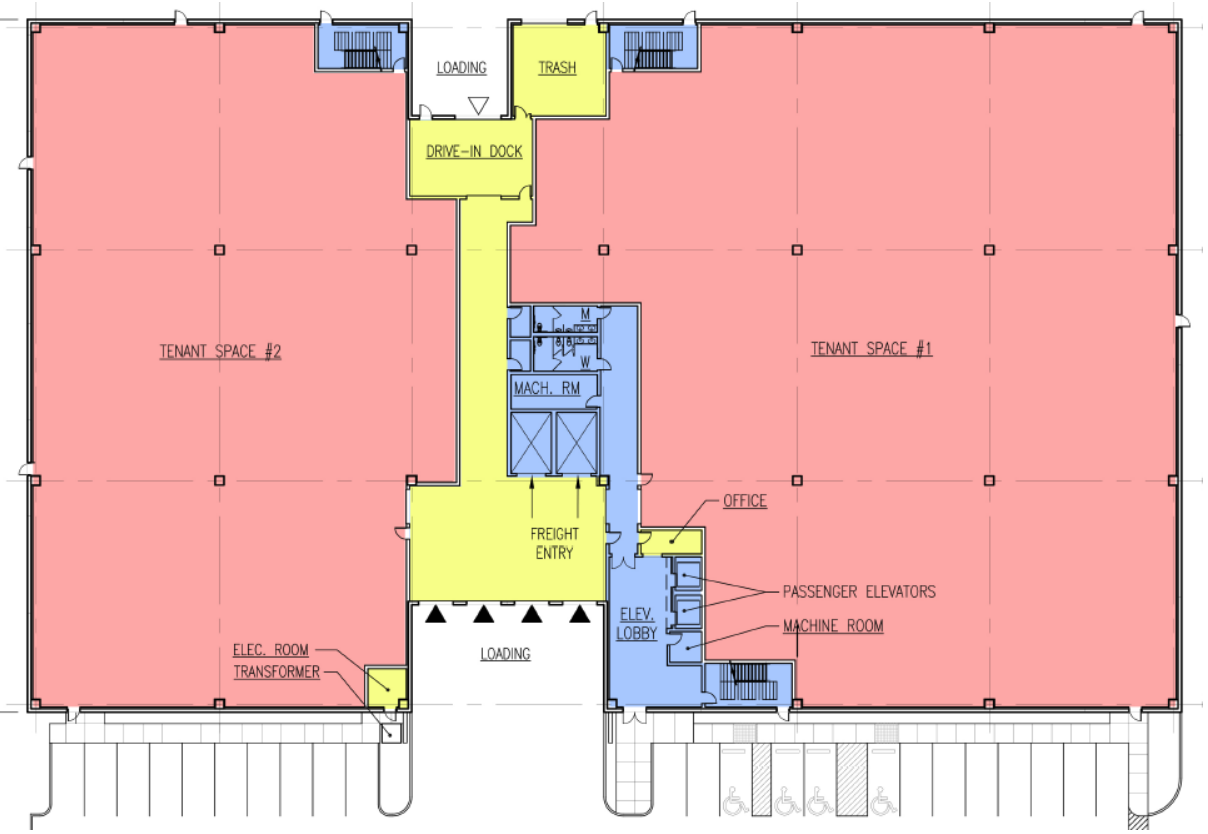

Trammell Crow Company

TRACK SIX

SODO BUSINESS PARK

track6sodo.com

AVENUE 55 - TRACK SIX
SEATTLE, WA



UPPER LEVEL TENANT CONSIDERATIONS

- **Multi-floor utility planning**
  - Water
  - Gas
  - Electricity
  - Sanitary
  - Heating/cooling
  - Exiting scenarios for whole floor versus multi-tenant floor significantly different
  - Multi-floor BOMA calculations
  - Tenant amenities
  - Showers, conference room
  - Security, exercise
  - Brand/employee retention
  - Material delivery

› Users

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› Users

- **USER TRENDS:**
  - Millennials order 2-3x more online retail
  - Higher demand for 1,2&4-hour delivery
- **LOCATION –** Example Demographics:
  - 8 million in NYC w/ high concentration of millennials in Manhattan, Brooklyn & Williamsburg
  - Wealthy zip codes north in Westchester County – served by the Bronx

Drivers for Multi-Story Distribution

- Tenant's Customer Demand
- Multi-modal
- Direct Truck Access
- NYC warehouse average age of 70
- Traffic Infrastructure

Demand for:

- Last mile Delivery
- Just-in-time Delivery
- Maker Spaces
- Research & Development
- Light Assembly
- Short-term Warehousing

Drivers for Multi-Story Distribution

Transportation Logistics

Cost drivers:

- 50% transportation cost
- 22% Inventory carry
- 10% labor
- %? Land cost
- Misc other costs

Reduce by:

- Close-in – faster delivery
- Faster inventory turns
- Direct dock access
- More dock doors

Land Costs

Land Costs:

- Smaller urban facility
- Larger DC in suburbs
- Higher rents / higher labor

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Transload fulfillment

- Port areas
  - NY/NJ
  - Seattle
  - LA/Long Beach
  - Charleston
  - San Francisco
  - Boston
  - Norfolk
  - Savannah
- Direct transfer from shipping containers to F/C & distributed directly to users – fewer “touches”

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Increase in air cargo demand

- Due to online e-commerce requiring faster distribution
- Offsets softening consumer confidence and contraction in exports
- Future multi-story with direct nose cone loading / unloading

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Online Grocery Shopping

- Consumer pick up
- Independent vehicle delivery
- Store employee delivery
- Shift towards:
  - More warehouse
  - Less retail floor area
  - More loading area
  - Priority short-term parking

› Trends

- **TENANT TRENDS:**
  - More office
  - Mixed uses
  - Higher floor loading
  - More power
  - Increased parking
- **DELIVERY METHODS:**
  - Box Trucks
  - Sprinter Vans
  - Uber
  - Scooters
- **TECHNOLOGY:**
  - Better optimization

CASE STUDY:

PROLOGIS—GEORGETOWN CROSSROADS

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› *Case Study: Prologis—Georgetown Crossroads*

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› *Case Study: Prologis—Georgetown Crossroads*

1st modern multistory warehouse in the US

› *Case Study: Prologis—Georgetown Crossroads*

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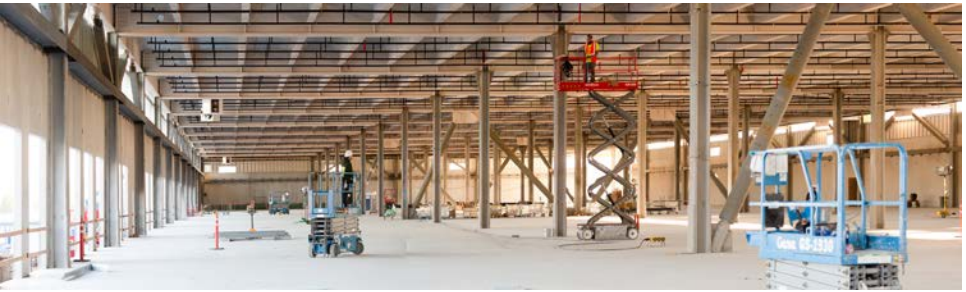

Building Design Considerations

- Column Spacing
- Floor loading & racking

› *Case Study: Prologis—Georgetown Crossroads*

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Building Design Considerations

- Column Spacing
- Floor loading & racking
- Construction type / fire-rating / egress
- Vertical circulation

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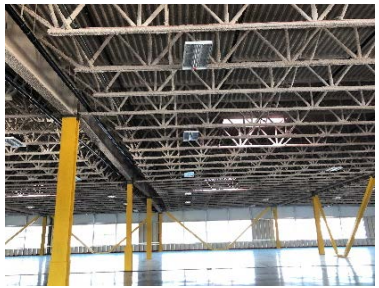
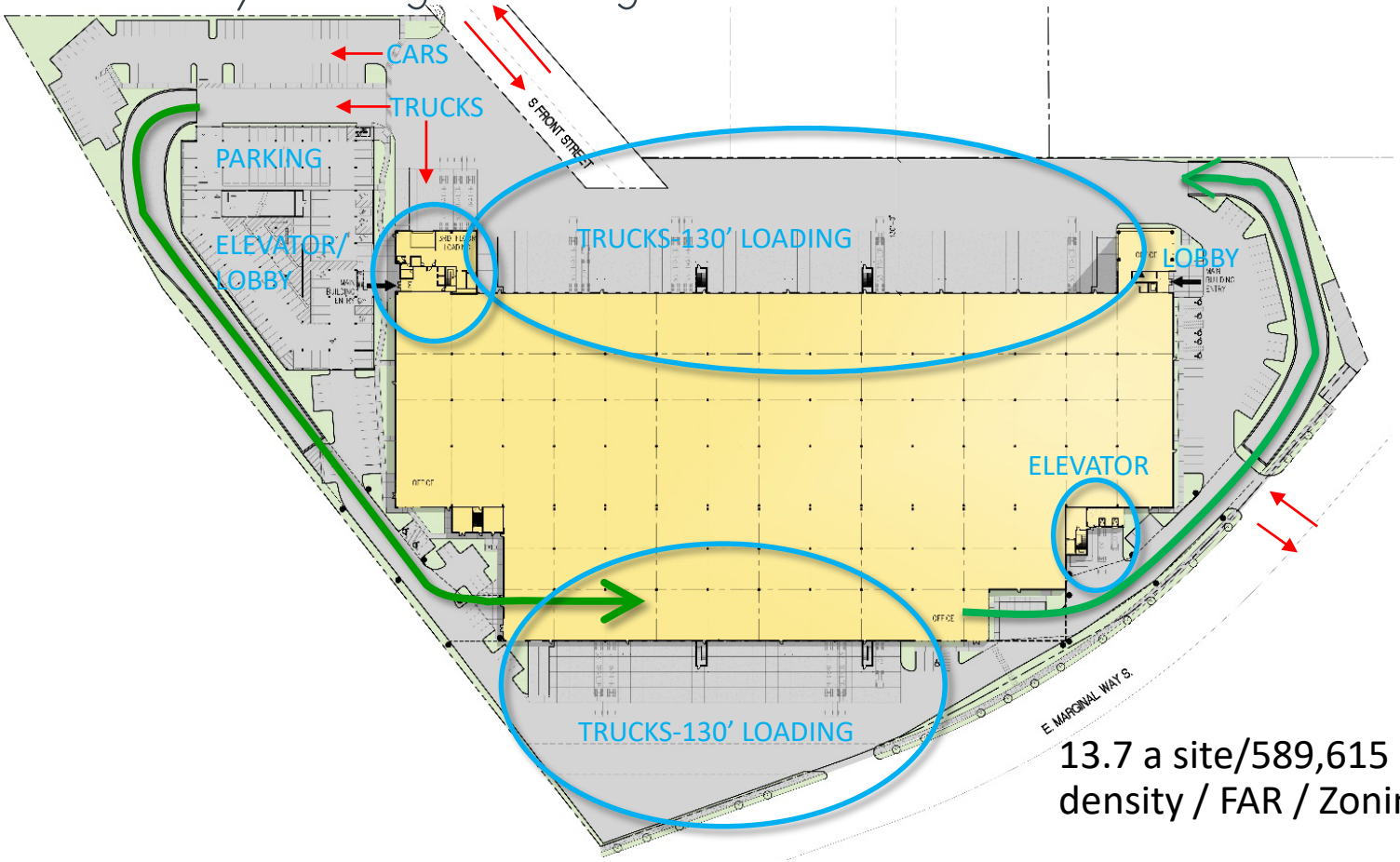


Building Design Considerations

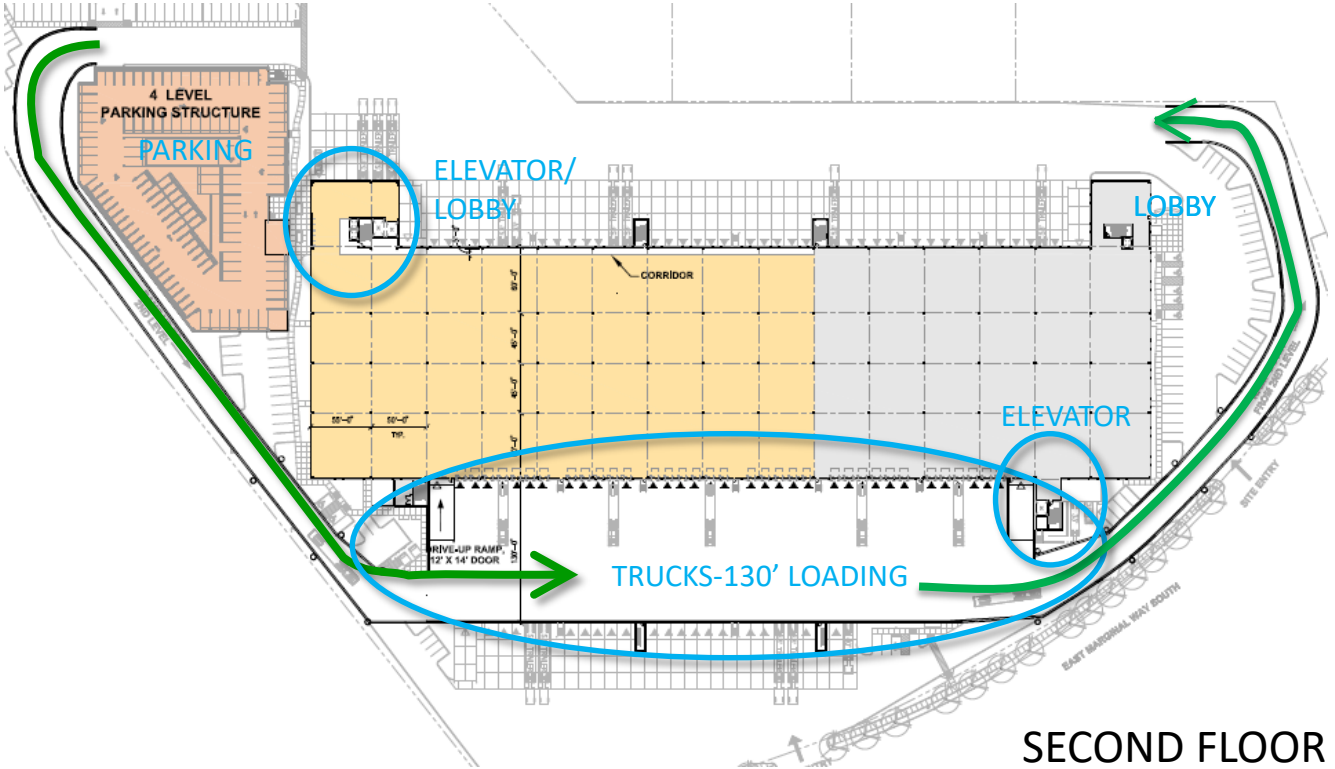
- Column Spacing
- Floor loading & racking
- Construction type / fire-rating / egress
- Vertical circulation
- Upper level utility distribution & dock levelers
- Tenant access & future tenant buildout

Case Study: Prologis—Georgetown Crossroads



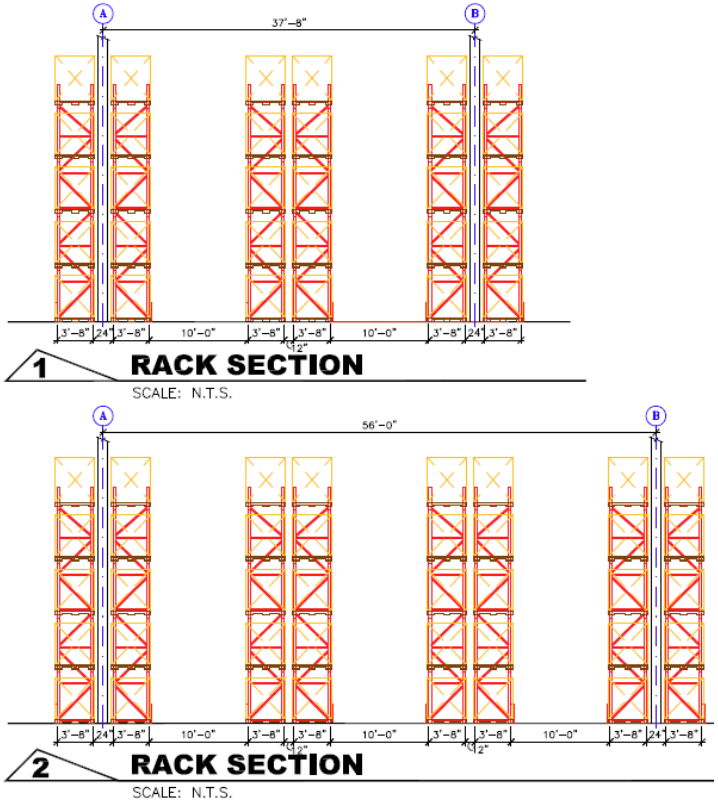
13.7 a site/589,615 sf
density / FAR / Zoning

Case Study: Prologis—Georgetown Crossroads



SECOND FLOOR

Case Study: Prologis—Georgetown Crossroads



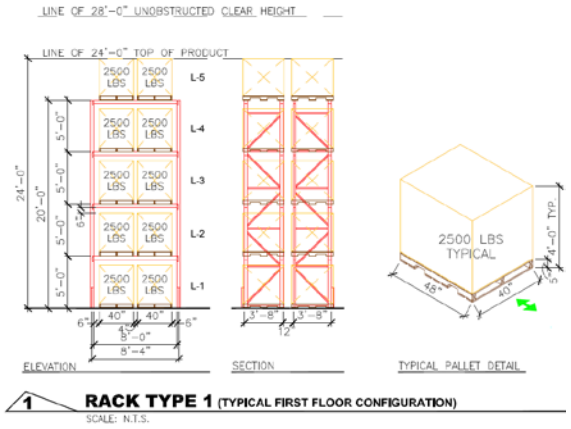
Bay Spacing:

- 10’ most common aisle w/ reach truck
- 37’-8” & 56’-0” most efficient Floor loading & racking

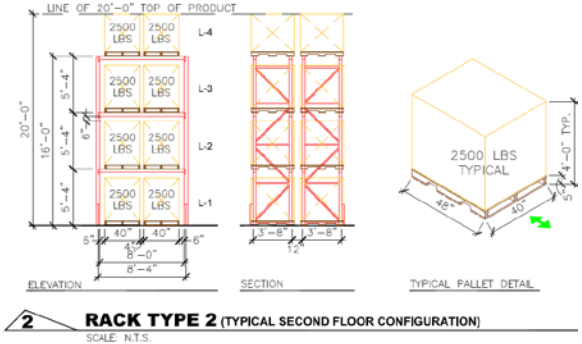
Floor Loading:

- 350# for 24’-28’ clear
- 300# for upper level 24’ clear

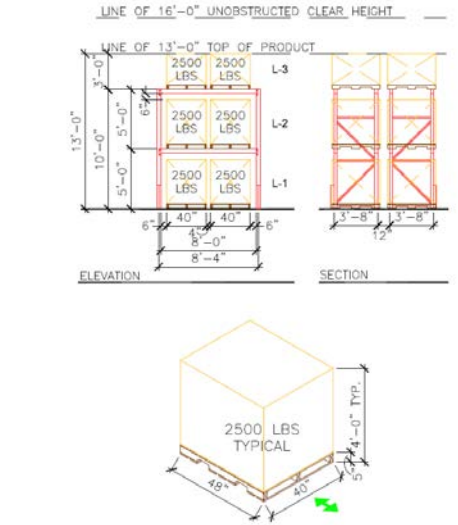
Case Study: Prologis—Georgetown Crossroads



1 **RACK TYPE 1** (TYPICAL FIRST FLOOR CONFIGURATION)
SCALE: N.T.S.



2 **RACK TYPE 2** (TYPICAL SECOND FLOOR CONFIGURATION)
SCALE: N.T.S.



3 **RACK TYPE 3** (TYPICAL THIRD FLOOR CONFIGURATION)
SCALE: N.T.S.

Clear Heights

- Structure depth-36”-48”
- Most likely cold rolled steel but looking at open web composites
- Higher racking requires deeper anchorage = thicker upper slabs
- Seismic zone dependent

› *Case Study: Prologis—Georgetown Crossroads*

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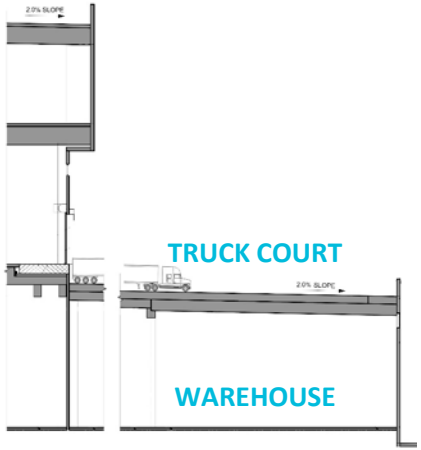
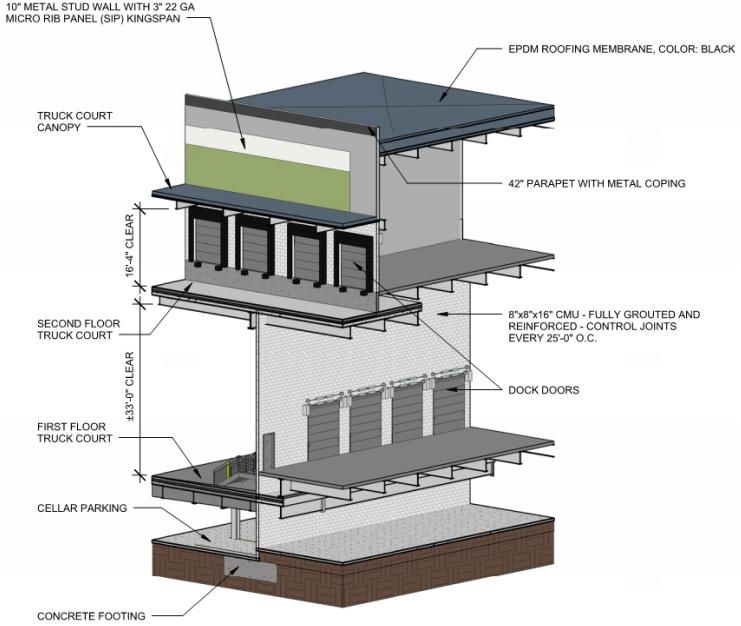
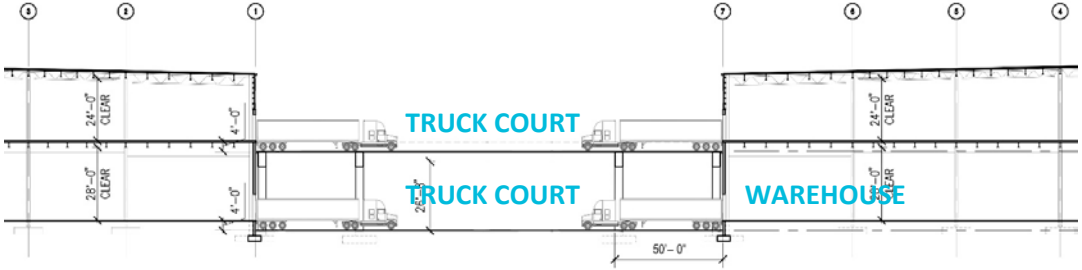
Case Study: Prologis—Georgetown Crossroads







Truck Courts

› Case Study: Prologis—Georgetown Crossroads

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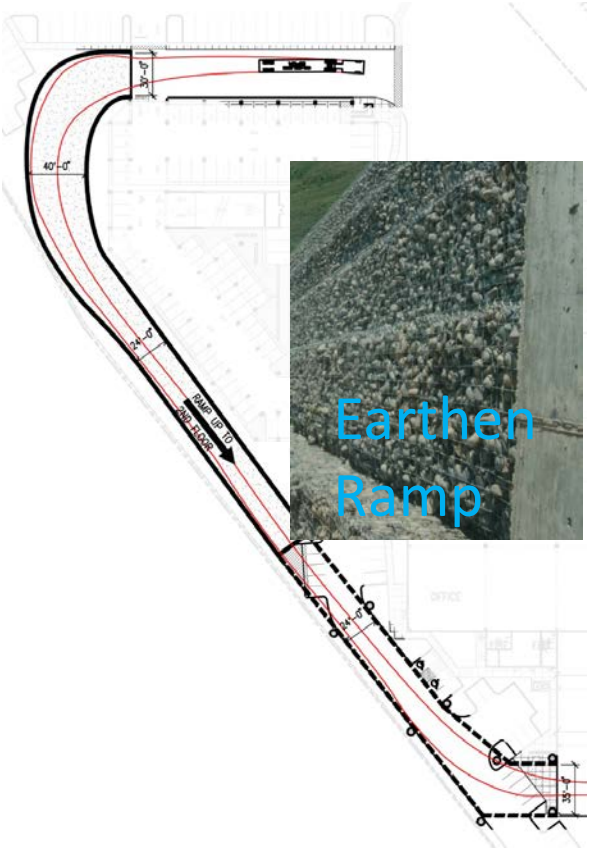
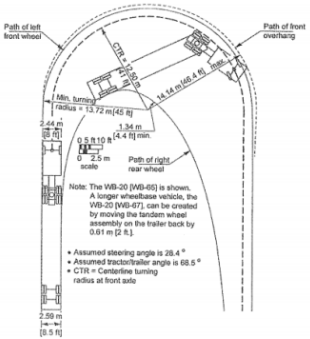


- Large inside and outside radii required
- Auto-turn studies required
- Earthen ramps are less expensive than elevated concrete but have no access below
- Precast concrete is less expensive than steel but also less flexible

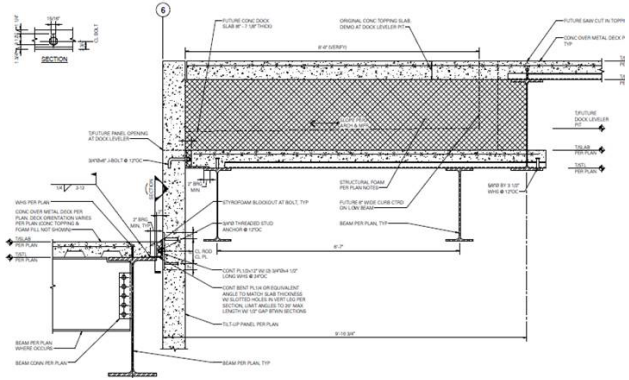


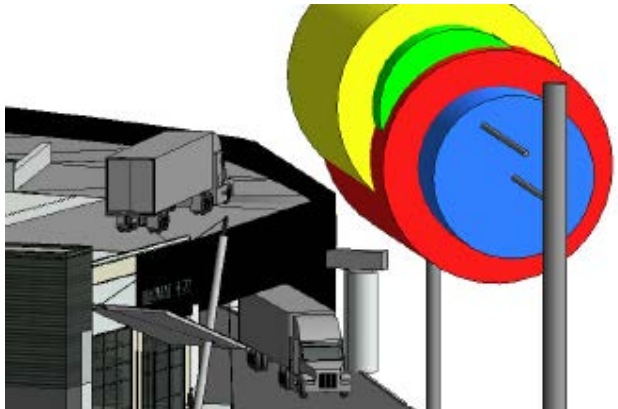
Parking / Ramps

Case Study: Prologis—Georgetown Crossroads

- Structured parking varies by Market:
  - West Coast – PT Slab less expensive than steel with concrete pan
  - East Coast – Steel is less expensive
- Roof parking:
  - 2-story building roof deck at 60-70’
  - 3-story building roof deck at 80-100’

Case Study: Prologis—Georgetown Crossroads

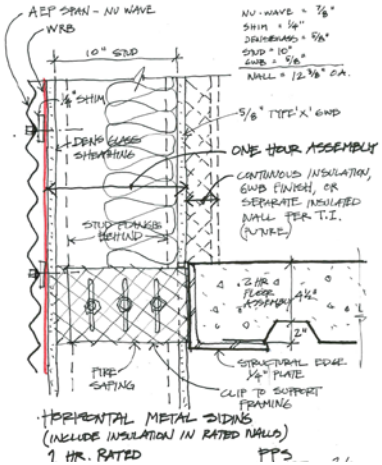




Unique challenges:

- Circulation
- Ground Improvements
- Fire Truck Circulation
- Ramps
- Water Proofing
- 2nd Level Dock Levelers
- Power Lines

Case Study: Prologis—Georgetown Crossroads



- **Tilt-up concrete:** Height limitations & end at floor line
- **Columns:** Much larger & at perimeter
- **Exterior cladding:**
  - SIP Panels
  - Metal siding
  - Fiber cement board
  - Cladding all in same direction simplifies framing
- **Fire rating & Construction Type**
  - Spray-on less expensive than paint
- **Energy Code:** fully condition now?
- **Slab:** Reinforced on metal deck due to spans and it assists w/ fire rating
- **Egress stairs:** rated & travel distance is reduced to 250’
- **Elevators:** high-rise above 75’
- **Fire sprinklers:** ESFR requires very specific spacing due to cold rolled steel

Case Study: Prologis—Georgetown Crossroads

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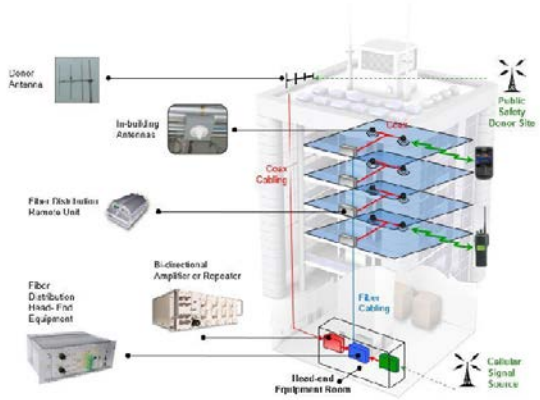
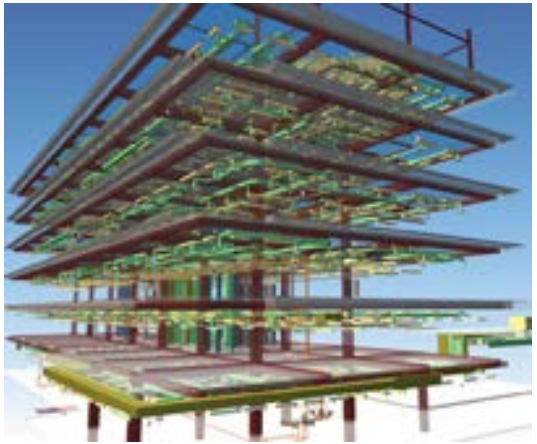
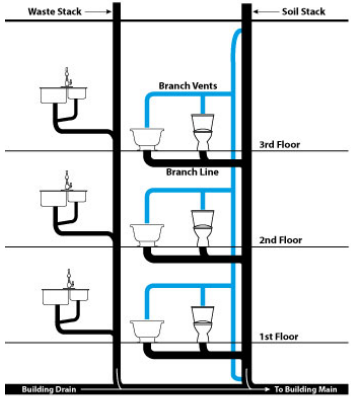
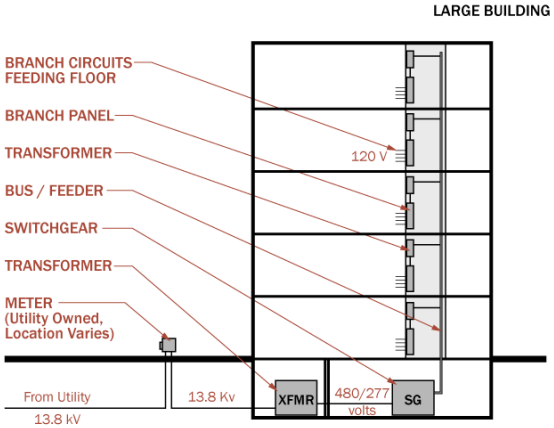






Multi-story Drainage and Venting



- Vertical chase planning:
  - Chilled water
  - Fresh/combustion air
  - Electrical
- Roof drains: siphonic drains concept
- Ventilation: From the sides, not roof
- Heating: unit heaters work only on top floor
- Electrical: Elect Rooms on each floor
- Sanitary lines:
  - Plan for future upper level office – probably can't cut in later
  - Recommend designated plumbing areas similar to office buildings
  - Minimize clear area impacts if bundles w/ interior columns
  - Visualize clear height impacts if sloped lines are below structure – 150' mid building run could impact clear height by 3'
- Fire: Radio signal may be required $$$

THANK YOU