

# 1. METROTECH CORPORATE CAMPUS

## 1.1 Complete Technical Specifications & Construction Methodology

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## 2. TABLE OF CONTENTS

### Complete Document Sections

1.0	Sitework & Civil Engineering Specifications
2.0	Structural Systems Specifications
3.0	Mechanical Systems Specifications
4.0	Plumbing Systems Specifications
5.0	Electrical Systems Specifications
6.0	Fire Protection Systems
7.0	Building Envelope & Exterior Closure
8.0	Interior Finishes & Architectural Millwork
9.0	Elevator & Vertical Transportation
10.0	Building Automation & Controls
11.0	Testing & Commissioning Protocols
12.0	Quality Assurance & Control
13.0	Safety & Site Management
14.0	Sustainability & Environmental Compliance

# 3. SITEWORK & CIVIL ENGINEERING SPECIFICATIONS

## 3.2 Earthwork & Grading

### 3.2.1 Excavation & Fill Specifications

#### Cut/Fill Operations

Excavation Depth	Maximum 15' below existing grade
Fill Material	Select granular fill, ASTM D2940
Compaction Requirements	95% Standard Proctor Density per ASTM D698
Slope Stabilization	3:1 maximum slope ratio with erosion control matting
De-watering	Wellpoint system with filtration to NPDES standards

### 3.2.2 Subdrainage System

Component	Material Specification	Size/Dimensions	Installation Method	Standard
Perforated Drain Pipe	HDPE SDR 35, Corrugated	6" Diameter	Minimum 0.5% slope to storm sewer	ASTM F667
Drainage Aggregate	Washed gravel, 3/4" clean stone	12" bed depth	Wrapped with geotextile fabric	ASTM D448
Filter Fabric	Non-woven geotextile	6 oz/sq yd	Overlap seams 18" minimum	ASTM D4751

## 3.3 Utility Trenches & Conduits

#### Underground Electrical Conduit Schedule

Conduit Use	Conduit Type	Size	Depth Below Grade	Bedding Material	Warning Tape
Primary Electrical	PVC Schedule 40	4" Conduit (Qty: 3)	36" minimum	1/2" pea gravel	Red "Danger Electrical"
Telecommunications	PVC Schedule 40	2" Conduit (Qty: 6)	24" minimum	Sand bedding	Orange "Communication"
Fiber Optics	Innerduct HDPE	1.25" Microduct	30" minimum	Sand bedding	Orange "Fiber Optic"

## 4. STRUCTURAL SYSTEMS SPECIFICATIONS

### 4.4 Foundation System

#### 4.4.3 Concrete Mix Designs

Application	Mix Design	Compressive Strength	Slump	Admixtures	Testing Frequency
Foundation Walls	4000 psi @ 28 days	5,000 psi design	4" ± 1"	Water reducer, Type D	1 set/50 yd³
Structural Slab	3500 psi @ 28 days	4,000 psi design	4" ± 1"	Fibers: 1.5 lb/yd³	1 set/100 yd³
Elevated Decks	5000 psi @ 28 days	6,000 psi design	7" ± 1"	High-range water reducer	1 set/40 yd³

#### 4.4.4 Reinforcing Steel Schedule

Location	Bar Size	Grade	Spacing	Lap Splice Length	Standard
Foundation Mat	#8 (Bottom), #6 (Top)	Grade 60	12" O.C. Each Way	45 diameters	ASTM A615
Columns	#10 Vertical, #4 Ties	Grade 60	12" O.C. Ties	Class B tension splice	ASTM A615
Elevated Slabs	#5 Bottom, #4 Top	Grade 60	12" O.C. Each Way	40 diameters	ASTM A615

### 4.5 Structural Steel

#### Steel Member Schedule

Member Type	Section Size	Grade	Connection Type	Fireproofing	Finish
Columns	W14x211	A992	Bolted: A325 1"Ø	Spray-applied, 2hr rating	Shop prime only
Beams	W24x94	A992	Shear tab connections	Spray-applied, 2hr rating	Shop prime only
Joists	24K10	A36	Welded to ledger angles	Intumescent coating	Shop prime only

# 5. MECHANICAL SYSTEMS SPECIFICATIONS

## 5.6 HVAC System Components

### 5.6.5 VRF System Detailed Specifications

Component	Manufacturer/Model	Capacity	Electrical Characteristics	Refrigerant	Sound Rating
Outdoor Unit	Daikin VRV IV-S Heat Recovery RXYQ24P8W1B	24 HP (67.2 kBTu/h)	460V/3Ph/60Hz, MCA 98.7A, MOCP 125A	R-32 (GWP 677)	68 dB(A) @ 1m
Indoor Ceiling Cassette	Daikin FDQ-B Series FDQ100BXVJU	4-way blow, 36 MBH cooling	208-230V/1Ph, 3.2A FLA	R-32	NC 35
Branch Controller	Daikin REFNET Joint BRC7D62	7 Ports, 2-3/8" main connection	N/A	R-32	N/A

### 5.6.6 Refrigerant Piping Details

#### Copper Pipe Specifications

Pipe Type	Material	Size Range	Wall Thickness	Joint Method	Cleaning Procedure
Main Gas Line	ACR Copper, Type L	2-1/8" to 3-1/8" OD	0.083" min wall	15% Silver Phosphorous Brazing	Nitrogen purge during brazing
Main Liquid Line	ACR Copper, Type L	3/4" to 1-5/8" OD	0.065" min wall	15% Silver Phosphorous Brazing	Nitrogen purge during brazing
Branch Connections	ACR Copper, Type L	1/2" to 1-1/8" OD	0.035" min wall	Mechanical flare joints	De-burring after cutting

### 5.6.7 Ductwork Specifications

Duct Type	Material	Gauge/Thickness	Insulation	Sealing Class	Hanger Spacing
Main Supply/Return	Galvanized Steel	22 ga (0.0336")	2" fiberglass, R-8	Class A (UL 181)	10' maximum
Branch Ducts	Galvanized Steel	24 ga (0.0276")	1" fiberglass, R-4.2	Class B (UL 181)	8' maximum
Flex Duct	Insulated Flex	Mylar reinforced	R-6 integral	Pressure independent	4' maximum



## 6. PLUMBING SYSTEMS SPECIFICATIONS

### 6.7 Water Distribution System

#### 6.7.8 Domestic Water Piping

System	Pipe Material	Size Range	Pressure Rating	Joint Method	Hanger Type
Water Main (Riser)	Type L Copper (ASTM B88)	3" to 4"	300 PSI @ 100°F	Brazed (Sil-Fos 15)	3-bolt Clevis hangers
Branch Lines	Uponor PEX-A (ASTM F876)	3/4" to 1-1/2"	160 PSI @ 73°F	ProPEX expansion fittings	Plastic J-hooks
Fixture Supplies	Uponor PEX-A (ASTM F876)	1/2"	160 PSI @ 73°F	ProPEX expansion fittings	Plastic J-hooks

#### 6.7.9 Plumbing Fixture Detailed Schedule

Fixture Type	Manufacturer/Model	Rough-in Dimensions	Supply/Waste Sizes	Trim/Finish	Accessories
Wall-hung Water Closet	TOTO Nexus EW576SB#01	20-1/2" AFF, 4-1/2" rough-in	1/2" supply, 4" waste	Cotton White, ADA compliant	Sloan EFX-850 flushometer
Lavatory Faucet	Chicago Faucet 872-315BKSQ	8" center set	1/2" IPS supplies	Matte Black, lever handles	Pop-up drain assembly
Lab Faucet	Speakman EDF-80 Gooseneck	8" center set	1/2" IPS supplies	Chrome plated brass	Wrist blades, vacuum breaker

#### 6.7.10 Sanitary Drainage System

Component	Material	Size Range	Slope Requirements	Joint Method	Cleanout Type
Soil/Waste Stacks	No-Hub Cast Iron	4" to 6"	1/4" per foot minimum	No-hub couplings	4" screw-type cleanout

Component	Material	Size Range	Slope Requirements	Joint Method	Cleanout Type
Branch Drains	Schedule 40 PVC	2" to 3"	1/4" per foot minimum	Solvent cement	4" screw-type cleanout
Fixture Traps	PVC P-trap	1-1/4" to 2"	N/A	Slip-joint compression	Integral cleanout

# 7. ELECTRICAL SYSTEMS SPECIFICATIONS

## 7.8 Power Distribution

### 7.8.11 Panelboard Schedule

Panel Designation	Type/Manufacturer	Voltage/Phases	Main Breaker	Branch Circuits	Enclosure Type
MBP-1 (Main)	Square D I-Line NQOD	277/480V, 3Ph, 4W	1200A, LSIG	(42) 20-100A poles	NEMA 1, Surface Mount
PP-2 (Power)	Square D I-Line NQOB	277/480V, 3Ph, 4W	400A, LSIG	(42) 20-60A poles	NEMA 1, Flush Mount
LP-3 (Lighting)	Square D NF Panelboard	277/480V, 3Ph, 4W	225A, Main Lug Only	(42) 20A, 1-pole	NEMA 1, Surface Mount

### 7.8.12 Conduit & Raceway Specifications

Location/Use	Conduit Type	Size Range	Support Spacing	Bending Radius	Box Types
Above Ceiling	EMT (Electrical Metallic Tubing)	1/2" to 4"	10' maximum	6x conduit diameter	4" square, 1-1/2" deep
Concrete Slab	PVC Schedule 40	3/4" to 2"	Continuous in concrete	Factory elbows only	Galvanized concrete boxes
Exposed Areas	Galvanized RMC	1/2" to 2"	8' maximum	6x conduit diameter	Cast device boxes

### 7.8.13 Lighting Fixture Schedule

Fixture Type	Manufacturer/Model	Light Source	Wattage	Mounting	Controls Integration
2x4 LED Troffer	Lithonia RT5 2X4 40K 80CRI	Integrated LED	40W	Lay-in T-bar	DALI dimming, 0-10V

Fixture Type	Manufacturer/Model	Light Source	Wattage	Mounting	Controls Integration
LED Downlight	Cooper ECDR4 40K 80CRI	Integrated LED	15W	Recessed 4" aperture	DALI dimming, 0-10V
Emergency Lighting	Dual-Lite EBRD Series	LED, battery backup	20W normal/8W emergency	Surface/wall mount	Self-testing per NFPA 101

# 8. FIRE PROTECTION SYSTEMS

## 8.9 Automatic Sprinkler System

### 8.9.14 Wet Pipe Sprinkler System

Component	Material Specification	Size Range	Pressure Rating	Listing Standard	Hanger Spacing
Main Riser	Schedule 10 Black Steel	6" to 8"	175 PSI working pressure	UL/FM Approved	12' maximum
Branch Lines	Schedule 10 Black Steel	2" to 4"	175 PSI working pressure	UL/FM Approved	10' maximum
Cross Mains	Schedule 10 Black Steel	2-1/2" to 4"	175 PSI working pressure	UL/FM Approved	10' maximum

### 8.9.15 Sprinkler Head Schedule

Location	Head Type	Temperature Rating	K-Factor	Coverage Area	Finish
Office Areas	Tyco LFII Recessed Pendent	155°F (68°C)	K5.6	130 sq. ft. max	White painted plate
Mechanical Rooms	Tyco Standard Response Upright	286°F (141°C)	K8.0	130 sq. ft. max	Red brass
Parking Garage	Tyco Dry Pendent	155°F (68°C)	K11.2	130 sq. ft. max	Wax-coated brass

## 8.10 Fire Alarm & Detection System

### Detection Devices & Notification Appliances

Device Type	Manufacturer/Model	Location/Spacing	Mounting Height	Wiring	NFPA Compliance
Smoke Detector	Simplex 4098-9714 Photo	30' spacing, 15' from walls	Ceiling mounted	SLC Class B	NFPA 72
Horn/Strobe	Wheelock SP Series 25/75cd	Per visibility calc	80" AFF minimum	NAC Class B	NFPA 72
Manual Pull Station	Simplex 2701 Single Action	Exit doors, 48" AFF	48" AFF	SLC Class B	NFPA 72

# 9. BUILDING ENVELOPE & EXTERIOR CLOSURE

## 9.11 Curtain Wall System

### 9.11.16 Unitized Curtain Wall

Component	Material Specification	Performance Criteria	Thermal Break	Air Infiltration	Water Penetration
Aluminum Frame	6063-T6 Aluminum Alloy	AAMA 501.1 structural	1-1/4" polyamide barrier	0.06 CFM/ft² @ 6.24 PSF	No leakage @ 12 PSF
Vision Glass	Viracon VNE-63 1" IGU	U-Value 0.28, SHGC 0.23	Thermally improved spacer	ASTM E283 compliant	ASTM E331 compliant
Spandrel Panels	Porcelain 5mm with insulation	R-Value 15 continuous	Thermal clip system	ASTM E283 compliant	ASTM E331 compliant

## 9.12 Roofing System

### TPO Roof Assembly

Layer	Material	Thickness	Installation Method	Warranty	Standard
Membrane	Firestone 60 mil TPO, White	0.060"	Fully adhered	20 years	FM 4470, UL Class A
Insulation	Polyiso, fiberglass facer	4-1/2" (R-30)	Mechanically attached	N/A	ASTM C1289
Vapor Barrier	Self-adhering modified bitumen	40 mil	Fully adhered	N/A	ASTM D1970

# 10. INTERIOR FINISHES & ARCHITECTURAL MILLWORK

## 10.13 Drywall & Partition Systems

### 10.13.17 Metal Stud Framing

Partition Type	Stud Size/Gauge	Spacing	Drywall Layers	Insulation	STC Rating
Office Partitions	3-5/8" 25 ga	24" O.C.	(1) Layer each side	R-13 batt insulation	STC 45
Corridor Partitions	3-5/8" 20 ga	24" O.C.	(2) Layers each side	R-13 batt insulation	STC 52
Toilet Partitions	6" 18 ga	16" O.C.	(2) Layers + cement board	R-19 batt insulation	STC 56

## 10.14 Flooring Systems

### Flooring Material Schedule

Area	Flooring Type	Manufacturer/Product	Thickness	Installation Method	Maintenance
Lobby/Common	Porcelain Tile	Crossville 24"x24" Series 8	3/8"	Thin-set mortar	Non-porous, chemical resistant
Office Areas	Luxury Vinyl Plank	Armstrong LUXE Plank 9"x60"	5mm	Loose-lay floating	Phthalate-free, low VOC
Restrooms	Ceramic Mosaic	Daltile 2"x2" mesh mounted	1/4"	Epoxy mortar	Chemical resistant grout



# 11. ELEVATOR & VERTICAL TRANSPORTATION

## 11.15 Traction Elevator Systems

### 11.15.18 Passenger Elevator Specifications

Elevator Bank	Capacity/Speed	Cabin Dimensions	Door Configuration	Control System	Code Compliance
Low-Rise (L1-L4)	3500 lbs @ 500 FPM	6'8"x5'6"x8' H	48" center opening	OTIS Compass Plus	ASME A17.1, IBC
High-Rise (H1-H4)	3500 lbs @ 800 FPM	6'8"x5'6"x8' H	48" center opening	OTIS Compass Plus	ASME A17.1, IBC
Freight (F1)	5000 lbs @ 200 FPM	8'x8'x10' H	6'0" vertical lift	OTIS standard	ASME A17.1, IBC

## 11.16 Elevator Finishes & Features

### Cabin & Landing Finishes

Component	Material/Finish	Manufacturer	ADA Compliance	Fire Rating	Maintenance
Cabin Walls	Brushed stainless steel	Forms+Surfaces	Yes - braille	Class A	Stainless cleaner
Cabin Flooring	Granite tile 18"x18"	Coldspring	Non-slip surface	Non-combustible	Stone sealer
Control Panel	Brushed aluminum	OTIS standard	35-48" AFF	UL listed	Touchscreen

# 12. BUILDING AUTOMATION & CONTROLS

## 12.17 BAS Architecture & Components

### 12.17.19 System Architecture

Component	Manufacturer/Model	Protocol	Points Capacity	Integration	Redundancy
Workstation	Siemens Desigo CC OP7	BACnet IP	Unlimited	Modbus, LonWorks	Hot standby
Field Panel	Siemens PXC00x series	BACnet MS/TP	1024 points	All major systems	Dual LAN
Room Controller	Siemens RVP300 series	BACnet MS/TP	24 points	VAV, FCU, lighting	Battery backup

## 12.18 Sensor & Actuator Schedule

### Monitoring & Control Devices

Device Type	Manufacturer/Model	Range/Accuracy	Mounting	Calibration	Communication
Room Sensor	Siemens RDF300	±0.5°F, 0-100% RH	Wall mounted 48" AFF	Factory calibrated	BACnet MS/TP
Duct Sensor	Siemens QFA3160	±0.36°F, ±2% RH	Duct insertion	Field adjustable	0-10V DC
Actuator	Siemens GDB...E series	35 lb-in torque	Direct damper mount	Spring return	24V AC/DC

# 13. TESTING & COMMISSIONING PROTOCOLS

## 13.19 Mechanical System Testing

### 13.19.20 HVAC Commissioning Sequence

#### VRF System Startup Procedure

Pressure Testing	625 PSIG nitrogen, 24-hour hold, < 1% drop acceptable
Vacuum Dehydration	Triple evacuation to 250 microns maximum
Refrigerant Charge	Weighed-in per manufacturer's calculation
Electrical Verification	Phase rotation, voltage balance within 2%
Control Calibration	Temperature sensors $\pm 0.5^{\circ}\text{F}$ , pressure $\pm 2\%$

### 13.19.21 Duct System Testing

Leakage Testing	Class A: 2% maximum leakage at 2" w.g.
Air Balance	NEBB standards: $\pm 10\%$ of design airflow
Sound Testing	NC 35 in offices, NC 40 in mechanical rooms
VAV Box Calibration	Flow measurement $\pm 5\%$ of setpoint

## 13.20 Plumbing System Testing

#### Pressure & Flow Testing

Water Supply Test	150 PSI for 2 hours, < 5 PSI drop acceptable
Drainage Test	10' head for 15 minutes, no visible leakage
Fixture Flow Rates	Verify 1.2 GPM faucets, 1.28 GPF toilets
Backflow Prevention	Annual test certification, reduced pressure zone

## 13.21 Electrical System Testing

### Electrical Verification

Insulation Resistance	100 MΩ minimum, 1000V megger test
Ground Continuity	< 1.0 ohm resistance to ground
Circuit Verification	Point-to-point verification of all circuits
Lighting Control	DALI address verification, scene programming

# 14. QUALITY ASSURANCE & CONTROL

## 14.22 Quality Management Plan

### 14.22.22 Inspection & Testing Frequency

System/Component	Inspection Type	Frequency	Acceptance Criteria	Documentation	Responsible Party
Structural Concrete	Slump test, cylinders	Each pour >5 yd <sup>3</sup>	Design strength +10%	ACI 318 reports	Structural Engineer
Welded Connections	Visual, UT where required	100% of critical welds	AWS D1.1 compliance	WPS/PQR records	Certified Welder
Electrical Grounding	Resistance measurement	Each ground electrode	< 25 ohms resistance	Test reports	Electrical Engineer

## 14.23 Deficiency Tracking & Resolution

Non-Conformance Process	
Deficiency Identification	Daily superintendent walks, weekly QC inspections
Documentation	Digital photos with GPS location, detailed descriptions
Tracking System	Procore platform with automated notifications
Resolution Timeline	Critical: 24 hours, Major: 7 days, Minor: 30 days
Verification & Closeout	Re-inspection by QC manager, photographic evidence

# 15. SAFETY & SITE MANAGEMENT

## 15.24 Site Safety Protocols

### 15.24.23 Personal Protective Equipment (PPE)

PPE Type	Standard/Requirement	Areas Required	Inspection Frequency	Replacement Criteria	Training Required
Hard Hat	ANSI Z89.1 Type II, Class E	Entire site	Daily visual	After impact/damage	Site orientation
Fall Protection	ANSI Z359.1 full body harness	6' and above	Before each use	After fall event	Competent person
Hearing Protection	ANSI S3.19, NRR 25 dB	>85 dBA areas	Weekly inspection	When damaged	Hazard communication

## 15.25 Emergency Response Plan

Emergency Procedures & Equipment	
First Aid Stations	6 locations site-wide, fully stocked per ANSI Z308.1
Emergency Evacuation	Monthly drills, designated assembly areas, headcount procedure
Fire Prevention	Hot work permits, 2A10BC fire extinguishers every 75 feet
Rescue Operations	Confined space rescue team on-call, retrieval equipment available
Emergency Communication	Site-wide radio system, emergency notification protocols

# 16. SUSTAINABILITY & ENVIRONMENTAL COMPLIANCE

## 16.26 LEED Certification Strategy

### 16.26.24 Targeted LEED v4.1 BD+C Credits

Credit Category	Specific Credit	Target Points	Implementation Strategy	Documentation Method	Responsible Party
Energy & Atmosphere	Optimize Energy Performance	18 points	VRF systems, DOAS with ERV, LED lighting	Energy modeling report	Mechanical Engineer
Materials & Resources	Building Life-Cycle Impact Reduction	3 points	Recycled content, regional materials	Material cut sheets, invoices	General Contractor
Indoor Environmental Quality	Low-Emitting Materials	3 points	VOC-compliant adhesives, paints, coatings	Manufacturer certifications	Architect

## 16.27 Environmental Management Plan

### Erosion & Sediment Control

SWPPP Implementation	Stormwater Pollution Prevention Plan per NPDES requirements
Silt Fencing	Type C filter fabric, minimum 18" embedment, 100' spacing
Sediment Basins	3,600 cubic feet capacity, 24-hour dewatering time
Dust Control	Water trucks, polymer stabilizers, 35 mph speed limits
Material Management	Spill prevention, secondary containment, hazardous waste protocols