Streets West Facility HVAC and Lighting Upgrade (Bid)

Sheetlist (Complete Contract)

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A 200	Architectural
M 001	General HVAC
M 200	Garage
M 310	3D Garage
M 300	Schedules and Details
EL 001	General Lighting
EL 002	Demolition
EL 200	Garage
EL 210	Shops - Level 1
EL 220	Shops - Level 2
EL 300	Schedules and Details
EP 200	Power
EP 300	Schedules

Sheets Designed by Kay Schindel, P.E.

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EP 200	Power
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General Abbreviations

AFF	Above Finished Floor
ACT	Acoustical Ceiling Tile
ADDL	Additional
AFC	Above Finished Counter
AFG	Above Finished Grade
ALUM	Aluminum
APPD	Approved
ASC	Above Suspended Ceiling
BF	Bottom Flange
BFF	Below Finished Floor
BFG	Below Finished Grade
BLDG	Building
BLW	Below
BO	Bottom of
BOC	Bottom of Concrete
BOS	Bottom of Steel
BPL	Base Plate
CB	Catch Basin
CBT	Ceramic Tile Base
CE	Center Elevation
CFCI	Contractor Furnished / Contractor Installed
CFOI	Contractor Furnished / Owner Installed
CG	Corner Guard
CIP	Cast-in-Place
CJ	Control Joint
CL	Center Line
CLG	Ceiling
CMU	Concrete Masonry Unit
CO	Cleanout
COL	Column
CONC	Concrete
CONT	Continuous
CORR	Corridor
CPT	Carpet
CRWK	Crawlwork
CT	Ceramic Tile
CW	Cold Water
DEMO	Demolition
DF	Drinking Fountain
DIA	Diameter
DR	Door
DS	Downspout
DW	Dishwasher
DWG	Drawing
E	Each
EA	Each
EJ	Expansion Joint
EL	Elevation
ELEV	Elevator
EPS	Expanded Polystyrene Board
EQ	Equal (Distance)
EST	Estimated
EXP	Expand, Expansion
EXT	Exterior
F	Female
FA	Fire Alarm
FAB	Fabric
FBO	Flat Bottom
FEC	Fire Extinguisher Cabinet
FHC	Fire Hose Cabinet
FLR	Floor
FM	Floormat
FND	Foundation
FO	Finished Opening
FP	Fire Protection
FTG	Footing
GA	Gauge
GALV	Galvanized
GB	Grab Bar
GR	Grade
GT	Grout
GYP	Gypsum Board
HB	Hose Bib
HC	Hollow Core
HGT	Height
HM	Handicapped
HM	Hollow Metal
HVAC	Heating, Ventilation & Air Conditioning
HW	Hot Water
ID	Inside Diameter
INT	Interior
JHA	Jurisdiction Having Authority
LAV	Lavatory
LT	Light, Lamp
M	Male
MAX	Maimum
MFR	Manufacturer
MIN	Minimum
MISC	Miscellaneous
MO	Masonry Opening
N	North
NA	Not Applicable
NIC	Not in Contract
NM	Nominal
NTS	No to Scale
OC	On center
OD	Outside Diameter
OF / CI	Owner Furnished / Contractor Installed
OF / OI	Owner Furnished / Owner Installed
OHD	Over Head Door
OPNG	Opening
OPP	Opposite
PERP	Perpendicular
POLYISO	Polyisocyanurate Board
PT	Paint, Painted
PTN	Partition
RCP	Reflected Ceiling Plan
RD	Roof Drain
REBAR	Reinforcing Steel Bars
REF	Refrigerator
REV	Revision
RO	Rough Opening
S	South
SAN	Sanitary
SST	Stainless Steel
TEMP	Temperature
TFF	Top of Finished Floor
TO	Top of
TOB	Top of Beam
TOC	Top of Concrete
TOS	Top of Steel
TYP	Typical
UNO	Unless Noted Otherwise
VIF	Verified in Field
W	West
W	With
W/O	Without
WC	Water Closet
WD	Wood
WH	Water Heater
XPS	Extruded Polystyrene Board
XTG	Existing

A. PROJECT DESCRIPTION:
1. Replacement of Garage Exhaust and Ventilation including, but not limited to:
   a. New make-up air unit, louvers, exhaust fans, and ductwork
   b. HVAC controls and related devices such as VFD
2. Replacement of lighting in garage, shop and storage areas. This includes but is not limited to:
   a. Replacement of all existing controls and lighting fixtures
   b. Wiring for above HVAC
   c. Re-wiring for 277V (from XTG 120V).
   d. XTG conduit shall be reused if possible. New conduit is required where XTG conduit is not sufficient.
   e. Emergency Lighting
   f. Connecting to 277/480V panels and providing new breakers as required
   g. Washbay lighting installation with wet-location rating

B. ALTERNATES:
1. BASE BID includes ALL plan sheets and specifications except as noted under ALTERNATE 1
2. ALTERNATE 1:
   a. All work on "EL" sheets EL 001; EL 002; EL 200; EL 210; EL 220; and EL 300
   b. All work in specification sections 26 09 23 - Lighting Control Devices; 26 33 23.13 - Central Battery Equipment For Emergency Lighting; 26 50 00 - Lighting
   c. Lighting Circuits listed on sheet EP 300

C. SPECIAL SITE CONDITIONS:
1. Facility will be operating and staff will use the work areas. Contractor shall schedule and arrange with staff to block off work areas without disrupting facility operation.

D. WORK HOURS
1. Meet requirements of local ordinances, rules and laws.
2. Hours of operation are limited to 7 a.m. to 7 p.m. Monday through Saturday and Sunday 10 a.m. through 7 p.m. unless approved otherwise.

E. WORK PROVIDED BY OWNER (DON'T INCLUDE IN BID PRICE):
1. XTG conduit near new intake louver will be relocated by owner.

F. EQUIPMENT PROVIDED BY OWNER (DON'T INCLUDE IN BID PRICE):
1. Streets shop will fabricate and provide brackets for wall-fixture mounting. Contractor is responsible for coordination and installation.
2. Panel HD and HE (including feeders and breakers) will be provided and installed by owner. Contractor shall wire in scheduled circuits.

G. EXISTING EQUIPMENT:
1. 3 Garage CO and NOx sensors already exist. Contractor can use XTG sensors. Contractor shall provide the remaining required number of sensors to fulfill manufacturer coverage requirements. 7 sensors in total will be needed (contractor provides the 4 additional sensors).

H. PROVISIONS FOR FUTURE WORK
1. Emergency Lighting inverter shall receive extra breakers for future extension of emergency system

I. PERMIT REQUIREMENTS:
1. Contractor is responsible to obtain all permits. See specifications for details.

J. UTILITIES:
1. Contractor may use owner's power and water at no cost.

K. CONTINUITY OF SERVICE:
1. Facility shall stay operational

A. General Conditions:
1. All scheduled numbers and amounts of material and equipment are for contractor's convenience only. Contractor shall count and measure independently for bidding and ordering purposes. All scheduled numbers, lengths and other amounts may be incorrect and owner is not liable for mismatch.
2. Notes applied to single items may apply to all like items on view.
3. Before bidding, contractor shall familiarize with existing conditions, scope of work and means and methods required. Contractor shall inquire about any missing or apparently incomplete details and specifications before bidding.
4. Entire contract includes all specifications, plan sheets and other documents issued by owner. Bid documents don't intend to detail which subcontractor is responsible for what type of work. Any trade shall be familiar with the entire contract. Division of work is responsibility of contractor.

B. Utility Connections:
1. Where work indicated includes installation of utilities (Gas, Power, Water, Sewer, Phone etc.) provide all the required work that normally is not done by the Utility. Contractor shall inquire with Utilities to learn about the Scope of the Utility's work.

C. Drawing Conventions
1. To be demolished items are shown in dashed line and/or colored. Some items necessary for removal may not be shown and removal is part of the contract.
2. Count of devices. lengths, areas and volumes are given for convenience only. Actually required numbers may be different and contractor is responsible to determine the actual need prior bidding.
3. Details will require items that will not be shown for every instance in the model. For example, a shut-off valve may be shown for a specific detail but the plans don't show this valve for every single instance - this valve will be required for each such device.

D. Clearances:
1. Required Clearances may or may not be shown. Often that will include red-dashed lines. Each trade installing near equipment close to other trades' equipment shall review those sheets to learn about required clearances. All contractors shall review manufacturer's installation suggestions to learn about specific clearance requirements. If clearance is not sufficient for maintenance and equipment replacement, contractor shall relocate equipment at no cost to owner.

E. Demolition:
1. Demolition drawings may not show every single item to be demolished. Demolish all indicated devices and systems completely. Include all associated ducts, pipes, hangers, insulation, fuel systems, devices, electrical systems, equipment. Only leave XTG items in place if it is indicated, or required for new installation and functioning of new system or equipment.

F. Fire Protection:
1. All trades shall review and understand Architectural and other Fire Protection plans and Section " 07 80 00 - Fire and Smoke Protection"
2. Maintain all XTG and new Fire Ratings of walls, ceilings, and floors. Provide adequate protection for each trade.

Designed by:
City of Madison
Facilities Management
City-County Building, Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Cover

G 01

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STRUCTURAL SPECIFICATIONS

PART 1 - GENERAL NOTES

1.1 GENERAL NOTES

A. ALL GENERAL NOTES APPLY, UNLESS OTHERWISE NOTED ON DRAWINGS OR SPECIFICATIONS.

B. ORDER OF PRECEDENCE: DRAWINGS GOVERN OVER NOTES, NOTES ON THE INDIVIDUAL DRAWINGS GOVERN OVER THESE GENERAL NOTES. FOUNDATION, FLOOR AND ROOF DETAILS GOVERN OVER TYPICAL DETAILS. REFER TO CONTRACT SPECIFICATIONS FOR INFORMATION IN ADDITION TO THAT CONTAINED IN THESE NOTES AND DRAWINGS. THE DRAWINGS SHALL TAKE PRECEDENCE OVER SPECIFICATIONS IF THEY CONTRADICT. ADDENDA, RFI'S AND SKETCHES TAKE PRECEDENCE OVER THESE DRAWINGS.

C. NOTIFY ARCHITECT AND ENGINEER OF RECORD OF ANY DISCREPANCIES:
   i. BETWEEN PLANS, SPECIFICATIONS AND GOVERNING CODE.
   ii. BETWEEN DETAILS AND TYPICAL DETAILS.
   iii. BETWEEN NOTES AND DRAWINGS.

1.2 SCOPE OF WORK

A. THE SEALED STRUCTURAL DRAWINGS AND PROJECT SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE.

1.3 CODE COMPLIANCE

A. ALL WORK AND MATERIALS SHALL COMPLY WITH THE LATEST RULES, CODES, AND REGULATIONS IN THE STATE OF THE PROJECT, INCLUDING, BUT NOT LIMITED TO OSHA, ADOPTED BUILDING CODE AND OTHER STATE AND LOCAL LAWS AND REGULATIONS. CODE COMPLIANCE IS MANDATORY. NOTHING IN THESE DRAWINGS AND SPECIFICATIONS PERMITS WORK NOT CONFORMING TO THESE CODES. WHERE WORK IS SHOWN TO EXCEED MINIMUM CODE REQUIREMENTS, COMPLY WITH DRAWINGS AND SPECIFICATIONS.

B. ALL PRODUCT SUBMITTALS AND PRODUCT SUBSTITUTIONS ARE TO BE SUPPLIED WITH ICC-ES REPORTS TO COMPLY WITH CODE REGULATIONS ACCORDING TO THE ADOPTED BUILDING CODE.

1.4 CONDITIONS AT SITE

A. CONTRACTOR TO VERIFY EXISTING STRUCTURE(S) SHOWN IN THE DRAWINGS AND NOTIFY ARCHITECT/STRUCTURAL ENGINEER IN WRITING OF ANY DISCREPANCIES.

1.5 SAFETY

A. CONTRACTOR TO PROVIDE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AS REQUIRED.

B. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS OF THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK.

1.6 COORDINATION

A. THE CONSTRUCTION DOCUMENTS DO NOT INDICATE THE METHOD OF CONSTRUCTION.

B. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND EXISTING ELEVATIONS SHOWN ON THESE DRAWINGS PRIOR TO CONSTRUCTION. DO NOT SCALE PLANS.

C. CONTRACTOR TO REPORT IN WRITING ANY OMISSIONS AND/OR DISCREPANCIES ON DRAWINGS AND/OR SPECIFICATIONS TO THE ARCHITECT PRIOR TO PROCEEDING.

D. REFER TO MECHANICAL AND ELECTRICAL PLANS FOR SLEEVES, OPENINGS, HANGERS FOR PIPES, DUCTS, AND EQUIPMENT. COORDINATE THESE ITEMS WITH STRUCTURAL WORK.

1.7 MISC.

A. DO NOT SCALE THE DRAWINGS.

PART 2 - MATERIALS AND DESIGN CRITERIA

2.1 DESIGN LOADING CRITERIA

A. APPLICABLE BUILDING CODES:
   I. 2015 INTERNATIONAL BUILDING CODE (IBC): REFERENCED IN DRAWINGS AS "ADOPTED BUILDING CODE"
   II. ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES

B. RISK CATEGORY: II

C. DEAD LOADS: SELF WEIGHT OF THE STRUCTURE

D. LIVE LOADS
   I. ROOF LIVE LOADS = 20 PSF

E. SNOW LOAD = 30 PSF

F. WIND LOAD = 115 MPH (EXPOSURE C)

2.2 STEEL

A. GENERAL
   I. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH ADOPTED BUILDING CODE CHAPTER FOR "STEEL" AND THE FOLLOWING:
      a. AISC 360-10 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
      b. AWS D1.1 STRUCTURAL WELDING CODE STEEL.
   II. ALL WELDING SHALL CONFORM TO CURRENT AMERICAN WELDING SOCIETY STANDARDS AND TO BE PERFORMED BY CERTIFIED WELDERS.

B. STRUCTURAL STEEL SHAPES
   I. W-SHAPES SHALL BE ASTM A992
   II. PLATES, ANGLES AND CHANNELS SHALL BE ASTM A36.

C. WELDING
   I. WELDING ELECTRODES SHALL BE E70XX, UNLESS NOTED OTHERWISE
   II. ALL FILLET WELD SHALL BE PER AISC. MINIMUM SIZES ARE BASED ON THICKNESS OF MATERIALS JOINED, UNLESS NOTED OTHERWISE.

D. BOLTS AND CONNECTIONS
   I. BOLTS IN STANDARD STEEL TO STEEL CONNECTIONS SHALL BE ASTM A325N. IF WEATHER OR CORROSION RESISTANCE BOLTS ARE REQUIRED, USE A325N TYPE 3 BOLTS.
   II. NUTS SHALL BE ASTM A563
   III. WASHERS SHALL BE F436
   IV. THREADED RODS SHALL BE ASTM A36.
   V. TYPICAL BOLT HOLES IN STEEL SHALL BE 1/16" LARGER THAN BOLT DIAMETER, UNLESS NOTED OTHERWISE ON DRAWINGS. BOLT HOLES FOR ANCHOR BOLTS SHALL BE OVERSIZED PER THE AISC.

E. EXECUTION
   I. ALL STEEL EXPOSED TO WEATHER SHALL BE PRIMED AND PAINTED, UNO.
   II. STEEL NOT EXPOSED TO WEATHER SHALL BE LEFT UN-PAINTED UNLESS NOTED OTHERWISE IN ARCHITECTURAL DRAWINGS OR SPECIFICATIONS.
   III. GAS CUTTING TORCHES SHALL NOT BE USED TO CORRECT FABRICATION ERRORS WITHOUT THE APPROVAL OF THE ENGINEER.
   IV. ROLLED STRUCTURAL STEEL SHALL BE IDENTIFIED WITH MILL IDENTIFICATION MARKS IN ACCORDANCE WITH ASTM A6. PIPES SHALL BE IDENTIFIED WITH MILL ID IN ACCORDANCE WITH ASTM A53, AND TUBE SHAPES IN ACCORDANCE WITH ASTM A1085.

2.2 STEEL (CONT.)

F. SHOP DRAWINGS AND SUBMITTALS
   I. STRUCTURAL STEEL SHOP DRAWINGS:
      a. SHOW FABRICATION OF STRUCTURAL STEEL COMPONENTS.
      b. INCLUDE DETAILS OF CUTS, CONNECTIONS, SPLICES, HOLES, AND OTHER PERTINENT DATA.
      c. INDICATE WELDS BY STANDARD AWS SYMBOLS, DISTINGUISHING BETWEEN SHOP AND FIELD WELDS, AND SHOW SIZE, LENGTH, AND TYPE OF EACH WELD. SHOW BACKING BARS THAT ARE TO BE REMOVED AND SUPPLEMENTAL FILLET WELDS WHERE BACKING BARS ARE TO REMAIN.
      d. INDICATE TYPE, SIZE, AND LENGTH OF BOLTS.
   II. WELDING PROCEDURE SPECIFICATIONS (WPS) AND PROCEDURE QUALIFICATION RECORDS (PQR): PROVIDE ACCORDING TO AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE - STEEL," FOR EACH WELDED JOINT WHETHER PREQUALIFIED OR QUALIFIED BY TESTING, INCLUDING THE FOLLOWING:
      a. POWER SOURCE (CONSTANT CURRENT OR CONSTANT VOLTAGE).
      b. ELECTRODE MANUFACTURER AND TRADE NAME, FOR DEMAND CRITICAL WELDS.

G. QUALITY ASSURANCE
   I. TESTING AGENCY QUALIFICATIONS: QUALIFIED ACCORDING TO ASTM E 329 FOR TESTING INDICATED.
   II. WELDING QUALIFICATIONS:
      a. QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE - STEEL.

2.3 COLD-FORMED STEEL

A. GENERAL
   I. COLD-FORMED STEEL SHALL COMPLY WITH THE FOLLOWING:
      a. AISI S100-12 NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS, 2012
      b. S200-12 NORTH AMERICAN STANDARD FOR COLD-FORMED STEEL FRAMING - GENERAL PROVISIONS, 2012
      c. AWS D1.3 STRUCTURAL WELDING CODE SHEET STEEL
   II. ALL COLD-FORMED STEEL SHALL BE GALVANIZED IN ACCORDANCE WITH ASM A653, G60, UNO; COLD-FORMED STEEL IN CONTACT WITH PRESSURE TREATED WOOD SHALL HAVE A MINIMUM GALVANIZED G90 COATING.

B. COLD-FORMED STEEL SHAPES
   I. C-SHAPED STUDS SHALL CONFORM TO ASTM A1003 GR 50 (50KSI) FOR STUDS THAT ARE 16GA AND THICKER; 18GA AND 20GA STUDS SHALL BE ASTM A653 GR 33 (33KSI), UNO.
   II. STEEL SHEET SHALL CONFORM TO ASTM A1003 STRUCTURAL GRADE 50 TYPE H (ST50H), UNO.
   III. STEEL SHEET FOR DEFLECTION CLIPS SHALL CONFORM TO ASTM A1003 GR 50 (50KSI).

2.3 COLD-FORMED STEEL (CONT.)

C. WELDING:
   I. WELDING ELECTRODES SHALL BE E60XX, UNLESS NOTED OTHERWISE
   II. ALL FILLET WELDS SHALL BE PER AISI MINIMUM SIZES BASED ON THICKNESS OF MATERIALS JOINED, UNLESS NOTED OTHERWISE.
   III. ALL WELDED JOINTS SHALL BE IN ACCORDANCE WITH PREQUALIFIED JOINT DETAILS IN THE STRUCTURAL WELDING CODE.
   IV. ALL WELDERS SHALL HAVE QUALIFICATIONS FOR THE WELDING OF COLD-FORMED MATERIAL.

D. SCREWS AND CONNECTIONS:
   I. SCREWS SHALL BE BY HILTI, ICC REPORT #2196 CONFORMING TO ASTM C1513 AND SHALL BE CORROSION-RESISTANT-COATED, SELF-DRILLING, AND SELF-TAPPING STEEL DRILL SCREW. ALL SCREWS SHALL BE #10 MINIMUM, UNO. SCREWS SHALL BE INSTALLED WITH HEADS FLUSH TO STEEL SURFACE AND PENETRATE INTO STEEL SUCH THAT THREE THREADS ARE EXPOSED.
   II. BOLTS IN STANDARD COLD-FORMED STEEL TO COLD-FORMED STEEL CONNECTIONS SHALL BE ASTM A 325N. IF WEATHER OR CORROSION RESISTANCE BOLTS ARE REQUIRED, USE A325N TYPE 3 BOLTS.
   III. WIRE TYING OF FRAMING MEMBERS IS NOT PERMITTED.

E. UNISTRUT OR EQUAL
   I. ALL STRUT CHANNELS SHALL BE FABRICATED FROM STRUCTURAL GRADE STEEL CONFORMING TO ASTM SPECIFICATION A 1011 GR 33 OR A 653 GR 33.
   II. STRUT CHANNELS SHALL HAVE A GALVANIZED FINISH IN ACCORDANCE WITH ASTM SPECIFICATION A 653, A 123, OR A 153.
   III. ALL STRUT FITTING SHALL BE FABRICATED FROM STEEL CONFORMING TO ASTM SPECIFICATION A 575, A 576, A 36, OR A 635.
   IV. MANUFACTURER OF STRUT SHALL HAVE AT LEAST 10 YEAR'S EXPERIENCE IN MANUFACTURING STRUT SYSTEMS.
   V. MANUFACTURER MUST CERTIFY IN WRITING THAT ALL COMPONENTS SUPPLIED HAVE BEEN PRODUCED IN ACCORDANCE WITH AN ESTABLISHED QUALITY ASSURANCE PLAN.
   VI. ALL STRUT SYSTEM COMPONENTS MUST BE SUPPLIED BY A SINGLE MANUFACTURER.

GENERAL NOTES

GENERAL NOTES:

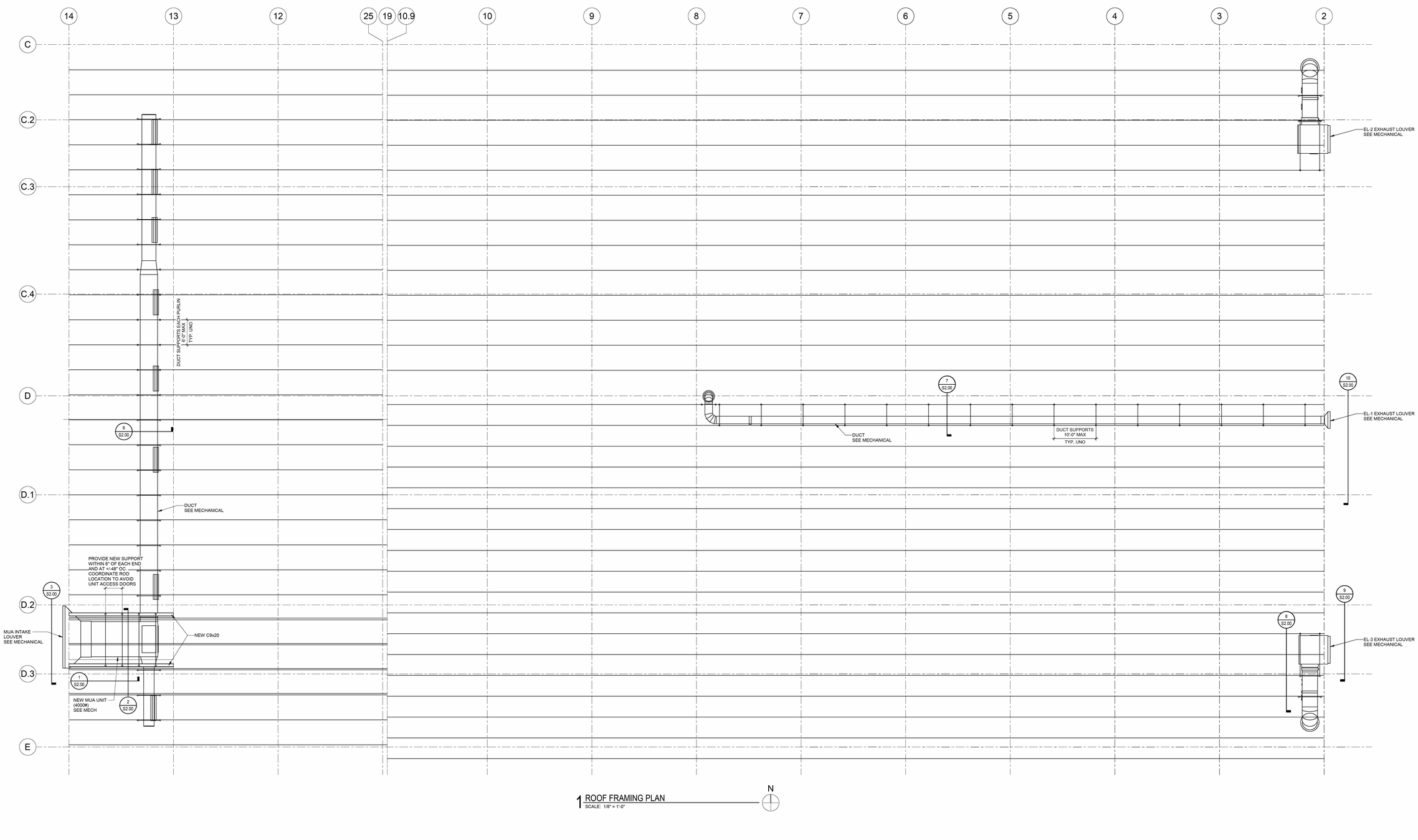
G1 THE DIMENSIONS SHOWN HERE APPLY TO STRUCTURAL ELEMENTS ONLY, SEE ARCHITECTURAL PLANS FOR ANY DIMENSIONS NOT SHOWN.

G2 CONTRACTOR SHALL FIELD VERIFY EXISTING STRUCTURAL CONDITIONS. IF ANY DISCREPANCY OCCURS BETWEEN EXISTING CONDITIONS AND PROPOSED ALTERATIONS, CONTRACTOR SHALL CONTACT ARCHITECT AND STRUCTURAL ENGINEER BEFORE PERFORMING ALTERATION WORK.

LEGEND:

- SECTION REFERENCE (1 / S0.00)
- ELEVATION REFERENCE (1 / S0.00)
- GENERAL VIEW REFERENCE (1 / S0.00)
- REVISION CLOUD AND NUMBER (1)
- NEW CONSTRUCTION
- EXISTING CONSTRUCTION OR PROVIDED BY OTHERS
- ELEMENT BEYOND/ OPTIONAL
- MASONRY (CMU)
- CONCRETE
- EARTH

SHEET INDEX



1 ROOF FRAMING PLAN
SCALE: 1/8" = 1'-0"

N

Designed by:
City of Madison
Facilities Management
City-County Building, Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53703

CITY OF MADISON ENGINEERING

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West
Facility HVAC and
Lighting Upgrade
(Bid)

WISCONSIN PROFESSIONAL ENGINEER
TYLER D. GARMAN
49194-6
MADISON, WI

DC ENGINEERING
Careful listening. Dynamic solutions.
www.dcengineering.net
Phone:608.416.1041 Project:23COMD04

Revisions

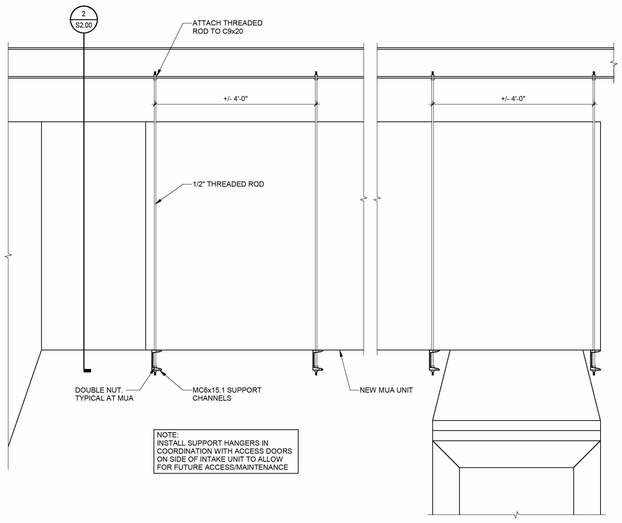
No.	Description

Roof
Framing Plan

S 1.00

Print Date:
2/16/2024 13:38:25

Print in color on 36" x 48"



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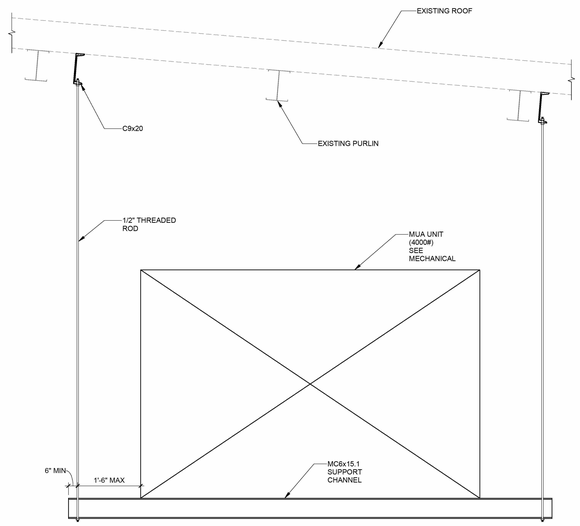

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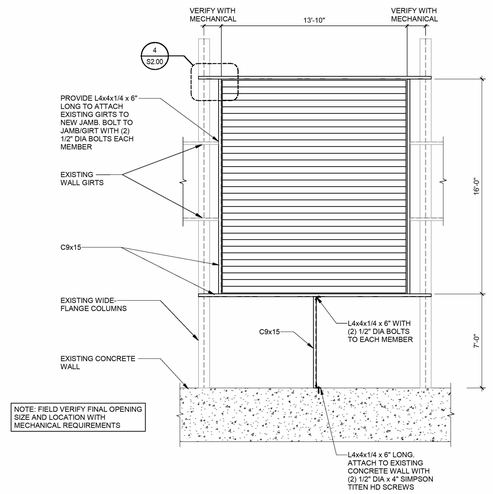

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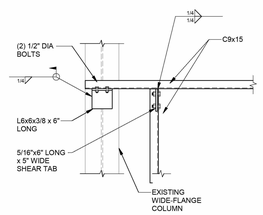

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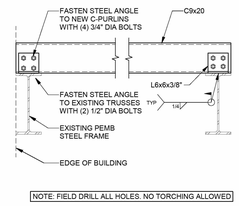

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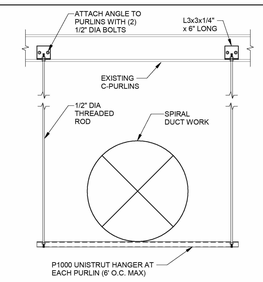

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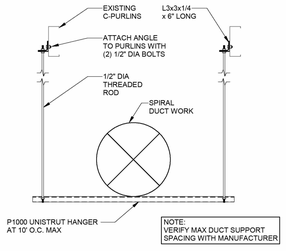

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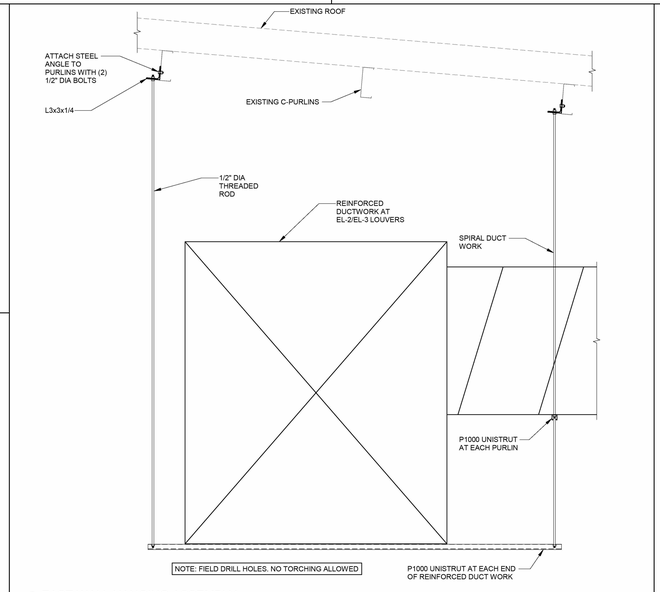

8 EAST WALL HANGING ASSEMBLY
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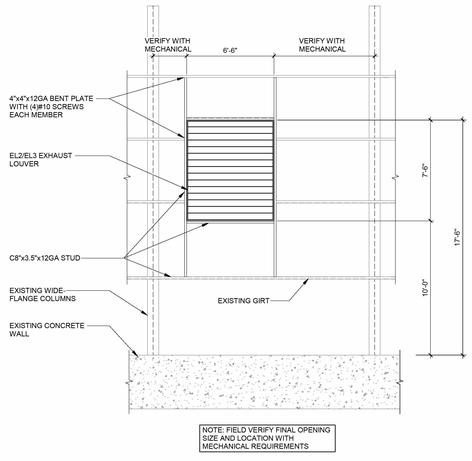
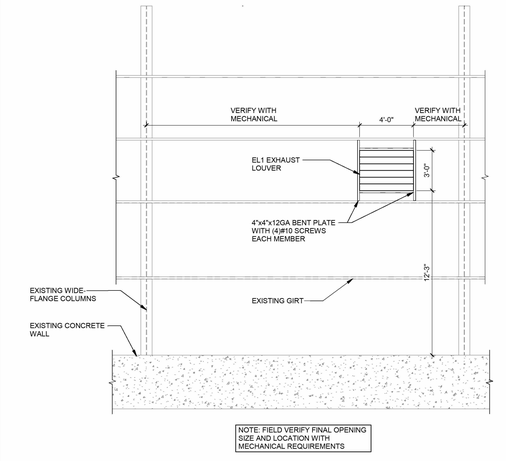


9 EXHAUST LOUVER FRAMING
SCALE: NTS



10 EXHAUST LOUVER FRAMING
SCALE: NTS

Designed by:
City of Madison
Facilities Management
City-County Building, Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Details

S 2.00

Print Date:
2/10/2024 13:38:33

Print in color on 36" x 48"

1 A Mapview - Complete Site 1" = 30'-0"

1/4" = 1'-0" | 3/16" = 1'-0" | 1/8" = 1'-0" | 3/32" = 1'-0" | 1/16" = 1'-0" | 1" = 20'-0" | 1" = 30'-0"

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City-County Building, Room 115
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Madison, WI 53703

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Madison, WI 53713

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Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

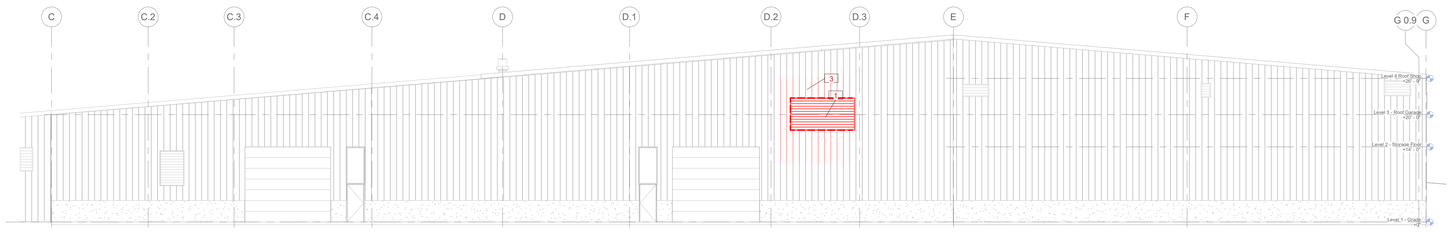
Project North
TRUE

Site Plan

A 100

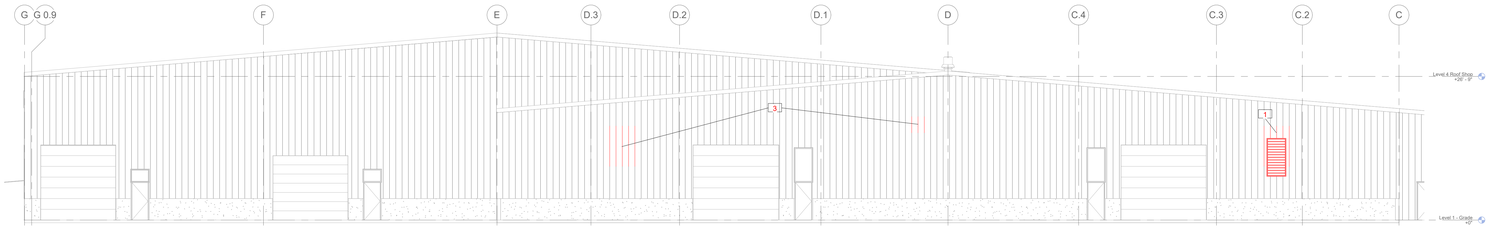
Print Date:
2/10/2024 13:38:34

Print in color on 36" x 48"

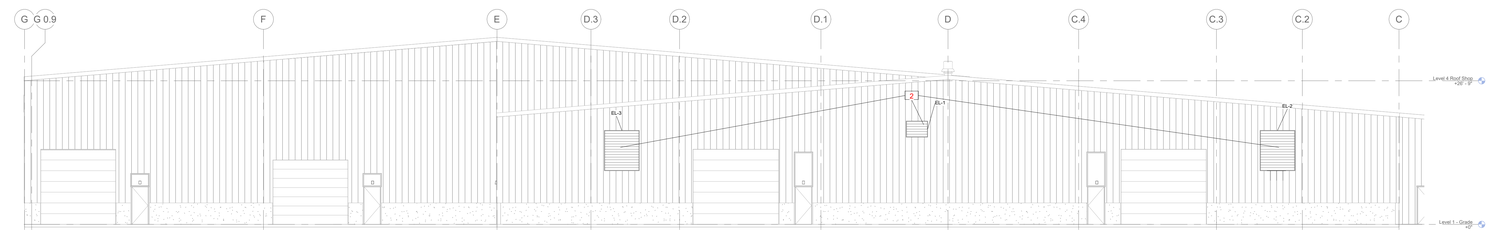


1 AD Elevation - Demolition from West 1" = 10'-0"

2 A Elevation - Proposed from West 1" = 10'-0"



3 AD Elevation - Demolition from East 1" = 10'-0"



4 A Elevation - Proposed from East 1" = 10'-0"

Keynote Legend

Key Value	Keynote Text
1	Demolish XTG Louver. Close opening with like material. Make watertight and paint to match surrounding.
2	Install new louvers weather-tight. Modify structure according to Structural Plans. Louver color shall match XTG wall.
3	Create Opening for louver

Louvers (08 91 00 - Louvers)

Mark	System Name	Description	Manufacturer	Model	URL	Airflow	Depth	Height	Width	Free Air Velocity	Type Remark	Specific Remark
EL-1	EF 1	Exhaust Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	2600 CFM	0' - 6"	3'-0"	4'-0"	403 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall
EL-2	EF 2	Exhaust Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	17550 CFM	2' - 6"	7'-0"	8'-0"	590 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall
EL-3	EF 3	Exhaust Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	17550 CFM	0' - 6"	7'-0"	8'-0"	590 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall
IL-1	MUA 1	Intake Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	30300 CFM	2' - 6"	16'-0"	13'-10"	229 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall

2 0 2 4 6 8 10
1/4" = 1'-0" FEET

2 0 2 4 6 8 10 12 14
3/16" = 1'-0" FEET

5 0 5 10 15 20
1/8" = 1'-0" FEET

5 0 5 10 15 20 25 30
3/32" = 1'-0" FEET

5 0 5 10 15 20 25 30 35 40 45
1/16" = 1'-0" FEET

20 0 20 40
1" = 20'-0" FEET

30 0 30 60
1" = 30'-0" FEET

Designed by:
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City-County Building, Room 115
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Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

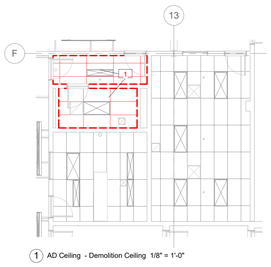
Project North
TRUE

Exterior Elevations

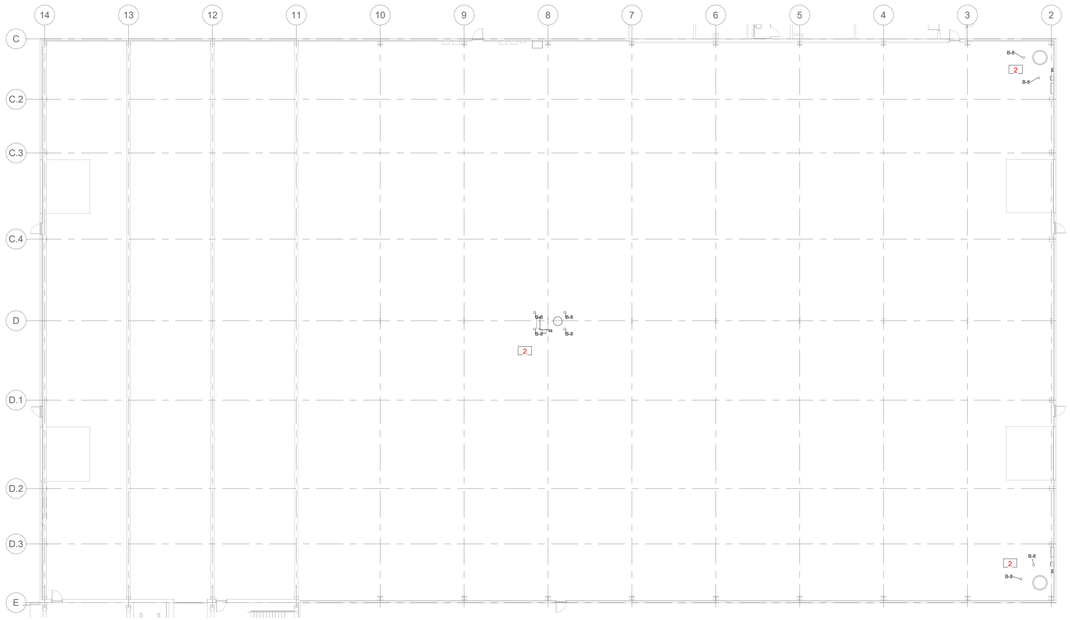
A 110

Print Date:
2/10/2024 13:38:36

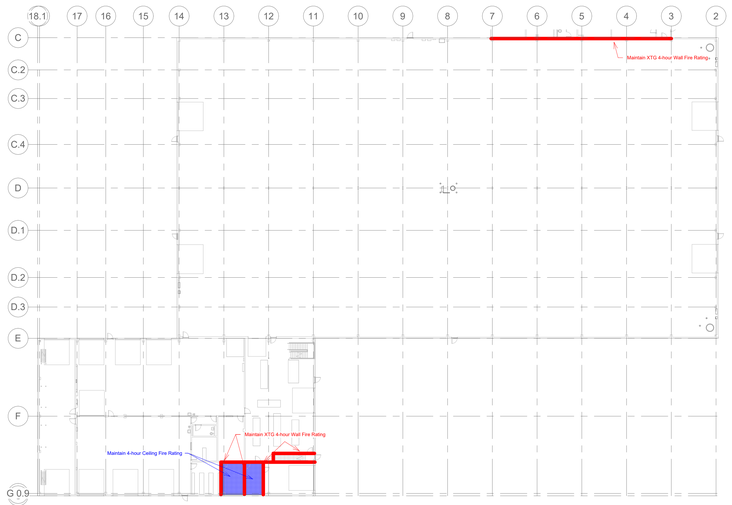
Print in color on 36" x 48"



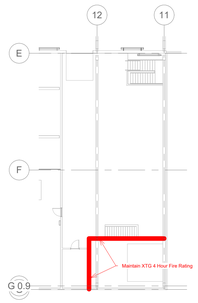
1 AD Ceiling - Demolition Ceiling 1/8" = 1'-0"



2 A Level 1 - Garage Bollards 1/16" = 1'-0"



3 A Fire Ratings - Level 1 1" = 30'-0"



4 A Fire Rating - Level 2 1" = 20'-0"

Keynote Legend

Key Value	Keynote Text
1	Demolish Ceiling. Keep fans, sprinkler and other devices in place. Re-attach to structure as required to ensure continued function of those devices.
2	Install bollards to protect equipment while allowing maintenance and replacement of all equipment. Coordiante exact location with staff on site. Repair slab.

Bollards (32 39 13 - Manufactured Metal Bollards)

Type Mark	Description	Count
B-8	Concrete-filled Steel bollard, yellow	8

General Notes:
1. Repair all openings and damages caused by removal of existing lighting fixtures, controls and wireways
2. Cover all openings and repair wall and ceiling. Match texture to adjacent texture and paint type. Make the repair not obvious.
3. Paint entire ceiling and wall that required above repair. Match the paint color of existing paint.
4. New wire raceway (e.g. conduit) shall be painted to match surface color.
5. Protect all surfaces and equipment.

2 0 2 4 6 8 10 — 1/4" = 1'-0" FEET
2 0 2 4 6 8 10 12 14 — 3/16" = 1'-0" FEET
5 0 5 10 15 20 — 1/8" = 1'-0" FEET
5 0 5 10 15 20 25 30 — 3/32" = 1'-0" FEET
5 0 5 10 15 20 25 30 35 40 45 — 1/16" = 1'-0" FEET
20 0 20 40 — 1" = 20'-0" FEET
30 0 30 60 — 1" = 30'-0" FEET

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Facilities Management
City-County Building, Room 115
210 Martin Luther King, Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

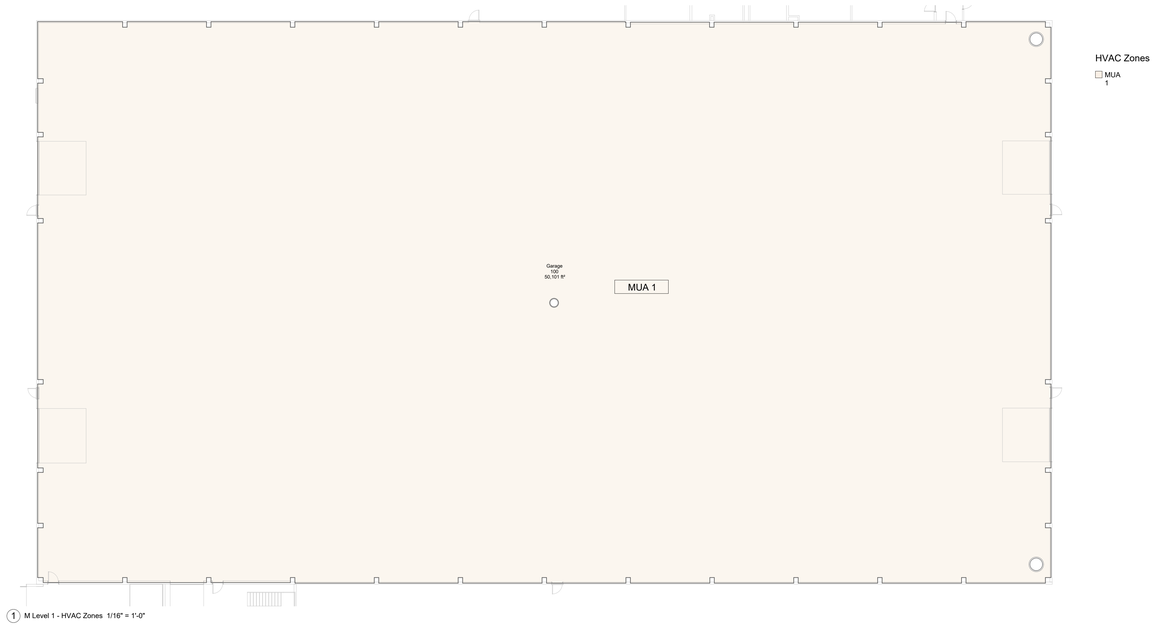
Project North
TRUE

Architectural

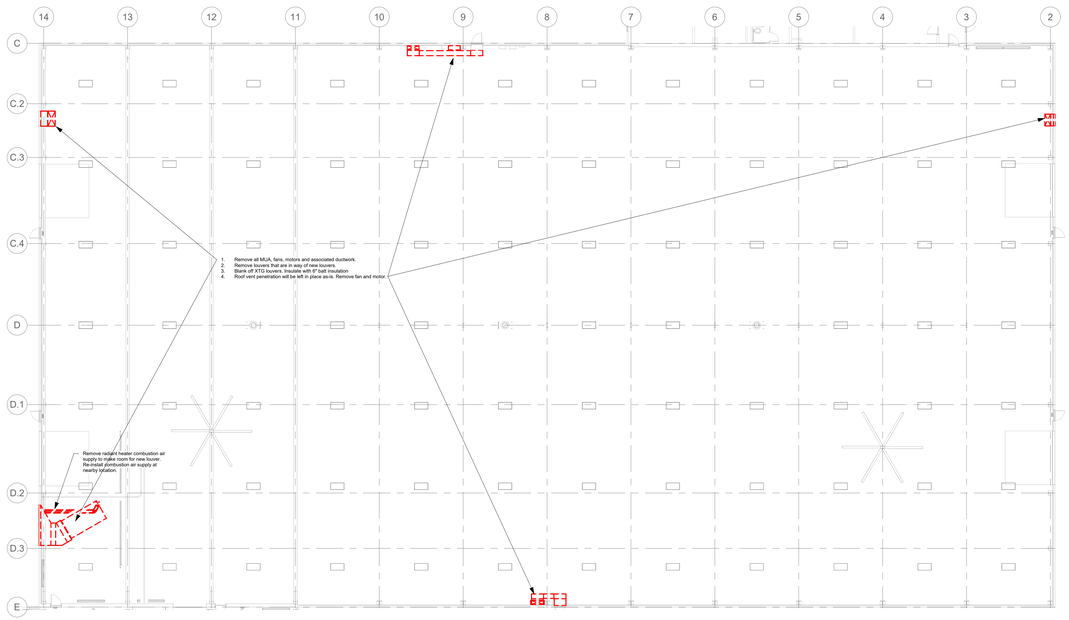
A 200

Print Date:
2/10/2024 13:38:37

Print in color on 36" x 48"



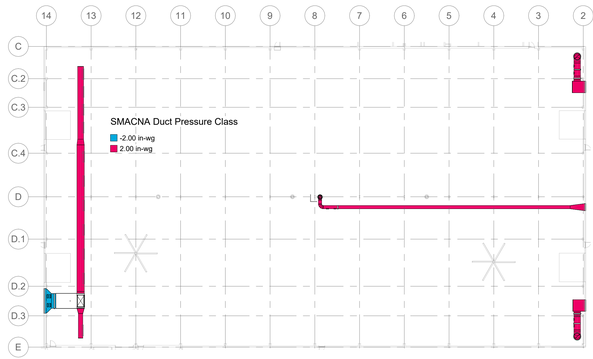
1 M Level 1 - HVAC Zones 1/16" = 1'-0"



2 MD - Demolition Level 1 - Garage 1/16" = 1'-0"

Ventilation Schedule

Space Number	Vent System	Zone	Sapce Name	Area	Volume	Ventilation Category	Outside Air: Occupants per 1000 ft²	Occupants (roundup)	OA per person	OA per area	OA Rate	Min. ACH	Min. VAV Flowrate	Exhaust: EA per area	Minimum EA	Fixtures req. Exhaust	Exhaust per Fixture	EA accumulated	Addl. Exhaust	EA Total	EA Garage Minimum	EA Garage excl. Minimum	Code Comment	Comment
MUA MUA 1																								
100	MUA	MUA 1	Garage	50,101 ft²	1,223,779 ft³	Garage SPS 364	0	0.0	7.5 CFM	0 CFM/ft²	0 CFM	0	0 CFM	0.75 CFM/ft²	0.05 CFM/ft²	0	0 CFM	37576 CFM	0 CFM	37576 CFM	2505 CFM	35071 CFM	Provide min. ventilation 24/7	
											0 CFM		0 CFM					37576 CFM		37576 CFM	2505 CFM			
MUA											0 CFM		0 CFM					37576 CFM		37576 CFM	2505 CFM			
											0 CFM		0 CFM					37576 CFM		37576 CFM	2505 CFM			



3 M Duct Pressure Class 1" = 30'-0"

General Requirements:

A. Duct Pressure Class:
1. If no pressure class is given, use these guidelines:
   a. Duct potentially restricted by control damper (from fan to control damper): constructed to withstand +/- 4 in-wg pressure.
   b. Duct open to atmosphere or rooms (from a control damper to a diffuser/grille or from fan to atmosphere with no control damper): constructed to withstand +/- 2 in-wg pressure.
2. Design per SMACNA duct construction guideline.
3. Relief doors shall be placed to protect duct from higher pressure. Size relife doors assuming all control dampers are closed and fans run at 100% speed.
4. Some sections may be labeled to be built to higher pressure class. This typically applies to section between control damper and fan or device with fan.

B. HVAC Insulation:
1. Pipe insulation may not be shown to keep plans concise. All pipes and devices shall be insulated to meet current code and Section "23 07 00 - HVAC Insulation"
2. Duct insulation may not be shown to keep plans concise. Typically insulation is required:
   a. On exhaust duct path from exterior up to a control damper or exhaust fan
   b. On intake duct path from exterior up to an AHU or other device that conditions air.
   c. On supply path where conditioned air ducts pass through plenums, or spaces not served by that duct.
   d. Unless noted otherwise, no insulation is needed on duct within space served.
   e. Insulate to meet Section "23 07 00 - HVAC Insulation" and current code

C. Duct and Pipe Accessories:
1. Sometimes pipe and duct accessories, such as valves, strainers, de-aerators, dampers etc. are shown and tagged.
2. But in some cases these are not shown (or not even scheduled). Such accessories shall be included and inferred from the typical details and control sequences. All such items required for the function shall be included.

2 0 2 4 6 8 10 FEET — 1/4" = 1'-0"
2 0 2 4 6 8 10 12 14 FEET — 3/16" = 1'-0"
5 0 5 10 15 20 FEET — 1/8" = 1'-0"
5 0 5 10 15 20 25 30 FEET — 3/32" = 1'-0"
5 0 5 10 15 20 25 30 35 40 45 FEET — 1/16" = 1'-0"
20 0 20 40 FEET — 1" = 20'-0"
30 0 30 60 FEET — 1" = 30'-0"

Designed by:
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Facilities Management
City-County Building, Room 115
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Madison, WI 53703

Client:
Streets Department

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Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

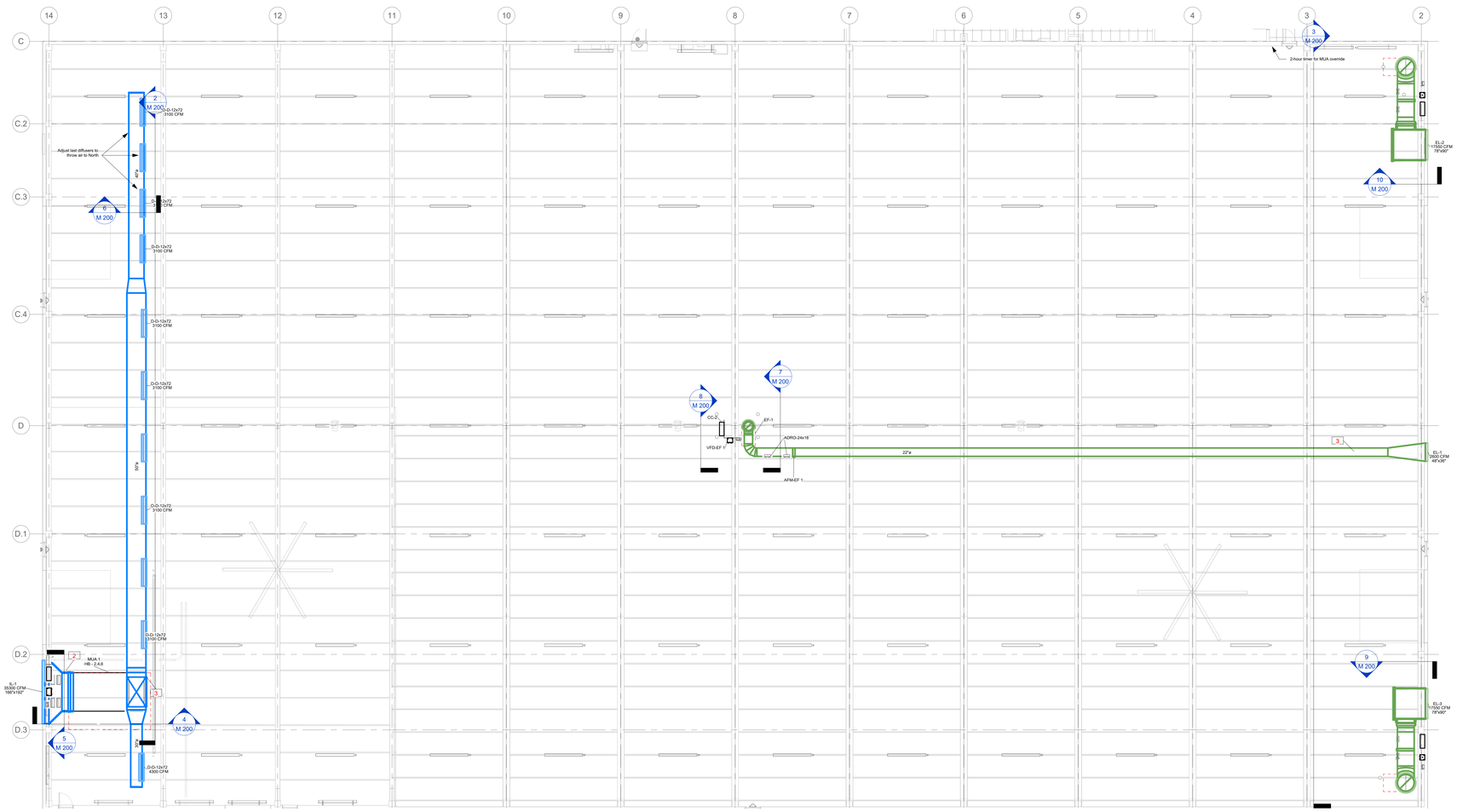
Project North
TRUE

General
HVAC

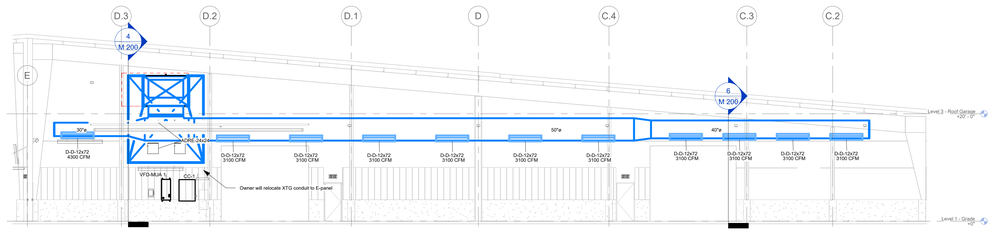
M 001

Print Date:
2/10/2024 13:38:38

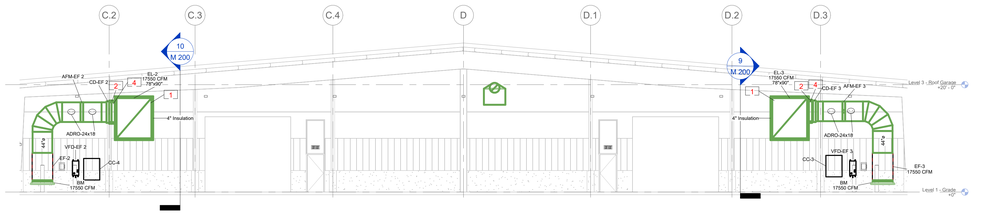
Print in color on 36" x 48"



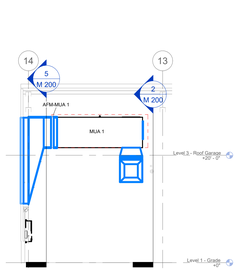
1 M Ceiling - Level 1 - Garage 1" = 10'-0"



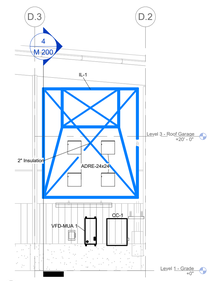
2 M Section - MUA 1 Discharge 1" = 10'-0" - M 200



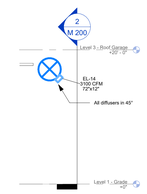
3 M Section - East Wall 1" = 10'-0" - M 200



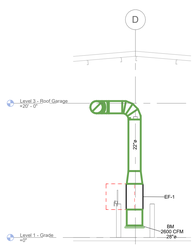
4 M Section - MUA 1 1" = 10'-0" - M 200



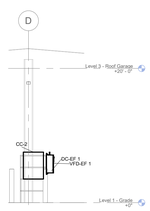
5 M Section - IL-1 1/8" = 1'-0" - M 200



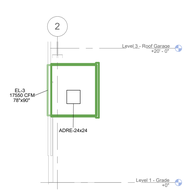
6 M Section - Supply Duct 1/8" = 1'-0" - M 200



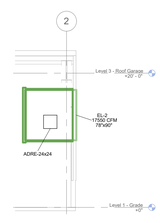
7 M - Section Minimum EA Intake 1/8" = 1'-0" - M 200



8 EL Section - EF 1 Controls 1/8" = 1'-0" - M 200



9 M Section - EL 3 1/8" = 1'-0" - M 200



10 M Section - EL 2 1/8" = 1'-0" - M 200

Keynote Legend

Key Value	Keynote Text
1	Exhaust opening shall be 10' away from openings and 10' above grade.Create stable plenum w/ insulation and access door.
2	Insulate up to AHU/Fan/Control Damper.
3	No insulation required.
4	Bellmouth/Pyramidal Fitting into Plenum. Plenum in louver size.

1/4" = 1'-0" FEET
3/16" = 1'-0" FEET
1/8" = 1'-0" FEET
3/32" = 1'-0" FEET
1/16" = 1'-0" FEET
1" = 20'-0" FEET
1" = 30'-0" FEET

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Client:
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Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

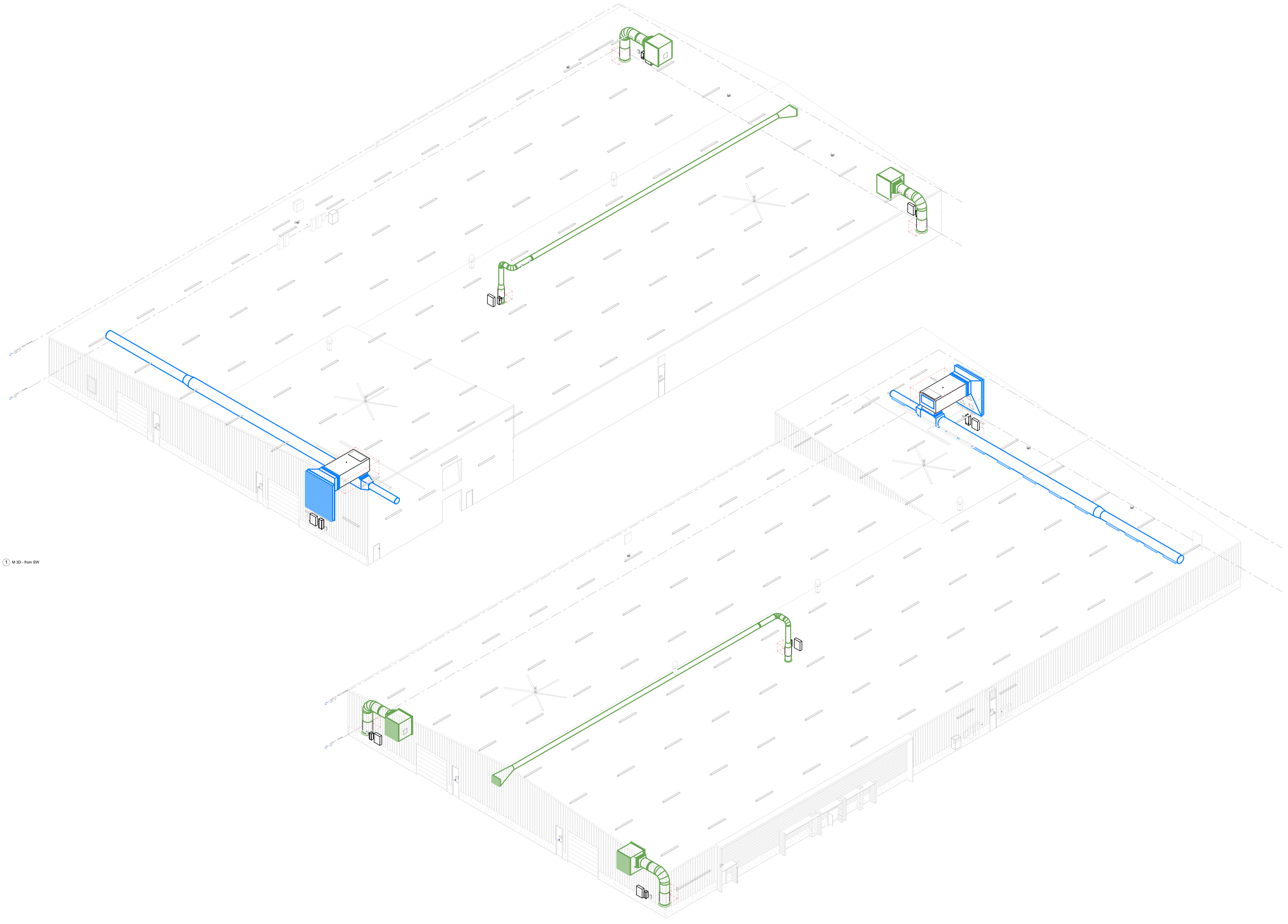
Project North
TRUE

Garage

M 200

Print Date:
2/10/2024 13:38:40

Print in color on 36" x 48"



1 M 3D - from SW

2 M 3D - from NE

1/4" = 1'-0" FEET | 3/16" = 1'-0" FEET | 1/8" = 1'-0" FEET | 3/32" = 1'-0" FEET | 1/16" = 1'-0" FEET | 1" = 20'-0" FEET | 1" = 30'-0" FEET

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Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Project North
TRUE

3D Garage

M 210

Print Date:
2/10/2024 13:38:41

Print in color on 36" x 48"

Direct-Fired Make Up Air Units (23 73 39 – Indoor Direct Gas-Fired Heating And Ventilation Units)

									Burner					Fan					Motor (each)			Electrical					Electrical	Weight and Dimensions				
Mark	System Name	Manufacturer	URL	Model	Room Name	Room Number	Filter	Special Features	Fuel	Input	Output	Efficiency	Temperature Rise	Airflow	External Static Pressure (ESP)	Fan	FEI	Design Fan RPM	Motor Type	Nominal Power	Brake Horsepower	Voltage	Poles	MCA	MOP	Panel	Circuit Number	Weight	Height	Width	Length	Specific Remark
MUA 1	MUA 1	Greenheck	www.greenheck.com	DGX-P227-H42	Garage	100	4in./MERV 8	no damper	Natural Gas	2,884,300 Btu/h	2,653,600 Btu/h	92%	70 °F	35100 CFM	0.75 in-wg	2x27" Plenum directdrive	1.18	1,831	TEFC, NEMA Premium Efficiency, VFD approved	15 hp	13.56 hp	480 V	3	53.4 A	60 A	HB	2,4,6	3,782 lbm	5'-8"	8'-5"	15'-11"	Connect to XTG 3" 5 psi gas pipe

Diffusers, Registers and Grilles (23 37 00 - Air Outlets and Inlets)

Type Mark	Description	Neck Size	Manufacturer	URL	Model	Est. Count
BM	Bellmouth Inlet	<varies>				3
D-D-12x72	Duct-mounted diffuser, Single Blade	72"x12"	Price Industries	www.priceindustries.com	HCD	11

Fans (23 34 00 - HVAC Fans)

									Fan						Electrical										
Mark	System Name	Description	Room Name	Room Number	Manufacturer	URL	Model	Model adder	Airflow	Static Pressure	Fan Type	Design Fan RPM	Brake Horsepower	FEI	Motor Type	Nominal Power	Voltage	Poles	FLA	Apparent Power	Panel	Circuit Number	Weight	Type Remark	Specific Remark
EF-1	EF 1	Axial Fan w/ Vane Section	Garage	100	Greenheck	www.greenheck.com	AXV-72	190-0405-A10	2600 CFM	0.50 in-wg	Direct Drive Axial w/Vanes	1212	0.28 hp	2.12	TEFC	1 hp	480 V	3	2.1 A	1746 VA	HA	10,12,14	358 lbm		Bellmouth Inlet
EF-2	EF 2	Axial Fan w/ Vane Section	Garage	100	Greenheck	www.greenheck.com	AXV-113	275-0615-C30	17550 CFM	0.50 in-wg	Direct Drive Axial w/Vanes	871	2.13 hp	1.95	TEFC	3 hp	480 V	3	2.8 A	2328 VA	HA	16,18,20	1,224 lbm		Bellmouth Inlet
EF-3	EF 3	Axial Fan w/ Vane Section	Garage	100	Greenheck	www.greenheck.com	AXV-113	275-0615-C30	17550 CFM	0.50 in-wg	Direct Drive Axial w/Vanes	871	2.13 hp	1.95	TEFC	3 hp	480 V	3	2.8 A	2328 VA	HA	22,24,26	1,224 lbm		Bellmouth Inlet

Louvers (08 91 00 - Louvers)

Mark	System Name	Description	Manufacturer	Model	URL	Airflow	Depth	Height	Width	Free Air Velocity	Type Remark	Specific Remark
EL-1	EF 1	Exhaust Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	2600 CFM	0' - 6"	3'-0"	4'-0"	403 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall
EL-2	EF 2	Exhaust Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	17550 CFM	0' - 6"	7'-6"	6'-6"	590 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall
EL-3	EF 3	Exhaust Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	17550 CFM	0' - 6"	7'-6"	6'-6"	590 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall
IL-1	MUA 1	Intake Louver, Rainproof	Greenheck	ESD 635	www.greenheck.com	35300 CFM	0' - 6"	16'-0"	13'-10"	228 FPM	3/4 in Aluminum Screen exterior mounted	Color Match White Wall

Air Flow Meters (23 09 00 - Instrumentation And Control For HVAC)

Mark	Description	System	Width	Height	Enclosure	Type Remark	Specific Remark
AFM-EF 1	Air Flow Meter - Round	EF 1	22"	22"	NEMA 1		
AFM-EF 2	Air Flow Meter - Round	EF 2	44"	44"	NEMA 1		
AFM-EF 3	Air Flow Meter - Round	EF 3	44"	44"	NEMA 1		
AFM-MUA 1	Air Flow Meter - Rectangular	MUA 1	99"	66"	NEMA 1		Alternatively use thermal dispersion fan-inlet flowstations

Access Doors (23 31 00 - HVAC Duct And Casings)

Type Mark	Description	Width	Height	Est. Count
ADRE-24x24	Rectangular Hinged Access Door for Rectangular Duct	24"	24"	6
ADRO-24x18	Oval Access Door for Round/Oval Ducts	24"	18"	6

Control Cabinets (23 09 00 - Instrumentation And Control For HVAC)

Mark	Room Number	Room Name	Powr Supply Voltage	Powersupply Size	Type Remark	Specific Remark
CC-1	100	Garage	277 V	300 VA	Provide space for one spare controller	
CC-2	100	Garage	277 V	300 VA	Provide space for one spare controller	
CC-3	100	Garage	277 V	300 VA	Provide space for one spare controller	
CC-4	100	Garage	277 V	300 VA	Provide space for one spare controller	

Control Dampers (23 31 00 - HVAC Duct And Casings)

Mark	System Name	Description	Width	Height
CD-EF 2	EF 2	Rectangular Control Damper - Insulated	44"	44"
CD-EF 3	EF 3	Rectangular Control Damper - Insulated	44"	44"

VFDs (23 09 00 - Instrumentation And Control For HVAC)

Mark	Room Number	Room Name	Description	Enclosure
VFD-MUA 1	100	Garage	Variable Frequency Drive	NEMA 4X
VFD-EF 1	100	Garage	Variable Frequency Drive	NEMA 4X
VFD-EF 3	100	Garage	Variable Frequency Drive	NEMA 4X
VFD-EF 2	100	Garage	Variable Frequency Drive	NEMA 4X

HVAC Ducts

Size	Estimated Length
78"x90"	14 ft
22"ø	147 ft
28"ø	2 ft
30"ø	14 ft
40"ø	41 ft
44"ø	22 ft
50"ø	82 ft
	321 ft

Standard Duct Fittings

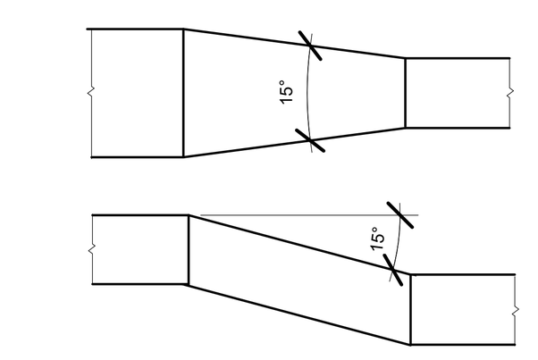
Duct Fittings shown are examples of Design Intent. The examples shown may not cover all actual Options on this Project. Combinations of the Details and Adjustments may be required and require approval by Engineer. Pressuredrop Reduction is required within the frame of available Fittings. Always use Fitting with available Lowest Pressuredrop whether shown on plans or not. Plans may not show the the fitting in the greatest detail.

Duct Type Changes

Plans may show round ducts that may not physically fit within obstructed areas. Contractor shall upon approval by engineer use oval duct to avoid obstructions. If oval duct is not possible, rectangualr duct may be used upon approval by engineer. For equivalent sizing refer to ASHRAE Fundamentals 2017 chapter 21. Round up to next available size. Contractor shall assume cost for these changes.
Duct Type Symbols:
Round: 8" ø
Oval: 12"/6"
Rectangular: 12"x6"

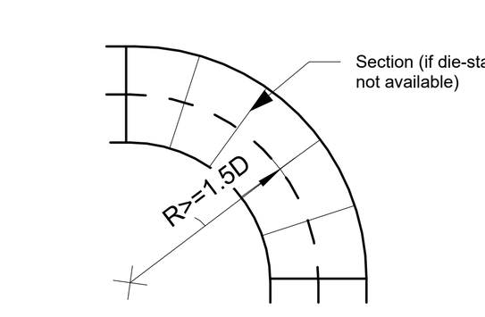
Transition and Offsets for all Ducts

If, despite good Coordination, 15° Fitting is not possible, larger angles may be allowed upon approval by Engineer. Ductsize Increase may be required.



Elbow for Round and Oval Duct

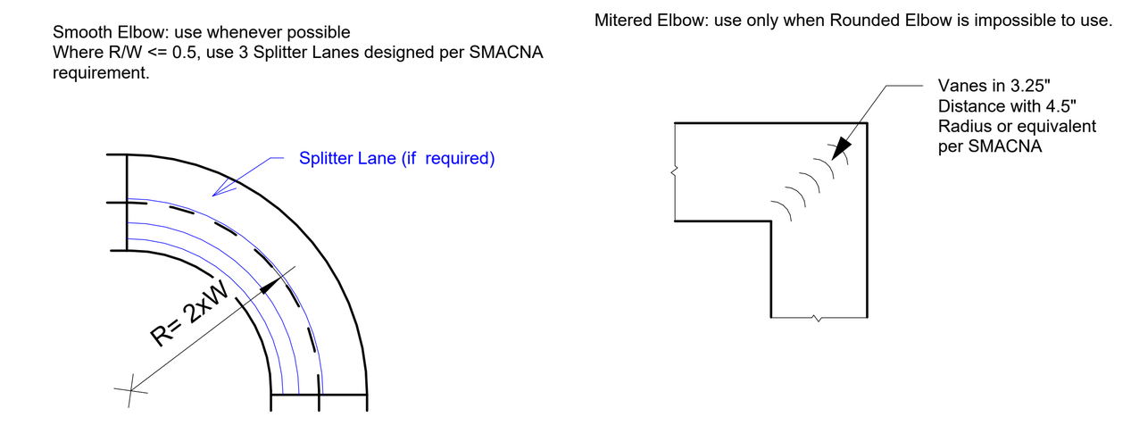
Elbows shall be die-stamped in the sizes available (up to 14"). For larger Elbows use 5-Gore fitting (4-Gore for 60°, 3Gore for 30°). R/D shall be 1.5 or larger where available.



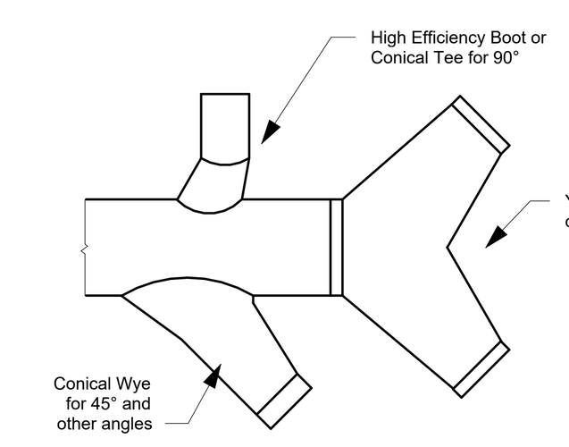
Elbow for Rectangular Duct

Smooth Elbow: use whenever possible
Where R/W <= 0.5, use 3 Splitter Lanes designed per SMACNA requirement.

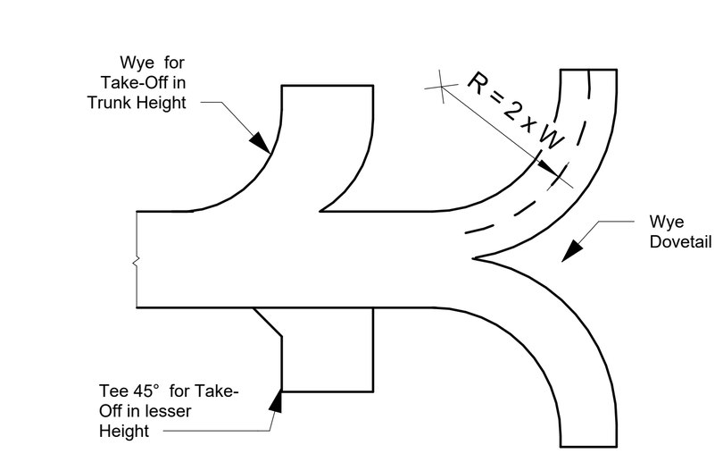
Mitered Elbow: use only when Rounded Elbow is impossible to use.



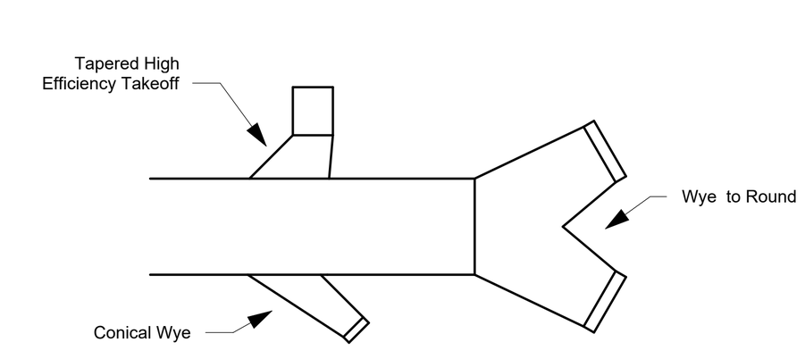
Round-Round (Oval-Oval)



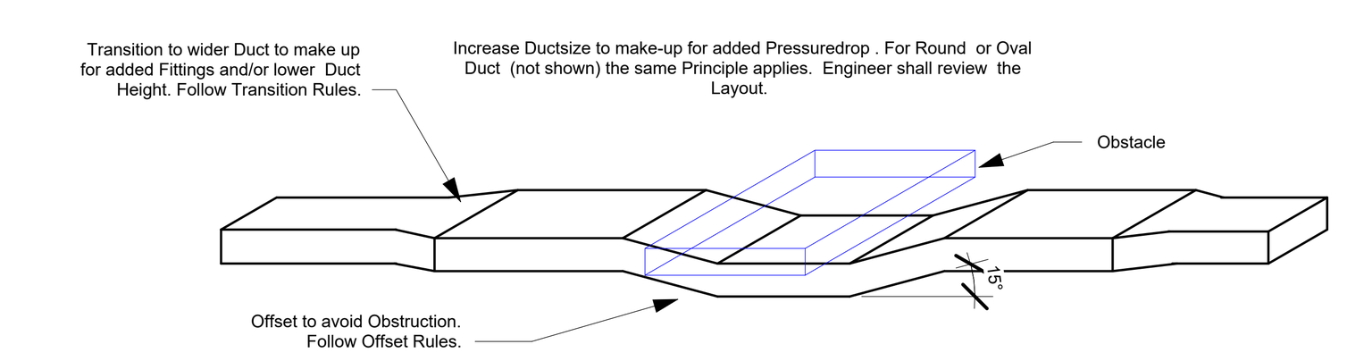
Rectangular-Rectangular



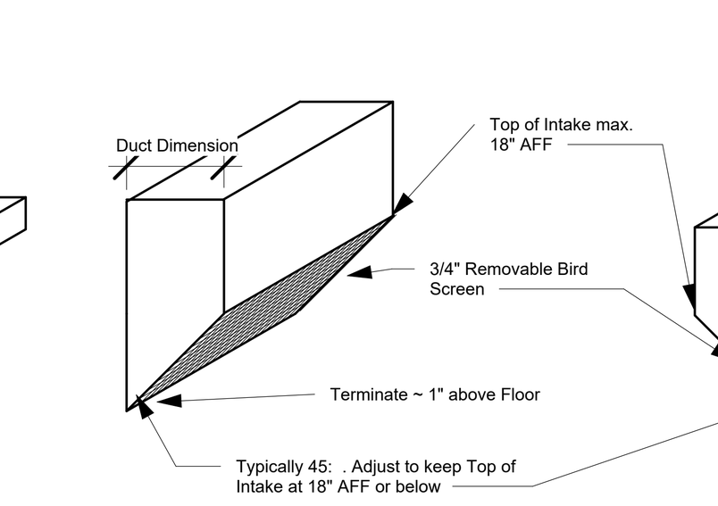
Rectangular-Round



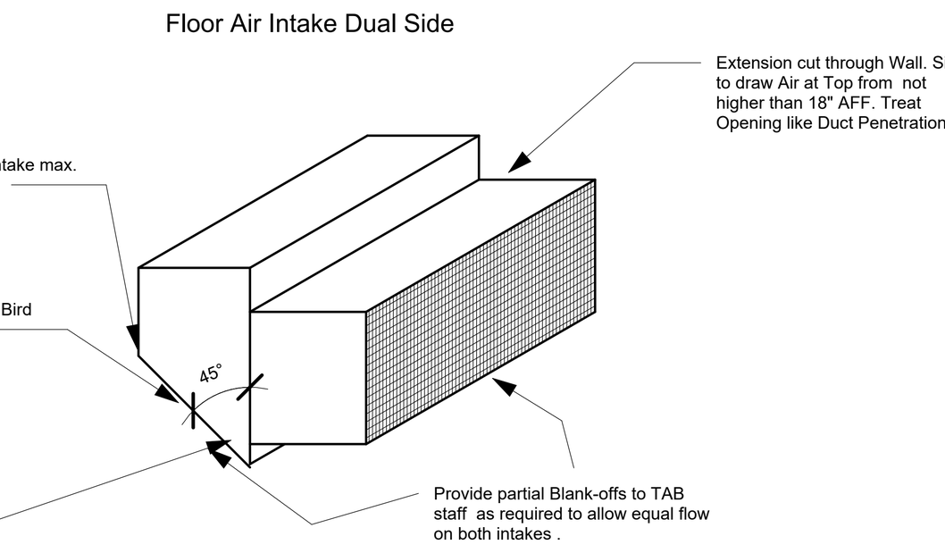
Obstruction Avoidance



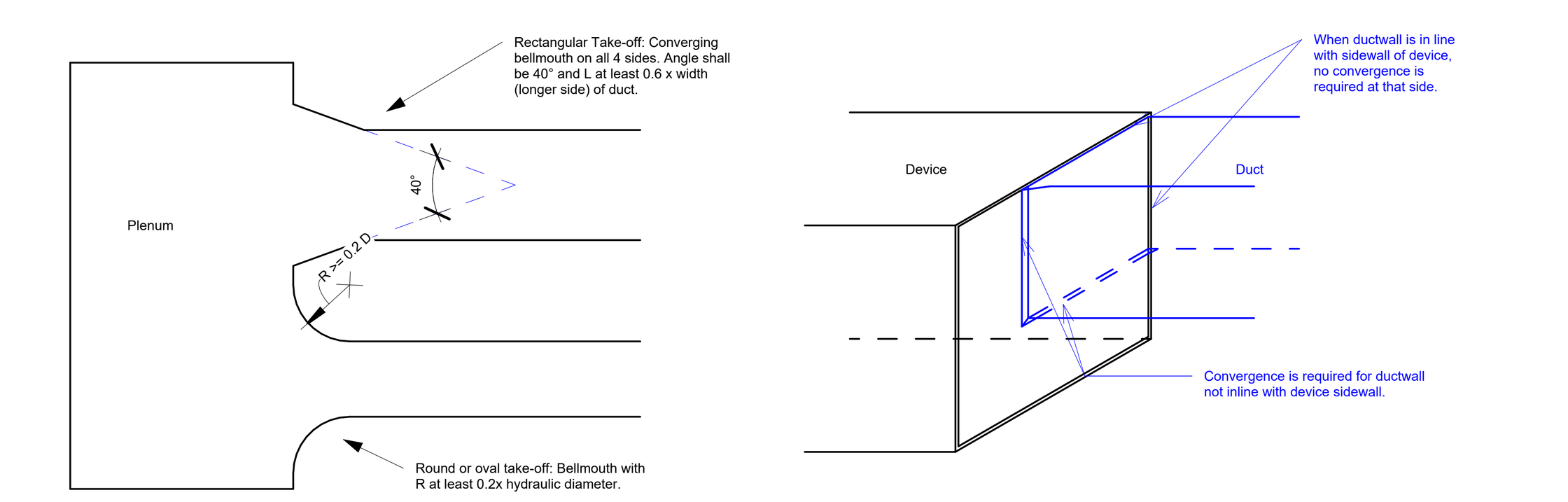
Floor Air Intake Single Side



Floor Air Intake Dual Side

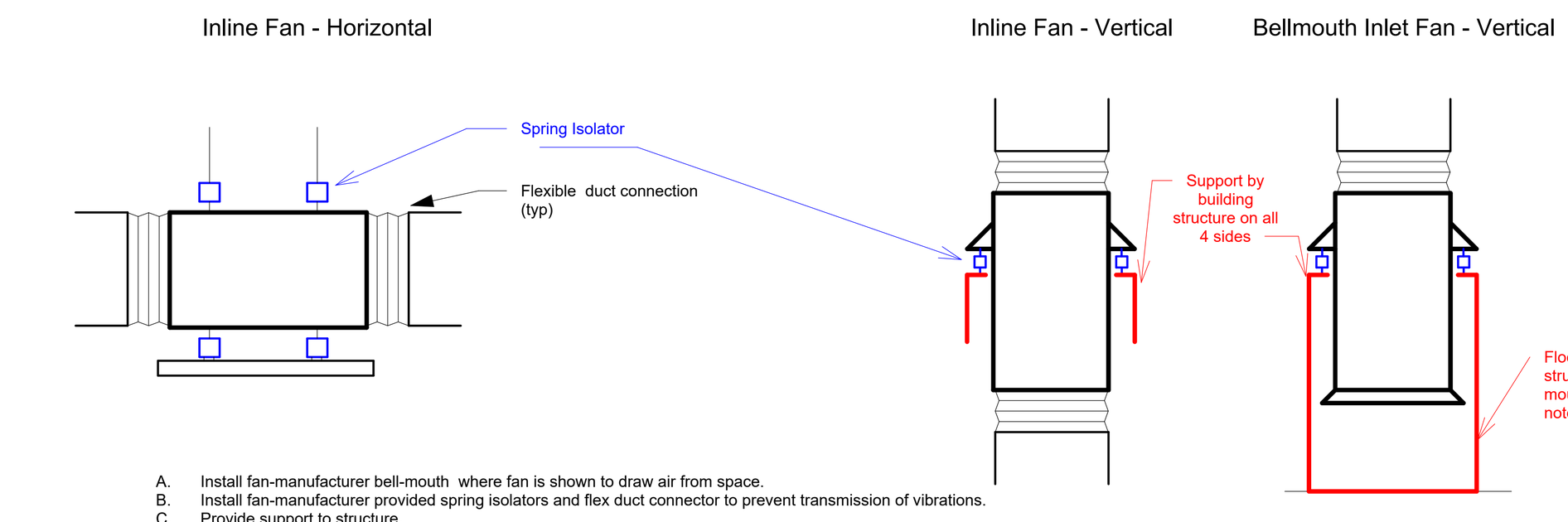


Plenums and Device Discharge/Intake



1 M General Duct Details - Not to Scale

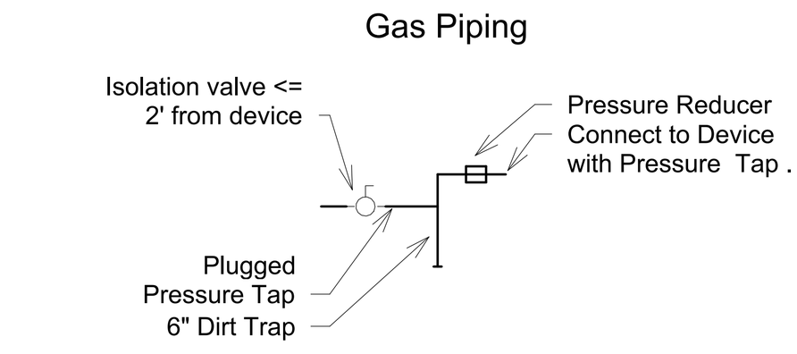
Inline Fan - Horizontal / Inline Fan - Vertical / Bellmouth Inlet Fan - Vertical



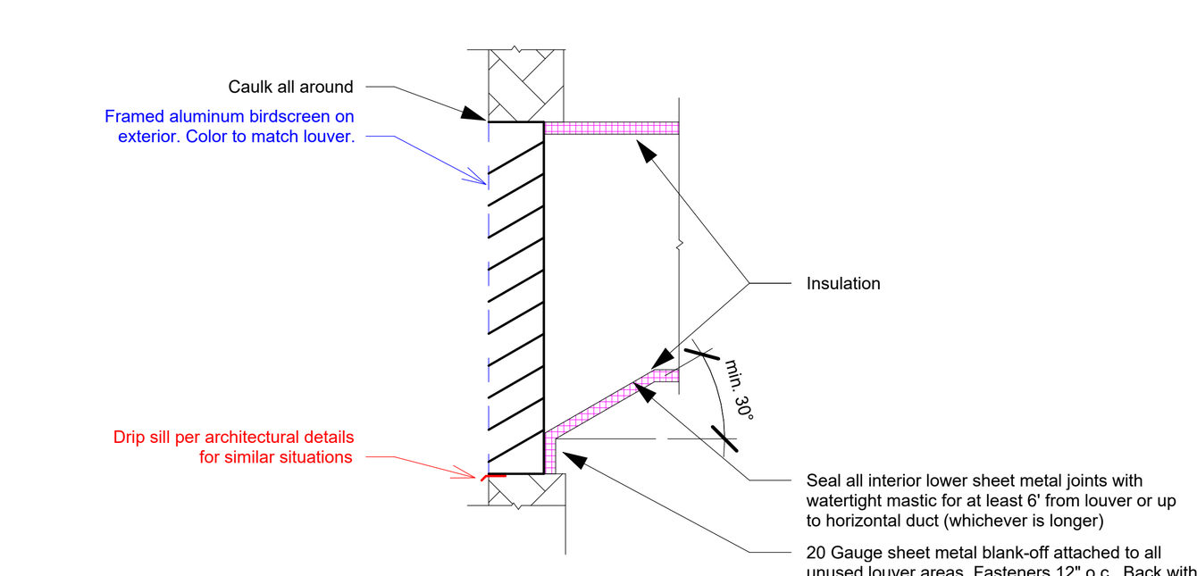
A. Install fan-manufacturer bell-mouth where fan is shown to draw air from space.
B. Install fan-manufacturer provided spring isolators and flex duct connector to prevent transmission of vibrations.
C. Provide support to structure.
   1. For vertical fans drawing air from floor, provide a floor-mounted steel structure that allows free air entry

2 M - Fan Installation - Not to Scale

Gas Piping



3 M Fuel - Gas Piping - Not to Scale

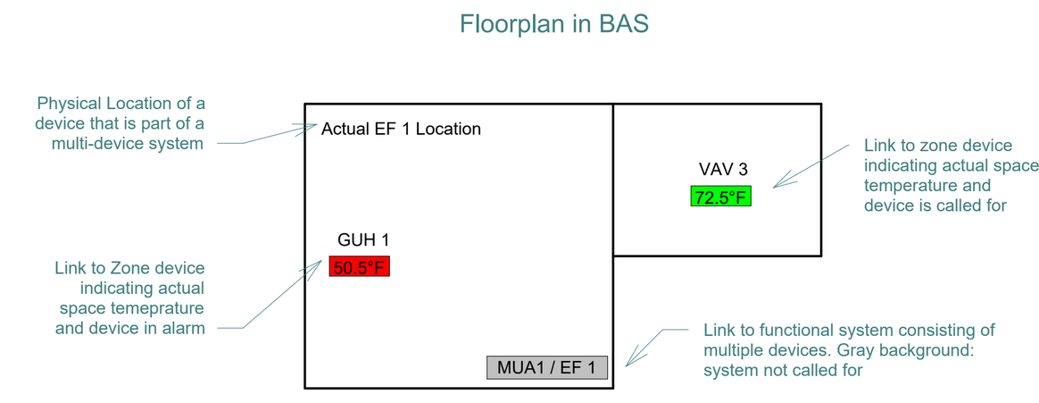


Notes:
1. Install clip angle around entire louver perimeter. Fasten lover to clip angle 18" o.c.
2. Bottom of louver min. 40" above grade or adjacent roof to minimize snow drift
3. Caulk screws where they penetrate metal
4. Coordinate with architectural/manufacturer details for specific type of wall. Architectural details may show more location-specific details supposed to be worked into above detail. Regardless of details provided in contract, enclosure must be water and airtight.

4 M Louver Installation - Not to Scale

Refer to Specification 23 09 00 - Instrumentation and Control for HVAC

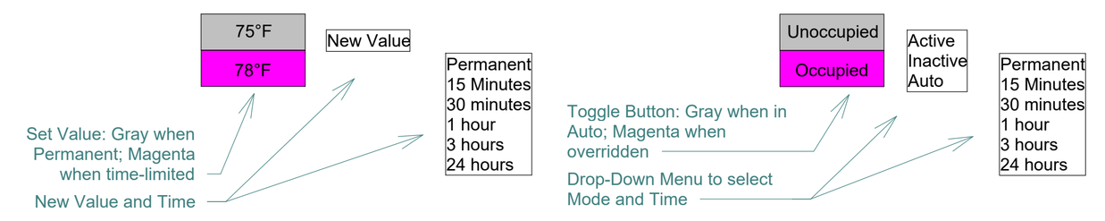
Floorplan in BAS



A. Locate Links to central equipment at actual location on floorplan. Combine concurrently operating equipment in one link. For example a MUA and associated Exhaust fans, or an AHU and associated ERV. If associated Devices are physically far apart, provide label where the actual device is located.
B. Locate links to zones at location of zone.
C. Links to terminal devices / zones shall display space temperature.
D. Change link color based on status:
   1. Commanded off: Gray
   2. Commanded on: Green
   3. Fault detected: Red

Override

A. Allow operator to override set (e.g. space temperature setpoint) and derived values (e.g. calendar based occupied mode)
B. An obvious choice shall allow to limit time frame of override. This will help to try out adjustments for trouble-shooting without forgetting re-setting them.



Space Thermostat Controls

Temperature Deadbands and Schedules
A. A schedule shall establish occupied and unoccupied timesand setpoints in to be determined areas. .
B. Heating-only or Cooling-only zones:
   1. Maintain setpoint by modulating or staging devices
C. Heating and Cooling Zones:
   1. Space temperature drifts in a dead-band and space temperature shall not exceed setpoints.

Occupied Setpoint Heating 71°F Cooling: 75°F
Unoccupied Setpoints Heating: 65°F Cooling: 80°F

Occupant-adjustable Thermostat (where scheduled)
A. User can enter a setpoint within predefined temperature limits.
B. Space will maintain temperature with this setpoint and deadbands established for occupied and standby times.
C. Display and log occupant setting

Upper Limit: 73°F
Lower Limit: 71°F

Motion Sensor Control and Standby (where scheduled)
A. During scheduled unoccupied times: no change - unoccupied setpoint will be met.
B. During scheduled occupied times: based on detected occupancy or vacancy the standby or occupied setpoints will be used
   a. Determination of Standby mode
      1. During scheduled occupied times motion sensors determine if space is actually occupied by people or vacated.
      2. Motion sensor has an internal delay (time to keep contact closed after no motion detected) of typically 30 seconds. BAS will use additional delay timers to enter into standby and back into occupied mode.
      3. Sufficient number and type of sensors shall be installed to detect movement in typically occupied areas. Sensors shall be shielded from detecting motion in adjacent areas (for example hallways)
   b. Setpoint in Standby mode
      1. Typically deadbands are widened by 2°F and ventilation reduced to levels below ability to meter flow (not actual zero).
      2. Minimum flow in zone will be 0 cfm.
C. Display and log motion sensor status and mode

Standby Setpoint Heating 70°F Cooling: 76°F
Enter Standby after no motion detected for 10 min.
Leave Standby mode after motion detection for 5 min.

Window Sensor (where scheduled)
A. All operable windows in a space have a sensor indicating if they are open
B. When windows in zone are open for a specific time, enter Window-Open mode
   1. Disable all cooling, ventilation
   2. Enable heating to only maintain a freeze protection temperature.
C. Display and log sensor status and mode

Time of window open before entering Window-Open mode: 5 min.
Freeze protection temperature: 45°F

CO2 Sensor (where scheduled)
A. Modulate ventilation rates to keep CO2 level below set threshhold.
B. For VAV systems modulate flowrate to up to maximum cooling flow rate.
C. Displayand log CO2 value

Maximum CO2 level 800 ppm

Outdoor Temperature Heat Disable (where scheduled)
A. When OAT is above a specific temperature, disable heating in this zone.
B. Display and log mode

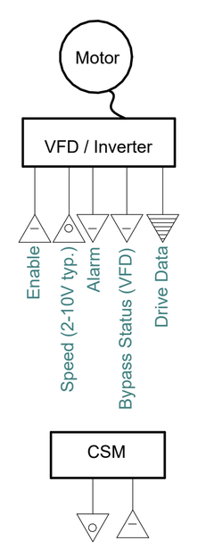
Disable Heating when OAT is above 45°F

Motor Control

Operation:
A. Enable when the associated device (i.e. fan, pump) is called for

VFD Motor Control
A. Speed:
   1. Operate at Speed required to meet the applicable setpoint.
   2. Display control signal speed 0% (device min. speed) -100%
   3. Set minimum speed (0% reference) at VFD based on manufacturer requirement to ensure proper motor operation and cooling. Typically 15Hz is the lower limit but needs to be verified by device manufacturer.
B. Alarm:
   1. VFD or inverter derives estimated tourque and load at the given speed and compares to actual values.
   2. If discrepancies indicate a problem, create an alarm signal.
C. Bypass:
   1. Bypass operation will be manually activated on site (not by BAS)
   2. When bypass is activated, user screen will indicate bypass operation.
D. Drive Data:
   1. All data (via Lon, BACNet etc.) will be displayed for user analysis.
   2. Data displayed depend on manufacturer but typically include actual current, voltage, frequency, tourque, fault codes, kW etc.
E. ECM:
   1. ECM and their controllers typically are proprietary to a device. Selection typically is specified by specifying the type of equipment. Control similar to VFD above. Include all the control and monitor options that are possible with the specified device.

Constant Speed Motor Control
A. Read and display motor current.
B. Generate alarm when current is below 0.5 A or above 5 A

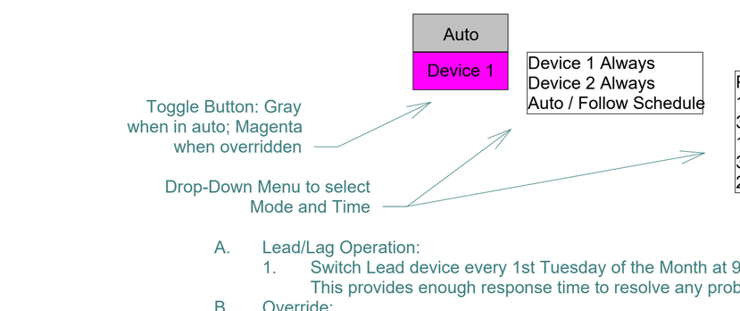


Outside Air Temperature Sensor

A. Local OAT readings can be inaccurate due to limitations of locations. If sun shines on or near sensor location readings are inaccurate. Sensors also can fail and since OAT determines many operations loss of signal or inaccuracy could be disastrous. Therefore redundancy is required.
B. Locate local OAT sensor on northwall away from possible sunshine or heat sources or exhausts
C. Display local and remote (weatherstation) OAT at main building site.
D. Operate based on remote OAT (primary). If remote OAT is unavailable use local OAT (secondary).
   1. OAT shown at the device shall be whatever is the used OAT.
   2. The currently used OAT shall be highlighted.
E. Alarm shall be generated if both OAT readings differ by more set temperature differential.

Temperature from weatherstation: 58.3°F
Temperature from local sensor: 56.3°F
Alarm when dT exceeds : 15°F
Highlight active OAT reading

Lead/Lag Setting



A. Lead/Lag Operation:
   1. Switch Lead device every 1st Tuesday of the Month at 9 am. This provides enough response time to resolve any problems
B. Override:
   1. Allow permanent or timed override

Typical Value

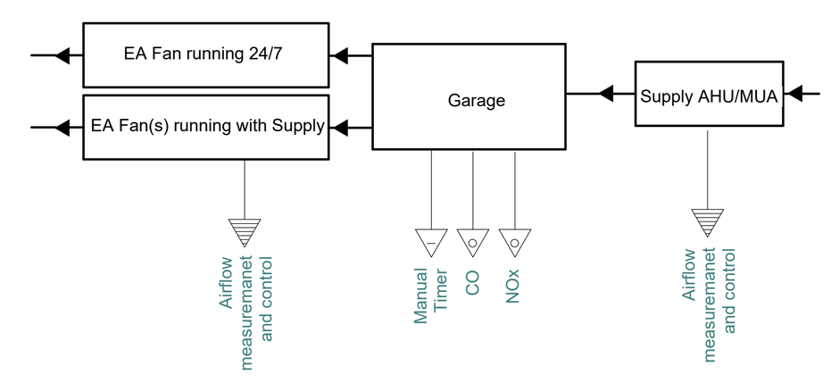
A. For each adjustable value provide a typical value for reference.
B. Adjust values after commissioning to reflect real-world system requirements.
C. Example:

Enable boiler when OAT is below: 50°F (typical 50°F)

Control Valves

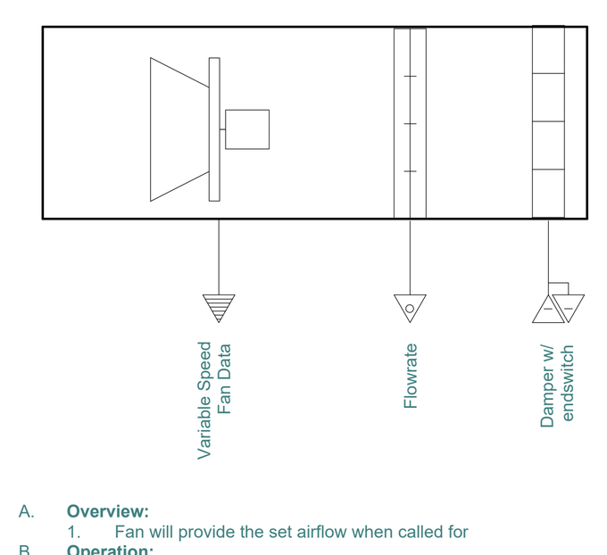
A. Electronic PICV shall include flowmeter and display flowrate. Flow setpoint will be set by controller. Read and display actual flow.
B. Valves without flowmeter shall be controlled by actuator setpoint.
C. Display actual actuator position for either valve type.
D. Control sequences will assume one type of valve. Adjust specific control sequences if a different than expected type of valve is used. Refer to design engineer for specifics.

5 M Standard Control - Not to Scale



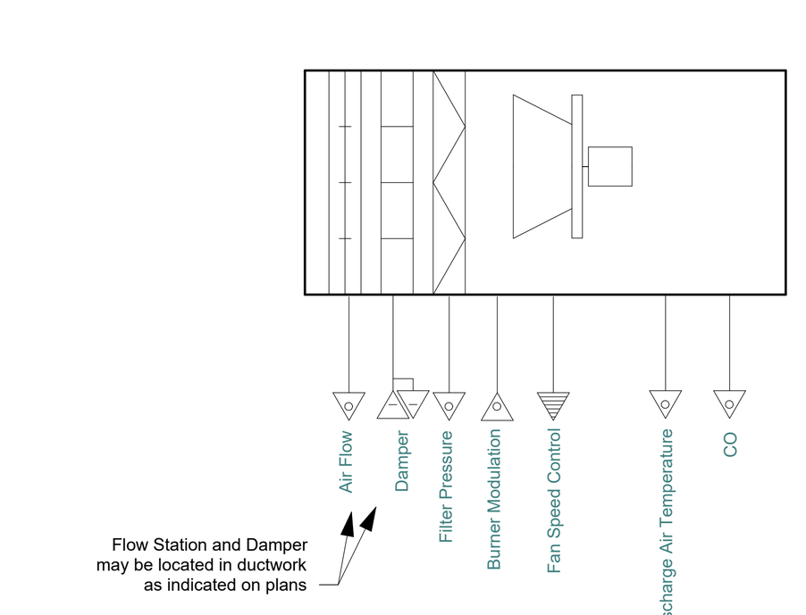
A. Permanent Exhaust:
   1. Lower Flowrate shall be exhausted all the time. Flowrate typically will equal 0.05 cfm/ft².
   2. This provides a reliable minimum exhaust and negative pressure to adjacent spaces.
B. Sensors:
   1. Place NOx and CO sensors to cover entire garage. Lay out based on manufacturer recommendation.
   2. Place manual override timer at location shown on plans or as described by designer
C. Design Exhaust and Supply:
   1. Design exhaust rate typically equals 0.75 cfm/ft². Design supply usually equals 0.7 cfm/ft². This ensures negative pressure to adjacent spaces.
   2. Heat Supply air to space temperature set point.
   3. Enable Design Exhaust and supply when any of these conditions exists:
      a. NOx or CO are above threshhold (Disable when below 50% of threshold)
      b. Schedule enabled
      c. Timer is running
         • Locate 2-hour rewind timer at lcoation shown on plans or instructed
D. History:
   1. all measured data
E. Alarms:
   1. NOx or CO above threshold for 30 minutes
F. Operator Setpoints:
   1. NOx threshold: *1 ppm*
   2. CO threshold: *20 ppm*
   3. Permanent Exhaust Rate: *500 cfm*
   4. Design Exhaust Rate: *7,500 cfm* (setpoint for each EA fan)
   5. Design Supply Rate: *7,000 cfm*

6 M Garage Ventilation - Not to Scale



A. **Overview:**
   1. Fan will provide the set airflow when called for
B. **Operation:**
   1. When unit is off, damper is closed and fan is off
   2. When airflow is called for:
      a. Open damper
      b. Once damper is proven open, start up fan
      c. In constat volume systems, start fan at a set minimum speed to stabilize the control loop
   3. Shutdown:
      a. Turn off fan
      b. Close damper after fan is off
C. **History:**
   1. Fan Speed
   2. Airflow
   3. Damper position
D. **Alarm:**
   a. Damper not opening
   b. No airflow
E. **Operator Setpoint:**
   1. Minimum Fanspeed: 70% (about 10% below typical speed)
   2. Flow: 3000 cfm (or from other source)

7 M Fan w/ Flowstation and Control Damper - Not to Scale



A. **Overview:**
   1. Operate when Ventilation of the served space is called for
B. Operations:
   1. When unit is off, damper will be closed and fan will be off
   2. Startup
      a. Open damper
      b. Once damper is proven open, start fan
         • In constant volume systems, start fan at a set minimum speed to stabilize the control loop
      c. Modulate fan speed to meet flow requirements
   3. Shutdown:
      a. Disable burner and shut off fan
      b. Close damper
C. **Burner Operation:**
   1. Enable Burner if OAT is below Heat Lockout Outdoor Temperature
   2. Modulate Burner to maintain Discharge Air Temperature setpoint
D. **CO Protection:**
   1. Disable MUA when CO levels in discharge air exceed CO threshold
E. **History:**
   1. Log and display:
      a. Damper signal and endswitch
      b. Air flow
      c. Fan speed
      d. DAT
      e. Filter pressure
F. Alarm:
   1. DAT more than 10°F below setpoint
   2. Flow 20% below setpoint
G. **Operator Setpoints:**
   1. Heat Lockout Outdoor Temperature: 45°F
   2. Discharge Air Temperature: 55°F
   3. Disable MUA when CO levels are above: 10 ppm
   4. Minimum Fan Speed: 70% (about 10% below typical speed)

8 M Fuel-Fired Make-up Air - Not to Scale

Designed by:
City of Madison
Facilites Management
City-County Building, Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Project North
TRUE

Schedules and Details

M 300

Print Date:
2/10/2024 13:38:42

Print in color on 36" x 48"

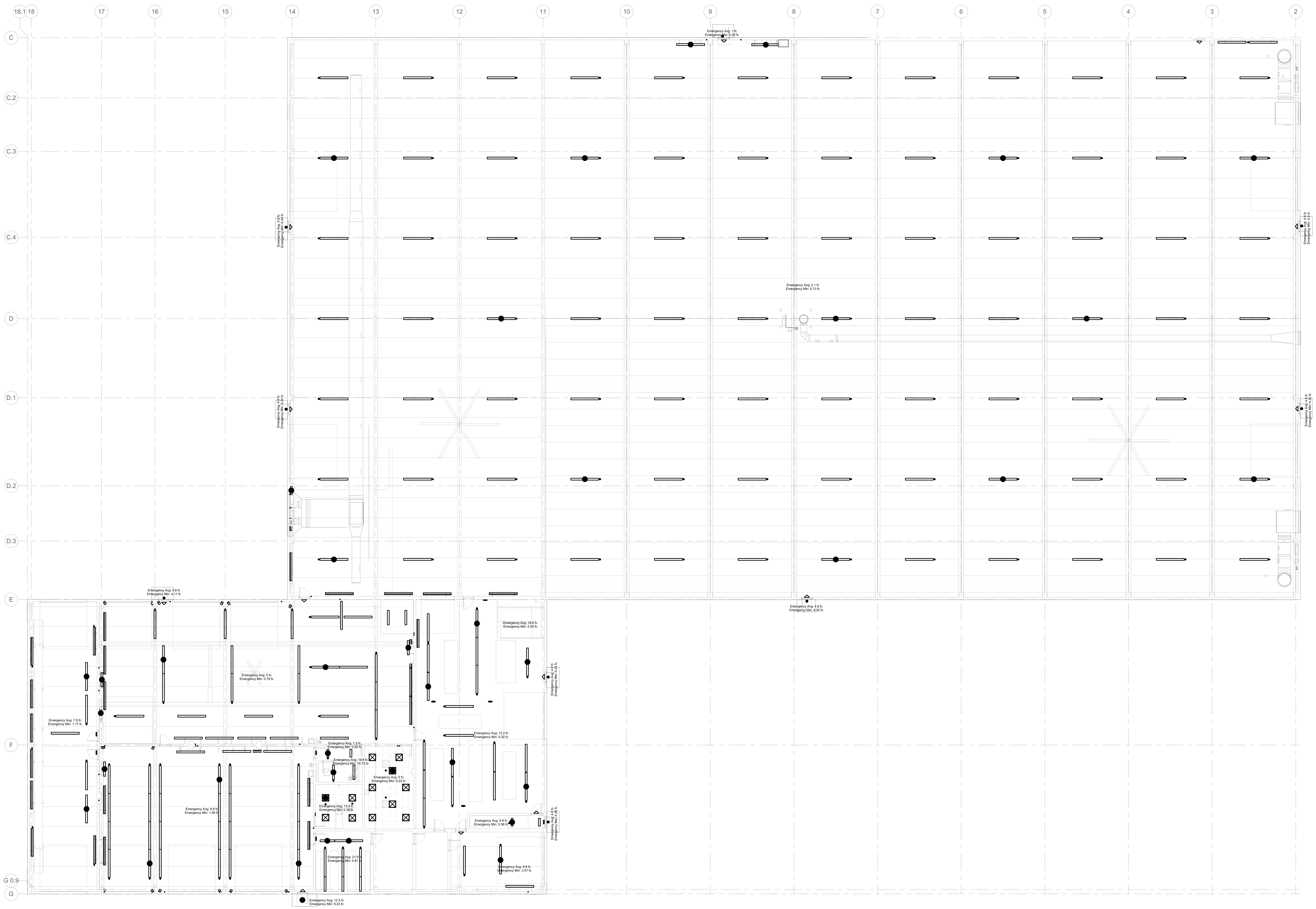
Entire sheet is Alternate 1

IECC 2015 Lighting Levels

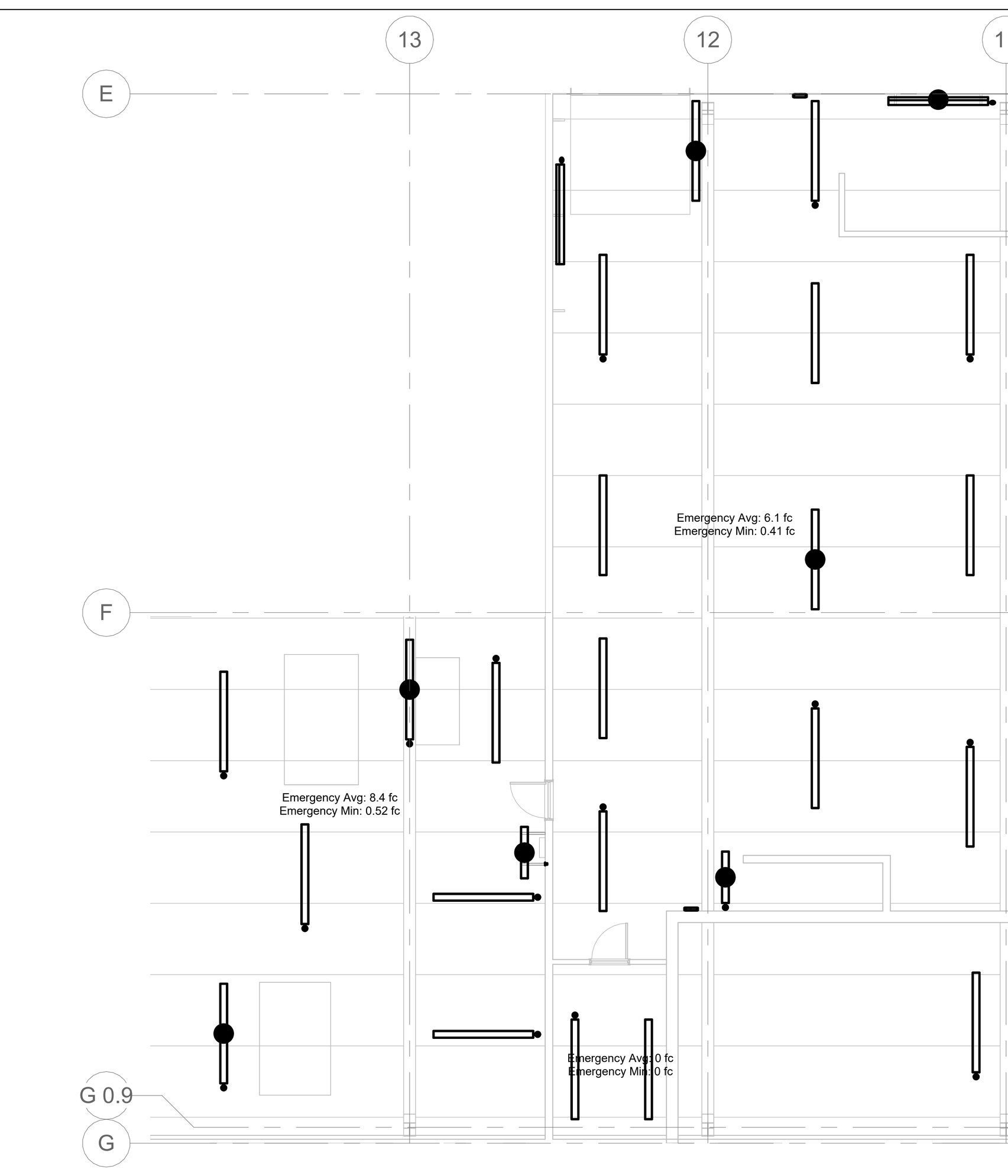
Space Number	Space Name	Area	Space Type	Workplane Height	Min. Required Avgerage Illumination	Actual Average Illumination	Illumination Goal	Max. Allowed Power Density IECC 2015	Actual Power Density	Actual Power Density compared to Code	Allowed Lighting Load	Actual Lighting Load	Space Lighting Load Contributing to Total Building Lighting Load
100	Garage	50,101 ft^2	Parking Garage	0' - 0"	10 fc	15.4 fc	154%	0.21 W/ft^2	0.12 W/ft^2	58%	10,521 VA	6,094 VA	0.09 VA/ft^2
101	Washbay	1,733 ft^2	Vehicular Maintenance	2' - 6"	30 fc	37.8 fc	126%	0.67 W/ft^2	0.57 W/ft^2	85%	1,161 VA	982 VA	0.01 VA/ft^2
102	Fleet Shop	2,777 ft^2	Workshop	2' - 6"	40 fc	73.7 fc	184%	1.59 W/ft^2	0.75 W/ft^2	47%	4,415 VA	2,088 VA	0.03 VA/ft^2
103	Storage	297 ft^2	Warehouse - small Items hand-carried	2' - 6"	30 fc	70.8 fc	236%	0.95 W/ft^2	1.18 W/ft^2	124%	282 VA	351 VA	0.01 VA/ft^2
106	Storage	495 ft^2	Workshop	2' - 6"	40 fc	41.8 fc	105%	1.59 W/ft^2	0.48 W/ft^2	30%	787 VA	236 VA	0 VA/ft^2
107	Fleet Office	186 ft^2	Office - enclosed	2' - 6"	40 fc	48.4 fc	121%	1.11 W/ft^2	0.55 W/ft^2	49%	207 VA	102 VA	0 VA/ft^2
108	Bathroom	69 ft^2	Restroom - otherwise	2' - 6"	20 fc	33.4 fc	167%	0.98 W/ft^2	0.69 W/ft^2	71%	67 VA	48 VA	0 VA/ft^2
109	Corridor	60 ft^2	Corridor - otherwise	1' - 0"	10 fc	14.7 fc	147%	0.66 W/ft^2	0.45 W/ft^2	68%	39 VA	27 VA	0 VA/ft^2
110	Streets Office	363 ft^2	Office - enclosed	2' - 6"	40 fc	45.3 fc	113%	1.11 W/ft^2	0.43 W/ft^2	39%	403 VA	157 VA	0 VA/ft^2
111	Streets Shop	4,010 ft^2	Workshop	2' - 6"	40 fc	54.9 fc	137%	1.59 W/ft^2	0.64 W/ft^2	40%	6,376 VA	2,547 VA	0.04 VA/ft^2
112	Streets Storage	2,522 ft^2	Warehouse - small Items hand-carried	2' - 6"	30 fc	44.5 fc	148%	0.95 W/ft^2	0.54 W/ft^2	57%	2,396 VA	1,368 VA	0.02 VA/ft^2
113	Stair	90 ft^2	Stairwell	0' - 0"	10 fc	14.3 fc	143%	0.69 W/ft^2	0.44 W/ft^2	64%	62 VA	40 VA	0 VA/ft^2
200	Storage	2,653 ft^2	Warehouse - small Items hand-carried	2' - 6"	30 fc	32.8 fc	109%	0.95 W/ft^2	0.34 W/ft^2	36%	2,520 VA	909 VA	0.01 VA/ft^2
201	Mechancial	140 ft^2	Electrical / Mechanical	2' - 6"	30 fc	36.1 fc	120%	0.95 W/ft^2	0.76 W/ft^2	80%	133 VA	107 VA	0 VA/ft^2
202	Mezzanine	1,333 ft^2	Warehouse - small Items hand-carried	2' - 6"	30 fc	31.2 fc	104%	0.95 W/ft^2	0.33 W/ft^2	35%	1,266 VA	442 VA	0.01 VA/ft^2
		66,828 ft^2									30,637 VA	15,496 VA	0.23 VA/ft^2

Emergency Lighting Load

Type Mark	Count	Emergency Luminaire	Real Power	Estimated UL 924 Relays required
EC-2.1K-B	1	Yes	15 W	1
EW-1.2K-B	9	Yes	81 W	9
EX-AC	8	Yes	8 W	0
EX-AC-2	13	Yes	46 W	0
EX-AC-WL	2	Yes	5 W	0
P-2x2-2.0K	1	Yes	14 W	1
P-2x2-4.0K	1	Yes	28 W	1
SVT-2-2.0K-W	2	Yes	27 W	2
SVT-2-3.0K-P	1	Yes	20 W	1
SVT-4-4.0K-W	7	Yes	167 W	7
SVT-4-6.0K-M	1	Yes	38 W	1
SVT-8-9.0K-M	10	Yes	534 W	10
SVT-8-9.0K-W	8	Yes	427 W	8
SVT-8-12.0K-M	9	Yes	680 W	9
SVT-8-12.0K-W	6	Yes	453 W	6
			2,541 W	56



1 EL Level 1 - Emergency Lighting 3/32" = 1'-0"



2 EL Level 2 - Emergency Lighting 3/32" = 1'-0"

1/4" = 1'-0" FEET
3/16" = 1'-0" FEET
1/8" = 1'-0" FEET
3/32" = 1'-0" FEET
1/16" = 1'-0" FEET
1" = 20'-0" FEET
1" = 30'-0" FEET

Designed by:
City of Madison
Facilites Management
City-County Building, Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

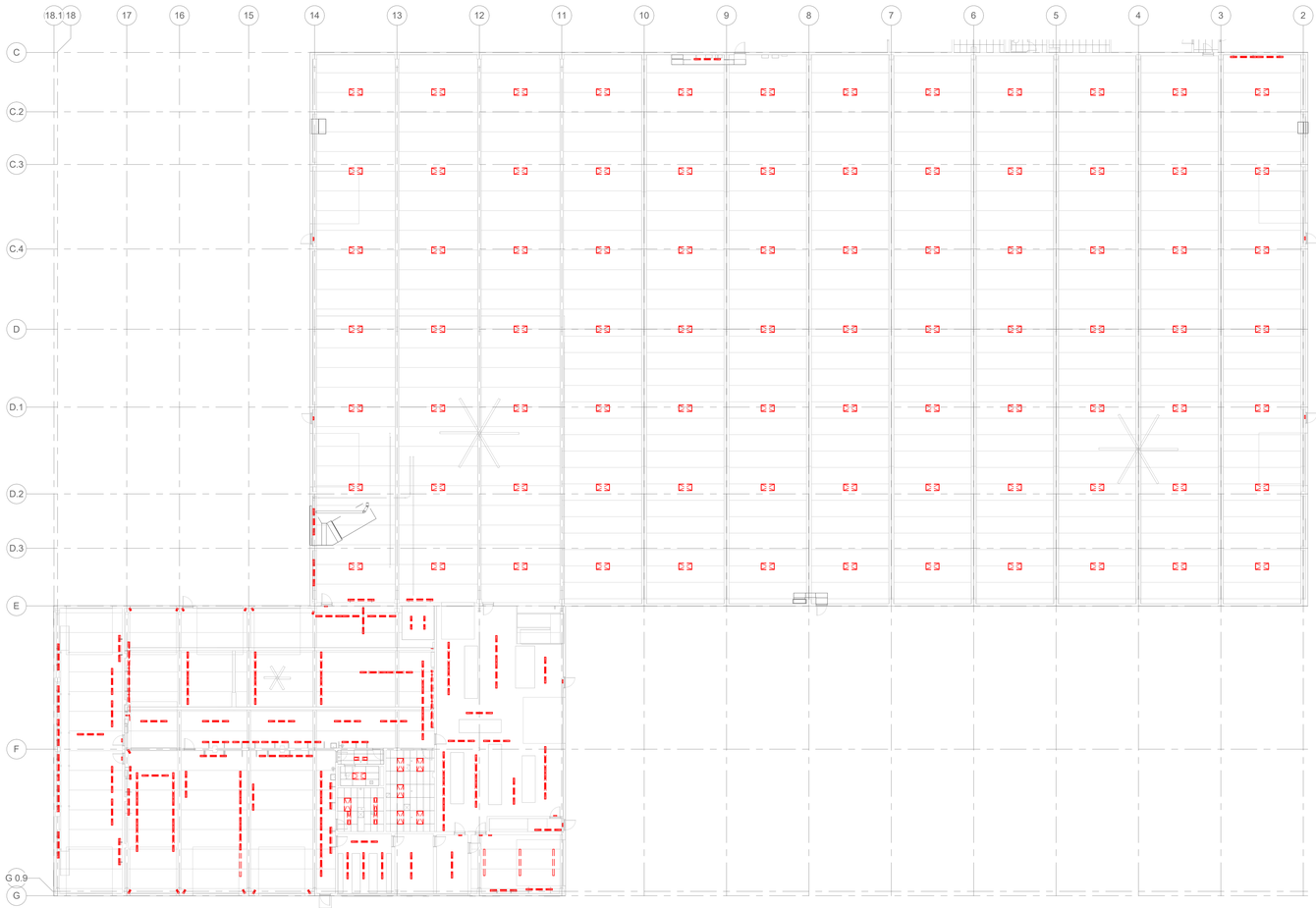
Project North
TRUE

General Lighting

EL 001

Print Date:
2/10/2024 13:38:44

Print in color on 36" x 48"



1 ED - Level 1 - Demolition 1/16" = 1'-0"

Entire sheet is Alternate 1

2 ED - Level 2 3/32" = 1'-0"

2 ED - Level 2 3/32" = 1'-0"

2 0 2 4 6 8 10
1/4" = 1'-0" FEET

2 0 2 4 6 8 10 12 14
3/16" = 1'-0" FEET

5 0 5 10 15 20
1/8" = 1'-0" FEET

5 0 5 10 15 20 25 30
3/32" = 1'-0" FEET

5 0 5 10 15 20 25 30 35 40 45
1/16" = 1'-0" FEET

20 0 20 40
1" = 20'-0" FEET

30 0 30 60
1" = 30'-0" FEET

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Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Project North
TRUE

Demolition

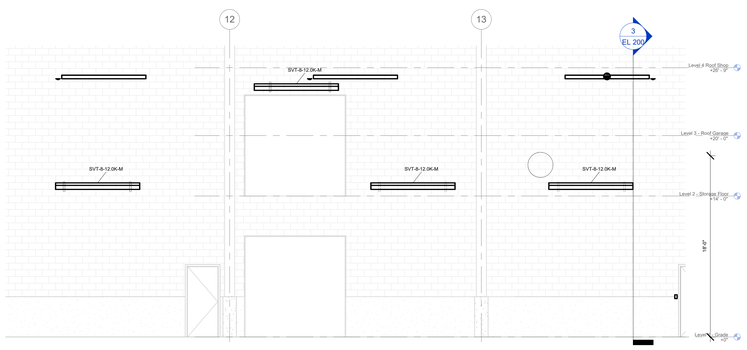
EL 002

Print Date:
2/10/2024 13:38:46

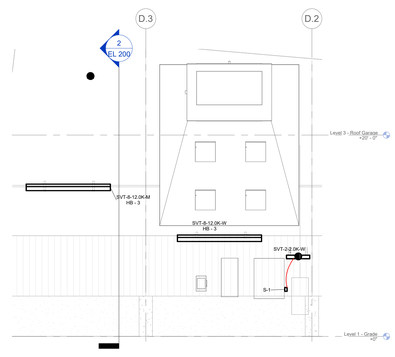
Print in color on 36" x 48"

Entire sheet is Alternate 1

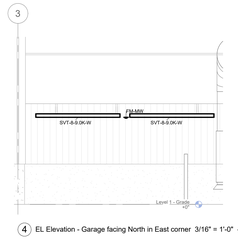
1 EL Level 1 - Garage 1/8" = 1'-0"



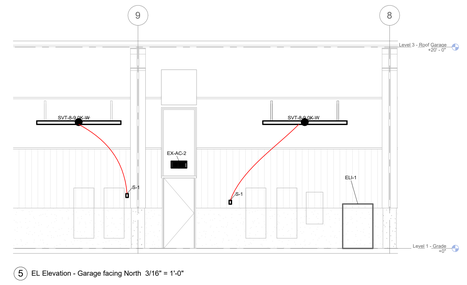
2 EL Elevation - Garage facing South 3/16" = 1'-0" - EL 200



3 EL Elevation - Garage facing West 3/16" = 1'-0" - EL 200



4 EL Elevation - Garage facing North in East corner 3/16" = 1'-0" - EL 200



5 EL Elevation - Garage facing North 3/16" = 1'-0"

Keynote Legend	
Key Value	Keynote Text
1	Install all suspended fixtures at XTG height unless a different height is noted.

2 0 2 4 6 8 10
1/4" = 1'-0" FEET

2 0 2 4 6 8 10 12 14
3/16" = 1'-0" FEET

5 0 5 10 15 20
1/8" = 1'-0" FEET

5 0 5 10 15 20 25 30
3/32" = 1'-0" FEET

5 0 5 10 15 20 25 30 35 40 45
1/16" = 1'-0" FEET

20 0 20 40
1" = 20'-0" FEET

30 0 30 60
1" = 30'-0" FEET

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Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

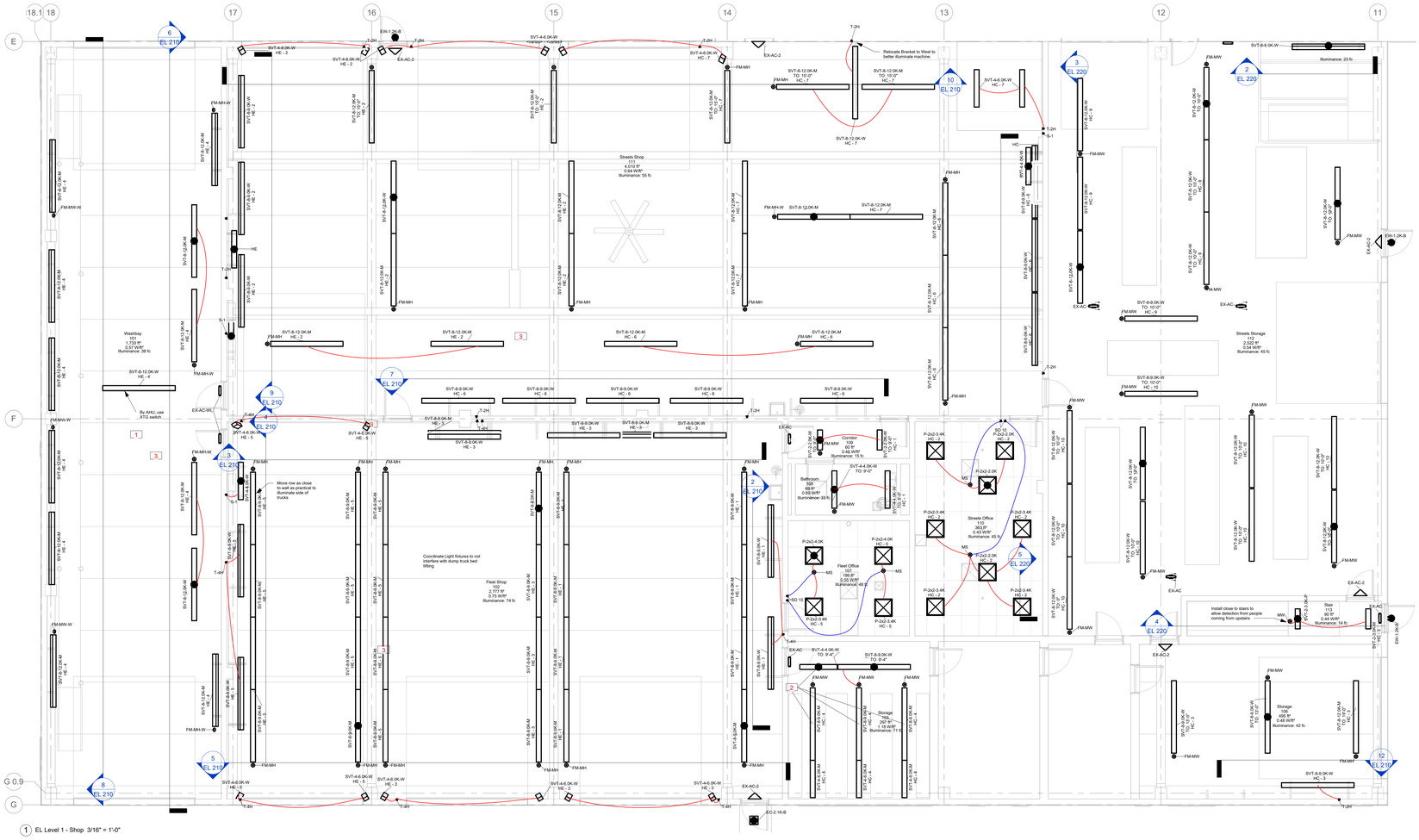
Project North
TRUE

Garage

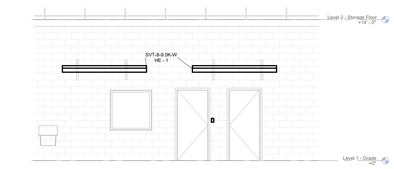
EL 200

Print Date:
2/10/2024 13:38:47

Print in color on 36" x 48"

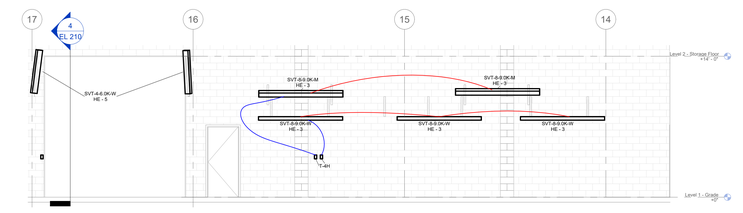


1 EL Level 1 - Shop 3/16" = 1'-0"

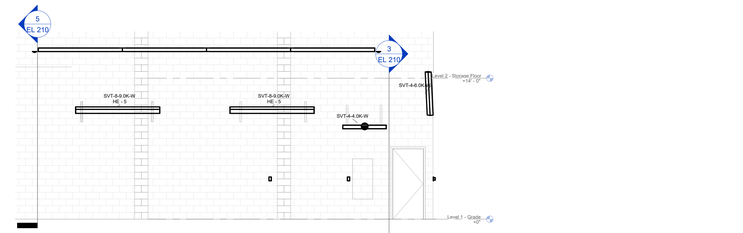


Entire sheet is Alternate 1

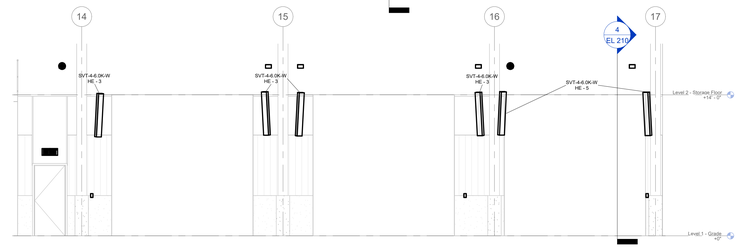
2 EL Elevation - Fleet Shop facing East 3/16" = 1'-0"



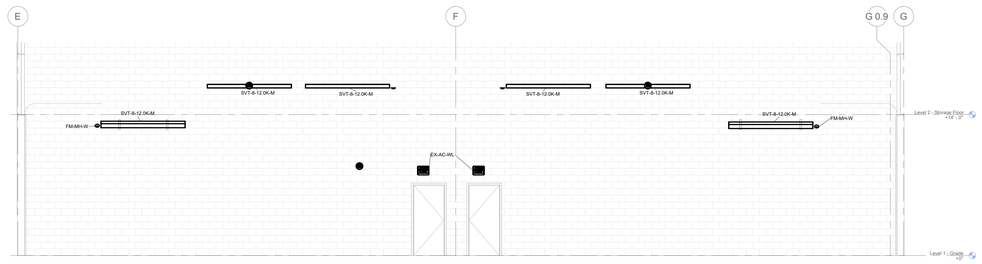
3 EL Elevation - Fleet Shop facing North 3/16" = 1'-0" - EL 210



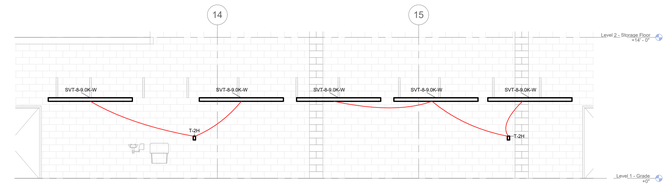
4 EL Elevation - Fleet Shop facing West 3/16" = 1'-0" - EL 210



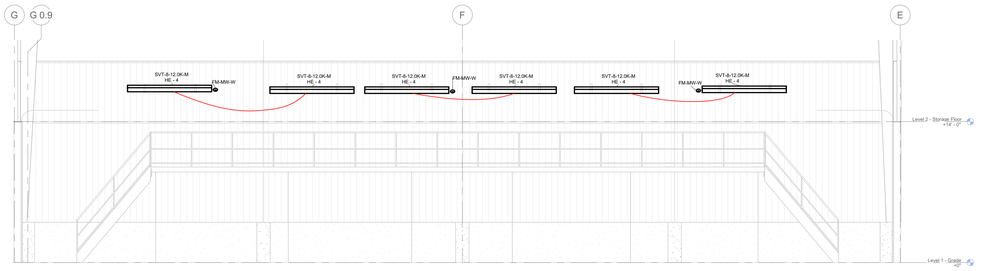
5 EL Elevation - Fleet Shop facing South 3/16" = 1'-0" - EL 210



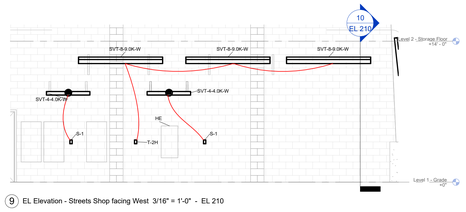
6 EL Elevation - Washbay facing East 3/16" = 1'-0" - EL 210



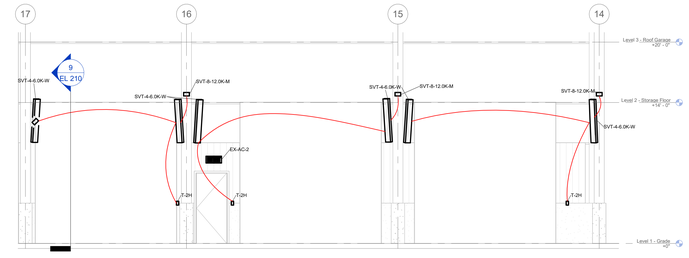
7 EL Elevation - Streets Shop facing South 3/16" = 1'-0" - EL 210



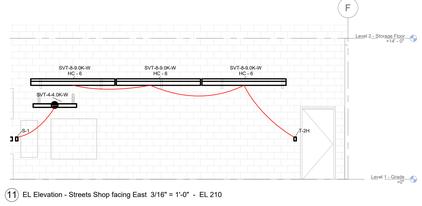
8 EL Elevation - Washbay facing West 3/16" = 1'-0" - EL 210



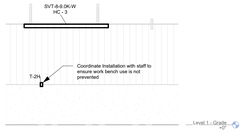
9 EL Elevation - Streets Shop facing West 3/16" = 1'-0" - EL 210



10 EL Elevation - Streets Shop facing North 3/16" = 1'-0" - EL 210



11 EL Elevation - Streets Shop facing East 3/16" = 1'-0" - EL 210



12 EL Elevation - Storage facing South 3/16" = 1'-0" - EL 210

Keynote Legend

Key Value	Keynote Text
1	Washbay: Entire space is NEC "Wet Location" and shall meet code requirements for such space. All fixtures, devices and enclosures shall be IP66 or NEMA 4X and meet all codes. Use LFNC conduit. Terminate conduit at bottom of device to avoid water entry into fixture.
2	Install about 1' above top of shelves. Prepare mock-up installation for staff to decide on optimum fixture height.
3	Install all suspended fixtures at XTG height unless a different height is noted.

1/4" = 1'-0" FEET | 3/16" = 1'-0" FEET | 1/8" = 1'-0" FEET | 3/32" = 1'-0" FEET | 1/16" = 1'-0" FEET | 1" = 20'-0" FEET | 1" = 30'-0" FEET

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Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Project North
TRUE

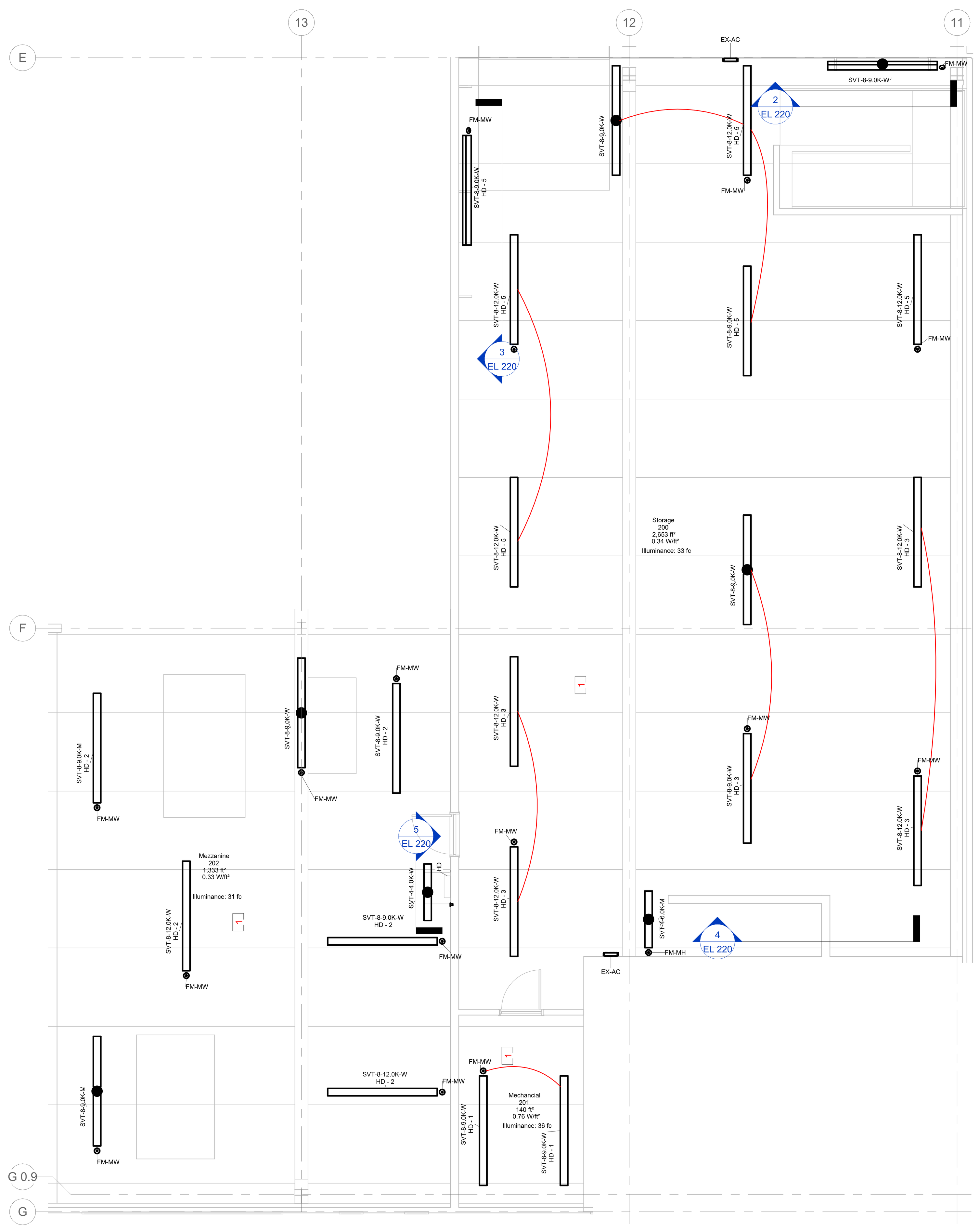
Shops - Level 1

EL 210

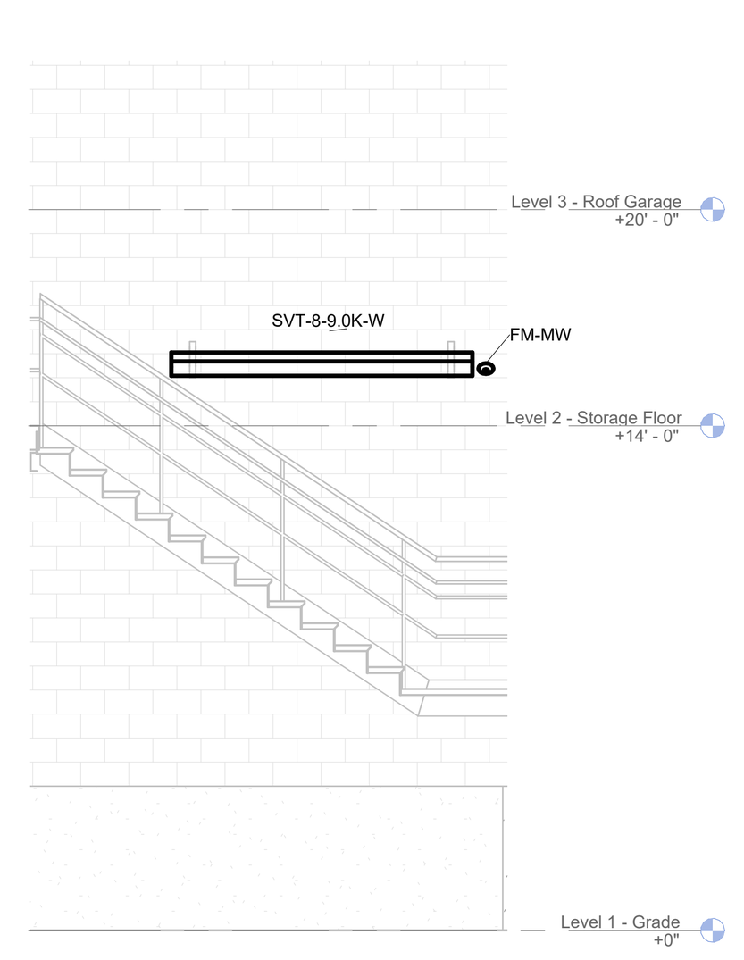
Print Date:
2/10/2024 13:38:49

Print in color on 36" x 48"

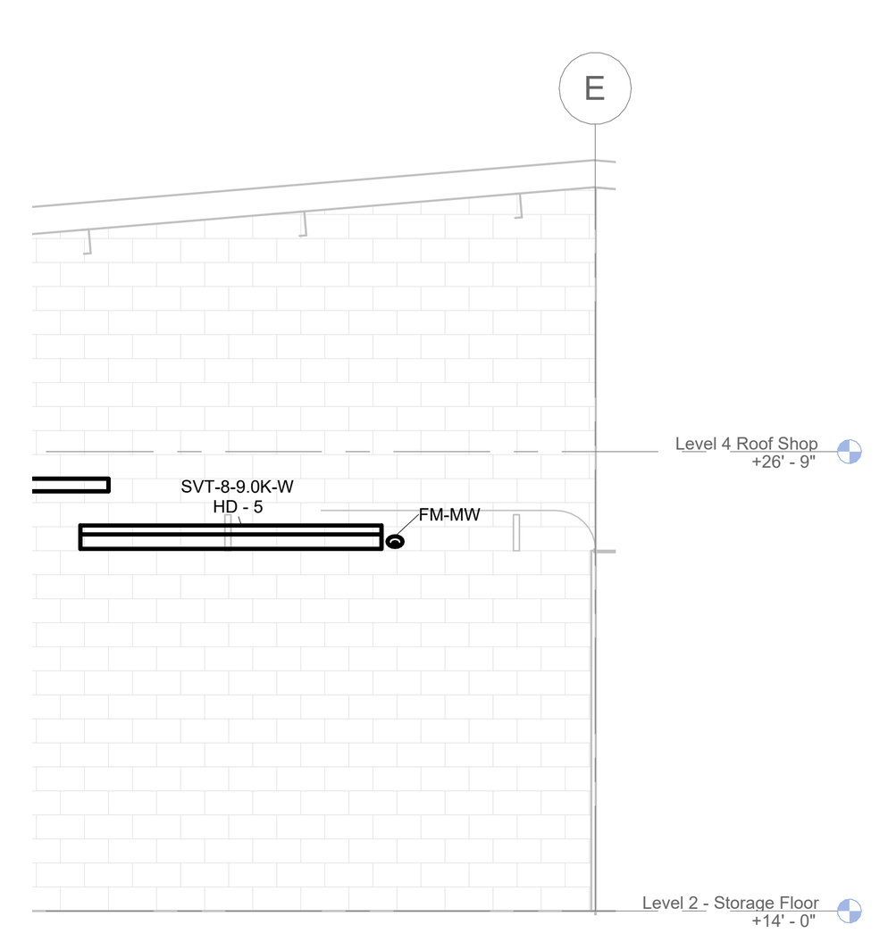
Entire sheet is Alternate 1



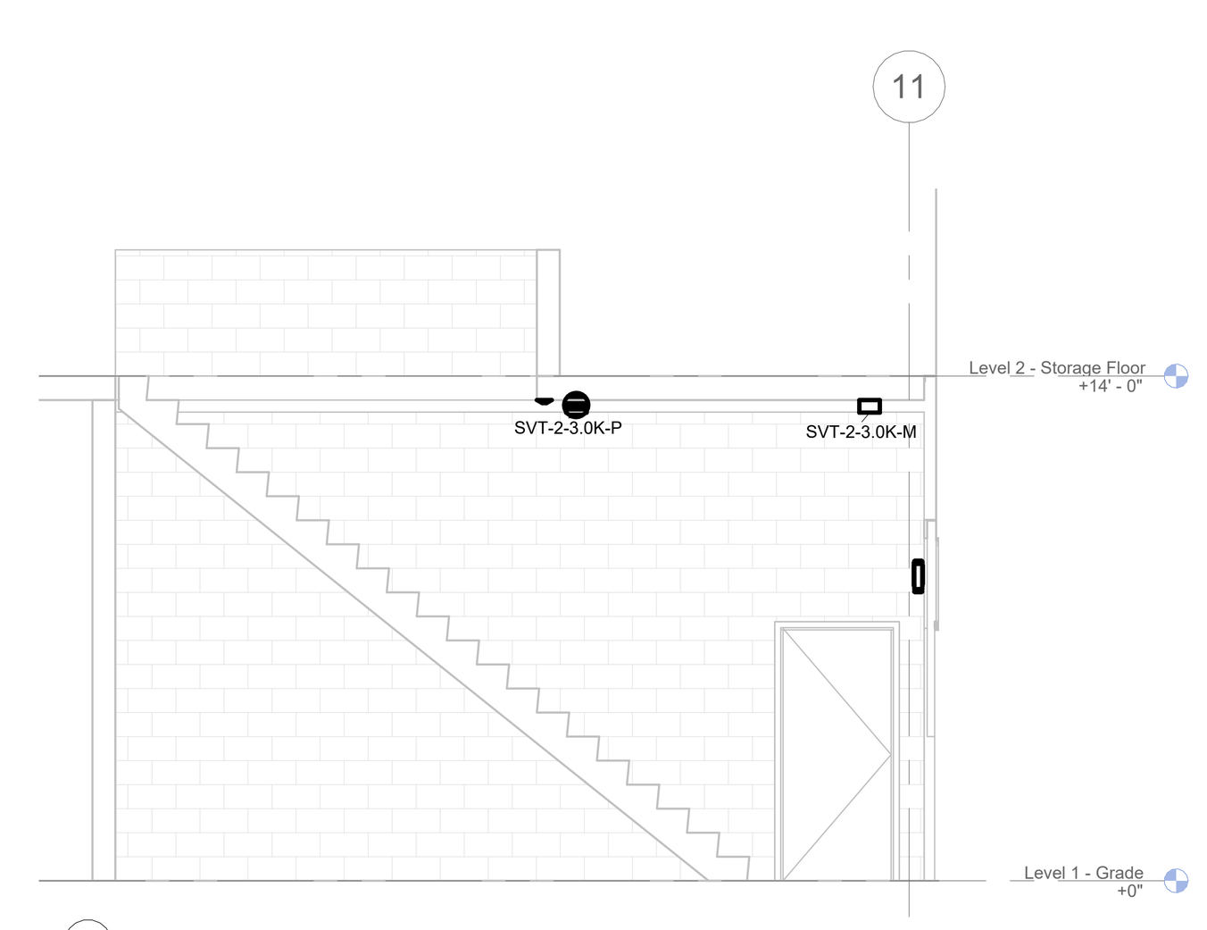
1 EL Level 2 - Storage 3/16" = 1'-0"



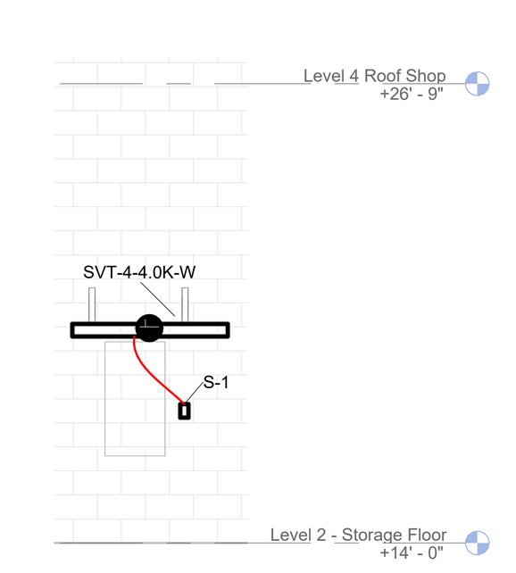
2 El Elevation - Storage facing North 3/16" = 1'-0" - EL 210



3 EL Elevation - Storage facing West 3/16" = 1'-0" - EL 210



4 EL Section - Stair facing North 3/16" = 1'-0" - EL 210



5 EL Elevation - Mezzanine facing East 3/16" = 1'-0"

Keynote Legend

Key Value	Keynote Text
1	Install all suspended fixtures at XTG height unless a different height is noted.

2 0 2 4 6 8 10 — 1/4" = 1'-0" FEET
2 0 2 4 6 8 10 12 14 — 3/16" = 1'-0" FEET
5 0 5 10 15 20 — 1/8" = 1'-0" FEET
5 0 5 10 15 20 25 30 — 3/32" = 1'-0" FEET
5 0 5 10 15 20 25 30 35 40 45 — 1/16" = 1'-0" FEET
20 0 20 40 — 1" = 20'-0" FEET
30 0 30 60 — 1" = 30'-0" FEET

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Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Project North
TRUE

Shops - Level 2

EL 220

Print Date:
2/10/2024 13:38:50

Print in color on 36" x 48"

Lighting Fixture Schedule (26 50 00 - Lighting)

Type Mark	Description	Est. Count	Model	URL	Real Power	Luminous Flux	Color Temperature	Luminous Flux	Efficacy	Lumen Maintenance	Environemntal Rating	Unified Glare Rating (highest value)	Type Remark
EC-2.1K-B	Exterior Canopy surface-mounted, Bronze	1	RAB VANLED-10-F	www.rablighting.com	15 W	2120 lm	5000 K	2120 lm	145 lm/W	L70 @ 100K hours	IP 66		Add Swivel Photocell (PCS/PCS2) if no other lighting control is scheduled
EW-1.2K-B	Exterior Wall, Bronze	9	RAB BRISK-S11L	www.rablighting.com	9 W	1212 lm	5000 K	1154 lm	128 lm/W	L80 @ 60K hours	IP 66		Add Photocell (PCU) If no other lighting control is scheduled
EX-AC	Exit Sign, no Battery	8	Lithonia LQM-S-W-3-G-120/277	www.acuitybrandslighting.com	1 W						Damp Location		Select # of faces as required for location
EX-AC-2	Exit Sign Triangular, 2-Face, no Battery	13	Big Beam TRXL-AC/LED-2-G-W	www.bigbeam.com	4 W								
EX-AC-WL	Exit Sign,no Battery, Wet Location	2	Lithonia WLTE-W-G	www.acuitybrandslighting.com	3 W						Wet Location		Select # of faces as required for location
P-2x2-2.0K	Panel 2x2	3	Lithonia SPX-2x2-2000LM-80CRI-40K-BFR-LUGR-MIN1-ZT-MVOLT-WH	www.acuitybrands.com	14 W	2111 lm	4000 K	2111 lm	151 lm/W	L90 @ 50K hours	IPX5; NSF Splash Zone	16.1	
P-2x2-3.4K	Panel 2x2	7	Lithonia SPX-2x2-3400LM-80CRI-40K-BFR-LUGR-MIN1-ZT-MVOLT-WH	www.acuitybrands.com	23 W	3438 lm	4000 K	3438 lm	149 lm/W	L90 @ 50K hours	IPX5; NSF Splash Zone	17.8	
P-2x2-4.0K	Panel 2x2	2	Lithonia SPX-2x2-4000LM-80CRI-40K-BFR-LUGR-MIN1-ZT-MVOLT-WH	www.acuitybrands.com	28 W	4080 lm	4000 K	4080 lm	146 lm/W	L90 @ 50K hours	IPX5; NSF Splash Zone	18.4	
SVT-2-2.0K-W	Strip Light, Vapor-Tight, Wide Distribution	3	Lithonia FEM-L24-2000LM-LPACL-WD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	13 W	2251 lm	4000 K	2251 lm	168 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-2-3.0K-M	Strip Light, Vapor-Tight, Medium Distribution	1	Lithonia FEM-L24-3000LM-LPACL-MD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	20 W	2251 lm	4000 K	3327 lm	167 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-2-3.0K-P	Strip Light, Vapor-Tight, Parking Distribution	1	Lithonia FEM-L24-3000LM-LPACL-PGD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	20 W	2251 lm	4000 K	3327 lm	167 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-4-4.0K-W	Strip Light, Vapor-Tight, Wide Distribution	8	Lithonia FEM-L48-4000LM-LPACL-WD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	24 W	2251 lm	4000 K	4109 lm	173 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-4-6.0K-M	Strip Light, Vapor-Tight, Medium Distribution	4	Lithonia FEM-L48-6000LM-LPACL-MD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	38 W	2251 lm	4000 K	6127 lm	162 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-4-6.0K-W	Strip Light, Vapor-Tight, Wide Distribution	16	Lithonia FEM-L48-6000LM-LPACL-WD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	38 W	2251 lm	4000 K	6127 lm	162 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-8-9.0K-M	Strip Light, Vapor-Tight, Medium Distribution	73	Lithonia FEM-L96-9000LM-LPACL-MD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	53 W	2251 lm	4000 K	9232 lm	173 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-8-9.0K-W	Strip Light, Vapor-Tight, Wide Distribution	39	Lithonia FEM-L96-9000LM-LPACL-WD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	53 W	2251 lm	4000 K	9232 lm	173 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-8-12.0K-M	Strip Light, Vapor-Tight, Medium Distribution	79	Lithonia FEM-L96-12000LM-LPACL-MD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	76 W	2251 lm	4000 K	12257 lm	162 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
SVT-8-12.0K-W	Strip Light, Vapor-Tight, Wide Distribution	30	Lithonia FEM-L96-12000LM-LPACL-WD-MVOLT-GZ10-40K-80CRI	www.acuitybrands.com	76 W	2251 lm	4000 K	12257 lm	162 lm/W	L80 @ 100K hours	IP66, NEMA 4X, NSF Splash Zone 2		Use STSL stainless latch and wet location fittings in wet environment like washbays and similar
		299											

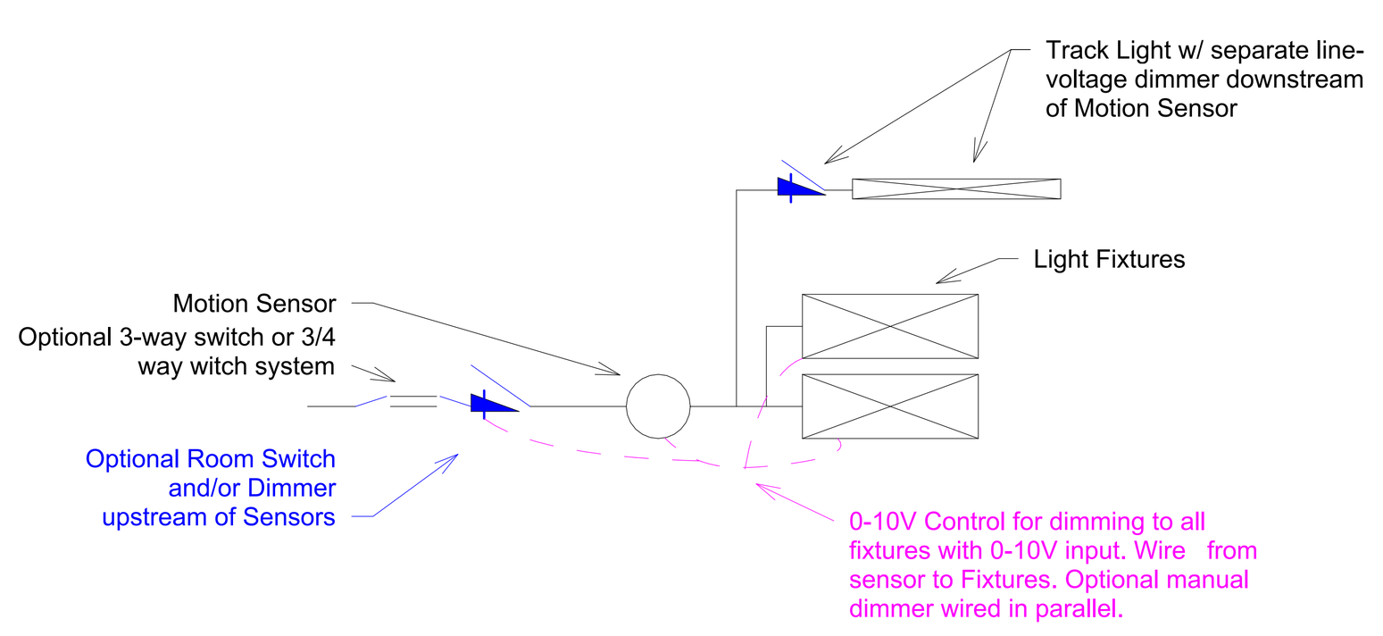
Entire sheet is Alternate 1

Lighting Device Schedule (26 09 23 - Lighting Control Devices)

Type Mark	Description	Est. Count	Model	URL	Environmental Rating	Type Remark
FM-MH	Fixture-mount Motion Sensor, 28' range at 30' height	109	Sensorswitch LSXR-6-ADC-VLP	www.acuitybrands.com		Select Bracket Option to be compatible with Light Fixture
FM-MH-W	Fixture-mount Motion Sensor, 28' range at 30' height	5	Sensorswitch SBOR-6-ODP-VLP-EB3-WH	www.acuitybrands.com	IP 66 Outdoor	Select Bracket Option to be compatible with Light Fixture
FM-MW	Fixture-mount Motion Sensor, 28' range at 9' height	35	Sensorswitch LSXR-10-ADC-VLP	www.acuitybrands.com		Select Bracket Option to be compatible with Light Fixture
FM-MW-W	Fixture-mount Motion Sensor, 28' range at 9' height	3	Sensorswitch SBOR-10-ODP-VLP-EB3-WH	www.acuitybrands.com	IP 66 Outdoor	Select Bracket Option to be compatible with Light Fixture
MS	Motion Sensor short Range	4	Sensorswitch CMR-9-PDT-ADC-VLP	www.acuitybrands.com		
MW	Motion Sensor wide Range	1	Sensorswitch CMR-10-PDT-ADC-VLP	www.acuitybrands.com		
S-1	Single Switch	8				
SD 10	Switch w/ 0-10V Dimmer	4	Wattstopper RH4FBL3PW	www.legrand.us		
T-2H	Timer 2 Hours	11	Intermatic FF2H	www.intermatic.com		
T-4H	Timer 4 Hours	8	Intermatic FF4H	www.intermatic.com		

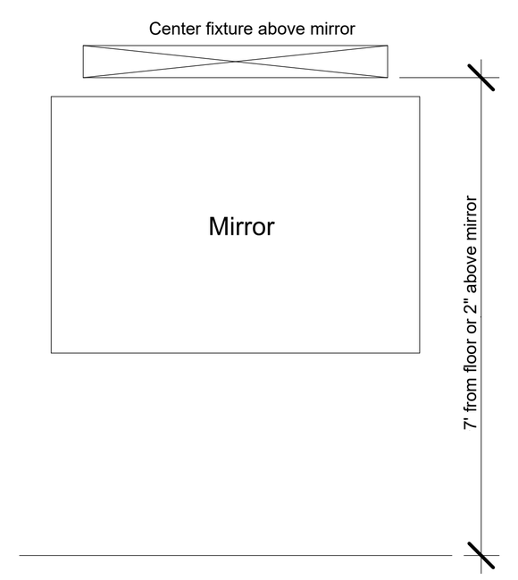
Emergency Lighting Inverters (26 33 23.13 - Central Battery Equipment for Emergency Lighting)

Mark	Space Number	Space Name	Description	Manufacturer	Model	URL	Input Rating	In / Out Voltage	Weight	Type Remark	Specific Remark
ELI-1	100	Garage	Emergency Lighting Battery Inverter	Myers	I-07-S-B-T-M(BBM)-I	www.myerseps.com	10249 VA	277 V	1,884 lbm		Add spare breakers for future Office load of 1,500W

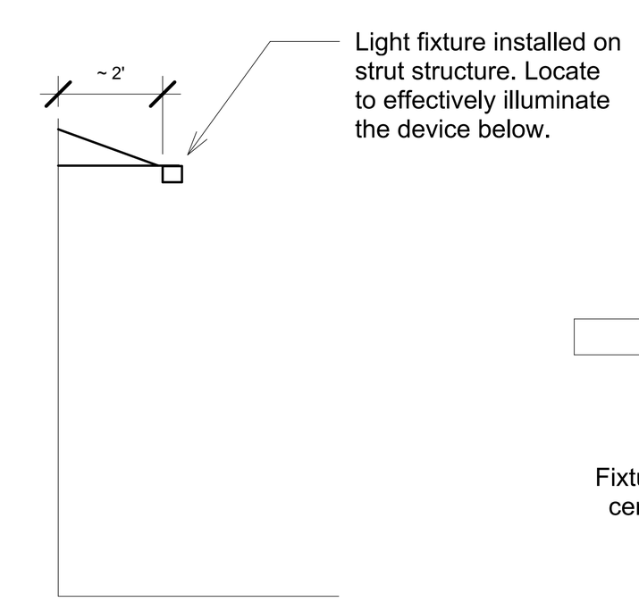


A. Lighting zones with lighting-devices and light-fixtures are indicated by wire lines and/or switch leg (SL) numbers.
B. Where devices allow, dimming shall be accomplished by 0-10V wiring of all devices.
C. Where shown on plans, a zone may have 3-way and 4-way switches. Enable 3-way function on dimmer switch and wire appropriately to enable control from all switch locations. Fixtures and devices in the same above zone are denoted by the same switchleg (SL) number.
D. Motion sensor with local switch will be de-energized when switch is off (sensor downstream of switch):
   1. Light will be on upon activation of local switch regardless of actual motion detection (sensor is ON upon power-up)
   2. Sensors will not click when local switch is off (nuisance avoidance in quiet rooms)
   3. If the order of switching is different at a specific location, plans will indicate so. Examples include, but are not limited to sensors controlling line-voltage dimmers or other track lighting control.
E. Line-voltage dimmers (i.e. track lighting) shall be downstream of local motion sensor.
F. Notes on plans or switchleg naming will indicate exceptions. For example:
   1. Disable Switchleg: A dimmer will only dim the lighting level to the allowable minimum. The line voltage switch in the dimmer will not be used. This prevents lights turning off entirely. Hallways are an example.
   2. One light fixture shall be controlled by switch only: Switchleg parameters indicate that some lights are controlled by switch and sensor, and some lights by switch only. This prevents the latter lights from turning off upon loss of motion detection. Electrical or mechanical rooms are examples.
G. Sensor Programming Instructions:
   1. The below is based on Sensorswitch Instructions at the time of design. Amend if different sensors are used or if manufacturer changes procedure. Confirm any deviation with engineer. Sensorswitch support#: 1-800-535-2465
   2. If sensors are equipped with VLC programming option, a smartphone app shall be used. Note that sensors needs to be initialized and set with a PIN within 45 minutes of powering up. Program is sent to sensor via flashlight. Lights will blink to acknowledge successful programming.
   3. Verify settings with engineer prior programming. Certain settings may be different in certain zones.
   4. Sensors shall be programmed depending on availability of daylight . Save presets to avoid deviations.
   5. No daylight available:
      a. Enable "Time Delay" - Set to 15 minutes
      b. Disable Trim
      c. Enable "Dim to Off Delay" - set to 5 minutes
      d. Disable Photocell
   6. Daylight available (inc. spaces with overhead doors, skylights, windows within 20' of sensor)
      a. Enable "Photocell" and set to "On/Off and Auto Dimming"
      b. Enable "Auto Set Point"
   7. After programming, all functions shall be tested to verify desired function. Adjust as required for intended function. Discuss problems with engineer.

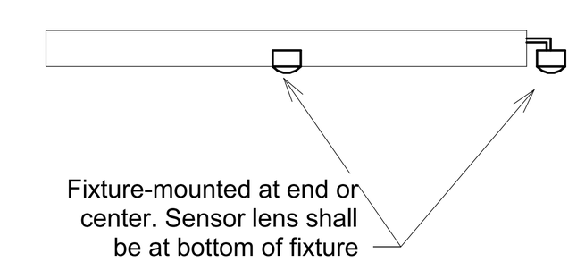
(1) EL Lighting Control Zone - Not to Scale



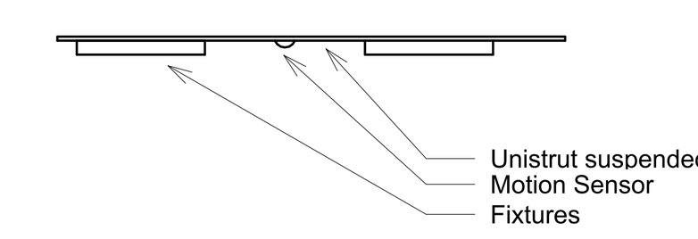
Fixture above Mirror



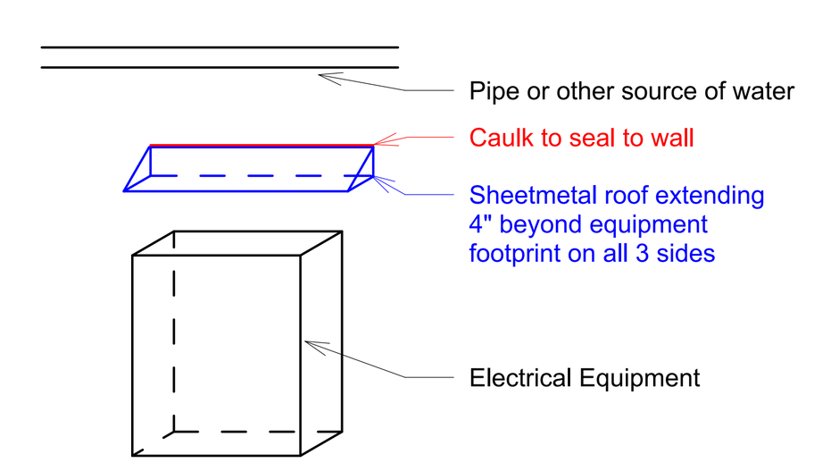
Fixture on bracket



Suspended Strip Fixture w/ Sensor

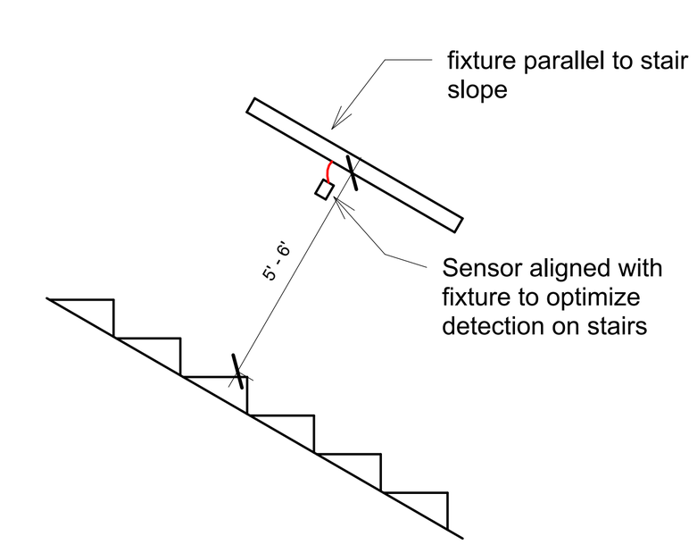


Multiple Suspended Strip Fixtures in a Row



A. Any electrical equipment installed under a water pipe and other water sources, inc. condensate, shall be protected by a roof deflecting water
B. Install roof high enough to maintain all required clearances

Protection of Inverters and other Electrical Lighting Equipment

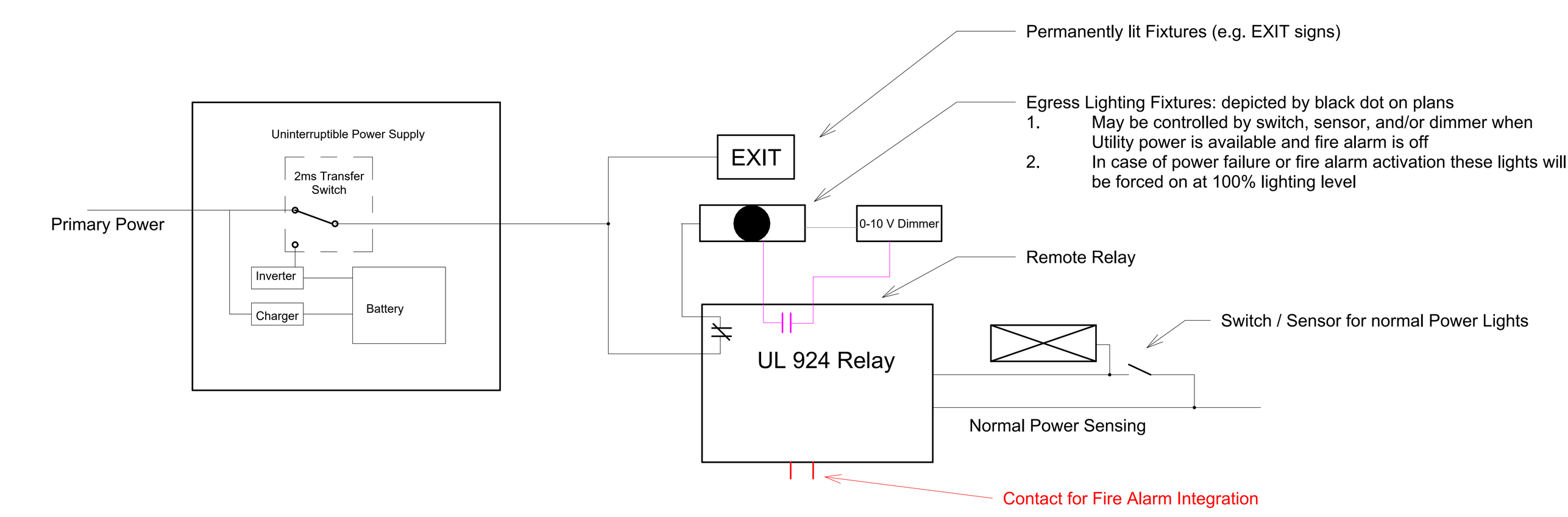


A. Review sensor coverage pattern. Adjust mounting to optimize motion detection of people coming from up-- and downstairs.

Wall fixture in stair case

A. Some spaces don't employ automatic lighting control and use manual switches only. These include but are not limited to mechanical, electrical, or crawl spaces.
B. In these spaces, adhere a sign to the exit door indicating that lights shall be shut off upon leaving the space.
C. Above sign is an example and similar signs can be used upon approval. Minimum size 8"x 8"
D. For spaces with no door by exit, install similar label on wall next to exit. Consult with designer on specifics.

(2) EL Typical Installation Details - Not to Scale



Objective:
1. Emergency light fixtures (indicated by a black dot) and Exit signs will be powered by the Uninterruptible AC Power Supply (UPS). Wiring has to be extended from UPS to all devices.
2. When normal power is present and fire alarm is OFF, lighting will be controlled by lighting control system. Local switches, timers, dimmers and sensors control on/off and dimming.
3. When normal power is not present, the emergency fixtures and exit signs will be powered by the battery for over 90 minutes. These fixtures will be forced on at 100% (no dimming)
4. When fire alarm is active, all emergency light fixtures will be forced on at 100% (no dimming).
5. Contractor shall verify availability of contacts in fire alarm panel and add relay(s) if required.
6. Wiring shall meet NEC 700.10 requirements. This includes, but is not limited to:
   a. Separate emergency raceway. Raceway shall be marked.
   b. Any junctions shall be labeled "Warning - 2 power sources" or as required by code
   c. Label indicates panel, circuit, and voltage
7. Conduit for emergency lighting shall be color-coded as specified in Division 26
8. When accessible installation of UL 924 relay is not possible (e.g. drywall, exterior), install the relay in near-by accessible location. Verify location with engineer.
9. Fixtures with built-in sensor shall be re-wired for UL 924 relay to bypass sensor (e.g. exterior fixture with included photocell)
10. Contractor is responsible for all wiring from uninterruptible power supply and fire alarm panel to the zones.

Testing:
1. Test by applying emergency power and normal power. Turn off local switch and set local dimmer to lowest dimming level.
   a. If no local switch is available, disconnect the appropriate wire to simulate light being turned off.
   b. If no local dimmer is available and dimming by sensor is scheduled, program sensor to dim to low level.
2. Disconnect normal sensing power and verify emergency light turns on to 100%
3. Re-instate normal power and activate fire alarm and verify emergency light turns on to 100%

(3) EL Egress Lighting Control w/ UPS and Fire Alarm Integration - Not to Scale

A. Demolition:
   1. Demolish all existing lighting fixtures and controls. This includes all items not needed for new installation to function. This includes, but is not limited to, emergency, exit, track, architectural and spot lights, switches, sensors, inverters, batteries and control panels. Demolition drawings may not show all existing items.
   2. Remove all unused raceways, boxes, conduit and wiring
   3. Patch wall, ceiling and other surfaces damaged by removal of XTG elements. Use adjacent surface matching cover for electrical boxes that remain.
B. Installation:
   1. Install new raceways, boxes, conduit and wiring as required for new lighting fixtures and controls.
   2. Locations shown are approximate only. Install as required to coordinate with tile patterns, architectural features, sprinklers, mechanical equipment and other obstacles. Center Fixtures and provide even grid wherever possible. Review deviations from plan with designer prior installation.
   3. Install fixtures at indicated height. Provide required suspension. A noted height typically applies to all fixtures in a space, even if only a single fixture has an indicated height shown. If no height is given, ceiling surface mounting or mounting at bottom of fixture can be assumed. Installation in between trusses or beams also is an option. Consult with engineer before determining mounting height.
   4. Surface wiring raceway in finished areas is only allowed where the structure does not allow installation inside ceiling or wall. Raceway shall be neatly routed and hidden in corners to the greatest extend possible. In finished spaces use surface wire molding instead of conduit. Wiremold shall be factory painted to match wall surface. Where matching factory paint is not available, use field-painting.
   5. Support all lighting fixtures adequately and provide all extra support.
   6. All conduit except at fixture entrance shall be 3/4" or larger. Turns between access boxes should not be more than 270°.
   7. Grid Ceilings:
      a. use flexible metal conduit from a J-box in enough length to allow lifting and 2' lateral move of fixture
      b. Move flexible head sprinklers where required for even layout pattern.
   8. Suspended Strip Light Fixtures: use rigid type hangers every 4' or less. Mount multiple fixtures in a row on a uni-strut structure.
   9. Cord & Plug Fixtures: Mount on hook for easy replacement and install safety wire. Provide plug within reach of fixture
   10. In rooms with obstruction (e.g. equipment, pipes, and ducts in mechanical and electrical rooms) mount the fixtures below obstruction and as high as practical to allow good light distribution without limiting access to obstructing equipment. Consult with designer before installation.
C. Lightfixture Disconnects:
   1. All light fixtures not controlled by a manual control (line voltage switch or rewind timer) shall receive external means of disconnect.
      a. This includes retrofit projects. Disconnects shall be added to XTG locations.
      b. Disconnect can be a switch or a twist-plug
      c. Provide one means of disconnect per lighting zone or per emergency fixture.
      d. Install visibly near light fixture set controlled.
      e. In finished areas, install disconnect above accessible ceiling near the zone. When ceiling is not accessible (e.g. drywall), no disconnect is required. Install disconnect near motion sensor or as instructed.
D. Retrofit Installation:
   1. Maintain all fire ratings while penetrating plenums, walls or ceilings.
   2. Install all wiring inside ceiling and wall. If wiring cannot be fished through, provide surface mounted conduit or wire molding in finished spaces.
   3. Modify Grid Ceiling to accommodate new fixtures. Fill in openings with new tiles of existing type. Contractor shall provide tiles and grid elements. Review Special site conditions for information on type of tile. Where sprinkler, diffuser or other permanent obstruction prevents even layout, relocate after consultation with engineer.
   4. Relocate wired devices (WiFi access points, speakers, signs) as required to allow new fixture layout. Relocate Fire Alarm devices up to 3'. Consult with designer before re-location.
   5. Prevent dirt and dust polluting occupied areas and take special care while working in occupied areas and cover equipment and furniture as needed.
   6. Canopy: Provide retrofit version of fixtures and/or all retrofit accessories for installing over existing fixture locations. Ensure existing opening is fully covered. Build cover matching surrounding surface.
   7. Bathroom Fans: where XTG bathroom fans are controlled by XTG lighting operation, re-instate this control with new lighting unless noted otherwise.
E. Control:
   1. Locate sensors to enable good detection within controlled zone and in between partitions. In enclosed rooms minimize detection of motion in adjacent rooms.
   2. Lighting zones are indicated by wire annotations and/or switchleg (SL) numbering. Wire annotations are schematic only to indicate control relationships and don't necessarily equal actually required physical wire runs. Lighting zones can be shown by proximity of sensor and light fixture without wire or switchleg annotation (for example, garage lighting where each fixture has one sensor). In a room with only one sensor (and dimmer/switch), it is assumed all fixtures are controlled by that sensor (and dimmer/switch) even if no wires or switchlegs are indicated. Unless noted otherwise assume the standard lighting control zone setup.
   3. Spaces with electrical panels shall have at least one light be controlled by a manual switch only (no automatic control) per code-requirement.
   4. Fixture-mounted sensors shall be installed to allow 360° detection and bottom of sensor lens shall be at or below bottom of fixture.
   5. Size analog 0-10V wiring to limit voltage drop. At 100% position the light fixture shall be 100% bright.
F. Emergency Lighting:
   1. Light fixtures with a black dot indicate emergency lights.
   2. Emergency lighting wiring shall be installed in separate conduit. Conduit shall be factory-colored per Division 26 specifications.
   3. Control fixtures from central inverter or generator. Provide all wiring to emergency power source.
   4. Re-wire fixture internals if fixture has integrated sensor or other lighting control.
   5. Install UL 924 relay in accessible location near controlled fixture. Verify location with engineer.
      a. Drywall Ceiling: if no easily accessible location is available, install relay above grid ceiling in adjacent area
      b. Outdoor fixtures: Install relay inside above a grid ceiling or other accessible location
   6. Retrofit of XTG fixtures: Re-arrange wiring and existing control to allow emergency fixture operation like for new fixtures. Note that schedules that show number of relays required only account for relays of NEW fixtures.

2 0 2 4 6 8 10 — 1/4" = 1'-0" FEET
2 0 2 4 6 8 10 12 14 — 3/16" = 1'-0" FEET
5 0 5 10 15 20 — 1/8" = 1'-0" FEET
5 0 5 10 15 20 25 30 — 3/32" = 1'-0" FEET
5 0 5 10 15 20 25 30 35 40 45 — 1/16" = 1'-0" FEET
20 0 20 40 — 1" = 20'-0" FEET
30 0 30 60 — 1" = 30'-0" FEET

Designed by:
City of Madison
Facilites Management
City-County Building, Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

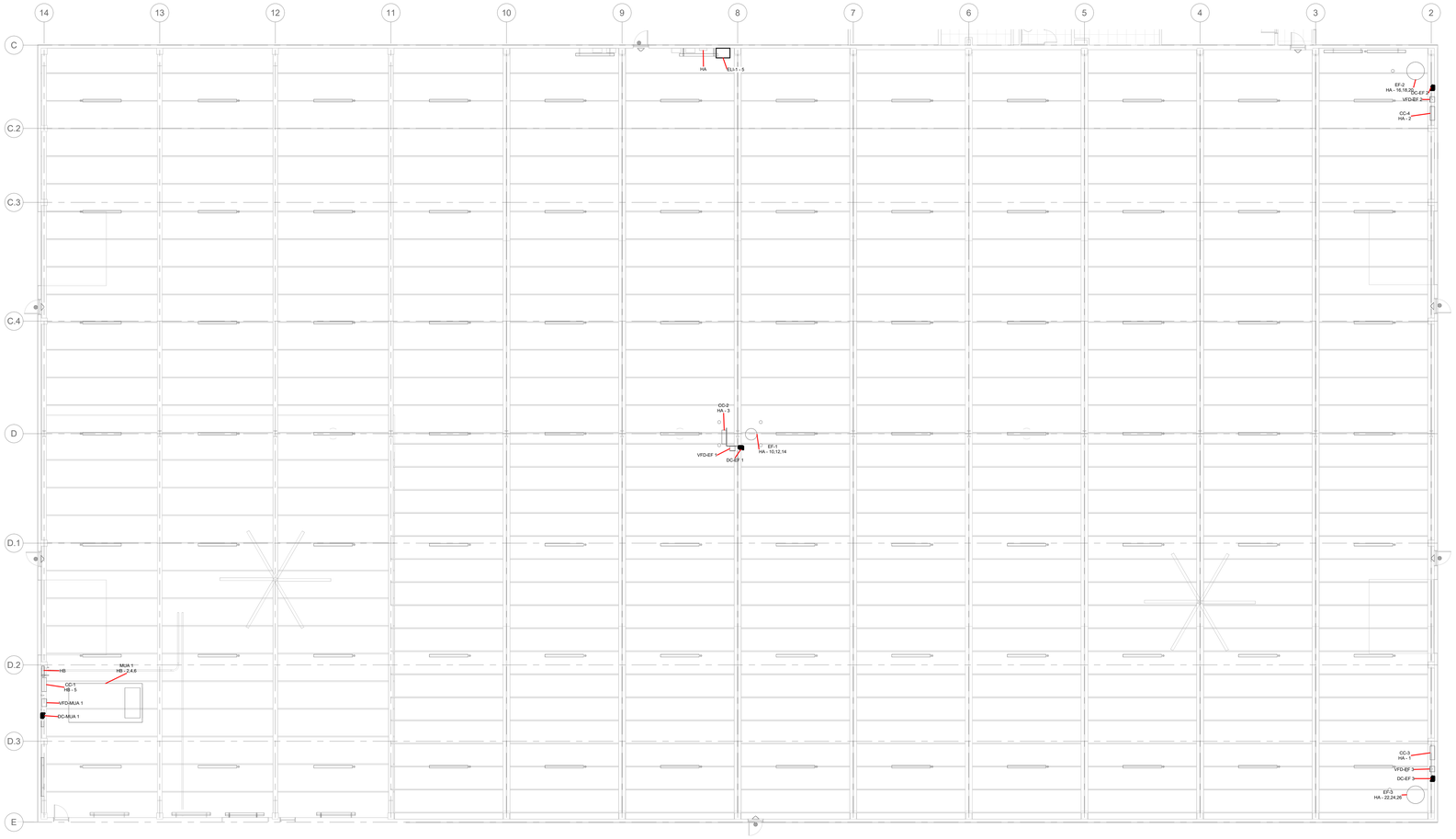
Project North
TRUE

Schedules and Details

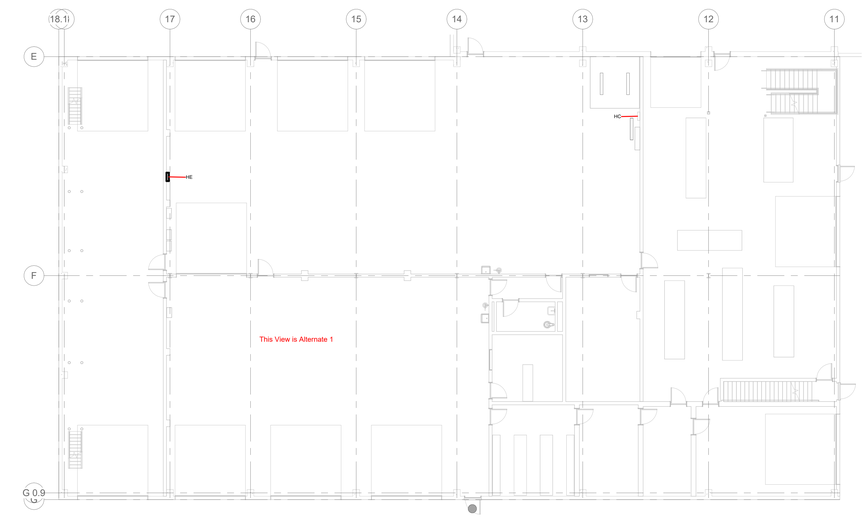
EL 300

Print Date:
2/10/2024 13:38:50

Print in color on 36" x 48"



1 EP Ceiling - Garage 3/32" = 1'-0"



2 EP Level 1 - Shops 3/32" = 1'-0"

3 EP Level 2 - Storage 3/32" = 1'-0"

2 0 2 4 6 8 10
1/4" = 1'-0" FEET

2 0 2 4 6 8 10 12 14
3/16" = 1'-0" FEET

5 0 5 10 15 20
1/8" = 1'-0" FEET

5 0 5 10 15 20 25 30
3/32" = 1'-0" FEET

5 0 5 10 15 20 25 30 35 40 45
1/16" = 1'-0" FEET

20 0 20 40
1" = 20'-0" FEET

30 0 30 60
1" = 30'-0" FEET

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City of Madison
Facilities Management
City-County Building, Room 115
210 Martin Luther King, Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Project North
TRUE

Power

EP 200

Print Date:
2/10/2024 13:38:52

Print in color on 36" x 48"

Panel: HA

26 24 00 - Switchboards and Panelboards

Notes:	Existing Panel - Contractor to provide breakers as requried				
Main Breaker:	125 A	Location: Garage 100	Supplied From:	System Type:	480V / 3
Main:	MLO		Enclosure: NEMA 1	Panel Slots:	30
Mounting:	Surface		AIC: 35 kA	Wires:	4

Circuit Number	Rating	Load Classification	A	A	B	B	C	C	Load Classification	Rating	Circuit Number
1	15 A	HVAC - Control	2.2 A	2.2 A					HVAC - Control	15 A	2
3	15 A	HVAC - Control			2.2 A	3.7 A			Lighting	15 A	4
5	50 A	Lighting - Emergency					37 A				6
7	15 A	Lighting	3.8 A	3.7 A					Lighting	15 A	8
9	15 A	Lighting			3.7 A	2.1 A			Motor	15 A	10,12,14
11								2.1 A			
13				2.1 A							
15	20 A	--			0 A	2.8 A			Motor	15 A	16,18,20
17	20 A	--					0 A	2.8 A			
19	20 A	--	0 A	2.8 A							
21	20 A	--			0 A	2.8 A			Motor	15 A	22,24,26
23	20 A	--					0 A	2.8 A			
25	20 A	--	0 A	2.8 A							
27	20 A	--			0 A						28
29	20 A	--					0 A				30
			19.8 A		**17.4 A**		**45 A**				
			5.4 kVA		**4.8 kVA**		**12.4 kVA**				

Load Classification	Demand Factor	Connected Load (VA)	Estimated Demand...	Connected Current	Estimated Demand Current
Lighting	100.00%	4139 VA	4139 VA	5 A	5 A
Motor	100.00%	6402 VA	6402 VA	8 A	8 A
HVAC - Control	100.00%	1800 VA	1800 VA	2 A	2 A

Panel: HB

26 24 00 - Switchboards and Panelboards

Notes:	Existing Panel - Contractor to provide breakers as requried				
Main Breaker:	250 A	Location: Garage 100	Supplied From:	System Type:	480V / 3
Main:	MLO		Enclosure: NEMA 1	Panel Slots:	42
Mounting:	Surface		AIC: 35 kA	Wires:	4

Circuit Number	Rating	Load Classification	A	A	B	B	C	C	Load Classification	Rating	Circuit Number
1	15 A	Lighting	2.9 A	42.7 A					Motor	60 A	2,4,6
3	15 A	Lighting			3.1 A	42.7 A					
5	15 A	HVAC - Control					2.2 A	42.7 A			
7											8
9											10
11											12
13											14
15											16
17											18
19											20
21											22
23											24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			45.7 A		**45.9 A**		**44.9 A**				
			12.6 kVA		**12.7 kVA**		**12.4 kVA**				

Load Classification	Demand Factor	Connected Load (VA)	Estimated Demand...	Connected Current	Estimated Demand Current
Lighting	100.00%	1639 VA	1639 VA	2 A	2 A
Motor	100.00%	35517 VA	35517 VA	43 A	43 A
HVAC - Control	100.00%	600 VA	600 VA	1 A	1 A

Panel: HC

26 24 00 - Switchboards and Panelboards

Notes:	Existing Panel - Contractor to provide breakers as requried				
Main Breaker:	250 A	Location: Streets Shop 111	Supplied From:	System Type:	480V / 3
Main:	MLO		Enclosure: NEMA 1	Panel Slots:	42
Mounting:	Surface		AIC: 35 kA	Wires:	4

Circuit Number	Rating	Load Classification	A	A	B	B	C	C	Load Classification	Rating	Circuit Number
1	15 A	Lighting	0.1 A	0.6 A					Lighting	15 A	2
3	15 A	Lighting			0.8 A	1.1 A			Lighting	15 A	4
5	15 A	Lighting					0.3 A	3.2 A	Lighting	15 A	6
7	15 A	Lighting	2.7 A								8
9	15 A	Lighting			1.4 A	2.3 A			Lighting	15 A	10
11								5.6 A	Lighting	125 A	12,14,16
13,15,17	125 A	Lighting	1.7 A	5.9 A							
					1.4 A	3.4 A					
							1.7 A				18
19											20
21											22
23											24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			10.8 A		**10.5 A**		**10.5 A**				
			3 kVA		**2.9 kVA**		**2.9 kVA**				

Load Classification	Demand Factor	Connected Load (VA)	Estimated Demand...	Connected Current	Estimated Demand Current
Lighting	100.00%	8787 VA	8787 VA	11 A	11 A

Panel: HD

26 24 00 - Switchboards and Panelboards

Notes:	New Panel and breakers installed by owner				
Main Breaker:	125 A	Location: Mezzanine 202	Supplied From: HC	System Type:	480V / 3
Main:	MLO		Enclosure: NEMA 1	Panel Slots:	30
Mounting:	Surface		AIC: 35 kA	Wires:	4

Circuit Number	Rating	Load Classification	A	A	B	B	C	C	Load Classification	Rating	Circuit Number
1	15 A	Lighting	0.4 A	1.2 A					Lighting	15 A	2
3	15 A	Lighting			1.4 A						4
5	15 A	Lighting					1.6 A				6
7											8
9											10
11											12
13											14
15											16
17											18
19											20
21											22
23											24
25											26
27											28
29											30
			1.7 A		**1.4 A**		**1.7 A**				
			0.5 kVA		**0.4 kVA**		**0.5 kVA**				

Load Classification	Demand Factor	Connected Load (VA)	Estimated Demand...	Connected Current	Estimated Demand Current
Lighting	100.00%	1314 VA	1314 VA	2 A	2 A

Panel: HE

26 24 00 - Switchboards and Panelboards

Notes:	New Panel and breakers installed by owner				
Main Breaker:	125 A	Location: Streets Shop 111	Supplied From: HC	System Type:	480V / 3
Main:	MLO		Enclosure: NEMA 1	Panel Slots:	30
Mounting:	Surface		AIC: 35 kA	Wires:	4

Circuit Number	Rating	Load Classification	A	A	B	B	C	C	Load Classification	Rating	Circuit Number
1	15 A	Lighting	1.9 A	3.4 A					Lighting	15 A	2
3	15 A	Lighting			2.3 A	3.3 A			Lighting	15 A	4
5	15 A	Lighting					3.4 A				6
7											8
9											10
11											12
13											14
15											16
17											18
19											20
21											22
23											24
25											26
27											28
29											30
			5.6 A		**5.9 A**		**3.4 A**				
			1.5 kVA		**1.6 kVA**		**0.9 kVA**				

Load Classification	Demand Factor	Connected Load (VA)	Estimated Demand...	Connected Current	Estimated Demand Current
Lighting	100.00%	3972 VA	3972 VA	5 A	5 A

All Lighting circuits only required for Alternate 1

Circuit Schedule

Panel	Circuit Number	Load Classification	Voltage	Voltage Drop	Voltage Drop %	Number of Elements	Receptacle Connected	Wire Size	Wire Type	Estimated Length tofarthest Device	Apparent Current Phase A	Apparent Current Phase B	Apparent Current Phase C	Apparent Current	Rating	Apparent Load	Comments
HA																	
HA	1	HVAC - Control	277 V	3.7 V	1.3%	1		1-#14, 1-#14, 1-#14	Copper	341 ft	2.2 A	0 A	0 A	2.2 A	15 A	600 VA	
HA	2	HVAC - Control	277 V	2.2 V	0.8%	1		1-#14, 1-#14, 1-#14	Copper	203 ft	2.2 A	0 A	0 A	2.2 A	15 A	600 VA	
HA	3	HVAC - Control	277 V	1.3 V	0.5%	1		1-#14, 1-#14, 1-#14	Copper	119 ft	0 A	2.2 A	0 A	2.2 A	15 A	600 VA	
HA	4	Lighting	277 V	3.7 V	1.4%	15		1-#12, 1-#12, 1-#12	Copper	274 ft	0 A	3.7 A	0 A	3.7 A	15 A	1,037 VA	
HA	5	Lighting - Emergency	277 V	1.3 V	0.5%	1		1-#6, 1-#6, 1-#10	Copper	37 ft	0 A	0 A	37 A	37 A	50 A	10,249 VA	
HA	7	Lighting	277 V	3.3 V	1.2%	14		1-#12, 1-#12, 1-#12	Copper	235 ft	3.8 A	0 A	0 A	3.8 A	15 A	1,052 VA	
HA	8	Lighting	277 V	2.8 V	1%	15		1-#12, 1-#12, 1-#12	Copper	206 ft	3.7 A	0 A	0 A	3.7 A	15 A	1,013 VA	
HA	9	Lighting	277 V	2.9 V	1%	15		1-#10, 1-#10, 1-#10	Copper	346 ft	0 A	3.7 A	0 A	3.7 A	15 A	1,037 VA	
HA	10,12,14	Motor	480 V	1.1 V	0.2%	1		3-#14, 1-#14, 1-#14	Copper	126 ft	2.1 A	2.1 A	2.1 A	2.1 A	15 A	1,746 VA	
HA	16,18,20	Motor	480 V	2.3 V	0.5%	1		3-#14, 1-#14, 1-#14	Copper	188 ft	2.8 A	2.8 A	2.8 A	2.8 A	15 A	2,328 VA	
HA	22,24,26	Motor	480 V	4.2 V	0.9%	1		3-#14, 1-#14, 1-#14	Copper	344 ft	2.8 A	2.8 A	2.8 A	2.8 A	15 A	2,328 VA	
																22,590 VA	
HB																	
HB	1	Lighting	277 V	2.1 V	0.8%	10		1-#14, 1-#14, 1-#14	Copper	134 ft	2.9 A	0 A	0 A	2.9 A	15 A	790 VA	
HB	2,4,6	Motor	480 V	1.9 V	0.4%	1		3-#4, 1-#4, 1-#10	Copper	83 ft	42.7 A	42.7 A	42.7 A	42.7 A	60 A	35,517 VA	
HB	3	Lighting	277 V	3.2 V	1.2%	11		1-#14, 1-#14, 1-#14	Copper	186 ft	0 A	3.1 A	0 A	3.1 A	15 A	849 VA	
HB	5	HVAC - Control	277 V	0.4 V	0.1%	1		1-#14, 1-#14, 1-#14	Copper	34 ft	0 A	0 A	2.2 A	2.2 A	15 A	600 VA	
																37,756 VA	
HC																	
HC	1	Lighting	277 V	0.1 V	0%	2		1-#14, 1-#14, 1-#14	Copper	85 ft	0.1 A	0 A	0 A	0.1 A	15 A	41 VA	
HC	2	Lighting	277 V	0.3 V	0.1%	7		1-#14, 1-#14, 1-#14	Copper	93 ft	0.6 A	0 A	0 A	0.6 A	15 A	159 VA	
HC	3	Lighting	277 V	0.7 V	0.2%	4		1-#14, 1-#14, 1-#14	Copper	147 ft	0 A	0.8 A	0 A	0.8 A	15 A	225 VA	
HC	4	Lighting	277 V	0.8 V	0.3%	6		1-#14, 1-#14, 1-#14	Copper	126 ft	0 A	1.1 A	0 A	1.1 A	15 A	304 VA	
HC	5	Lighting	277 V	0.2 V	0.1%	3		1-#14, 1-#14, 1-#14	Copper	107 ft	0 A	0 A	0.3 A	0.3 A	15 A	82 VA	
HC	6	Lighting	277 V	2.3 V	0.8%	13		1-#14, 1-#14, 1-#14	Copper	125 ft	0 A	0 A	3.2 A	3.2 A	15 A	894 VA	
HC	7	Lighting	277 V	1.4 V	0.5%	11		1-#14, 1-#14, 1-#14	Copper	90 ft	2.7 A	0 A	0 A	2.7 A	15 A	755 VA	
HC	9	Lighting	277 V	0.5 V	0.2%	5		1-#14, 1-#14, 1-#14	Copper	60 ft	0 A	1.4 A	0 A	1.4 A	15 A	395 VA	
HC	10	Lighting	277 V	1.3 V	0.5%	8		1-#14, 1-#14, 1-#14	Copper	95 ft	0 A	2.3 A	0 A	2.3 A	15 A	647 VA	
HC	12,14,16	Lighting	480 V	0.2 V	0%	1		3-#1/0, 1-#1/0, 1-#6	Copper	136 ft	5.9 A	3.4 A	5.6 A	4.8 A	125 A	3,972 VA	Panel and feeder installed by owner
HC	13,15,17	Lighting	480 V	0 V	0%	1		3-#1/0, 1-#1/0, 1-#6	Copper	74 ft	1.7 A	1.4 A	1.7 A	1.6 A	125 A	1,314 VA	Panel and feeder installed by owner
																8,787 VA	
HD																	
HD	1	Lighting	277 V	0.2 V	0.1%	2		1-#14, 1-#14, 1-#14	Copper	63 ft	0.4 A	0 A	0 A	0.4 A	15 A	119 VA	
HD	2	Lighting	277 V	0.5 V	0.2%	5		1-#14, 1-#14, 1-#14	Copper	74 ft	1.2 A	0 A	0 A	1.2 A	15 A	346 VA	
HD	3	Lighting	277 V	0.8 V	0.3%	5		1-#14, 1-#14, 1-#14	Copper	99 ft	0 A	1.4 A	0 A	1.4 A	15 A	395 VA	
HD	5	Lighting	277 V	1.1 V	0.4%	6		1-#14, 1-#14, 1-#14	Copper	117 ft	0 A	0 A	1.6 A	1.6 A	15 A	454 VA	
																1,314 VA	
HE																	
HE	1	Lighting	277 V	1.7 V	0.6%	9		1-#14, 1-#14, 1-#14	Copper	153 ft	1.9 A	0 A	0 A	1.9 A	15 A	534 VA	
HE	2	Lighting	277 V	1.6 V	0.6%	14		1-#14, 1-#14, 1-#14	Copper	83 ft	3.4 A	0 A	0 A	3.4 A	15 A	933 VA	
HE	3	Lighting	277 V	1.7 V	0.6%	12		1-#14, 1-#14, 1-#14	Copper	127 ft	0 A	2.3 A	0 A	2.3 A	15 A	643 VA	
HE	4	Lighting	277 V	2.2 V	0.8%	11		1-#14, 1-#14, 1-#14	Copper	115 ft	0 A	3.3 A	0 A	3.3 A	15 A	923 VA	
HE	5	Lighting	277 V	2 V	0.7%	17		1-#14, 1-#14, 1-#14	Copper	103 ft	0 A	0 A	3.4 A	3.4 A	15 A	939 VA	
																3,972 VA	

General Requirements:

A. Scope:
1. Electrical work required for non-electrical sheets and specifications shall be included in electrical work.
2. All demolition of building elements and equipment shall include demolition of electrical systems. This includes but is not limited to HVAC, plumbing, and other equipment, walls, ceilings, and floor.
3. Electrical information for equipment to be installed may be available on HVAC, plumbing, door and other schedules and specifications.
4. Schedules and equipment from other disciplines may or may not be duplicated on electrical scheets. Electrical contractor is repsonsible for learning the other disciplines' electrical requirements and equipment requiring electricity.

B. Installation:
1. Use factory colored conduit and labeling as described in Division 26 specifications.
2. Install conduit and raceways close to structure of the building. Free-air runs will not be acceptable unless noted otherwise.
3. Contractor shall verify all equipment locations with all other discipline plans, elevations and reviewed shop drawings. Prior to electrical installation, contractor shall adjust receptacles, outlets or connection locations to accommodate furniture and/or equipment.

C. Circuiting:
1. Plans may suggest wire sizes and types. If code requires larger wire for the application, use whichever is larger (smaller gauge number).
2. Contractor may suggest changes to panel circuiting.

Disconnects (26 28 00 - Low-Voltage Circuit Protective Devices)

Mark	Room Number	Room Name	Description	Enclosure
DC-EF 1	100	Garage	Fused Disconnect	NEMA 1
DC-EF 2	100	Garage	Fused Disconnect	NEMA 1
DC-EF 3	100	Garage	Fused Disconnect	NEMA 1
DC-MUA 1	100	Garage	Fused Disconnect	NEMA 1

Fans (23 34 00 - HVAC Fans)

									Fan						Electrical										
Mark	System Name	Description	Room Name	Room Number	Manufacturer	URL	Model	Model adder	Airflow	Static Pressure	Fan Type	Design Fan RPM	Brake Horsepower	FEI	Motor Type	Nominal Power	Voltage	Poles	FLA	Apparent Power	Panel	Circuit Number	Weight	Type Remark	Specific Remark
EF-1	EF 1	Axial Fan w/ Vane Section	Garage	100	Greenheck	www.greenheck.com	AXV-72	190-0405-A10	2600 CFM	0.50 in-wg	Direct Drive Axial w/Vanes	1212	0.28 hp	2.12	TEFC	1 hp	480 V	3	2.1 A	1746 VA	HA	10,12,14	358 lbm		Bellmouth Inlet
EF-2	EF 2	Axial Fan w/ Vane Section	Garage	100	Greenheck	www.greenheck.com	AXV-113	275-0615-C30	17550 CFM	0.50 in-wg	Direct Drive Axial w/Vanes	871	2.13 hp	1.95	TEFC	3 hp	480 V	3	2.8 A	2328 VA	HA	16,18,20	1,224 lbm		Bellmouth Inlet
EF-3	EF 3	Axial Fan w/ Vane Section	Garage	100	Greenheck	www.greenheck.com	AXV-113	275-0615-C30	17550 CFM	0.50 in-wg	Direct Drive Axial w/Vanes	871	2.13 hp	1.95	TEFC	3 hp	480 V	3	2.8 A	2328 VA	HA	22,24,26	1,224 lbm		Bellmouth Inlet

Direct-Fired Make Up Air Units (23 73 39 – Indoor Direct Gas-Fired Heating And Ventilation Units)

									Burner					Fan					Motor (each)			Electrical					Electrical	Weight and Dimensions				
Mark	System Name	Manufacturer	URL	Model	Room Name	Room Number	Filter	Special Features	Fuel	Input	Output	Efficiency	Temperature Rise	Airflow	External Static Pressure (ESP)	Fan	FEI	Design Fan RPM	Motor Type	Nominal Power	Brake Horsepower	Voltage	Poles	MCA	MOP	Panel	Circuit Number	Weight	Height	Width	Length	Specific Remark
MUA 1	MUA 1	Greenheck	www.greenheck.com	DGX-P227-H42	Garage	100	4in./MERV 8	no damper	Natural Gas	2,884,300 Btu/h	2,653,600 Btu/h	92%	70 °F	35100 CFM	0.75 in-wg	2x27" Plenum directdrive	1.18	1,831	TEFC, NEMA Premium Efficiency, VFD approved	15 hp	13.56 hp	480 V	3	53.4 A	60 A	HB	2,4,6	3,782 lbm	5'-8"	8'-5"	15'-11"	Connect to XTG 3" 5 psi gas pipe

Control Cabinets (23 09 00 - Instrumentation And Control For HVAC)

Mark	Room Number	Room Name	Powr Supply Voltage	Powersupply Size	Type Remark	Specific Remark
CC-1	100	Garage	277 V	300 VA	Provide space for one spare controller	
CC-2	100	Garage	277 V	300 VA	Provide space for one spare controller	
CC-3	100	Garage	277 V	300 VA	Provide space for one spare controller	
CC-4	100	Garage	277 V	300 VA	Provide space for one spare controller	

VFDs (23 09 00 - Instrumentation And Control For HVAC)

Mark	Room Number	Room Name	Description	Enclosure
VFD-MUA 1	100	Garage	Variable Frequency Drive	NEMA 4X
VFD-EF 1	100	Garage	Variable Frequency Drive	NEMA 4X
VFD-EF 3	100	Garage	Variable Frequency Drive	NEMA 4X
VFD-EF 2	100	Garage	Variable Frequency Drive	NEMA 4X

Designed by:
City of Madison
Facilites Management
City-County Building, Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53703

Client:
Streets Department

Location:
1501 W Badger Rd.
Madison, WI 53713

Contract: 9497
Project: 15066, 13370

Streets West Facility HVAC and Lighting Upgrade (Bid)

Revisions

No.	Description

Schedules

EP 300

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