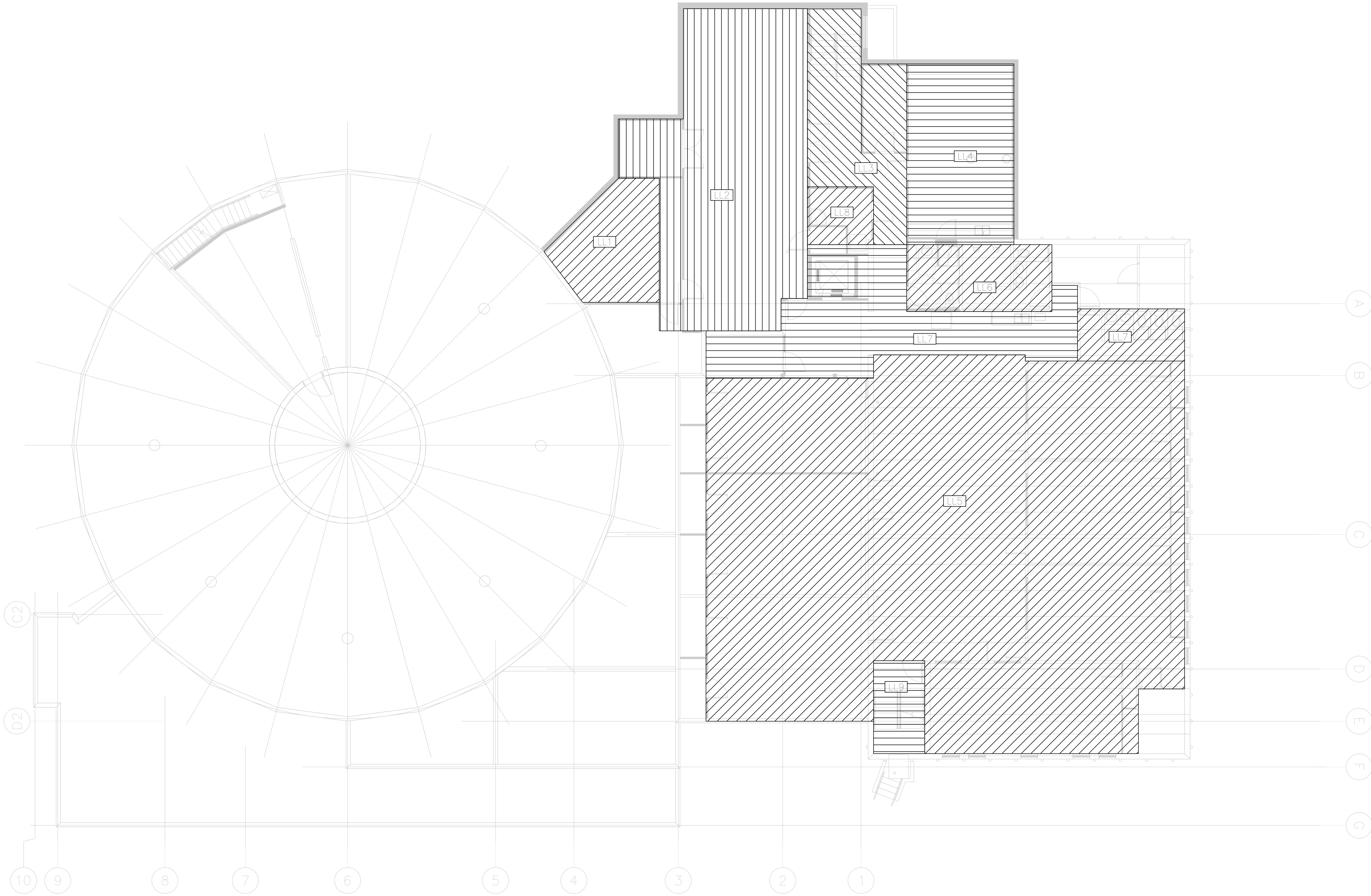


LOWER FLOOR ZONE DIAGRAM
SCALE: 1/8" = 1'

PLAN NORTH

DMA ENGINEERING

6606 W. 96th AVE
Westminster, Colorado 80021
(303) 732-5559
info@dma-eng.com
www.dma-eng.com

FIRST UNIVERSALIST CHURCH OF DENVER

4101 EAST HAMPDEN AVENUE

DENVER, CO 80222

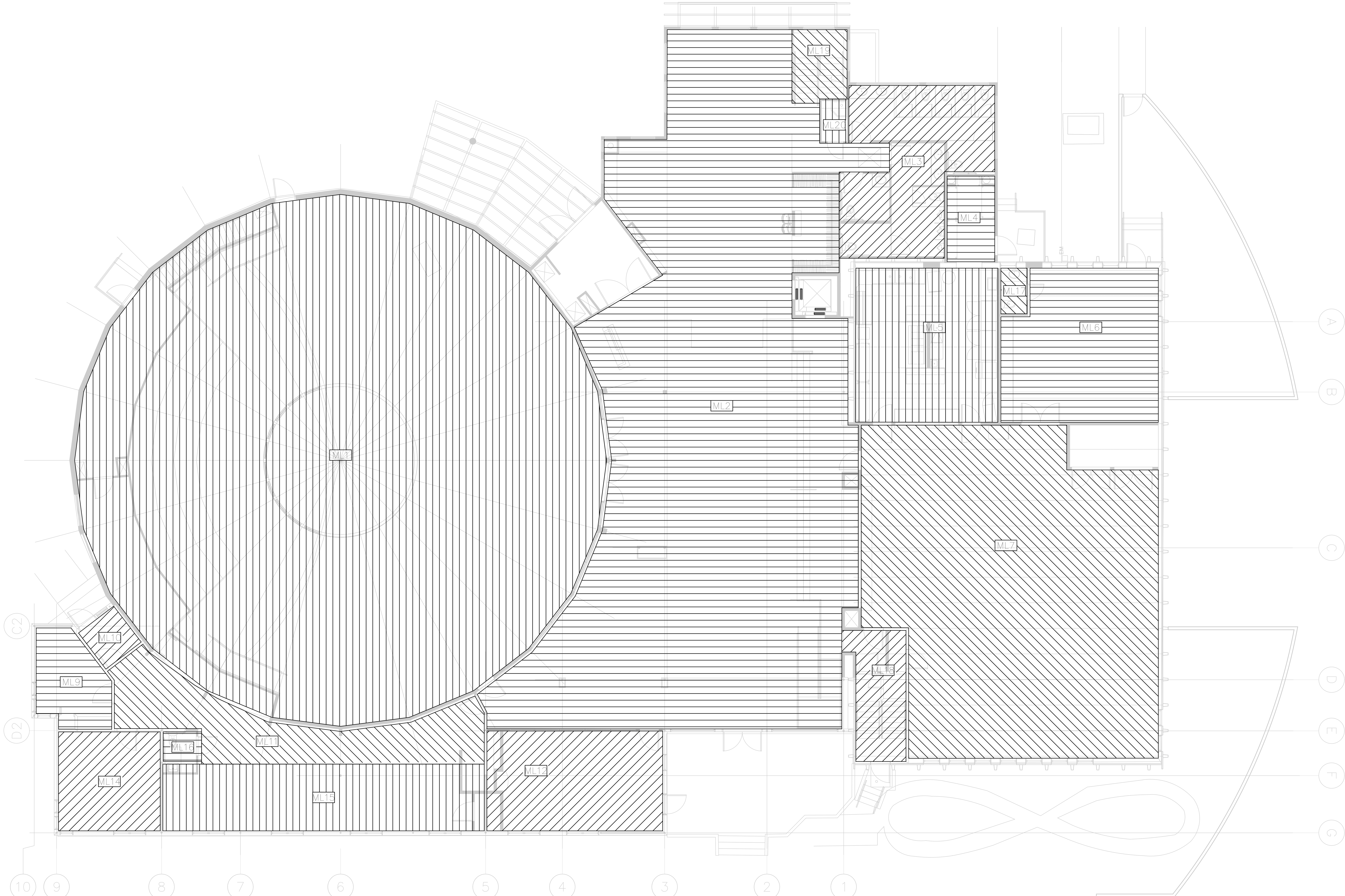
Drawn By:	Checked By:
SPF	--

ISSUE	Date:
80% DD SET	2/25/16
90% DD SET	3/9/16
90% CD SET	7/5/16
CONSTRUCTION SET	8/2/16
REV 1.0 CITY COMMENTS	10/18/16
REV 2.0 SEWER USE	1/26/17
REV 3.0 GREEN TEAM SUBMITTAL	1/26/17
REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED
STEVEN FORRESTER
39316
PROFESSIONAL ENGINEER

Sheet Number:

Z100



MAIN FLOOR ZONE DIAGRAM

SCALE: 1/8" = 1'

PLAN NORTH

DMA ENGINEERING

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4101 EAST HAMPDEN AVENUE

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Drawn By:	Checked By:
SPF	--

ISSUE	Date:
80% DD SET	2/25/16
90% DD SET	3/9/16
90% CD SET	7/5/16
CONSTRUCTION SET	8/2/16
REV 1.0 CITY COMMENTS	10/18/16
REV 2.0 SEWER USE	1/26/17
REV 3.0 GREEN TEAM SUBMITTAL	1/26/17
REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED
STEVEN FORRESTER
39316
PROFESSIONAL ENGINEER

Sheet Number:

Z200

Building: Sanctuary
System Tag/Name: HP-1 thru HP-3 & ERV-1
Operating Condition Description: Heating
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	5,375			
Population of area served by system	Ps	P	645	D	100%	645
Design primary supply fan airflow rate	Vpsd	cfm	7,804		100%	7,804
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones	
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	*Sanctuary*	
Zone Tag			ML1	
Occupancy Category		Select from pull-down list:	Places of religious worship	Storage rooms
Floor Area of zone	Az	sf	5,375	
Design population of zone	Pz	P (default value listed; may be overridden)	645	
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	7,804	
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:		
Frac. of local recirc. air that is representative of system RA	Er			

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSFR	FSCRW
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	0.70
Primary air fraction of supply air at conditioned analyzed	Ep				

Results	Name	Units	Value
System Ventilation Efficiency	Ev		1.00
Outdoor air intake required for system	Vot	cfm	3548
Outdoor air per unit floor area	Vot/As	cfm/sf	0.66
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	5.5
Outdoor air as a % of design primary supply air	Ypd	%	45%

Building: Sanctuary
System Tag/Name: HP-1 thru HP-3 & ERV-1
Operating Condition Description: Cooling
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	5,375			
Population of area served by system	Ps	P	645	D	100%	645
Design primary supply fan airflow rate	Vpsd	cfm	6,591		100%	6,591
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones	
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	*Sanctuary*	
Zone Tag			ML1	
Occupancy Category		Select from pull-down list:	Places of religious worship	Storage rooms
Floor Area of zone	Az	sf	5,375	
Design population of zone	Pz	P (default value listed; may be overridden)	645	
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	6,591	
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:		
Frac. of local recirc. air that is representative of system RA	Er			

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSCR	FSCR
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep				

Results	Name	Units	Value
System Ventilation Efficiency	Ev		1.00
Outdoor air intake required for system	Vot	cfm	3548
Outdoor air per unit floor area	Vot/As	cfm/sf	0.66
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	5.5
Outdoor air as a % of design primary supply air	Ypd	%	54%

Building: Offices
System Tag/Name: HP-4 & ERV-2
Operating Condition Description: Heating
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	1817			
Population of area served by system	Ps	P	7	D	100%	7
Design primary supply fan airflow rate	Vpsd	cfm	537		100%	537
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones				
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	Offices	*Corridors*	Meditation	Office	Open Office
Zone Tag			ML9	MI11	MI12	MI14	ML15
Occupancy Category		Select from pull-down list:	Office space	Corridors	Office space	Office space	Office space
Floor Area of zone	Az	sf	152	463	431	246	525
Design population of zone	Pz	P (default value listed; may be overridden)	0.76	0	2.155	1.23	2.625
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	66	57	186	94	134
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:					
Frac. of local recirc. air that is representative of system RA	Er						

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSFR	FSFR	FSFR	FSFR	FSFR
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep							

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.78
Outdoor air intake required for system	Vot	cfm	183
Outdoor air per unit floor area	Vot/As	cfm/sf	0.10
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	27.1
Outdoor air as a % of design primary supply air	Ypd	%	34%

Building: Offices
System Tag/Name: HP-4 & ERV-2
Operating Condition Description: Cooling
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	1817			
Population of area served by system	Ps	P	7	D	100%	7
Design primary supply fan airflow rate	Vpsd	cfm	537		100%	537
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones				
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	Offices	*Corridors*	Meditation	Office	Open Office
Zone Tag			ML9	MI11	MI12	MI14	ML15
Occupancy Category		Select from pull-down list:	Office space	Corridors	Office space	Office space	Office space
Floor Area of zone	Az	sf	152	463	431	246	525
Design population of zone	Pz	P (default value listed; may be overridden)	0.76	0	2.155	1.23	2.625
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	66	57	186	94	134
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:					
Frac. of local recirc. air that is representative of system RA	Er						

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSFR	FSFR	FSFR	FSFR	FSFR
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep							

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.78
Outdoor air intake required for system	Vot	cfm	183
Outdoor air per unit floor area	Vot/As	cfm/sf	0.10
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	27.1
Outdoor air as a % of design primary supply air	Ypd	%	34%

Building: Friendship Hall
System Tag/Name: HP-5 - HP-6 & ERV-3
Operating Condition Description: Heating
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	4,655			
Population of area served by system	Ps	P	123	D	100%	123
Design primary supply fan airflow rate	Vpsd	cfm	2,800		100%	2,800
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.07			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	7.5			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones			
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	*Freindship Hall*	Corridor	Janitor	Bathrooms
Zone Tag			ML2	ML19	ML20	ML3
Occupancy Category		Select from pull-down list:	Lobbies/prefunction	Corridors	Storage rooms	Storage rooms
Floor Area of zone	Az	sf	4,084	96	32	443
Design population of zone	Pz	P (default value listed; may be overridden)	122.52	0	0	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	2,550	50	80	120
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:				
Frac. of local recirc. air that is representative of system RA	Er					

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3	Zone 4
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSCRW	FSCRW	FSCRW	FSCRW
Zone air distribution effectiveness at conditioned analyzed	Ez			0.70	0.70	0.70	0.70
Primary air fraction of supply air at conditioned analyzed	Ep						

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.79
Outdoor air intake required for system	Vot	cfm	1561
Outdoor air per unit floor area	Vot/As	cfm/sf	0.34
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	12.7
Outdoor air as a % of design primary supply air	Ypd	%	56%

Building: Friendship Hall
System Tag/Name: HP-5 - HP-6 & ERV-3
Operating Condition Description: Cooling
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)	
Floor area served by system	As	sf	4,714				Default entry has been overridden.
Population of area served by system	Ps	P	123	D		123	Default entry has been overridden.
Design primary supply fan airflow rate	Vpsd	cfm	2,800		100%	2,800	
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.07				
OA req'd per person for system area (Weighted average)	Rps	cfm/p	7.5				
Percent increase in Vbz over minimum required			0%				

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones			
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	*Freindship Hall*	Corridor	Janitor	Bathrooms
Zone Tag			ML2	ML19	ML20	ML3
Occupancy Category		Select from pull-down list:	Lobbies/prefunction	Corridors	Storage rooms	Storage rooms
Floor Area of zone	Az	sf	4,084	96	32	443
Design population of zone	Pz	P (default value listed; may be overridden)	122.52	0	0	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	2,550	50	80	120
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:				
Frac. of local recirc. air that is representative of system RA	Er					

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3	Zone 4
Percent of total design airflow rate at conditioned analyzed	Ds	% — May need to manually edit Ds:	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSCR	FSCR	FSCR	FSCR
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep						

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.98
Outdoor air intake required for system	Vot	cfm	1254
Outdoor air per unit floor area	Vot/As	cfm/sf	0.27
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	10.2
Outdoor air as a % of design primary supply air	Ypd	%	45%

Building: Flex Gathering
System Tag/Name: HP-7 - HP-8, ERV-4
Operating Condition Description: Cooling
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	2787.3			
Population of area served by system	Ps	P	234	D	100%	234
Design primary supply fan airflow rate	Vpsd	cfm	4,020		100%	4,020
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.08			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	7.6			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones		
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	Nursery	*Flex Gathering*	Bathroom
Zone Tag			ML6	ML7	ML17
Occupancy Category		Select from pull-down list:	Daycare (through age 4)	Multi-use assembly	Storage rooms
Floor Area of zone	Az	sf	559	2199	29
Design population of zone	Pz	P (default value listed; may be overridden)	13.975	219.9	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	858	3112	50
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:			
Frac. of local recirc. air that is representative of system RA	Er				

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSCR	FSCR	FSCR
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep					

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.93
Outdoor air intake required for system	Vot	cfm	2174
Outdoor air per unit floor area	Vot/As	cfm/sf	0.78
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	9.3
Outdoor air as a % of design primary supply air	Ypd	%	54%

Building: Flex Gathering
System Tag/Name: HP-7 - HP-8, ERV-4
Operating Condition Description: Cooling
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	2787.3			
Population of area served by system	Ps	P	234	D	100%	234
Design primary supply fan airflow rate	Vpsd	cfm	4,020		100%	4,020
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.08			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	7.6			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones		
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	Nursery	*Flex Gathering*	Bathroom
Zone Tag			ML6	ML7	ML17
Occupancy Category		Select from pull-down list:	Daycare (through age 4)	Multi-use assembly	Storage rooms
Floor Area of zone	Az	sf	559	2199	29
Design population of zone	Pz	P (default value listed; may be overridden)	13.975	219.9	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	858	3112	50
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:			
Frac. of local recirc. air that is representative of system RA	Er				

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		FSCR	FSCR	FSCR
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep					

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.93
Outdoor air intake required for system	Vot	cfm	2174
Outdoor air per unit floor area	Vot/As	cfm/sf	0.78
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	9.3
Outdoor air as a % of design primary supply air	Ypd	%	54%

AIR BALANCE SCHEDULE

EQUIPMENT	SUPPLY (CFM)	GENERAL EXHAUST (CFM)	BATHROOM/MOP SINK EXHAUST (CFM)
HP-1 thru HP-3 $ ERV-1	3548	3548	0
HP-4, ERV-2	183	133	50
HP-5 & HP-6 ERV-3	1561	1561	0
ERV-4	2174	2174	0
ERV-5	2547	2547	0
EF-1			0
MAU-1	1296		1612
TOTAL	10013	9963	50

REV 7.0

Building: Classrooms
System Tag/Name: HP-9 - HP-10, ERV-5
Operating Condition Description: Cooling
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	8,631			
Population of area served by system	Ps	P	150	D	100%	150
Design primary supply fan airflow rate	Vpsd	cfm	3,260		100%	3,260
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.11			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	10.0			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones					
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	Colvin Commons	Corridor	Art	*Education Center*	Mens Bathrooms	Womens Bathrooms
Zone Tag			LL2	LL3	LL4	LL5	LL6	LL7
Occupancy Category		Select from pull-down list:	Classrooms (ages 5–8)	Corridors	Classrooms (ages 5–8)	Classrooms (ages 5–8)	Storage rooms	Storage rooms
Floor Area of zone	Az	sf	1,822	1023	669	4,789	211	117
Design population of zone	Pz	P (default value listed; may be overridden)	40	0	10	100	0	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	830	80	250	2,000	50	50
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:						
Frac. of local recirc. air that is representative of system RA	Er							

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		CS	CS	CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep								

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.97
Outdoor air intake required for system	Vot	cfm	2547
Outdoor air per unit floor area	Vot/As	cfm/sf	0.30
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	17.0
Outdoor air as a % of design primary supply air	Ypd	%	78%

Building: Classrooms
System Tag/Name: HP-9 - HP-10, ERV-5
Operating Condition Description: Heating
Units (select from pull-down list): IP

Delete Zone | Add Zone

Inputs for System	Name	Units	System (w/o diversity)		Diversity	System (w/ diversity)
Floor area served by system	As	sf	8,631			
Population of area served by system	Ps	P	150	D	100%	150
Design primary supply fan airflow rate	Vpsd	cfm	3,260		100%	3,260
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.11			
OA req'd per person for system area (Weighted average)	Rps	cfm/p	10.0			
Percent increase in Vbz over minimum required			0%			

Inputs for Potentially Critical zones	Name	Units	Potentially Critical Zones					
Zone Name (Show Values per Zone)		Zone title turns purple italic for critical zone(s)	Colvin Commons	Corridor	Art	*Education Center*	Mens Bathrooms	Womens Bathrooms
Zone Tag			LL2	LL3	LL4	LL5	LL6	LL7
Occupancy Category		Select from pull-down list:	Classrooms (ages 5–8)	Corridors	Classrooms (ages 5–8)	Classrooms (ages 5–8)	Storage rooms	Storage rooms
Floor Area of zone	Az	sf	1,822	1023	669	4,789	211	117
Design population of zone	Pz	P (default value listed; may be overridden)	40	0	10	100	0	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	830	80	250	2,000	50	50
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A:						
Frac. of local recirc. air that is representative of system RA	Er							

Inputs for Operating Condition Analyzed	Name	Units	System	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed		Select from pull-down list: (Show codes for Ez)		CSCRW	CSCRW	CSCRW	CSCRW	CSCRW	CSCRW
Zone air distribution effectiveness at conditioned analyzed	Ez			1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep								

Results	Name	Units	Value
System Ventilation Efficiency	Ev		0.97
Outdoor air intake required for system	Vot	cfm	2547
Outdoor air per unit floor area	Vot/As	cfm/sf	0.30
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	17.0
Outdoor air as a % of design primary supply air	Ypd	%	78%

REV 1.0

SYSTEM LOADS

SYSTEM	SYSTEM NAME	ZONES SERVED	COOLING SENSIBLE	TOTAL COOLING	HEATING	AIRFLOW SUPPLY	AREA	HEATING FLUX	COOLING FLUX	NOTES
			Btu/h	Btu/h	Btu/h	cfm	ft^2	Btu/h/ft^2	Btu/h/ft^2	
HP-1	SANCTUARY 1	ML1	51,033	51,033	32,483	2,288	75	1,297.6	2,038.6	
HP-2	SANCTUARY 2		51,033	51,033	32,483	2,288				
HP-3	SANCTUARY 3		51,033	51,033	32,483	2,288				
HP-4	SANCTUARY OFFICES	ML9 THRU ML16	9,900	9,900	29,290	447	4,405	6.6	2.2	
HP-5	FRIENDSHIP HALL	ML2 & ML3	26,450	26,450	31,445	1,186	6,201	10.1	8.5	
HP-6	FRIENDSHIP HALL		26,450	26,450	31,445	1,186				
HP-7	FLEX GATHERING 1	ML6 THRU ML8	37,950	37,950	33,815	1,702	1,102	61.4	48.0	
HP-8	FLEX GATHERING 2		37,950	37,950	33,815	1,702				
HP-9	BSMNT CLASSROOMS	LL1 THRU LL9	22,950	22,950	31,455	1,029	7,503	8.4	10.1	
HP-10	BSMNT CLASSROOMS		22,950	22,950	31,455	1,029				
Systems Totals			337,700	337,700	320,170	15,145	19,286	16.6	17.5	

ROOM LOADS COINCIDENT

ZONE NAME	COOLING SENSIBLE	TOTAL COOLING	HEATING	FLOW RATE	AREA	COOLING FLUX	HEATING FLUX	Notes
	Btu/h	kBtu/h	kBtu/h	cfm	ft^2	Btu/h/ft^2	Btu/h/ft^2	
LL1 - Archive	0	0	0.0	0	186	0.0	0.0	1,4
LL2 - Colvin Commons	8.8	8.8	18.9	393	1297	6.8	14.5	1,4
LL3 - Corridor	0	0	1.8	0	1023	0.0	1.7	1,4
LL4 - Classroom	3.6	3.6	6.8	161	389	9.3	17.6	1,4
LL5 - Classrooms	33.5	33.5	32.5	1504	4307	7.8	7.5	1,4
LL6 - Men's Bathroom	0	0	1.1	0	184	0.0	5.7	1,4
LL7 - Women's Bathroom	0	0	0.8	0	117	0.0	7.2	1,4
LL8 - Janitor	0	0	0.2	0	75	0.0	2.9	6
LL9 - Corridor	0	0	0.8	0	95	0.0	8.6	1,4
ML1 - Sanctuary	153.1	153.1	97.5	6865	6106	25.1	16.0	3,4
ML2 - Friendship Hall	51	51	55.8	2286	4354	11.7	12.8	3,4
ML3 - Bathrooms	1.9	1.9	7.1	85	443	4.3	15.9	2,4
ML4 - Storage	0	0	0.0	0	94	0.0	0.0	2,4
ML5 - Kitchen	1.4	1.4	4.7	61	565	2.5	8.3	2,4
ML6 - Nursery	6.7	6.7	11.6	300	531	12.6	21.8	2,4
ML7 - Flex Gathering	68	68	52.5	3049	2539	26.8	20.7	2,4
ML9 - Admin	1.2	1.2	3.5	55	163	7.4	21.6	2,4
ML10 - Vestibule	0	0	0.0	0	49	0.0	0.0	2,4
ML11 - Corridor Sanctuary	1.6	1.6	5.2	70	456	3.5	11.3	3,4
ML12 - Meditation	2.7	2.7	7.2	120	430	6.3	16.7	3,4
ML14 - Office	1.5	1.5	4.5	68	238	6.3	18.8	3,4
ML15 - Offices	2.9	2.9	8.6	131	517	5.6	16.6	3,4
ML16 - Unisex	0	0	0.4	2	26	0.0	14.8	3,4
Totals	337.9	337.9	321.3	15150.7	24182.2	14.0	13.3	

Notes:
1. Loads based on a wall R-Value of 15, Ceiling and Roof R-Value of 38, Foundation R-Value of 0, Infiltration of 0.10 ACH, Window U-Value 0.32 and a SHGC of 0.35
2. Loads based on a wall R-Value of 15, Ceiling and Roof R-Value of 20, Foundation R-Value of 10, Infiltration of 0.10 ACH, Window U-Value 0.32 and a SHGC of 0.35
3. Loads based on a wall R-Value of 19, Ceiling and Roof R-Value of 49, Foundation R-Value of 10, Infiltration of 0.10 ACH, Window U-Value 0.32 and a SHGC of 0.35
4. Thermostat setpoints are 75 Degrees for Cooling and 70 Degrees for Heating
5. Thermostat setpoints are 55 Degrees for Heating and no Cooling
6. Unconditioned Space

DMA ENGINEERING
6606 W. 96th AVE
Westminster, Colorado 80021
(303) 732-5559
info@dma-eng.com
www.dma-eng.com

FIRST UNIVERSALIST CHURCH OF DENVER

4101 EAST HAMPDEN AVENUE
DENVER, CO 80222

Drawn By:	Checked By:
SPF	—

ISSUE	Date:
80% DD SET	2/25/16
90% DD SET	3/9/16
90% CD SET	7/5/16
CONSTRUCTION SET	8/2/16
REV 1.0 CITY COMMENTS	10/18/16
REV 2.0 SEWER USE	1/26/17
REV 3.0 GREEN TEAM SUBMITTAL	1/26/17
REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED PROFESSIONAL ENGINEER — STEVEN FORRESTER — 39316

Sheet Number:
Z300

MECHANICAL SPECIFICATION:

1. NATURAL GAS: STEEL, SCHEDULE 40, BLACK, ASTM A-53 OR GASTITE FLEXIBLE GAS PIPING. FLEXIBLE GAS PIPING TO BE RESIZED PER INTERNATIONAL FUEL GAS CODE FOR EQUIVALENT STEEL SCHEDULE 40 PIPING
2. HYDRONIC HEATED OR CHILLED WATER OR ANTIFREEZE SOLUTION TO BE TYPE M COPPER PEX-a OR PEX-b WITH OXYGEN BARRIER.
3. PROVIDE SLEEVES AT ALL PIPING PENETRATIONS OF NEW CONCRETE FLOOR OR NEW WALL CONSTRUCTION. SEAL ALL PIPING WITH COMPATIBLE SEALANT FOR MATERIAL USED. HYDROCARBON MATERIALS ARE NOT TO BE USED WITH PEX AND PVC.
4. BELOW GRADE WALL PENETRATIONS TO BE SEALED WITH A MECHANICAL CONNECTION. CONNECTION TO HAVE AN EPDM SEAL WITH REINFORCED PRESSURE PLATES AND STAINLESS STEEL HARDWARE. METRASEAL OR EQUIVALENT.
5. ALL PIPING CONNECTIONS TO EQUIPMENT SHALL BE MADE WITH ISOLATION VALVES AND UNIONS OR FLANGES TO PERMIT DISMANTLING. PROVIDE DIELECTRIC UNIONS AT ANY PIPING CONNECTIONS OF DISSIMILAR METALS.
6. ALL PIPING SHALL BE SECURELY SUPPORTED BY MEANS OF PIPE HANGERS. DUE PROVISION SHALL BE MADE FOR EXPANSION OF PIPING. PIPES SHALL BE SECURELY ANCHORED WHERE NECESSARY TO PROPERLY DISTRIBUTE STRESSES. DO NOT REST PIPING ON ANY PART OF BUILDING STRUCTURE FOR SUPPORT.
7. TEST ALL HYDRONIC PIPING TO 80 PSIG FOR A MINIMUM TEST PERIOD OF 24 HOURS DURING WHICH THE TEST PRESSURE SHALL NOT FALL BY 5 PERCENT. IF PIPING FAILS TEST, FIND AND REPAIR LEAK, AND REPEAT TEST.
8. TEST THREADED NATURAL GAS PIPING AT 20 PSIG FOR A MINIMUM TEST PERIOD OF 2 HOURS DURING WHICH THE TEST PRESSURE SHALL NOT FALL OVER 5 PERCENT. IF PIPING FAILS TEST, FIND AND REPAIR THE LEAK, AND REPEAT TEST.
9. INSTALL ALL PIPING TRUE AND PLUMB. USE ONLY NEW MATERIALS, CLEAN AND FREE OF RUST.
10. COORDINATE FINAL LOCATION OF ALL PIPE ROUTINGS WITH GENERAL CONTRACTOR.
11. ALL PIPING, DUCTWORK, AND EQUIPMENT SHALL BE INSULATED WITH FIBERGLASS INSULATION; MINIMUM THICKNESS SHALL BE PER THE STATE OF COLORADO ENERGY CODE.
12. COORDINATE EXACT LOCATION OF ALL AIR DEVICES WITH THE ARCHITECT'S FINAL REFLECTED CEILING PLAN. ALERT ENGINEER OF ANY COMPLICATIONS OR DISCREPANCIES.
13. ALL THERMOSTATS, EXHAUST FANS, FURNACES, DUCTWORK AND AIR DEVICES SERVING THIS SPACE SHALL BE CLEANED AND CALIBRATED BY CONTRACTOR.
14. ALL DUCTWORK, PIPING, AND TEMPERATURE CONTROL CONDUIT TO VIBRATING EQUIPMENT SHALL HAVE FLEXIBLE CONNECTORS.
15. THE AIR DISTRIBUTION SYSTEMS SHALL BE TESTED AND BALANCED BY BALANCING CONTRACTOR. ALL AIR FLOWS SHALL BE VERIFIED AGAINST THE PRINT AND THE AIR FLOWS SHALL BE DOCUMENTED. ANY DEVIATIONS GREATER THAN 10% SHALL BE RECTIFIED.
16. THE OUTSIDE AIR DAMPERS OF ALL THE RTU'S OR OUTSIDE AIR DAMPER ON THE FAN COIL UNITS SERVING THE SPACE NEED TO BALANCED TO KEEP THE SPACE IN A NEUTRAL POSITIVE PRESSURE.
17. ALL STEAM PIPING TO BE RATED ABOVE THE PRESSURE RELIEF VALVE OF THE BOILER.
18. ALL CLOSE LOOP STEAM PIPING TO HAVE A VACUUM BREAKER.

DUCTING SPECIFICATION:

1. FIELD VERIFY ALL EXISTING SUPPLY AND RETURN DUCT. LENGTHEN OR SHORTEN EXISTING DUCTS AND PROVIDE NEW ELBOWS AS REQUIRED TO ACHIEVE AIR DEVICE LAYOUT SHOWN ON THIS PLAN, WITH A MAXIMUM FLEX DUCT LENGTH OF 10'-0".
2. ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK SHALL BE GALVANIZED STEEL, FABRICATED AND INSTALLED PER SMACNA STANDARDS.
3. EXCEPT AS OTHERWISE INDICATED, FABRICATE ELBOWS WITH CENTERLINE RADIUS EQUAL TO ASSOCIATED DUCT WIDTH; FABRICATE TO INCLUDE TURNING VANES IN ELBOWS WHERE SHORTER RADIUS IF NECESSARY. ALL SQUARE OR RECTANGULAR DUCTING 24" OR GREATER IN WIDTH OR HEIGHT ARE TO HAVE TURNING VANES AT ALL 90 DEGREE ELBOWS. LIMIT ANGULAR TAPERS TO 30 DEGREES FOR CONTRACTING TAPER AND 20 DEGREES FOR EXPANDING TAPERS. PROVIDE RADIUS TYPE FITTINGS FABRICATED OF MULTIPLE SECTION WITH MAXIMUM 15 DEGREE CHANGE OF DIRECTION PER SECTION. UNLESS SPECIFICALLY DETAILED OTHERWISE, USE 45 DEGREE ELBOWS FOR BRANCH TAKEOFF CONNECTIONS. WHERE 90 DEGREE BRANCHES ARE INDICATED. PROVIDE CONICAL TYPE TEES.
4. ALL MAIN SUPPLY DUCTWORK IN UNCONDITIONED SPACE SHALL BE INSULATED WITH R-9 FIBERGLASS LINING OR DUCT WRAP. ALL DUCT SIZES SHOWN ARE CLEAR INSIDE AIR WAY DIMENSIONS.
5. DUCTWORK SUPPORT MATERIALS: EXCEPT AS OTHERWISE INDICATED, PROVIDE HOT-DIPPED GALVANIZED STEEL FASTENERS, ANCHORS, RODS, STRAPS, TRIM AND ANGLES FOR SUPPORT OF DUCTWORK.
6. ALL DUCTWORK CONNECTED TO VIBRATING EQUIPMENT SHALL HAVE FLEXIBLE
7. ANY CHANGES IN DUCT SIZE SHALL BE REPORTED TO DMA ENGINEERING. EQUIVALENT ROUND SIZE SHOULD BE MAINTAINED OR ROUNDED UP AS NECESSARY.

GENERAL NOTES:

1. THE DRAWINGS AND SPECIFICATIONS ARE SCHEMATIC IN NATURE. THE PURPOSE OF THE DRAWINGS AND SPECIFICATIONS IS TO COMMUNICATE THE GENERAL INTENT OF THE DESIGN. IT IS INTENDED THAT PRICING SUBMITTED SHALL BE FOR A COMPLETE AND OPERATIONAL INSTALLATION AND SHALL INCLUDE EVERYTHING REQUIRED TO MAKE IT SO, WHETHER SHOWN ON THE DRAWINGS AND SPECIFICATIONS OR NOT.
2. CONTRACTOR SHALL VISIT THE JOBSITE PRIOR TO SUBMITTING A BID TO VERIFY DIMENSIONS GOVERNING MECHANICAL WORK AT THE BUILDING. DO NOT SCALE THE MECHANICAL DRAWINGS FOR DIMENSIONS. TAKE DIMENSIONS, MEASUREMENTS, LOCATIONS, LEVELS, ETC. FROM THE ACTUAL FIELD CONDITIONS AND ARCHITECTURAL DRAWINGS. EXAMINE ALL ADJOINING WORK ON WHICH THE MECHANICAL WORK IS DEPENDENT FOR MAXIMUM EFFICIENCY AND REPORT ANY DESIGN CONFLICT WHICH MUST BE CORRECTED PRIOR TO SUBMITTING BID.
3. ALL WORK SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL CODES, LAWS, ACTS, ORDINANCES, AND ALL AUTHORITIES HAVING JURISDICTION.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ASPECTS OF JOBSITE SAFETY; ENGINEER AND ARCHITECT ASSUME NO RESPONSIBILITY OR RISK FOR METHODS USED BY CONTRACTOR FOR INSTALLING WORK DEPICTED ON THIS PLAN.
5. IF THERE ARE CONFLICTS WITH DUCTS, PIPES, AND CONDUIT, THE ORDER OF PRIORITY IS AS FOLLOWS: PLUMBING WASTE AND VENT PIPING, ROOF DRAIN PIPING, DUCTWORK, ELECTRICAL CONDUIT AND LIGHTING, DOMESTIC HOT AND COLD WATER PIPING, FIRE SPRINKLER PIPING.

LINETYPES

- ANTIFREEZE SOLUTION SUPPLY
- ANTIFREEZE SOLUTION RETURN
- DOMESTIC HOT WATER SUPPLY
- EXISTING DOMESTIC HOT WATER SUPPLY
- DOMESTIC HOT WATER RETURN
- CHILLED WATER SUPPLY
- CHILLED WATER RETURN
- HEATED WATER SUPPLY
- HEATED WATER RETURN
- GLYCOL SOLUTION SUPPLY
- GLYCOL SOLUTION RETURN
- GAS
- DOMESTIC COLD WATER
- EXISTING DOMESTIC COLD WATER
- EXISTING
- REFRIGERANT LIQUID
- REFRIGERANT SUCTION

SYMBOLS LEGEND

- X / X.XX — DETAIL MARKER
- X / X.XX — DETAIL MARKER
- X / X.XX — SECTION CUT
- SECTION A, SCALE: 1/4" = 1'-0" — VIEW CALLOUT
- X / X.XX — DETAIL CALLOUT
- X / 1 — EQUIPMENT TYPE / EQUIPMENT NUMBER
- DIFFUSER CALLOUT: LEADER POINTS TO G-R-D; A; CFM; 9X12; X (SHOWN ON DRAWING); CODE; THE SAME AREA. USE WHEN MORE THAN ONE SIZE OF G-R-D IDENTICAL G-R-D IS USED IN

MECHANICAL CONTRACTOR:

1. MECHANICAL CONTRACTORS TO HAVE THE FOLLOWING QUALIFICATIONS TO BID ON THE PROJECT:
   1.1. LEAD INSTALLER TO HAVE COMPLETED MANUFACTURERS TRAINING ON CONDENSING BOILERS
   1.2. LEAD INSTALLER TO BE NATE CERTIFIED ON HEAT PUMP SYSTEMS.
   1.3. CONTRACTOR TO BE IGSHPA CERTIFIED INSTALLER.
   1.4. EXPERIENCE ON AT LEAST 3 PROJECTS OF SIMILAR COMPLEXITY AND SCOPE.
2. CONTRACTOR TO SUBMIT BASE BID ON THE MECHANICAL DESIGN AND EQUIPMENT SELECTION IN THESE DRAWINGS AND EQUIPMENT SCHEDULES.
3. SUBSTITUTIONS TO BE INCLUDED AS AN ALTERNATE TO BASE BID AT THE TIME THE BID IS DELIVERED. SUBSTITUTIONS WILL NOT BE ACCEPTED AFTER BIDDING PROCESS UNLESS EQUIPMENT IS UNAVAILABLE TO COMPLETE PROJECT IN TIME ALLOTTED. CONTRACTOR TO SUPPLY ALL SUBMITTALS FOR ALTERNATE EQUIPMENT TO ENGINEER AT THE TIME BID IS SUBMITTED. ALL EQUIPMENT SUBMITTALS ARE REQUIRED BEFORE PURCHASE.
4. CONTRACTOR IS RESPONSIBLE FOR KEEPING REDLINE DRAWINGS OF ALL MODIFICATIONS TO BASE DESIGN DURING INSTALLATION.
5. CONTRACTOR SHALL LEAVE ALL SPACES, STRUCTURAL SYSTEMS, ROOM FINISHES, FIXTURES, AND EQUIPMENT IN THE SAME CONDITION AS FOUND AT THE START OF WORK. ALL FIXTURES AND EQUIPMENT MOVED OR DISTURBED IN CONNECTION WITH WORK SHALL BE PROPERLY REINSTALLED BY THE ORIGINAL METHOD, AND ALL DAMAGE TO EXISTING FIXTURES AND EQUIPMENT SHALL BE FULLY REPAIRED.
6. SUBMITTALS (SHOP DRAWINGS) SHALL BE REQUIRED FOR ALL HVAC AND PLUMBING EQUIPMENT, FIRE SPRINKLERS, AND TEMPERATURE CONTROLS.
7. THE CONTRACTOR SHALL PREPARE 1 SET OF BOUND OPERATION AND MAINTENANCE MANUALS FOR THE TEMPERATURE CONTROL SYSTEM AND THE ENTIRE MECHANICAL SYSTEM; THE OWNER'S PERSONNEL SHALL BE FULLY INSTRUCTED IN THE OPERATION AND MAINTENANCE OF THE ENTIRE SYSTEM BY THE CONTRACTOR.
8. GUARANTEE ALL WORK AND EQUIPMENT FOR 1 YEAR FROM THE DATE OF ACCEPTANCE BY OWNER.

PIPING SYMBOLS

- PRESSURE GAUGE WITH SHUT-OFF COCK 0-50 PSI
- TEMPERATURE INDICATOR 0-180
- FLEXIBLE CONNECTOR
- RPBP
- INLINE CIRCULATOR
- DRAIN VALVE
- ANTI SCALD VALVE (110°F)
- 3-WAY CONTROL VALVE - CV
- PUMP W/ SUCTION DIFFUSER
- MAKE-UP WATER SELF FILL VALVE
- STRAINER WITH BLOWDOWN VALVE
- BALANCING VALVE
- PRESSURE RELIEF VALVE
- VACUM RELIEF VALVE
- MANUAL AIR VENT
- AUTOMATIC AIR VENT
- VALVE (<2"=BALL, >2"=BUTTERFLY)
- DRAIN VALVE
- PLUG COCK
- BUTTERFLY VALVE
- GLOBE VALVE
- INLINE SPRING LOADED CHECK VALVE
- TEMPERATURE AND PRESSURE TEST PORT - TTE, PTE
- FLANGE
- UNION
- 2-WAY CONTROL VALVE - CV
- B.D.D. — BACK DRAFT DAMPER

GENERAL SYMBOLS

- DIRECTION OF PIPE PITCH (DOWN)
- DIRECTION OF FLOW
- ANCHOR
- REDUCER OR INCREASER
- ECCENTRIC REDUCER
- TOP CONNECTION, 45° OR 90°
- BOTTOM CONNECTION, 45° OR 90°
- SIDE CONNECTION
- CAPPED OUTLET
- RISE OR DROP IN PIPE
- T — THERMOSTAT
- TS — REMOTE TEMPERATURE SENSOR FOR THERMOSTAT
- CO — CO2 SENSOR
- H — HUMIDITY SENSOR
- DP — DEW POINT SENSOR
- BU — BUTANE SENSOR
- X / 1 — EQUIPMENT TYPE / EQUIPMENT NUMBER
- DIFFERENTIAL PRESSURE SENSOR
- TEMPERATURE SENSOR, RTD, THERMOCOUPLE
- FLOW SENSOR
- DUCT SMOKE SENSOR
- PRESSURE SENSOR

DUCT SYMBOLS

- SUPPLY TOP REGISTER OR GRILLE (WALL TYPE)
- FLEXIBLE DUCT CONNECTION
- SUPPLY DIFFUSER
- RETURN DIFFUSER
- MOTORIZED DAMPER
- D.S. — DUCT SILENCER
- UP / DN — SUPPLY DUCT (UP & DOWN)
- UP / DN — EXHAUST DUCT (UP & DOWN)
- CEILING DIFFUSERS
- VANED ELBOW & AIR SPLIT TYPE DUCT TAKE-OFF
- CONNECT NEW DUCT TO EXISTING DUCT
- R — INCLINED RISE, IN DIRECTION OF AIR FLOW
- D — INCLINED DROP, IN DIRECTION OF AIR FLOW
- LIMIT OF DEMOLITION
- VANED ELBOW (PROVIDE ALL SQUARE OR RECTANGULAR ELBOWS WITH VANES EVEN IF SYMBOL IS MISSING)
- VANED ELBOW (SHORT RADIUS)
- STANDARD RADIUS ELBOW
- 10x8 — NEW DUCT (WIDTH x DEPTH)
- EXISTING DUCT TO REMAIN
- EXISTING DUCT TO BE REMOVED
- LOUVER (LOUVER SPECIFIED IN ARCHITECTURAL SECTION.)
- FLEXIBLE DUCTWORK (INSULATED)
- DUCT WITH SOUND LINING
- VD — MANUAL VOLUME DAMPER
- F. DPR — FIRE DAMPER
- BDD — BACK DRAFT DAMPER

ABBREVIATIONS

AC	ABOVE COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
CLG	CEILING MOUNTED
E OR (E)	EXISTING
FLR	FLOOR MOUNTED
H.B.	HOSE BIB
N OR (N)	NEW
P.O.C.	POINT OF CONNECTION
R OR (R)	RELOCATE

DMA ENGINEERING
6606 W. 96th AVE
Westminster, Colorado 80021
(303) 732-5559
info@dma-eng.com
www.dma-eng.com

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4101 EAST HAMPDEN AVENUE
DENVER, CO 80222

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ISSUE	Date:
80% DD SET	2/25/16
90% DD SET	3/9/16
90% CD SET	7/5/16
CONSTRUCTION SET	8/2/16
REV 1.0 CITY COMMENTS	10/18/16
REV 2.0 SEWER USE	1/26/17
REV 3.0 GREEN TEAM SUBMITTAL	1/26/17
REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED STEVEN FORRESTER 39316 PROFESSIONAL ENGINEER

Sheet Number:

MO.1

GRILLE/REGISTER/DIFFUSER SCHEDULE

NEW

CODE	MANUFACTURER	MODEL NUMBER	SERVICE	FACE TYPE	MOUNTING TYPE	VOLUME DAMPER	MATERIAL	SIZE										NOTES
								AIR FLOW (0-50 CFM)	BOOT SIZE (DIAMETER IN)	AIR FLOW (50-125 CFM)	BOOT SIZE (DIAMETER IN)	AIR FLOW (125-175 CFM)	BOOT SIZE (DIAMETER IN)	AIR FLOW (175-225 CFM)	BOOT SIZE (DIAMETER IN)	AIR FLOW (390-545 CFM)	BOOT SIZE (DIAMETER IN)	
A	SHOEMAKER	951	SUPPLY	LOUVER	FLOOR	YES	STEEL	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	1
C	LIMA	AL2500F	SUPPLY	LOUVER	FLOOR	YES	ALUM	4 X 10, 4 X 12	5,6	6 X 10	7,8	6 X 12, 10 X 10	7,8	6 X 14, 8 X 12, 10 X 10	8, 9	24X6	8, 9	1
D	TITUS	CT-540	SUPPLY	LOUVER	WALL LOW	YES	ALUM	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	PER DRAWING	1
								AIR FLOW (0-100 CFM)	BOOT SIZE (DIAMETER IN)	AIR FLOW (100-175 CFM)	BOOT SIZE (DIAMETER IN)	AIR FLOW (175-300 CFM)	BOOT SIZE (DIAMETER IN)	AIR FLOW (300-500 CFM)	BOOT SIZE (DIAMETER IN)			
B	TITUS	250	SUPPLY	CURVED BALDE	DUCT/T-GRID	YES	STEEL	6 X 6, 10 X 4	6	16 X 4, 10 X 6, 8 X 8	8	18 X 6, 10 X 10	10	20 X 6, 14 X 8 , 12 X 10	12			1
R	TITUS	S300	SUPPLY	CURVED BALDE	ROUND DUCT	YES	STEEL	10 X 3	N/A	10 X 6, 20 X 3	N/A	14 X 6, 20 X 4, 28 X 3	N/A	24 X 6, 18 X 8 , 12 X 12	N/A			1
								AIR FLOW (0-130 CFM)	AIR FLOW (130-260 CFM)	AIR FLOW (175-400 CFM)	AIR FLOW (400-800 CFM)	AIR FLOW (600-800 CFM)	AIR FLOW (800-1000 CFM)	AIR FLOW (1000-1200 CFM)	AIR FLOW (1200-1800 CFM)	AIR FLOW (2600-4600 CFM)		
W	TITUS	8R	RETURN	PERFORATED	DUCT	NO	STEEL	6 X 6, 10 X 6	8 X 8, 12 X 6	10 X 10, 18 X 6, 12 X	14 X 14, 18 X 12	24 X 12, 18 X 18	24 X 14, 30 X 12	24 X 16, 20 X 20	24 X 20, 22 X 22	42X24		1
X	TITUS	8R	RETURN	PERFORATED	T-GRID/CEILING	NO	STEEL	6 X 6, 10 X 6	8 X 8, 12 X 6	10 X 10, 18 X 6, 12 X	14 X 14, 18 X 12	24 X 12, 18 X 18	24 X 14, 30 X 12	24 X 16, 20 X 20	24 X 20, 22 X 22	42X24		1
Y	TITUS	8R	RETURN	PERFORATED	SIDE WALL HIGH	NO	STEEL	6 X 6, 10 X 6	N/A	8 X 8, 12 X 6	N/A	10 X 10, 18 X 6, 12 X	N/A	14 X 14, 18 X 12	N/A	N/A		1
Z	TITUS	8R	RETURN	PERFORATED	SIDE WALL LOW	NO	STEEL	6 X 6, 10 X 6	N/A	8 X 8, 12 X 6	N/A	10 X 10, 18 X 6, 12 X	N/A	14 X 14, 18 X 12	N/A	N/A		1
E1	TITUS	8R	EXHAUST	PERFORATED	T-GRID/CEILING	NO	STEEL	6 X 6, 10 X 6	8 X 8, 12 X 6	10 X 10, 18 X 6, 12 X	14 X 14, 18 X 12	24 X 12, 18 X 18	24 X 14, 30 X 12	24 X 16, 20 X 20	24 X 20, 22 X 22	42X24		1

EXISTING

								MEASURED SIZE	CFM									
E	UNKNOWN	N/A	SUPPLY	PERFORATED	T-GRID	NO	STEEL	24X24	196-204									1
F	UNKNOWN	N/A	SUPPLY	PERFORATED	FLOOR	NO	STEEL	17.5X5.5	54									1
E2	UNKNOWN	N/A	RETURN	PERFORATED	T-GRID	NO	STEEL	24X24	1431									1
F2	UNKNOWN	N/A	RETURN	PERFORATED	FLOOR	NO	STEEL	17.5X5.5	110									1
HW	UNKNOWN	N/A	RETURN	PERFORATED	SIDE WALL HIGH	NO	STEEL	9.5X3.5	100									1
LW	UNKNOWN	N/A	RETURN	PERFORATED	SIDE WALL LOW	NO	STEEL	15X5.5	110									1

NOTES:
1. OTHER SIZE AS NECESSARY

WATER-TO-AIR HEAT PUMP SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	TYPE	USAGE	AREA SERVED	IMPOSED LOAD (BTU/H)	IMPOSED AIR FLOW (CFM)	TRANSFER FLUID					SOURCE FLUID						EFFICIENCY (COP/EER)	ELECTRICAL			PHYSICAL				NOTES
								CAPACITY (BTU/H)	AIRFLOW (CFM)	ESP (inH20)	ENTERING AIR TEMP. DB / WB (°F)	LEAVING AIR TEMP. (°F)	HEAT EXTRACTED/ REJECTED (BTU/H)	FLOW RATE (GPM)	ENTERING TEMP. (°F)	LEAVING TEMP. (°F)	WORKING FLUID	HEAD LOSS (FT)		MCA	MFS	VOLT/PH/HZ	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	WEIGHT (LBS)	
HP-1	CARRIER / 50PCV070 ECM	SANCTUARY MECHANICAL ROOM	VERTICAL	HEATING	ML1	32483	2288	47600	2197	0.61	70/10	94.3	47600	18	30	25.8	20% ETHY. GLY	24.9	3.2	31.4	50	208/3/60	25.4	30.6	58.5	443	1
				COOLING		51033	2288	62400	2197	0.61	75 / 62	49.4	73800	18	85	93.8		24.9	13.2								
HP-2	CARRIER / 50PCV070 ECM	SANCTUARY MECHANICAL ROOM	VERTICAL	HEATING	ML1	32483	2288	47600	2197	0.61	70/10	94.3	47600	18	30	25.8	20% ETHY. GLY	24.9	3.2	31.4	50	208/3/60	25.4	30.6	58.5	443	1
				COOLING		51033	2288	62400	2197	0.61	75 / 62	49.4	73800	18	85	93.8		24.9	13.2								
HP-3	CARRIER / 50PCV070 ECM	SANCTUARY MECHANICAL ROOM	VERTICAL	HEATING	ML1	32483	2288	47600	2197	0.61	70/10	94.3	47600	18	30	25.8	20% ETHY. GLY	24.9	3.2	31.4	50	208/3/60	25.4	30.6	58.5	443	1
				COOLING		51033	2288	62400	2197	0.61	75 / 62	49.4	73800	18	85	93.8		24.9	13.2								
HP-4	CARRIER / 50PCH024NCC3ADC1	SANCTUARY CRAWL SPACE	HORIZONTIAL	HEATING	ML9 THRU ML16	29290	447	14900	730	0.5	70/10	93	10800	6	30	26.8	20% ETHY. GLY	20.6	3.1	12	15	208/3/60	22	43	17	181	1
				COOLING		9900	447	21500	730	0.5	75 / 62	49.6	25900	6	85	92.17		20.6	12.9								
HP-5	CARRIER / PCV042JCC5ADD1	BSMT MECH ROOM	VERTICAL	HEATING	ML2 & ML3	31445	1188	27000	1020	0.5	70/10	91.7	19300	10.5	30	26	20% ETHY. GLY	9.4	3	17	25	208/3/60	21.5	26	43.3	265	1,2
				COOLING		26500	1188	38700	1419	0.5	75 / 62	50.6	45800	10.5	85	94.4		9.4	13.1								
HP-6	CARRIER / PCV042JCC5ADD1	BSMT MECH ROOM	VERTICAL	HEATING	ML2 & ML3	31445	1188	27000	1020	0.5	70/10	91.7	19300	10.5	30	26	20% ETHY. GLY	9.4	3	17	25	208/3/60	21.5	26	43.3	265	1,2
				COOLING		26500	1188	38700	1419	0.5	75 / 62	50.6	45800	10.5	85	94.4		9.4	13.1								
HP-7	CARRIER / PCV060JCC5ADC1	BSMT MECH ROOM	VERTICAL	HEATING	ML6 THRU ML8	33815	1702	43200	2010	0.5	70/10	94.1	30700	15	30	25.6	20% ETHY. GLY	17.1	3	40	60	208/3/60	24	32.5	45.3	307	1,2
				COOLING		37950	1702	55400	2010	0.5	75 / 62	51.3	65900	15	85	94.5		17.1	13								
HP-8	CARRIER / PCV060JCC5ADC1	BSMT MECH ROOM	VERTICAL	HEATING	ML6 THRU ML8	33815	1702	43200	2010	0.5	70/10	94.1	30700	15	30	25.6	20% ETHLYENE GLY	17.1	3	40	60	208/3/60	24	32.5	45.3	307	1,2
				COOLING		37950	1702	55400	2010	0.5	75 / 62	51.3	65900	15	85	94.5		17.1	13								
HP-9	CARRIER / 50PCV048JCC5ADC1	BSMT MECH ROOM	VERTICAL	HEATING	LL1 THRU LL6	31455	1029	34600	1630	0.5	70/10	93.8	25600	12	30	25.4	20% ETHLYENE GLY	10.0	3.3	20	30	208/3/60	24	32.5	45.3	287	1
				COOLING		22950	1029	44700	1630	0.5	75 / 62	50.6	53200	12	85	94.5		10.0	13.1								
HP-10	CARRIER / 50PCV048JCC5ADC1	BSMT MECH ROOM	VERTICAL	HEATING	LL1 THRU LL6	31455	1029	34600	1630	0.5	70/10	93.8	25600	12	30	25.4	20% ETHLYENE GLY	10.0	3.3	20	30	208/3/60	24	32.5	45.3	287	1
				COOLING		22950	1029	44700	1630	0.5	75 / 62	50.6	53200	12	85	94.5		10.0	13.1								

NOTES:
1. PROVIDE VIBRATION ISOLATION, FLEXIBLE DUCT CONNECTIONS AND VIBRATION ISOLATION PAD
2. UNIT TO HAVE 5 KW ELECTRIC STRIP HEAT
3. UNIT TO HAVE 10 KW ELECTRIC STRIP HEAT

AIR-TO-AIR ENERGY RECOVERY SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	SERVICE	TYPE	USAGE	OUTSIDE			SUPPLY				EFFICIENCY	ELECTRICAL				PHYSICAL			NOTES
						AIRFLOW RATE (CFM)	ENTERING TEMP. DB/WB (°F)	STATIC PRESSURE (IN. WATER)	AIRFLOW RATE (CFM)	ENTERING TEMP. DB/WB (°F)	LEAVING TEMP. DB/WB (°F)	STATIC PRESSURE (IN. WATER)	SENSIBLE TOTAL %	MOTOR SIZE (HP)	MCA	MOP	MOTOR VOLT/PH/HZ	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	
ERV-1	RENEWAIRE HE4XINV	BASEMENT MECH ROOM	ML1	MEMBRANE, COUNT	HEAT	3548	70/54	0.5	3548	-3/-3	46/37.1	0.5	67/62	2	26	30	208/3/60	81 1/2"	35 1/4"	62	1,2,3
					COOL	3548	75/62.6	0.5	3548	93/60	80.9/59	0.5	67/49								
ERV-2	RENEWAIRE EV300	BASEMENT MECH ROOM	ML9 THRU ML16	MEMBRANE, COUNT	HEAT	183	70/54	0.25	183	-3/-3	49.8/40	0.25	76/72	0.2			120/1/60	28 3/4"	23 7/8"	20 1/8"	1
					COOL	183	75/62.6	0.25	183	93/60	80/58.7	0.25	76/57								
ERV-3	RENEWAIRE HE2XINH	BASEMENT MECH ROOM	ML2, ML3, ML19 & ML20	MEMBRANE, COUNT	HEAT	1561	70/54	0.5	1561	-3/-3	50.7/41.1	0.5	74/70	1.5	11.9	15	208/3/60	41 1/2"	60 1/2"	34 3/4"	1,2,3
					COOL	1561	75/62.6	0.5	1561	93/60	80/60	0.5	74/58								
ERV-4	RENEWAIRE HE2XINV	BASEMENT MECH ROOM	ML6, ML7 & ML19	MEMBRANE, COUNT	HEAT	2174	70/54	0.5	2174	-3/-3	44.3/35.7	0.5	65/59	1.5	11.9	15	208/3/60	45 1/8"	45 1/8"	51 5/8"	1,2,3
					COOL	2174	75/62.6	0.5	2174	93/60	81.3/58.7	0.5	65/46								
ERV-5	RENEWAIRE HE3XINV	BASEMENT MECH ROOM	LL1 THRU LL6	MEMBRANE, COUNT	HEAT	2547	70/54	0.5	2547	-3/-3	45.9/37	0.5	67/62	2	15	15	208/3/60	61 3/4"	49 5/8"	62"	1,2,3
					COOL	2547	75/62.6	0.5	2547	93/60	81/59	0.5	67/49								

NOTES:
1. PROVIDE MANUAL BALANCING DAMPERS ON THE EXHAUST AIR AND OUTSIDE AIR DUCT RUNS. OUTSIDE AIR SUPPLY AND EXHAUST TO BE INSULATED DUCTING.
2. UNIT TO HAVE VFD DRIVES. UNIT TO START ON MINIMUIM AND SPEED UP AS CO2 LEVEL INCREASES.
3. UNIT TO HAVE ECONOMIZER COOLING, FANS TO RUN WHEN OUTSIDE AIR IS BELOW 55 DEGREES AND THERE IS A CALL FOR COOLING FOR RESPECTIVE ZONES..

MAKEUP AIR UNIT

ID	MANUFACTURER AND MODEL NUMBER	TYPE	LOCATION	AREA SERVED	FAN		ELECTRICAL				HEATING				PHYSICAL			CIRCUIT			NOTES
					FLOW RATE (CFM)	ESP (in H20)	VOLTAGE	MOTOR SIZE (HP)	PHASE	TYPE	INPUT CAPACITY (BTU/H)	OUTPUT CAPCAITY (BTU/H)	ENTERING AIR TEMP. (°F)	TEMPERATURE RISE (°F)	LENGTH (IN.)	DEPTH (IN.)	HEIGHT (IN.)	VOLTAGE	M.C.A	M.O.P.	
MAU-1	CAPTIVE AIRE / D76	DIRECT FIRED	ROOF	KITCHEN	1296	0.5	208	2.00	3	NAT	109033	100310	0	72	130 3/4	22 1/2	22 1/8	208	5.9	-	1

NOTES:
1. UNIT TO BE EQUPPED WITH EVAPORATIVE COOLER SECTION.
2. PROVIDE ROOF CURB AND WINTERIZE KIT.

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info@dma-eng.com
www.dma-eng.com

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DENVER, CO 80222

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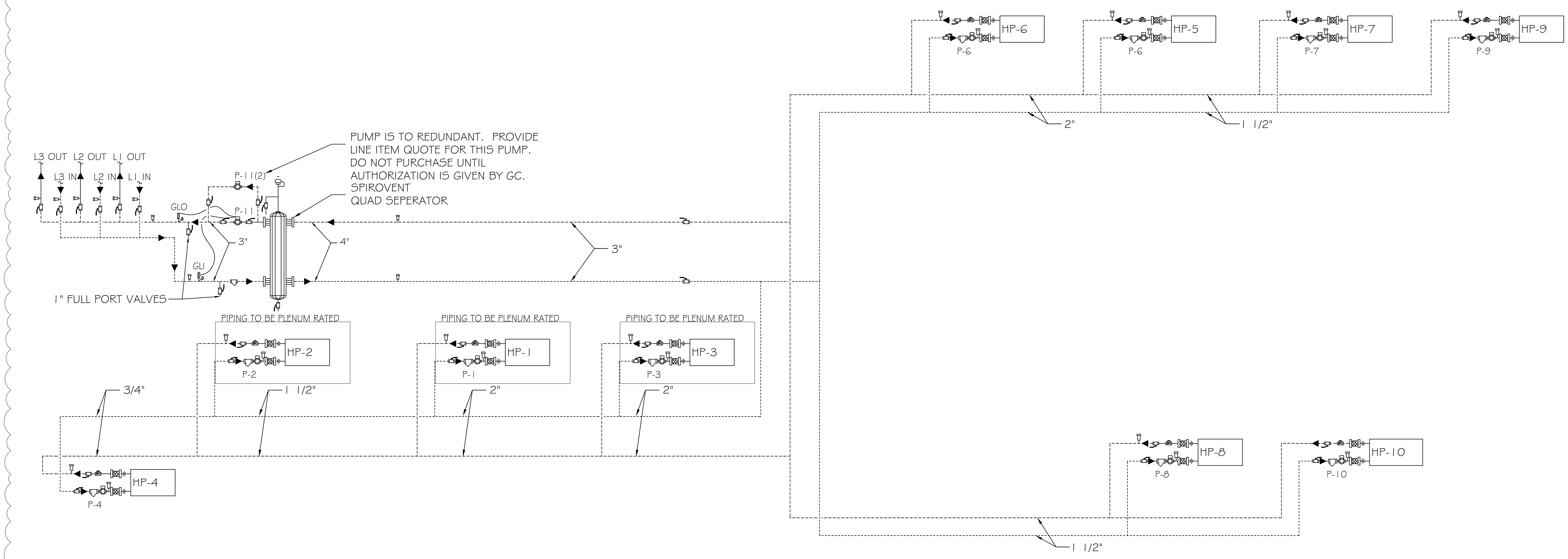
REV 2.0 SEWER USE	1/26/17
REV 3.0 GREEN TEAM SUBMITTAL	1/26/17
REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED
STEVEN FORRESTER
39316
PROFESSIONAL ENGINEER

Sheet Number :
M0.2



CONTROL SEQUENCE OF OPERATIONS NON DDC:

ALL ISOLATION RELAYS TO HAVE LED INDICATING CLOSED RELAY. RELAY TO HAVE MANUAL OVER RIDE. ALL WIRING TO BE 18 GAUGE IN PVC JACKET WITH EACH END OF THE TERMINATION LABELED MATCHING POINT TO POINT WIRING DIAGRAM.

HP-1 THRU HP-3:
1. EACH HEAT PUMP TO OPERATE ON THERMOSTAT IN SANCTUARY. EACH HEAT PUMP TO OPERATE IN SAME MODE, NO SIMULTANEOUS HEATING OR COOLING IN THE SANCTUARY.
2. EACH HEAT PUMP FAN TO OPERATE AND LOWEST SPEED WHEN THE ERV IS IN OPERATION AND THERE IS NO HEATING OR COOLING CALL.
3. SANCTUARY IS TO BE PROGRAMMED TO MEET THE SCHEDULE OF THE CHURCH SERVICES. OVER RIDE AT THE THERMOSTAT IS TO BE ALLOWED.
4. HP-1 THRU HEAT PUMP HP-3 TO COME OUT OF SET BACK AT 15 MINUTE INTERVALS. HEAT PUMPS TO CHANGE ORDER EVERY SIX MONTHS. COMMISSIONING AGENT TO DEVELOP PROTOCOL WITH CHURCH PERSONNEL ON THERMOSTAT PROGRAMMING.

HP-4:
1. HEAT PUMP TO OPERATE ON THERMOSTAT IN OFFICES.
2. HEAT PUMP FAN TO OPERATE AND LOWEST SPEED WHEN THE ERV IS IN OPERATION AND THERE IS NO HEATING OR COOLING CALL.
3. OFFICES IS TO BE PROGRAMMED TO MEET THE SCHEDULE OF THE OFFICES SERVICES. OVER RIDE AT THE THERMOSTAT IS TO BE ALLOWED.

HP-5 THRU HP-10:
1. EACH HEAT PUMP TO OPERATE ON THERMOSTAT LOCATED RESPECTIVE ZONE.
2. EACH HEAT PUMP FAN TO OPERATE AND LOWEST SPEED WHEN THE ERV IS IN OPERATION AND THERE IS NO HEATING OR COOLING CALL.
3. EACH ZONE IS TO BE PROGRAMMED TO MEET THE SCHEDULE OF THE ZONES SERVICES. OVER RIDE AT THE THERMOSTAT IS TO BE ALLOWED.
4. HP-5 THRU HP-8 ARE TO HAVE THE ELECTRIC STRIP HEAT USED AS SECOND STAGE. STRIP HEAT TO BE ENABLED WHEN DISCHARGE AIR TEMPERATURE DROPS BELOW 90 DEGREES F.
5. HP-5 THRU HEAT PUMP HP-10 TO COME OUT OF SET BACK AT 15 MINUTE INTERVALS. HEAT PUMPS TO CHANGE ORDER EVERY SIX MONTHS. COMMISSIONING AGENT TO DEVELOP PROTOCOL WITH CHURCH PERSONNEL ON THERMOSTAT PROGRAMMING.

ERV-1, ERV-3 THRU ERV-5:
ERV'S ARE TO BE CONTROLLED USING A HONEYWELL JADE CONTROLLER
1. ERV'S ARE TO BE ENABLED BY 0-10 VDC OUTPUT OF CO2 SENSOR LOCATED IN SPACE. CO2 SENSOR TO BE SET AT 800 PPM, SENSOR TO PRODUCE A MINIMUM OF 10% OF TOTAL RATED CFM, MAXIMUM CFM WHEN CO2 SENSOR IS 1200 PPM.
2. WHEN THE OUTSIDE AIR IS BELOW IS 70 DEGREES F AND THE RESPECTIVE ZONE IS CALLING FOR COOLING THE ERV IS TO ACT AS AN ECONOMIZER. ERV EXHAUST FAN TO OPERATE AT 10% OF RATED CFM, BYPASS DAMPER TO OPEN. WHEN THE OUTSIDE AIR IS AT 55 DEGREE F AND THERE IS A CALL FOR A COOLING, EXHAUST FAN TO OPERATE 100%.

ERV-2:
ERV TO BE CONTROLLED BY RENEWAIRE CO2-W
1. TO RUN WHEN THE CO2 SENSOR IN THE OFFICE ZONE CLOSES.

PUMP P-1:
PUMP CONTROLLED BY VFD DRIVE WITH INTEGRAL PID CONTROLLER FOR CONSTANT PRESSURE CONTROL.
1. TO RUN WHEN ANY OF THE HEAT PUMPS ARE TO BE ENABLED, STATUSED BY END SWITCH CLOSURE ON CONTROL VALVE.
2. PUMP TO RUN ON CONSTANT PRESSURE.

PUMP P-2:
PUMP CONTROLLED BY JOHNSON CONTROLS SYSTEM 450
1. TO RUN ON DELTA T, PUMP TO KEEP AN ABSOLUTE TEMPERATURE DIFFERENCE OF 5 DEGREES. PUMP SPEED TO INCREASE WHEN ABSOLUTE TEMPERATURE DIFFERENCE IS GREATER THAN 5 DEGREES.

REV 5.0

1 HEAT PUMP GROUND HEAT EXCHANGER DISTRIBUTION PIPING DETAIL

NOT TO SCALE

DETAILS

FANS

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	USAGE	FLUID: AIRFLOW RATE (CFM)	FLUID: STATIC PRESSURE (in. H20)	ELECTRICAL: MOTOR SPEED (RPM)	ELECTRICAL: MAX AMPS	ELECTRICAL: VOLT/PH/HZ	NOTES
EF-1	CAPTIVEAIRE / DU85HFA	ROOF	EXHAUST	1612	1.35	1494	2.6	208/3/60	1

NOTES:
1. PROVIDE ROOF CURB.

PUMP SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	USAGE	TYPE	FLUID: FLOW RATE (GPM)	PUMP: WORKING FLUID	PUMP: HEAD LOSS (FT)	PUMP: EFFICIENCY (%)	PUMP: CONSTRUCTION	PUMP: MOTOR SIZE (HP)	PUMP: MOTOR BHP (HP)	PUMP: MOTOR SPEED (RPM)	PUMP: ELECTRICAL VOLT/PH/HZ	NOTES
P-1	FLOWCENTER / GFM/AAPB 99-23	HEAT PUMP 1 CIRCULATOR	CIRCULATOR	18	20% ETHYLENE GLYCOL	30	-	CAST IRON	1.8 AMPS	-	-	230/1/60	1
P-2	FLOWCENTER / GFM/AAPB 99-23	HEAT PUMP 2 CIRCULATOR	CIRCULATOR	6	20% ETHYLENE GLYCOL	24	-	CAST IRON	1.8 AMPS	-	-	230/1/60	1
P-3	FLOWCENTER / GFM/AAPB 99-23	HEAT PUMP 3 CIRCULATOR	CIRCULATOR	18	20% ETHYLENE GLYCOL	30	-	CAST IRON	1.8 AMPS	-	-	230/1/60	1
P-4	FLOWCENTER / GFM/AAPB 99-13	HEAT PUMP 4 CIRCULATOR	CIRCULATOR	6	20% ETHYLENE GLYCOL	30	-	CAST IRON	0.9 AMPS	-	-	230/1/60	1
P-5	FLOWCENTER / GFM/AAPB 99-23	HEAT PUMP 5 CIRCULATOR	CIRCULATOR	10.5	20% ETHYLENE GLYCOL	30	-	CAST IRON	1.8 AMPS	-	-	230/1/60	1
P-6	FLOWCENTER / GFM/AAPB 99-23	HEAT PUMP 6 CIRCULATOR	CIRCULATOR	10.5	20% ETHYLENE GLYCOL	30	-	CAST IRON	1.8 AMPS	-	-	230/1/60	1
P-7	FLOWCENTER / GFM/AAPB 99-13	HEAT PUMP 7 CIRCULATOR	CIRCULATOR	15	20% ETHYLENE GLYCOL	20	-	CAST IRON	0.9 AMPS	-	-	230/1/60	1
P-8	FLOWCENTER / GFM/AAPB 99-13	HEAT PUMP 8 CIRCULATOR	CIRCULATOR	15	20% ETHYLENE GLYCOL	20	-	CAST IRON	0.9 AMPS	-	-	230/1/60	1
P-9	FLOWCENTER / GFM/AAPB 99-13	HEAT PUMP 9 CIRCULATOR	CIRCULATOR	12	20% ETHYLENE GLYCOL	18	-	CAST IRON	0.9 AMPS	-	-	230/1/60	1
P-10	FLOWCENTER / GFM/AAPB 99-13	HEAT PUMP 10 CIRCULATOR	CIRCULATOR	12	20% ETHYLENE GLYCOL	18	-	CAST IRON	0.9 AMPS	-	-	230/1/60	1
P-11	WILO/ STRATOS 3X3-40	GROUND HEAT EXCHANGER	CIRCULATOR	135	20% ETHYLENE GLYCOL	30	-	CAST IRON	1	1	-	230/1/60	1,3

NOTES:
1. 125# ANSI FLANGE, UNIT TO HAVE VFD CONTROL ON CONSTANT HEAD.
2. ALL PUMPS WITH FACTORY INSULATED COMPARTMENTS.
3. UNIT TO HAVE CONTROL ON DIFFERENTIAL TEMPERATURE, PUMP TO SPEED UP IF DIFFERENTIAL TEMPERATURE IS GREATER THAN 5°F.

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DUTY OF COOPERATION

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DENVER, CO 80222

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90% DD SET	3/9/16
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CONSTRUCTION SET	8/2/16
REV 1.0 CITY COMMENTS	10/18/16
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REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED
STEVEN FORRESTER
39316
PROFESSIONAL ENGINEER

Sheet Number:
M0.3

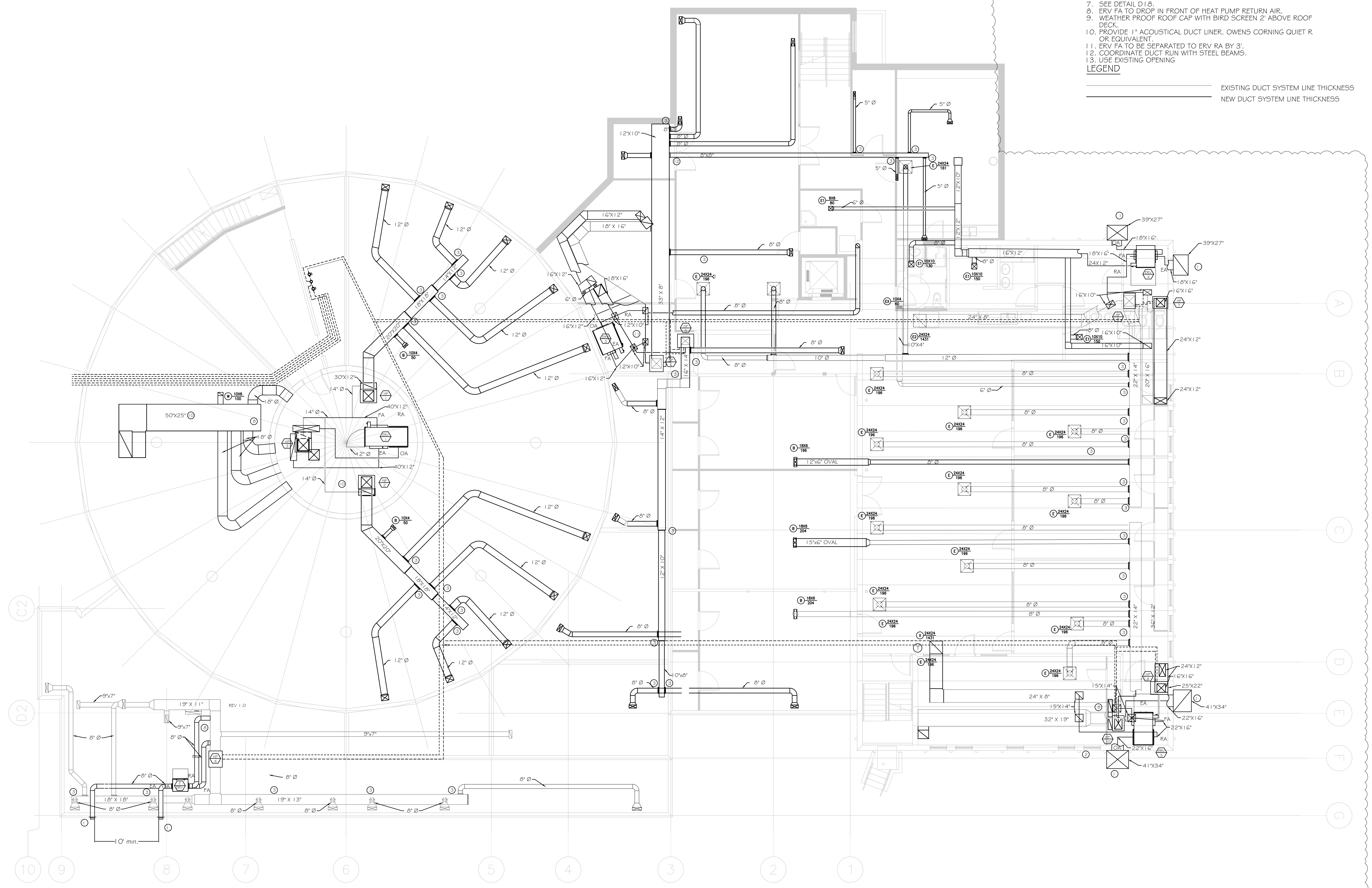
MECHANICAL KEYNOTES:

1. SEE ARCHITECTURAL DETAILS.
2. WINDOW MUST BE INOPERABLE.
3. SEE DETAIL D10.
4. TO BE 2' ABOVE GRADE.
5. DENOTES AREA TO CLEAR OF ANY INTAKE.
6. MECHANICAL ROOM TO BE THE RETURN AIR PLENUM. ALL EQUIPMENT IN THIS LOCATION TO BE PLENUM RATED.
7. SEE DETAIL D18.
8. ERV FA TO DROP IN FRONT OF HEAT PUMP RETURN AIR.
9. WEATHER PROOF ROOF CAP WITH BIRD SCREEN 2' ABOVE ROOF DECK.
10. PROVIDE 1" ACOUSTICAL DUCT LINER. OWENS CORNING QUIET R OR EQUIVALENT.
11. ERV FA TO BE SEPARATED TO ERV RA BY 3'.
12. COORDINATE DUCT RUN WITH STEEL BEAMS.
13. USE EXISTING OPENING

LEGEND

EXISTING DUCT SYSTEM LINE THICKNESS

NEW DUCT SYSTEM LINE THICKNESS



LOWER FLOOR MECH LAYOUT
SCALE: 1/8" = 1'

PLAN NORTH

DMA ENGINEERING

6606 W. 96th AVE
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REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED
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39316
PROFESSIONAL ENGINEER

Sheet Number:

M1.0

MECHANICAL KEYNOTES:

1. SEE ARCHITECTURAL DETAILS.
2. WINDOW MUST BE INOPERABLE.
3. SEE DETAIL D10.
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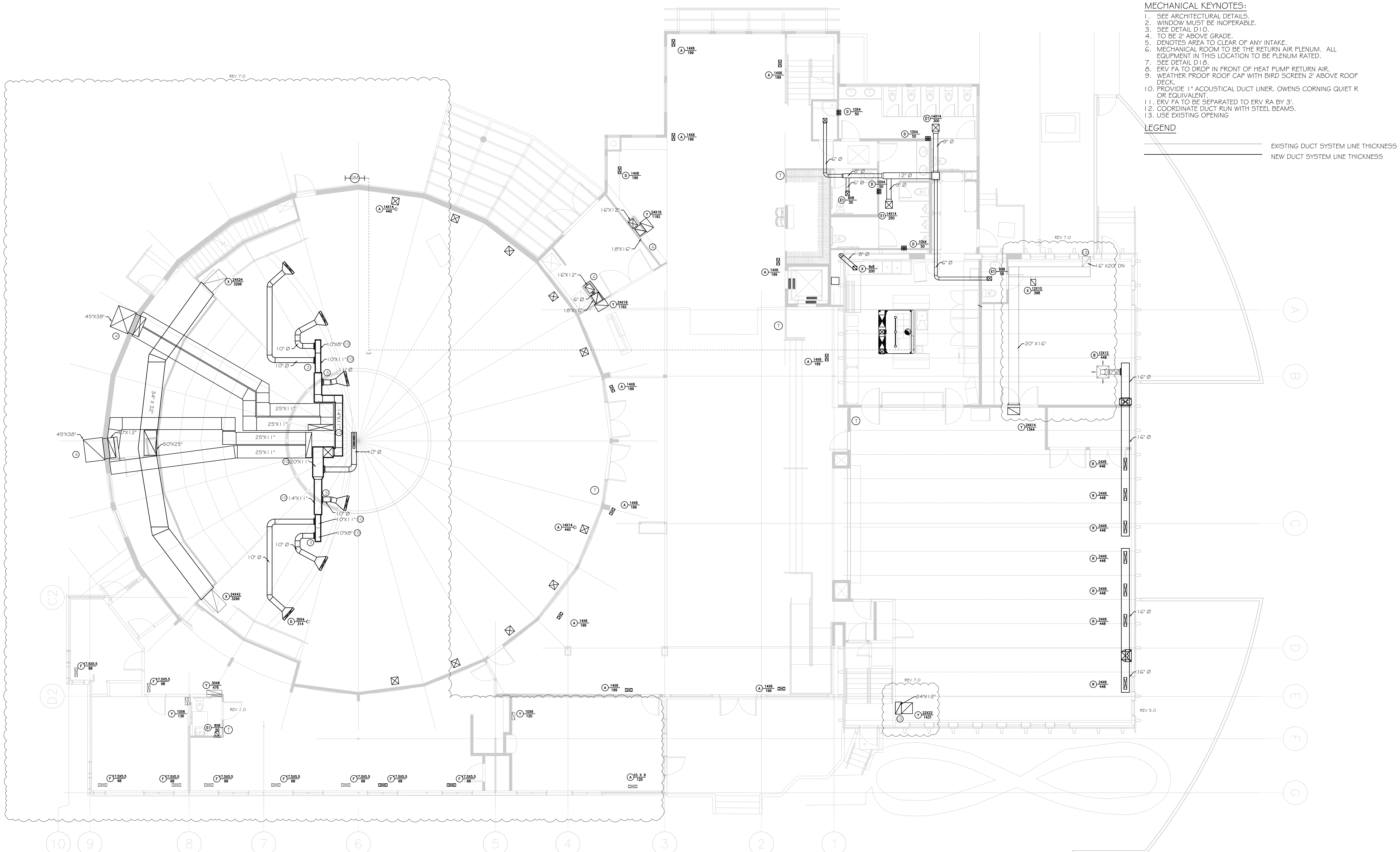
LEGEND

EXISTING DUCT SYSTEM LINE THICKNESS

NEW DUCT SYSTEM LINE THICKNESS



MAIN FLOOR MECH LAYOUT

SCALE: 1/8" = 1'

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REV 3.0 GREEN TEAM SUBMITTAL	1/26/17
REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

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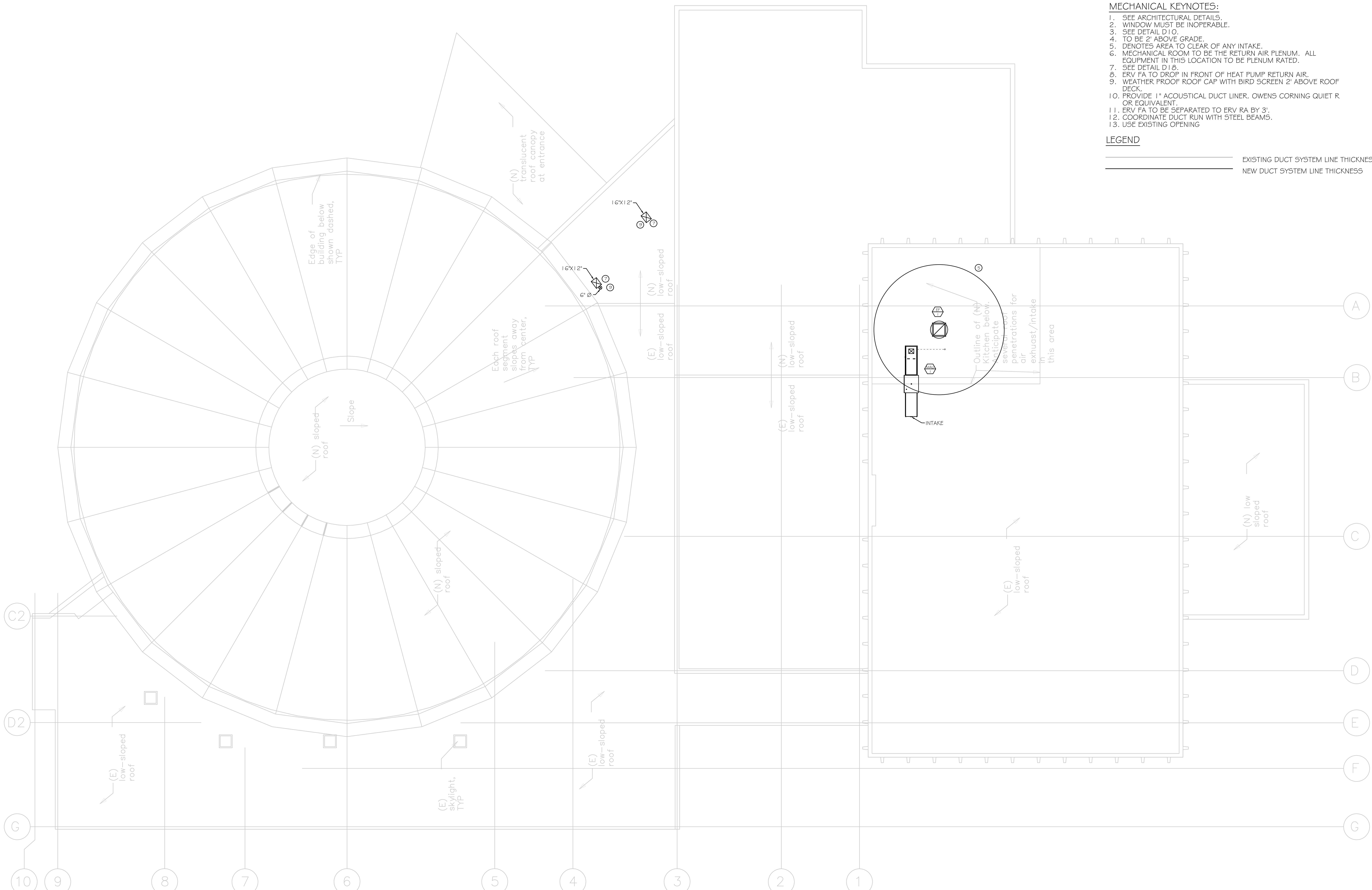
STEVEN FORRESTER
39316
PROFESSIONAL ENGINEER

Sheet Number :

M1.1



MECHANICAL KEYNOTES:

1. SEE ARCHITECTURAL DETAILS.
2. WINDOW MUST BE INOPERABLE.
3. SEE DETAIL D10.
4. TO BE 2' ABOVE GRADE.
5. DENOTES AREA TO CLEAR OF ANY INTAKE.
6. MECHANICAL ROOM TO BE THE RETURN AIR PLENUM. ALL EQUPMENT IN THIS LOCATION TO BE PLENUM RATED.
7. SEE DETAIL D18.
8. ERV FA TO DROP IN FRONT OF HEAT PUMP RETURN AIR.
9. WEATHER PROOF ROOF CAP WITH BIRD SCREEN 2' ABOVE ROOF DECK.
10. PROVIDE 1" ACOUSTICAL DUCT LINER. OWENS CORNING QUIET R OR EQUIVALENT.
11. ERV FA TO BE SEPARATED TO ERV RA BY 3'.
12. COORDINATE DUCT RUN WITH STEEL BEAMS.
13. USE EXISTING OPENING

LEGEND

EXISTING DUCT SYSTEM LINE THICKNESS

NEW DUCT SYSTEM LINE THICKNESS

ROOF MECH LAYOUT
SCALE: 1/8" = 1'

PLAN NORTH

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6606 W. 96th AVE
Westminster, Colorado 80021
(303) 732-5559
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ISSUE	Date:
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90% DD SET	3/9/16
90% CD SET	7/5/16
CONSTRUCTION SET	8/2/16
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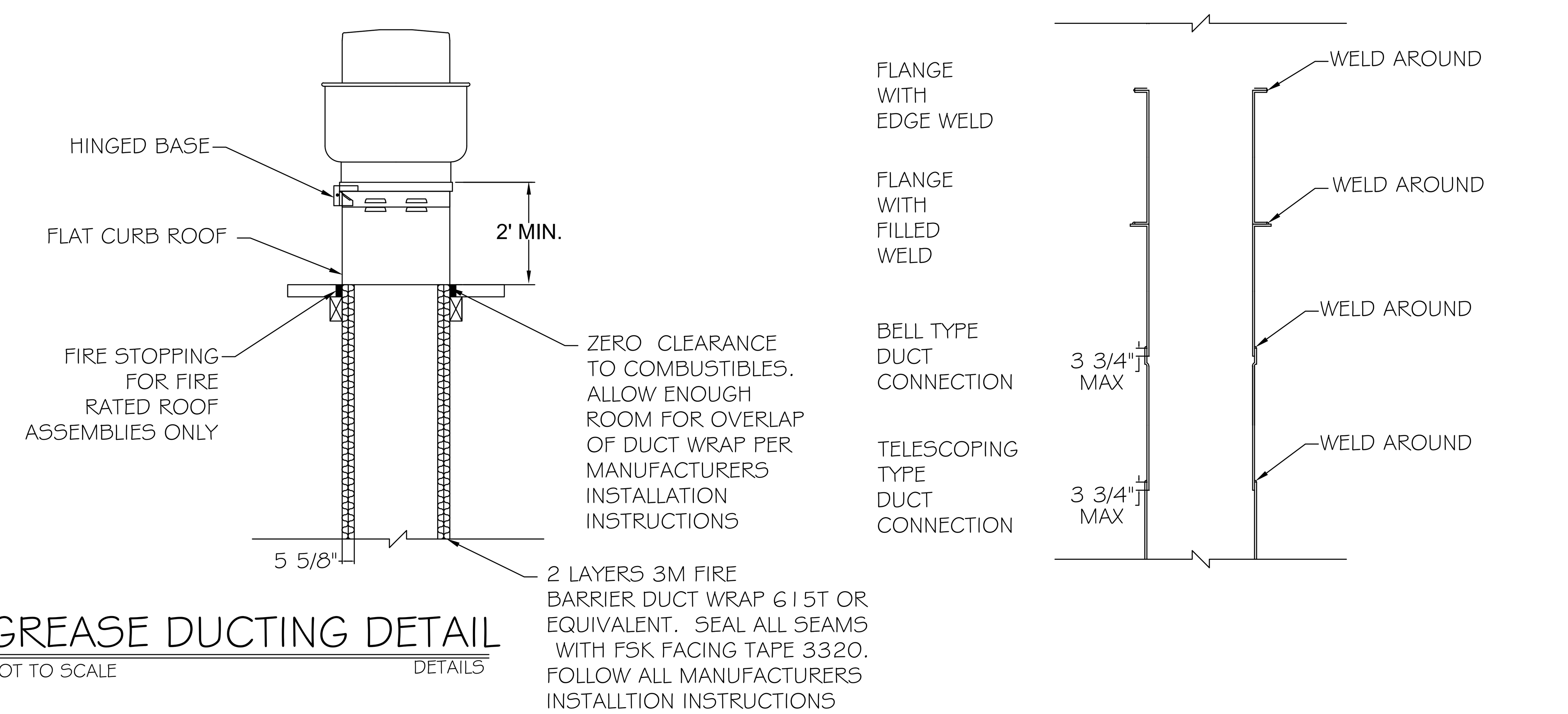
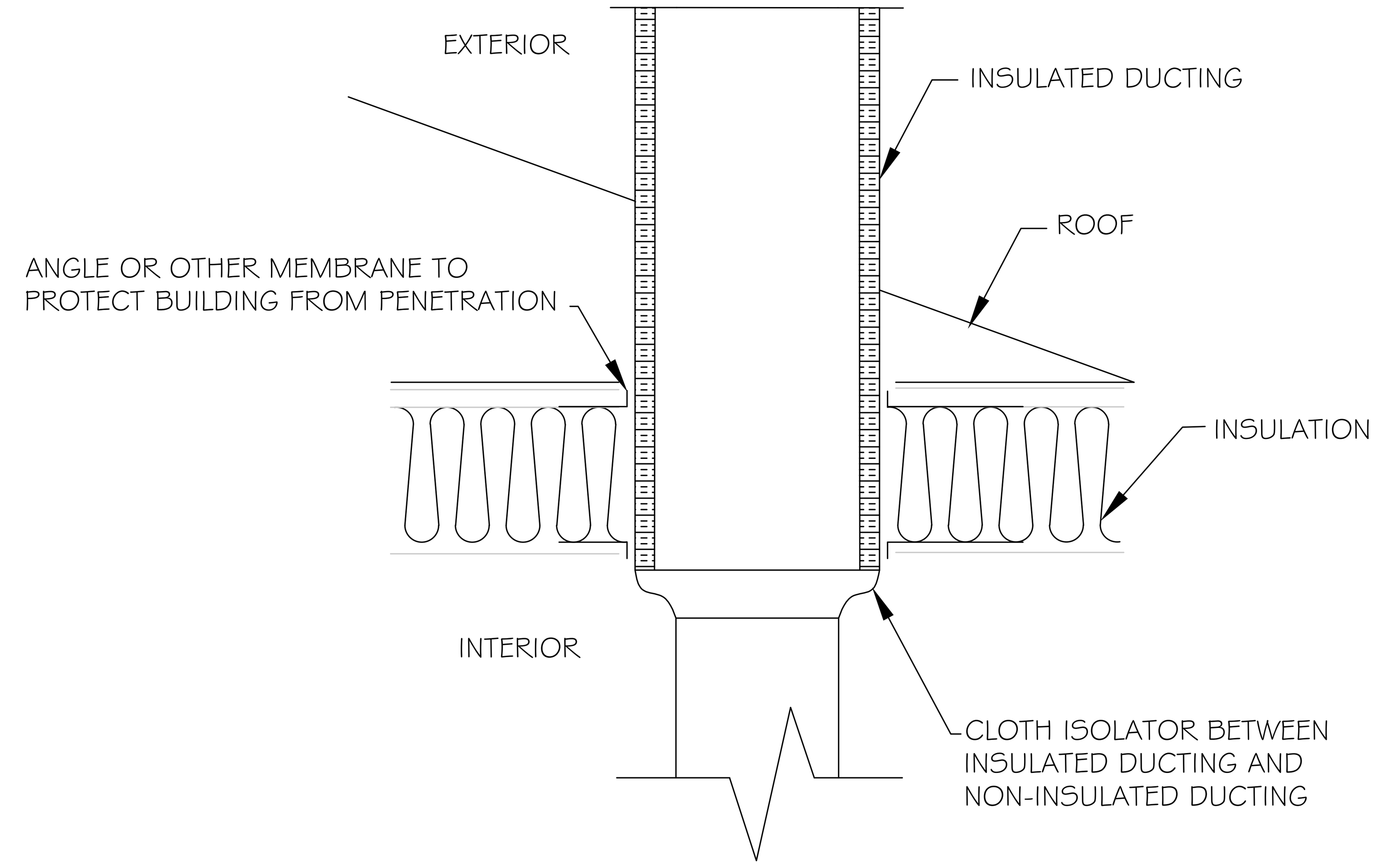
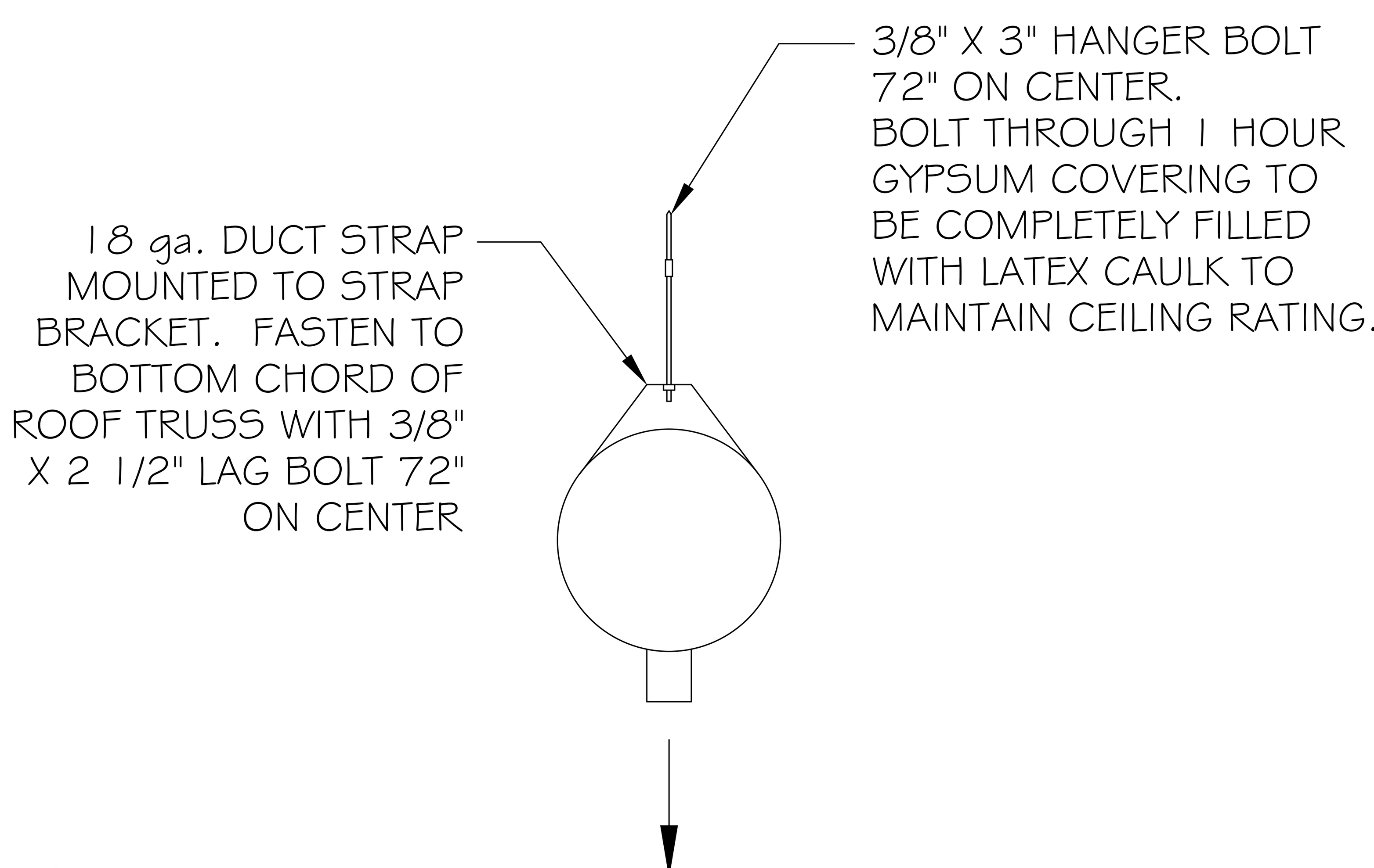


D16 GREASE DUCTING DETAIL
NOT TO SCALE DETAILS

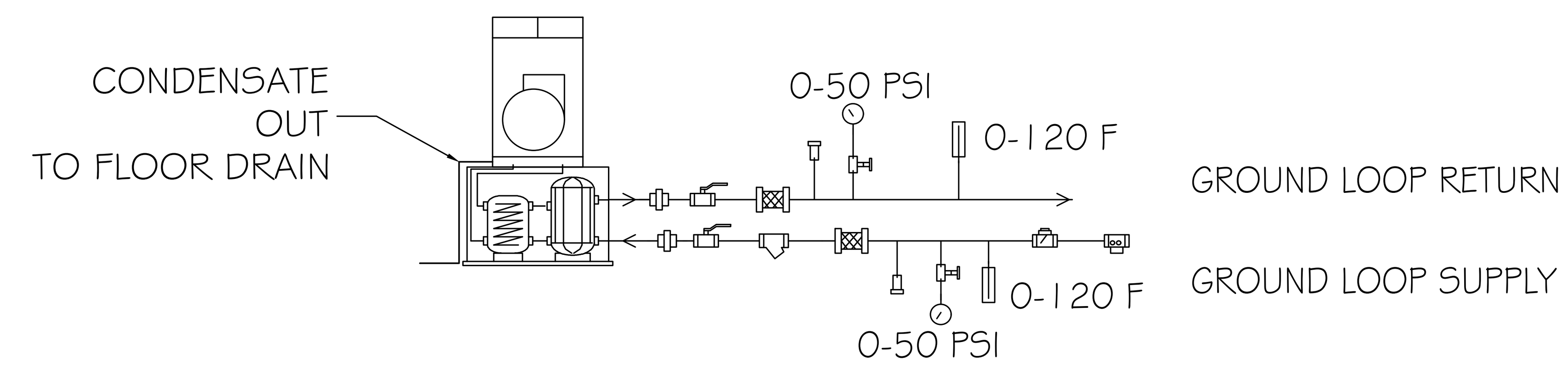


D18 ROOF DUCT PENETRATION DETAIL
NOT TO SCALE DETAILS

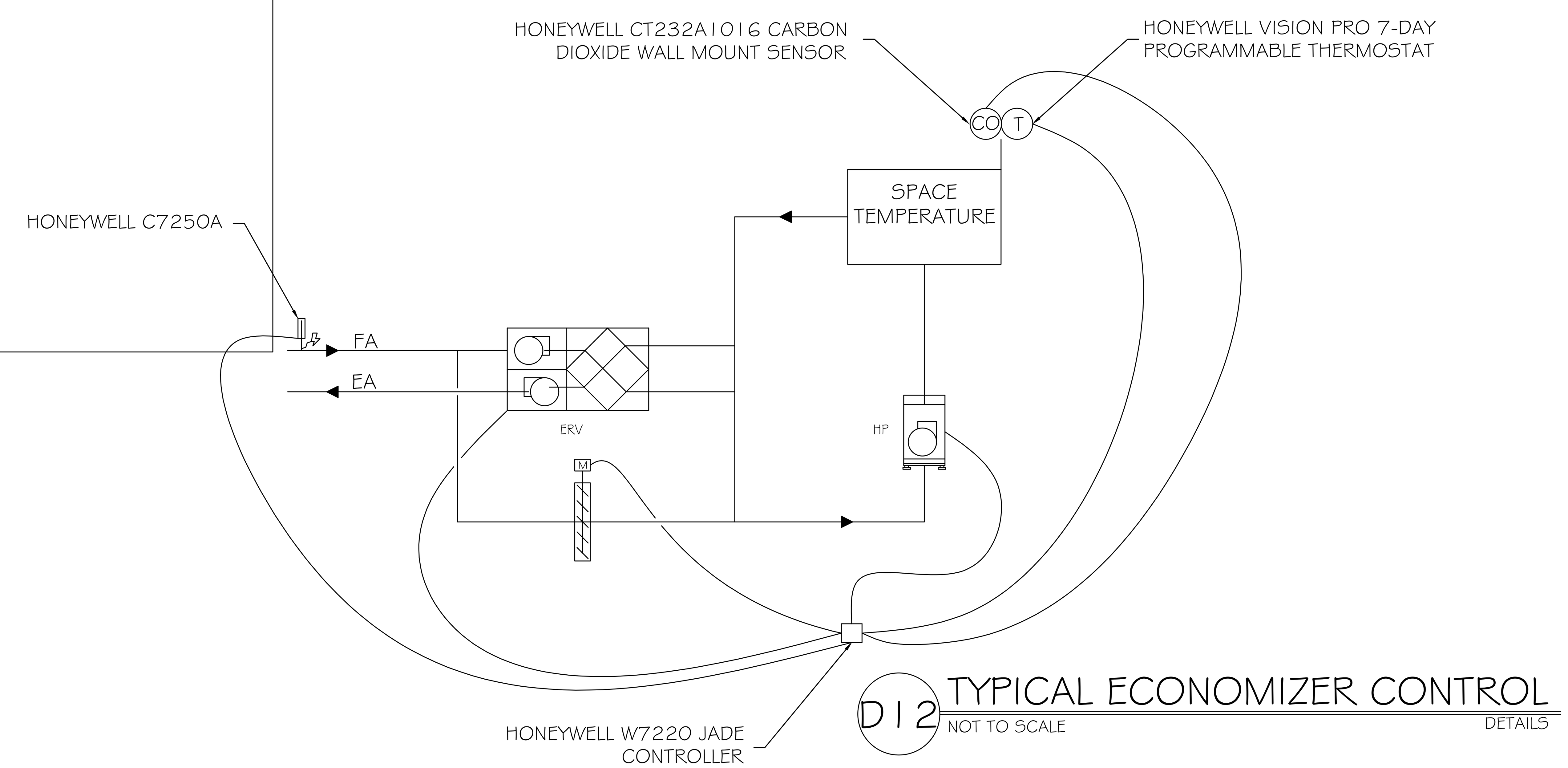


D15 EXPOSED ROUND DUCT HANGER
NOT TO SCALE DETAILS

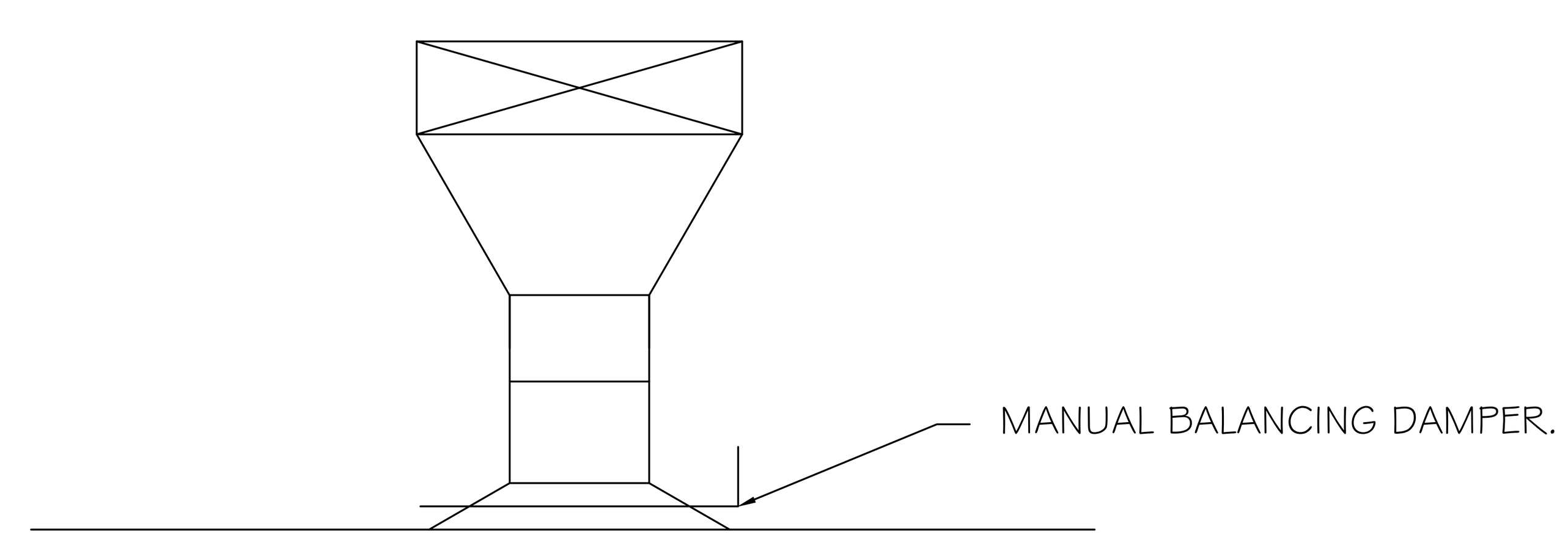
REV 5.0



H1 AIR TO WATER HEAT PUMP DETAIL
NOT TO SCALE DETAILS



D12 TYPICAL ECONOMIZER CONTROL
NOT TO SCALE DETAILS



D10 TYPICAL SUPPLY DUCT BRANCH DETAIL
NOT TO SCALE DETAILS

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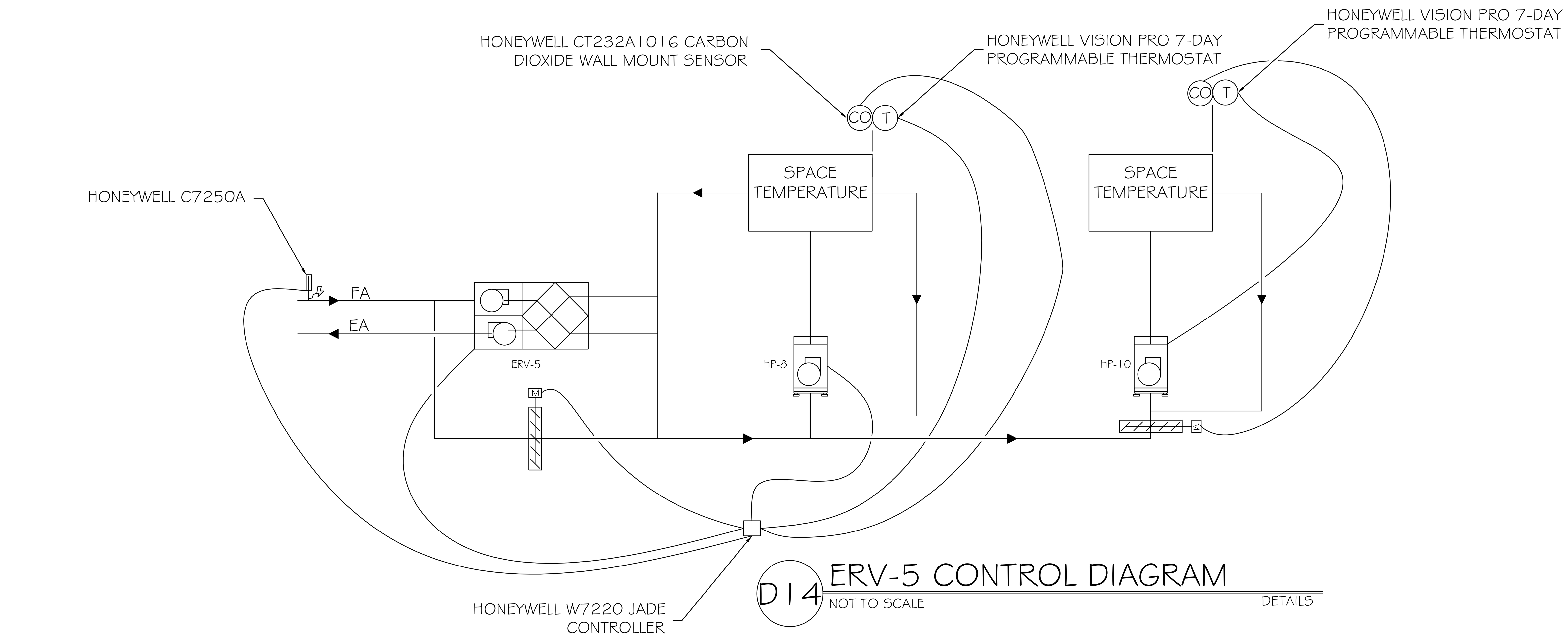
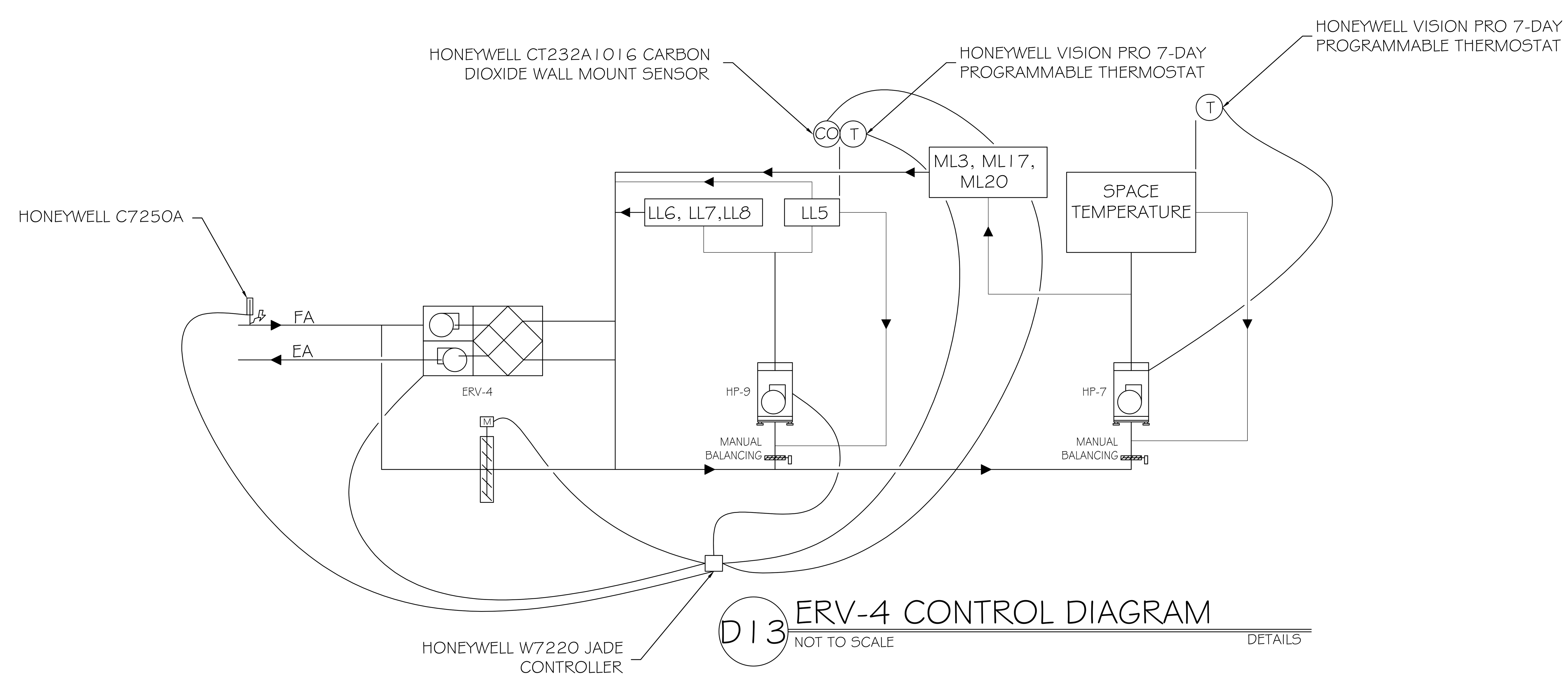


D14 ERV-5 CONTROL DIAGRAM
NOT TO SCALE
DETAILS



D13 ERV-4 CONTROL DIAGRAM
NOT TO SCALE
DETAILS

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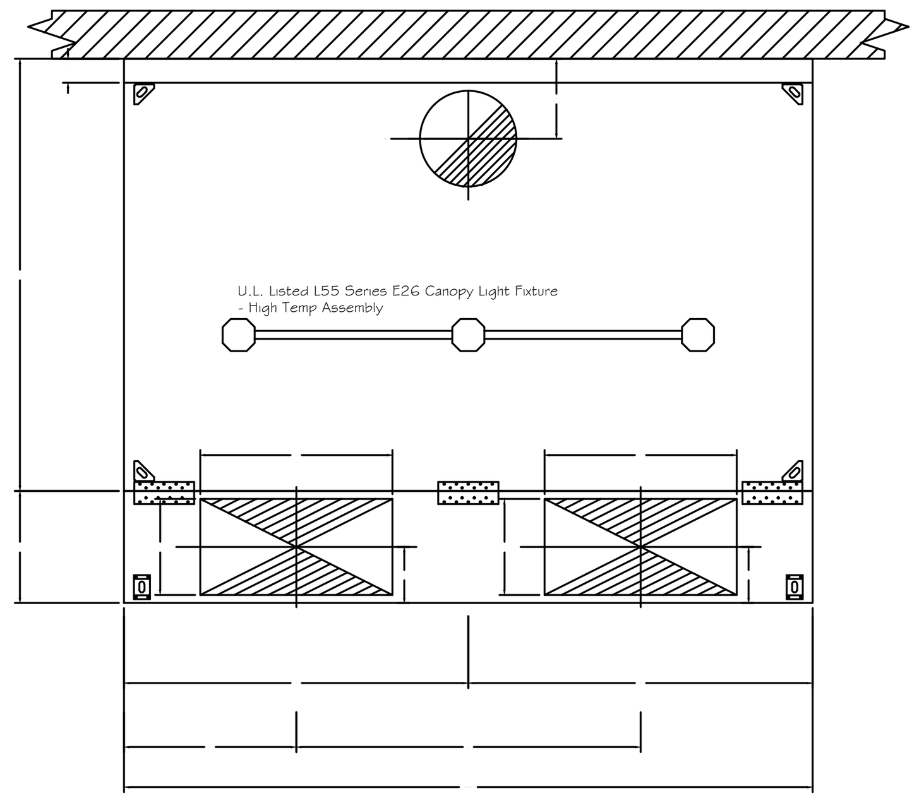
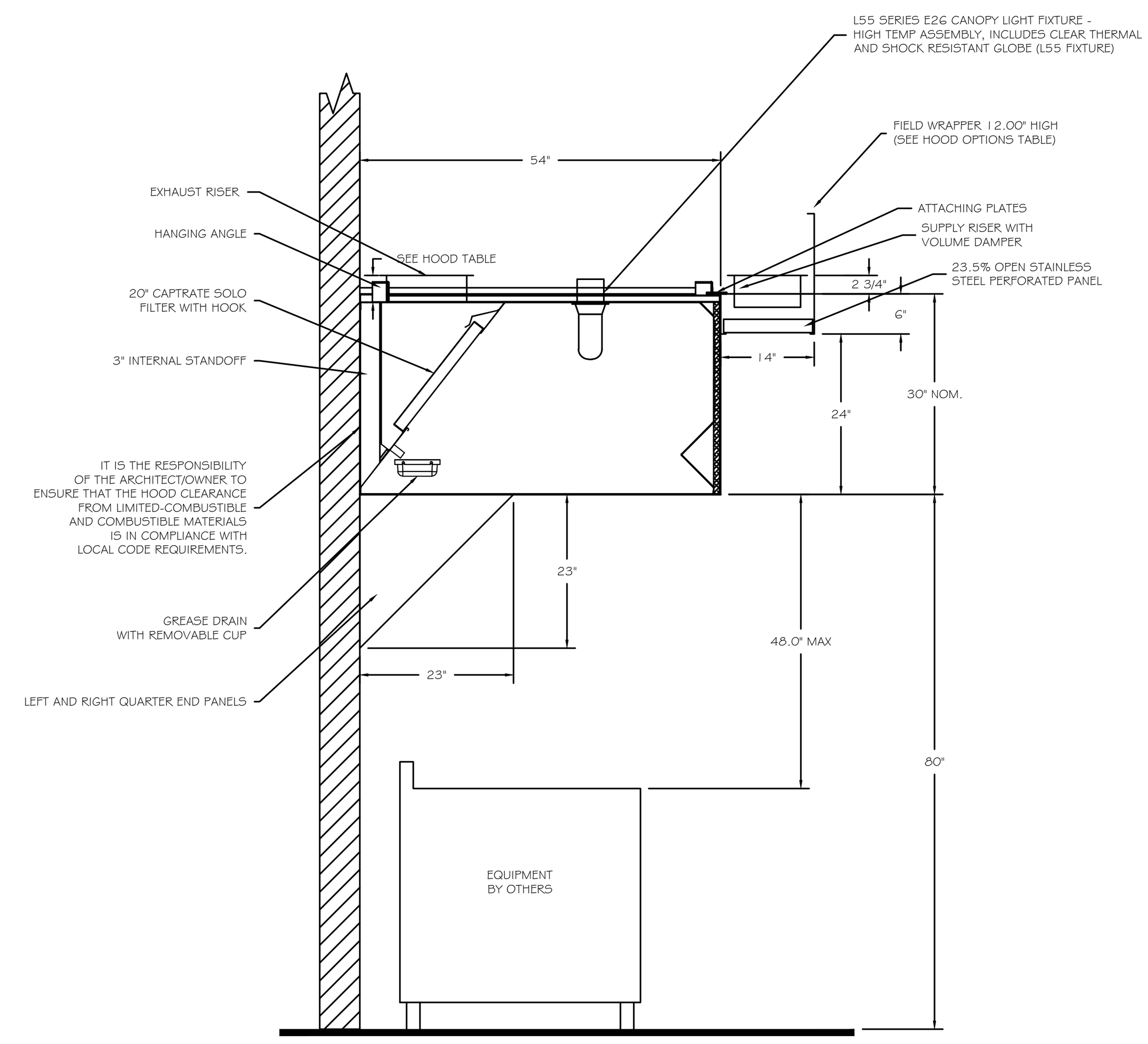


PLAN VIEW – Hood #1
7' 2.00" LONG 5430ND–2–PSP–F



SECTION VIEW – MODEL 5430ND–2–PSP–F
HOOD – #1

FOR QUESTIONS, CALL THE
COLORADO REGIONAL SALES OFFICE
6547 S. Racine Cir., Suite 1500, Centennial, CO 80111
PHONE: (720) 570-0981
FAX: (919) 227-5999

VERIFY CEILING HEIGHT

___' ___"

Height required to verify that the hood will fit and to size the enclosure panels

*** NOTE ***

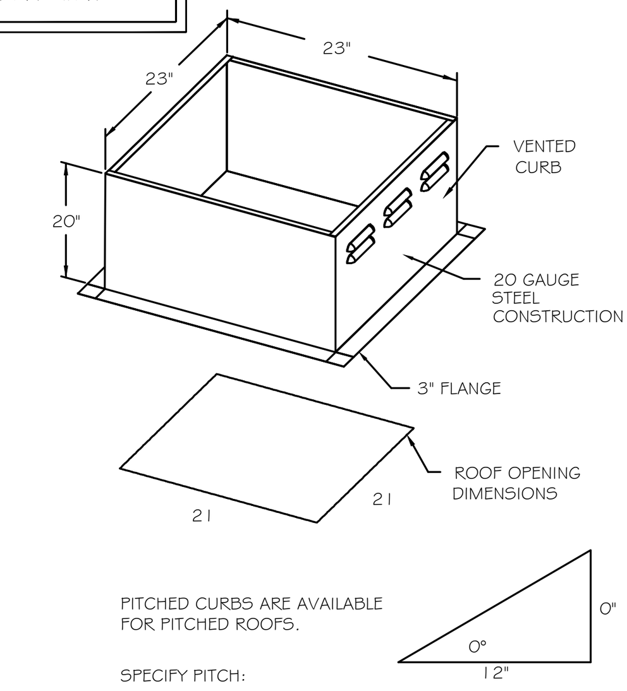
ALL WALLS AND STRUCTURES THAT COME WITHIN 18" OF HOOD MUST BE METAL STUDS AND SHEETROCK. WOOD STUDS OR ANY OTHER COMBUSTIBLE MATERIAL WITHIN 18" OF HOOD NOT ALLOWED

*** NOTE ***

HOOD MANUFACTURER RECOMMENDS NO RETURNS OR 4-WAY DIFFUSERS WITHIN 10 FEET OF HOOD IN ALL DIRECTIONS.

*** NOTE ***

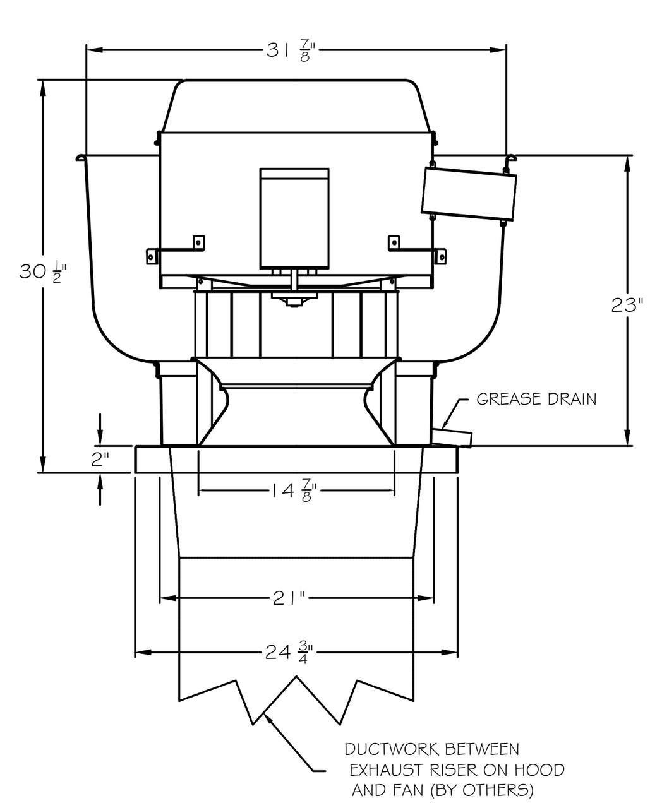
MAKE-UP AIR SHALL BE DELIVERED INTO SPACE IN MANNER THAT WILL NOT DISRUPT HOODS ABILITY TO CAPTURE AND CONTAIN.



PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.

SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE

FAN #1 DU85HFA - EXHAUST FAN



FEATURES:

- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS)
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL705 AND UL762
- VARIABLE SPEED CONTROL
- INTERNAL WIRING
- WEATHERPROOF DISCONNECT
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE)
- HIGH HEAT OPERATION 300°F (149°C)
- GREASE CLASSIFICATION TESTING

NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

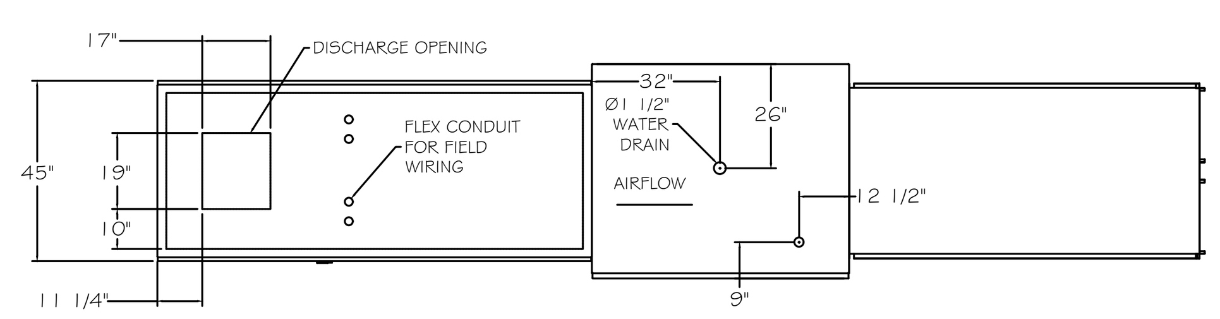
OPTIONS

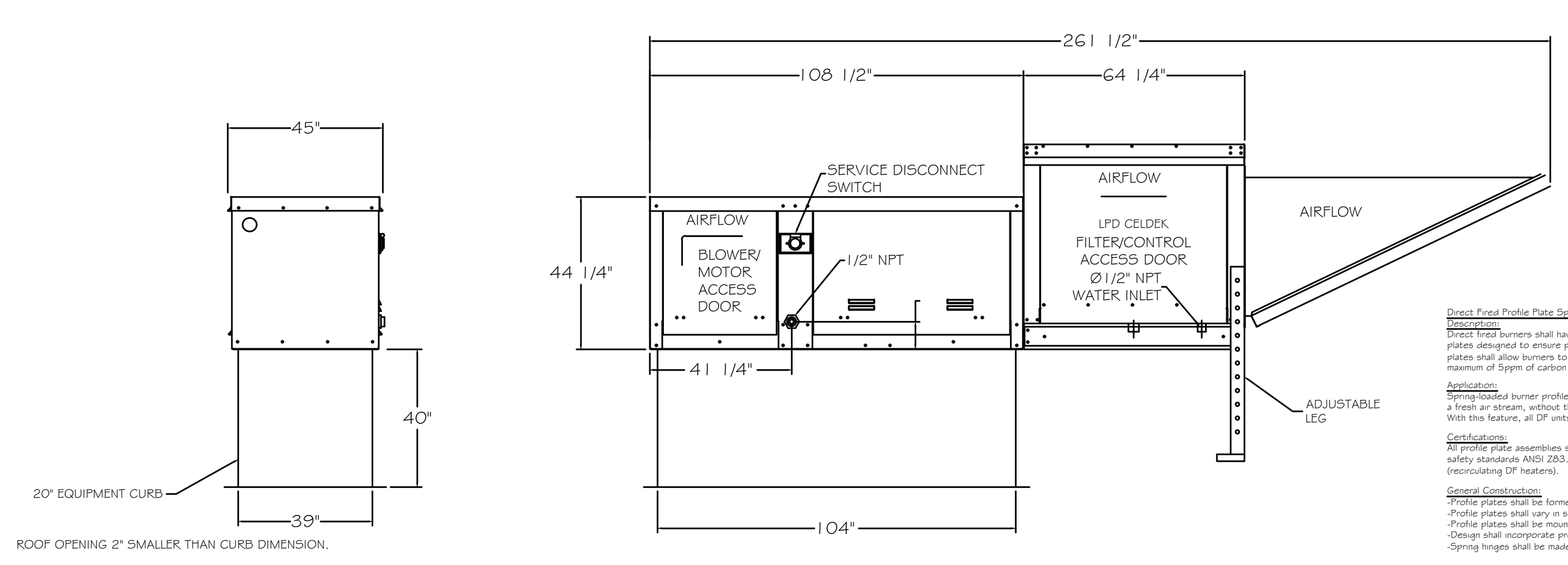
GREASE BOX
FAN BASE CERAMIC SEAL - FOR GREASE DUCTS

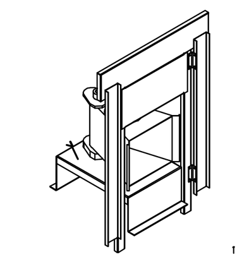
FAN #2 D76 - HEATER
1. LOW CFM DIRECT FIRED HEATER. BELT DRIVE.
2. EVAP COOLER (LPD CELDEK) – W/INTAKE HOOD W/EZ FILTERS
3. DOWN DISCHARGE - AIR FLOW RIGHT -> LEFT
4. COOLING INTERLOCK RELAY. 24VAC COIL. 120V CONTACTS. LOCKS OUT BURNER CIRCUIT WHEN AC IS ENERGIZED.
5. GAS PRESSURE GAUGE, 0-35", 2.5" DIAMETER, 1/4" THREAD SIZE
6. GAS PRESSURE GAUGE, -5 TO +15 INCHES WC., 2.5" DIAMETER, 1/4" THREAD SIZE
7. MOTORIZED BACK DRAFT DAMPER 13" X 17" FOR D76 COMPACT DIRECT FIRED HEATERS W/EXTENDED SHAFT, STANDARD GALVANIZED CONSTRUCTION, 3/4" REAR FLANGE, TF120S ACTUATOR INCLUDED
8. FREEZE PROTECTION DRAIN CONTROL KIT FOR EVAPORATIVE COOLERS. INCLUDES 3-WAY WATER SOLENOID VALVE 8316G064 (SHIPPED LOOSE), PRESSURE SWITCH INSTALLED UPSTREAM OF 2WAY SOLENOID IN UNIT, BRASS TEE, 2 NPT HALF INCH NIPPLES, AND TWO STAGE THERMOSTAT T678A-1015. FIELD WIRING REQUIRED BY OTHERS FOR 3-WAY VALVE. FOR BOTH CELDEK AND STANDARD V-BANK TYPE CONFIGURATIONS.

SUPPLY SIDE HEATER INFORMATION:

WINTER TEMPERATURE = 3°F. TEMP. RISE = 72°F.
BTUs CALCULATED OFF STANDARD AIR DENSITY
OUTPUT BTUs AT ALTITUDE OF 0.0 ft. = 100310
INPUT BTUs AT ALTITUDE OF 0.0 ft. = 109033

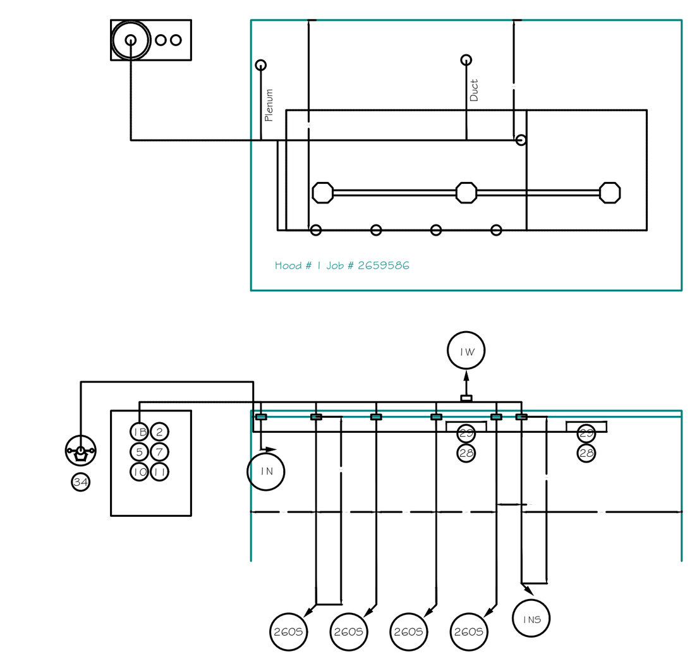


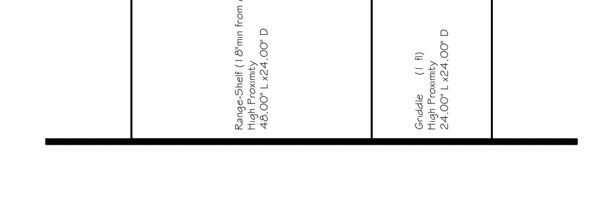




Direct Fired (DF) Profile Plate Assembly

Direct Fired Profile Plate Specifications:
Description:
Direct fired burners shall have patented (US Patent No.: US6629523B2), self-adjusting profile plates designed to ensure proper air velocity and pressure drop across the burner. Profile plates shall allow burners to achieve clean combustion by limiting by-product levels to a maximum of 5ppm of carbon monoxide (CO), and 0.5ppm of nitrogen dioxide (NO2).
Application:
Spring-loaded burner profile plates are engineered to automatically react to the momentum of a fresh air stream, without the need for any motors or actuators to mechanically adjust them. With this feature, all DF units are designed for demand control ventilation (DCV) requirements.
Certifications:
All profile plate assemblies shall be included in the DF unit's ETL listing and comply with combined safety standards ANSI Z83.4 and CSA 3.7 (non-recirculating DF heaters) and ANSI Z83.18 (recirculating DF heaters).
General Construction:
-Profile plates shall be formed from G90 galvanized steel.
-Profile plates shall vary in size per unit.
-Profile plates shall be mounted along the same plane as the discharge of the burner.
-Design shall incorporate properly torqued, permanently mounted spring hinges.
-Spring hinges shall be made from plated steel.





NOTES
- FIELD PIPE DROPS AS SHOWN
  SLEEVING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY CAS
- RELOCATE NOZZLES IF FLOW PATTERN IS BLOCKED BY SHELVING, SALAMANDERS, ETC.
- MAXIMUM 9 ELBOWS IN SUPPLY LINE.
- MINIMUM 72 INCHES OF AGENT LINE FROM TANK TO FIRST NOZZLE.
- IF APPLICABLE, PRE-PIPED CHARBROILER DROPS ARE SHIPPED LOOSE.
- FACTORY PIPING EXTENDS A MAXIMUM OF 6" ABOVE THE TOP OF THE HOOD.

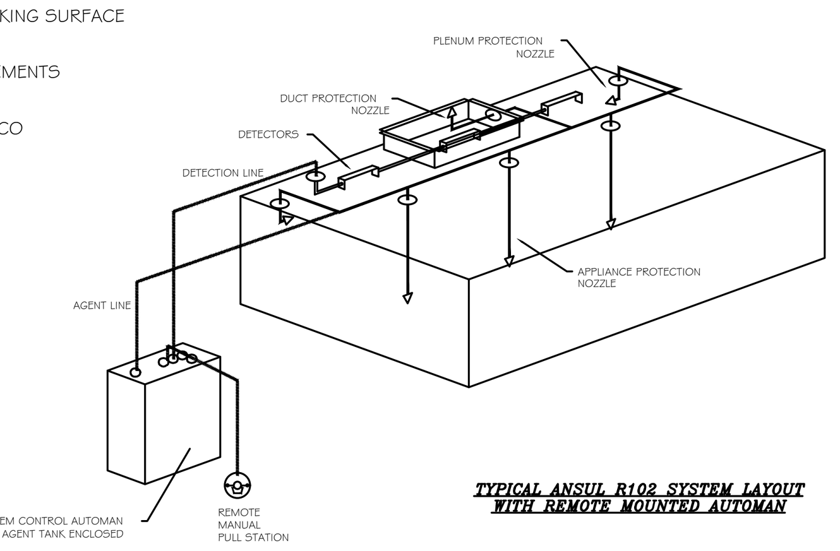
- APPLIANCE DIMENSIONS LISTED REPRESENT THE COOKING SURFACE SIZE, NOT THE OVERALL APPLIANCE SIZE.

- THIS FIRE SYSTEM COMPLIES WITH U.L. 300 REQUIREMENTS

Job #: 2659586
Job Name: First Universalist Church - Downtown Denver, CO
Drawn By:
System Size: ANSUL-3.0 Total FP required: 11
Hood # 1 7' 2.00" Long x 54" Wide x 30" High
Riser # 1 Size: 12" Dia.
Hood # 1 Metal Blow-Off Caps included.

LEGEND – WALL MOUNTED ANSUL SYSTEM

1A 1.5 GALLON TANK
1B 3.0 GALLON TANK
2 AUTOMAN RELEASE
3 3 GALLON TANK ENCLOSURE
3A 6 GALLON TANK ENCLOSURE
4 REGULATED ACTUATOR
5 ANSULEX LIQUID AGENT (3 GAL.)
6 ANSULEX LIQUID AGENT (1.5 GAL.)
7 CARTRIDGE (101-20)
8 CARTRIDGE (101-10)
9 CARTRIDGE (101-30)
9A CARTRIDGE (LT-A-101-30)
9B DOUBLE TANK CARTRIDGE
10 TEST LINK
11 DOUBLE MICROSWITCH
2W DUCT NOZZLE (419337)
1W NOZZLE ASSEMBLY (419336)
1F NOZZLE ASSEMBLY (419333)
1N NOZZLE ASSEMBLY (419335)
1/2N NOZZLE ASSEMBLY (419334)
3N NOZZLE ASSEMBLY (419338)
245 NOZZLE ASSEMBLY (419340)
230 NOZZLE ASSEMBLY (419339)
2120 NOZZLE ASSEMBLY (419343)
290 NOZZLE ASSEMBLY (419342)
260 NOZZLE ASSEMBLY (419341)
28 DETECTOR BRACKET
29 LOW TEMP FUSIBLE LINK
30 HIGH TEMP FUSIBLE LINK
MGV MECHANICAL GAS VALVE
EGV ELECTRICAL GAS VALVE
34 REMOTE MANUAL PULL STATION
S SWIVEL ADAPTOR



TYPICAL ANSUL R102 SYSTEM LAYOUT WITH REMOTE MOUNTED AUTOMAN

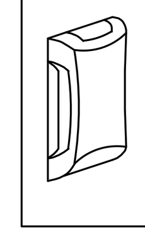
ELECTRICAL PACKAGES – Job#2659586

NO.	TAG	PACKAGE #	LOCATION	SWITCHES: LOCATION	SWITCHES: QUANTITY	OPTION	FANS CONTROLLED: TYPE	Φ	H.P.	VOLT	FLA
1		SC-31111OFP-VFDE	Wall Mount In SS Box	Face Mount Left Side of Hood	1 Light	Smart Controls Thermostatic Control	Exhaust	3	0.750	208	2.6
				Hood # 1	1 Fan		Supply	3	2.000	208	5.9

Hood Control Panel Specifications:

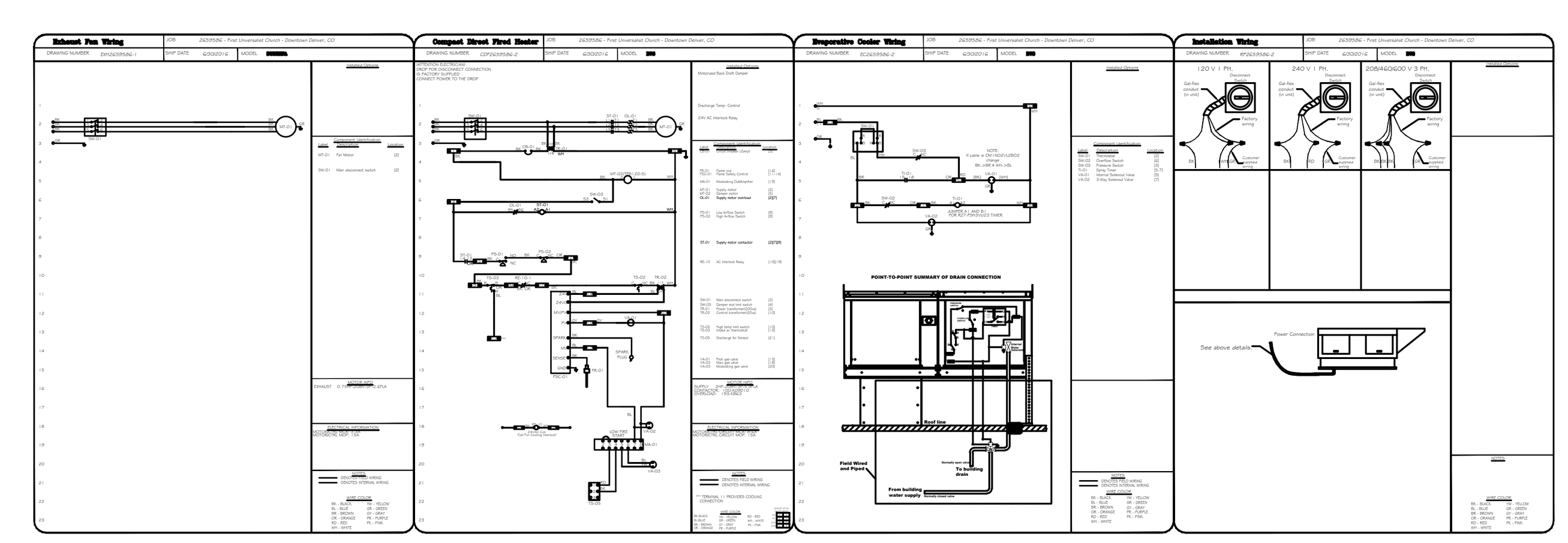
- Controls shall be listed by ETL (UL 508A)
- The control enclosure shall be NEMA 1 rated and listed for installation inside of the exhaust hood utility cabinet. The control enclosure may be constructed of stainless steel or painted steel.
- Temperature probe(s) located in the exhaust duct riser(s) shall be constructed of stainless steel.
- A digital thermostat controller shall be provided to activate the hood exhaust fans dynamically based on a +15 degree adjustable offset from the room temperature sensor. This function shall meet the requirements of IMC 507.2.1.1
- A digital thermostat controller shall provide adjustable hysteresis settings to prevent cycling of the fans after the cooking appliances have been turned off and/or the heat in the exhaust system is reduced.
- A digital thermostat controller shall provide an adjustable minimum fan run-time setting to prevent fan cycling.
- A digital thermostat controller shall disable the supply fan(s), activate the exhaust fan(s), activate the appliance shunt trip, and disable an electric gas valve automatically under the following conditions (as applicable):
  a. A fire condition is detected on a covered hood
  b. A safety sensor sends a signal to the hood control panel
- A digital thermostat controller shall allow for external BMS fan control via Dry Contact (external control shall not override fan operation logic as required by code).
- An LCD interface shall be provided with the following features:
  a. On/Off push button fan & light switch activation
  b. Integrated gas valve reset for electronic gas valves (no reset relay required)
  c. Fan starter overload trip detection with audible & visual alarm notification.
  d. Duct temperature sensor failure detection with audible & visual alarm notification
  e. Mis-wired duct temperature sensor detection with audible & visual alarm notification
  f. A single low voltage Cat-5 RJ45 wiring connection

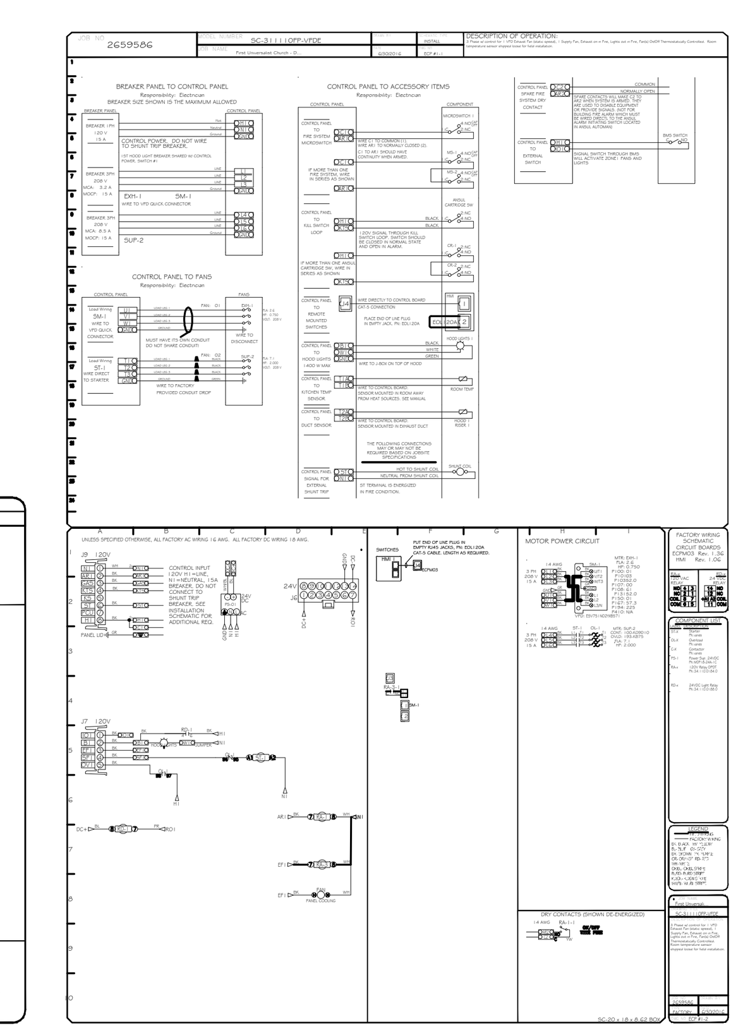
ROOM TEMPERATURE SENSOR



The Room Temperature sensor is a 10K Ohm Thermistor. The sensor provides constant room temperature to the controller. It should be installed on a wall somewhere in the space but not directly under the hood or close to an appliance so that the reading is not affected by heat.

Typically a system will have one room temperature sensor. However, systems configured with 2 fan zones have the option to be ordered with 2 room temperature sensors, one for each zone. They should be mounted in the space accordingly.





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info@dma-eng.com
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DUTY OF COOPERATION

Release of these plans contemplates further cooperation among the owner, the contractor, and the architect. Design and construction are complex. Although the architect and consultants have performed their services with due care and diligence, they cannot guarantee perfection. Communication is imperfect, and every contingency cannot be anticipated. Anyambiguity or discrepency discovered by the use of these plans shall be reported to the architect immediately. Failure to notify the architect compounds misunderstanding and increases construction costs. A failure to cooperate by a simple notice to the architect shall relieve the architect from responsibility for all consequences. Changes made from the plan without the consent of the architect are unauthorized, and shall relieve the architect from responsibility for all consequences arising out of such changes.

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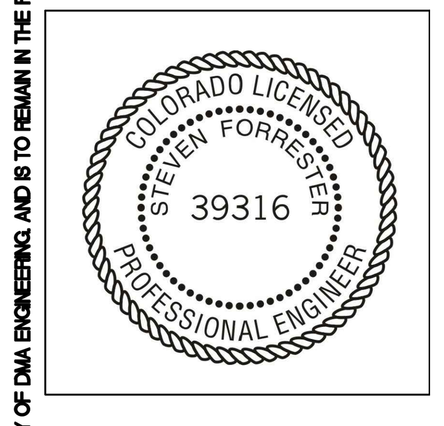


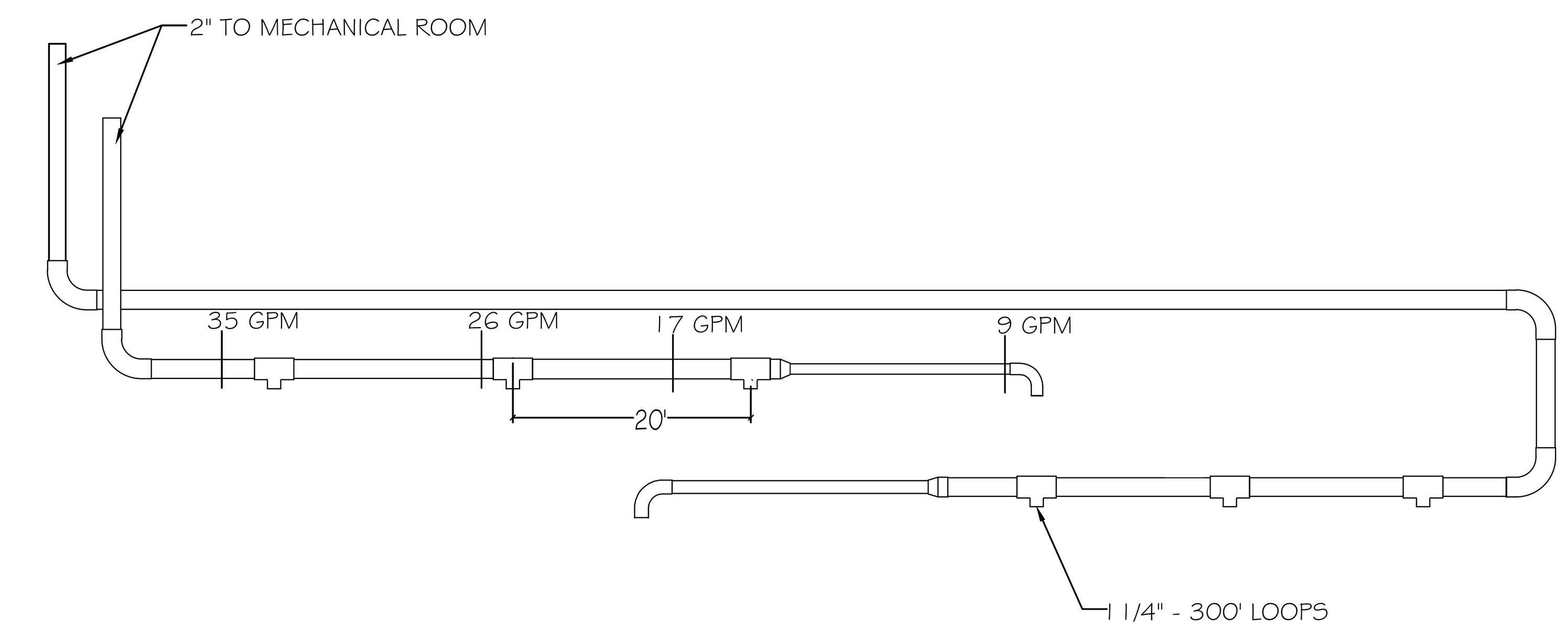
Sheet Number :

M2.2

NOTES:

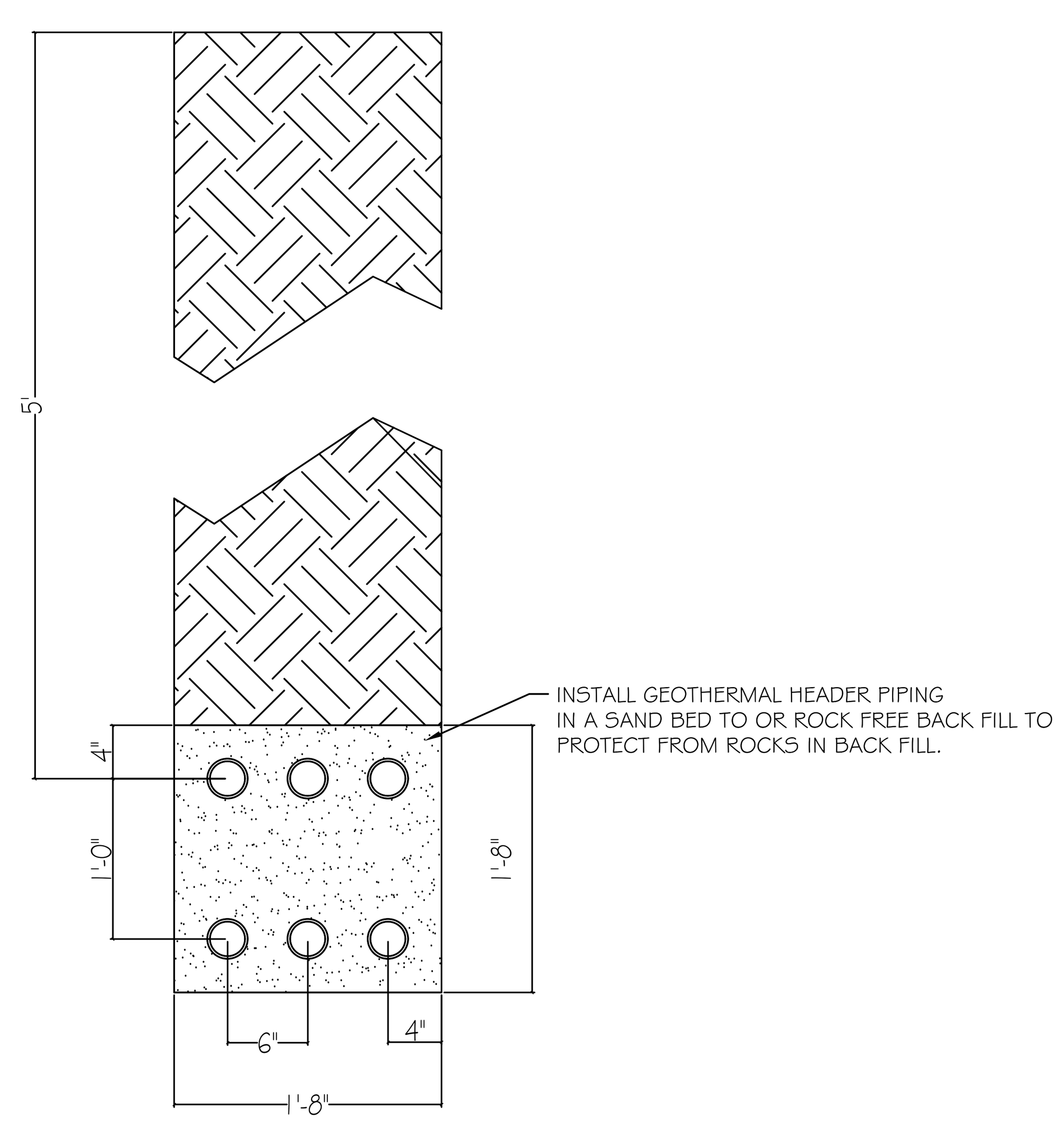
1. PIPE TO BE HDPE 3408 SDR 11.
2. ALL CONNECTIONS TO BE SOCKET FUSION TYPE.
3. USE SOCKET FUSION U-BENDS. VERTICAL U-TUBES TO BE PRESSURIZED WITH WATER TO 100 PSI FOR 24 HOURS BEFORE THEY ARE TO BE INSTALLED. TUBES TO REMAIN PRESSURIZED WHILE BEING INSTALLED.
4. BORE HOLES TO BE GROUTED WITH BENONITE SOLIDS ENHANCED GROUT. GROUT THERMAL CONDUCTIVITY TO BE GREATER THAN 0.8 BTU/HR*FT* GROUT TO HAVE A PERMEABILITY WITH A MINIMUM VALUE OF 1 X 10^-7 CM/S.
5. GROUT TO BE INSTALLED WITH THE USE OF A TREMIE. GROUT MUST BE INSTALLED FROM THE BOTTOM UP. GROUT MUST FILL ALL AREAS OF THE BORE NOT OCCUPIED BY PIPE. GROUT MUST DISPLACE ALL CUTTING FLUIDS FROM THE BORE.
6. CONTRACTOR TO REMOVE ALL CUTTINGS FROM DRILLING SITE AND DISPOSE PER LOCAL AND NATIONAL CODES.
7. BORE HOLE TO HAVE THE FIRST 5 FEET SEALED WITH A BENTONITE GROUT OR WITH ENHANCED GROUT IF THE PERMEABILITY OF THE GROUT IS GRAEATER THAN THE BENTONITE.
8. AFTER PIPE IS HEADER TOGETHER THE ENTIRE ASSEMBLY TO BE PRESSURE TESTED TO 100 PSI AND HOLD PRESSURE FOR 24 HOURS BEFORE BEING BACK FILLED.
9. CONTRACTOR TO FILE BORING LOG WITH THE STATE ENGINEERS OFFICE.
10. GROUND LOOP TO BE FILLED WITH A 25% DYNALENE OR EQUIVALENT GEOGLYCOL SOLUTION. SYSTEM VOLUME IS APPROXIMATELY 600 GALLONS.

NOTE:
1. TYPICAL HEADER LAYOUT PER ROW OF BOREHOLES
2. FLOWS SHOWN ARE MINIMUM TO ACHIEVE ADEQUATE AIR PURGE PER ROW OF BORE HOLES.



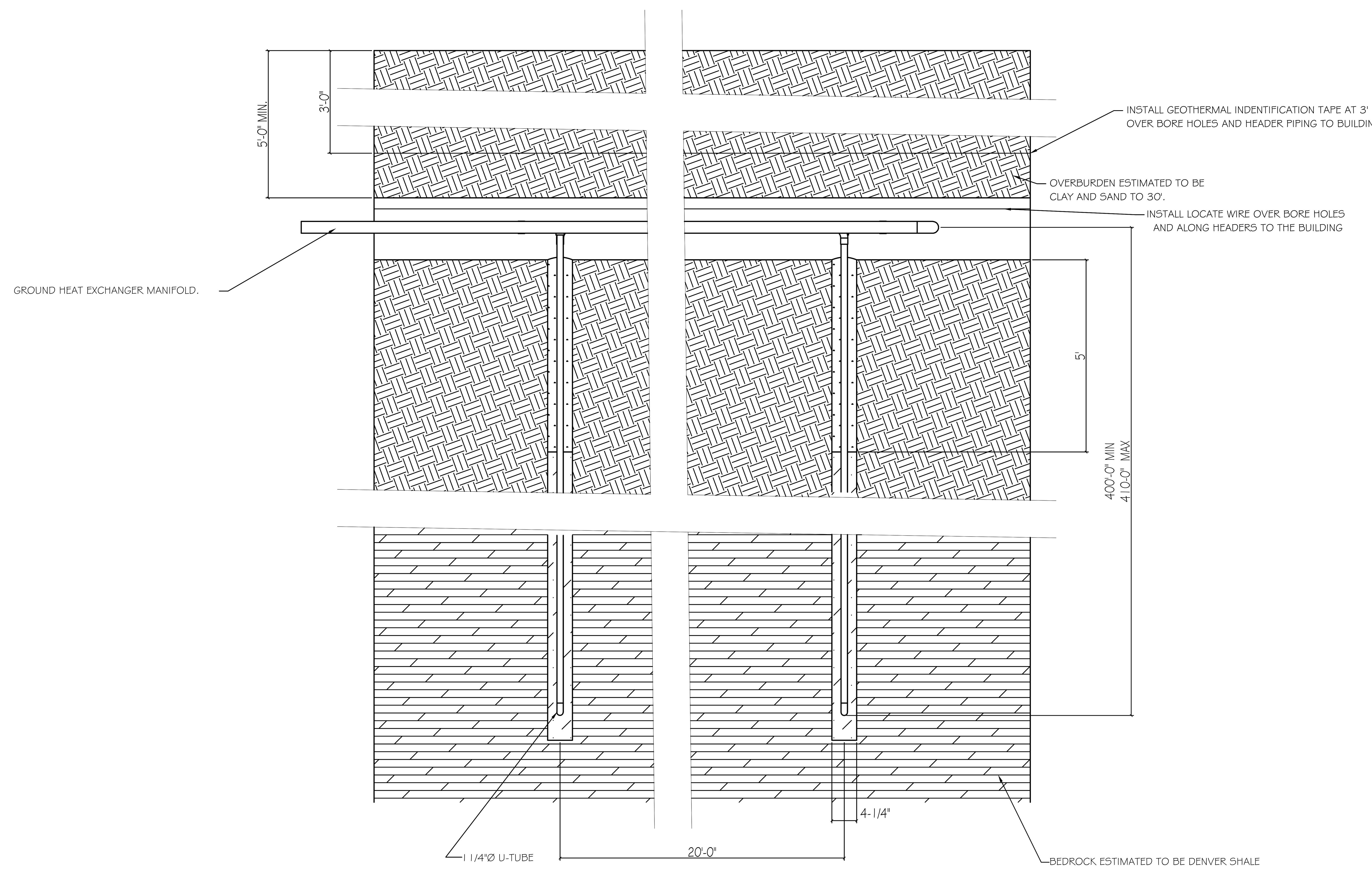
GROUND HEAT EXCHANGER MANIFOLD

NOT TO SCALE DETAILS



GROUND HEAT EXCHANGER TRENCH DETAIL

NOT TO SCALE DETAILS



GROUND HEAT EXCHANGER SECTION

NOT TO SCALE DETAILS

DMA ENGINEERING
6606 W. 96th AVE
Westminster, Colorado 80021
(303) 732-5559
info@dma-eng.com
www.dma-eng.com

DUTY OF COOPERATION

FIRST UNIVERSALIST CHURCH OF DENVER

4101 EAST HAMPDEN AVENUE DENVER, CO 80222

Drawn By:	Checked By:
SPF	--

ISSUE	Date:
80% DD SET	2/25/16
90% DD SET	3/9/16
90% CD SET	7/5/16
CONSTRUCTION SET	8/2/16
REV 1.0 CITY COMMENTS	10/18/16
REV 2.0 SEWER USE	1/26/17
REV 3.0 GREEN TEAM SUBMITTAL	1/26/17
REV 4.0 PLUMBING REVISONS	2/3/17
REV 5.0 SOUTH WALL DUCT	3/2/17
REV 6.0 PLUMBING REROUT	3/6/17
REV 7.0 DUCTING REVISION	5/10/17

COLORADO LICENSED STEVEN FORRESTER 39316 PROFESSIONAL ENGINEER

Sheet Number :

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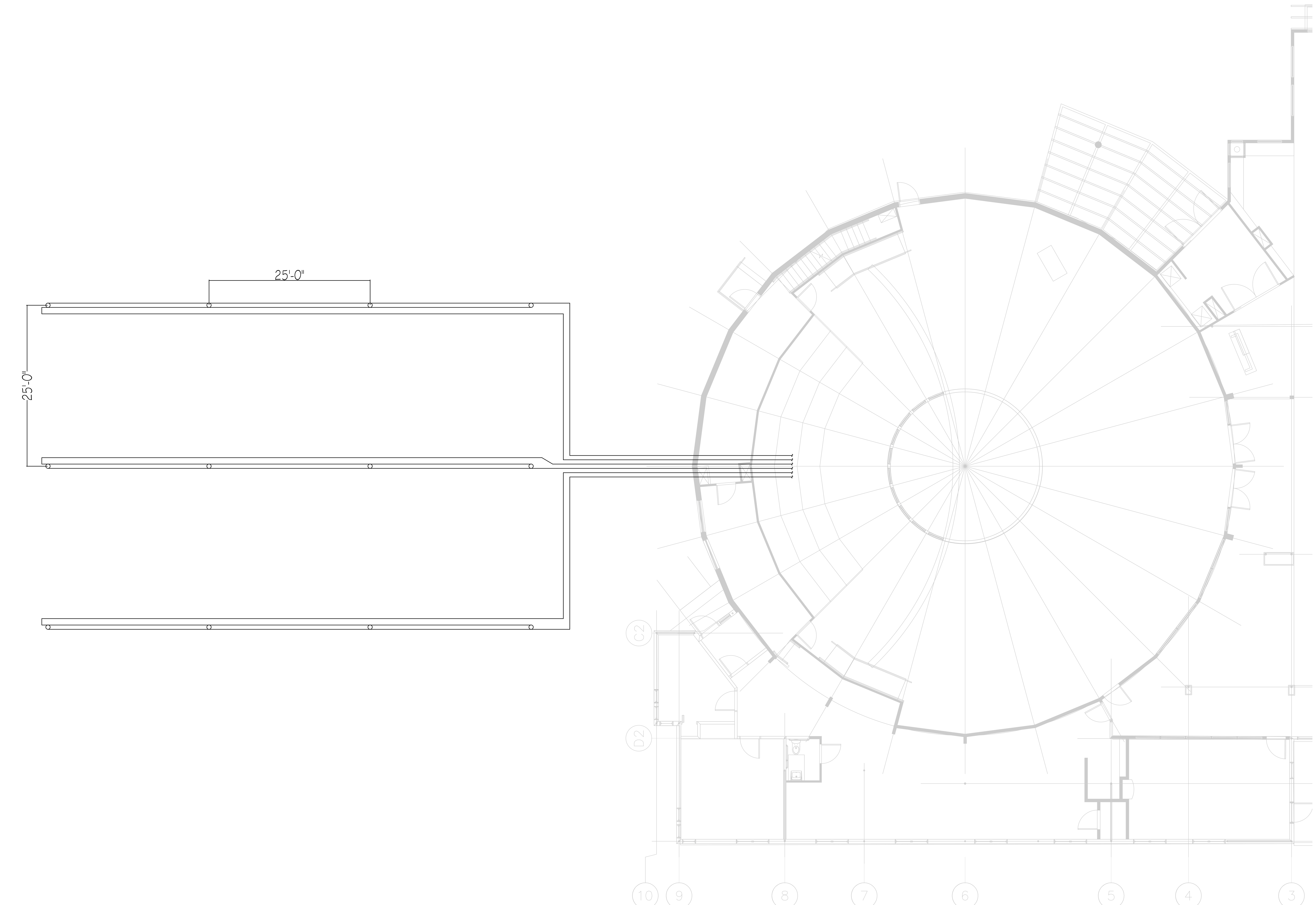

GROUND HEAT EXCHANGER LAYOUT

SCALE: 1/8" = 1'

PLAN NORTH

DMA ENGINEERING

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Sheet Number:

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