Air Systems and Equipment

1. Balancing dampers shall be provided at all supply, return, exhaust and fresh air ducts. Balancing dampers shall be adequate to provide the air balance indicated on the drawings.
2. Prior to occupancy, the HVAC Contractor shall provide the Engineer a complete air balance report. Report shall be in accordance with and formatted similar to standard report formats by NEBB or AABC. The document shall be retained at the site and shall be made available to the department upon request.
3. Provide turning vanes in ductwork only where shown on the drawings.
4. Provide access doors at all coils, fire dampers, smoke dampers, comb. fire&smoke dampers, gravity or motorized dampers.
5. Provide appropriate condensate removal for all cooling coils and high efficiency condensing-type heating equipment. This may require a "little giant" condensate pump and tubing. Verify the final plumbing arrangement and condensate drainage requirements with the Plumbing Contractor prior to start of work.
6. Provide the Owner or Owner's designated representative with complete training on all systems, temperature controls and standard maintenance requirements.
7. Provide the Owner and the Engineer with complete, bound, operations and maintenance manuals prior to request for final payment.
8. Any equipment subsitiutions made the HVAC Contractor shall be approved by the Engineer prior to purchase and installation. All equipment shall be by a major manufacturer of the equipment type in question, and shall meet or exceed all performance requirements noted on the drawings. In some special instances, substituions will be closely controlled and some equipment will not be approved. These items are noted on the drawings.
9. The HVAC Contractor is responsible for coordinating all equipment and space requirements with all the other contractors prior to start of construction. This includes the General Contractor, Fire Protection Contractor, Plumbing Contractor, Electrical Contractor and any medical equipment or kitchen equipment suppliers.
10. The Successful HVAC Contractor shall Provide SIX (6) copies of shop drawings to the Architect / Engineer on the following equipment for approval prior to installation or purchase: Furnaces, Air Conditioners, Exhaust Fans, Thermostats, Louvers, Grilles & Diffusers. Include the name of the supplier, suppliers phone number and the contact person at the suppliers office.
11. The HVAC Engineer will provide not more than SIX sets of drawings to the successful contractors. Additional copies will be provided for a modest fee.
12. Contractor to install and adjust equipment according to manufacturer's guidelines.
13. Vent all exhaust fans to exterior of building.
14. Owner to maintain and service hvac equipment according to manufacturer's guidelines or more often if conditions warrant.
15. Annular space created by penetrations in rated assemblies to be filled with approved material (fire caulk, etc.).
16. Doors marked with a "UC" designation to be undercut 3/4" minimum.
17. The designation "FD" indicates **1.5 hour fire damper**. The designation "CRD" indicates **ceiling radiation damper**.

Ductwork

1. All supply, return, exhaust, fresh air and mixed air ductwork shall be sealed in accordance with the 2015 IECC regardless of actual duct pressure class. All longitudinal & transverse joints, seams, & connections to be securely fastened in complete compliance with the requirements of the 2015 IECC.
2. Supply and Return ductwork insulation may be either internal duct liner, or external wrap, as appropriate, or unless specifically noted on the drawings.
3. Fresh air and mixed air ductwork may only be insulated externally, and may not be insulated with ductliner.
4. Where ductwork is insulated with ductliner, the final sealed sheetmetal ductwork shall serve as the vapor barrier.
5. All ductwork shall be sheet metal constructed in accordance with SMACNA duct construction standards.
Ductboard is not acceptable.
6. Flexible ductwork to grilles and diffusers, or used as a short connector for outside air or exhaust air, shall not be more than **8'-0"** in length.
7. Flexible ductwork shall be Hart & Cooley or approved equal with fiberglass insulation, fiberglass reinforced metalized vapor barrier, and wire helix support core.
8. All branch ducts for all services shall be tapped from the main duct using either an Acme HET or a bellmouth fitting. All
takeoffs shall have a balancing damper at the take-off, unless noted otherwise.
9. All duct dimensions are clear inside dimensions. Actual installed duct size shall reflect the clear inside dimensions shown. Sheetmetal size shall be increased to reflect any duct liner insulation.
10. All duct dimensions are as intended for bidding. If the HVAC Contractor needs to make changes to the duct dimensions
to accommodate construction site conditions, the ductwork dimensions may be changed so long as the revised dimensions provide equal performance as calculated by using a Ductulator Duct Size Calculator.

Gas Piping

1. Gas piping shall be Schedule 40 black steel.
2. Gas piping 2" and smaller shall use threaded fittings.
3. Gas piping 3" and larger shall be all welded fittings.
4. Gas piping shall be sized and installed in accordance with the 2015 International Fuel Gas Code, as amended by SPS Chapter 365 which incorporates the use of NFPA 54-2015 for gas piping installations.
5. Gas piping installed on the roof or exposed outside the building shall be painted with rust resistant epoxy paint, bright yellow color, and labeled "Natural Gas" or "Propane", as appropriate. The gas pressure in the pipe shall also be included in the labeling. Labels shall appear every 50' minimum.
5-A. Underground gas piping shall be seamless plastic, orange in color, and shall be in compliance with ASTM D 2513. The anodless riser from the plastic pipe, connecting to the steel piping in the building, shall be factory assembled and installed in accordance with the manufacturer's recommendations.
6. This contractor shall provide gas pressure regulators at all necessary locations. Regulators shall be Fischer, Equiquip or Maxitrol and shall be installed in accordance with the manufacturer's recommendations and all applicable codes and standards.
7. Gas pressure regulators shall be vented to the outside, where required as noted above.
8. All gas connections to all equipment shall include the following: shut-off valve, full size dirt leg, minimum 12" long stainless steel (Dormont, Flex-Hose, True-Flex or Parker) flex gas connector or 18" long GasTite or approved equal.
9. All screwed fittings shall be new and may not be re-used. This is in accordance with NFPA 54. The couplings that come on steel pipe to protect the threads may not be used.
10. Gas pressure regulator vent piping may be steel, aluminum alloy or copper, where allowed by the 2015 International Fuel Gas Code, as amended by SPS Chapter 365.
11. Above ground portions of gas piping systems (other than CSST) shall be bonded to an effective ground-fault current path. Gas piping (other than CSST) shall be considered to be bonded where it is connected to appliances that are connected to the equipment grouping conductor of the circuit supplying that appliance.
12. Corrugated stainless steel tubing (CSST) gas piping systems shall be bonded to the electrical service grounding electrode system at the point where the gas service enters the building. The bonding jumper shall not be smaller than 6 AWG copper wire or equivalent. A licensed electrician is not required unless the bonding is occurring within the electrical box, or if local rules are more strict.

Thermostats

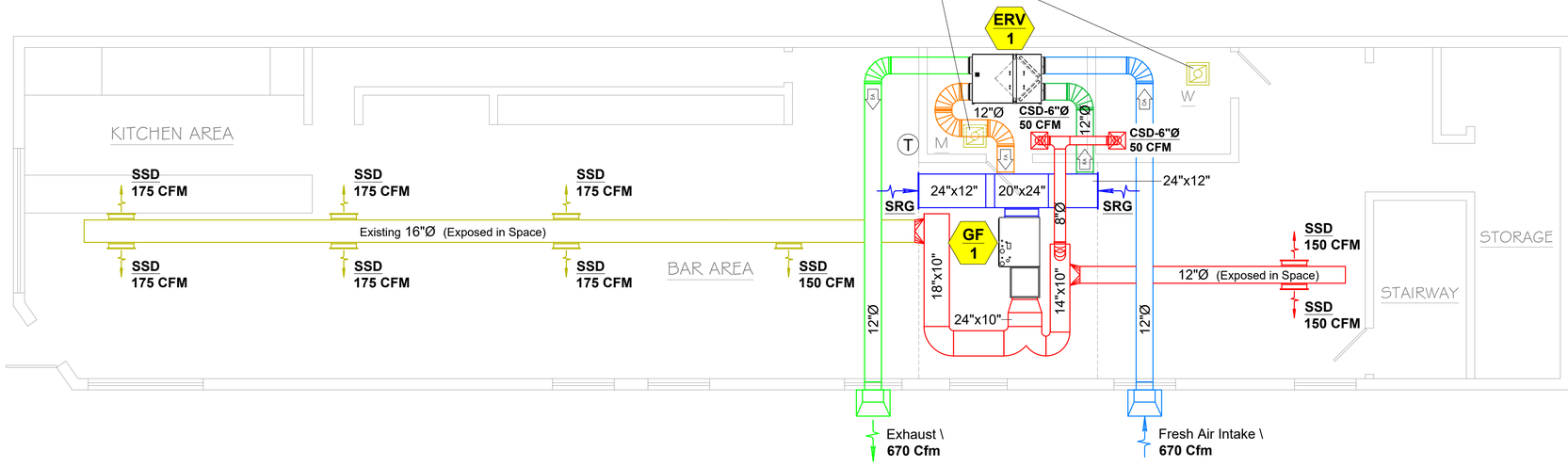
1. Thermostats shall be capable of heating and cooling control and shall be suitable for use with the provided HVAC equipment.
2. Thermostats shall be installed at ± 48" AFF to bottom and shall be installed in compliance with Wisconsin ADAAG requirements.
3. Coordinate final thermostat locations with the General Contractor.
4. Thermostats shall provide night set-back / occupied-unoccupied controls for both heating and cooling.
5. Thermostats shall be in compliance with Wisconsin Energy Code.
6. Thermostat for forced air furnace shall have capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F or up to 85°F. Thermostat shall be initially programmed with a heating temperature set point no higher than 70°F and cooling temperature no lower than 78°F.

Duct Insulation Schedule

Service	Location						
	Outside Building Envelope	Unheated Attic Space	Above Ceiling but Below Attic	Interior Wall Cavity or Chase	Wall Cavity or Chase on Exterior Wall	In Ground, Under the Slab	Exposed In Occupied Space
Supply	R-12	R-8	R-6	R-6	R-6	R-8	None
Return	R-12	R-8	R-6	R-6	R-6	R-8	None
Exhaust	None	R-8	R-6	R-6	R-6	R-6	None
Fresh Air	None	R-8	R-6	R-6	R-6	R-6	R-6

Notes:
1) Minimum values for installed insulation. Pre-application values may need to be higher in order to meet installed value requirements.
2) Contiguous vapor barrier is required on all insulated ductwork.
3) All ductwork outside of the building envelope must be sealed weather tight with an approved with an approved weather coating such as"Alumaguard 60" by PolyGuard Products.

Existing restroom exhaust systems to remain. No changes.



Floor Plan - HVAC

Scale: 1/4" = 1'-0"

0' 2' 4' 6' 8' 10' 12'

North

NARROWSCOPE DUCT CONSTRUCTION TABLE 1-4 EX

SMACNA © 1" W.G. STATIC POS. OR NEG.

TRANSVERSE JOINT REINFORCEMENT | INTERMEDIATE REINFORCEMENT

① DUCT DIM.	② DUCT GA. (MAX.)	③ REINF. SPACING (MAX.)	④ REINF. CODE GRADE	⑤ HEMMED "S" SLIP T-4 SLIP GAGE	⑤ HEMMED "S" SLIP T-4 BACKUP	⑥ STANDING "S" T-10 H X T	⑦ STANDING "S" T-12 H X T	⑧ CROSSING "S" (ANGLE REINFORCED) T-14 H X T + HR	⑨ POCKET LOCK T-17 H	⑨ BAR REINF. POCKET LOCK T-18 LOCK T, DUCT T, HR	⑩ COMPANION ANGLES (CAULK OR GASKET) T-22 H X T	⑪ ANGLE H X T (MIN)	⑫ ZEE H X B X T (MIN)
12"-DN	26	NONE		24	NONE								
13"-26"	26	4'	A	24	*				T-17 1"	26 GA. LOCK		1 X 18 GA. OR 3/4 X 1/8	3/4 X 1/2 X 18 GA.
27"-36"	24	4'	C	24	*	1 X 26 GA.							
37"-42"	24	4'	D	24	*	1 X 24 GA.	1-1/8 X 26 GA.		T-17 1"	24 GA. LOCK		1-1/4 X 18 GA. OR 1 X 1/8	1 X 3/4 X 20 GA.
43"-48"	22	4'	E	24	*	1-1/8 X 20 GA. W= 3/16	1-1/8 X 18 GA.		T-18 1"	22 GA. LOCK 1 X 1/8 BAR	TWO 1 X 1/8	1-1/4 X .090 OR 1-1/2 X 16 GA.	1 X 3/4 X .090 OR 1-1/2 X 3/4 X 20 GA.
49"-54"	22	4'											
55"-60"	22	4'	F	24	*	1-5/8 X 22 GA. W= 3/16	1-1/2 X 24 GA.	1-1/2 X 24 GA. 1-1/2 X 1/8 BAR	T-17 1-1/2"	22 GA. LOCK		1-1/2 X 1/8	1 X 3/4 X 1/8 OR 1-1/2 X 3/4 X 18 GA.
61"-72"	22	4'	G	24	*	1-5/8 X 18 GA. W= 3/16	1-1/2 X 18 GA.	1-1/2 X 22 GA. 1-1/2 X 1/8 BAR	T-18 1-1/2"	22 GA. LOCK 1-1/2 X 1/8 BAR	TWO 1-1/4 X 1/8	1-1/2 X 3/16	1-1/2 X 3/4 X 1/8 OR 2 X 1-1/8 X 20 GA.
73"-84"	20	4'	H	22	*	NOT GIVEN	NOT GIVEN	1-1/2 X 20 GA. 1-1/2 X 1-1/2 X 3/16	T-19 1-1/2"	20 GA. LOCK 1-1/2 X 3/16 ANGLE	TWO 1-1/2 X 1/8	2 X 1/8	2 X 1-1/8 X 16 GA.
85"-96"	20	3'	I	22	*			2 X 20 GA. 2 X 2 X 1/8	T-19 1-1/2"	20 GA. LOCK 2 X 1/8 ANGLE	TWO 1-1/2 X 3/16	2 X 3/16	2 X 1-1/8 X .090
97"-UP	18	3'	J					2 X 20 GA. 2 X 2 X 3/16	T-19 1-1/2"	20 GA. LOCK 2 X 3/16 ANGLE	TWO 1-1/2 X 1/4	2 X 1/4 OR 2-1/2 X 1/8	2 X 1-1/8 X 1/8 OR 3 X 1-1/8 X 16 GA.

NOTES:
1. * MEANS USE BACK-UP MEMBER FROM COLUMNS 11 OR 12. EXCEPTIONS: THE DRIVE ONLY REQUIRES BACK-UP OVER 20" LENGTH.
2. SPACING IN COLUMN 3 REFERS TO JOINT-TO-JOINT, JOINT-TO-INTERMEDIATE OR INTERMEDIATE-TO-INTERMEDIATE.
3. THE SAME SHEET THICKNESS MUST BE USED ON ALL SIDES OF DUCT. EACH DUCT DIMENSION, WIDTH OR DEPTH, CONTROLS THE MINIMUM REINFORCEMENT REQUIRMENTS FOR THAT PARTICULAR SIDE.
4. DUCT SIDES 19" WIDE AND LARGER WHICH HAVE MORE THAN TEN SQUARE FEET OF UNBRACED PANEL SHALL BE BEADED OR CROSSBROKEN UNLESS THE DUCTS WILL HAVE EXTERNAL INSULATION OR INTERNAL LINER. THIS APPLIES TO DUCTS OF 20 GA. OR LESS.

Sealed Combustion Gas Furnace with A/C Schedule

Mark	GF-1	
Serves	Kitchen Area Bar Area Storage Men's R.R. Women's R.R.	
Heating Input	100,000 Btuh	
Heating Output	97,000 Btuh	
Fuel	Natural Gas	
Min. AFUE	96.00%	
Add-on Cooling Coil Size	4 ton w/ TXV	
Min. CFM Supply Air	1,600	
Min. CFM Return Air	670	
Min. CFM Outside Air	670 (41.9%)	
External S.P.	0.5"	
Arrangement	Horizontal	
Fan Motor	1 hp	
Furnace Electrical	115v	
Condensing Unit Size & Efficiency	4 ton - SEER 13.0	
Cond. Unit Electrical	208/230v-1 Phase	
Min. Circuit Amps	26.2 Amps	
Max. Breaker Size	40 Amps	
Disconnect @ Condensing Unit	Non-Fused	
Accessories	---	
Cooling Coil Section	Tempstar # **EAM4X48L21A**	
Condensing Unit Manufacturer & Model	Tempstar # **N4A348AKG**	
Furnace Manufacturer & Model	Tempstar # **F96VTN1002120A**	
Quantity	1	

Note:
Fresh air intake shall be open and furnace fan shall operate continuously during normal business hours.

Energy Recovery Unit Schedule

Mark	ERV-1
Serves	GF-1
Heat Exchanger Type	Enthalpy
Fresh Air CFM	670
Exhaust Air CFM	670
Winter Entering Outside Air	-10°F
Winter Tempered Leaving Air	+48.2°F
Summer Outside Entering Air	92°F db / 75°F wb
Summer Tempered Leaving Air	79.7°F db / 66.7°F wb
Approximate Winter Efficiency	68%
Approximate Summer Efficiency	55%
Fan Hp	0.75
Defrost Control	N.A.
Electrical Power	115v
Max. Power Watts	989
Max. Amps	8.6
Operating Weight	211 lbs.
Manufacturer Model #	Renewaire # **HE-1XJINH-S11HH--SANT---N**
Notes	---
Quantity	1

Indicates Existing & Equipment Ductwork to Remain

Indicates New Supply Air Ductwork

Indicates New Return Air Ductwork

H.V.A.C. Systems Installed by:

Badger State Heating & A.C.

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Sussex, WI. 53089
Bus: (262) 442-2508

Revisions	
8 October, 2021	

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PROJECT:
ALTERATIONS TO EXISTING BUILDING
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TSI JOB NO.: C21-01-13

DRAWN BY: BDD

CHECKED BY:

APPROVED BY:

DRAWING NO.: --

DATE DRAWN: 8 January, 2021

SHEET NO.: HVAC-1